Government of **Western Australia**
Department of **Health**

Chief Health Officer's Inquiry into Aeromedical Services in Western Australia

by Dr Marcus Kennedy

June 2022

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Preliminaries

Acknowledgements

We would like to thank all the individuals and organisations who lodged written submissions, completed online surveys, received the Inquiry team for site visits, attended public forums and appeared as witnesses at our formal hearings. Your participation and contributions were essential and highly valued.

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Inquiry team

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Contents

Figures

Tables

Executive summary

Introduction

Born of necessity, there is a long history of innovation and leadership in aeromedical practice in Australia, and Western Australia (WA) presents a case in point to demonstrate our reliance on aeromedical systems for provision of access to care in rural and remote settings.

There are few jurisdictions in the world where aeromedical services play such a crucial role as they do in WA; so ensuring the quality of service and its governance, and delivering continuous improvement and innovation in access, care standards and clinical outcomes, is more important than in a general hospital or fixed health service settings.

The need to innovate and to be progressive falls to relatively few organisations in aeromedical practice; the ability to research is challenged by the practicalities of a mobile and inherently fluid environment, which lacks much of the basic stability in systems that support research.

It is in this context that the Inquiry has been delivered at the request of the WA Chief Health Officer under the authority of Section 228(1) of the *Public Health Act 2016*, WA. The Terms of Reference required:

- a comprehensive analysis of all aspects of the current aeromedical systems
- comparative review of interjurisdictional systems
- the proposal of effective aeromedical services model and implementation strategy for WA.

Its goals have been to review the systems that are established and to provide advice and recommendations on improvement to both structure and process, with a view to ensure that those systems become and remain more effective and safer, dynamically progressive, inherently forward focused and proactive, and culturally supportive and just.

Background

The Inquiry was administered within the requirements of the *Public Health Act 2016* and the approach for the Inquiry was guided by the following principles:

- a strong focus on the Western Australian context
- listen, inform, engage, link, and connect with communities, consumers and partners
- a transparent, fair, accountable, and robust process
- consistent with contemporary, evidence based, good practice and policy directions.

Stakeholder input was a significantly valuable component of the Inquiry, with engagement of industry providers, users and health services both metropolitan based and regional.

The Inquiry engaged with stakeholders including:

- Government entities, such as the Department of Health, WA Country Health Services, Department of Fire and Emergency Services, Department of Finance, Australian Maritime Safety Authority
- contracted service providers, including Royal Flying Doctor Service Western Operations and St John Ambulance WA (holder of the clinical staffing contract for Emergency Helicopter Rescue Services)
- other stakeholders in the industry, including other providers and users of aeromedical services.

The Inquiry developed a strategic framework to form a basis for its assessment of the current state of aeromedical systems in WA. The framework comprised a hierarchy of structural and process matters, some of which are key to essentially all organisations, and others which are specific and integral to aeromedical and retrieval systems.

The domains of the strategic framework are:

- Policy and System, including corporate governance, the governance environment, and policy and procedures
- Aircraft, including aircraft types and distribution
- Aeromedical Case Activity, including current activity levels and consideration of comparative systems
- Case Coordination, including coordination systems and processes, case management, crewing and platform selection
- Clinical Governance, including systems and processes to optimise clinical outcomes and minimise risk
- Clinical Workforce, including credentialing, scope of practice, performance, and education
- Knowledge Management, including education, research, and the evidence base of practice
- Information Management, including operational and business systems
- Funding Model.

Using the strategic framework, the Inquiry sought through a range of consultative tools to describe the features of the existing aeromedical system and to understand its strengths and weaknesses.

The Inquiry performed a comprehensive review of available literature, research, reports, policy and strategy documents; a comprehensive bibliography was collated.

A current state review consisted of a systematic review of a range of data and information accessed or collated by the Inquiry including:

- WA policy and planning context – key documents were reviewed
- review of the WA health service structures and context
- administration of a current state questionnaire to stakeholders (providers, users, government bodies, community, others)
- consideration of a range of written submissions – requested and spontaneous
- review of service provider workload metrics, performance measures, contracts, budget and financial data
- site visits to numerous facilities (aeromedical and health)
- public forums across the entire state
- targeted follow-up interviews with key stakeholders and service providers
- interjurisdictional reviews with leaders of interstate retrieval and aeromedical services.

Each component of the current state review process contributed to the development of considerations for the Inquiry. Many submissions, including statements of opinion, commentary and documentation were provided to the Inquiry and these were formulated into a 'Considerations Paper'.

The purpose of this paper was to provide an overview of the breadth of material and views received by the Inquiry in its assessment of the current state of aeromedical systems in WA. The material was edited, paraphrased and expanded with some analysis and expert commentary and subsequently represented to key stakeholders prior to the formal hearings of the Inquiry where considerations were addressed, endorsed, and challenged.

Each of the many considerations were viewed by the Inquiry as a noteworthy comment about the existing system, or an important reflection for a future WA aeromedical system.

For the purposes of the Inquiry, formal hearings were conducted as permitted under section 231 (1) of the *Public Health Act 2016*.

Witnesses were selected based on previous input provided to the Inquiry, including written submissions, attendance at the public forums, current state questionnaire responses and active roles within the existing system.

A total of 29 hearings were initially scheduled. Two additional hearings were scheduled after requests from registered stakeholders, bringing the total to 31 hearings. The hearings were conducted on 10, 11, 14 and 15 February 2022, at the WA Industrial Relation Commission premises, Level 18, 111 St Georges Terrace, Perth WA 6000.

Findings

Although a review or inquiry fundamentally focusses on improvement opportunities, and because of what that may confront, it is important to note that the current standard of aeromedical services in WA reflects the dedication and capability of individual staff and individual organisations.

The overwhelming impression of this system is of a potential that is yet to be fully realised. It has the potential to be a high-performing, safe and reliable system – if it can be integrated and united in common purpose, where organisational perspectives are structured for collaboration and an unwavering focus on the patient and their complex, and sometimes hazardous, journey.

The findings of the Inquiry were reached through amalgamation of the current state data, material produced in the considerations paper, and evidence and discussion arising at the Formal Hearings. They are summarised in this paper after careful deliberation over the 192 considerations raised and over 30 hours of evidence presented at the Hearings.

Consistently through this mass of material and data, it was clear that the overwhelming issue facing WA aeromedical services is the lack of a mature system of governance. Inherent in this is a lack of strategic oversite and an uncontrolled approach to service development and management of service gaps and policy. At each turn and in each involved organisation there is a form of governance (mostly effective at a local level), however there is no consistency, no overall systems view, little commonality, and a culture of competition - not effective collaboration. There is no party or organisation tasked with management of the overall system and all its complexity, inter-dependencies and competing demands. To consumers this is incongruous and unfathomable, and they along with clinical users of the system are often left wondering about how much focus is directed to what really matters: appropriateness, effectiveness, timeliness, clinical safety and quality of services.

The conclusion that one could draw from this situation is simply a need for stronger leadership, however, within the system there is no shortage of competent leaders, but there is an absence of cohesion. The findings repetitively returned to themes of siloed behaviour. In consideration of other jurisdictions, it was clear that where similar issues had been identified in the past, a reform program to establish a state-wide approach through development of system-level governance processes is effective.

Best examples of aeromedical culture demonstrate a patient focus across the entire care journey and a commitment to building and improving the system to narrow 'the gap' experienced by populations that is due to geography or resource limitation. These cultures are underpinned by excellence in clinical governance.

The relationships between the health system and the providers of aeromedical services (contractors) are undoubtedly better managed in jurisdictions where a single body centrally manages governance, performance, contracting and service development and scope. WA has a long history of productive work with RFDS as its major aeromedical services supplier, however it is clear in the findings of

the Inquiry that there is scope for significant improvement. Whether existing challenges relate to 'suboptimal management', 'supplier assertiveness', 'governmental strategy gaps' or simply the evolution of population, health services and patient need is unclear – however, the solution lies within a reform program as described.

Perhaps the greatest value of system reform and improvement is the opportunity to build an organisation which has a strategic focus as this avoids a repetition of the findings related to lack of system design, relative under-resourcing of remote populations, and a lack of effective organisation of rotary wing services (which have become such an integral component of effective modern health systems). Major findings detail a need for significant expansion to WA rotary wing services and significant improvement in ERHS rotary wing staffing model. Additional government investment will be required as the benchmarked gap in rotary wing capability is notable, however, in many jurisdictions partnerships between government, benevolent bodies, and industry provide collaborative solutions. What all parties gain through the improvements achieved are major enhancements in consistent effective care delivery for their people – reducing or eliminating bespoke responses with varying clinical governance approaches.

Recommendations

Where health systems have evolved rather than being planned from the outset, it is common that they focus primarily on the important aspects of clinical process and direct service delivery. Governance systems, interagency policy and relationships, and mechanisms for collaboration often miss out. When attempts are made to 'retro-fit' policy, strategy and governance systems they run a risk of becoming lost in their own paradigm and not connecting to the operational needs of a system effectively.

The challenge in significant system change (when it is required) is to imagine the perfect future state, the 'greenfield option', and then to balance it against the existing – resolving the dissonance in an achievable, constructive, optimised way.

The WA aeromedical system needs significant change if it aspires to best contemporary practice – clinically and organisationally. To be effective, this change will acknowledge the best of the past, but will also commit to a different future.

Much of the recommended change will involve new ways for organisations and their people to work together — often, providing services and care differently — rather than providing completely new services. However, there will also be some new processes, new ways of thinking, new shared values, and new clinical systems.

With these changes will come a need for cultural development, different approaches to contractual relationships, and an ability to collaborate around the patient journey in a way that is patient centric and agnostic of organisational competition, power, or influence.

The Inquiry recommendations are intended to be read in the context of the findings presented in detail within the report. They are the conclusions reached by the Inquiry regarding the whole of the materials in the findings and as otherwise considered. The strategic framework and therefore the findings of the Inquiry are complex assessments of a significantly fragmented system – they inform the many components of a future system as described in the body of the report. The recommendations listed in this executive summary are each informed and dependent upon a range of specific advisories and have been cross-referenced from the Inquiry Findings.

There are 10 principal recommendations and a range of secondary or enabling recommendations. In addition, important qualifying notes and rationale accompany each recommendation in the body of this report.

1. Develop a 10-year Strategic Plan for Aeromedical Services

1.1 Commission an independently-chaired, Implementation Group to manage the project of works arising from the Inquiry including development of the draft strategic plan (to incorporate retrieval and outreach functions including emergency telehealth) and initial business plan.

1.2 The Implementation Group has a 2-year tenure.

2. Establish a new structure to provide a centralised system of governance for aeromedical services

2.1 Establish an office within WA Health (system manager) which is responsible for the implementation and ongoing governance, coordination and development of aeromedical and related services.

(For the purposes of this report referred to as: The Office of Aeromedical Services, Retrieval and Outreach).

2.2 The Office of Aeromedical Services, Retrieval and Outreach will develop the Aeromedical Services Service Model and Capability Framework.

2.3 The Office of Aeromedical Services, Retrieval and Outreach will be responsible for management of all aeromedical contracts (fixed wing and rotary wing) and related budgets and performance.

Contract management specifically includes rigorous oversight of aviation standards compliance, staff credentialing and scope of practice standards, and all clinical governance standards.

2.4 Office of Aeromedical Services, Retrieval and Outreach becomes responsible for promoting and managing health interests in Helicopter Landing Site and airstrip management, including advocacy and technical support for expansion of Helicopter Landing Site infrastructure.

2.5 Research and education in the sector are promoted and supported.

3. Building on the existing WA Country Health Service (WACHS) command centre, establish a whole-of-State Coordination Service[1] administered by the Office of Aeromedical Services, Retrieval and Outreach.

3.1 Coordination functions currently bundled within the Royal Flying Doctor Service – Western Operations (RFDS) contract are extracted, and the process is transferred to the coordination centre (in which RFDS is represented).

3.2 Improve central coordination of aeromedical services aircraft tasking.[2]

The coordination service is responsible for all aeromedical services aircraft tasking except for rotary wing primary response (tasking is via St John Ambulance (WA)).

Despatch (unchanged)[3]: fixed wing despatch functions are provided by the fixed wing contractor(s), and rotary wing despatch functions are provided by St John Ambulance (WA).

3.3 The coordination service is responsible for arbitration of all conflicting Aeromedical System tasking requests or prioritisation.

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1 Coordination Service Functions: 24/7, call taking, case data collection, case assessment including telehealth, provision of standardised evidence-based early and interim clinical advice, case formulation and planning, transport and destination coordination, case follow up and associated clinical governance functions.

2 Tasking: Communication to a despatcher of a decision to activate and respond to a case utilising a particular aircraft type (FW or RW), with a specified crew mix, and with a specified urgency (time to departure) based on the clinical needs and acuity of a case.

3 Despatch: The process of sourcing and allocation of a specific aircraft and crew, provision of data and logistic support to the pilot, scheduling documenting and facilitating departure, including flight-tracking, coordination of flight segments and support ground logistics, and troubleshooting mission issues.

4. Review and revise the fixed wing contract(s) and services to implement a more rigorous and clarified service relationship with providers.

4.1 The contract(s) must be improved to reflect contemporary standards and expectations and must be monitored and managed effectively.

4.2 Although 10-year contracts are common in Aeromedical systems an initial approach of 5 years with an additional 5-year option for WA Health is recommended.

4.3 Funding conditions and financial models are reset for 10 years (with interim reviews of rates) after further interjurisdictional benchmarking and audit – it is recommended that a contemporary payment framework or model is developed based on first principles.

4.4 Parallel commercial or other activity of contractor(s) (e.g. Commonwealth or industry contracts) must be managed transparently and must not give rise to conflicts of interest.

5. Improve regional rotary wing aeromedical capability

5.1 Complete analysis through the Service Refinement Plan to inform the necessary expansion of the Rotary Wing Aeromedical Services in a coordinated network to meet the needs of inland (Goldfields), coastal, remote and offshore populations.

6. Improve rotary wing operations capability in the Perth and Southwest regions

6.1 Consolidate all rotary wing operations in the Perth and SW regions to a single operator system (Emergency Rescue Helicopter Service). Specifically, implementation of the proposed RFDS EC145[4] services are not recommended.

6.2 Immediately expand the Perth/Bunbury Emergency Rescue Helicopter Service AW139[5] fleet by one additional aircraft, to meet current demand (particularly in interhospital transport).

6.3 Supplement current rotary wing Critical Car Paramedic (CCP) crewing with a second clinical crew member immediately.

It is recommended that the governance of this change be overseen by the Office of Aeromedical Services, Retrieval and Outreach and that should include crewing by consultant medical practitioners (appropriately trained for the primary response environment) as the second clinical crew member in selected platforms and/or at selected bases.

7. Standardise and implement a whole system Clinical Governance Framework.

7.1 Through the Clinical Governance Framework promote common clinical guidelines including tasking and crewing guidelines, commonality and compatibility of equipment and systems, and shared systems for Audit, Case Review, and Adverse Event reporting.

7.2 The Office of Aeromedical Services, Retrieval and Outreach defines standards and oversees credentialing and scope of practice of all aeromedical services health practitioners.

8. The Office of Aeromedical Services, Retrieval and Outreach establish a WA road retrieval service (aligned to the aeromedical services model and distinct from an ambulance interhospital transport service), providing governance, coordination, tasking and support.

8.1 Initially, the road retrieval service should service the Perth, Bunbury and peri-urban areas.

4 Eurocopter Helicopter model 145 / Airbus Helicopters H145

5 AW139 – Helicopter model – Augusta Westland/Leonardo

8.2 Road retrieval capability from collocated[6] regional aeromedical services bases and WACHS campuses should be developed as a part of the Service Refinement Plan and planning of future facilities or system modifications.

9. Implement contemporary enabling information systems and technologies.

9.1 Data contribution and linkage to a central (national) registry for benchmarking and research at a national level is recommended.

9.2 Ensure clinical information systems interface as effectively as possible with those of the WA Health system.

10. Provision of additional funding for system improvement and development.

10.1 Determination of funding sources (additional State and/or Commonwealth, or redistributed funds) will be informed by recommendation 4 (RFDS contracts including contract components for provision of coordination services $3M pa and for purchase of rotary wing interhospital transport services $0.8M pa).

10.2 A formal business plan is required to accurately cost the total amount of additional funding required (Beyond the scope of the Inquiry).

10.3 Indicative start-up funding for years 1 and 2, that is, support and administrative (not ongoing operational): $0.75M pa.

10.4 Indicative immediate additional recurrent funding requirement including governance, coordination, road retrieval establishment and limited (one aircraft) rotary wing fleet expansion: $12.5M pa.

10.5 Indicative future additional rotary wing Fleet expansion: $20–25M pa.

Implementation strategy

Based on the recommendations above, a standard program implementation methodology (of local preference or capability) is necessary to implement the significant developments and changes required. In summary (at the highest level):

- **Acceptance of recommendations:** The Chief Health Officer, WA Health, and Government must consider the Inquiry recommendations and formally decide upon and communicate their acceptance and application of budget.
- **Funding:** Despite the most demanding demographic and geographical scenario in Australia and perhaps the world, the WA Aeromedical System is significantly under-funded and under-resourced. If progress is to be made, gaps in access to healthcare redressed, and contemporary health governance, safety, and outcome standards achieved, then substantial additional funding is required.
- **Acceptance of the proposed establishment of a service/office** (Office of Aeromedical Services, Retrieval and Outreach) within WA Health. Whilst the initial inclination may be to apply a devolved governance approach, this is advised against, given the fundamental (and high level) whole-of-health system role of the proposed service and its fundamental connection and synergy with current functions which are within Health (putative State Health Operations Centre, Patient Flow Coordination Centre, Major Incident Management).
- **Commission an Implementation Group** (independently chaired) to oversee the project of works arising from the Inquiry.

6 Collocated: refers to collocation of (WACHS) health service and FW contractor (RFDS) service base.

The Implementation Group would:

- Oversee early works (Goals and deliverables of the improvements and developments, perceived functional model, service location, management structure and processes, budget considerations).
- Define the vision and mission of the new service – A service needs to understand its goals and aspirations in terms of vision (organisation-values-based, humanistic, future-system-focused, constant) and its mission (the way forward, actions-to-goals, dynamic, stakeholder-linked).
- Develop a draft strategic plan engaging executive, consultants (if required), specialist advisors, service leaders.
- Establish the Office of Aeromedical Services, Retrieval and Outreach and Recruitment of a Director and principal support staff to establish the service including:
  - early development of a Clinical Governance Framework
  - development of the Service Model and Capability Framework
  - development of the formal Program Implementation (and Evaluation) Plan
  - develop an infrastructure and coordination centre establishment plan – serious consideration should be given to collocation of the coordination centre with like organisations.
- Define the pathway to implementation from start-up to year 10 (over the page).

0–6 Months	Immediate developments and implementation
6–12 Months	Transition of services and processes
12–24 Months	Embedding and assessment (measurement and evaluation)
24 Months	Develop a Service Refinement Plan, based upon data and analysis to date. Utilise the SRP to update and modify the draft strategic plan (with consultation/authorisation)
24 Months	Finalise strategic plan
24–36 Months	Implement the Service Refinement Plan and embed systems
36+ Months	Functioning established maturing service
5 Years	Interim review including contracts and performance at 5 years
10 Years	Strategic plan and service review years 9–10

1. Background

In December 2016, the Coroner investigating the death of Mr Pu on board the MV Equator Prosper off the coast of Port Hedland, recommended that there be an independent strategic review of the aeromedical (rotary wing) retrieval services. Additionally, there have been other concerns raised regarding deficiencies in corporate and clinical governance, and lack of cohesion in the current aeromedical services.

On 3 January 2020, Minister for Health, Hon Roger Cook MLA formalised a request to the Chief Health Officer to conduct an Inquiry under Section 228(1) of the *Public Health Act 2016*, into Western Australian aeromedical services, and make recommendations for the improvement of contract management, clinical oversight, tasking coordination and patient outcomes.

The Inquiry was due to begin in March 2020, however due to the onset of the COVID-19 Pandemic becoming a priority for WA Health, the Inquiry was subsequently deferred in March 2020 for 6 months, and subsequently deferred again in September 2020 for a further 6 months.

On 17 May 2021, the project office for the Aeromedical Services WA Inquiry was established and began preparatory work for the Inquiry.

2. Terms of reference

The Aeromedical Services WA Inquiry was established under part 15 of the WA *Public Health Act 2016*. The aim of the Inquiry is to review current arrangement for aeromedical transport and make recommendations for improving patient outcomes and related governance and coordination arrangements.

As specified in the terms of reference, the Inquiry will:

- Establish current knowledge of aeromedical transport arrangements in Western Australia (WA), including matters relating to the role of WA Health, governance (including clinical governance), workforce, contract management, coordination and tasking of assets, access to services, and cost
- Evaluate interjurisdictional models of aeromedical transport for their suitability to the WA context
- Review and analyse the information obtained and devise an appropriate, efficient, and effective model for WA
- Identify and recommend a program of work to enable the development of an operational aeromedical model for WA, with appropriate governance, adequate resourcing, and coordinated tasking and communication.

3. Conduct of the Inquiry

3.1. *Public Health Act 2016*, Part 15 – Inquiries

The Minister for Health requested the state's Chief Health Officer (CHO) conduct an Inquiry into aeromedical services (AMS) in Western Australia under part 15 of the *Public Health Act 2016*. The CHO appointed an independent external consultant, Dr Marcus Kennedy, to conduct the Inquiry on his behalf (the Inquirer) providing directions in writing, including full powers under section 232 (1).

Therefore, for the purposes of conducting the Inquiry, the Inquirer (Project Lead) has the following powers, such that they:

- may, by written notice, require the attendance of a person at a place and time specified in the notice; and
- may, by written notice, require a person to produce at a place and time specified in the notice a document that is in the possession or under the control of that person; and
- may inspect any document produced and retain it for any reasonable period that the inquirer thinks fit, and may make copies of it or any of its contents; and
- may require a person to take an oath or make an affirmation and may administer an oath or affirmation to a person; and
- may require a person to answer any question put to that person.

3.2. Guiding principles

The approach for the Inquiry will be guided by the following principles:

- A strong focus on the Western Australian context.
- Listen, inform, engage, link, and connect with communities, consumers and partners.
- A transparent, fair, accountable, and robust process.
- Consistent with contemporary, evidence based, good practice and policy directions.

3.3. Governance arrangements

The Project Sponsor is the Chief Health Officer, and the Project Lead is an independent external consultant appointed by the Chief Health Officer.

A nominated Project Director and project support staff (the Project Team) manage this project.

The Project Team is supported by subject matter experts within the Department of Health.

The Project Lead and Project Director report directly to the Chief Health Officer as the Project Sponsor.

The Project Lead and Project Director attend monthly meetings with the Project Sponsor and Project Control Group.

The Project Sponsor provides updates on the Inquiry to the Department Executive Committee (DEC) and Health Executive Committee (HEC) quarterly.

4. Stakeholder engagement

Stakeholder input was a significantly valuable component of the Inquiry, with engagement with industry providers, users and health services both metropolitan based and regional.

The Inquiry engaged with stakeholders including:

- Government entities, such as the Department of Health, WA Country Health Services, Department of Fire and Emergency Services, Department of Finance, Australian Maritime Safety Authority
- contracted service providers, including Royal Flying Doctor Service Western Operations and St John Ambulance (holder of the clinical staffing contract for Emergency Helicopter Rescue Services)
- other stakeholders in the industry, including other providers and users of aeromedical services.

Identified stakeholders were engaged though initial invitations to register their interest, tailored surveys, open written submission, public forums and for some formal hearings. The Inquiry office leveraged the Department of Health's own channels such as website, consultation platforms, intranet and email to communicate messages with stakeholders, and paid media to encourage attendance at public forums.

A list of stakeholders and parties engaged through the Inquiry is provided at Appendix 1.

5. Strategic framework

The Inquiry developed a strategic framework to form a basis for its assessment of the current state of aeromedical services (AMS) in WA. The framework comprised a hierarchy of structural and process matters, some of which are key to essentially all organisations, and others which are specific and integral to aeromedical and retrieval systems. For example, the items listed under Corporate Governance would provide a generic framework against which to review the corporate structures and processes for most organisations. Similarly, Clinical Governance provides a framework applicable to many clinical services. In distinction, Case Coordination provides a framework clearly applicable to aeromedical services (but would also apply to road retrieval services and ambulance services).

Expert knowledge, consultation, and reference to key documents influenced the development of the strategic framework, including:

- A statement on accreditation of retrieval services: *corporate and clinical governance, Australian Association of State Medical Retrieval Directors*, 2018, version 3.0 (Personal Communication, Dr A. Pearce)
- *Aeromedical Society of Australasia (ASA) Standards for Aeromedical Services*, 2020. aeromedsocaustralasia.org/Standards.aspx
- NSW Ministry of Health, 2013, *Reform Plan for Aeromedical (Rotary Wing)* Retrieval Services in NSW. https://1library.net/document/y6m9xgoq-reform-plan-aeromedical-rotary-wing-retrieval-services-nsw.html
- *National Safety and Quality Health Service Standards* (second edition), 2021. ACSQHC. www.safetyandquality.gov.au/sites/default/files/2021-05/national_safety_and_quality_health_service_nsqhs_standards_second_edition_-_updated_may_2021.pdf

The 9 domains of the strategic framework are:

1. Policy and System, including corporate governance, the governance environment, and policy and procedures
2. Aircraft, including aircraft types and distribution
3. Aeromedical Case Activity, including current activity levels and consideration of comparative systems
4. Case Coordination, including coordination systems and processes, case management, crewing and platform selection
5. Clinical Governance, including systems and processes to optimise clinical outcomes and minimise risk
6. Clinical Workforce, including credentialing, scope of practice, performance, and education
7. Knowledge Management, including education, research, and the evidence base of practice
8. Information Management, including operational and business systems
9. Funding Model.

Using the strategic framework, the Inquiry sought through a range of consultative tools to describe the features of the existing aeromedical system and to understand its strengths and weaknesses.

We present the components of the strategic framework at Appendix 6 along with the features of each component which the Inquiry explicitly sought to initially review. We considered many other features as consultation and engagement progressed through the processes of the review.

6. Literature reviews/bibliography

6.1. Research and systematic reviews

Review of the health and general peer-reviewed literature databases using a broad range of search strategies failed to reveal significant relevant contemporary publications related to aeromedical systems evaluation, development, governance, implementation or improvement.

Several observational or descriptive publications were noted (see bibliography) which provided an overview of single service activity over time. In general, these were relatively superficial, used inconsistent methods and were unable to provide models or benchmarks for broader systems analysis.

6.2. Industry and service (commissioned) reviews

A range of commissioned reviews of aeromedical and retrieval services were made available to the Inquiry (some confidentially). These assisted in the establishment of the strategic framework and methodology of the Inquiry, however, none provided a blueprint or standard for 'review of an aeromedical system' due to the specific goals, terms of reference, and limitations of those reviews.

Reviews accessed:

- Queensland Government Department of Health ('Department'): *DLA Piper review of provision by the Royal Flying Doctor Service (Queensland Section) ('RFDS') of aero-medical and retrieval services, credentialing systems and clinical governance systems* 2015 (Confidential Review — Inquirer was a panel member)
- RFDS QLD: *Review of Clinical Governance systems, oversight and integration with partner organisations*, 2016 (Confidential Review – performed by the Inquirer)
- Safer Care Victoria: *Independent assessment of the quality and safety of Ambulance Victoria's aeromedical critical care services*, 2020 (Unpublished Review – personal communication)
- NSW Ministry of Health, 2013, *Reform Plan for Aeromedical (Rotary Wing) Retrieval Services in NSW* www.health.nsw.gov.au/about/nswhealth/Publications/helicopter-reform-plan.pdf
- Tasmanian Dept Health. *Tasmanian Medical retrieval services Review*, Sharly, 2007.

6.3. Specific texts/literature

It is straightforward to access general texts and white papers relating to systems assessment and review, program evaluation, and system innovation, however, there are very few publications relating to governance of aeromedical systems. The small sample listed below are 2 relatively generic approaches to the subject. The first provides a reasonable blueprint, perspective and method for implementation or revision of an (aero)medical retrieval system, the second provides an insight into the structures, scale, and governance of aeromedical and outreach systems in the USA. Neither provides a standard methodology for assessment on an aeromedical program or system.

- Evans C, Creaton A, Kennedy M, eds. *Oxford Specialist Handbook of Retrieval Medicine*. 1st ed. Oxford: Oxford University Press; 2016. Chapters 1–5 On Retrieval systems and governance.
- David C. Cone MD, Jane H. Brice MD, MPH, Theodore R. Delbridge MD, MPH, J. Brent Myers MD, MPH, Editor(s): *Emergency Medical Services: Clinical Practice and Systems Oversight*, Third Edition, First published:18 August 2021, Print ISBN:9781119756248 |Online ISBN:9781119756279 |DOI:10.1002/9781119756279, © 2021 NAEMSP. Vol 2 Chapters 70-75.

6.4. Bibliography

The bibliography at Appendix 7 provides a catalogue of materials of relevance to aspects of the Inquiry. The bibliography contains citations and abstracts of all Inquiry referenced papers and a range of other materials of significance to aeromedical and retrieval services.

7. Current state

The current state review consisted of systematic review of a range of data and information collated by the Inquiry including:

- WA policy and planning context – key documents were reviewed
- review of the WA health service structures and context
- administration of a current state questionnaire to stakeholders (providers, users, government bodies, community, others)
- consideration of a range of written submissions – requested and spontaneous
- review of service provider workload metrics, performance measures, contracts, budget and financial data
- site visits to numerous facilities (aeromedical and health)
- public forums across the entire state
- targeted follow-up interviews with key stakeholders and service providers
- interjurisdictional reviews with leaders of interstate retrieval and aeromedical services.

7.1. WA policy and planning context

The Aeromedical Services WA Inquiry recognises the overarching strategic planning documentation that guides the Department of Health and Health Service Providers, with 3 documents identified as pivotal to the strategic direction relating to the Inquiry.

The documents that were considered are:

1. *The Clinical Services Framework 2020 Addendum* (Department of Health, Western Australia)
2. *The Sustainable Health Review Final Report 2019* (Department of Health, Western Australia) and the closely aligned *Ambulance Services Framework* (2021)
3. *WA Country Health Service Strategic Plan 2019–24* (WA Country Health Service).

There are several key facts, strategies, recommendation, priorities and actions, within the documents, that were identified as specifically relevant to the Inquiry, and these are highlighted as follows, and were considered throughout the Inquiry process and recommendations development.

Clinical Services Framework 2020 Addendum

The Director General, Department of Health, states:

'*The Clinical Services Framework 2020 Addendum* provides and interim, guiding resource, referencing the number of the major structural and strategic reforms that play a pivotal role in the way health services are delivered across the WA health system, besides providing updated public and private hospital matrices.

'Delivering safe, high quality and sustainable health services that support and improve the health of all Western Australians remains our focus, and the *Clinical Services Framework 2014–2024* and supported by this update, the *Clinical Services Framework 2020 Addendum* both provide a foundation for the whole health system in planning to meet the demand for health services given changing services capabilities and evolving models of care. They remain a reference point for determining requirements in workforce and infrastructure and for integrating new technology.

'To ensure our services are well-placed to support people across the continuum of care into the coming decade and beyond, the Department of Health will commence work at the end of 2020 to develop a completely revised and comprehensive updated clinical services planning document to support health system planning in the coming decades.' (p2–3)

This *Clinical Service Framework (CSF) 2020 Addendum* highlights that as the system manager, it is the responsibility of the of the Department of Health to ensure allocation of resources to the WA public health system, that reflects the prioritised health needs of the population.

The scope of this document focuses on the key components of the *Clinical Service Framework 2014–2024 (CSF 2014–2024)*, ensuring that they are current and robust enough to guide WA's health system during Phase 2 (November 2020 plus 18–24 months). The *CSF 2020 Addendum*, also aims to address any urgent service changes, leading to better performance, improved access, safety and quality of service, that reflect updates to the *CSF 2014–2024*, in the areas of: characteristics of the WA Populations, Metropolitan and WACHS Hospital Matrix, and Non-government Health Service Providers Matrix.

The *CSF 2020 Addendum* strategic priorities align with guidance and recommendations as informed by:

- *The Sustainable Health Review Final Report 2019* (Department of Health, Western Australia)
- *WA Digital Strategy 2020–2030*
- Review of Safety and Quality in the WA health system
- *Western Australian Mental Health, Alcohol and Other Drug Services Plan 2015–2025*
- *Mental Health Act 2014*
- Review of the Clinical Governance of Public Mental Health Services in Western Australia
- Elective services reform
- Outpatient Reform Program
- Infrastructure – construction and commissioning or upgraded health facilities (since CSF 2014–2024 initial release)
- *WA End-of-Life and Palliative Care Strategy 2018–2028*
- End of Life Choices (*My Life, My Choice report*)
- Voluntary Assisted Dying legislation
- *The WA Cancer Plan 2020–2025*
- Public Health
  - *Public Health Act 2016*
  - Public health strategic plans and frameworks specific to:
    - Aboriginal Health
    - Chronic Disease Prevention
    - Genomics
    - Communicable Disease Control
    - Environmental Health.

The *CSF 2020 Addendum* highlights the identified changes in the WA population and the level of demand, which is an important consideration for the Inquiry and aeromedical services now and going into the future.

Regarding population:

'The WA estimated resident population as of 30 June 2019 was 2,621,680 people an increase of 104,072 people since 20 June 2014 (4%). This is a marked decrease in growth from the previous 5 years (2009 to 2014) when the population increased by 300,422 people (13%). In 2009 the proportion of people aged 65 and over was 12%, increasing to 15% in 2019.

'Over the next 5 years, to 30 June 2024, the population is projected to increase by 210,133 (8%) with the proportion of those aged 65 and over increasing to 16%. Population projections are obtained from WA Tomorrow, 2018 developed by the Department of Planning, Lands and Heritage and have not considered changes due to COVID-19 pandemic.' (p19).

Regarding the level of demand:

'Inpatient, emergency department and outpatient activity demand projections are undertaken to determine the output of the WA Health system. These projections are refined through clinical consultation, consideration of policy direction and input from clinical service planners. We should note that no matter how carefully these projections are developed, they become less exact the further they reach into the future.

'Increases in demand for hospital services are driven by:

- population growth and ageing
- technology development
- diagnostic and pharmaceutical changes
- patient expectation.

'Over the next 5 years there is an expectation that there will be continued growth in demand for services with an 11% increase in inpatient separations, a 9% increase in emergency department presentation and 22% growth in outpatient occasions of service.' (p.20).

The updated matrices within the *CSF 2020 Addendum*, describe the actual service levels across hospitals for *FY20/21*. This is shown next to the endorsed service level, set out by the *CSF 2014–2024*, and the *FY 2024/25* endorsed service level (where services are planned to be). In review of the matrices, there are no specific service deficiencies identified for individual hospitals in review of the current services listed, however, it is clear from the information presented that outside of the metropolitan area, regional and remote health care facility services vary and, in many cases, limited.

Sustainable Health Review

The Sustainable Health Review Panel's final report (*Sustainable Health Review*), published and released in 2019, provides guidance and direction to the WA health system to ensure delivery of patient-first, innovation and financially sustainable care.

This report aims to drive a cultural shift, with a strong focus for the health system on prevention, equity, early child health, end-of-life care, and seamless access to services at home and in the community through use of technology and innovation, in contrast to the current predominantly reactive, acute, hospital-based system. To do this, the report provides 8 enduring strategies and 30 recommendations.

In review of the *Sustainable Health Review*, several key facts highlighted, strategies and recommendations made within the document were considered specifically relevant to aeromedical services in Western Australia:

Key facts: (p.3)

Demand for services — 90 per cent of people attending an ED for acute mental health care in WA in 2016–17 waited for up to 15 hours before progressing to a suitable care environment.

Population health — People living in regional WA experience significant difference in health outcomes, with mortality rates for some conditions, such as coronary heart disease, 1.5 times higher than for people living in the metropolitan areas.

Strategies: (p.6-8)

Strategy 1: Commitment to collaboration to address major public health issues

- A sustained effort to reduce disparities in health outcomes and access to care.

Strategy 2: Improve mental health outcomes

- Mental health care must be integrated with physical health. Efforts should be focused on improving the patient journey and greater transparency of quality, safety, patient experience and outcomes.

Strategy 4: Person-centred, equitable, seamless access

- Telehealth and virtual services will become a regular part of service delivery in country and metropolitan areas, with much greater coordination and safer access for country patients to services they need.

Strategy 5: Drive safety, quality and value through transparency, funding and planning

- Partnerships with consumers, clinicians and researchers for high value health care will ensure clinical variation and waste is reduced.

Strategy 6: Invest in digital healthcare and use data wisely

- Investments in data systems and analytical capability will drive safety and quality, and support decision making for high value health care, innovation and patient choice.

Strategy 7: Culture and workforce to support new models of care

- A system-wide culture of courage, innovation and accountability will build on the existing pride, compassion and professionalism of staff and support the collaboration necessary for sustainable change. Capability will be developed to produce a cohesive, outward-looking system that work in partnership across sectors, with a strong focus on system integrity, transparency and public accountability.
- Contemporary workforce roles and scope of practice will be progressively implemented where there is a proven record of supporting better health outcomes based on community health needs and interdisciplinary models of care, rather than professional-based approaches.

Strategy 8: Innovate for sustainability

- There will be a culture that supports innovation at all levels, from whole-of-system policy and program design to the most basic aspects of on-the-ground services delivery.

Recommendations:

Recommendation 12 (p.15): Improve coordination and access for country patients by establishing formal links between regions and metropolitan health service providers for elective services including outpatients and telehealth, patient transfers, clinical support and education and training.

- Introduction and evaluation of a 24-hour WA Health Operations/Command Centre, commencing for

country patients to improve safety and quality, access to emergency and specialist services and patient transport and retrieval.

IR2 (p.25): Implement a pilot of the Emergency Telehealth Service Model in a least one other specialty in the country and metropolitan area.

WA Country Health Services Strategic Plan 2019–24.

The Chief Executive, WA Country Health Service, describes the *WA Country Health Services Strategic Plan 2019–24* as:

'A 5-year plan set against a 15-year horizon, this plan provides a roadmap for achievement of a sustainable future, and one which sees greater equity for country communities. It articulates the overarching mission which is to deliver and advance high-quality care for country WA communities. This reflects the importance of work we already do but highlights that we can always do more, and our desire is to advance healthcare for country communities drives us to achieve this. Our vision is to be a global leader in rural and remote healthcare.' (p.3).

In review of the *WA Country Health Services Strategy Plan 2019–24,* several identified actions relating to Priorities 1-3, 5 and 6 were considered specifically relevant to aeromedical services in Western Australia. They are as follows:

Priority 1 – Caring for our patients (p.11)

We will align our services locally to provide safe, patient-centred care, ensuring the needs of outpatients are at the core of everything we do.

Identified actions:

- Improve the patient experience through safer more integrated and tailored services.
- Engage with consumers to ensure that their needs are at the centre of everything we do.
- Provide car as close to home as possible – we leverage the opportunities presented by technology and a more flexible workforce to introduce, where possible, new models that provide more care closer to home.

Priority 2 – Addressing disadvantage and inequity (p.12)

We will deliver focussed and accessible services for those who need it most.

Identified actions:

- Improve health outcome for individuals and communities experiencing disadvantage – all country Western Australians should have the access to the same quality of care, irrespective of location, cultural background, or socio-economic circumstances.

Priority 3 – Building healthy and thriving communities (p.13)

We will support country people to be as healthy as they can be and continue to play out part in the economic and social viability of country communities.

Identified Actions:

- Improving mental health and wellbeing – this required timely access to the right service achieved by working closely with communities and other agencies.

Priority 5 – Collaborating with our partners (p.16)

We will partner to deliver more integrated services that will improve patient outcomes and experience, giving customers more choice and control.

Identified actions:

- Maximise the impact we deliver to country communities through partnerships – we develop a strategic approach to partnering that ensures we enter into partnerships that are mutually beneficial, aligned with our strategic priorities, and most importantly, deliver value for country communities.
- Create an integrated patient transport system – we know that travelling long distances is a difficult and sometime traumatic experience. We are committed to making patient transport a seamless, supported experience for all country patients. We will work with our partners to develop better ways of coordinating patient movements and supporting the entire patient journey. We will use transport networks and telehealth to provide more remote outreach services, reducing the need for patients to travel. We will work to continuously improve services access and coordination to deliver care closer to home.
- Support other providers to improve services access and choice.

Priority 6 – Leading innovation and technology (p.17)

We will continue to embrace innovation and technology to create a more connected and equitable health system.

Identified actions:

- Harness digital technology, data and artificial intelligence to deliver more innovative health services.
- Increase our use of virtual care and other technologies to provide more accessible care, closer to home – virtual health technologies have the potential to improve access to care across country WA and reduce the need for patients to travel long distances to access care.

7.2. Service context

The WA health system comprises the Department of Health (the Department), Health Service Providers (HSPs) and contracted health entities. The department is responsible for the overall management of the WA health system, in the role of system manager, with HSPs responsible for the delivery of health services governed by service level agreements between the Department and individual HSPs. The main functions of the department CEOs are outlined in section 20 of the *Public Health Act 2016* (the Act).

A HSP's main function, as outlined in section 34 of the Act, is to provide: health services as agreed with the department CEO, teaching, training and research that supports the provision of health services as agreed with the department CEO, and other services as agreed with the department CEO.

The current health service providers are:

- North Metropolitan Health Service (NMHS) – responsible for health service provision in the central and northern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of Joondalup Health Campus. NMHS provides a comprehensive range of adult specialist medical, surgical, mental health and obstetric services, delivered across 3 tertiary hospitals (Sir Charles Gairdner Hospital (SCGH), King Edward Memorial Hospital (KEMH) and Graylands Hospital) and 2 secondary hospitals (Osborne Park Hospital and Joondalup Health Campus (JHC)), inclusive of emergency department, intensive care and mental health services.

  The WA Liver and Kidney Service, WA PET Department, WA Psycho-Oncology Service, State Head Injury Unit and the State Sarcoma Service are based at SCGH. KEMH is the State's tertiary obstetrics and gynaecology hospital. Graylands Hospital is the States' only public psychiatric teaching hospital. NMHS is the destination service for WACHS aeromedical interhospital patient transfers (IHPTs) from the Midwest, Coastal Wheatbelt, and obstetrics and gynaecology patients.

- South Metropolitan Health Service (SMHS) – responsible for health service provision in the Southern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of Peel Health Campus. SMHS provides a comprehensive range of adult and paediatric services across 1 tertiary hospital (Fiona Stanley Hospital (FSH)) and 4 secondary hospitals (Fremantle Hospital, Rockingham General Hospital, Murray District Hospital and Peel Health Campus) inclusive of emergency department, intensive care and mental health services.

  State Adult Burns Unit, State Rehabilitation Service and the State Heart, Lung and Bone Marrow Transplant Service are based at FSH. SMHS is the destination service for WACHS aeromedical IHPTs from the Great Southern, South West, Southern Wheatbelt and Goldfields, and all burns patients.
- East Metropolitan Health Service (EMHS) – responsible for health service provision in the Eastern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of St John of God Midland Public Hospital. EMHS provide a comprehensive range of adult services across 1 tertiary hospital (Royal Perth Hospital (RPH)) and 4 secondary hospitals (Armadale Hospital, Kalamunda Hospital, Bentley Health Service and St John of God Midland Public Hospital) inclusive of emergency department, intensive care and mental health services.

  The State Trauma Service, Rapid Access Chest Pain Clinic and State Spinal and Scoliosis Services are based at RPH. EMHS is the destination service for WACHS aeromedical IHPTs from the Eastern and Western Wheatbelt, Pilbara and Kimberly regions, and all major trauma patients.
- Child and Adolescent Health Service (CAHS) – responsible for providing paediatric healthcare in Western Australia, as the State's only dedicated health service for infants, children and young people. CAHS is made up of 4 service areas: Neonatology, Community Health, Child and Adolescent Mental Health Services (CAMHS), and Perth Children's Hospital (PCH). PCH provides an emergency department, intensive care and mental health service for neonates through to adolescents 15 or under.

  Neonatal Emergency Transport Services, Kids Rehab WA and State wide Paediatric and Adolescent Remote Care are based at PCH. CAHS is the destination service for WACHS aeromedical IHPTs for all Paediatric and Neonatal patients.
- WA Country Health Service (WACHS) – responsible for the regional public hospitals, health services and nursing posts located across regional and remote WA. WACHS provides a wide range of services at the Regional Resources Centres in each region, with specialists rotating through sites, with varying services levels throughout the rest of the facilities, from small hospital to nursing post services. All hospitals have emergency department services.

  WACHS provides the State's Telehealth service from the metropolitan area, supporting regional and remote clinicians. WACHS manages the current contract with Royal Flying Doctor Service Western Operations relating to IHPTs, with WACHS hospitals being the primary user of this service due to the vast distances between the facilities and the metropolitan based tertiary services.
- Health Support Services (HSS) – provides the Department and HSPs with support in relation to finance, human resources and payroll, procurement and supply, and ICT. There was no specific relationship with aeromedical services identified for this HSP.
- PathWest Laboratory Medicine WA (PathWest) – the only public pathology provider for the State. Providing services throughout metropolitan and regional WA. PathWest is also responsible for several Statewide services including the State Mortuary, the Statewide Perinatal Pathology Service and the Statewide Newborn Bloodspot Screening Service. There was no specific relationship with aeromedical services identified for this HSP.

- Quadriplegic Centre (QC) – provides health care and outreach services to people with permanent high spinal cord injury, often with co-morbidities. There was no specific relationship with aeromedical services identified for this HSP.

Primary contracted patient transport entities are:

- St John Ambulance Western Australia (SJAWA) – contracted directly with the department to provide statewide ambulance services. SJAWA primarily work in the pre-hospital space, also providing various first aid and paramedic development training. SJAWA also hold a separate contract with DFES to provide the clinical services and coordinates the tasking of the Emergency Rescue Helicopter Service.
- Royal Flying Doctor Service Western Operations (RFDS) – contracted by WACHS to provide IHPT throughout the State. RFDS is a long-time provider of aeromedical transportation and other health services within WA, with significant experience in emergency and primary care services for those in regional and remote areas.
- WACHS Kimberley Ambulance Services – WACHS provides a 24-hour ambulance service, providing: emergency response to Halls Creek, Fitzroy Crossing, Derby and surrounding communities; transfer and transport to and from RFDS, and transfer and transport to neighbouring health units and outlying communities for ongoing medical management.

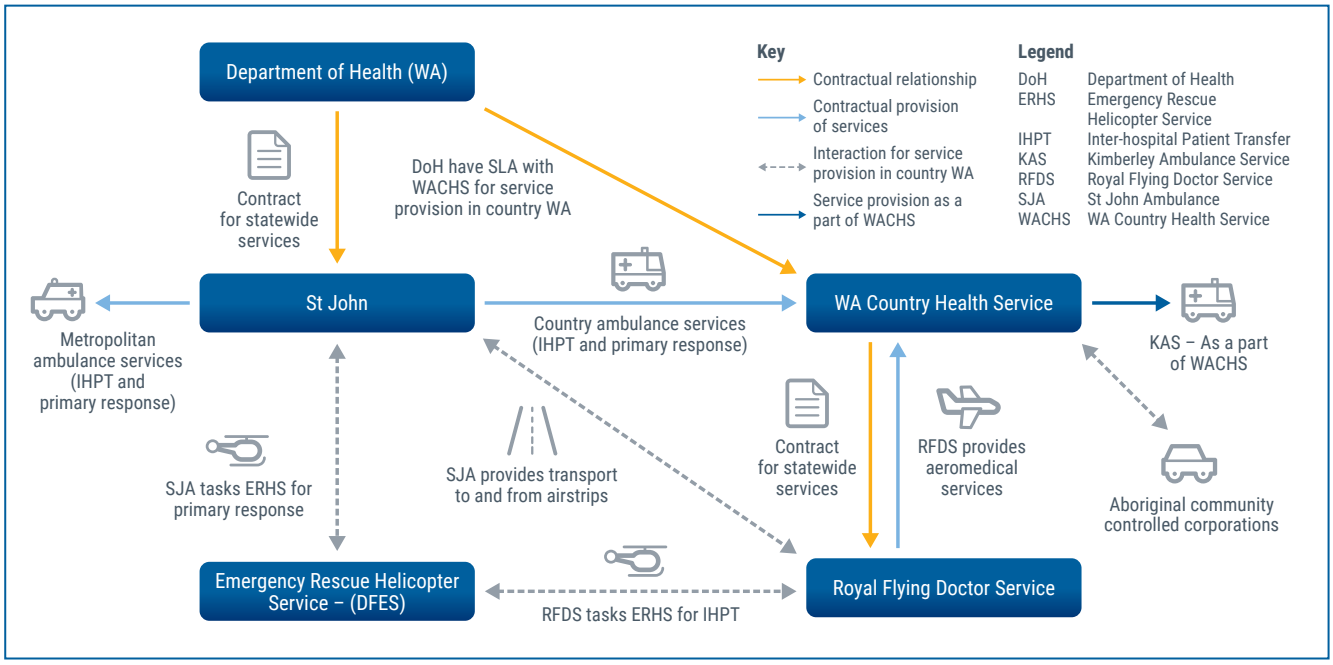


Figure 1: The key organisations involved in the country ambulance system in WA, *WACHS Review 2019, Key Organisational Relationships*

7.3. Current State data

The Current State Questionnaire was developed by the Inquiry and drew upon a range of accreditation, standards, and systems structure tools and publications. It was intended to promote thought and discussion amongst stakeholders regarding the structure of the aeromedical services (AMS) current state and its strengths and weaknesses. Data was collected via categorised Likert Scale responses and through free text responses. The survey was built and administered via CitizenSpace (© 2022 Delib Limited). The survey was available for response from 17/09/21 to 24/10/21 (further extended for an additional week between 26/10/22 to 31/10/21) and the data obtained was subsequently compiled by Inquiry staff.

Refer Appendix 2.

The current state Aviation Standards questionnaire was derived from the *Queensland Health Aeromedical Aviation Standards* document under Creative Commons Licence May 2020. The document was adapted and administered to air service providers in the WA AMS. The document responses provided key information regarding the aviation standards and systems in the AMS in WA. Refer Appendix 2.

Data was provided by provider organisations (RFDS, DFES, SJAWA), by the Department via WACHS, and by interstate aeromedical services. Some data was accessed through publicly published annual and other reports. Population and mapping data were provided by Epidemiology Directorate, Department of Health WA. Financial analysis was provided by Paxon.

Additional written responses were received from a range of contributors including clinicians, health services management, aeromedical services staffs, industry staff and members of the public. Relevant data and contributions were extracted from these documents.

In addition, a range of contemporary relevant key documents were reviewed, and their content or recommendations were considered. These included (see also Bibliography):

- *WA Health: East Metropolitan Health Service (EMHS) Inter-hospital Transport of Critically Ill Patients (IHPT)*: Final Report, 2018
- *WACHS Strategic Plan 2019–2024*
- *Clinical Services Framework 2020 WA*
- Department of Health (Queensland), "*Retrieval Services Queensland*", V1.3, January, 2020.
- NSW Ministry of Health, 2013, *Reform Plan for Aeromedical (Rotary Wing) Retrieval Services in NSW*.
- *Queensland Health: Clinical Standards for retrieval Services 2021*
- *Queensland Health Aeromedical Aviation Standard 2020*
- *Retrieval Services Queensland – Standard Operating Procedures*
- *WA Country Ambulance Strategy 2019*
- AASMRD Statements on Aeromedical Standards.

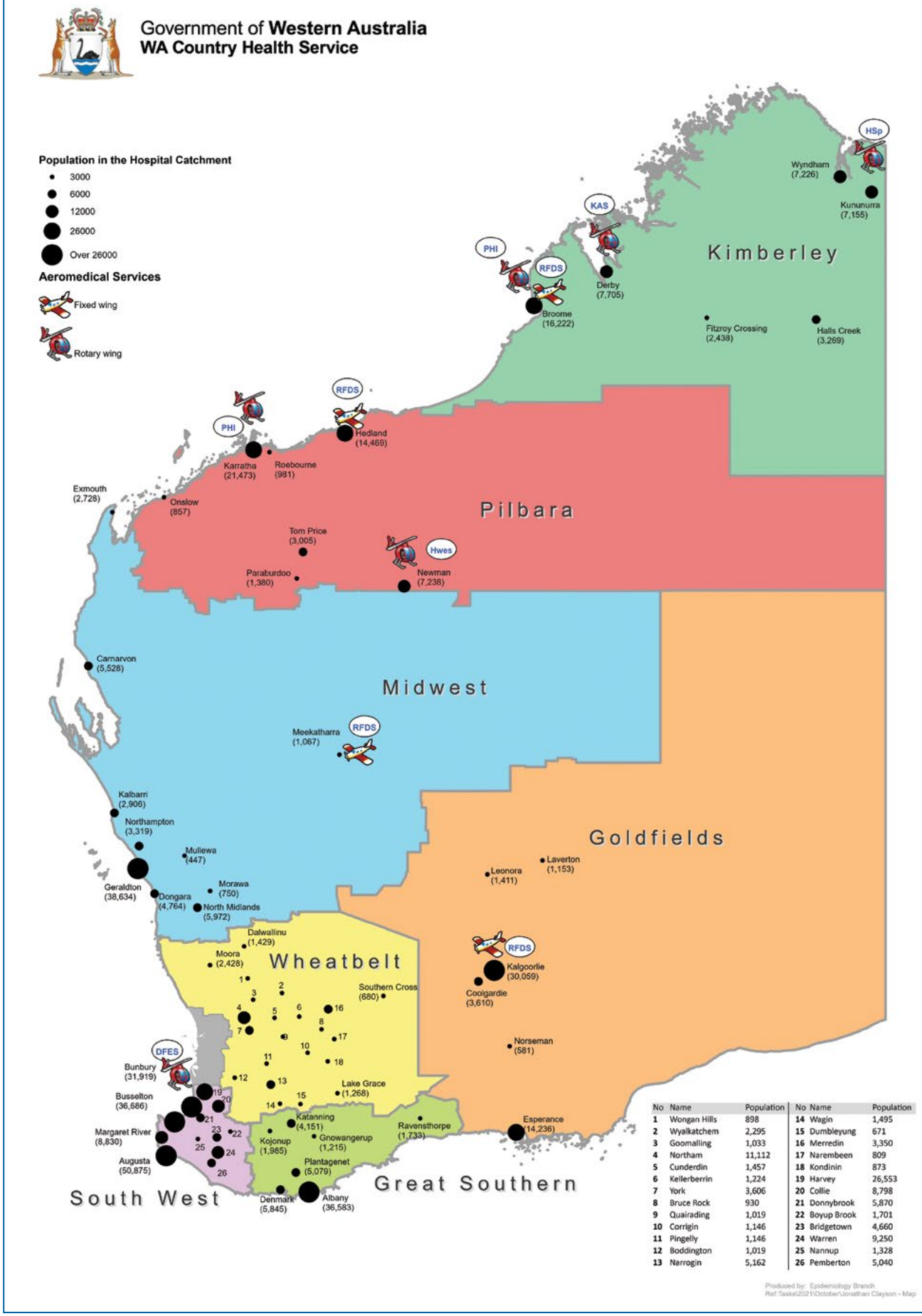


Figure 2: AMS System structures and health facilities

7.4. Aircraft inventory and activity

Inventory of air platforms			
Provider	**Fixed wing**	**Rotary wing**	**Notes**
RFDS	Y	Y	Operates 17 x PC12 and 3 x PC24 and will commence limited Perth-based EC145 (x2) service Q1 2022.
Medical Air	Y	N	Operates 6 x Lear jets and 6 x King Air.
Life Flight	Y	N	Unsure of capability and capacity as they have not responded to requests for information.
Aspen Medical	Y	N	Operates 3 x Cessna Citation XLS solely for WARAME Oil and Gas ex-Karratha will assist at commercial rates.
CareFlight	Y	Y	Previously in WA but no current WA capability but they have agreed to assist WA and have a plan and pricing for this as ad-hoc service. Can support with rotary and fixed wing jet and prop.
BHP / Heliwest	N	Y	Operates 1 x BK117 ex-Newman. BHP hold contract and other mining companies buy hours. Others can access on request at commercial rates.
CHC	N	Y	Operates AW139 ex-Perth for ADF SAR. Operates 2 x Bell 412 ex-Perth / Bunbury for DFES ERHS. (Currently out to tender with result imminent – Dec 2021). Operates ex-Karratha for Oil and Gas on S92. They have agreed to assist WA and have a plan and pricing for this as ad-hoc service.
PHI	N	Y	Operates S92 ex-Broome for Oil and Gas AWSAR. Operates S92 ex-Onslow for Oil and Gas LIMSAR. Operates AW139 and AW109 ex-Broome & Karratha for Oil and Gas and marine pilot transfer. They have agreed to assist WA and have a plan and pricing for this as ad-hoc service.
Babcock	N	Y	Operates 3 x AW139 ex-Karratha for Oil and Gas no medivac capability. As of 2022 they become part of CHC.
Toll	N	Y	No current WA capability but they have services supporting ADF and have expressed interest in commercial expansion in WA.

Table 1: WA AMS platform inventory

7.5. Aeromedical case activity

RFDS activity

	Number of patients		
Transport type	**2019/21**	**2020/21**	
Primary evacuation	1,734	1,835	18%
'Early' evacuation	20	1	0%
Inter-hospital transfers	7,121	8,040	80%
Repatriation	158	227	2%
Total	**9,033**	**10,103**	
Note: 'Early' evacuations were transport of well patients from remote communities to regional towns for testing or isolation only. These were done during the early months of the pandemic only and in general required no doctor or nurse on board.			

Table 2: Transported patients by transport type

	Number of patients		
Priority*	**2019/20**	**2020/21**	
Priority 1	685	865	8.5%
Priority 2	4,691	5,022	50.0%
Priority 3	3,657	4,216	41.5%
Total	**9,033**	**10,103**	

Table 3: Transported patients by priority

* Legend

Priority 1	Life threatening emergency	Potentially life threatening and no adequate facilities for local management e.g. respiratory failure, upper airway obstruction, acute myocardial infarction, meningitis, premature infant at a station or nursing post time critical condition needing immediate specialist care e.g. bleeding aortic aneurysm or ectopic pregnancy, acute extradural haematoma.

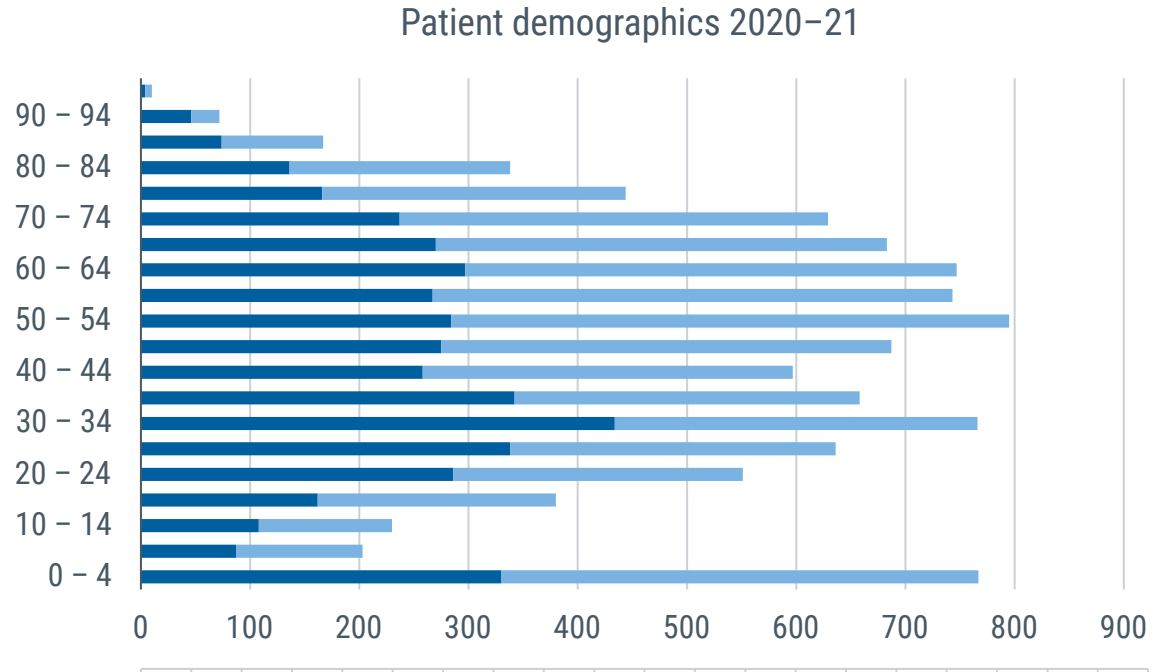
Priority 2	Urgent medical transfer	Urgent medical problem, some stabilisation and treatment may be possible locally, but prompt transfer needed e.g. peritonitis, severe preeclampsia, cardiac arrhythmias, preterm labour, compound fractures.
Priority 3	Non-urgent or routine transfer	Elective inter-hospital transfer or clinic transfer.

	Number of patients		
Clinical crew mix on board	**2019/20**	**2020/21**	
RFDS Nurse Only	2,490	3,170	31.5%
RFDS doctor + RFDS Nurse	6,205	6,607	65.5%
RFDS doctor only	153	109	1.0%
Non-RFDS doctor + RFDS Nurse	162	198	2.0%
Other	23	19	0%
Total	**9,033**	**10,103**	
Note: most non-RFDS doctors are NETS Paediatricians			

Table 4: Transported patients by clinical crew mix

	Number of patients		
Aboriginal status	**2019/20**	**2020/21**	
Aboriginal	3,313	3,710	37.0%
Torres Strait Islander	49	24	0%
Both Aboriginal and Torres Strait Islander	18	18	0%
Not Aboriginal nor Torres Strait Islander	5,613	6,309	62.5%
Unknown	40	42	0.5%
Total	**9,033**	**10,103**	

Table 5: Transported patients by Aboriginal status



	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	80 - 84	85 - 89	90 - 94	95 - 99
Male	330	87	108	162	286	338	434	342	258	275	284	267	297	270	237	166	136	74	46	4
Female	437	116	122	218	265	298	332	316	339	412	511	476	450	413	392	278	202	93	26	6

Figure 3 Transported patient demographics

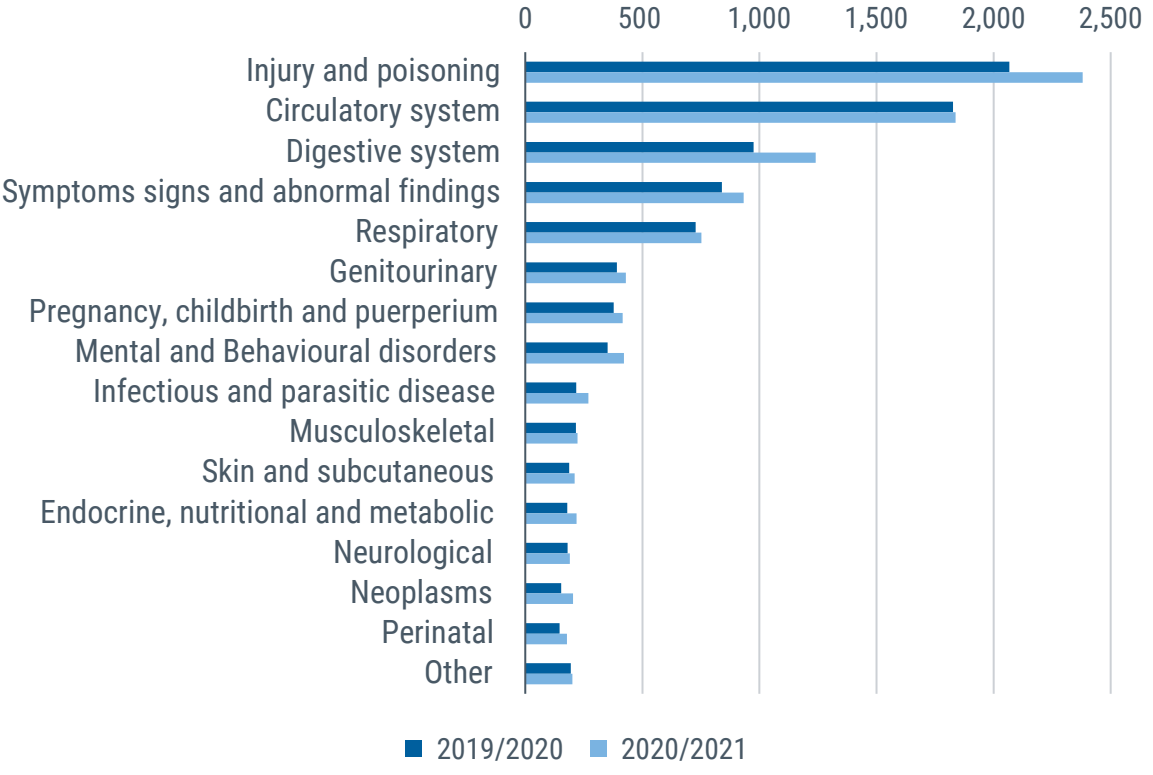


Figure 4 Transported patients by principal diagnosis group

		2019/20			2020/21		
Fleet	**Aircraft Type**	**Landings**	**Block hours**	**Km flown**	**Landings**	**Block hours**	**Km flown**
Western Operations fleet aircraft*	PC12	14,852	19,891	6,651,000	15,739	21,155	7,113,000
	PC24	1,195	2,395	1,306,000	1,720	3,417	1,912,000
	Subtotal	16,047	22,286	7,957,000	17,453	24,572	9,025,000
Charters and third-party aircraft	Helicopters	154	80	13,000	115	99	19,000
	Other	48	104	53,000	51	111	71,000
	Subtotal	202	184	66,000	166	210	90,000

Notes:
1. * Includes Central Section's PC24 in use by Western Operations during FY2020/21.
2. Only Aeromedical charters are shown here – primary health care clinic charters are not included.

Table 6: Landings, hours and distance flown

		Number of patients by destination				
		2020/21				
Patient source		**Within region**	**Perth Metro**	**Interstate**	**Other WA region**	**Total**
WACHS	Kimberley	1,290	858	19	6	2,173
	Pilbara	735	1,088	-	94	1,917
	Midwest	111	1,696	-	76	1,883
	Goldfields	644	1,062	-	8	1,714
	Wheatbelt	-	801	-	12	813
	South West	1	543	-	1	545
	Great Southern	8	883	-	3	894
	Subtotal	2,789	6,931	19	200	9,939
Other	Perth Metro	-	12	3	129	144
	Indian Ocean Territories	-	14	-	-	14
	Interstate	-	4	1	1	6
	Subtotal	-	30	4	130	164
Overall total		**2,789**	**6,961**	**23**	**330**	**10,103**

Table 7: Transported patients by region

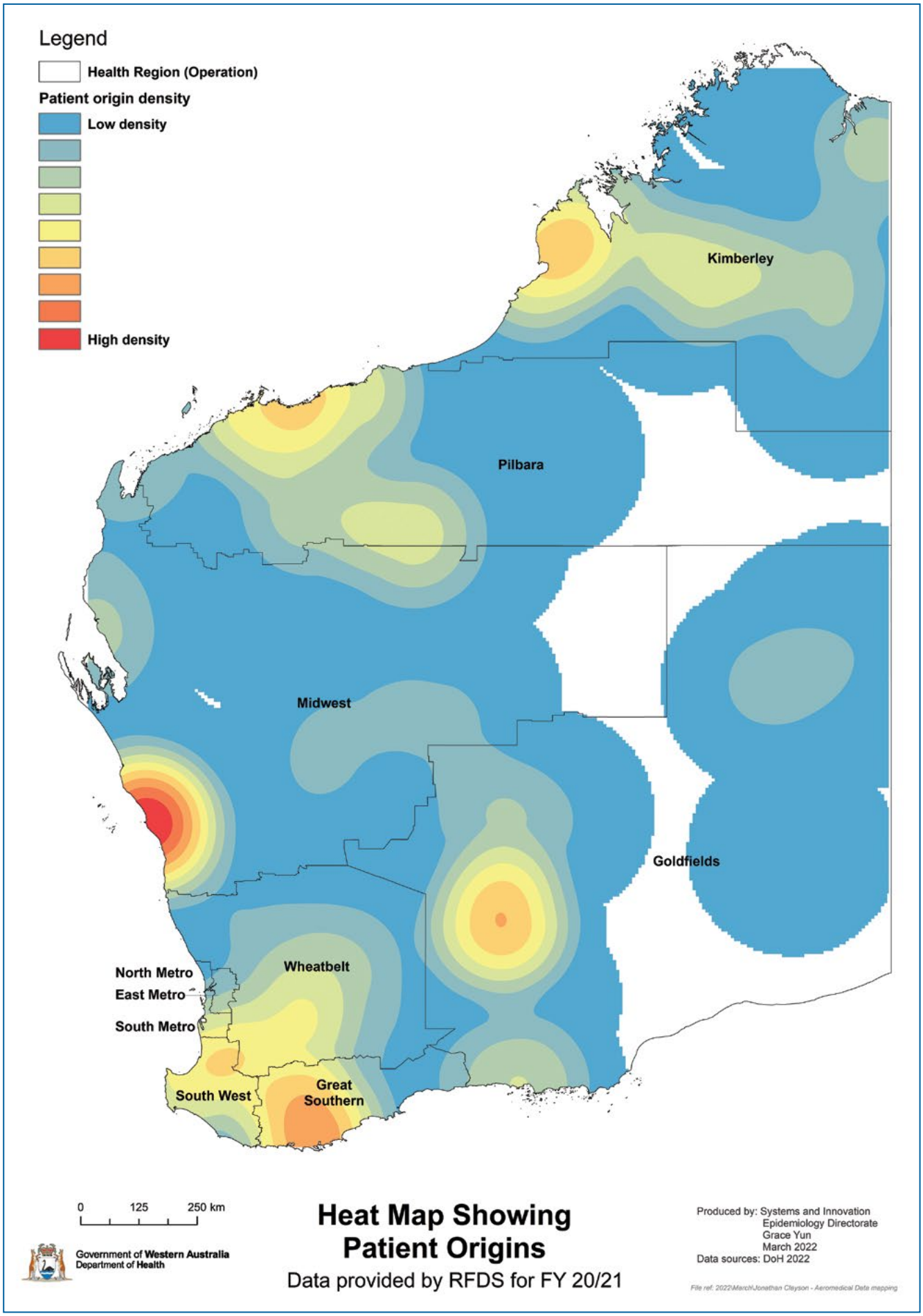


Figure 5 RFDS patient origin heatmap

Fixed wing accessibility and response

To better understand the accessibility and responsiveness of fixed wing (FW) services, the Inquiry reviewed RFDS response KPI's vs Case Volume and base location for the 5-year period 2016 to 2021. Trends were noted in case volumes and performance:

- There is some variability in case numbers 2016 to 2020, a growth trend of approximately 2% pa across the 5 years, and a growth peak in 2020/21 (12% c/w 2019/20) – suggesting a base situation of low to moderate growth and a peak in 2019/20 potentially due to COVID-19 related activity.
- P3 performance improved 2018 to 2021.
- P1 and 2 performance deteriorated 2018 to 2021.
- 2018 to 2021 growth in P1 and P3 is greater than growth in P2 suggesting possible changes to case types and/or triage practices.
- There is high statistical correlation between total case numbers (overall workload) and deterioration in P1 and 2 performance – most notably in non-collocated[7] bases.
- There is no statistical correlation between total cases and P3 performance.

Performance	Case type	Correlation
Vs	p1NCL	-0.84309
Total cases (N)	p2NCL	-0.94738
	p3NCL	0.10169
	p1CL	-0.74472
	p2CL	-0.85196
	p3CL	0.178155

Legend:

- p1: priority 1
- p2: priority 2
- p3: priority 3
- CL: RFDS base collocated with patient origin
- NCL: RFDS base not collocated with patient origin

There is an apparent reluctance (reported by users) of RFDS to access overflow or surge platform providers – a strategy which would improve response and/or accessibility – activity data (2020/21) confirms that 'other' or third party platform providers are utilised for approximately 0.4% of IHPT cases and 0.9% of primary cases – overall, less than 1 in 200 cases (of an annual caseload of approximately 10,000) are referred to a third-party platform provider.

There is a need to examine this practice in more detail to understand if this is simply related to the RFDS coordination processes or to contract conditions potentially providing perverse incentive to increase workload (since km serviced above base contract levels are paid at a loaded (150%) rate).

7 Collocated: refers to collocation of (WACHS) health service and fixed wing contractor (RFDS) service base.

Similarly, where the RFDS-WACHS contract includes $735K for ERHS rotary wing subcontracting, there exists a clear financial perverse disincentive to use this service and to substitute fixed wing where possible. In this context it is also challenging to understand the RFDS rotary wing projections of caseload used in their rotary wing 'business case' or proposal against the current referral rate which is underwritten in the contract as above.

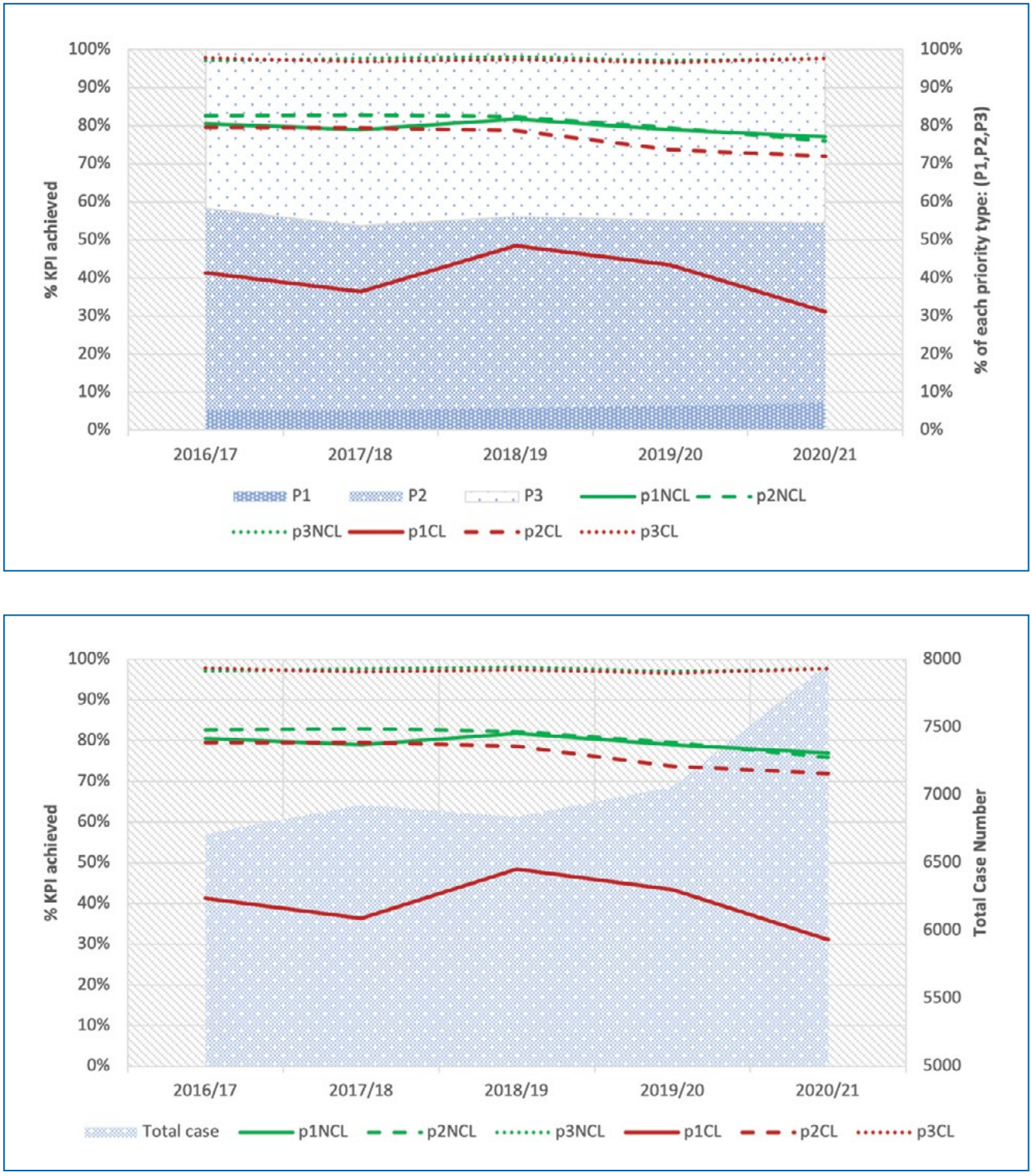


Figure 6 RFDS KPIs vs time and case load

ERHS activity

DFES Emergency Rescue Helicopter Service (ERHS) operate 3x Bell 412EP aircraft (2 primary, 1 technical backup) with an average 98% online status.

ERHS operates from a nominal range of up to 500km (i.e. 200-250km out and back without refuelling) from the Jandakot and Bunbury Rescue Helicopter Bases but have established jet fuel caches at select regional airports allowing for extended range operation more than 400 km straight line distance without refuelling. ERHS are capable of being airborne within 15 minutes of activation and can land directly at most incident scenes, as well as all airports and hospital helicopter landing sites (HLS).

Average ERHS mission flight time is approximately 2.5 hours but are longer for extended range operations.

ERHS operate with 1x Air Transport Pilot Licenced Pilot, 1x Aircrewman / sensor operator, and 1x Rescue Crewman / Critical Care Paramedic. ERHS aircraft and crew operate with night vision goggles and instrument systems, Forward Looking InfraRed (FLIR) cameras, all-hazards emergency services radios, reality augmented moving map systems, rescue homing and deployment equipment, winch stretcher and other systems or equipment for emergency services rescue operations.

ERHS helicopters can carry 2 stretchered patients simultaneously, have 2x defib / monitors, 3x syringe drivers, 1x ventilator, integrated oxygen and suction system, and staff are credentialled for administration of Schedule 8 drugs and blood products.

ERHS total missions 2020–21 = 749:

- 70% Primary emergency response, road crash rescue or high trauma incidents
- 10% Search and Rescue – land or maritime
- 3% Emergency Services – such as Carnarvon flood and Cyclone rescue
- 17% Secondary – IHPT (time critical).

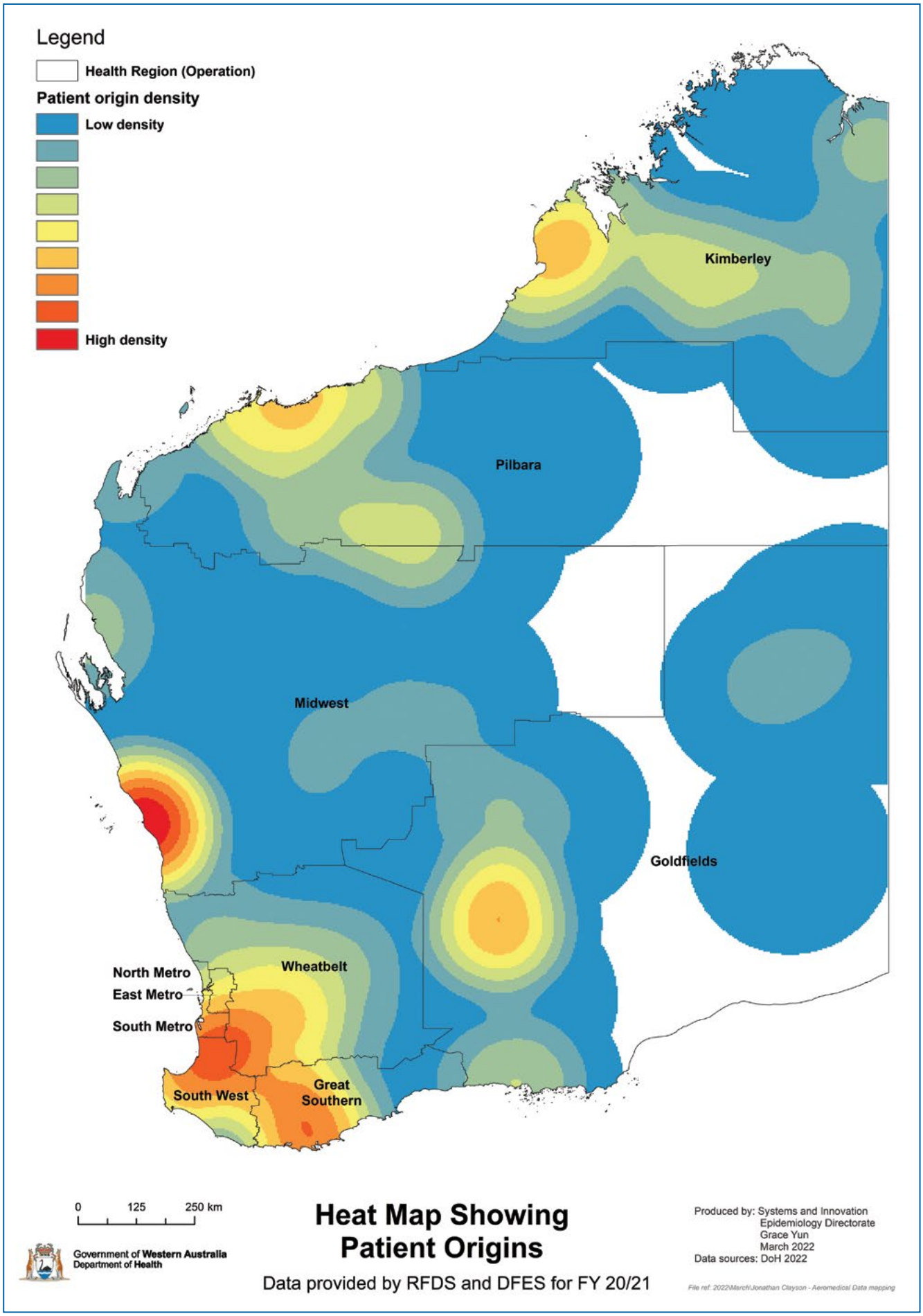


Figure 7 Case origins (all AMS cases)

Assessment of unmet rotary wing need

Simple comparison of rotary wing (RW) capacity across like jurisdictions highlights a significant under-resourcing in WA. SA and QLD have 155% and 250% higher state-system RW platforms per million population than WA — differences which cannot be explained by geographic or demographic differences alone.

It was important, therefore, for the Inquiry to assess potential unmet need in RW services – however, a lack of readily available comprehensive case-level and reliable system-level data necessitated the application of estimates and assumptions (see below).

The data reviewed and considered included material from the *RFDS RW business case (2020)*, WACHS IHPT data and ERHS activity data. The analysis conservatively estimated patients transferred by road who would likely have been flown by RW (based on their acuity, urgency, triage status) had RW platforms been available.

The case is strongest (data clearest) in the Perth/Southwest regions with demonstrated unmet caseload of greater than 250–350 per annum plus a known NETS potential load of at least 125–150 cases.

In other regions, the case for expansion of RW services is very strong however data is inadequate at present to allow definitive recommendations regarding priorities. Analysis to date indicates the need for additional RW platforms are likely to be confirmed in Kalgoorlie/Goldfields, Geraldton, Port Hedland, and potentially Broome.

The strongest cases amongst these is for the Goldfields region, due to case load and the potential for additional overlap coverage of the SW and Wheatbelt regions.

Estimate of (Peri-metro, Wheatbelt, SW, GS) rotary wing unmet need

Assume tasking of RW platform is agreed for defined time-critical patients where RW use meets the tests of time advantage or significant 'clinical care in transit' advantage.

	Per year	Note/method
RFDS RW business case		
P1 and P2 Cases <250km from Perth	1200	Discount all P2 as non-time-critical i.e. non RW appropriate
Given P1:P2 ratio ~ 1:6, then P1 load =	200	Eliminate 50% as non-time-critical i.e. non RW appropriate or no-advantage due to no HLS
Estimate of current RFDS load <250km which is RW appropriate	100	
WACHS SW data (confirmed via SJAWA data) ATS cat 1 and 2 transferred by road to metro from <250km		
Cat 1	25	
Cat 2	395	Eliminate 80% as non-time-critical i.e. non RW appropriate
Estimate of current SJAWA load <250km which is RW appropriate	105	
ERHS data		
ERHS decline or delay cases (IHPT)	100	
SUM estimate of SW RW unmet need	300	+/- 15% ≈ 250–350 pa.

Table 8: RW unmet need: Peri-metro, Wheatbelt, Great Southern, Southwest

Case numbers	Primary SJAWA data	Primary SJAWA data	Primary SJAWA data	IHPT (WACHS data)	Potential RW caseload by region (est)
	Total P1 50–400 km	250 km adjustment (x 0.75)	Time criticality adjustment (x 0.25)	Cat 1 and 2 ED + Emerg In-Pt IHPT <250 km	
Broome, Kimberley region	23	17	4	75	100–125
Port Hedland, Pilbara region	1,102	827	207	158	350–400
Kalgoorlie, Goldfields region	1,316	987	247	N/A	250–300

Table 9: RW unmet need: other regions

Note: Calculation assumptions are extremely conservative and may underestimate load:

- Response range of the new AW139 helicopter is much greater than the 'traditional' RW primary response range consideration of 250 km.
- Totals (above) are reduced by 25% to approximate a radius of 250 km (more usual primary response radius).
- Further reduction of cases by 75% by estimated application of finer time-criticality criteria.
- Additional estimate of IHPT load is provided from emergency department or ward data, considering time criticality and <250 km.
- Wheatbelt, Southwest and Great Southern excluded from this analysis – see previous
- The Midwest caseload significantly overlaps the caseload analysed in the 'peri-Perth' analysis above, and additional caseload mapping is required to allow recommendations or consideration of this region. However, the caseload is high and there is no collocated RFDS base – suggesting likely RW need.
- Further refinement and interrogation of the data is indicated.

SJAWA regional P1 data: Case volume for financial year 2020–21 referenced above.

The following table presents the Priority 1 Ambulance Case Volume originating 50 to 400 km from each Major Regional Centre airport, within each Western Australian Region.

In the table, the 50 to 400 km radius has been calculated independently for each major regional centre. For example, case volume has been calculated for a 50 to 400 km radius of Bunbury airport, then separately for Albany airport. This means that cases may overlap between regions that are within a certain proximity to one another. Figures have been calculated in this way to provide insight into potential RW demand from each location.

Major Regional Centre and Region of pick-up	Case volume
Broome, Kimberley region	23
Port Hedland, Pilbara region	1,102
Kalgoorlie, Goldfields region	1,316
Geraldton, Midwest region	2,997
Merredin, Wheatbelt region	16,276
Bunbury, South West region	9,203
Albany, Great Southern region	12,086

Table 10: Priority 1 ambulance case volume 50 to 400 km from each major regional centre

7.6. Facility tours

During October 2021, several facility tours occurred to the primary aeromedical service providers contracted or managed by the State. Due to travel restrictions in place at the time these tours were conducted by Jonathan Clayson (Project Office) and Dr Andrew Jamieson (Medical Advisor) on behalf of the Inquirer.

Facility tours occurred with Department of Fire and Emergency Services – Emergency Rescue Helicopter Service (ERHS) – Jandakot base (18 October), Royal Flying Doctor Service Western Operations – Jandakot Head Office and base (19 October), and St John Ambulance WA Head Office – contracted to provide Clinician and provides tasking of the ERHS (20 October).

The purpose of the site visits was to:

- gain an appreciation of the nature, size, complexity and sophistication of the infrastructure, staffing, equipment, IT and systems
- see and understand the operational processes in 'real time' and to appreciate process flows
- walk through the 'patient journey' and case systems – to allow collaborative development of an accurate process flow chart
- develop collegiate relationships with and between key individuals to optimise future communications and open channels of dialogue.

A virtual tour of the WA Country Health Service (WACHS) Command Centre also occurred (26 October), with Dr Kennedy and Jonathan Clayson in attendance along with the Command Centre management, seeking to understand the current and proposed future of Telehealth within the WA health system and its current interplay with the aeromedical services in WA.

Summary briefs of the facility tours were provided to Dr Kennedy by the Inquiry Office.

With Dr Kennedy visiting WA to conduct the formal hearings, additional facility tours and re-visits were organised to allow Dr Kennedy to get a first-hand clarification of the organisation's involvement in the aeromedical arena, the organisation's processes and the patient journey articulated by each organisation. Facility tours occurred over 8 and 9 February 2022 to:

- Department of Health
- WACHS Command Centre
- State Trauma Services (Royal Perth Hospital)
- Neonatal Emergency Transport Service WA (Perth Children's Hospital)
- Department of Fire and Emergency Services – ERHS – Jandakot base
- Royal Flying Doctor Service Western Operations – Jandakot head office and base
- St John Ambulance WA head office.

7.7. Public forums

For the purposes of the Inquiry, a public forum was held for each region, including the Greater Perth Metropolitan area.

The purpose of the hearings was to develop an understanding of the current state of aeromedical services in WA, gathering information from stakeholders including, but not limited to aeromedical providers; aviation providers; non-aeromedical patient transportation providers, local governments, and users of the services, such as the referring clinician, patient (members of the public).

Eight public forums occurred across a 3-week period, with the first forum occurring on the 28 October concluding the final forum on the 12 November. Six forums were held in-region and all forums offered the option for virtual attendance.

The hearing schedule was as follows:

- Thursday, 28 October – Great Southern – virtual forum
- Friday, 29 October – South West – held in Bunbury
- Tuesday, 2 November – Midwest – planned to be held in Geraldton, but rescheduled
- Wednesday, 3 November – Wheatbelt – virtual forum
- Thursday, 4 November – Perth metropolitan area – held in South Perth
- Friday, 5 November – Goldfields – held in Kalgoorlie
- Monday, 8 November – Kimberley – held in Broome
- Wednesday, 10 November – Pilbara – held in Port Hedland
- Friday, 12 November – Midwest – held in Geraldton.

All forums were advertised through direct email to registered stakeholders, advisory to local governments, regional newspapers specific to the individual forums, statewide newspapers, and information and registration links on the Aeromedical Services WA Inquiry website.

Interested parties were asked to register for the individual forums, advising if they would like to provide prepared statements or had any specific topics that they would like to discuss. There was a total of 121 registrations, with several people registering to attend more than one forum.

Forums were facilitated by the Inquiry Office team and supported by Dr Andrew Jamieson, Medical Advisor to the Inquiry. The Inquirer, Dr Kennedy, attended all forums via virtual means due to travel restrictions in place for Western Australia, relating to COVID-19.

There were 90 individual participants in attendance across the 8 forums, providing their perspective on the current state of aeromedical services in WA, and specifically aeromedical services in the individual regions.

The forums involved a summary of the inquiry process and timeline, an introduction of the Inquirer, Dr Kennedy, and an introduction to the strategic framework that was developed by the Inquirer to help facilitate and gather relevant information regarding aeromedical services in WA.

Participants in attendance were offered the opportunity to provide their prepared statements, topics highlighted during the registration process and then open discussion on topics relating to aeromedical services in WA.

Summaries of the forums were collated by the Inquiry Office, and the information and themes were used by Dr Kennedy in development of the 'Considerations paper', which was utilised for the formal hearings process.

Some of the key themes that were highlighted across the forums included:

- The need for effective corporate oversite of all governance issues, currently no central authority or responsible agency, with oversite of the system – including corporate relationships, contract management and clinical governance
- That the current absence of a statewide framework and policy needs to be addressed, noting that this will take time
- The lack of integrated service for end-to-end management of patient journey
- Data management systems lack integration, siloed systems
- The need for legislation and strategic direction in WA for aeromedical and patient transport services
- Support for formal interstate agreements to meet needs near borders to provide the best care to patients

- Preference from providers for long-term contracts to enable strategic planning of fleet and staffing
- Many regional areas were requesting additional rotary winged services to be available within the regions
- Centralising of coordination and tasking for aeromedical services across the state, by a central agency, holistically covering end-to-end patient journey
- Repatriation of patients (including by air) after treatment needs to be considered as part of the patient journey
- Single clinician model for aeromedical services is not supported by or for the current ERHS
- There is a general (widespread) lack of clarity around the funding models relating to the current aeromedical system.

7.8. Interjurisdictional reviews

The Inquiry met with representatives of each of the State jurisdictions (between 23/11 and 29/11/21) except Tasmania and Victoria. The Tasmanian system is small and geographically less relevant. The Victorian system is well known to the Inquirer as a recent retrieval service director in that State.

- Northern Territory: John Dettman
- Queensland: Mark Elcock
- New South Wales: Gary Tall, Dominic Morgan
- South Australia: Andrew Pearce.

Discussions with each jurisdiction took a structured form, reviewing key aspects of each system, then consideration of key aeromedical systems components that drive quality and safety for patients. The jurisdictions were encouraged to be innovative and constructive in responses and the format did not constrain frank discussion or recommendations. The Inquiry has incorporated those statements and opinions into the considerations presented below.

Each jurisdiction shared a range of documents with the Inquiry including policies and procedures, activity data, governance frameworks and KPI suites – all of which have been useful in comparative analysis. The relationships between these groups nationally are collaborative and strongly supportive and is likely to be valuable to WA in the future.

The geography and population distribution of SA and Queensland provide the best comparison points.

The principal drivers of an aeromedical system design are distance (area), population density (volume) and importantly, the accessibility of local definitive (tertiary) healthcare, and burden of disease. In the states under comparison the overall proportion of the population which lives in areas which do not have ready access to tertiary health services is approximately 30% (range 20–38% est.) – this represents a coarse illustration of the potential demand population for aeromedical services.

The density of population without ready access to tertiary level care is a key determinant of AMS needs, and Queensland and NSW have broadly similar levels (approximately 1.13 and 2.73 persons per km^2). SA and WA are also similar in this regard measuring approximately 0.46 and 0.21 persons per km^2 without readily accessible tertiary healthcare.

In terms of overall area of AMS coverage, WA and QLD are most similar at 2.646 and 1.729 million km^2, however WA has much larger areas of very low population density.

Distribution of tertiary care centres also varies significantly in pattern from state to state, with SA having essentially no critical care capability outside Adelaide, and QLD having northern and southern tertiary care centres. Like SA, WA has little tertiary level health care outside major population centres (capital cities) except a small critical care service at Bunbury.

Similarity is noted particularly in the State population density, population density of persons without proximate access to tertiary health services, the rate of AMS transfers for persons without proximate access to tertiary health services adjusted for population density, number of AMS platforms required per 1,000 transfers adjusted (approximate) for flight distances.

	WA	SA	QLD	NT	NSW	VIC
AMS patients 10^3 pa	9.9	6.5	19.2	6.7	5.5	6.9
Fixed wing platforms (incl reserve/off line)	20	6	17	11	6	6
Rotary wing platforms	3	3	15	1	10	6
Population of State ($x10^6$)	2.67	1.77	5.22	0.25	8.19	6.65
Area of State ($x10^6$ km^2)	2.646	0.984	1.729	1.347	0.801	0.238
State population density persons/km^2	1.01	1.80	3.02	0.18	10.22	27.94
Population without PTHS[8] ($x10^6$)	0.55	0.45	1.96	0.10	2.18	1.58
% of population without PTHS*	20%	25%	38%	41%	27%	24%
Statewide density of population without PTHS (N/km^2)	0.21	0.46	1.13	0.07	2.73	6.62
AMS transfers /10^3 population without PTHS	18.12	14.39	9.78	66.56	2.51	4.35
AMS transfers /10^3 population without PTHS/km^2	6.85	14.62	5.66	49.41	3.13	18.28
Platforms / 10^3 transfers	2.33	1.39	1.67	1.80	2.92	1.75
Platforms / 10^3 transfers/state area	0.88	1.42	0.97	1.34	3.64	7.35

Table 11: Interjurisdictional data for systems comparison

Notes:

- * Estimate/indicative data
- The purpose of this data is to illustrate the broad commonality and differences between the state AMS systems. This assists in recognising which State systems are most useful in comparative review of the WA AMS.
- Data is sourced directly from services and from publicly available sites and reports (some data is unclear due to interjurisdictional definition, role and process differences).
- Back transfers (repatriation) are not included due to inconsistent methods and recording across jurisdictions.

8 PTHS = Proximate Tertiary Health Service – within a city or regional centre or district.

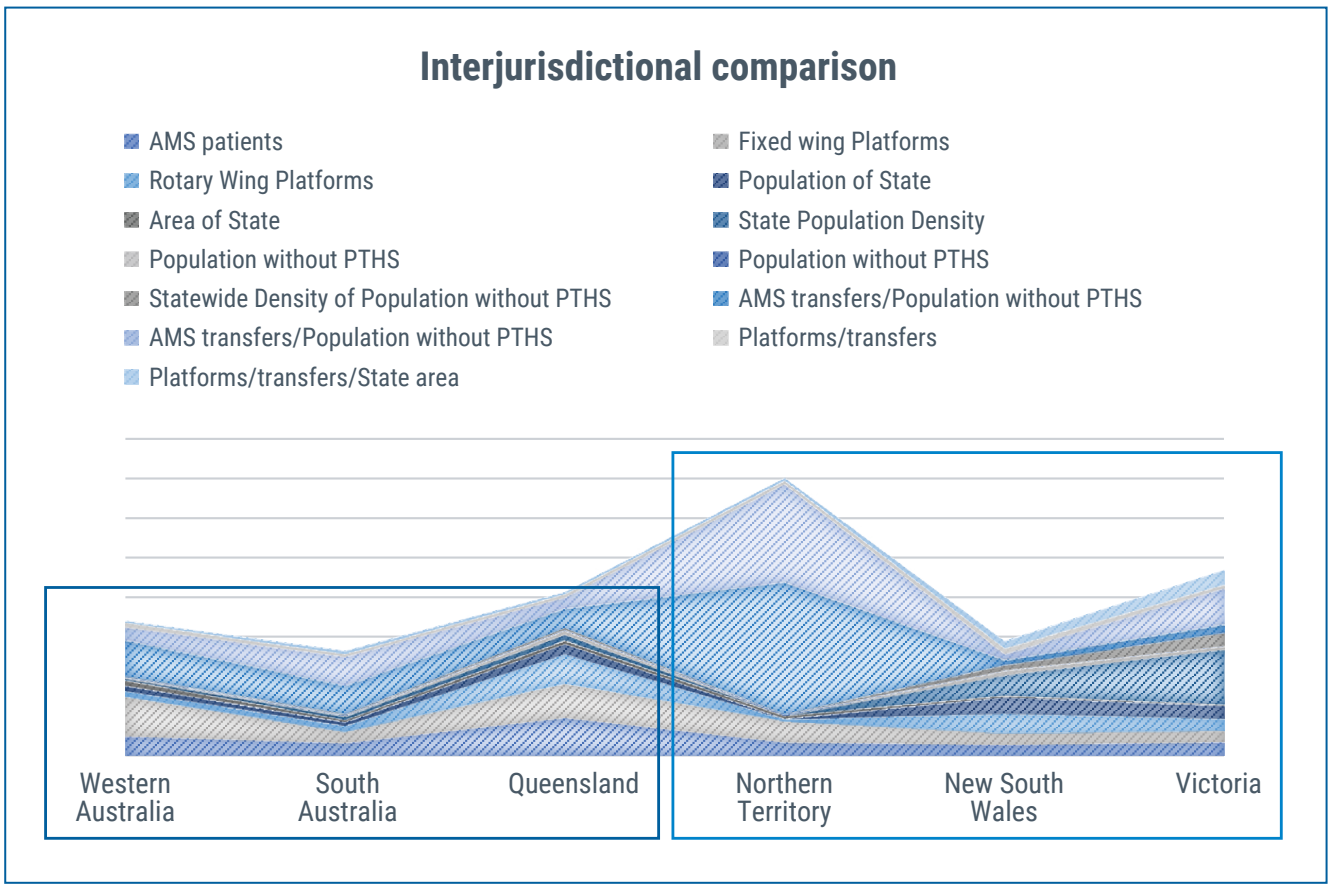


Figure 8 Interjurisdictional illustrative comparison

The diagram illustrates the relative commonality of the pattern of measures amongst WA, SA, and QLD, when compared to the broader scatter and lack of consistent patterns of measure in the NT, NSW and VIC data.

For the purposes of comparison of the AMS systems, there is no clear one-to-one match between WA and another State jurisdiction however based on the above there is significant similarity between WA, QLD and SA.

The similarities between SA and WA are very close, and if QLD is considered conceptually as 2 systems (north and south), each is very similar to WA.

NSW has significantly higher population density without immediate access to tertiary care however as a state of significantly smaller area, and wider distribution of tertiary care centres it has different key drivers in AMS systems terms (including relatively greater application of RW platforms). Victoria is much smaller, has wider distribution of advanced health facilities outside the capital, and has many more feasible options for road transfer.

To conclude: In terms of general health demographics and drivers of acute patient transfer, SA and QLD provide the closest match in AMS system needs to WA.

Key features of the WA, QLD and SA systems are tabulated below for comparison:

Feature	WA	QLD	SA
Corporate governance	WA Health-WACHS and DFES	QLD Health	SA Ambulance Service (SAAS)
Clinical governance	WACHS-RFDS, DFES-SJAWA	Retrieval Services QLD (RSQ)	MedSTAR
Coordination	SJAWA/RFDS/WACHS	RSQ	MedSTAR
FW platforms	RFDS + ad hoc	RFDS + ad hoc	RFDS + ad hoc
FW staffing	RFDS	RFDS with RSQ credentialing and SOP definition	RFDS RN/MedSTAR Medical
RW platforms	DFES-SJAWA, (RFDS) + Ad hoc-Industry based	Lifeflight	MedSTAR
RW staffing	SJAWA	Lifeflight/QAS with RSQ credentialing and SOP definition	MedSTAR/SAAS

Table 12: Comparative features of WA, QLD, SA aeromedical systems

As agreed by each jurisdiction, the fundamental (and most effective) principles of the QLD and SA systems are:

- governance connection to a single peak health body
- clinical governance managed via a single authoritative health agency
- single point of coordination and control across the AMS (including contracting of air platforms)
- RW platforms provided through contract, with staffing provided by a system-level service in partnership with ambulance and accountable for credentialing/SOP
- FW platforms and staff provided via contract and/or in partnership with a system-level service; accountable for credentialing/SOP.

AMS principle	WA	QLD	SA
Governance connection to a single peak health body	✗	✓	✓
Clinical governance managed via a single authoritative health agency	✗	✓	✓
Single point of coordination and control across the AMS (including contracting of air platforms)	✗	✓	✓
RW platforms provided through contract, with staffing oversight by a system-level service in partnership with ambulance and accountable for credentialing/SOP	+/-	✓	✓
FW platforms and staff provided via contract and/or in partnership with a system-level service accountable for credentialing/SOP	+/-	✓	✓

Table 13: Interjurisdictional systems features – alignment with ideals

It is noteworthy that these principles are also largely applied in the Victorian, NSW, Tas and NT systems. These fundamentals are essentially core features of most high-performing aeromedical systems. As a reasonable point of difference, in Victoria and NSW, the FW platforms alone are provided on contract via an aviation provider (Pel-Air), with staffing provided by the state ambulance and retrieval services. In NT (southern) aircraft are provided by RFDS and staffed by Alice Springs Retrieval. There is therefore a feasible option for provision of FW platforms and FW staff separately.

An important point of difference across the systems is the model of FW staffing. There are arguments for and against the 3 potential FW platform and/or staffing models:

Model 1: Contractor provides FW platforms with all clinical staffing.

- Characteristics: High level of aviation capability in crews, less clinical governance connection between contractor and governing body unless effective systems of monitoring are in place, workforce development is contractor focussed, provides contractor with simpler options for other work (e.g. RFDS Commonwealth contracts).
- Comment: There is no specific clinical care or governance driver to support the joint provision of air platforms with clinical staff, however this is the historical model for RFDS. Preservation of a commitment to this model is not dependant on any single provider however, and if this model were decided upon in the longer term, there may be options to tender for a service of this model type (1). Such a tender would likely result in consortium proposals from commercial groups with interest in provision of aeromedical platforms and/or aeromedical staffing.

Model 2: Contractor provides FW platform and no clinical staffing.

- Characteristics: Additional aviation training may be required initially, governing body develops solid retrieval workforce which may be integrated into other land and/or local health systems, consistent workforce contracting etc within state systems, centralises staff development, education, clinical governance systems.
- Comment: This model (in place in NSW, VIC, NT) creates a clear separation of aviation services and clinical services, as is the usual situation in most RW aeromedical services. The singularity of the contract ensures an airframe provider does not operate competing or conflicting services and is completely performance focussed. It recognises the specialisation of aviation services and clinical services in their own rights, not expecting an organisation to provide expertise across both complex areas. The model ensures the fundamental longevity and independence of the specialised workforce, separate from airframe providers (who may change over time due to contract changes or re-tendering).

Model 3: Contractor provides FW platforms with some staffing (core) paramedic or nursing to which a central retrieval service adds additional medical nursing and/or other crew.

- Characteristics: High level of aviation capability in core crew members, may effectively centralise staff development, education, clinical governance systems, retrieval workforce which may be partly integrated into other land and/or local health systems.
- Comment: Model 3 provides a hybrid or compromise approach which may provide a transition option for a developing system, or a workable model in a smaller system where medical and specialised paramedic workforce may be less available.

In WA, model 1 is currently in place, however there are specific geographical and system development opportunities that may lead to consideration of transition to model 2 or 3 in the future.

These relate to the disparate availability of clinical workforce in the state – in particular, the Pilbara, Kimberley and Goldfields regions. Greater development of local health service workforce with additional aeromedical roles and skills, and the ability to work in a range of disciplines (medical, nursing, paramedic) in local facilities will increase the capability and capacity of those services, encouraging growth and sustainability over time. The concept of developing this 'health' workforce rather than the current 'WACHS vs RFDS' workforces is likely to benefit staff development, skill sets, longevity, and clinical quality and safety.

7.9. Funding

See: Appendix 5 cost and funding review

8. Considerations Paper

Each component of the Current State Review Process contributed to the development of considerations for the Inquiry. Many submissions, including statements of opinion, commentary and documentation were provided to the Inquiry and these were formulated into the Considerations Paper.

The purpose of this paper was to provide an overview of the breadth of material and views received by the Inquiry in its assessment of the current state of aeromedical systems in WA. The material was edited, paraphrased and expanded with some analysis and expert commentary and subsequently represented to key stakeholders prior to the formal hearings of the Inquiry where considerations were addressed, endorsed, and challenged.

Each of the many considerations were viewed by the Inquiry as a noteworthy comment about the existing system, or an important reflection for a future WA aeromedical system. They do not purport to encompass all aspects of an aeromedical system nor to predefine the recommendations of the Inquiry. The Inquiry does not specifically endorse or accept responsibility for the accuracy of opinions reported.

The Considerations Paper is abridged and attached as Appendix 4

9. Formal hearings

For the purposes of the Inquiry, formal hearings were conducted as permitted under section 231 (1) of the *Public Health Act 2016*.

The purpose of the hearings was to explore in more detail the current state considerations that have been raised through the written submissions received, public stakeholder forums conducted in October and November 2021 and information gathered during the interjurisdictional review.

Formal hearings were conducted on 10, 11, 14 and 15 February, at the WA Industrial Relation Commission premises, Level 18, 111 St Georges Terrace, Perth WA 6000.

Witnesses were selected due to previous input provided to the Inquiry, including previous written submissions, attendance at the public forums and the current state questionnaire responses and current engagement contracts with the current systems in place.

A few stakeholders were selected at the discretion of the Inquiry due to known project works that are occurring in WA.

Notices to Attend were issued to the respective Chief Executive Officers or Organisational Presidents of the identified stakeholders on either the 12, 13 or 18 January 2022, providing a minimum of 4 weeks' notice, for review of the documents provided and organise attendance.

All witnesses were provided with a copy of the 'Considerations Paper' with most stakeholders also being provided with focused considerations as highlighted by the Inquirer to assist in providing their response. The witnesses were also provided a copy of part 15 of the *Public Health Act 2016* and an information sheet describing the hearing process for the day.

A total of 29 hearings were initially scheduled. Two additional hearings were scheduled after requests from 2 previously registered stakeholders, bringing the total to 31 hearings.

Of these: 6 Petitions for exemption from attendance were received and approved by the Inquirer, 2 petitions for a closed hearing were received, one of which was determined to justify a closed hearing. Three hearings were held using virtual means due to the interstate location of the witnesses in attendance. One witness also attended along with another scheduled witness, adjusting the schedule of hearings to a total of 24 (23 with observer attendance, one closed hearing).

Stakeholders who participated in the formal hearings are as follows.

- **Department of Health** – Department of Health has been established as the system manager responsible for the overall health system in WA. Providing strategic direction, management and performance of the public health system, ensuring the delivery of high-quality, sustainable, safe and timely health services. Strategic direction, management and performance of patient transport within the health system, be it by road or air, sits with Department of Health.
- **Western Australian Country Health Service (WACHS)** – WACHS is a health service provider responsible for the regional public hospitals, health services and nursing posts located across regional and remote WA. WACHS has and does manage the current contract with RFDS relating to aeromedical IHPTs, with WACHS hospitals being the primary user of this service due to the vast distances between the facilities and the metropolitan based tertiary services.

- **North Metropolitan Health Service (NMHS)** – NMHS is a health service provider responsible for hospitals in the central and northern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of Joondalup Health Campus. NMHS is the destination service for WACHS aeromedical IHPTs from the Midwest, Coastal Wheatbelt, and obstetrics and gynaecology patients.
- **South Metropolitan Health Service (SMHS)** – SMHS is a health service provider responsible for hospitals in the Southern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of Peel Health Campus. SMHS is the destination service for WACHS aeromedical IHPTs from the Great Southern, South West, Southern Wheatbelt and Goldfields, and all burns patients.
- **East Metropolitan Health Service (EMHS)** – EMHS is a health service provider responsible for hospitals in the Eastern corridor of the Greater Perth Metropolitan Area, including oversight of the public-private partnership of St John of God Midland Public Hospital. EMHS is the destination service for WACHS aeromedical IHPTs from the Eastern and Western Wheatbelt, Pilbara and Kimberly regions, and all major trauma patients.
- **Child and Adolescent Health Service (CAHS)** – CAHS is a health service provider responsible for providing paediatric healthcare in Western Australia, as the State's only dedicated health service for infants, children and young people. CAHS is made up 4 service areas: Neonatology, Community Health, Child and Adolescent Mental Health Services (CAMHS), and Perth Children's Hospital (PCH). CAHS is the destination service for WACHS aeromedical IHPTs for all paediatric and neonatal patients.
- **Purchasing and System Performance Division of Department of Health (PSPD)** – As a division of the Department of Health, PSPD oversees the agreements between Department of Health and the Health Service Providers, in addition to system performance, health budgets and health purchasing for the organisation, amongst other portfolios. PSPD directly manages the road bases ambulance service contract for the State, which is in partnership with SJAWA.
- **Clinical Excellence Division of Department of Health (CED)** – As a division of the Department of Health, CED holds the Patient Safety and Clinical Quality portfolio, which includes but not limited to licensing and accreditation, patient safety surveillance, healthcare quality intelligence. The medical and clinical safety of patients (and staff) is integral to aeromedical services, it is important that perspective of the overseeing body is heard by the Inquiry.
- **Clinical Strategy and Planning Division of Department of Health (CSPD)** – As a division of the Department of Health, CSPD will lead and steward key systemwide, transformational, clinical planning and strategy, and related programs, including those aligned to major health infrastructure projects. The division will lead the Clinical Services Framework refresh and future strategy and ensure this is aligned to the initiatives of the *Sustainable Health Review (SHR)*. This division also oversee the current Patient Flow Command Centre which focuses on IHPTs between metropolitan hospital health services and COVID-19 patient management.
- **Neonatal Emergency Transport Service Western Australia (NETS WA)** – NETS WA a specialist team of doctors and nurses solely dedicated to providing neonatal intensive care during transport. NETS WA is a division of the Neonatology Clinical Care Unit (NCCU) of King Edward Memorial Hospital (KEMH) and PCH. NETS WA works in conjunction with SJAWA, RFDS and Medical Air Pty Ltd, retrieving patients back to the metropolitan area from regional areas.

- **WACHS Command Centre** – The Command Centre delivers a digitally enabled, flexible and dedicated specialist clinical workforce available to WA Country Health Service hospitals and nursing posts in real-time, supporting country doctors and nurses, improving outcomes for patients and keeping care closer to home. An Acute Patient Transport Coordination centre has recently commenced to oversee safe, timely and efficient patient transport to and from regional and metropolitan hospitals for admitted country patients, for both road and air transport.
- **Department of Fire and Emergency Services (DFES)** – a government department that is responsible for fire and emergency services in Western Australia, performing a critical role coordinating emergency services for a range of natural disasters and emergency incidents threatening life and property. DFES also manages the contracts for the State's Emergency Rescue Helicopter Service, inclusive of the platform, crew and critical care paramedics.
- **Royal Flying Doctor Services Western Operations (RFDS)** – RFDS is a long-time provider of aeromedical transportation, and other health services within WA, with significant experience in emergency and primary care services for those in regional and remote areas. At the time of this report RFDS WO has the contract with WACHS for aeromedical Inter-Hospital Patient Transport throughout the State. FRDS WO currently utilises fixed wing (both jet and turboprop) aircraft to provide its services, with the recent introduction of rotary wing aircraft to its fleet.
- **Department of Finance (DoF)** – DoF is a government agency, driving whole-of-government policy and influencing strategy, delivering practical outcomes for the community of Western Australia. DoF also construct and maintain government buildings, manage major state projects, lead government procurement, and administer revenue, grant and subsidy schemes. DoF have provided oversight and guidance for the re-contracting of aeromedical services, or components of, by DFES and WACHS.
- **St John Ambulance WA (SJAWA)** – Contracted directly to the Department of Health, SJAWA have provided the road ambulance services for the state for many years. While traditionally focused on road transport with interactions with aeromedical services primarily consisting of transporting patients from a health facility to an airstrip or airstrip to a health facility, SJAWA also more recently provide the clinical care paramedics and clinical governance to the Emergency Rescue Helicopter Service, under contract to DFES.
- **Australian Maritime Safety Authority (AMSA)** – virtual attendance – AMSA is Australia's national agency responsible for maritime safety, protection of marine environment, and maritime aviation search and rescue. When AMSA require assistance from WA regarding retrievals off the coast that involve a medical need, AMSA will contact the WA health system and aeromedical services to assist in retrieving the patient or casualty and subsequently handing over the patient or casualty to the WA health system.
- **Australian Medical Association WA (AMAWA)** – With WA's aeromedical services often staffed by medical practitioners, the AMAWA is well placed to provide input into the Inquiry, with their role being to look after the professional and industrial needs of members in whether they be they working in WA's public hospital system, running a private practice or providing services in community health centres in the rural and remote parts of the State, or on an aircraft.
- **Aboriginal Health Council of Western Australia (ACHWA)** – ACHWA is the peak body for Aboriginal Community Controlled Health Services (ACCHS) in Western Australia, existing to support and act on behalf of our 23 Member ACCHS throughout WA, actively responding to the individual and collective needs of our members. Several remote Aboriginal communities rely on the current aeromedical services not only for primary health care but also patient transport where appropriate.

- **Helicopter Logistics Pty Ltd** – Closed hearing – Helicopter Logistics is a Perth based specialist aerial work operator, providing fixed wing and rotary wing services across WA, supporting the mining and construction industry and service provision to government during disaster response.
- **PHI International Pty Ltd** – PHI is an international organisation with operating based within WA's north, working across the Pilbara and Kimberley regions. Services are primarily provided to the oil and gas industry, including surveying, marine pilot transfer, search and rescue, and aeromedical retrieval services.
- **Careflight Ltd** – Careflight is a medical retrieval organisation, utilising fixed wing (jet and turbo-prop) and rotary wing aircraft, providing and national and international air ambulance service, based out of Sydney, New South Wales (NSW), with a division also based in Darwin, Northern Territory (NT), servicing NT on behalf of NT Department of Health.
- **Medical Air Pty Ltd** – Medical Air is a provider of medical repatriation flights and Emergency Aeromedical Evacuation transportation, in both domestic and international arenas. This provider uses fixed wing jet aircraft based out of Jandakot, Western Australia.
- **Aviator Group Pty Ltd** - virtual attendance – The Aviator Group is a provider of specialist helicopter services offering a wide range of services to various industries, inclusive of aeromedical retrieval services. Headquartered and based in Mackay, Queensland, Aviator Group also currently provides services in Pilbara region out of Port Hedland.
- **CHC Helicopters Australia Pty Ltd** – International helicopter services provider working across various industries providing solutions for offshore transport, search and rescue, emergency medical services, and helicopter maintenance. Currently provides the rotary wing aircraft contracted to DFES for the Emergency Rescue Helicopter Service.
- **Aspen Medical Pty Ltd** - virtual attendance – Provider of healthcare solutions across a range of sectors in WA and internationally, inclusive of aeromedical retrieval/evacuation and transportation. Utilising fixed wing jet aircraft based out of Karratha in the Pilbara region.

Organisations who requested and received approval for an exemption from attendance are as follows.

- **Public and Aboriginal Health Division of Department of Health (PAHD)** – As a division of the Department of Health, PAHD is committed to protecting and promoting the health of the WA population by applying primary preventive measures, promoting healthy behaviours and environments, and intervening to reduce hazards to health.
- **Strategy and Governance Division of Department of Health (SGD)** – As a division of the Department of Health, SGD are responsible for the system-wide governance, strategy, policy and planning functions of the System Manager (Department of Health).
- **Western Australia Police Force (WA Police)** – WA Police provide front-line police services across Western Australia and a visible police presence in the community to keep the state a safe and secure place. WA Police are the Hazard Management Agency for land search and rescue and in the past have utilised Police Air Wing to facilitate aeromedical rescues, prior to the introduction of the Emergency Rescue Helicopter Service.
- **Wilson's Medic-One** – Wilson's Medic-One primarily are a training provider, however, also have a presence patient transport arena, both for industry and the public health system. Wilson Medic-One practice in the transport of non-emergency patients in all acuity types, primarily to and from health care facilities, also partnering with aeromedical services to provide solutions for repatriation of patients both to interstate and overseas.

- **Ambulance Employee Association WA (AEAWA)** – With WA's aeromedical services often staffed by Paramedics, coordinated by communications centre staff and often interacting at patient handover with ambulance or transport officers. The AEAWA is well placed to provide input into the Inquiry, with their role being to look after the professional and industrial needs of members in whether they be they working in WA's public hospital system, running a private practice or providing services in community health centres in the rural and remote parts of the State, or on an aircraft. (It is noted that in the absence of attendance, the AEAWA provided a written response to the considerations posed by the Inquirer.)
- **Australian Nursing Federation (ANF) WA** – With WA's aeromedical services often staffed by nursing and midwifery staffs, the ANF (WA) is well placed to provide input into the Inquiry, with their role being to look after the professional and industrial needs of members in whether they be they working in WA's public hospital system, running a private practice or providing services in community health centres in the rural and remote parts of the State, or on an aircraft.

All information captured during these hearings adds to the information gathered throughout the Inquiry process and were used to develop the Inquiry findings and final recommendations.

All hearing held complied with either section 231 (2) and (3) of the Act, which states that hearings must be held in public. However, the inquirer may direct that a hearing, or any part of a hearing, be held in private if the inquirer is satisfied that it is desirable to do so because of the confidential nature of any evidence or matter or for any other reason.

Transcripts of the Hearings are available at:
health.wa.gov.au/Improving-WA-Health/Aeromedical-Services-WA-Inquiry/Formal-hearings

10. Findings

10.1. Policy and system

Corporate and system governance

Organisational structure

Most respondents and interviewees believe that the existing structure of aeromedical services in WA is not optimal.

There is a lack of an integrated statewide system with appropriate policy and regulated frameworks to administer the AMS.

All interstate jurisdictions recommended a central single office for coordination and governance of the AMS. This includes corporate, financial and clinical governance.

The overarching body with authority for management of an AMS normally sits within Health and reports at a high level to the Director General or equivalent principle public servant. This relates to its 'pan-service' role and need for whole-of-system alignment.

In WA there are 2 structural elements of the AMS which appear inherently conflicted and risk prone:

- All FW case coordination, tasking, prioritisation response and clinical care, including most of the governance of these functions is vested in a single contracted provider agency (RFDS).
- The aeromedical rotary wing service (ERHS) is embedded in a department (DFES) which has limited fundamental clinical focus or clinical governance culture.

Throughout the conduct of the Inquiry, little dissent was heard regarding potential solutions to these issues, and the concepts of centralised coordination, and the movement of ERHS to a Health mantle were supported. Given that it would be important to maintain existing ERHS RW platform and technical (flight and support) crew systems, and appropriate emergency services capability (as current) whilst increasing health response capability.

Strategic direction

There is currently no state policy, legislation or strategic direction with respect to statewide aeromedical/patient transport services.

Strategic planning for an aeromedical system must fully articulate with general health service planning and capability frameworks.

Holistic models would recognise aeromedical services as a fundamentally intertwined (inextricable) component of systems of outreach, road retrieval services, and interim support or care in location. The absence of an effective road retrieval system (other than primary ambulance transport) is at odds with all other interstate jurisdictions and despite previous consideration of its need has not progressed. Current demand for road retrieval is highest in the Perth-Bunbury areas, however there is no doubt that road retrieval capability from collocated regional RW and FW bases and WACHS campuses could and should be developed as a part of a future system.

Capability of road platforms and crews varies across the state with considerable reliance on volunteer workforce in rural settings.

Lack of formal strategic planning or agreements for cross border transfers and care (in SA and NT) limits the development of efficient patient-focused systems to best serve some isolated communities.

Culture

Best examples of aeromedical culture demonstrate a patient focus across the entire care journey and a commitment to building and improving the system to narrow 'the gap' experienced by populations that is due to geography or resource limitation.

The views expressed to the Inquiry suggest a lack of common understanding between service provision organisations, their staff, the 'purchaser' (State) and health service staff. There is not a strong feeling of 'being on the same page'. This is unfortunate because the basis of the WA aeromedical system is potentially world-class.

Clinical services plan

There is no strategic or clinical services plan for statewide aeromedical (or other patient) transport systems. Such a plan, including a mature capability framework is important to articulate with the mature statewide Clinical Services Framework 2020.

Risk management

Risk management systems appear reasonable at an individual organisation level (focussing principally on internal processes and structures).

The approach to risk management across the aeromedical system is hampered by the segmented nature of the provider arrangements. Whole-system risk management can be addressed by careful management of contracts, including their requirement for interagency cooperation and holistic patient journey focus.

OHS/WHS systems

Inherent in aeromedical systems is the need (at times) for staff to work across organisations. Although organisations, contractors and providers maintain core responsibility for their OHS performance, the lack of an overarching body or framework creates risk through lack of uniformity or consistency of standards and systems.

Management of crew fatigue is a critical issue in all aeromedical services.

Contract management

There is currently no appropriate overarching consolidated government body to accountably oversee all aeromedical contracts. This results in disparate, non-articulated and non-strategic arrangements.

Components of existing contracts are not in step with contemporary industry-standard contracts of a similar nature, which are more formally commercial in style, and which manage performance, accountability and commercial conflicts of interest transparently.

Systems for contract management require a combination of excellent corporate governance skills and effective understanding of and connection to the clinical deliverables. In the AMS setting they also require expertise in aviation contracting, performance, pricing and procurement. To reasonably expect this constellation of skills, the establishment of a specialised overarching management capability is required.

All interstate jurisdictions support or expressed preference for long (10 year) contracts, and which incorporate long term capital requirements including aircraft and bases. Contracts may acknowledge that some providers also engage in other (separate) aeromedical services however the State contract must be explicit and effectively managed regarding conflict of interest, performance, and the implications of underperformance.

Management reporting

Management reporting and monitoring systems are compliant but basic and do not represent contemporary capability or optimised functionality.

Relationship management

Management of relationships between providers, users and purchasers, and between one provider and another requires a strategic and coordinated approach.

In single, statewide systems of aeromedical retrieval, the central leadership of an authoritative accountable body has demonstrated marked improvement in previous problematic relationships across a fragmented system.

In WA, the relationship between RFDS and the State and Health system is unusual and complex. This relates to the long and important history of RFDS, its status and arrangements as a partially federally and benevolently funded charitable organisation, and its effective contribution to the health and wellbeing of Western Australians. Aspects of this relationship, related behaviours, special arrangements, and communication channels would not be seen in a contemporary governance-focussed AMS. They perhaps should become a part of an acknowledged history rather than continue.

10.2. Governance environment

Legislative/Accreditation/Regulatory

All contracted providers involved in aeromedical services in WA report compliance with all legislative, regulatory and accreditation requirements however there is no central system in place to verify the appropriateness of the applied tools or the degree of compliance against them.

The aeromedical system has no overarching capability to monitor clinical practice against relevant legislation (*Health Services Act 2016*, *Mental Health Act 2014*, *Health Practitioner Regulation National Law Act 2009*, Australian Health Practitioner Regulation Agency requirements).

10.3. Policy and procedures

In general providers have very comprehensive, up to date, collated, policy and procedure systems and provided a catalogue of policies and schedule of currency to the Inquiry.

10.4. Aircraft

Type and distribution of aircraft

Distribution of aircraft (RW and FW) should ensure optimised response times and viable case volumes/loads (minimum and maximum).

Performance against contract, and respondent views regarding delays and access to platforms, suggest a need for re-examination of management of peak or surge demand and/or the number and/or distribution of platforms.

Current FW arrangements and contracts limit WA to a single provider essentially. This may represent a risk in terms of redundancy and surge capability and limits commercial negotiation options.

Current FW performance levels suggest that the FW fleet size is close to optimised (i.e. at capacity) based on current workload. Efficiencies (additional capacity) may be gained through review of base locations to collocate with major high-volume referral sites (e.g. Geraldton, Albany).

Formal professional independent planning is required regarding both FW and RW deployments. This however requires a mature strategic framework and understanding of service capability (aeromedical, hospital and workforce), and better consolidated data regarding the system's demands.

Comparison of RW capacity across like jurisdictions highlights a significant under-resourcing in WA. SA and QLD have 155% and 250% higher state-system RW platforms per million population than WA — differences which cannot be explained by geographic or demographic differences alone. (See Interjurisdictional Reviews)

Notably, there is a lack of coordinated RW aeromedical capability in the northern part of the State despite clearly unmet needs both overland and offshore. There are similar challenges and potential for development in the Goldfields and Midwest regions.

There is a need to increase, improve and ensure strategic and systematic expansion of RW services in the Southwest of WA.

Airstrips

Clarification is required regarding systems for construction and maintenance of airstrips. Coordination is required at high levels to consider provision of statewide coordination for these services by a specialist provider of airport infrastructure.

The AMS is not the only user of such facilities however to discharge the expectations of the community and health system (and Government) regarding access and responsiveness, it must take an active role in progressing improvement in airstrip infrastructure.

Helipads

Hospital based helipad infrastructure is inadequate and is fundamentally related to the lack of AMS strategy and planning. All hospitals offering a significant level of emergency care, or which regularly transfer time-critical patients to higher care, within the SW operating range of RW platforms should be equipped with a helipad. Similarly, major receiving hospitals which are the destination for these patients should also be helipad equipped.

Perth receiving hospitals with HLS are Royal Perth, Fiona Stanley and Queen Elizabeth II complex (PCH and Sir Charles Gairdner).

The Civil Aviation Safety Authority does not currently have a legal instrument to certify or register HLS that are not an integral element of an aerodrome certified or registered under Part 139 of the *Civil Aviation Safety Regulations 1998*. The responsibility for determining the suitability of a place as a helicopter landing site is held under *Civil Aviation Regulation 92* (CAR 92) by the pilot in command and in some circumstances, is shared with the aircraft operator.

The 3 tertiary hospital Heliports, together with Jurien Bay and Narrogin meet current ICAO Annexure 14 and CASA 92.2 requirements, and DFES were consulted during the development of these sites.

Referral hospitals (in the Perth/Bunbury RW zone) with collocated secondary HLS are limited to Jurien Bay, Narrogin, Northam and Peel.

Bunbury Hospital (with the only ICU capability outside metro Perth) has no collocated HLS.

This arrangement of HLS severely limits the system options in both referral and destination considerations and precludes expansion of RW services unless addressed.

Geographical considerations

Current FW systems are designed on the premise of provision of most high-complexity healthcare in Perth. Similar services (in general terms) are available in Darwin. Geographically (and leaving aside State boundaries) there is inherent logic and potentially cultural relevance in rearrangement of the provision of part of the complex and tertiary health services for the population of northern WA towards Darwin. Reorganisation of the aeromedical system to support this is feasible and is likely to be more cost-efficient.

The demography of the State, together with local placement of medical services and well-developed outreach and support services defines the extent of required aeromedical activity. Each aspect of these should be optimised within reasonable system constraints, whilst supporting a goal of equity of access to care – as so far is feasible.

RW replacements, implementation and unmet RW need (Peri-metro, Wheatbelt, SW, GS)

DFES RW retendering

On December 7 2020, DFES provided pre-release advice regarding its RW tender process which occurred on February 2 2021. In April 2021 DFES closed the tender process for replacement of the RW and (flight) crew which ultimately resulted in the awarding of a contract February 21 2022 for provision of RW services with a platform change to the highly capable AW 139, a contemporary AMS platform ideally suited to the WA context.

Although this may be a suitable outcome, it remains problematic that such developments appear to proceed in a vacuum which ignores the potential synergies, rectitude and connections of the RFDS RW acquisition, and the CHO initiated Review of Aeromedical Services (announced some 10 months prior).

Proposed RFDS RW EC145x2 trial

In early December 2020 RFDS committed to purchase 2xEC145 RW aircraft and on December 17 2020, advised the WACHS that the purchase had occurred.

Concerns were expressed to the Inquiry by many respondents including interjurisdictional experts regarding this proposed implementation. Concerns were raised over platform suitability, operational model, and lack of system integration of (all) RW platforms.

There is little precedent to support fragmentation of RW aeromedical services into primary vs IHPT-only platforms, and in Australia there is only 1 such RW platform which operates in a unique, high-volume, state-coordinated, mature IHPT system setting. This (RFDS) model was not supported for WA by any interjurisdictional experts consulted by the Inquiry.

The Inquiry's review of the data regarding unmet need in the region suggests an initial caseload estimate appropriate for 1 additional RW platform (250-350 missions) in the SW. A reasonable, objective conclusion would, on this basis, advise an increase of 1 helicopter initially, increasing the existing ERHS fleet to 4. (With an assumption that changes to platform, configuration and crewing recommended elsewhere are achieved).

The implementation of the 2 RFDS EC145's follows an unprecedented and extremely irregular pathway from which is absent most of the norms of public sector service development, including: strategic alignment, needs analysis, consultation, and business case agreement. Instead, the aircraft (intended to service WA Health patients) were purchased without strategic analytic support from Health, a business case was developed almost a year post-hoc, and a 'trial' agreed without a clear professional evaluation strategy. A 'trial' of a system of patient care and transport that has been implemented and evaluated across the world is an unusual and unnecessary approach and may be further questioned when it is pre-empted by media promotion including announcement of helicopter purchases, the implementation of a

new service, and partnership with and branding by significant benevolent funders.[9]

Throughout this period, fundamental consultation and important enablers were unaddressed, namely engagement with system emergency RW experts (DFES/ERHS), including consideration of best options for the State and population in expansion of rotary services, and the key issue of lack of health service HLS capability in the principal service area. The issues of probity and adherence to public sector and charitable organisation governance norms around this process may require further investigation.

Both the above related scenarios highlight the fragmented and non-strategic nature of WA AMS, and a culture of siloed activity by key organisations.

Unmet rotary wing need (other regions)

There is no system of health coordinated RW service to the regions outside SW despite reasonable volumes of ad hoc tasking of industry medivac helicopters. A lack of comprehensive case-level and reliable system-level data necessitated the application of estimates and assumptions (see below).

Conservative analysis of SJAWA and WACHS data strongly suggests viable RW caseloads in the Pilbara and Goldfields regions.

Kimberley (Broome) and Pilbara (Port Hedland) data suggest the potential for a Northern regional solution due to proximity (overlap of RW potential radius of operation).

Unmet need – system design considerations

Various proposals for potential location of additional assets and for reorganisation of existing FW assets have been tabled. There is a need for better data and integration of thinking, planning and capability strategy between the AMS, Ambulance and WACHS services before this type of planning can be progressed comprehensively.

Figure 9 is illustrative examples of the input received which begin to draw a picture of a better integrated system with overlapping and synergistic networks of FW and RW aircraft. A component of a system level Strategic Plan must include measurement, assessment and design with this level of service integration considered.

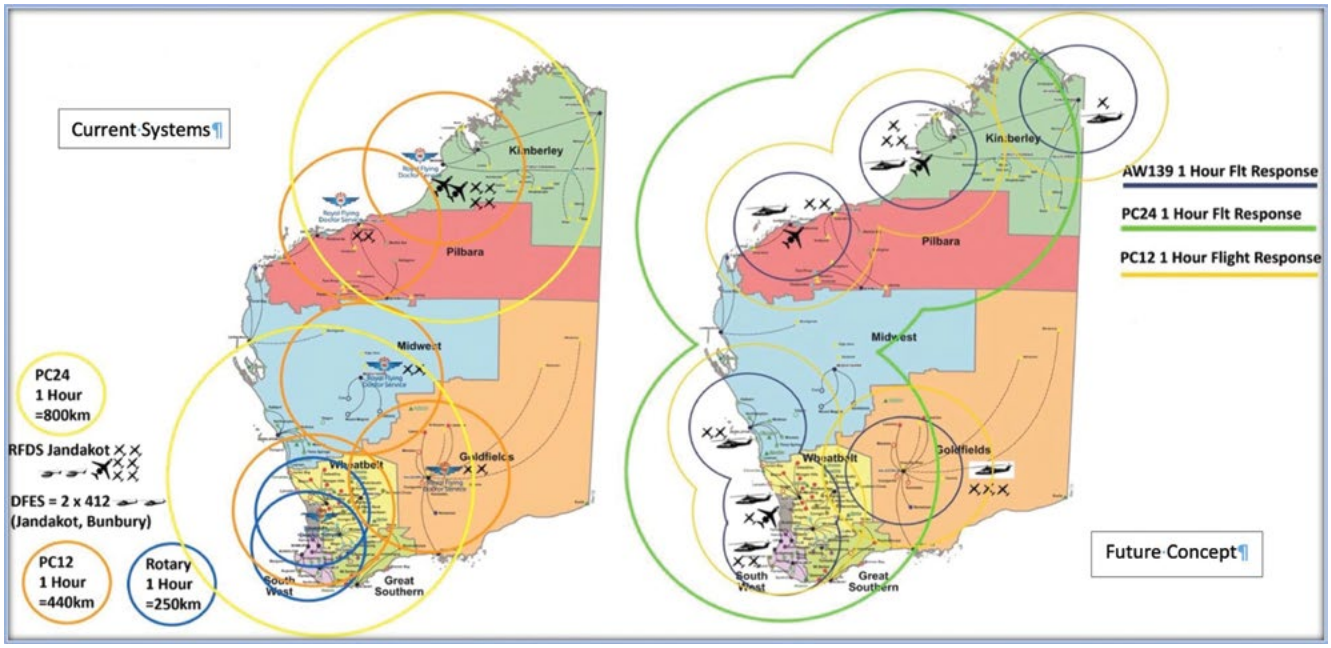


Figure 9 Concept map of future AMS base design

9 flyingdoctor.org.au/wa/news/rfds-and-fortescue-announce-new-aeromedical-helicopter-service-wa/

Such design must also be overlaid against heat maps of health service, IHPT and primary response demand to understand service workload and viability. It must also be constructed with workforce and hospital capability factored.

However, intuitive redesign based on currently available data does provide ostensibly sensible (low-to-zero risk) options based on even the limited data available to date.

For example:

- There is a strong (performance) case for collocation of FW bases and major referral populations, so transfer of the RFDS Meekatharra base to Geraldton could be proposed
- There is a significant potential caseload for RW in the Goldfields region, especially primary response, so establishment of an additional RW platform could be proposed which would also improve services into the Great Southern and over water
- There is a similar case for RW development in the Pilbara, therefore, an additional RW service collocated with a significant health service and RFDS base and positioned to provide land and offshore response is a reasonable proposition.

10.5. Case coordination

Central coordination

The need for an effective and innovative, authoritative, central coordination capability has been agreed by virtually all Inquiry participants.

Across large geographical service areas, hub and spoke models of service organisation may prove effective.

Central coordination of aeromedical services will form part of a broader outreach and transport system in a mature AMS. The fundamental principle in the operations of such services is to recognise and narrow gaps and disadvantage in access to health care which are experienced by more remote communities.

The absence of a single mechanism of centralised balanced coordination creates tasking prioritisation competition and risk. Centralised coordination allows cooperative oversite of the logistics of the whole patient journey, and enables multi-platform tasking, fully informed and efficient task diversion or revision, and articulation of all transport legs (e.g. road segments to and from airfields).

Coordination services which are provided by a contractor whose subsequent response is a fundamental KPI measure, and which may be in competition with similar KPIs applied to parallel aspects of their work (with other health transport purchasers) represents a fundamental conflict of interest.

Central oversite of bed access and patient flow is an increasingly common part of aeromedical and retrieval system models. This recognises the need for resource limited health systems to have a central point of knowledge, arbitration and decision regarding this data and associated functions.

All interjurisdictional services recommend medical consultant oversight of aeromedical (and road retrieval) activity, including all tasking.

Coordination and provision of aeromedical services should be seamlessly integrated with road retrieval systems as their spectrum of services and systems needs are inherently enmeshed.

Structured central clinical outreach and advisory services increase consistency and appropriateness of clinical advice across a retrieval system or AMS.

Access to services

There is a general perception that FW responsiveness is not consistently meeting demand requirements. Existing services arrangements for FW (single provider – RFDS), has resulted in limited options for surge capacity and redundancy (Notably, NETS estimates RFDS responses to be delayed in approximately 50% of cases and has independently contracted aircraft services outside the coordinated statewide AMS - to achieve the responsiveness required for its critical service type).

Review of 5 years of RFDS performance data shows:

- The current FW system (RFDS) is severely limited in its ability to respond in an agile way to growth or case volume changes.
- The model of non-collocated bases is associated with lower response performance.
- The rationale for low rates of outsourcing or usage of overflow platforms in the face of performance decline is problematic.

There is an apparent reluctance (reported by users) of RFDS to access overflow or surge platform providers – a strategy which would improve response and/or accessibility – activity data (2020/21) confirms that 'other' or third party platform providers are utilised for approximately 0.4% of IHPT cases and 0.9% of Primary cases – overall, less than 1 in 200 cases (of an annual caseload of approximately 10,000) are referred to a third-party platform provider.

Similarly, where the RFDS-WACHS contract includes $735K for ERHS RW subcontracting, there exists a clear financial perverse disincentive to use this service and to substitute FW where possible. In this context it is also challenging to understand the RFDS RW projections of caseload used in their RW 'business case'/proposal against the current referral rate which is underwritten in the contract as above.

Other AMS access issues noted:

- The current orientation of ERHS RW services is strongly towards the rescue and primary response aspects of its missions, and IHPT seems to be viewed as 'lower risk'. This is a flawed mental model that does not consider individual patient risk, however, is understood in the setting of deficient central coordination or oversite of the AMS
- Aeromedical service access for psychiatric patients does not always meet the triage and/or urgency needs of clients. Use of WA Police escorts in these circumstances creates another staff availability dependence and drains local police resource
- Systems for allocation of retrieval case priority (urgency) are not uniform and are blunt (less patient focussed) compared to other jurisdictional approaches – there is scope for improvement in scheduling and timeliness of aircraft response. There is cognitive dissonance between RFDS and some users (esp. NETS, Mental Health) approaches to urgency classification.

Communication systems

Communication systems (technical) are generally reported as good and meeting the needs of the system. It is likely that improvements would be achieved (including greater application of telehealth systems) with central coordination of aeromedical services.

Case management and clinical support

Whilst existing systems provide an overall adequacy, they are risk-prone, non-systematised, non-centralised and variably governed. There is no system of objective assessment of performance at a whole service level.

Various providers report satisfaction with high levels of case management and support they provide, however, users frequently report need for improvement. This suggests that improvement is required in the effectiveness of connections and understanding of satisfaction between providers and users.

Repatriation (back transfer) is an aspect of case management which is compromised by the current silo arrangements – availability of beds to transfer into, and the availability of AMS resources to perform transfers both contribute to unnecessary use of limited bed-stock and to system cost. Excess length of stay, dislocation from family and community, and delay to access rehabilitation all impact patients and the community negatively. There was no available data that comprehensively measured back-transfer delays.

Both retrieval and repatriation services must possess and demonstrate appropriate cultural awareness for their populations. Repatriation is one area where this important maxim is tested in the WA health system, however in general, it was reported that the AMS responds well to the needs of the diverse WA population.

Destination management

Existing systems require referring clinicians to organise patient destinations in most cases. This is an arduous process, requiring the clinician with the least time, resource, and power to negotiate patient destination via 'push' systems. Mature aeromedical and patient transfer systems provide 'pull' brokerage of this role, releasing referring clinicians to patient care, and coordinating communication between referrer, transport and destination.

This is achieved through AMS central coordination systems.

Platform and crew allocation

WA aeromedical crewing has potential for improvement. The current RFDS systems rely on provider staff who have a range of skills from primary health to critical care. Allocation of a crew with an appropriate skill set is fundamental to good clinical outcomes in the AMS environment.

The Inquiry received significant input suggesting that there may be scope for improvement in the clinical performance of some RFDS crews, and that the existing mechanisms for feedback, case review and improvement are not as effective as they might be. It is critical that these governance systems are in place, function across the system and are proactive in ensuring the crew-mix meets patient needs, and that systems monitor this effectively.

The current models for RW and FW have fixed links between the platform and crew options – for example a RW response will provide one paramedic only, unless complex recrewing (and delays) add a medical officer to the crew (albeit one with very little RW experience). Tasking of a RFDS FW provides access to medical and RN crews only. This is not optimally patient-focused.

End-to-end case monitoring

End-to-end case monitoring is not an effective component of the often-fragmented approach to the patient journey. This relates to the lack of central case coordination systems.

Escalation and control systems

Escalation systems exist however there is no centralised, independent authority to be the decision maker if escalation does not produce a timely resolution, and there appears to be no system to capture how often, or what outcome an escalation has produced.

Clinician groups provided consistent input regarding the need for effective escalation to an authoritative endpoint.

10.6. Clinical governance

Clinical governance framework

There is no common (shared), overarching clinical governance framework for aeromedical services in WA.

The responsible arm of government (WA Health), which also has operational roles in the aeromedical system is 'a step removed' from the bulk of the aeromedical system's active clinical governance processes.

Receiving hospitals view of retrieval service clinical standards was at times critical, and underlined the lack of system oversite, verification, and ability to effectively investigate or resolve such concerns.

Clinical guidelines and standard operating procedures

General clinical guidelines and standard operating procedures for aeromedical transfer are reported to be comprehensive and readily accessible.

Whole system development and coordination of contemporary guidelines, auspices by a central body, and coordinated across the health service-aeromedical interface would support seamless, consistent clinical practice.

Periodic external review

There is no integrated and state-led process for independent periodic external review of clinical services of aeromedical services. Such reviews engage external experts and colleagues to regularly scrutinise processes and the application of policy – searching for improvement opportunities.

Incident and adverse event monitoring

Providers indicate that they have mature incident and adverse event monitoring systems. These systems exist outside the statewide Health incident system, limiting system level visibility, learnings and improvement opportunities.

The systems are internal to each agency and do not contribute to statewide systems except for SAC1 incidents for which reporting is reported to be variable.

Root cause analysis program

Multi-agency root cause analysis (RCA) is not common and there is no defined pathway for effective coordination of interagency RCA.

Open disclosure program

Open disclosure processes are embedded in the aeromedical services. Central monitoring by an overarching agency may generate system level learnings and improvements.

Case review

Internal case review systems are identified in existing agencies; however, these are internal to each agency. Increasing consistency of process, transparency of learnings, and interagency participation enriches case review systems.

System-wide case review and auditing results in shared learning.

There are no systems for effective follow up of patient outcomes beyond the period of case management – thus the impact of any assessment, treatment or intervention is unknown. Complete linkage of clinical datasets across the whole patient journey provides a comprehensive but challenging solution to this issue, however other mechanisms such as interagency audit, mortality review and research are readily achievable.

Clinical audit

RFDS demonstrated strong (internal) audit processes aligned to the recent NSQHS accreditation, however the maturity of the system was not determined, and staff statements suggested further development of the system may be necessary. ERHS did not present evidence of a mature clinical audit processes.

An established audit system reviews case or issue cohorts to determine compliance with guidelines or policy that link to better patient outcomes. They may be routine (repeated each period) or one off, and they must contain a recommendation and action component that is remeasured in a repeat audit. A mature audit system is, in essence a rolling program of Plan-Do-Study-Act (PDSA) cycles.

KPI monitoring and reporting

There is scope for improvement in organisational and system-level monitoring of KPIs. KPI's are not specifically constructed to adequately measure quality and safety of systems or to reflect clinical outcomes of patients. General 'health system' KPIs do not always translate well to aeromedical services.

Clinical quality and safety indicators as exemplified in mature interjurisdictional AMS clinical governance and standards systems better reflect clinical standards at both process and outcome levels. It would be beneficial for a statewide AMS body to partake in the active national collaborations available in Australasia.

Risk management framework (clinical)

Organisations advised that mature clinical risk management frameworks and systems were in place however no validation was received by the Inquiry. A central single office for coordination and governance of the AMS would resolve this gap.

Clinical documentation review

Provider organisation indicated the presence of clinical documentation review systems. This was well validated in the ERHS and RFDS audit or case review process. Opportunity exists for increased staff involvement and feedback.

Process for new equipment/intervention/treatment

There is no process for standardisation of equipment in the aeromedical system. Variation is seen between platforms, provider, and road ambulances – creating risk. In austere environments, standardisation reduces risk of clinical error.

Each of the provider organisations indicate that they have an effective policy and procedure defined for introduction of new equipment, intervention and/or treatment.

Equipment management system

Each of the provider organisations indicate that they have a formal equipment management system which considers equipment appropriateness, longevity and maintenance.

Complaints and feedback

Individual organisations involved in aeromedical services have systems in place to manage complaints. At a system level there is no transparency of these processes and no clear evidence of systematic reporting to staff or to Health. A central single office for coordination and governance of the AMS would resolve this gap.

Increased transparency and sharing of learnings from complaints provides a valuable mechanism for improvement.

10.7. Workforce (clinical)

Workforce model

In general, the AMS industry advocates for 2-clinician standard crewing (including RW) except for very low acuity transfers.

The existing single clinician model for ERHS staffing is not supported.

FW staffing models are effective however currently do not include the option for paramedic staffing.

The aeromedical and retrieval workforce is increasingly specialised and must look to staff with appropriate levels of training and optimised scope of clinical practice.

The recommendations contained within the Inquiry report are likely to lead to a significant growth in permanent workforce working in the aeromedical, coordination, retrieval and outreach areas. Increasing the coordination of the service and ironing out the frustrations of a relatively disconnected service, coupled with professional development options are attractive drivers for workforce growth.

Interdisciplinary framework

Pre-hospital and inter-hospital care in WA have a long history of interdisciplinary provision of care for road and aeromedical retrieval and transport.

Innovative and extended practice roles are evolving and may have a role in aeromedical practice. The current arrangements where the workforce in ambulance and aeromedical providers is all third party-contracted (i.e. not health department linked) creates complexity in the potential flexible employment and deployment of highly skilled staff across parallel functioning services i.e. RFDS, ERHS, SJAWA, WACHS health services.

Compared for example with NSW where the workforce in these sectors are all (medical, nursing, paramedic) 'government' employees where conditions, arrangements, policy etc are managed state-wide and are consistent – allowing greater flexibility.

Selection and recruitment

All respondents state that selection and recruitment processes are robust and compliant with contemporary standards.

Credentialing and scope of practice

Defined and consistent scope of practice, clinical expertise and clinical practice standards are required for aeromedical services regardless of platform or provider.

Mature aeromedical systems have processes for central (system manager level) management of scope of practice and credentialing – including highly specialised forms of retrieval such as neonatal or Extracorporeal membrane oxygenation (ECMO). Cross-credentialing of practitioners (across platforms or aeromedical services) may be accomplished by a central process and deliver efficiencies.

WA is currently unable to provide this aspect of clinical governance.

Onboarding systems

Organisations indicated compliance with general standards for onboarding.

Education and professional development

Organisations indicated the provision of education and access to professional development opportunities for staff.

Central (system-level governance) or externally assessed verification of education and professional development systems is not clear.

Performance management

All organisations indicated compliance with general standards for performance management

Central (system-level governance) verification of performance management systems are not clear.

Training programs and qualifications

All organisations indicated compliance with general standards and expectations for training and qualifications of staff.

Central (system-level governance) verification of performance retraining and qualification management is not clear.

Training accreditation standards and processes of ACEM and Affiliates PHARM Diploma are supported.

10.8. Knowledge management

Education

System level coordination of higher education for aeromedical practice is a marker of a mature aeromedical and retrieval system.

Further maturation of statewide governance is required to enable development of educational systems.

Research

System level coordination of research for aeromedical practice is a marker of a mature aeromedical and retrieval system. Further maturation of statewide governance is required to enable development of research systems.

All jurisdictions strongly support the development of a national registry for aeromedical and retrieval practice to inform best (and evidence-based) practice, research, and strategic development of systems and services.

Evidence based guidelines

Each service utilises individual evidence-based guidelines, however system-level coordination and commonality (interagency, including road services and hospital care systems) is lacking.

10.9. Information management

Operational systems

Coordination and case management systems:

- single data pool (or repository) with clearly defined data sets would deliver real-time intelligence to inform clinical, operational and system level decision making
- there is no agreed minimum data set
- cross-agency visibility of whole-State activity is not possible
- telehealth systems are advanced.

Clinical (POC) systems

Contemporary clinical point of care IT systems provide not only a tool for capture of data and clinical information, but also provide clinicians with valuable tools to improve patient quality and safety.

There is no agreed minimum data set.

Platform management systems

Cross-agency shared visibility of whole-State activity is not currently possible.

In considering the future of information systems for WA AMS across the above areas, there is much to recommend a specific review of the current developing and varied information system arrangements. It is not difficult to envisage a single or integrated cloud-based system to enable and/or provide for:

- case intake
- coordination and case management
- outreach and support through structured advice and telehealth systems
- transport coordination and tasking
- destination coordination through integration with system-wide hospital bed capacity systems
- integrated whole-system guidelines and decision support underpinning these
- integrated real-time governance systems monitoring and driving safety, performance and efficiency
- background 'person' systems to manage the governance of the workforce
- research capability
- business modelling and strategic development capability.

Business systems

Business reporting:

- Business systems are reported to be largely satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

Asset management system:

- Asset management systems are reported to be largely compliant and satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

Human resources

- Human Resource systems are reported to be largely compliant and satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

10.10. Funding model

RFDS

There is no single point of government control, responsibility, or coordination of aeromedical funding.

Funding of FW (RFDS) is complex and reflects the range of services RFDS provides to 2 governments, industry and compensable individuals. The result is a system lacking in clarity to purchasers wherein the relationship between price and product is not transparent or easily understood.

An illustration of this complexity is consideration of the billable km for a patient transfer:

- Essentially a flight (or RFDS mission) may be an irregular journey where an aircraft travels around the state picking up and dropping of multiple patients, of different types, with different purchasing agencies (State or Commonwealth or Industry), usually ending up back at a base it started from
- Chargeable km are based on each patient's share of the total km in that total journey, calculated as a percentage, using the direct distance from their pickup location to destination as the numerator, and the total length of the journey as the denominator. It is not clear from data provided whether the rate per km is consistent or varies by purchaser
- Therefore, and depending on the number of pickups, multi loads etc a trip from A to B will, on different occasions, cost a different amount depending on the flight tasking, coordination and passenger logistics (which the purchaser has no control of). Further, the length of the total journey may be determined by one purchaser's contracted need and/or performance requirement, and that aspect of the journey may drive up the journey length and therefore the expenditure incurred by another purchaser
- The same model applies to calculation of flight hours.

Appropriateness of RFDS cost allocation methodology

The allocation of costs between the IHPT and Primary Evacuation services has been based on the direct (straight-line) travel distance for each service dependent on the passenger's destination and arrival location. This is subject to several shortcomings, as it assumes a homogenous service offering by way of:

- resource consumption across the IHPT and Primary Evacuation services in terms of:
  - Type of aircraft (with the introduction of the rotary wing assets)
  - Crew composition – number and skill level of paramedics
- flight characteristics
  - Time taken for flight tasking, coordination and passenger logistics
- proximity and therefore distance between base and passenger pick up location
- proximity and therefore distance between passenger drop off location and base
- standby-availability – influenced by the ability to plan staffing for the patient movement. IHPT services are likely to be significantly more planned, and therefore require significantly less standby capacity.

The above factors are unlikely to be homogeneous and are likely to vary significantly between an IHPT and Primary Evacuation service event, and it is therefore likely that the cost of Primary Evacuation is under-allocated (based on the existing allocation framework).

Contemporary payment model

Upon review of the analysis conducted, it appears as though there is likely to be cross-subsidisation between:

1. services offered by funder (substantiated by the inability to differentiate the cost of each service – as detailed above)
    - WACHS and/or IHPT services
    - Commonwealth and/or Primary Evacuation services.
2. services delivered to WACHS
    - IHPT by fixed wing aircraft
    - IHPT delivered by rotary wing assets
    - Emergency Rescue Helicopter Service
    - Repatriations.

Furthermore, the parameters within the payment model appear to have been adjusted year on year, based on negotiated growth (either volume or inflation) adjustments applied to:

- base service kilometres
- unit fees per Base Service kilometre
- service payment – fixed
- service payment – Emergency Rescue Helicopter Service.

Over time, it is likely that these parameters have deviated from their originally calibrated position (of optimal funding by service category) resulting in perverse incentives (because certain service categories and events now receive a relatively higher rate of funding).

Accordingly, it is recommended that a contemporary payment framework and/or model is developed based on first principles that includes:

- Reference to an appropriately fully costed service (in respect of services within the scope of the Service Agreement). This will ensure that:
    - There is transparency in respect of the scope of services costed
    - The price (and therefore funding) is calibrated via reference to the cost of service delivery plus appropriate risk margin.
- Review and allocation of risks to ensure value for money (by ensuring the risk is assumed by the party best placed to control the risk) to either:
    - funder
    - service provider
    - shared.
- Development of commercial principles and payment framework that:
    - achieve the overall procurement objectives
    - achieve the desired risk allocation
    - future proof the payment model over the contract term (based on reference to appropriate indexation indices, population releases) to avoid the need to negotiate the price increase that applies annually.

- Development of supporting:
  - service specifications
  - reporting requirements
  - performance management regime including:
    - KPIs
    - Abatement regime (to the extent required).

Note: funding of the RFDS RW platforms is not considered by the review as this remains to be determined.

ERHS

DFES ERHS has a complex funding model sourcing funds (2022/23) of $25.7M from the State Consolidated Account ($17.9M [70%]), Emergency Services Levy ($5M [19.6%]), Road Trauma Trust Account (Previously – to 2021/22), RAC Sponsorship funding ($2.8M [11%], and some Commonwealth funding (AMSA cost recovery).

The road trauma trust account (RTTA) funding of approximately $4.7 million per annum is ceasing in 2021/22 as the Road Safety Council did not support DFES' request in September 2019 to continue RTTA funding, based on the absence of an evaluation of the ERHS contribution to improving road safety outcomes.

It is further noted that the ESL can only fund the portion of the ERHS that is considered within the scope of the Western Australian *Fire and Emergency Services Act 1998*, which is mainly dedicated to search and rescue operations under the correct undertaken by the ERHS.

With regards to Commonwealth funding from the Australian maritime safety authority for maritime search and rescue missions, it is noted that this funding is on a cost recovery basis bracket and excluded from the budgeted funding.

Charging of Aboriginal Community Controlled Health Services

There are several Aboriginal Community Controlled Health Services (ACCHS) affected by the costs of ambulance transfer between the airstrips and the hospitals. In general, where such transfers occur from or to WACHS hospitals, the cost of the transfer is carried by WACHS. If the ACCHS is in a town with a WACHS hospital, the patient will usually be transferred to the hospital, and air transport coordinated from there, thus circumventing the funding impost on the ACCHS. If there is no WACHS hospital immediately available, the transfer increases in complexity and cost issues, road ambulance logistics, and various private transport considerations are considered. Therefore, for appropriate and isolated services, it may be prudent to review policy and payment streams to provide a more patient-focussed solution.

11. Recommendations

Where health systems have evolved rather than being planned from the outset, it is common that they focus primarily on the important aspects of clinical process and direct service delivery. Governance systems, interagency policy and relationships, and mechanisms for collaboration often miss out. When attempts are made to 'retro-fit' policy, strategy and governance systems they run a risk of becoming lost in their own paradigm and not connecting to the operational needs of a system effectively.

The challenge in significant system change (when it is required) is to imagine the perfect future state, the 'greenfield option', and then to balance it against the existing – resolving the dissonance in an achievable, constructive, optimised way.

The WA aeromedical system needs significant change if it aspires to best contemporary practice – clinically and organisationally. To be effective, this change will acknowledge the best of the past, but will also commit to a different future.

Much of the recommended change will involve new ways for organisations and their people to work together — often, providing services and care differently — rather than providing completely new services. However, there will also be some new processes, new ways of thinking, new shared values, and new clinical systems.

With these changes will come a need for cultural development, different approaches to contractual relationships, and an ability to collaborate around the patient journey in a way that is patient centric and agnostic of organisational competition, power, or influence.

The approach to recommendations in the Inquiry report flows from an appreciation of the principal assets and liabilities of the existing system.

Assets	Liabilities
• Established high-quality fixed wing and helicopter services. • A network of infrastructure which provides high level capability. • Highly capable and developing systems of outreach, support and coordination (APTC/WACHS command centre). • Talented and intelligent staff. • Solid levels of organisation-level governance.	• Lack of an agreed strategic framework. • Contracts and contract management processes which are lacking. • Absence of an authoritative central coordinating governance entity to manage both corporate and clinical governance. • Disconnected coordination and case management processes. • Lack of collaboration.

Figure 10 Current system assets vs liabilities

Principal recommendation	Secondary or enabling recommendation
1. Develop a 10-year Strategic Plan for Aeromedical Services	1.1 Commission an independently-chaired, Implementation Group to manage the project of works arising from the Inquiry including development of the draft Strategic Plan (to incorporate retrieval and outreach functions including emergency telehealth) and initial business plan. 1.2 The Implementation Group has a 2-year tenure.
Rationale/notes: The aeromedical system requires a cohesive strategic plan which considers all elements of the related system (including road retrieval, outreach, and repatriation), together with a business plan which refines the indicative estimates of this report into a robust business proposition. The Strategic Plan remains in draft until completion of a Service Refinement Plan, completed at 2 years. The Service Refinement Plan will be strongly influenced by collection of reliable, strategic, focussed data over years 1 and 2 and will allow informed completion of the plan especially regarding sites and models of service development. Through the Service Refinement Plan complete data analysis and demand modelling to investigate the perceived need for and placement of additional fixed wing platforms. Optimisation of base location including articulation with rotary wing systems and WACHS regional centres for workforce development is achieved.	
2. Establish a new structure to provide a centralised system of Governance for Aeromedical Services	2.1 Establish an office within WA Health (system manager) which is responsible for the implementation and ongoing governance, coordination and development of Aeromedical and related services. (For the purposes of this report referred to as: The Office of Aeromedical Services, Retrieval and Outreach). 2.2 The Office of Aeromedical Services, Retrieval and Outreach will develop the Aeromedical Services Service Model and Capability Framework 2.3 The Office of Aeromedical Services, Retrieval and Outreach will be responsible for management of all aeromedical contracts (fixed wing and rotary wing) and related budgets and performance. Contract management specifically includes rigorous oversight of aviation standards compliance, staff credentialing and scope of practice standards, and all clinical governance standards. 2.4 Office of Aeromedical Services, Retrieval and Outreach becomes responsible for promoting and managing health interests in Helicopter Landing Site and airstrip management, including advocacy and technical support for expansion of Helicopter Landing Site infrastructure 2.5 Research and education in the sector is promoted and supported

Principal recommendation	Secondary or enabling recommendation
Rationale/notes: Improved Governance systems are fundamentally required to resolve existing challenges in the Aeromedical System and to provide the leadership required for development of a solid collaborative culture in WA Aeromedical System. To ensure whole-of-health integration and connection, the Office of Aeromedical Services, Retrieval and Outreach may be a department of a WA Health Division. It has a logical relationship and synergies with the Patient Flow Command Centre, the planned State Health Operations Centre, demand management functions, and incident management functions. Centralisation of Aeromedical System contract management is required to ensure optimised connection with health systems and culture, and to focus a central authority and capability in contract management. This optimises the connection between contracting, services and patient outcomes.	
3. Building on the existing WACHS command centre, establish a whole-of-State Coordination Service[10] administered by the Office of Aeromedical Services, Retrieval and Outreach.	3.1 Coordination functions currently bundled within the Royal Flying Doctor Service – Western Ops (RFDS) contract are extracted and the process is transferred to the coordination centre (in which RFDS is represented). 3.2 Improve central coordination of Aeromedical Services aircraft Tasking[11] The coordination service is responsible for all Aeromedical Services aircraft tasking except for rotary wing primary response (tasking is via St John Ambulance (WA) WA). Despatch[12]: Fixed wing despatch functions are provided by the fixed wing contractor(s), and rotary wing despatch functions are provided by St John Ambulance (WA). 3.3 The coordination service is responsible for arbitration of all conflicting Aeromedical System tasking requests or prioritisation.

10 Coordination Service Functions: 24/7, call taking, case data collection, case assessment including telehealth, provision of standardised evidence-based early and interim clinical advice, case formulation and planning, transport and destination coordination, case follow up and associated clinical governance functions.

11 Tasking: Communication to a despatcher of a decision to activate and respond to a case utilising a particular aircraft type (FW or RW), with a specified crew mix, and with a specified urgency (time to departure) based on the clinical needs and acuity of a case.

12 Despatch: The process of sourcing and allocation of a specific aircraft and crew, provision of data and logistic support to the pilot, scheduling documenting and facilitating departure, including flight-tracking, coordination of flight segments and support ground logistics, and troubleshooting mission issues

Principal recommendation	Secondary or enabling recommendation
Rationale/notes: Central coordination is the cornerstone of all Aeromedical and Retrieval Services. The Coordination Service collocates and integrates disciplines, service providers and processes to provide cohesive case-management, liaison and cooperation, to meet the needs of the patients requiring Aeromedical Services, Retrieval and Outreach services. The relationships of organisations involved in the operations of coordination recognise the peak authority of the Coordination Service and are defined by appropriate legal instruments or agreements. The relationships are based on service provision contracts and collaborative processes as distinct from federated partnerships.	
4. Review and revise the fixed wing contract(s) and services to implement a more rigorous and clarified service relationship with providers.	4.1 The contract (s) must be improved to reflect contemporary standards and expectations and must be monitored and managed effectively. 4.2 Although 10-year contracts are common in Aeromedical systems an initial approach of 5 years with an additional 5-year option for WA Health is recommended. 4.3 Funding conditions and financial models are reset for 10 years (with interim reviews of rates) after further interjurisdictional benchmarking and audit – it is recommended that a contemporary payment framework and/or model is developed based on first principles. 4.4 Parallel commercial or other activity of contractor(s) (e.g. Commonwealth or industry contracts) must be managed transparently and must not give rise to conflicts of interest.
Rationale/notes: Core fixed wing services and staffing are to be provided by the principal contractor (under the current preferred provider model – RFDS); but reframing the government/health relationship with provider to reflect more contemporary commercial standards, relationships, behaviours and probity required of a public sector purchaser/supplier relationship Additional fixed wing services (surge and redundancy) are to be provided by a panel of secondary operators contracted and coordinated by the Office of Aeromedical Services, Retrieval and Outreach, and to which all system aviation and clinical standards apply. Considering the importance of the changes proposed by the Inquiry, and of the required organisational realignments, it is recommended that consideration be given to a contract option for open tender for fixed wing services in 5 years, at the discretion of WA Health– if the desired system improvements are not achieved through the period of the Service Refinement Plan	

Principal recommendation	Secondary or enabling recommendation
5. Improve regional rotary wing aeromedical capability	5.1 Complete analysis through the Service Refinement Plan to inform the necessary expansion of the Rotary Wing Aeromedical Services in a coordinated network to meet the needs of inland (Goldfields), coastal, remote and off-shore populations.
Rationale/notes: The findings of the Inquiry strongly support a networked expansion of capability. Interstate benchmarking of rotary wing capability (per population) suggests a need for WA to at least double its rotary wing fleet and when geographical challenges are factored, the WA Rotary Wing fleet should be in the order of 2.5x the current. Additional technical backup fleet may increase the fleet size further to a future total of 7-9 aircraft. Additional data, to be sought within 2 years by the Service Refinement Plan, is required to inform the best distribution of services and the best models of staffing, service provision, relationship with existing Aeromedical Services and health providers.	
6. Improve rotary wing operations capability in the Perth and Southwest regions	6.1 Consolidate all rotary wing operations in the Perth and SW regions to a single operator system (Emergency Rescue Helicopter Service). (Specifically, implementation of the proposed RFDS EC145[13] services is not recommended.) 6.2 Immediately expand the Perth/Bunbury Emergency Rescue Helicopter Service AW139[14] fleet by one additional aircraft, to meet current demand (particularly in interhospital transport). 6.3 Supplement current rotary wing CCP crewing with a second clinical crew member immediately. It is recommended that the governance of this change be overseen by the Office of Aeromedical Services, Retrieval and Outreach and that should include crewing by consultant medical practitioners (appropriately trained for the primary response environment) as the second clinical crew member in selected platforms and/or at selected bases.
Rationale/notes: There is a compelling data-based case for expansion of services utilising new platforms in the Southwest. The creation of an additional non-integrated rotary wing service for provision of interhospital transport-only services lacks strategic or fiscal rationale and is not consistent with typical contemporary Aeromedical Services Rotary Wing systems development. Current (single practitioner) crewing arrangements for the Emergency Rescue Helicopter Service Rotary Wing are sub-optimal when compared across industry standards.	

13 Eurocopter Helicopter model 145 / Airbus Helicopters H145

14 AW139 – Helicopter model – Augusta Westland/Leonardo

Principal recommendation	Secondary or enabling recommendation
7. Standardise and implement a whole system Clinical Governance Framework.	7.1 Through the Clinical Governance Framework promote common clinical guidelines including tasking and crewing guidelines, commonality and compatibility of equipment and systems, and shared systems for Audit, Case Review, and Adverse Event reporting. 7.2 The Office of Aeromedical Services, Retrieval and Outreach defines standards and oversees credentialing and scope of practice of all Aeromedical Services health practitioners.
Rationale/notes: Coordinated development and application of overarching clinical governance standards and systems across the coordination centre, contracted agencies (air service providers) and service intersections including ambulance, road retrieval services and hospital interfaces is the cornerstone of safe high quality clinical care.	
8. The Office of Aeromedical Services, Retrieval and Outreach establish a WA road retrieval service (aligned to the aeromedical services model and distinct from an ambulance interhospital transport service), providing governance, coordination, tasking and support.	8.1 Initially, the road retrieval service should service the Perth, Bunbury and peri-urban areas. 8.2 Road retrieval capability from collocated regional Aeromedical Services bases and WACHS campuses should be developed as a part of the Service Refinement Plan and planning of future facilities or system modifications.
Rationale/notes: This is a fundamental and inextricable prerequisite of a contemporary Aeromedical System. Coordinated road retrieval services provide a centrally organised higher quality system (via the coordination service) for movement by road of patients who require a higher level of care than routine ambulance primary response or interhospital transport. They provide dedicated trained specialised staff who provide for the patient in the same way as air platforms and crews. Ideally a road retrieval system and an Aeromedical System are parts of the same patient care and movement system. Circumstances will exist in every Aeromedical Services where flight is impossible or unavailable – for this reason alone a mature and capable road retrieval system is needed to meet that demand safely and professionally. Road retrieval systems may be contracted from aeromedical providers (RFDS/Emergency Rescue Helicopter Service), ambulance services (St John Ambulance – WA) or be operated from a central office directly. Contracted services hold an advantage of integration with existing governance and training systems.	

Principal recommendation	Secondary or enabling recommendation
9. Implement contemporary enabling information systems and technologies.	9.1 Data contribution and linkage to a central (national) registry for benchmarking and research at a national level is recommended. 9.2 Ensure clinical information systems interface as effectively as possible with those of the WA Health system.
Rationale/notes: The Aeromedical System requires optimised Information Systems, Telehealth capability, PACS, Point of Care clinical systems, Case Coordination Systems, Aircraft and Flight Management systems, including a central or single data management system and business analysis systems. The needs will be defined by the existing WACHS command centre and the Implementation Group in considering strategic direction.	
10. Provision of additional funding for system improvement and development.	10.1 Determination of funding sources (additional State and/or Commonwealth or redistributed funds) will be informed by recommendation 4 (RFDS contracts including contract components for provision of coordination services $3 Million pa and for purchase of rotary wing interhospital transport services $0.8 Million pa) 10.2 A formal business plan is required to accurately cost the total amount of additional funding required (beyond the scope of the Inquiry) 10.3 Indicative start-up funding for years 1 and 2 support and administrative (not ongoing/operational): $0.75 Million pa. 10.4 Indicative immediate additional recurrent funding requirement including governance, coordination, road retrieval establishment and limited (one aircraft) rotary wing fleet expansion: $12.5 Million pa. 10.5 Indicative future additional rotary wing Fleet expansion: $20–25 Million pa.

Principal recommendation	Secondary or enabling recommendation

Rationale/notes:

The Inquiry was not briefed or scoped to provide a business plan for a future state therefore, indicative figures above factor many assumptions, including:

- An allowance of (+/-)10–15%
- Office of Aeromedical Services, Retrieval and Outreach is established in part by redeployment of some existing management roles.
- Central coordination functions assume redeployed/varied existing WACHS command centre functions.
- 85% of RFDS coordination funds ($3 Million) are transferred to the new central coordination centre.
- 100% of RFDS rotary wing interhospital transport budget ($0.8 Million) is applied to additional rotary wing expenditure.
- Infrastructure costs are minimised through use of available system resources.
- Helipad expansion costs are limited to $1 Million and community funding sources considered.
- Inquiry recommendations including enhanced staffing models are implemented.
- Road retrieval services are contracted from RFDS or St John Ambulance (WA) – 1x, 24/7 team.
- Road retrieval is costed to referrers at the same rate as ambulance road interhospital transport.
- Completion of a successful RFDS contract and pricing renegotiation.
- Any additional required fixed wing services are achieved through RFDS efficiencies initially.
- Rotary wing Fleet expansion costs are offset by private or benevolent funding sources to a degree.
- Future regional Aeromedical Services and/or Retrieval staffing costs may be offset by synergies with WACHS rural and regional staffing developments.
- No additional Commonwealth funding has been assumed however should be considered.

12. Implementation strategy

Based on the recommendations above, a standard program implementation methodology (of local preference or capability) is necessary to implement the significant developments and changes required. In summary (at the highest level):

- **Acceptance of recommendations:** The Chief Health Officer, WA Health, and Government must consider the Inquiry recommendations and formally decide upon and communicate their acceptance and application of budget.
- **Funding:** Despite the most demanding demographic and geographical scenario in Australia and perhaps the world, the WA Aeromedical System is significantly under-funded and under-resourced. If progress is to be made, gaps in access to healthcare redressed, and contemporary health governance, safety, and outcome standards achieved, then substantial additional funding is required.
- **Acceptance of the proposed establishment of a service/office** (Office of Aeromedical Services, Retrieval and Outreach) within WA Health. Whilst the initial inclination may be to apply a devolved governance approach, this is advised against, given the fundamental (and high level) whole-of-health system role of the proposed service and its fundamental connection and synergy with current functions which are within Health (putative State Health Operations Centre, Patient Flow Coordination Centre, Major Incident Management).
- **Commission an Implementation Group** (independently chaired) to oversee the project of works arising from the Inquiry.

  The Implementation Group will:

  - Oversee early works (Goals and deliverables of the improvements and developments, perceived functional model, service location, management structure and processes, budget considerations)
  - Define the vision and mission of the new service – A service needs to understand its goals and aspirations in terms of vision (organisation-values-based, humanistic, future-system-focused, constant) and its mission (the way forward, actions-to-goals, dynamic, stakeholder-linked)
  - Develop a draft strategic plan engaging executive, consultants (if required), specialist advisors, service leaders.

Establish the Office of Aeromedical Services, Retrieval and Outreach and recruitment of a Director and principal support staff to establish the service including:

- early development of a Clinical Governance Framework
- development of the Service Model and Capability Framework
- development of the formal Program Implementation (and Evaluation) Plan
- develop an infrastructure and coordination centre establishment plan – serious consideration should be given to collocation of the coordination centre with like organisations.

Define the pathway to implementation from start-up to year 10 (below).

Figure 11 Pathway to service implementation and establishment

Appendices

13. Appendix 1 – Stakeholder list

Aeromedical Suppliers/Aviation Providers

Royal Flying Doctors Service – Western Operations
Aviator Group Pty Ltd
CHC Helicopter Australia Pty Ltd
LifeFlight Medical Pty Ltd
Medical Air Pty Ltd
PHI International Australia Pty Ltd
Helispirit
Heliwest Group Pty Ltd
KAS Helicopters
Helicopter Logistics Pty Ltd
CareFlight Ltd
Aspen Medical Pty Ltd
Skymed Aeromedical Pty Ltd
Medical Rescue Pty Ltd
Toll Helicopters (NSW) Pty Ltd
Surf Life Saving Western Australia (SLSWA)
Yellow Scorpion Pty Ltd

Interstate and Australian Government Agencies

Queensland Ambulance Service
New South Wales Ambulance
Ambulance Victoria
SAAS MedSTAR (SA Health)
Ambulance Tasmania
Northern Territory Health
Australian Dept of Health – National Incident Room
Australian Commission on Safety and Quality in Healthcare
Australian Maritime Safety Association (AMSA)
Agency of Clinical Innovation (NSW Health)

Health Care Services/Providers

Department of Health Western Australia
Purchasing and System Performance Division – Department of Health
Clinical Excellence Division – Department of Health
Public and Aboriginal Health Division – Department of Health
Strategy and Governance Division – Department of Health
Clinical Strategy and Planning Division – Department of Health
WA Country Health Service
North Metropolitan Health Service
South Metropolitan Health Service
East Metropolitan Health Service
Child and Adolescent Health Service
Neonatal Emergency Transport Services WA
State Trauma Centre
Burns Services of Western Australia
St John of God Bunbury Hospital
Office of the Chief Medical Officer
WACHS Command Centre
St John Ambulance WA
St John of God Healthcare
Health Scope
Ramsay Healthcare
Wilson's Medic-One

State Government Departments and Trading Enterprises

Department of Finance
Department of Treasury
Department of Fire and Emergency Services
Western Australia Police Force
Pilbara Ports Authority
Kimberley Ports Authority
Southern Ports Authority
Midwest Ports Authority
Fremantle Port Authority

Associations/Colleges/Advocacy

Aeromedical Society of Australasia

Australasian Association of State Medical Retrieval Directors

Royal Australian College of General Practitioners

Australian College of Rural and Remote Medicine

Rural Doctors' Association of Western Australia

Australasian College of Emergency Medicine WA faculty

Australian and New Zealand Intensive Care Society

Australasian College of Pharmacy

Council of Ambulance Authorities

Australasian College of Paramedicine

Aboriginal Health Council of Western Australia

District Health Advisory Council

Australian Medical Association (WA)

Australian Nursing and Midwifery Federation (WA)

Ambulance Employees Association of Western Australia

Academic Institutions

University of Western Australia

Curtin University

Murdoch University

Edith Cowan University

Notre Dame University

Individuals

Twelve individuals registered their interest as stakeholders during the Inquiry process.

Local Governments

City of Albany

City of Armadale

Shire of Ashburton

Shire of Augusta Margaret River

Town of Bassendean

City of Bayswater

City of Belmont

Shire of Beverley

Shire of Boddington

Shire of Boyup Brook

Shire of Bridgetown

Shire of Brookton

Shire of Broome

Shire of Broomehill Tambellup

Shire of Bruce Rock

City of Bunbury

City of Busselton

Town of Cambridge

City of Canning

Shire of Capel

Shire of Carnamah

Shire of Carnarvon

Shire of Chapman Valley

Shire of Chittering

Town of Claremont

City of Cockburn

Shire of Collie

Shire of Coolgardie

Shire of Coorow

Shire of Corrigin

Town of Cottesloe

Shire of Cranbrook

Shire of Cuballing

Shire of Cue

Shire of Cunderdin

Shire of Dalwallinu

Shire of Dandaragan

Shire of Dardanup

Shire of Denmark

Shire of Derby / West Kimberley

Shire of Donnybrook

Shire of Dowerin

Shire of Dumbleyung

Shire of Dundas

Town of East Fremantle

Shire of East Pilbara

Shire of Esperance

Shire of Exmouth

City of Fremantle
Shire of Gingin
Shire of Gnowangerup
Shire of Goomalling
City of Gosnells
City of Greater Geraldton
Shire of Halls Creek
Shire of Harvey
Shire of Irwin
Shire of Jerramungup
City of Joondalup
Shire of Kalamunda
City of Kalgoorlie-Boulder
Shire of Karratha
Shire of Katanning
Shire of Kellerberrin
Shire of Kent
Shire of Kojonup
Shire of Kondinin
Shire of Koorda
Shire of Kulin
City of Kwinana
Shire of Lake Grace
Shire of Laverton
Shire of Leonora
City of Mandurah
Shire of Meekatharra
City of Melville
Shire of Menzies
Shire of Merredin
Shire of Mingenew
Shire of Moora
Shire of Morawa
Town of Mosman Park
Shire of Mount Magnet
Shire of Mount Marshall
Shire of Mukinbudin
Shire of Mundaring
Shire of Murchison
Shire of Murray
Shire of Nannup
Shire of Narembeen
Shire of Narrogin
City of Nedlands
Shire of Ngaanyatjarraku
Shire of Northam
Shire of Northampton
Shire of Nungarin
Shire of Peppermint Grove
Shire of Perenjori
City of Perth
Shire of Pingelly
Shire of Plantagenet
Town of Port Hedland
Shire of Quairading
Shire of Ravensthorpe
City of Rockingham
Shire of Sandstone
Shire of Serpentine Jarrahdale
Shire of Shark Bay
City of South Perth
City of Stirling
City of Subiaco
City of Swan
Shire of Tammin
Shire of Three Springs
Shire of Toodyay
Shire of Trayning
Shire of Upper Gascoyne
Town of Victoria Park
Shire of Victoria Plains
City of Vincent
Shire of Wagin
Shire of Wandering
City of Wanneroo
Shire of Waroona
Shire of West Arthur
Shire of Westonia
Shire of Wickepin
Shire of Williams

Shire of Wiluna
Shire of Wongan
Shire of Woodanilling
Shire of Wyalkatchem
Shire of Wyndham East Kimberley
Shire of Yalgoo
Shire of Yilgarn
Shire of York

Note:

Not all those identified as stakeholders chose to participate in the Inquiry when engagement offered.

14. Appendix 2 – Survey tools and questionnaires

14.1. Engagement

Expression of Interest Survey

ww2.health.wa.gov.au/~/media/Corp/Documents/Improving-health/Aeromedical-services-WA-inquiry/Aeromedical-Services-WA-Inquiry-Expression-of-Interest.pdf

14.2. Current state

Current State Survey – Aeromedical Service Provider

ww2.health.wa.gov.au/~/media/Corp/Documents/Improving-health/Aeromedical-services-WA-inquiry/Aeromedical-Services-WA-Inquiry-Current-State-Survey-Provider-Response.pdf

Current state survey – Aeromedical service provider staff

ww2.health.wa.gov.au/~/media/Corp/Documents/Improving-health/Aeromedical-services-WA-inquiry/Aeromedical-Services-WA-Inquiry-Current-State-Survey-Provider-Staff-Response.pdf

Current state survey – non-provider

ww2.health.wa.gov.au/~/media/Corp/Documents/Improving-health/Aeromedical-services-WA-inquiry/Aeromedical-Services-WA-Inquiry-Current-State-Survey-Non-Provider-Response.pdf

14.3. Aviation services (standards)

Aviation services survey

ww2.health.wa.gov.au/~/media/Corp/Documents/Improving-health/Aeromedical-services-WA-inquiry/Aeromedical-Services-WA-Inquiry-Avaition-Services-Survey.pdf

15. Appendix 3 – Glossary and acronyms

Term	Definition
Access to	On site or nearby location within local community or catchment or regularly visiting including via virtual visit/Telehealth.
Accredited	A time limited recognition of an institution, organisation or business that verifies it has met predetermined and standardised criteria, which have been award by a non-government agency.
Advanced trainee	A person enrolled in a University or College advanced training program recognised by the Australian Medical Council for the relevant specialty.
Allied health	A term generally applied to services provided by health professionals who are not doctors or nurses including but not limited to physiotherapists, social workers, pharmacists, occupational therapists, podiatrists and speech pathologists.
Clinical governance	Clinical governance is the set of relationships and responsibilities established by a health service organisation between its department of health (for the public sector), governing body, executive, workforce, patients and consumers, and other stakeholders to deliver safe and high-quality health care.
Complex mental health presentation	A person presenting with one or more conditions such as a mental disorder, acquired brain injury, intellectual disability or significant abuse problem, often accompanied by social disadvantage.
Consultant/ specialist	A medical practitioner who holds the appropriate higher qualification of a University or College, recognised by the Australian Medical Council (AMC), and includes a Fellow of the Australian Chapterof Medicine, or, in exceptional circumstances to satisfy areas of unmet need, such other specialist qualification recognised by the Director General of Health and who, unless otherwise approved by the Director General of Health, is employed and practising in the specialty for which he/she is qualified.
Coordination service	24/7, call taking, case data collection, case assessment including telehealth, provision of standardised evidence-based early and interim clinical advice, case formulation and planning, transport and destination coordination, case follow up and associated clinical governance functions.
Credentialed	The umbrella term which includes the concepts of accreditation, scope of practice, licensing, registration and professional certification; a formal recognition by which an entity authorised and qualified to do so, grants formal recognition for professional services provided by authorised individuals (medical practitioner or specialist) that has met predetermined and standardised criteria of fairness, quality, competency and safety.

Term	Definition
Critical Care Paramedic	A paramedic who is endorsed by the health service/entity to provide an advanced level of paramedic care based on completion of an advanced level of paramedic training.
Cultural security	A commitment to the principle that the construct and provision of services offered by the health system will not compromise the legitimate cultural rights, views, values and expectations of Aboriginal people.
Designated	An appropriately skilled health professional is available to provide care for the listed specialty.
Despatch	The process of sourcing and allocation of a specific aircraft and crew, provision of data and logistic support to the pilot, scheduling documenting and facilitating departure, including flight-tracking, coordination of flight segments and logistics, and troubleshooting mission issues.
Estimated resident population	The official ABS estimate of the Australian population.
Emergency Telehealth Service (ETS)	A dedicated specialist emergency medicine service serving as a single point of referral for clinical staff in need of virtual emergency medicine advice or assistance.
General Medical Physician	A medical practitioner who has completed the basic training program of Royal Australasian College of Physicians.
General Practitioner (GP)	A medical practitioner engaged in the provision of primary, continuing whole patient care to individuals, families and their community not being a vocationally registered general practitioner.
Hospital separations rate	The number of hospital separations (discharges, transfers, and deaths) per thousand people.
Links with	Established communication and dispensing of advice between 2 parties. This may include referral to and/or receiving of referrals.
Low/medium/high Risk	This denotes the level of patient clinical risk or risk of adverse outcomes as defined by the particular specialty.
Nurse Practitioner (NP)	Registered as a nurse practitioner by the Health Practitioner Regulation National Law (Western Australia) whose name is entered on the register of nurses kept under that Law as being qualified to practice as a nurse practitioner. Refer to: www.health.wa.gov.au/awardsandagreements/docs/Registered_NursesMidwives_Enrolled_Mental_Health_Nurses_ANF_WA_Health_Ind_Agreement_2010.pdf

Term	Definition
On-call	Health professional rostered to remain readily contactable and available at site within a clinically appropriate timeframe.
On-site	Physically located at the place where the patient is. For health professionals they are available on-site on a regular basis.
Paediatric skilled	Practitioner who has recent experience in interventions with children and their care-givers; may have undertaken formal paediatric training but usually has gained relevant paediatric skills* through on- the job supervision, mentoring, coaching, and targeted professional development in paediatric care and the relevant discipline/ profession. * Skills for nursing as outlined in Australian College of Children and Young People's Nurses September 2009 (www.accypn.org.au/wp-content/uploads/Executive-Summary-ReviewFINAL09.pdf), and as applicable as a guide for other disciplines. Professional development and supervision as per recommendations or practice of specific individual profession or disciplines.
Regional referral role	Capability to accept referrals at listed service level for specialty within the region.
Remote	Is a statistical geographical area or community, which is located over 350km from the nearest service centre in rural areas.
Resident Medical Officer (RMO)	A registered medical practitioner who has not commenced in a recognised training program and is employed as a Resident Medical Officer in the second or subsequent years of relevant experience following graduation. Refer to: http://www.health.wa.gov.au/awardsandagreements/docs/Department_of_Health_Medical_Practitioners_(WA_Country_Health_ Service) AMA_Industrial_Agreement_2011.pdf
Rural	Is a statistical geographical area defined by population and distance from a capital city centre (for all areas outside of urban areas).
Scope of practice	The extent of an individual's clinical practice within a particular organisation based on the individual's credentials, competence, performance and professional suitability, together with the needs and capabilities of the health facility.
Senior Medical Officer (SMO)	A registered non-specialist medical practitioner requiring clinical supervision by a Consultant / Specialist or Senior Medical Practitioner.

Term	Definition
Senior Registered Nurse (SRN)	Registered by the Nursing and Midwifery Board of Australia as a Registered Nurse or Midwife, who holds a current practising certificate and any other qualification required for working in the employee's particular practice setting, and who is appointed as such by a selection process or by reclassification from a lower level in the circumstances that the employee is required to perform the duties detailed in this subclause on a continuing basis. Refer to: www.health.wa.gov.au/awardsandagreements/docs/Registered_Nurses_Midwives_Enrolled_Mental_Health_Nurses_ANF_ WA_Health_Ind_Agreement_2010.pdf
Specialised allied health services	Allied health services provided by health professionals specifically trained and/or experienced in the provision of allied health services related to the particular specialty.
Specialist allied health practitioner	Allied health practitioner who is specifically trained and/or experienced in provision of allied health services in relation to the particular specialty.
Specialist Senior Registered Nurse	As per SRN definition as well as being specifically trained and/or experienced in provision of the particular specialty.
Tasking	Communication to a despatcher of a decision to activate and respond to a case utilising a particular aircraft type (FW or RW), with a specified crew mix, and with a specified urgency (time to departure) based on the clinical needs and acuity of a case.
Visiting	Physically visits the service as required or Telehealth visits.

Acronym	Definition
AASMRD	Australasian Association State Medical Retrieval Directors
ABF	Activity Based Funding
ABM	Activity Based Management
ACEM	Australasian College of Emergency Medicine
ACHWA	Aboriginal Health Council of Western Australia
ACAP	Aged Care Assessment Program
ACAT	Aged Care Assessment Team
ACSQHC	Australian Commission on Safety and Quality in Health Care
ADG	Assistant Director General

Acronym	Definition
ADIS	Alcohol and Drug Information Service
AEAWA	Ambulance Employees Association of Western Australia
AKMH	Armadale Kelmscott Memorial Hospital
ALS	Aboriginal Liaison Service
AMAWA	Australian Medical Association (WA branch)
AMS	Aeromedical Services
AMSA	Australian Maritime Safety Authority
ANFWA	Australian Nursing and Midwifery Federation (WA Branch)
APAC	Australian Pharmaceutical Advisory Council
APTC	Acute Patient Transport Coordination Centre
ASA	Aeromedical Society of Australasia
ATSI	Aboriginal and Torres Strait Islander
BHS	Bentley Health Service
CACH	Child and Adolescent Community Health
CAHS	Child and Adolescent Health Service
CALD	Culturally and Linguistically Diverse
CAMHS	Child and Adolescent Mental Health Service
Cat	Category
CCA	Care of children and adolescents
CCP	Critical Care Paramedic
CCU	Coronary Care Unit
CED	Clinical Excellence Division
CEO	Chief Executive Officer
CG	Clinical Governance
CHO	Chief Health Officer
CICM	College of Intensive Care Medicine
CNC	Clinical Nurse Consultant
CNE	Clinical Nurse Educator
CNS	Clinical Nurse Specialist

Acronym	Definition
CoNeCT	Complex Needs Coordination Teams
COPD	Chronic Obstructive Pulmonary Disease
CRS	Central Referral Service
CSF	Clinical Services Framework
CSP	Clinical Services Plan
CSPD	Clinical Services and Planning Division
CT	Computed Tomography
DEC	Department Executive Committee
DFES	Department of Fire and Emergency Services
DHAC	District Health Advisory Committees
DMO	District Medical Officer
DoF	Department of Finance
DTU	Day Therapy Unit
DUE	Drug Use Evaluation
ECMO	Extracorporeal membrane oxygenation
ED	Emergency Department
EEG	Electroencephalogram
EMG	Electromyography
EMHS	East Metropolitan Health Service
EN	Enrolled Nurse
EOC	Emergency Operations Centre
ERHS	Emergency Rescue Helicopter Service
ESSU	Emergency Short Stay Unit
ETS	Emergency Telehealth Services
FDISC	Framework Development and Implementation Steering Committee
FDIWG	Framework Development and Implementation Working Group
FIFO	Fly-In and Fly-Out (workers)
FINE	Friend in Need – Emergency
FLIR	Forward Looking Infrared

Acronym	Definition
FSH	Fiona Stanley Hospital
FW	Fixed Wing
GP	General Practitioner
HACC	Home and Community Care
HDU	High Dependency Unit
HEC	Health Executive Committee
HiTH	Hospital in the Home
HIV	Human Immunodeficiency Virus
HLS	Helicopter Landing Site
HPIMR	Harry Perkins Institute for Medical Research
HPSF	Health Promotion Strategic Framework
HRT	Hospital response teams
HSP	Health Service Provider
HTA	Health Technology Assessment
ICT	Information and Communication Technology
ICU	Intensive Care Unit
IDHS	Integrated District Health Service
IHPT	Inter-Hospital Patient Transfer
IHT	Inter-Hospital Transfer
IOT	Indian Ocean Territories
JHC	Joondalup Health Campus
KEMH	King Edward Memorial Hospital
KPI	Key Performance Indicator
MBU	Mother and Baby Unit
MHC	Midland Health Campus
MHETS	Mental Health Emergency Telehealth Service
MHU	Mental Health Unit
MO	Medical Officer
MoC	Models of Care

Acronym	Definition
MPC	Multi-Purpose Centre
MRI	Magnetic Resonance Imaging
NEAT	National Emergency Access Target
NEST	National Elective Surgery Target
NETS	Newborn Emergency Transfer System
NGO	Non-government Organisation
NICU	Neonatal Intensive Care Unit
NIV	Non-Invasive Ventilation
NM	Nurse Manager
NMHS	North Metropolitan Health Service
NP	Nurse Practitioner
NPA	National Partnership Agreement
NSQHSS	National Safety and Quality Health Service Standards
NT	Northern Territory
OAMSRO	Office of Aeromedical Services, Retrieval and Outreach
OR	Operating Room
OSQH	Office of Safety and Quality in Health Care
P1, P2, P3 etc	Priority1, Priority 2, Priority 3 etc
PACS	Picture Archiving and Communication System (Radiology)
PAHD	Public and Aboriginal Health Division
PCH	Perth Children's Hospital
PDSA	Plan, Do, Study, Act
PET	Positron Emission Tomography
PHARM	Prehospital and Retrieval Medicine
PHC	Peel Health Campus
PFCC	Patient Flow Coordination Centre
PIP	Paediatric Implementation Plan
PMH	Princess Margaret Hospital
POC	Point-of-care

Acronym	Definition
PSPD	Purchasing and System Performance Division
PTHS	Proximate Tertiary Health Service
QAS	Queensland Ambulance Service
QC	Quadriplegic Centre
QEIIMC	Queen Elizabeth II Medical Centre
RACS	Royal Australasian College of Surgeons
RAS	Regional Assessment Services
RCS	Root Cause Analysis
REOC	Regional Emergency Operations Centre
RFDS	Royal Flying Doctor Service Western Operations
RITH	Rehabilitation in the Home
RM	Registered Midwife
RMO	Resident Medical Officer
RN	Registered Nurse
RPH	Royal Perth Hospital
RRC	Regional Resource Centre
RSQ	Retrieval Services Queensland
RW	Rotary Wing
SAAS	South Australia Ambulance Service
SCGH	Sir Charles Gairdner Hospital
SCV	Safe Care Victoria
SDH	Swan District Hospital
SES	Socio-economic Status
SGD	Strategy and Governance Division
SHHC	Small Hospital/Primary Healthcare Centre
SHICC	State Health Incident Coordination Centre
SHIP	State Health Infrastructure Plan
SHOC	State Health Operations Centre
SHPA	Society of Hospital Pharmacists of Australia

Acronym	Definition
SHR	Sustainable Health Review
SJAWA	St John Ambulance
SJOG	St John of God Health Care
SMHS	South Metropolitan Health Service
SMO	Senior Medical Officer
SOP	Standard Operating Procedure
SPC	Shenton Park Campus
SRG	Service-Related Group
SRN	Senior Registered Nurse
Specialist SRN	Specialist Senior Registered Nurse
SRP	Service Refinement Plan
STS	Statewide Telehealth Service
SW	South West region
TCP	Transitional Care Packages
TRACS WA	Training Centre in Subacute Care
TVMRC	Trauma Verification Model Resource Criteria (Royal Australasian College of Surgeons)
UPS	Uninterruptible power supply
VMP	Visiting Medical Practitioner
WA	Western Australia
WACHS	WA Country Health Service
WAIMR	Western Australian Institute for Medical Research
WO	Western Operations
WPDRC	Workforce Planning, Development and Reform Committee

16. Appendix 4 – Current State Considerations Paper

Inquiry into Aeromedical Services Western Australia

Current State and Interjurisdictional Review

Abridged considerations

Policy and system

Corporate/System Governance

Organisational Structure

1. Most respondents and interviewees believe that the existing structure of aeromedical services in WA is not optimal. There is a significant disconnect between the providers (RFDS and DFES) and most respondents, with providers tending towards support for the current system.
2. The core of dissatisfaction stems from lack of effective corporate oversite of the totality of governance issues (from corporate relationships to contract administration to clinical governance).
3. Health service governance (including aeromedical services) must be closely monitored and managed by a central coordinating authoritative agency.
4. There is a lack of an integrated Statewide system with appropriate policy and regulated frameworks to administer AMS.
5. There is a lack of an integrated structure or effectively integrated systems for end-to-end management of the patient journey – including coordination, outreach support, response and transfer, destination planning.
6. Data management systems lack integration and accessibility that would allow clear understanding of existing patient transfer reasons, pathways, care and outcomes.
7. Each interstate jurisdiction has evolved over time from variable collections of community providers, benevolent groups, and bespoke arrangements to become centrally coordinated, professionally linked and commercially focussed.
8. All interstate jurisdictions recommended central coordination and governance of the aeromedical system. This includes corporate, financial and clinical governance.
9. Establishment of a formal Board of Management structure may be beneficial depending on jurisdictional structural arrangements (as for Hospital Boards).
10. The overarching body in an aeromedical system usually has management roles in service design, funding, strategy, service delivery, education, training, research, emergency management (disaster response) and outreach.
11. The overarching body with authority for management of aeromedical services normally sits within Health and reports at 'divisional level' to the Director General or equivalent principle public servant.
12. In WA all FW case coordination, tasking, prioritisation response and clinical care, including most of the governance of these functions is vested in a single provider agency (RFDS).
13. The aeromedical rotary wing service (ERHS) is embedded in a department (DFES) which has limited fundamental clinical focus or clinical governance culture.

Strategic Direction

14. There is currently no state policy, legislation or strategic direction in WA with respect to state-wide aeromedical/patient transport services.
15. Strategic planning for an aeromedical system must fully articulate with general health service planning and capability frameworks.
16. There is an exceptional opportunity to develop a single patient transport strategy that includes all patient transfers – primary and secondary, retrieval and repatriation, metropolitan/rural, intrastate/interstate/international utilising one or a mix of modalities.
17. There is a lack of strategic articulation of aeromedical systems with other components of healthcare delivery. Holistic models would recognise aeromedical services as a fundamentally intertwined (inextricable) component of a systems of outreach, support, care in location and/or transfer. The vast majority of aeromedical transfers have segments of road transfer and all require destination coordination.
18. Capability of road platforms and crews varies across the state with considerable reliance on volunteer workforce in rural settings.
19. Lack of formal strategic planning or agreements for cross border transfers and care (in SA and NT) limits the development of efficient patient-focused systems to best serve some isolated communities.
20. All services support formal interstate agreements which enable logistical systems to best meet the definitive care needs of patients based on both clinical drivers and geography.
21. WA and NT should consider closer interoperation of systems to provide best geographical solutions for populations in northern WA.
22. Lack of formal strategic planning or agreements for most off-shore response and transfers limits the development of efficient patient-focused response systems.

Culture

23. Participants commented that at the (aeromedical) coalface the culture is one that focuses on patient care, with all parties striving to provide the best and most appropriate care for patients being transported.
24. The culture of the aeromedical system also reflects the lack of strategic direction and integration of the system. In this regard, some ring-fencing of opinion & views is noted.
25. Best examples of aeromedical culture demonstrate a patient focus across the entire care journey and a commitment to building and improving the system to narrow 'the gap' experienced by populations that is due to geography or resource limitation.
26. The views expressed to the Inquiry suggest a lack of common understanding between service provision organisations, their staff, the 'purchaser' and health service staff. There is not a strong feeling of 'being on the same page'. This is unfortunate because the basis of the WA aeromedical system is potentially world-class.

Clinical Services Plan

27. There is no strategic or clinical services plan for state-wide aeromedical (or other patient) transport systems.

Risk Management

28. Risk management systems appear reasonable at an individual organisation level (focussing principally on internal processes and structures).

29. The approach to risk management across the aeromedical system is hampered by the ring-fenced nature of the provider arrangements. Absence of an authoritative responsible body means that gaps between service provider systems, and an inherent segmentation of the system exist – essentially creating cracks for patients to fall through.
30. Current arrangements and contracting are not constructed or administered effectively to best manage system-wide risk

OHS/WHS Systems

31. Inherent in aeromedical systems is the need (at times) for staff to work across organisations. Although organisations, contractors and providers maintain core responsibility for their OHS performance, the lack of an overarching body or framework creates risk through lack of uniformity or consistency of standards and systems.
32. Management of crew fatigue is a critical issue in all aeromedical services.

Contract Management

33. Lack of an appropriate overarching government body to accountably oversee aeromedical contracts results in disparate, non-articulated and non-strategic arrangements.
34. The existing contract between WACHS and RFDS and the Inquiry has noted the following concerns:
    - The contract is poorly constructed, containing internal inconsistency (through reference to many duplicative, overlapping, and contradictory standards).
    - The contract administration responsibility sits with a non-operational department which does not have the subject matter expertise to effectively manage the application of the contract.
    - The contract is not structured in a way that enables effective understanding of specific charging practice, or to account for the multi-purchaser arrangements under which RFDS operates.
    - The contract is not in step with contemporary interjurisdictional contracts of a similar nature which are more formally commercial in style.
35. RFDS is not adequately held to account (as part of a state-wide system) but rather are afforded an unusually autonomous position which is seen as connected and privileged. There is considerable importance and value to the culture and brand of "RFDS", however there are also critical contemporary commercial, governance and probity elements to its relationship with the State and with its 'community of purchasers' (from donors to taxpayers and commercial contractors). These elements should be recognised as the appropriate foundation for the RFDS integration as a component of a modern health system.
36. The EHRS / DFES platform and crew contract(s) sits within a non-health government department which is unlikely to be the best arrangement for a service which is fundamentally part of the health system. Non-health components (SAR) of the EHRS work make up a small (<8%) component of its workload.
37. RW platform contracts:
    - The existing DFES contract for RW aircraft and related crew and services is currently in an advanced phase of tendering. DFES are also in the process of commencing a tender process for clinical crewing which may result in the introduction of paramedic practitioners outside of the current agreement with SJAWA.

- Concurrently RFDS are in the process of commissioning 2 RW platforms. These platforms cannot be integrated into a Statewide primary response system, and at present there are no contracted arrangements for their use. The capital components of the RFDS RW procurement are under-written by donors and have been endorsed politically, however there is no agreed long-term business case, contract or agreement for operational funding with the WCAHS.
- The above are examples of current processes which are not articulated or constructed in the context of an agreed strategic framework, and which can be described as perversely disparate.

38. It is not clear to the Inquiry that any contracts or formal agreements exist in relation to industry-based or other benevolent medivac RW activity or adhoc utilised FW platforms.
39. Aeromedical contract must be let via a commercial process, and consideration provided to various provider models e.g. State owned/operated, competitive tender for a panel of providers (generic any/all system or specialised providers), competitive tender for sole provider, renegotiation with existing provider.
40. There may be advantages in contracting for platform services (FW and RW) only; (with clinical crewing provided via other arrangements e.g. state health, contractor, ambulance).
41. All interstate jurisdictions support or expressed preference for long (10 year) contracts that are specific and limited to providers addressing State services exclusively – that is, excluding Commonwealth and other commercial services.
42. Contracts must specify Aviation Standards
43. Contracts must specify performance requirements (including clinical standards) – and must reach agreement on limitations to the size and distribution of fleet with clear understanding of the impact of these decisions on performance, redundancy, surge capability etc.
44. Whole-system contracts should incorporate capital requirements including aircraft and bases, avoiding parallel or separate ad hoc funding processes for capital items.

Management reporting

45. Management reporting and monitoring systems are compliant but basic and do not represent contemporary capability or optimised functionality.
46. Real-time monitoring of performance, activity and capacity across all platforms is required for an aeromedical system to function optimally.

Relationship management

47. In the same way that the culture of the aeromedical system reflects the lack of strategic direction and integration of the system, so too does the management of relationships. Again, siloed protectionism through to direct competition undermines the potential for best relationships.
48. Management of relationships between providers, users and purchasers, and between one provider and another requires a strategic and coordinated approach.
49. In single, Statewide systems of aeromedical retrieval, the central leadership of an authoritative accountable body has demonstrated marked improvement in previous problematic relationships across a fragmented system.

Governance Environment

Legislative/Accreditation/Regulatory

50. All agencies involved in aeromedical services in WA state compliance with all legislative, regulatory and accreditation requirements however there is no system in place to verify the appropriateness of the applied tools or the degree of compliance against them.
51. The aeromedical system has no overarching capability to monitor aeromedical systems or clinical practice against relevant legislation (*Health Services Act 2016*, *Mental Health Act 2014*, *Health Practitioner Regulation National Law Act 2009*, Australian Health Practitioner Regulation Agency requirements).
52. There was general support for the Draft Standards produced by the Australasian Association of State Medical Retrieval Directors, an advisory group of industry experts.
53. There is general support for the Accreditation processes of the ACQSH recognising that the Standards are not specific to some aspects of aeromedical and retrieval practice and suggesting modification to address specific issues of aeromedical services.
54. Training accreditation standards of ACEM & Affiliates PHARM Diploma are supported.
55. Regulation of Clinician (Medical, Nursing and Paramedic) Credentialling and Scope of Practice should be provided by the peak governance entity.

Policy and Procedures

56. In general providers have very comprehensive, up to date, collated, policy and procedure systems and provided a catalogue of policies and currency to the Inquiry.

Aircraft

Type and Distribution of Aircraft:

57. Type and distribution of FW aircraft is in essence a commercial decision based on the contracted requirements (It is driven by population need). Providers must have modelling systems in place to allow demonstration of the efficiency of aircraft types and distribution, including distribution of bases.
58. Distribution of aircraft (RW and FW) should ensure optimised response times and viable case volumes/loads (minimum and maximum). Specialised consulting services use modelling to assist in best-fit design of systems.
59. Performance against contract and respondent views regarding delays and access to platforms suggest re-examination of the number and/or distribution of platforms, together with examination of their utilisation for non-WA-contracted services.
60. Current FW systems are designed on the premise of provision of most high-complexity healthcare in Perth. Similar services (in general terms) are available in Darwin. Geographically (and leaving aside State boundaries) there is inherent logic and potentially cultural relevance in rearrangement of the provision of complex and tertiary health services for the population of northern WA towards Darwin. Reorganisation of the aeromedical system to support this is feasible and is likely to be more cost-efficient.
61. Current FW arrangements and contracts limit WA to a single provider essentially. This may represent a risk in terms of redundancy and surge capability and limits commercial negotiation options.

62. The RW aeromedical services are not strategically managed by a central body with whole of state responsibility. The consequence is a range of services which are not contemporary in terms of platforms, capability, crewing, distribution, funding or governance. Current processes for (ad hoc) use of industry-provided platforms does not occur within any governance context – exposing all involved to potential risk.

63. There is a lack of coordinated RW aeromedical capability in the northern part of the State despite clearly unmet need both overland and offshore. There may be potential to develop local capability in clinical workforce, in collaboration between WACHS, SJAWA and RFDS around existing hospital and aeromedical services in Broome and Headland, which could include additional RW capacity.

64. There is potential for similar development in the Goldfields region, however the caseload in this region is skewed towards primary response (not IHPT) and a (2) paramedic-only crewing model may be appropriate.

65. There may be a need to consider implementation of RW services in the Midwest Region (see below).

66. There is a need to increase, improve and systematise RW services in the Southwest of WA (see below).

Airstrips

67. Clarification is required regarding systems for construction and maintenance of airstrips. Coordination is required at high levels to consider provision of a statewide contract for these services by a specialist provider of airport infrastructure, administered by a 'central body'.

68. When seeking funding for airstrip maintenance as a requirement for safe aeromedical services, there may need to be scope for greater assistance from the State Government to provide support to local governments in the writing grant applications and showing State level support to the applications, which may bolster the likelihood of being funded. RFDS, it has also been noted from the grants issued, has also provided support for specific grant applications, which also may have played a contributing factor in their success in being funded.

69. Airstrip maintenance and airstrip supporting infrastructure are often not considered when discussing aeromedical transfers with the focus on the flight component, however this supporting infrastructure can make or break a smooth journey for the patient/casualty.

Helipads

70. Hospital based helipad infrastructure is inadequate. All hospitals offering a significant level of emergency care within the SW operating range of RW platforms should be equipped with a helipad.

Aeromedical case activity

Geographical consideration

71. The demography of the State, together with local placement of medical services and well-developed outreach and support services defines the extent of required aeromedical activity. Each aspect of these should be optimised within reasonable system constraints, whilst supporting a goal of equity of access to care – as so far is feasible.

72. Alternate prioritisation systems are applied in other jurisdictions, allowing a more graded or finessed approach to patient triage.

PHI

Comparison with interstate aeromedical volumes

Unmet RW need (Peri-metro, Wheatbelt, SW, GS)

73. Proposed RFDS RW EC145x2. Significant concerns were expressed by many respondents including interjurisdictional experts regarding this proposed implementation. Concerns were raised over platform suitability, operational model, and lack of system integration of all RW platforms.
74. Inquiry review of the data regarding unmet need in the region suggests an initial caseload estimate appropriate for 1 additional RW platform (250–350 missions) in the SW.
75. A mature whole-system view would currently consider an increase in RW platforms by 1 operational unit initially, building the existing EHRS fleet to 4, with an assumption that changes to platform, configuration and crewing discussed elsewhere are achieved. This would provide 3 'SW-based-always-on' helicopters to be centrally tasked with optimised crew mix for primary or secondary (IHPT) tasks as required, and one backup platform. This arrangement guarantees optimum system flexibility and the highest aviation and clinical standards. As the system stabilises and infrastructure (especially Hospital-based HLS) is addressed, additional casemix may be realised.
76. There is little precedent to support fragmentation of RW aeromedical services into primary vs IHPT-only platforms, and in Australia there is only 1 such RW platform which operates in a unique, high-volume, IHPT setting. This model was not supported for WA by interjurisdictional experts consulted by the Inquiry.
77. The implementation of the 2 RFDS EC 145's follows an unprecedented and extremely irregular pathway from which is absent most of the norms of public sector service development, including: strategic alignment, needs analysis, consultation, and business case agreement. Instead, the aircraft were purchased without strategic agreement from Health, a business case was developed almost a year post hoc, and a 'trial' agreed without a clear professional evaluation strategy. Throughout this period, fundamental consultation and important enablers were unaddressed, namely engagement with system emergency RW experts (DFES/EHRS), including consideration of best options for the State and population in expansion of rotary services, and the key issue of lack of health service HLS capability in the principal service area. The issues of probity and adherence to public sector and charitable organisation governance standards around this process may require further investigation.

Unmet RW need (Other regions)

78. There is no system of health-coordinated RW service to the Regions outside SW despite reasonable volumes of ad hoc tasking of industry medivac helicopters.
79. Conservative analysis of provided SJAWA and WACHS data sources strongly suggests viable RW caseloads in the Pilbara and Goldfields regions.
80. Kimberley (Broome) and Pilbara (Port Hedland) data suggest the potential for a Northern regional solution due to proximity (overlap of RW potential radius of operation).

Case coordination

Central coordination

81. The southwest of WA presents a relatively 'standard' aeromedical systems scenario: central large population, smaller but significant smaller populations within several hundred km, centralisation of tertiary health services, lack of critical care capability outside the main centre.

82. The remainder of WA presents a different and extreme aeromedical scenario characterised by huge distances, isolated communities, and very limited local health infrastructure.
83. To manage this combined scenario, the need for an effective and innovative, authoritative, central coordination capability has been agreed by virtually all Inquiry participants.
84. Across large geographical service areas, hub and spoke models of service organisation may prove effective. A regional retrieval hub in the SW (Bunbury), and a Northern hub (Broome/Port Hedland), collocated with RW services (and FW in the north) may be effective and strategic.
85. Central coordination of aeromedical services will form part of a broader outreach and transport system in a mature system. The fundamental principle in the operations of such services is to recognise and narrow gaps and disadvantage in access to health care which are experienced by more remote communities.
86. The absence of a single mechanism of centralised balanced coordination creates tasking prioritisation competition and risk. Centralised coordination allows cooperative oversite of the logistics of the whole patient journey, and enables multi-platform tasking, fully informed and efficient task diversion or revision, and articulation of all transport legs (e.g. road segments to and from airfields)
87. Coordination is provided (as a single point of contact) by the central agency, is holistic, covers the patient journey end-to-end and has destination determination authority when required.
88. Central oversite of bed access / patient flow is an increasingly common part of aeromedical and retrieval system models. This recognises the need for resource limited health systems to have a central point of knowledge, arbitration and decision.
89. Coordination is an interagency/interdisciplinary activity
90. Coordination involves authority for and responsibility for, all aircraft tasking for health matters. Tasking of aeromedical platforms requires sound algorithmic basis to semi-automate responses and to minimise variability of practice.
91. All interjurisdictional services recommend Medical Consultant oversight of aeromedical (and road retrieval) activity including all tasking.
92. Coordination and provision of aeromedical services should be seamlessly integrated with road retrieval systems as their spectrum of services and systems needs are inherently enmeshed. A single system managing both is desirable.
93. Aeromedical bases should be equipped for road retrieval services also – when road response is preferred and aeromedical staff are available, and for when flight is impossible due to weather. This adds flexibility and optimises utilisation of crew resources.
94. Structured central clinical outreach and advisory services reduce variation and inappropriateness in clinical advice that may be obtained from junior or uninformed medical staff in receiving hospitals.

Access to services

95. Existing services arrangements for FW (single provider – RFDS), has resulted in limited options for surge capacity and redundancy.
96. The current orientation of ERHS RW services is strongly towards the rescue and primary response aspects of its missions, and IHPT seems to be viewed as 'lower risk'- following the mental model that suggests 'that if you're in a hospital, you're OK'. This is a flawed model that does not consider individual patient risk – it is a model whose origins sit in the disarticulation of tasking between primary response and urgent IHPT.

97. Aeromedical service access for psychiatric patients does not always meet the triage/urgency needs of clients, resulting in increased pharmacological intervention and restraint and increased morbidity.

98. Service delays were reported by many respondents and are reflected in service metrics provided by RFDS. This includes NETS who cited significant delay in a disturbing proportion of cases.

99. Significant unmet need in access to appropriate RW platforms was noted (72 above).

100. Systems for allocation of retrieval case priority (urgency) are not uniform and are blunt (less patient focussed) compared to other jurisdictional approaches. Though a component of existing contracts, their adequacy is questionable.

Communication systems

101. Communication systems are generally reported as good and meeting the needs of the system. It is likely that improvements would be achieved (including greater application of telehealth systems) with central coordination of aeromedical services.

Case management and clinical support

102. Whilst existing systems provide an overall adequacy, they are risk-prone, non-systematised, non-centralised and variably governed.

103. Various providers report satisfaction with high levels of case management and support they provide; however, users frequently report need for improvement. This suggests that improvement is required in the effectiveness of connections and understanding of satisfaction between providers and users.

104. Repatriation (back transfer) is an aspect of case management which is compromised by the current silo arrangements – the impact of delays in discharge and repatriation of hospital bed availability is important.

Destination management

105. Existing systems require referring clinicians to organise patient destinations in most cases. This is an arduous process, requiring the clinician with the least time, resource, and power to negotiate patient destination via 'push' systems. Mature aeromedical and patient transfer systems provide 'pull' brokerage of this role, releasing referring clinicians to patient care, and coordinating communication between referrer, transport and destination.

106. Effective management of patient flow and receiving care is critical to the efficient delivery of a state-wide aeromedical service. Close focus here can help deliver a more cost effective and efficient service.

Platform and crew allocation

107. WA aeromedical crewing has potential for improvement and requires fundamental examination. The current RFDS systems rely on provider staff who have a range of skills from primary health to critical care – this skill mix being driven by the different nature of their state and Commonwealth and industry contracts.

108. The current models for RW and FW have fixed links between the platform and crew options – for example a RW response will provide one paramedic only, unless complex recrewing (and delays) add a medical officer to the crew (albeit one with very little RW experience). Tasking of a RFDS FW provides access to medical and RN crews only. See Workforce model.

End-to-end case monitoring

109. End-to-end case monitoring is not an effective component of the often-fragmented approach to the patient journey. Indeed, it would be impossible to seamlessly monitor the whole patient journey in WA in most instances.
110. It is disturbing to again note the dichotomous view between providers and purchaser indicating a disconnect at a cultural, service-expectation and governance level.

Escalation and control systems

111. As expected from the situation regarding case monitoring, escalation options and control systems are not optimally effective.
112. There is no centralised, independent authority to be the decision maker if escalation does not produce a timely resolution, and there appears to be no system to capture how often, or what outcome an escalation has produced.
113. There may be perverse commercial (contract) disincentives to pursue escalation options.
114. Clinician groups provided consistent input regarding the need for effective escalation to an authoritative endpoint.

Clinical governance

Clinical governance framework

115. There is no common, overarching clinical governance framework for aeromedical services in WA.
116. A respondent opined: "...that the delivery of clinical services by the main providers is clinically appears to be sound and safe". This statement may be more accurate if prefaced by the observation that 'without evidence to the contrary' it would seem... There is no adequately transparent system in place which assures WA Health of the robustness of clinical care quality or clinical governance systems across the AMS.
117. The responsible arm of government, which also has operational roles in the aeromedical system is 'a step removed' from the bulk of the aeromedical system's active clinical governance processes.

Clinical guidelines and standard operating procedures

118. General clinical guidelines and standard operating procedures for aeromedical transfer are reported to be comprehensive and readily accessible.
119. The RFDS National Standards on Aeromedical Evacuation (referenced heavily as a cornerstone in the WACHS contract) are however not contemporary and date from 2011.
120. Whole system development and coordination of contemporary guidelines, auspiced by a central body, and coordinated across the health service-aeromedical interface would support seamless, consistent clinical practice.

Periodic external review

121. There is no integrated and state-led process for independent periodic external review of clinical services of aeromedical services. Such reviews engage external experts and colleagues to regularly scrutinise processes and the application of policy – searching for improvement opportunities.

Incident and adverse event monitoring

122. Providers indicate that they have mature incident and adverse event monitoring systems. These systems exist outside the Statewide Health incident system, limiting system level visibility, learnings and improvement opportunities.
123. The systems are internal to each agency and do not contribute to Statewide systems.
124. The largest (RFDS) is a paper-based system which would benefit from upgrading to make best use of contemporary technologies.

Root cause analysis program

125. Multi-agency RCA is not common and there is no defined pathway for coordination of interagency RCA.

Open disclosure program

126. Open disclosure processes are embedded in aeromedical services. Central monitoring by an overarching agency may generate system level learnings and improvements.

Case review

127. Internal case review systems are identified in existing agencies. Increasing consistency of process, transparency of learnings, and interagency participation enriches case review systems.
128. System-wide case review and auditing results in shared learning.
129. Compliance with case review requirements should be actively audited in all services.

Clinical audit

130. RFDS demonstrated strong audit processes aligned to the recent ACQSH accreditation, however the maturity of the system was not determined, and staff statements suggested further development of the system may be necessary. EHRS did not present evidence of a mature clinical audit processes.
131. There are no systems for effective follow up of patient outcomes beyond the period of case management.

KPI monitoring and reporting

132. System level monitoring of KPI's does not occur at an appropriate level. The processes for monitoring are loose and the KPI's are not constructed to adequately measure quality and safety of systems or to reflect clinical outcomes of patients.
133. Key performance criteria include accessibility, response times and coordination efficiency measures.
134. Clinical quality and safety indicators as exemplified in interjurisdictional clinical governance and standards documents reflect clinical standards at both process and outcome levels.
135. Audit and other validation of all performance data is required.

Risk management framework (clinical)

136. Organisations advised that mature clinical risk management frameworks and systems were in place however no validation was received by the Inquiry.

137. Some respondents recommended performance of a formal risk analysis across the entire patient journey – again recognising the dangers inherent in a disparate system without overarching governance structures.

Clinical documentation review

138. Provider organisation indicated the presence of clinical documentation review systems. This was well validated in the RFDS audit process. Opportunity exists for increased staff involvement and feedback.

Process for new equipment/intervention/treatment

139. There is no process for standardisation of equipment in the aeromedical system. Variation is seen between platforms, provider, and road ambulances – creating risk. In austere environments, standardisation reduces risk of clinical error.
140. Each of the provider organisations indicate that they have an effective policy and procedure defined for introduction of new equipment/intervention/treatment.

Equipment management system

141. Each of the provider organisations indicate that they have a formal equipment management system which considers equipment appropriateness, longevity and maintenance.

Complaints and feedback

142. Individual organisations involved in aeromedical services have systems in place to manage complaints. At a system level there is no transparency of these processes and no clear evidence of systematic reporting to staff or to Health.
143. Increased transparency and sharing of learnings from complaints provides a valuable mechanism for improvement.

Workforce (clinical)

Workforce model

144. The existing single clinician model for ERHS staffing is not supported.
145. Options exist regarding the structure of a two-person clinical team, with most jurisdictions opting for the maximum flexibility and capability of Dr-Paramedic teams on RW teams.
146. FW staffing models are effective however currently do not include the option for paramedic staffing.
147. The current RFDS model in WA employs medical staff on contract directly by RFDS, part or full-time for a fixed contract period.
148. The aeromedical and retrieval workforce is increasingly specialised and must look to staff with appropriate levels of training and optimised scope of clinical practice.
149. Clinical staffing systems should be developed to meet local needs in consideration of local capability. Options include contracted systems or local development through State health services. The latter provides improved interagency standardisation and integration and can provide useful career options for regional practitioners.
150. Specific arrangements for neonatal aeromedical services are required due to the highly specialised systems and capabilities required.
151. Paediatric aeromedical services can be covered in the main by general aeromedical services provided there is good access to real time paediatric specialist support.

152. All interstate jurisdictions support interdisciplinary crewing
153. In general, the AMS industry advocates for two-clinician standard crewing (including RW) except for very low acuity transfers.

Interdisciplinary framework

154. Pre-hospital and inter-hospital care in WA have a long history of interdisciplinary provision of care for road and aeromedical retrieval and transport. The current patient journey from regional areas includes volunteer, paramedic, critical care paramedic, nurse, General practitioner, RFDS, Specialist telehealth and referring expertise.
155. Innovative and extended practice roles are evolving and may have a role in aeromedical practice.

Selection and recruitment

156. All respondents state that selection and recruitment processes are robust and compliant with contemporary standards.

Credentialing and scope of practice

157. Defined and consistent scope of practice, clinical expertise and clinical practice standards are required for aeromedical services regardless of platform or provider.
158. Monitoring of credentialing and scope of practice occurs at the provider level and may be reported to Health as the purchaser and final point of governance responsibility.
159. Mature aeromedical systems have processes for central management of scope of practice and credentialing – including highly specialised forms of retrieval such as neonatal or ECMO. Cross-credentialing of practitioners (across platforms or aeromedical services) may be accomplished by a central process and deliver efficiencies.

Onboarding systems

160. Organisations indicated compliance with general standards for onboarding.

Education and professional development

161. Organisations indicated the provision of education and access to professional development opportunities for staff.
162. Central (system-level governance) verification of education and professional development systems is not clear.

Performance management

163. All organisations indicated compliance with general standards for performance management
164. Central (system-level governance) verification of performance management systems is not clear.

Training programs and qualifications

165. All organisations indicated compliance with general standards and expectations for training and qualifications of staff.
166. Central (system-level governance) verification of performance re training and qualification management is not clear.
167. Training accreditation standards and processes of ACEM and Affiliates PHARM Diploma are supported.

Knowledge management

Education

168. System level coordination of higher education for aeromedical practice is a marker of a mature aeromedical and retrieval system.
169. Further maturation of state-wide governance is likely to enable development of educational systems.

Research

170. System level coordination of research for aeromedical practice is a marker of a mature aeromedical and retrieval system.
171. All jurisdictions strongly support the development of a National Registry for aeromedical and retrieval practice to inform best (and evidence-based) practice, research, and strategic development of systems and services.

Evidence based

172. Each service utilises individual evidence-based guidelines, however system-level coordination and commonality (interagency, including road services and hospital care systems) is lacking.

Information management

Operational systems

Coordination and case management systems

173. Single data pool (or repository) with clearly defined data sets would deliver real-time intelligence to inform clinical, operational and system level decision making.
174. There is no agreed minimum data set
175. Cross-agency visibility of whole-State activity is not possible.
176. Telehealth systems are advanced.
177. Specialised and effective IT systems are required for case coordination, aircraft asset management and tracking and clinical care
178. Integration and wide visibility of IT systems is preferred.

Clinical (POC) systems

179. Contemporary clinical point of care IT systems provide not only a tool for capture of data and clinical information, but also provide clinicians with valuable tools to improve patient quality and safety.
180. There is currently no central agency, common minimum data set, forum or central data repository to support oversight of performance, clinical review and patient outcomes in a holistic patient-centric view and providers generally work, store data and are governed in relative autonomy.
181. There is no agreed minimum data set
182. Cross-agency visibility of whole-State activity is not possible.

Platform management systems

183. Cross-agency shared visibility of whole-State activity is not possible.

Business systems

Business reporting

184. Business systems are reported to be largely satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

Asset management system

185. Asset management systems are reported to be largely compliant and satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

Human resources

186. Human Resource systems are reported to be largely compliant and satisfactory, with some potential for improvement through contract specification or purchaser-provider communication.

Funding model

187. Funding of FW (RFDS) is complex and reflects the range of services RFDS provides to 2 governments, industry and compensable individuals. The result is a system lacking in clarity to purchasers wherein the relationship between price and product is not transparent.
188. From the RFDS perspective this provides a consolidated income stream and access to additional capital grant funding which governments provide.
189. The RFDS Commonwealth funding stream has a historical basis, however, given that the greater bulk of RFDS work is now 'state-facing', and whose coordination is state funded, and which is provided for patients who are or will soon be WACHS (state) patients, the rationale for the Commonwealth funding arrangements can be drawn into question. There would be much sense in flowing these funds to the State to administer and to thereby ensure integration and coordination of the aeromedical retrieval and outreach systems across the whole population. This avoids duplication and improves the transparency and accountability of this expenditure (of public funds).
190. From a systems, quality and governance perspective, the divide in RFDS accountability between state and Commonwealth creates a bureaucratic grey zone which is unlikely to benefit government or community.
191. DFES ERHS has a complex funding model sourcing funds from the State Consolidated Account, Emergency Services Levy, Road Trauma Trust Account, Sponsorship funding, and some Commonwealth funding.
192. There is no single point of government control, responsibility, or coordination of aeromedical funding.

RFDS funding

DFES funding
Australian Maritime Safety Authority
Lack of clarity in funding models

17. Appendix 5 – Aeromedical services cost and funding review

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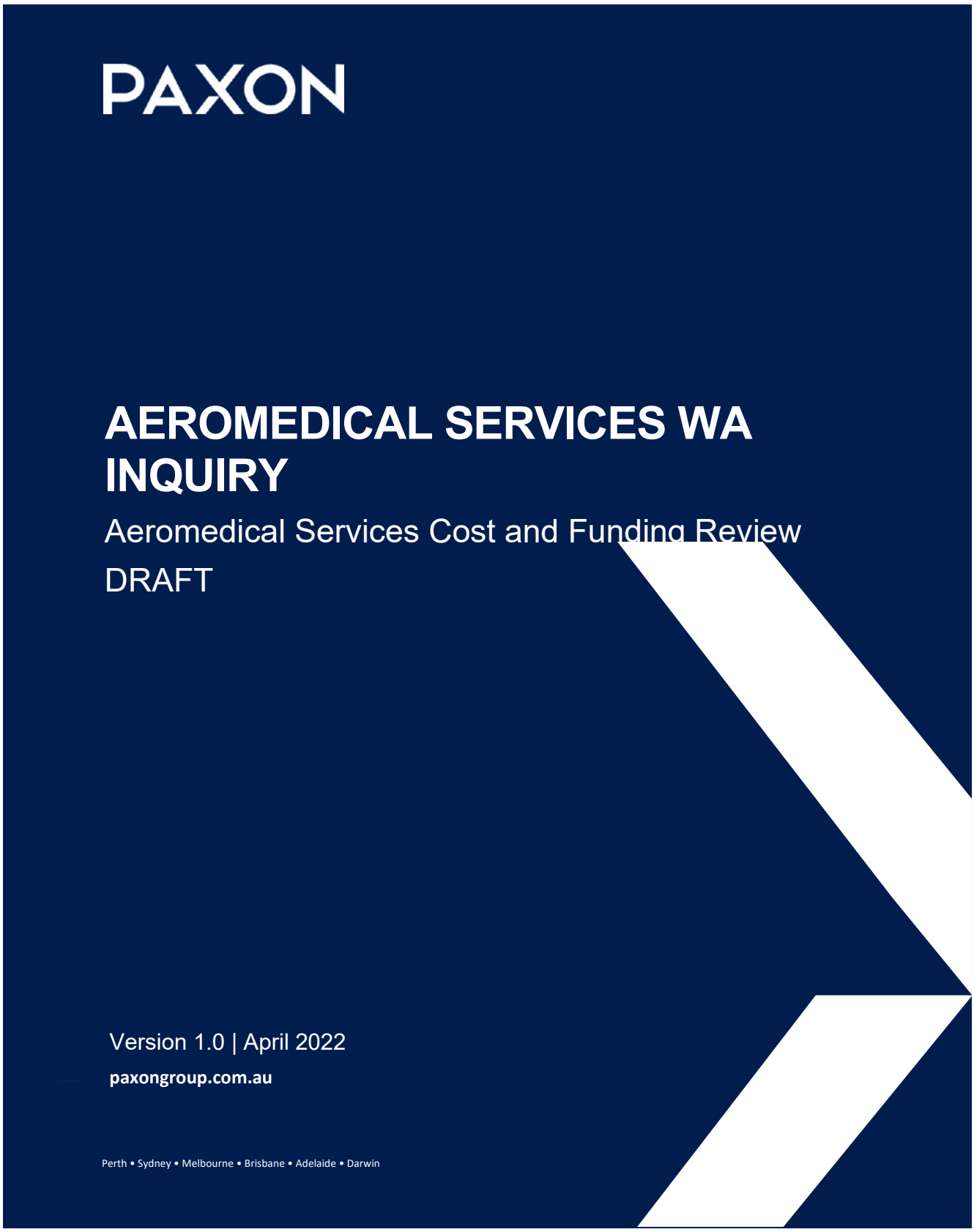


Paxon contents

1. EXECUTIVE SUMMARY

1.1 Background

The Aeromedical Services WA Inquiry (Inquiry) was established under part 15 of the *Public Health Act 2016.* The aim of the Inquiry is to review arrangements for aeromedical transport in Western Australia (WA) and make recommendations for improving patient outcomes and related governance and coordination arrangements.

1.2 Scope of Work

Paxon was engaged by the Inquiry to provide total cost of services delineated by the following organisations:

Royal Flying Doctor Service Western Operations (RFDS);

Department of Fire and Emergency Services (DFES);

WA Country Health Service (WACHS).

Service costs include the direct costs of service, indirect costs of service and the return on and of capital.

1.3 Summary Costs

This section contains a summary of the service costs across departments and service lines including operating and capital costs for FY2021. Service costs have been allocated by service type and reporting entity to provide measures of cost as required by the Inquiry.

Aeromedical Service Cost by Reporting Entity

The scope of services included in summary cost figures and cost benchmarking are summarised in Table 144.

Table 14: Scope of Aeromedical Cost Data Analysis by Reporting Entity

Reporting Entity	Inclusions	Exclusions
RFDS	IHPT services including: Patient transfers Repatriations IHPT delivered with the DFES helicopter (staffing only)	Primary evacuations (Commonwealth Government service contract)
DFES	Primary care retrievals; Search and rescue services; Secondary retrieval and other IHPT Training operations to support the above business activities.	
WACHS	Services that support the delivery of IHPT services through the WACHS regional service network including Clinical coordination and tasking; Patient transport services (supporting).	

Table 15 contains a summary of total operating and capital cost by reporting entity for FY19, 20 and 21.

Table 15: Total Cost of Aeromedical Services WA

		FY2018/19 ($m)	FY2019/20 ($m)	FY2020/21 ($m)
RFDS	Operating Costs	$59.2	$56.3	$59.2
	Capital Charge	$20.0	$20.4	$20.8
WACHS	Operating Costs	$0.2	$0.2	$2.2
	Capital Charge	$0.0	$0.0	$0.0
DFES	Operating Costs	$17.6	$17.7	$19.2
	Capital Charge	$2.3	$2.4	$2.4
Total Operating Costs		**$77.0**	**$74.2**	**$80.6**
Total Capital Charges		**$22.3**	**$22.7**	**$23.2**
Total Cost of Service		**$99.3**	**$96.9**	**$103.8**

Source: Reporting entity financial information and general ledgers.

2. APPROACH AND METHODOLOGY

2.1 Scope

The scope of this project is to identify the total cost of aeromedical services in Western Australia and benchmark them against various activity and operational metrics. Total cost, unless otherwise indicated, includes recurrent operating expenses and a capital charge associated with the capital required to deliver services.

The following service lines were in scope for the cost collection and benchmarking project:
Inter-hospital Patient Transfer services;

Primary retrieval services;

Search and rescue services;

Other transfer services.

Primary cost information and data was collected from three entities including WACHS, the RFDS and the DFES.

2.2 Data Sources

Analysis and cost benchmarking was conducted using publicly available data and information requested relevant entities through the Inquiry.

The following primary source data and information from relevant reporting entities was used to identify and benchmark aeromedical service costs in Western Australia:

Department of Fire and Emergency Services:

Attachment A - Service Agreeme~tivity Profile, Financial Info.pdf

Attachment B - AMSA-DFES SAR Agreement.pdf

Attachment B - MOU - DFES - WA~apability and Service Delivery.pdf

Attachment C - Aeromedical Ser~ Inquiry - ERHS Financial Data.xls

Attachment D - Aeromedical Ser~ Inquiry - ERHS Asset Register.xls

Royal Flying Doctor Service:

1.2 Activity Profile Supporting Document.pdf

1.2 Activity Profile.pdf

2.1 Summary Cost Allocation.pdf

2.3 Assets.pdf

State Contract.pdf and variations.

Western Australia Country Health Service:

eDoc - CO - 1. WACHS2016353 RFDS Service Agreement Aeromedical IHPT Service.pdf

eDoc - CO - 2. WACHS2016353 Letter to RFDS Additional Funding COVID 2019-20 - September 2020.pdf

eDoc - CO - 3. Variation letters.pdf

eDoc - CO - 4. WACHS RFDS Activity Report Financial Year 2018-19.pdf

eDoc - CO - 5. WACHS RFDS Activity Report Financial Year 2019-20.pdf

eDoc - CO - 6. WACHS RFDS Activity Report Financial Year 2020-21.pdf

eDoc - CO - 7. GL Actual Journals - Line Transactions - RFDS 201819.xls

eDoc - CO - 8. GL Actual Journals - Line Transactions - RFDS 201920.xls

eDoc - CO - 9. GL Actual Journals - Line Transactions - RFDS 202021.xls

eDoc - CO - 10. WACHS2016353 - RFDS IHPT Contract Management Plan V4.0 January 2022.pdf

eDoc - CO - 2022-03-01 - OUTGOING - WACHS Response to Aeromedical Inquiry Information Request - 28 February 2022.pdf

State Contract.pdf

2.3 Approach and Methodology

Primary Source Cost Benchmarking and Analysis

Cost analysis and benchmarking of aeromedical services was undertaken using the following approach:

- In-scope aeromedical costs were identified, isolated and extracted from source data for financial year 2019, 2020 and 2021.
- Depreciation, amortisation, one-off items and other non-cash charges were removed from cost data.
- Capital charge calculated on the basis of the useful life of assets and replacement cost assuming a 6% return on capital. Where useful life and replacement value was unavailable, market data was used as the basis for calculations. The capital charge was then allocated to service lines based first on the relative proportion of flying time for each service line and, where unavailable, service volumes or other operational metrics. A nominal inflation was applied to the capital charge in prior years to account for cost inflation of asset replacement values provided for FY2021.
- The following activity and operational data was identified for each service line (where available):

  Patient transfers/service events

  Flight time

  Distance travelled (kilometres)
- Cost benchmarking required raw cost data be refined to ensure cost attribution captured only relevant costs. Where costs for a service crossed multiple reporting entities, these costs were identified and attributed to the appropriate service. Costs were identified and assigned to one of the following services:

  Inter Hospital Patient Transfer;

  Primary evacuation;

  Primary care retrievals;

  Search and rescue operations.

  Cost benchmarks were then calculated by combining total cost of service including by cost component with operational and activity metrics.

3. ROYAL FLYING DOCTOR SERVICE

The Royal Flying Doctor Service Western Operations provides aeromedical and transport services across Western Australia, including IHPT and primary evacuations along with a range of general medical services and consultations in rural areas.

3.1 Service Specification and Service Agreement

Service Agreement and Funding Mechanism

The Western Australian government, through WACHS, contracts IHPT services from the RFDS Western Operations.

The service payment is made up of four components:

1. Service Payment (Fixed) – a fixed fee attributable to the fixed costs of providing services.
2. Service Payment (Variable) – activity based payment payments for aeromedical IHPT service events based on a rate per billable kilometre.
3. Service Payment (Emergency Rescue Helicopter Service) – a fixed fee attributable to the fixed costs of providing medical escorts and support the transport of patients on the emergency rescue helicopter service.
4. Fee for Service (Repatriations) – fee for service payment for repatriation transfers based on a fixed Hospital to Hospital rate.

Fixed and variable service payments are based on billable service kilometres as reported by the provider, with funding split equally between fixed and variable components. Prior to the commencement of the financial year, the contractor and service provider agree to the estimated billable service kilometres required to meet service demand, referred to as Base Service Kilometres. Funding is then adjusted based on the actual billable service kilometres provided over the period, using the following logic:

If actual billable service kilometres delivered in the period exceeds Base Service Kilometres, the difference between Base Service Kilometres and actual billable service kilometres provided is funded at 1.5x Base Rate per billable kilometres (i.e. a 50% loading to the base rate).

If actual billable service kilometres delivered in the period are less than the Base Service Kilometres, the difference between Base Service Kilometres and actual billable service kilometres provided is funded at 0.5 x Base Rate per billable kilometre (i.e. funding is reduced by 50% of the base rate).

Rates and billable kilometres used in calculating the fixed and variable service payment for FY2021/22 are contained in Table 16.

Table 16: IHPT Rates and Funding Payments FY2021/22

Payment Element	Unit	Rate/Quantity
Base Service Kilometres	km	9,254,299
Fee for Base Service Kilometres	$ per billable kilometre	$2.56 (excl. GST)
Fee for excess Kilometres beyond Base Service Kilometres	$ per billable kilometre	$3.84 (excl. GST)
Fee for Kilometres less than the Base Service Kilometres	$ per billable kilometre	$1.28 (excl. GST)

The State and the RFDS are currently engaged in the development of a new service agreement which is expected to be completed at some stage shortly after the release of findings of the WA Aeromedical Services Inquiry.

Changes to the IHPT Service Model

Since the initial establishment of the service agreement for IHPT services, there have been two service model changes introduced by the service provider. These include the introduction of the High Acuity Retrieval Unit (HARU) and the introduction of aeromedical helicopter capabilities.

In August 2020 parties agreed to a variation to introduce the use of the HARU for delivering IHPT services. Under the variation, the road based mode of transport is used to address IHPT service demand fitting one of the following eligibility criteria:
The patient location is within 200 kilometres of the of Jandakot Airport;

Conditions or resources prohibit the safe use of aircraft;

St John Ambulance confirms that it is unable to provide an ambulance service; and

The patient must possess a clinical condition that requires critical care retrieval and/or the presence of a medical officer/nurse.

As part of the agreement, billable services kilometres provided through the HARU are reporting with fixed wing billable kilometres and funded through the same payment rate and mechanism.

In November 2021[15], the RFDS announced the introduction of a new aeromedical helicopter service in partnership with Fortescue. Two helicopter assets are to be added to the RFDS fleet and used to deliver existing business activities in locations proximate to Perth and the South-West corner of the state.

3.2 Service Activity Allocation Methodology

The RFDS provides Inter-Hospital Patient Transfer services on behalf of the Western Australian state government (contracted through WACHS) as well as Primary Evacuation services on behalf of the Commonwealth Government. The RFDS delivers these services using the same operating model, assets, equipment and staffing models. A typical flight can involve multiple patients on a single plane with each being picked up and dropped of at different destinations.
As part of reporting requirements under the service contract with WACHS, the RFDS is required to billable kilometres associated with IHPT services. Multiple primary evacuation and IHPT services can occur concurrently and involve a single or multiple planes, operational bases and staffing teams. The methodology used to allocate flight kilometres between primary evacuation and IHPT includes the following key elements:

Direct (straight-line) travel distance is calculated for each service event based on the passenger's destination and arrival location;

Distance for each service event is allocated to primary evacuation and IHPT;

Total distanced travelled for each service line is divided by the sum of direct travel distances for primary evacuation and IHPT to calculate an allocation proportion;

Allocation proportions (for IHPT and primary evacuation) are then applied to total distance travelled (actual) including returns to base and transfers between bases to calculate the travel distance allocated to each service type.

Flight time for other RFDS operations, such as training, ferry, engineering checks and medical clinic transportation are excluded from allocation and have no impact on reported flight time for primary evacuation.

This methodology drives the allocation of billable hours to IHPT and therefore determines the revenue derived from service contracts with WACHS for the provision of IHPT services. It will also therefore drive the results of costing benchmarks presented in the section.

[15] https://www.flyingdoctor.org.au/wa/news/rfds-and-fortescue-announce-new-aeromedical-helicopter-service-wa/

3.3 Service Activity Profile

Table 17 below contains a summary of IHPT and related service activity volumes and operational metrics for financial years 2018/19, 2019,20 and 2020/21. Components of IHPT related activity include the following services:

Primary evacuations: patients transferred from locations without a hospital.

IHPT: services delivering patients from a hospital in a WACHS to a metropolitan health facility.

Other IHPT: transfers from the Indian Ocean Territories (Christmas Island and Cocos Islands), from Perth to interstate or interstate hospitals to Perth.

Repatriations include transfers to return patients from Perth or regional hospitals back to their local hospital or home community after treatment.

Table 17: Service Activity Volumes, IHPT

	Units	FY2018/19	FY2019/20	FY2020/21
Primary Evacuation				
Patients Transported	Transfer events	1,650	1,754	1,836
Flying Hours	Hours	1,449,653	1,552,486	1,604,804
Distance Flown	Kilometres	1,650	1,754	1,836
IHPT				
Patients Transported	Transfer events	7,058	7,317	8,162
Flying Hours	Hours	17,312	16,864	18,598
Distance Flown	Kilometres	8,513,105	9,191,792	11,000,859
Other IHPT				
Patients Transported	Transfer events	15	6	20
Flying Hours	Hours	117	54	173
Distance Flown	Kilometres	80,760	34,483	112,103
Repatriations				
Patients Transported	Transfer events	119	158	227
Flying Hours	Hours	231	331	419
Distance Flown	Kilometres	91,445	132,330	167,287

Source: RFDS-WACHS Activity Reporting, RFDS Activity Data

The service volume and profile indicates that IHPT (including other IHPT) represented approximately 81% of the RFDS' total service volumes in FY21, and approximately 85% of total distance flown (see Table 1818).

Table 18: RFDS Service Drivers and Operational Metrics, FY21

	Service Events		Kilometres Flown	
	Patient Nos.	Proportion of Total (%)	Kilometres	Proportion of Total (%)
Primary Evacuation	1,836	18.2%	1,604,804	12.4%
IHPT	8,162	80.8%	11,000,859	85.3%
Other IHPT	20	0.2%	112,103	0.9%
Repatriations	89	0.9%	186,041	1.4%
Total	**10,107**		**12,903,807**	

Source: RFDS-WACHS Activity Reporting, RFDS Activity Data

3.4 RFDS Cost of Aeromedical Services Costs

The following table contains the total cost of IHPT services provided in WA. Total cost is split into the direct operating costs of service provision and a capital charge attached to the assets required to deliver services. The high capital intensity of aeromedical services means that capital costs represents a material component of the cost of service annually, between 25% and 27% across the examined period.

Table 19: Total Cost of IHPT services, FY19 to FY21

	FY2018/19 ($m)	FY2019/20 ($m)	FY2020/21 ($m)
Operating Costs	$59.2	$56.3	$59.2
Capital Charge	$20.0	$20.4	$20.8
Total Cost of Service	**$79.2**	**$76.7**	**$80.0**

Source: RFDS Western Operations Summary Financial Information

3.5 RFDS Revenue and Funding

The RFDS receives funding from WACHS for IHPT services it provides across WA. Other funding sources include revenue from fundraising and bequests and revenue from contracted services for the Commonwealth Government (Primary Evacuations). Primary evacuation revenue has been excluded from the scope of this project as it is a Commonwealth Government procured service.

Table 20 contains a summary of RFDS revenue sources for FY19, FY20 and FY21.

Table 20: RFDS Revenue, FY19 to FY21

	FY2018/19 ($m)	FY2019/20 ($m)	FY2020/21 ($m)
WACHS Funding*			
Emergency Rescue Helicopter Service	$0.8	$0.8	$0.8
Clinical Coordination	$2.8	$3.3	$3.3
Service Payment - Fixed	$20.0	$22.0	$29.7
Service Payment - Variable	$22.8	$25.3	$33.0
Total WACHS Funding	**$46.4**	**$51.4**	**$66.9**
Other Funding			
Revenue from fundraising and bequest income	$9.3	$11.0	$10.1
Total Other Funding	**$9.3**	**$11.0**	**$10.1**

	FY2018/19 ($m)	FY2019/20 ($m)	FY2020/21 ($m)
Total Revenue	**$55.7**	**$62.4**	**$77.0**

Source: WACHS Service Agreements and Reporting

*Funding derived from WACHS Service Agreements and RFDS Activity Reporting

4. DEPARTMENT OF FIRE AND EMERGENCY SERVICES

The Department of Fire and Emergency Services (DFES) operates the emergency rescue helicopter services (ERHS) that provides services including primary care retrievals, search and rescue and secondary care and IHPT, including activities that support the RFDS in delivery of IHPT using the ERHS.

4.1 Service Model

The DFES operates the State Emergency Rescue Helicopter Service (otherwise known as RAC Rescue). This service operates 24 hours a day and 7 days a week and consists of crewed and equipped helicopters that are rapidly deployed to incidents or otherwise inaccessible patients. The nominal operating range and maximum service coverage area is approximately 400 kilometres with two primary helicopters and one standby helicopter based in Perth and Bunbury. Table 21 summarises the mission types provided through the ERHS.

Table 21: DFES Emergency Helicopter Service Mission Types

Mission Types	Service Description
Primary Care Retrievals	Response to ambulance Priority 1 incidents and patients that require Critical Care Paramedic capabilities on scene, or when aeromedical evacuation is required from otherwise remote or inaccessible locations – These tasks have priority over the other ERHS operations and are conducted in accordance with the Department of Health Ambulance Distribution Model.
Search and Rescue	Conducted on behalf of other Hazard Management Agencies such as the Australian Maritime Safety Authority in Canberra or the Western Australian Police. Service includes sea and land searches for missing persons and if necessary vertical retrieval plus advanced medical treatment. SAR is conducted in accordance with agreements between DFES and the other agencies.
Secondary Care and IHPT	Time-critical adult and child patient transfers from regional medical facilities to tertiary hospitals with specialist medical capabilities on behalf of the Department of Health and the Royal Flying Doctor Service (RFDS). IHPT are conducted in accordance with the Department of Health Contract with RFDS for provision of aeromedical IHPT services.
Other Approved Tasks	Include training for the above operations and those tasks necessary to enable the delivery of the Contracts between DFES and the ERHS Service Providers: CHC Helicopters Australia and St John Ambulance.

The DFES maintains a number of individual service agreements covering the services outlined above. These include the following:

Service agreement with the Australian Maritime Safety Authority representing a ‘call-when-needed’ use of helicopter assets;

Service agreement with the Australian Maritime Safety Authority for Aerial firefighting capabilities;

Memorandum of Understanding with the Western Australian Police Force for the mutual use and collaboration of aviation and capability operations allowing for the use of DFES aviation capabilities.

Summary of service agreement, service agreement and payment mechanisms.

4.2 Service Activity Profile

Activity volumes and operational metrics for the ERHS are summarised in Table 22 and Table 23.

Table 22: ERHS Service Activity Volumes, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Primary Care Retrievals	285	370	307
Search and Rescue	8	10	81
Secondary Care and IHPT	159	202	142

Source: DFES Activity Data Report

Table 23: ERHS Flight Hours, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Primary Care Retrievals	535	699	606
Search and Rescue	110	97	77
Secondary Care and IHPT	269	327	216

Source: DFES Operational Information

4.3 DFES Cost of Aeromedical Services

The total cost of service for the ERHS has been identified and isolated within the DFES financial data. This includes direct costs of the services such as salary and wages, aircraft operating expenses as well as indirect costs relating to property plant and equipment, overheads and support activities. Table 24 contains a summary of total cost of services including operating costs derived from the DFES general ledger and a capital charge estimated from market data.

Table 24: ERHS Total Cost of Service, FY19 to FY21 ($m)

	FY2018/19	FY2019/20	FY2020/21
Operating Costs	$17.6	$17.7	$19.2
Capital Charge	$2.3	$2.4	$2.4
DFES Total Cost of Services	**$19.9**	**$20.1**	**$21.6**

Source: DFES General Ledger

Where possible, individual cost items were attributed to the appropriate service line. Service costs that could not be directly attributed to an appropriate service line were then apportioned to individual service lines on the basis of relative proportion of activity. The capital charge was allocated across service lines by the relative proportion of operating costs. This approach assumes a uniform service cost profile across the three services lines and therefore a limitation of the approach and data available to isolate specific service costs.

Table 25: ERHS Total Cost of Service, FY19 to FY21 ($m)

	FY2018/19	FY2019/20	FY2020/21
Primary Care Retrievals	$12.5	$12.7	$12.9
Search and Rescue	$0.7	$0.6	$3.0
Secondary Care and IHPT	$6.8	$6.8	$5.7
DEFS Total Cost of Service	**$19.9**	**$20.1**	**$21.6**

Source: DFES General Ledger

5. WESTERN AUSTRALIAN COUNTRY HEALTH SERVICE

The Western Australian Country Health Service (WACHS) provides a range of support functions for aeromedical services across WA. This typically includes tasking and clinical support duties as well as patient transport functions throughout its regional health network. The agency is also involved in administering service agreements for IHPT services with the RFDS, and provides funding for these services.

5.1 WACHS Aeromedical Costs

The cost of aeromedical service provision and support activity has been isolated within the agency general ledger along with other quantitative information on the cost of administering IHPT service agreements and contracts. Table 26 contains a summary of the cost information it was possible to identify and attribute to aeromedical service support activities incurred by WACHS.

Table 26: WACHS Support Service Costs, FY19 to FY21 ($m)

	FY2018/19	FY2019/20	FY2020/21
WACHS Support Service Operating Costs	$0.18	$0.19	$2.19

Source: WACHS General Ledger, Response to Information Request

5.2 Capital Grants and Funding

WACHS does not own assets relating to aeromedical services, however the State Government has made significant investment contributions to the value of $94.15 million dollar since 2008 to build the capacity of the RFDS to provide aeromedical IHPT services across the State. For the purposes of this report, these capital costs have been accounted for within the RFDS section of this report, as RFDS is the entity that maintains ownership and for the management and use of the assets. The table below summarises some of the capital funding and grants provided to the RFDS since 2008 to facilitate aeromedical capabilities within WA.

Table 27: WA State Government Capital Grants and Contributions to RFDS, 2008 to present ($m)

Capital Funding ($m)	Financial Year	Description
$32.9	2009	Funding of two replacement and one new aircraft and the associated flight and medical team operating costs for the additional aircraft over five years, approved on 1 December 2008, funded by Royalties for Regions (RfR).
$3.3	2009	Contribution towards the RFDS medical jet pilot project over three years, approved on 1 July 2009, funded by RfR.
$13.3	2014	Contribution towards the replacement of four aircraft in the RFDS fleet and a one year extension of operational funding in 2013-14 for the aircraft previously purchased with RfR funding, approved on 14 April 2014.
$25.5	2017	Capital provision for the establishment of a Broome base, the purchase of two additional aircraft, and the replacement of two existing aircraft, approved on 12 February 2016, funded by RfR.
$7.15*	2019	Capital grant through LotteryWest to contribute towards the purchase of a PC-24 jet in 2019.
$12.0*	2022, 2023	Requested by RFDS to fund the engine replacement, exterior and medical interior refurbishment of seven aircraft in financial years 2021-22 and 2022-23 in line with the RFDS Asset Replacement Plan project.

Source: WACHS Response to Information Request, includes some portion of recurrent funding grants

**It was not possible to determine if this funding was reported within revenue from fundraising and bequest income in Section 3.

6. AEROMEDICAL SERVICE COST BENCHMARKING

To provide further insight into aeromedical costs, a cost benchmarking study has been conducted using aggregate costs collected and presented in the previous sections. This section contains benchmarked costs of aeromedical service by service lines. Where possible, the following services have been benchmarked on activity and operational metrics:
IHPT;

Primary Retrieval;

Search and Rescue

As a result of the organisational structure and responsibilities of the agencies and entities involved, cost benchmarking has required the reallocation of costs by service line. For example, WACHS and DFES both incur costs for IHPT service activity that is reported by RFDS. The DFES operates the helicopter used by RFDS clinicians in specific circumstances to deliver IHPT services. Similarly, WACHS incurs costs relating to support service activities, patient transfers and clinical coordination.

6.1 IHPT

Using activity based allocation, IHPT unit service costs have been determined by:
Activity volume (patient transfers);

Hours flown; and

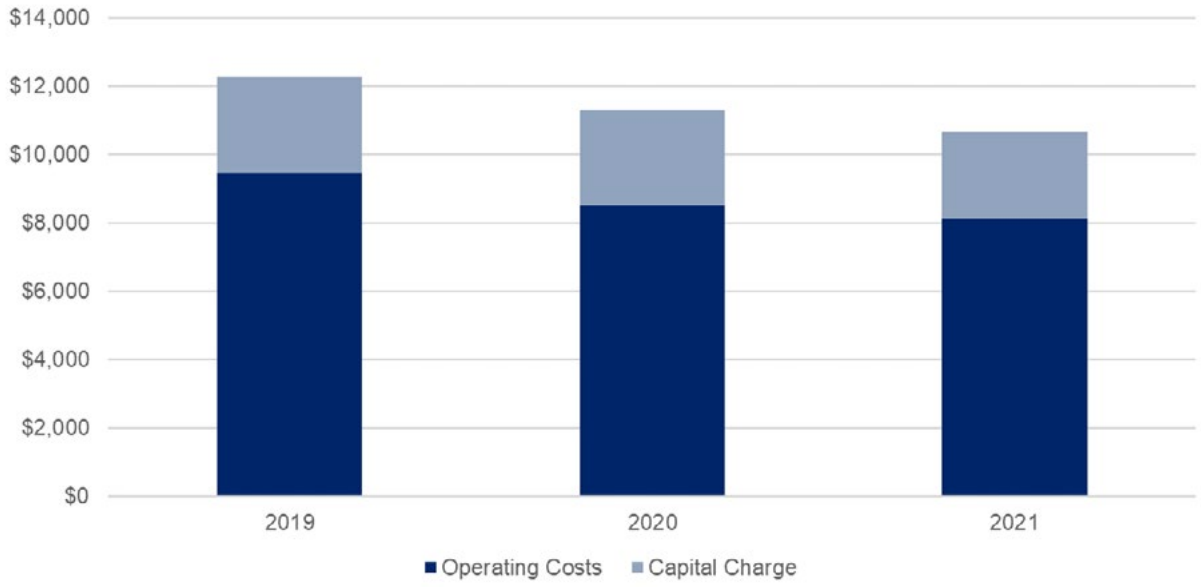
Distance travelled (kilometres).

Table 28: IHPT Cost per Patient Transfer, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Operating Costs	$9,443	$8,516	$8,100
Capital Charge	$2,828	$2,783	$2,545
Total Cost of Service	**$12,271**	**$11,299**	**$10,645**

Source: RFDS Western Operations Summary Financial Information, WACHS-RFDS Activity Reporting

Table 29: IHPT Cost per Patient Transfer, FY19 to FY21



Source: RFDS Western Operations Summary Financial Information, WACHS-RFDS Activity Reporting

Table 30: IHPT Cost per Hour Flying, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Operating Costs	$3,850	$3,695	$3,455
Capital Charge	$1,153	$1,207	$1,117
Total Cost of Service	**$5,003**	**$4,902**	**$4,571**

Source: RFDS Western Operations Summary Financial Information, WACHS-RFDS Activity Reporting

Table 31: IHPT Cost per Kilometre, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Operating Costs	$7.83	$6.78	$5.84
Capital Charge	$2.34	$2.22	$1.89
Total Cost of Service	**$10.17**	**$8.99**	**$7.73**

Source: RFDS Western Operations Summary Financial Information, WACHS-RFDS Activity Reporting

6.2 Emergency Rescue Helicopter Service

Services provided by the DFES through the ERHS cost have been benchmarked on patient activity volume (transport or service event) and flight hours, contained in the tables below.

Table 32: Service Costs per Patient/Service Event, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Primary Care Retrievals	$44,126	$34,573	$42,664
Search and Rescue	$101,304	$71,972	$35,589

Source: DFES General Ledger, DFES Activity Data Report

Table 33: Service Costs per Flight Hour, FY19 to FY21

	FY2018/19	FY2019/20	FY2020/21
Primary Care Retrievals	$23,502	$18,303	$18,931
Search and Rescue	$7,354	$7,412	$23,351

Source: DFES General Ledger, DFES Activity Data Report

7. JURISDICTIONAL SERVICE MODELS AND COSTS

Aeromedical services in other jurisdictions principally consist of IHPT, Primary Evacuations and search and rescue. The Royal Flying Doctor, across a range of operational divisions, provides IHPT and Primary Evacuation services to state and federal governments across jurisdictions. This section outlines cost benchmarking of IHPT services provided in other jurisdictions on the basis of publicly available information.

7.1 Methodology

IHPT services were benchmarked across state jurisdictions using publicly reported activity and cost data sourced from the RFDS for FY21. The methodology used to conduct this benchmarking included the following:

Sourcing of financial and activity data for the following organisations:

- RFDS Central Operations (South Australia and Northern Territory);
- RFDS South Eastern (New South Wales and Victoria); and
- RFDS Queensland.

Depreciation, amortisation, one of items and non-cash charges were removed from cost data.

Publicly available activity and operational data collected including the following:

- Service events (patients transported) by service type:
  - IHPT;
  - Primary evacuation.
- Distance travelled (kilometres) apportioned to IHPT or primary evacuation on the basis of proportion of total service events service events.

Costs allocated to service lines (IHPT and primary evacuation) based on the assigned proportion of total service events.

Cost benchmarks that form the basis for inter-jurisdictional comparisons are based on publicly available information. Limitations in the detail of publicly available information should be noted in interpretation of the results of the cost benchmarks. The approach and methodology used to formulate jurisdictional comparisons of cost benchmarks have the following limitations:

Inability to adjust costs for specific non-IHPT or other business activities such as the following:

- Primary healthcare relative business activities;
- Health access initiatives;
- COVID related support services;
- Other.

Application of high level activity based costing assumptions including the assumption that primary evacuation and IHPT service events have a uniform operating and cost profile.

7.2 Service volumes and Activity

Table 34 contains a summary of service activity volumes for RFDS across its jurisdictional operations.

Table 34: Service Activity Volumes, IHPT and Primary Evacuation (FY21)

RFDS Business Unit	IHPT	Primary Evacuation
Western Operations	8,040	1,835

RFDS Business Unit	IHPT	Primary Evacuation
Central Operations	7,639	1,635
South East Operations	8,445	104
Queensland Operations	11,187	1,028

Source: RFDS Divisional Reporting

7.3 Cost Benchmarks

Jurisdictional cost benchmarks are presented in Table 35. In interpreting these benchmarks, the following caveats apply:

Costs are operating costs excluding depreciation and amortisation and do not include a capital charge associated with aircraft or other capital costs incurred by the business.

One-off and costs and non-cash charges such as foreign exchange gains or loses and gain or loss on sale of assets have been excluded.

Table 35: IHPT Operating Cost Benchmarks by Jurisdiction (FY21)

RFDS Business Unit	Cost per Transfer	Cost per KM Flown
Western Operations	$9,178	$10.0
Central Operations	$5,772	$8.8
South Eastern Operations	$9,025	$15.0
Queensland Operations	$7,610	$11.2
Average	**$7,896**	**$11.3**

Source: Paxon Calculation, RFDS Divisional Financial Reporting

Note that due to the treatment of capital (not included) and differences in the underlying financial data used as the basis for cost benchmarks contained in Table 35, these cost benchmarks will be different from those presented elsewhere in this report.

The method for costs collection adopted in the table above has been conducted uniformly across jurisdictions (based on publicly reported information), and therefore provides a somewhat comparable measure of relative cost of service provision across jurisdictions, certeris paribus. Further discussion of operating cost differentials between jurisdictions is provided in Appendix A.

APPENDIX A

Appendix A provides a comparison of the following by jurisdiction:
Composition of aeromedical related FTE to Other FTE; and

Composition of Aeromedical services to Other services.

FTE Composition

The table below shows the RFDS full-time equivalent workforce delineated between aeromedical FTE and other FTE by jurisdiction.

Table 36: FTE by region

Role	Central Operations	Queensland Operations	South Eastern Operations	Western Operations
Aeromedical FTE	137	202	177	205
(Percentage share)	61.86%	56.47%	57.64%	77.23%
Other FTE	85	156	130	61
(Percentage share)	38.14%	43.53%	42.36%	22.77%

RFDS Western Operations contains a higher share of its FTE workforce committed to aeromedical operations. This would support a relatively higher allocation of the overall cost toward aeromedical services in WA relative to other states, which would further exacerbate the unit cost differential (which is based on the overall report cost by jurisdiction).

Service Composition

Similarly, the table below shows the relative composition of aeromedical services to other services across jurisdiction.

Table 37: Service by region

Service Type	Central Operations	Queensland Operations	South Eastern Operations	Western Operations
Primary Evacuations	3.14%	1.76%	0.19%	13.15%
Interhospital Transfers	14.68%	19.11%	15.10%	57.60%
Other	82.18%	79.13%	84.71%	29.25%

The RFDS Western Operations provides the lowest composition of Other services (clinics and tele-health consultations) by service volume. This would support a relatively higher allocation of the overall cost toward aeromedical services in WA relative to other states, which would further exacerbate the unit cost differential (which is based on the overall report cost by jurisdiction).

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18. Appendix 6 – Strategic framework

18.1. Policy and system

Sub-domain	Components	Aspirational features
Corporate/System Governance	Organisational Structure	The existing structure of aeromedical services is effective at a statewide level? The existing organisational structure of this aeromedical service is optimised and fully effective?
	Strategic direction / plan	The strategic plan is mature and well understood
	Culture of the organisation	The culture of the organisation is effectively aligned to drive safe, effective outcomes for patients.
	Clinical Services Plan	The clinical services plan is mature and well understood
	Risk Management	Risk management systems meet contemporary standards and are effectively administered and monitored
	OHS/WHS systems	OHS systems meet contemporary standards and are effectively administered and monitored
	Contract Management	Contract management systems meet contemporary standards and are effectively administered and monitored
	Management reporting	Management reporting is comprehensive and provides both dynamic (live/real-time) monitoring and amalgamated reporting
	Relationship management	Inter-organisation relationships are managed actively and effectively
Governance environment	Legislative	Legislative compliance is met
	Accreditation	Accreditation compliance is met
	Regulatory	Regulatory compliance is met

Sub-domain	Components	Aspirational features
	Other	
Policy and Procedures		Note: Relates to general organisational and governance policy and procedure (not clinical) The organisation has a comprehensive, up-to-date, collated policy and procedure system. Attach a list of all policies and procedures, including date of last review and date of next planned review

18.2. Aircraft

Sub-domain	Components	Aspirational features
	Fixed Wing (turbine)	Provide a description of existing assets including type and distribution
	Fixed Wing (Jet)	Provide a description of existing assets
	Helicopter	Provide a description of existing assets
	Airstrips	
	Helipads	

18.3. Aeromedical case activity

Sub-domain	Components	Aspirational features
		Provide a breakdown of at least 12 months activity for all aeromedical platforms: Case numbers, aircraft type, base, flight distance (&/or origin, destination, flight time analysis), urgency(priority), acuity, mission type (primary etc), crew, clinical problem, patient criticality, critical interventions, patient age, patient demography, and other data as may be available to inform the inquiry.

18.4. Case coordination

Sub-domain	Components	Aspirational features
	Central Coordination	To what extent is system coordination centralised and within what style of organisational structure?
	Access to services	Are services available when needed? Processes to access services are well understood by referrers?
	Communication systems	Are case communication systems (telephony, radio, telehealth) for users and aeromedical providers reliable and effective?
	Case management and clinical support	How effective and efficient is case management and access to clinical advice?
	Destination management	Is choice of destination and patient acceptance by a destination hospital managed efficiently?
	Platform and crew allocation	How effective are systems for appropriate allocation of crew and platform for aeromedical cases?
	End-to-end case monitoring	There is a coordinated process for end-to-end case monitoring for delays, incidents or other problems?
	Escalation and control systems	How effective are escalation options and control systems to manage issues arising during aeromedical transfer?

18.5. Clinical governance

Sub-domain	Components	Aspirational features
Clinical Governance Framework	Documented structure of CG	Please provide a copy of the Clinical Governance Framework
Clinical Governance Processes	Clinical Guidelines and SOPs	Are clinical guidelines comprehensive and readily accessible to aeromedical staff? Are clinical guidelines comprehensive and readily accessible to referring clinical staff Attach a list of all clinical policies and procedures, including date of last review and date of next planned review

Sub-domain	Components	Aspirational features
	Periodic external review	There is a process for independent periodic external review of clinical services and outcomes?
	Incident and adverse event monitoring	The clinical incident review system provides timely, effective and transparent management of clinical incidents and adverse events?
	Root Cause Analysis program	The Root Cause Analysis program is timely, effective and transparent
	Open disclosure program	The Open Disclosure program is timely, effective and transparent
	Case review	Cases are subjected to peer review, analysis and discussion and outcomes are fed back to relevant clinicians
	Audit	Clinical Audit is performed regularly and leads to improvement in patient care. Please attach a copy of the clinical audit program and an illustrative audit record.
	KPI monitoring and reporting	KPI monitoring & reporting is performed regularly and leads to improvement in patient care. Please attach a copy of the KPI monitoring and reporting program and an illustrative KPI record.
	Risk Management framework (clinical)	Clinical risk is managed actively through a structured risk management system
	Clinical Documentation review	Clinical documentation is peer-reviewed and fed back to relevant clinicians
	Process for new equipment/ intervention/treatment	There is an effective policy and procedure defined for introduction of new equipment/ intervention/treatment
	Equipment management system	There is a formal equipment management system which considers equipment appropriateness, longevity and maintenance
	Complaints and feedback	There is a system for complaints and feedback to users which provides timely, effective, and transparent management of complaints?

18.6. Workforce (clinical)

Sub-domain	Components	Aspirational features
Model	Model	The current workforce model meets the clinical needs of the patient
	Interdisciplinary framework	The current workforce model supports interdisciplinary clinical practice
Practices	Selection and recruitment	Selection and recruitment processes are robust and compliant with contemporary standards
	Credentialing and Scope of Practice	All clinical staff undergo regular credentialing and scope of practice review
	Onboarding systems	Induction systems for new staff are comprehensive and effective
	Education and professional development	All staff have access to professional education and development systems
	Performance management	Individual performance standards are managed according to policy and contemporary standards
	Training programs / qualifications	Formal training programs assist staff to attain expert status as aeromedical practitioners

18.7. Knowledge management

Sub-domain	Components	Aspirational features
	Education	The education program is comprehensive and meets the needs of all staff groups
	Research	The research program is active, contemporary, and materially affects clinical practice
	Evidence Base	There is a clearly documented evidence base for clinical practices and policies

18.8. Information management

Sub-domain	Components	Aspirational features
Operational systems	Coordination systems and Clinical case management systems	There is an IT system for real-time active management of cases which allows case tracking, decision support, and comprehensive reporting There is an IT system which provides real-time support for clinical advice, telehealth advice or other advice provided to clinicians
	Clinical (POC) systems	There is a mobile IT system which provides a clinical record, and which comprehensively supports delivery of clinical care at the point of care
	Platform management systems	There is an IT system to effectively and actively monitor, allocate and track air assets in real time
Business systems	Business reporting	Business reporting systems meet contemporary standards
	Asset management systems	Asset management systems meet contemporary standards
	Finance	Finance systems meet contemporary standards
	HR	HR systems meet contemporary standards

18.9. Funding model

Sub-domain	Components	Aspirational features
		Provide a description of the funding system for the organisation Comment on the effectiveness or strengths of this component Comment on the weaknesses, gaps or unmet need related to this component

19. Appendix 7 – Bibliography

Citation	Abstract / Executive summary
Abraham J, Kannampallil T, Patel B, Almoosa K, Patel V. Ensuring patient safety in care transitions: an empirical evaluation of a handoff intervention tool. AMIA Annual Symposium Proceedings. 2012-3:17-26.	Successful handoffs ensure smooth, efficient and safe patient care transitions. Tools and systems designed for standardization of clinician handoffs often focuses on ensuring the communication activity during transitions, with limited support for preparatory activities such as information seeking and organization. We designed and evaluated a Handoff Intervention Tool (HAND-IT) based on a checklist-inspired, body system format allowing structured information organization, and a problem-case narrative format allowing temporal description of patient care events. Based on a pre-post prospective study using a multi-method analysis we evaluated the effectiveness of HAND-IT as a documentation tool. We found that the use of HAND-IT led to fewer transition breakdowns, greater tool resilience, and likely led to better learning outcomes for less-experienced clinicians when compared to the current tool. We discuss the implications of our results for improving patient safety with a continuity of care-based approach.
Aeromedical Society of Australasia (ASA) Standards for Aeromedical Services Final Version 1.0 2020	This draft standard has been developed by the Standards Committee of the Aeromedical Society of Australasia (ASA) and is intended to ensure that the quality of aeromedical service provided in Australia and New Zealand promotes safety, consistency and is patient focused. The concept of safety and risk minimisation underpins the development of this document and builds upon the excellent safety record experienced in the sector to date. Aeromedical providers wishing to provide these services will be encouraged to meet the standards required within this document once finalised. To ensure that the standards provide a framework for clinical best practice, they will be aligned to the National Safety and Quality Health Service Standards (NSQHSS) developed by the Australian Commission on Safety and Quality in Health Care (ACSQHC). These draft standards are currently going through a process of peer review and critique, not only by the providers of aeromedical services but also key stakeholder organisations such as CASA, other health providers, clinical colleges and aeromedical experts

Citation	Abstract / Executive summary
Akl N, Coghlan EA, Nathan EA, Langford SA, Newnham JP. Aeromedical transfer of women at risk of preterm delivery in remote and rural Western Australia: why are there no births in flight? Aust N Z Obstet Gynaecol. 2012;52:327–333.	Objective: For more than three decades, women at imminent risk of preterm birth (PTB) in Western Australia have been transferred by small aircraft over long distances to the single tertiary level perinatal centre in Perth, with no known case of birth during the flight. We aimed to review recent experience to understand how aircraft travel may delay PTB. Design and setting: Retrospective observational study of 500 consecutive Royal Flying Doctor Service (RFDS) transfers of women at risk of preterm labour to the tertiary referral centre, from September 2007 to December 31, 2009. Main outcome measures: In-flight delivery, complications associated with transfer and factors associated with delay in preterm delivery. Results: There were no in-flight deliveries or serious complications associated with the aeromedical transfer of these patients. In a multivariable Cox proportional hazards regression analysis, clinical factors in the presentation that were associated with a shorter time from landing to subsequent delivery included cervical dilatation ≥ 4 cm, ruptured membranes, gestational age > 32 weeks and nulliparity. The aircraft reaching an ambient altitude > 14,000 feet, or cabin altitude above zero (sea level), was associated with a delay in time from landing to delivery for women who were not in spontaneous preterm labour. Conclusions: Our findings add to a 30-year experience that women at risk of preterm labour do not deliver during aeromedical transfer. Ambient and cabin altitude of the aircraft were associated with an extension in the time to delivery after arrival. The mechanisms underpinning this effect warrant further investigation.
Andrew E, deWit A, Meadley S, Cox S, Bernard S, Smith K (2014) Characteristics of patients transported by a paramedic-staffed Helicopter Emergency Medical Service in Victoria, Australia. Prehospital Emergency Care 19(3): 416-424	Objective: The optimal staffing of helicopter emergency medical services (HEMS) is uncertain. An intensive care paramedic-staffed HEMS has operated in the state of Victoria, Australia for over 28 years, with paramedics capable of performing advanced procedures, including rapid sequence intubation, decompression of tension pneumothorax, and cricothyroidotomy. Administration of a wide range of vasoactive, anesthetic, and analgesic medications is also permitted. We sought to explore the characteristics of patients transported by HEMS in Victoria, and describe paramedic utilization of their skill set in the prehospital environment. Methods: A retrospective data review was conducted of patients transported by the HEMS between 1 July 2012 and 30 June 2013. Data were sourced from the Ambulance Victoria data warehouse and the Victorian State Trauma Registry. Interhospital transfers were excluded.

Citation	Abstract / Executive summary
	Results: HEMS attended 1,519 cases during the study period. A total of 825 primary transport cases were included in analyses. Most patients were male (69.5%) and the majority of cases involved trauma (86.1%). Rapid sequence intubation (RSI) was performed in 36.8% of pediatric and 29.9% of adult major trauma patients, with a procedural success rate of 100%. Ketamine was administered to 18.5% of all trauma patients. The proportion of patients with a severe pain score (≥7) decreased from 33.8 to 3.2% ($p < 0.001$) between initial and final paramedic assessments. A clinically significant pain reduction of ≥2 points was achieved by 87.0% (95% CI 82.9-90.4%) of adult trauma patients who had an initial pain score >2 points and a valid final pain score. In-hospital mortality following major-trauma was 7.6% (95% CI 5.0-11.0%). Conclusions: The skill set of HEMS intensive care paramedics in Victoria is broad, including a large number of prehospital critical care procedures commonly utilized by physician-staffed HEMS in other jurisdictions. A high RSI procedural success rate was observed across the study period, as were significant improvements in patient physiological parameters and pain scores.
Ash A, Whitehead C, Hughes B, Williams D, Nayyar V. Impact of a transport checklist on adverse events during intra-hospital transport of critically ill patients. Australian Critical Care. 2015;28(1):49-50.	Introduction: Intra-hospital transport of critically ill patients is challenging due to unanticipated complications. which can adversely affect patient safety. These can be contributed by organisationai. equipment. patient and human factors. Objectives: We designed a transport checklist and determined its effect on adverse events during intra-hospital transport. Methods: A prospective, single-centre study was conducted from 1/712013 to 31/12/2103 in a 23 bed, mixed medical surgical ICU. A transport checklist was introduced at three months for ICU patients proceeding for a diagnostic imaging procedure. Data were obtained before and after introduction of this checklist and focussed on physiological derangements and adverse events during intra-hospital transport. The study was approved by the hospital ethics committee. Results: 143 patients (99M/44F. mean age 53.5 years. median APACHE-II 20.5) contributed to 263 transport events during the study. 120 transports occurred prior to and 143 transports occurred post introduction of the checklist. Seven in the first and nine trans- ports in the second group did not meet the inclusion criteria. There were no significant differences in baseline characteristics among the pre (n = 113) and post-checklist (n -134) groups. 72.4% of check- lists had physiological and equipment sections completed but only 60.4% of checklists were completed fully. Transport with any physiological derangement was significantly reduced (73.2% vs 39.6%, $p < 0.001$) and equipment related adverse events were significantly reduced

Citation	Abstract / Executive summary
	(47.1% vs 15.7%. p <0.05) following introduction of the checklist. Risk of undocking (28.9% vs 3.7%. p < 0.001) and infusion pump failure (9.4% vs 0.75%. p < 0.05) were also reduced. Conclusion: Introduction of a transport checklist significantly reduces the number of physiological and equipment related adverse events
Association of Ambulance Chief Executives. National Framework for Inter-facility transfers.	This framework is intended for patients who require transfer by ambulance between facilities due to an increase in either their medical or nursing care need. The aim of this framework is to ensure: • equity of access for all seriously ill or injured patients; • recognition that in certain situations, immediate clinical assistance to make a lifesaving intervention may be required, in addition to ambulance transportation; • consistent definitions for high acuity inter-facility transfer (IFT) responses are established and are mapped to Ambulance Response Programme (ARP) response priorities Category 1 and Category 2; • opportunity for local innovation and acknowledgement of different contractual and commissioning arrangements for lower acuity incidents; • activity and response to IFT incidents can be measured separately to other 999 activity in order to examine parity of response.
Atkins D, Best D, Briss, PA, Eccles, M, Falck-Ytter Y, Flottorp, S. et al. Grading quality of evidence and strength of recommendations. British Medical Journal. 2004;328(7454):1490.	Users of clinical practice guidelines and other recommendations need to know how much confidence they can place in the recommendations. Systematic and explicit methods of making judgments can reduce errors and improve communication. We have developed a system for grading the quality of evidence and the strength of recommendations that can be applied across a wide range of interventions and contexts. In this article we present a summary of our approach from the perspective of a guideline user. Judgments about the strength of a recommendation require consideration of the balance between benefits and harms, the quality of the evidence, translation of the evidence into specific circumstances, and the certainty of the baseline risk. It is also important to consider costs (resource utilisation) before making a recommendation. Inconsistencies among systems for grading the quality of evidence and the strength of recommendations reduce their potential to facilitate critical appraisal and improve communication of these judgments. Our system for guiding these complex judgments balances the need for simplicity with the need for full and transparent consideration of all important issues.

Citation	Abstract / Executive summary
Australian Government Geoscience Australia. Land areas of states and territories. www.ga.gov.au/scientific-topics/national-location-information/dimensions/area-of-australia-states-and-territories. Accessed June 6, 2019.	Calculations on Australia's area are based on data explained in Geoscience Australia's GEODATA Coast 100K 2004 page. Calculations are based on GDA_1994_Australia-Albers projection. The data is nationally uniform, is sourced primarily from the 1:100 000 scale National Topographic Map Series and is the most authoritative data source currently available to calculate the area of Australia.
Barker C, Ross M (2014) Pediatric aeromedical retrievals in the 'Top End' of the Northern Territory. Australian Journal of Rural Health 22(1): 29-32	Objective The primary objective of this study was to describe the remote paediatric aeromedical population of the 'Top End' of the Northern Territory. The secondary objective was to identify children requiring high-dependency care by the transport team. Design Retrospective case review. Setting Aeromedical service in the remote Northern Territory. Participants All patients under the age of 16 years transported over a one-year period between February 2012 and February 2013. Outcome measures Age, gestation if newborn, diagnosis at referral, requirement for high-dependency care and transport team members. Results Seven hundred eighty-nine children were transported with an average age of 4.4 years (range 0 days to 16 years). Nursing staff transferred 646 (82%). Respiratory problems (bronchiolitis and pneumonia) were the predominant illness type (31%). Other frequent diagnoses were trauma (11%), gastroenteritis (10%), cellulitis or abscess (9%) and the sequelae of streptococcal infection (8%). Thirty preterm infants including seven below 31 weeks gestation were transferred. Twenty-five children required high-dependency care, 15 of these on day 0 of life. Twenty-five required respiratory support, seven central venous access, four surfactant, two inotropes and one chest tubes.

Citation	Abstract / Executive summary
	Conclusions The majority of paediatric aeromedical patients have an infective cause for their illness. Respiratory disease is the most common indication for aeromedical transport. The majority of patients are transferred by a flight nurse and do not require high-dependency care. The main risk factor identified for requiring high-dependency care during transport is respiratory distress in a newborn infant.
Barratt H, Harrison D, Rowan K, Raine R. Effect of non-clinical inter-hospital critical care unit to unit transfer of critically ill patients: a propensity-matched cohort analysis. Critical Care. 2012;16(5):R179.	Introduction: No matter how well resourced, individual hospitals cannot expect to meet all peaks in demand for adult general critical care. However, previous analyses suggest that patients transferred for non-clinical reasons have worse outcomes than those who are not transferred, but these studies were underpowered and hampered by residual case-mix differences. The aim of this study was to evaluate the effect of transferring adult general critical care patients to other hospitals for non-clinical reasons. Methods: We carried out a propensity-matched cohort analysis comparing critical care patients who underwent a non-clinical critical care unit to unit transfer to another hospital with those who were not transferred. The primary outcome measure was mortality at ultimate discharge from acute hospital. Secondary outcomes were mortality at ultimate discharge from critical care, plus length of stay in both critical care and acute hospital. Results: A total of 308,323 patients were admitted to one of 198 adult general critical care units in England and Wales between January 2008 and September 2011. This included 759 patients who underwent a non-clinical transfer within 48 hours of admission to the unit and 1,518 propensity-matched patients who were not transferred. The relative risk of ultimate acute hospital mortality was 1.01 (95% confidence interval = 0.87 to 1.16) for the non-clinical transfer group, compared with patients who were not transferred but had a similar propensity for transfer. There was no statistically significant difference in ultimate critical care unit mortality. Transferred patients received on average three additional days of critical care ($P < 0.001$) but the difference in length of acute hospital stay was of only borderline significance ($P = 0.05$). Conclusion: In our analysis the difference in mortality between non-clinical transferred and nontransferred patients was not statistically significant. Nevertheless, non-clinical transfers received, on average, an additional 3 days of critical care. This has potential ramifications in terms of distress, inconvenience and cost for patients, their families, and the National Health Service. We therefore need further evidence, including qualitative data from family members and cost-effective analyses, to better understand the broader effects of non-clinical transfer.

Citation	Abstract / Executive summary
Beaumont O, Lecky F, Bouamra O, Kumar DS, Coats T, Lockey D, Willett K (2020) Helicopter and ground emergency medical services transportation to hospital after major trauma in England: a comparative cohort study. Trauma Surgery and Acute Care 5:e000508. DOI:10.1136/tsaco-2020-000508	Background: The utilization of helicopter emergency medical services (HEMS) in modern trauma systems has been a source of debate for many years. This study set to establish the true impact of HEMS in England on survival for patients with major trauma. Methods: A comparative cohort design using prospectively recorded data from the UK Trauma Audit and Research Network registry. 279 107 patients were identified between January 2012 and March 2017. The primary outcome measure was risk adjusted in-hospital mortality within propensity score matched cohorts using logistic regression analysis. Subset analyses were performed for subjects with prehospital Glasgow Coma Scale <8, respiratory rate <10 or >29 and systolic blood pressure <90. Results: The analysis was based on 61 733 adult patients directly admitted to major trauma centers: 54 185 ground emergency medical services (GEMS) and 7548 HEMS. HEMS patients were more likely male, younger, more severely injured, more likely to be victims of road traffic collisions and intubated at scene. Crude mortality was higher for HEMS patients. Logistic regression demonstrated a 15% reduction in the risk adjusted odds of death (OR=0.846; 95% CI 0.684 to 1.046) in favor of HEMS. When analyzed for patients previously noted to benefit most from HEMS, the odds of death were reduced further but remained statistically consistent with no effect. Sensitivity analysis on 5685 patients attended by a doctor on scene but transported by GEMS demonstrated a protective effect on mortality versus the standard GEMS response (OR 0.77; 95% CI 0.62 to 0.95). Discussion: This prospective, level 3 cohort analysis demonstrates a non-significant survival advantage for patients transported by HEMS versus GEMS. Despite the large size of the cohort, the intrinsic mismatch in patient demographics limits the ability to statistically assess HEMS true benefit. It does, however, demonstrate an improved survival for patients attended by doctors on scene in addition to the GEMS response. Improvements in prehospital data and increased trauma unit reporting are required to accurately assess HEMS clinical and cost-effectiveness. Keywords: emergency medical services; mortality; multiple trauma; survival rate.

Citation	Abstract / Executive summary
Beck B, Smith K, Mercier E, Bernard S, Jones C, Meadley B, St Clair T, Jennings P, Nehme Z, Burke M, Based R, Fitzgerald M, Judson R, Teague W, Mitra B, Mathew J, Buck A, Varma D, Ganne B, Bray J, McLennan S, Ford J, Siedenburg J, Cameron P (2019) Potentially preventable trauma deaths: a retrospective review. Injury (50): 1009-1016	Background: Reviewing prehospital trauma deaths provides an opportunity to identify system improvements that may reduce trauma mortality. The objective of this study was to identify the number and rate of potentially preventable trauma deaths through expert panel reviews of prehospital and early in-hospital trauma deaths. Methods: We conducted a retrospective review of prehospital and early in-hospital (<24 h) trauma deaths following a traumatic out-of-hospital cardiac arrest that were attended by Ambulance Victoria (AV) in the state of Victoria, Australia, between 2008 and 2014. Expert panels were used to review cases that had resuscitation attempted by paramedics and underwent a full autopsy. Patients with a mechanism of hanging, drowning or those with anatomical injuries deemed to be unsurvivable were excluded. Results: Of the 1183 cases that underwent full autopsies, resuscitation was attempted by paramedics in 336 (28%) cases. Of these, 113 cases (34%) were deemed to have potentially survivable injuries and underwent expert panel review. There were 90 (80%) deaths that were not preventable, 19 (17%) potentially preventable deaths and 4 (3%) preventable deaths. Potentially preventable or preventable deaths represented 20% of those cases that underwent review and 7% of cases that had attempted resuscitation. Conclusions: The number of potentially preventable or preventable trauma deaths in the pre-hospital and early in-hospital resuscitation phase was low. Specific circumstances were identified in which the trauma system could be further improved. Keywords: Emergency medical services; Mortality; Pre-hospital care; Preventable; Trauma; Trauma systems.
Becker T, Skiba J, Sozener C. An Educational Measure to Significantly Increase Critical Knowledge Regarding Interfacility Patient Transfers. Prehospital and Disaster Medicine. 2015;30(03):244-248.	Background: Patient transfers among medical facilities are high-risk situations. Despite this, there is very little training of physicians regarding the medical and legal aspects of transport medicine. Objectives: To examine the effects of a one hour, educational intervention on Emergency Medicine (EM) residents' and Critical Care (CC) fellows' knowledge regarding the medical and legal aspects of interfacility patient transfers. Methods: Prior to the intervention, physician knowledge regarding 12 key concepts in patient transfer was assessed using a pre-test instrument. A one hour, interactive, educational session followed immediately thereafter. Following the intervention, a post-intervention test was given between two and four weeks after delivery. Participants were also asked to describe any prior transportation-medicine-related education, their opinions as they relate to the relevance of the topic, and their comfort levels with patient transfers before and after the intervention.

Citation	Abstract / Executive summary
	Results: Only a minority of participants had received any formal training in patient transfers prior to the intervention, despite dealing with patient transfers on a frequent, often daily, basis. Both groups improved in several categories on the post-intervention test. They reported improved comfort levels with the medicolegal aspects of interfacility patient transfers after the intervention and felt well-prepared to manage transfers in their daily practice. Conclusion: A one hour, educational intervention objectively increased EM and CC physician trainees' understanding of some of the medicolegal aspects of interfacility patient transfers. The study demonstrated a lack of previous training on this important topic and improved levels of comfort with transfers after study participation. Keywords: CC Critical Care; EM Emergency Medicine; EMS Emergency Medical Services; EMS-SICK-PT An Educational Measure to Significantly Increase Critical Knowledge Regarding Interfacility Patient Transfers; EMTALA; EMTALA Emergency Medical Treatment and Active Labor Act; VAS visual analogue scale; critical care; patient transfer; transportation medicine.
Bellingan G, Oliver T, Batson SM, et al. Comparison of a specialist retrieval team with current United Kingdom practice for the transport of critically ill patients. J Intensive Care Med 2000;26:740–4.	Objective: The inter-hospital transfer of critically ill patients in the United Kingdom is commonly undertaken using standard ambulance under junior doctor escort, despite recommendations for the use of specialist retrieval teams. Patients are transferred into University College London Hospitals (UCLH) intensive care unit (ICU) by both methods. We undertook to evaluate the effect of transfer method on acute physiology (within 2 h of ICU admission) and early mortality (< 12 h after ICU admission). Design: Retrospective review of all transfers over 1 year. Setting: UCLH ICU. Subjects: 259 transfers; 168 by specialist retrieval team (group A) and 91 by standard ambulance with doctor provided by referring hospital (group B). Interventions: None Main outcome measures: Acute physiology (pH, PaO2, PaCO2, heart rate (HR), mean arterial blood pressure (MAP), 24 h severity of illness scores (APACHE II, SAPS II), length of stay and mortality.

Citation	Abstract / Executive summary
	Results: There were no differences in demographic characteristics or severity of illness between the two groups; nevertheless significantly more patients in group B than in group A were severely acidotic (pH < 7.1: 11 % vs. 3 %, p < 0.008) and hypotensive (MAP < 60: 18 % vs. 9 %, p < 0.03) upon arrival. In addition, there were more deaths within the first 12 h after admission with 7.7 % deaths (7/91) in group B transfers vs. 3 % (5/168) in group A. Conclusions: The use of a specialist transfer team may significantly improve the acute physiology of critically ill patients and may reduce early mortality in ICU.
Belway D et al, Do specialist transport personnel improve hospital outcome in critically ill patients transferred to higher centers? A systematic review Journal of Critical Care (2006) 21, 8–18	Purpose: The aim of the study was to determine whether the use of specialist transport personnel improves patient outcome at the receiving hospital for critically ill patients transferred to higher centers. Materials and Methods: A search of 6 electronic databases, 15 relevant journals, and the reference lists of all retrieved articles was conducted for studies comparing outcome at the receiving hospital for critically ill adult or pediatric patients transported by dedicated transport crews or tertiary-based specialists with other forms of transport personnel including referring house staff. All potentially relevant articles were retrieved in full and reviewed independently by 2 reviewers to determine eligibility for inclusion. Data were tabulated and results were summarized. Results: Six cohort studies (n = 4534) were included. When patients of equal severity were assessed, only 1 study demonstrated an improvement in outcome at the receiving hospital (survival to 6 hours) when specialist personnel transported the patients. Methodological limitations and interstudy differences in participants and transport personnel precluded pooling of results. Conclusions: Current data are insufficient. The study designs used create opportunity for significant bias, preventing any useful inferences to be drawn. Further study is warranted.
Bérubé M, Bernard F, Marion H, Parent J, Thibault M, Williamson D et al. Impact of a preventive programme on the occurrence of incidents during the transport of critically ill patients. Intensive and Critical Care Nursing. 2013;29(1):9-19.	Objective: Incidents related to transport of critically ill patients have been extensively reported. The objective of this study was to determine the effect of an interdisciplinary preventive programme used by all intensive care unit team members involved in patients' transport on the rate of these incidents. Methods: A clinical quality improvement audit using a prospective pre and post intervention design was performed among medical and surgical patients hospitalised in intensive care who required intra or inter-hospital transport.

Citation	Abstract / Executive summary
	Results: A total of 180 transports occurred in the pre-implementation phase of the study and 187 transports in the post-implementation phase. A 20% absolute reduction of incidents was observed (57.2% vs. 37.4%, $p < 0.001$). Statistically significant reductions were obtained for the technical problems category of incidents (25% vs. 7.5%, $p < 0.001$) as well as the problems related to patient's mobilisation category (14.4% vs. 7.5%, $p = 0.05$). Clinically significant trends were also observed for the clinical deterioration (24.4% vs. 17.1%, $p = 0.11$) and undesired delay before test (23.9% vs. 17.6%, $p = 0.14$) categories but did not reach statistical significance. Conclusions: A preventive programme applied by all care providers involved in transport of critically ill patients was associated with a reduction of incidents. The application of such a programme should be acknowledged as a standard of care considering the risks inherent to the transportation of ICU patients.
Bieler D, Franke A, Lefering R et al. Does the presence of an emergency physician influence pre-hospital time, pre-hospital interventions and the mortality of severely injured patients? A matched-pair analysis based on the trauma registry of the German Trauma Society (TraumaRegister DGU®). Injury 2017; 48: 32–40.	Purpose: The role of emergency physicians in the pre-hospital management of severely injured patients remains controversial. In Germany and Austria, an emergency physician is present at the scene of an emergency situation or is called to such a scene in order to provide pre-hospital care to severely injured patients in approximately 95% of all cases. By contrast, in the United States and the United Kingdom, paramedics, i.e. non-physician teams, usually provide care to an injured person both at the scene of an incident and en route to an appropriate hospital. We investigated whether physician or non-physician care offers more benefits and what type of on-site care improves outcome. Material and methods: In a matched-pair analysis using data from the trauma registry of the German Trauma Society, we retrospectively (2002–2011) analysed the pre-hospital management of severely injured patients (ISS ≥16) by physician and non-physician teams. Matching criteria were age, overall injury severity, the presence of relevant injuries to the head, chest, abdomen or extremities, the cause of trauma, the level of consciousness, and the presence of shock. Results: Each of the two groups, i.e. patients who were attended by an emergency physician and those who received non-physician care, consisted of 1235 subjects. There was no significant difference between the two groups in pre-hospital time (61.1 [SD 28.9] minutes for the physician group and 61.9 [SD 30.9] minutes for non-physician group). Significant differences were found in the number of pre-hospital procedures such as fluid administration, analgosedation and intubation. There was a highly significant difference ($p<0.001$) in the number of patients who received no intervention at all applying to 348 patients (28.2%) treated by non-physician teams and to only

Citation	Abstract / Executive summary
	31 patients (2.5%) in the physician-treated group. By contrast, there was no significant difference in mortality within the first 24h and in mortality during hospitalisation. Conclusion: This retrospective analysis does not allow definitive conclusions to be drawn about the optimal model of pre-hospital care. It shows, however, that there was no significant difference in mortality although patients who were attended by non-physician teams received fewer pre-hospital interventions with similar scene times. Keywords: Emergency medicine; Emergency physician; Fluid administration; Intubation; Paramedic; Pre-hospital care; Registry; Severely injured patients.
Bingham BL, Buick JE Brooks SC, Morrison M, Shojana KG, Morrison LJ (2012) Patient safety in Emergency Medical Systems: a systematic review of the literature. Prehospital Emergency Care 16(1): 20-35	Background: Preventable harm from medical care has been extensively documented in the inpatient setting. Emergency medical services (EMS) providers care for patients in dynamic and challenging environments; prehospital emergency care is a field that represents an area of high risk for errors and harm, but has received relatively little attention in the patient safety literature. Objective: To identify the threats to patient safety unique to the EMS environment and interventions that mitigate those threats, we completed a systematic review of the literature. Methods: We searched MEDLINE, EMBASE, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) for combinations of key EMS and patient safety terms composed by a pan-canadian expert panel using a year limit of 1999 to 2011. We excluded commentaries, opinions, letters, abstracts, and non-english publications. Two investigators performed an independent hierarchical screening of titles, abstracts, and full-text articles blinded to source. We used the kappa statistic to examine interrater agreement. Any differences were resolved by consensus. Results: We retrieved 5,959 titles, and 88 publications met the inclusion criteria and were categorized into seven themes: adverse events and medication errors (22 articles), clinical judgment (13), communication (6), ground vehicle safety (9), aircraft safety (6), interfacility transport (16), and intubation (16). Two articles were randomized controlled trials; the remainder were systematic reviews, prospective observational studies, retrospective database/chart reviews, qualitative interviews, or surveys. The kappa statistics for titles, abstracts, and full-text articles were 0.65, 0.79, and 0.87, respectively, for the first search and 0.60, 0.74, and 0.85 for the second.

Citation	Abstract / Executive summary
	Conclusions: We found a paucity of scientific literature exploring patient safety in EMS. Research is needed to improve our understanding of problem magnitude and threats to patient safety and to guide interventions.
British and European Standards: Medical Vehicles and their Equipment – Road Ambulances BS EN 1789 – 2007.	This European Standard specifies requirements for the design, testing, performance and equipping of road ambulances used for the transport, monitoring, treatment and care of patients. It contains requirements for the patient's compartment in terms of the working environment, ergonomic design and the safety of the crew and patients.This European Standard does not cover the training of the staff which is the responsibility of the authority/authorities in the country where the ambulance is to be registered. This European Standard is applicable to road ambulances capable of transporting at least one person on a stretcher and excludes the transportation of hospital beds. This standard also specifies requirements for ambulances intended to carry transport incubator systems. The European Standard covers the specific requirements of each type of road ambulance which are designated according to the patient condition e.g. patient transport road ambulance types A1, A2, B and C. This European Standard gives general requirements for medical devices carried in road ambulances and used therein and outside hospitals and clinics in situations where the ambient conditions can differ from normal indoor conditions.
Brunsveld-Reinders A, Arbous M, Kuiper S, de Jonge E. A comprehensive method to develop a checklist to increase safety of intra-hospital transport of critically ill patients. Critical Care. 2015;19(1):214	Introduction: Transport of critically ill patients from the Intensive Care Unit (ICU) to other departments for diagnostic or therapeutic procedures is often a necessary part of the critical care process. Transport of critically ill patients is potentially dangerous with up to 70% adverse events occurring. The aim of this study was to develop a checklist to increase safety of intra-hospital transport (IHPT) in critically ill patients. Method: A three-step approach was used to develop an IHPT checklist. First, various databases were searched for published IHPT guidelines and checklists. Secondly, prospectively collected IHPT incidents in the LUMC ICU were analyzed. Thirdly, interviews were held with physicians and nurses over their experiences of IHPT incidents. Following this approach a checklist was developed and discussed with experts in the field. Finally, feasibility and usability of the checklist was tested. Results: Eleven existing guidelines and five checklists were found. Only one checklist covered all three phases: pre-, during- and post-transport. Recommendations and checklist items mostly focused frequently related to patient physiology and equipment malfunction and occurred most often during transport. Discussing the incidents with ICU physicians and

Citation	Abstract / Executive summary
	ICU nurses resulted in important recommendations such as the introduction of a standard checklist and improved communication with the other departments. This approach resulted in a generally applicable checklist, adaptable for local circumstances. Feedback from nurses using the checklist were positive, the fill in time was 4.5 minutes per phase. Conclusion: A comprehensive way to develop an intra-hospital checklist for safe transport of ICU patients to another department is described. This resulted in a checklist which is a framework to guide physicians and nurses through intra-hospital transports and provides a continuity of care to enhance patient safety. Other hospitals can customize this checklist to their own situation using the methods proposed in this paper.
Calderbank P, Wooley T, Mereers S, Schrager J, Kazel M, Bree S, Bowley PM (2010) Doctor on Board? What is the optimal skill set in military prehospital care? Emergency Medical Journal DOI: 10.1136/emj:2010.097642	Background In a military setting, pre-hospital times may be extended due to geographical or operational issues. Helicopter casevac enables patients to be transported expediently across all terrains. The skill-mix of the pre-hospital team can vary. Aim To quantify the doctors' contribution to the Medical Emergency Response Team–Enhanced (MERT-E). Methods A prospective log of missions recorded urgency category, patient nationality, mechanism of injury, medical interventions and whether, in the crew's opinion, the presence of the doctor made a positive contribution. Results Between July and November 2008, MERT-E flew 324 missions for 429 patients. 56% of patients carried were local nationals, 35% were UK forces. 22% of patients were T1, 52% were T2, 21.5% were T3 and 4% were dead. 48% patients had blast injuries, 25% had gunshot wounds, 6 patients had been exposed to blast and gunshot wounds. Median time from take-off to ED arrival was 44 min. A doctor flew on 88% of missions. It was thought that a doctor's presence was not clinically beneficial in 77% of missions. There were 62 recorded physician's interventions: the most common intervention was rapid sequence induction (45%); other interventions included provision of analgesia, sedation or blood products (34%), chest drain or thoracostomy (5%), and pronouncing life extinct (6%). Conclusion MERT-E is a high value asset which makes an important contribution to patient care. A relatively small proportion of missions require interventions beyond the capability of well-trained military paramedics; the indirect benefits of a physician are more difficult to quantify.

Citation	Abstract / Executive summary
Cameron PA, Finch CF, Gabbe BJ, et al. Developing Australia's first statewide trauma registry: what are the lessons? ANZ J Surg 2004;74:424–8.	Trauma registries, like disease registries, provide an important analysis tool to assess the management of patient care. Trauma registries are well established and relatively common in the USA and have been used to change legislation, promote trauma prevention and to evaluate trauma system effectiveness. In Australia, the first truly statewide trauma registry was established in Victoria in 2001 with an estimated capture of 1700 major trauma cases annually. The Victorian State Trauma Registry, managed by the Victorian State Trauma Outcomes Registry and Monitoring (VSTORM) group, was established in response to a ministerial review of trauma and emergency services undertaken in 1997 to advise the Victorian Government on a best practice model of trauma service provision that was responsive to the particular needs of critically ill trauma patients. This taskforce recommended the establishment of a new system of care for major trauma patients in Victoria and a statewide trauma registry to monitor this new system. The development of the Victorian state trauma registry has shown that there are certain issues that must be resolved for successful implementation of any system-wide registry. This paper describes the issues faced by VSTORM in developing, implementing and maintaining a statewide trauma registry.
Cameron PA, Gabbe BJ, Cooper DJ, et al. A statewide system of trauma care in Victoria: effect on patient survival. Med J Aust 2008;189:546–50.	Objective: To determine whether the statewide system of trauma care introduced in 2000 has resulted in improved survival for all major trauma patients in Victoria. Design, setting and participants: Population-based cohort study using data from the Victorian State Trauma Registry (VSTR), a registry of all hospitalised major trauma patients in Victoria. The study included major trauma patients with an Injury Severity Score > 15 captured by the VSTR between July 2001 and June 2006. Main outcome measure: In-hospital mortality. Results: The number of major trauma cases captured by the registry rose from 1153 in 2001-02 to 1737 in 2005-06. Adjusting for key predictors of mortality, there was a significant overall reduction between 2001-02 and 2005-06 in the risk of death for patients treated in the trauma system (adjusted odds ratio [AOR], 0.62 [95% CI, 0.48-0.80]). The reduced risk of death was also significant when road trauma cases (AOR, 0.56 [95% CI, 0.39-0.80]) and serious head injury cases (AOR, 0.62 [95% CI, 0.46-0.83]) were analysed separately. The proportion of road trauma patients definitively treated at one of the three major trauma service (MTS) hospitals in Victoria rose by 7% over the 5-year period. Direct transfers from the scene of injury to MTS hospitals rose by 8% for all cases and 13% for road trauma cases over the same period.

Citation	Abstract / Executive summary
	Conclusions: Introduction of a statewide trauma system was associated with a significant reduction in risk-adjusted mortality. Such inclusive systems of trauma care should be regarded as a minimum standard for health jurisdictions.
Chang J C-Y, Huang H-H, Chang S-H, Chen Y-R, Fan J-S, Chan Y-C, Yen D H-T (2017) Clinical predictors of outcomes in patients undergoing emergency air medical transport from Kinmen to Taiwan. Medicine 96:44(e8440.DOI	Emergency air medical transport (EAMT) is indispensable for acutely or critically ill patients in remote areas. We determined patient-level and transport-specific factors associated with all-cause mortality after EAMT. We conducted a population-based, retrospective cohort study using a prospective registry consisting of clinical/medical records. Study inclusion criteria consisted of all adults undergoing EAMT from Kinmen hospital to the ED of Taipei Veterans General Hospital (TVGH) between January 1, 2006 and December 31, 2012. The primary outcome assessments were 7-day and 30-day mortality. A total of 370 patients transported to TVGH were enrolled in the study with a mean age of 54.5 ± 21.5 (SD) years and with a male predominance (71.6%). The average in-transit time was 1.4 ± 0.4 hours. The 7-day, 30-day, and in-hospital mortality rates were 10.3%, 14.1%, and 14.9%. Among them 33.5% (124/370) were categorized under neurological etiologies, whereas 24.9% (90/370) cardiovascular, followed by 16.2% (60/370) trauma patients. Independent predictors associated with 7-day all-cause mortality were age (odds ratio [OR] 1.043, 95% confidence interval [CI] 1.016–1.070), Glasgow Coma Scale (GCS) (OR 0.730, 95% CI 0.650–0.821), and hematocrit level (OR 0.930, 95% CI 0.878–0.985). Independent predictors associated with 30-day all-cause mortality were age (OR 1.028, 95% CI 1.007–1.049), GCS (OR 0.686, 95% CI 0.600–0.785), hematocrit (OR 0.940, 95% CI 0.895–0.988), hemodynamic instability (OR 5.088 95% CI 1.769–14.635), and endotracheal intubation (OR 0.131 95% CI 0.030–0.569). The 7-day and 30-day mortality were not significantly related to transport-specific factors, such as length of flight, type of paramedic crew on board, or day and season of transport. Clinical patient-level factors, as opposed to transport-level factors, were associated with 7- and 30-day all-cause mortality in patients undergoing interfacility EAMT from Kinmen to Taiwan.

Citation	Abstract / Executive summary
Choi H, Shin S, Ro Y, Kim D, Shin S, Kwak Y. A before- and after-intervention trial for reducing unexpected events during the intrahospital transport of emergency patients. The American Journal of Emergency Medicine. 2012;30(8):1433–1440.	Background: This study was aimed to explore the effect of intervention in safe intrahospital transport on the incidence of unexpected events (UEs) occurring during the transport of emergency patients. Methods: This study was performed in an urban tertiary teaching hospital emergency department (ED) from May 17 to October 30, 2010. Patients older than 15 years who were transported to general wards; intensive care units; and magnetic resonance imaging, intervention, or operation rooms were enrolled. Demographics and data on all UEs related to the devices, clinical situations, and tubes or lines were measured by registered nurses at pre- and postintervention period. The intervention was that acting nurses were required to use a designed transport checklists before the patients were transported. Primary outcomes were the rate of all and serious UEs during the pre- and postintervention periods. Serious UEs were defined as any worsening of a patient's clinical status. Statistical values were measured with 95% confidence intervals (CIs) and compared using Student t tests or x(2) tests. Results: In total, there were 680 transports before interventions and 605 transports after interventions. Overall, UEs decreased significantly from a value of 36.8% (95% CI, 33.1-40.5) in the preintervention period to a value of 22.1% (95% CI, 18.9-25.7) in the postintervention period (P = .001). Serious UEs in clinical status also decreased significantly from 9.1% (95% CI, 7.1-11.5) in the preintervention period to a value of 5.2% (95% CI, 3.6-7.4) in the postintervention period (P = .005). Conclusion: A significant reduction in the rate of total and serious UEs during intrahospital transport from the ED was found through using transport checklists.
Clarke JE, David PR (2012) Medical evacuation and triage of combat casualties in Helmand Province, Afghanistan: October 2010-April 2011. Military Medicine 177(11): 1261–1266	Medical evacuation of combat casualties in Operation Enduring Freedom-Afghanistan is achieved primarily by helicopter, because of distances involved as well as ground-based threats. In Helmand Province, evacuation from the point of injury may occur on a variety of helicopter evacuation platforms with disparate levels of attendant medical expertise. Furthermore, triage to a medical treatment facility may involve varying echelons of care before definitive management. Consequently, considerable differences in medical care may be encountered between point of injury and definitive treatment. We discuss the role of helicopter-based medical evacuation in Helmand, Afghanistan, as well as triage and timelines to the most appropriate medical facilities. Based on our experience and available evidence, we have made recommendations to regional commanders which favor the utilization of prehospital critical care teams aboard helicopter-based evacuation platforms and direct triage to the highest echelon of care available when feasible.

Citation	Abstract / Executive summary
Coggins AR, Cummins EN, Burns B (2016) Management of critical illness with noninvasive ventilation in Australian HEMS. Emergency Medicine Journal 33(11): 807-811	Background: Non-invasive ventilation (NIV) therapy is widely used for the management of acute respiratory failure. The objective of this study was to investigate the current use of NIV during interhospital retrievals in an Australian physician-led aeromedical service. Methods: We reviewed patients receiving NIV during interhospital retrieval at the Greater Sydney Area Helicopter Medical Services (GSA-HEMS) over a 14-month period. The main objectives were to describe the number of retrievals using NIV, the need for intubation in NIV patients and the effect of the therapy on mission duration. Results: Over the study period, 3018 missions were reported; 106 cases (3.51%) involved administration of NIV therapy during the retrieval. The most common indication for NIV was pneumonia (34.0%). 86/106 patients received a successful trial of NIV therapy prior to interhospital transfer. 58 patients were transferred on NIV, while 28 patients had NIV removed during transport. None of these 86 patients required intubation or died, although 17/86 ultimately required intubation within 24 hours at the receiving centre. 20/106 patients required intubation at the referring hospital after a failed trial of NIV therapy. NIV was successfully used in all available transport platforms including rotary wing. Patients receiving NIV were found to have prolonged mission durations compared with other GSA-HEMS patients (222.5 vs 193 min). This increase in mission duration was largely attributable to NIV failure, resulting in a need for Rapid Sequence Intubation at the referring hospital. Conclusions: With careful patient selection, the use of interhospital NIV is feasible and appears to be safe in a retrieval system with care provided by a critical care physician. Keywords: emergency care systems, remote and rural medicine; prehospital care, clinical management; ventilation, non invasive.
Colyer E, Sorensen M, Wiggins S, Struwe L (2018) The effect of team configuration on the incidence of adverse events in pediatric critical care transport. Air Medical Journal 37(3): 186-198	Objective: Specialty pediatric transport teams are widely used for pediatric interfacility transport in the United States, with little industry consensus on optimal team configuration. The aim of this study is to assess the quality of the nurse/paramedic specialty team configuration as indirectly measured by the rate of adverse events in these transports. Methods: Retrospective analysis of pediatric transport data from a hospital-based dedicated pediatric/neonatal transport team was conducted for patients transported in 2016. Data were categorized by general characteristics of transport and analyzed for the occurrence of adverse events.

Citation	Abstract / Executive summary
	Results: Five hundred sixty-four cases were analyzed. Cases were described by team configuration and then by transport mode, duration, time, patient age and acuity, and disposition. The overall rate of adverse event incidence was 8.3%, chiefly centered in device and process domains. There was no significant difference in the rate of adverse events between team configurations. Conclusion: There was no significant difference in the rate of adverse event occurrence in nurse/paramedic team configurations versus nurse/nurse configuration. Using critical care paramedics on pediatric transport teams enables a larger volume of patients to be transported to definitive care without concerns for decrease in quality or safety.
Cone David C. MD,, Jane H. Brice MD, MPH,, Theodore R. Delbridge MD, MPH,, J. Brent Myers MD, MPH, Editor(s): Emergency Medical Services: Clinical Practice and Systems Oversight, Third Edition First published:18 August 2021, Print ISBN: 9781119756248 |Online ISBN: 9781119756279 |DOI:10.1002 / 9781119756279, © 2021 NAEMSP	The two-volume Emergency Medical Services: Clinical Practice and Systems Oversight delivers a thorough foundation upon which to succeed as an EMS medical director and prepare for the NAEMSP National EMS Medical Directors Course and Practicum. Focusing on EMS in the 'real world', the book offers specific management tools that will be useful in the reader's own local EMS system and provides contextual understanding of how EMS functions within the broader emergency care system at a state, local, and national level. The two volumes offer the core knowledge trainees will need to successfully complete their training and begin their career as EMS physicians, regardless of the EMS systems in use in their areas. A companion website rounds out the book's offerings with audio and video clips of EMS best practice in action. Readers will also benefit from the inclusion of: A thorough introduction to the history of EMS An exploration of EMS airway management, including procedures and challenges, as well as how to manage ventilation, oxygenation, and breathing in patients, including cases of respiratory distress Practical discussions of medical problems, including the challenges posed by the undifferentiated patient, altered mental status, cardiac arrest and dysrhythmias, seizures, stroke, and allergic reactions An examination of EMS systems, structure, and leadership

Citation	Abstract / Executive summary
Cook C, Allan C. Are Trainees Equipped to Transfer Critically Ill Patients?.Journal of the Intensive Care Society. 2008;9(2):145-147.	Transferring critically ill patients, whether intra- or inter-hospital, is an integral part of the daily working life of intensive care unit staff. It requires a multitude of skills, including thorough patient assessment, rigorous pre-transfer preparation, and constant vigilance throughout the transfer to ensure the safety of the patient. The development of these skills is a fundamental necessity for trainees in critical care. We investigated current critical care trainees' experience of patient transfer in one region in the UK, and assessed their views of their training in patient transfer. The results of our survey demonstrate some worrying conclusions about deficiencies in specific transfer training. We hope to encourage a discussion about the standards in transfer training which are needed and the best way to deliver such training.
Cowan GM, Burton F, Newton A (2012) Prehospital anaesthesia: a survey of current practice in the UK. Emergency Medicine Journal 29:136-140	Introduction: Prehospital emergency anaesthesia (PHEA or 'prehospital rapid sequence intubation') is a high-risk procedure. Standard operating procedures (SOPs) and checklists within healthcare systems have been demonstrated to reduce human error and improve patient safety. We aimed to describe the current practice of PHEA in the UK, determine the use of checklists for PHEA and describe the content, format and layout of any such checklists currently used in the UK. Method: A survey of UK prehospital teams was conducted to establish the incidence and conduct of PHEA practice. Results were grouped into systems delivering a high volume of PHEA per year (>50 PHEAs) and low volume (≤50 PHEAs per annum). Standard and 'crash' (immediate) induction checklists were reviewed for length, content and layout. Results: 59 UK physician-led prehospital services were identified of which 43 (74%) participated. Thirty services (70%) provide PHEA and perform approximately 1629 PHEAs annually. Ten 'high volume' services deliver 84% of PHEAs per year with PHEA being performed on a median of 11% of active missions. The most common indication for PHEA was trauma. 25 of the 30 services (83%) used a PHEA checklist prior to induction of anaesthesia and 24 (80%) had an SOP for the procedure. 19 (76%) of the 'standard' checklists and 5 (50%) of the 'crash' induction checklists used were analysed. On average, standard checklists contained 169 (range: 52-286) words and 41 (range: 28-70) individual checks. The style and language complexity varied significantly between different checklists.

Citation	Abstract / Executive summary
	Conclusion: PHEA is now performed commonly in the UK. The use of checklists for PHEA is relatively common among prehospital systems delivering this intervention. Care must be taken to limit checklist length and to use simple, unambiguous language in order to maximise the safety of this high-risk intervention. Keywords: anaesthesia - Rsi; prehospital care; trauma.
Crewdson K, Lockey D, Roislien J, Lossius HM, Rehn M (2017) The success of prehospital tracheal intubation by different pre-hospital providers: a systematic literature and meta-analysis. Critical Care 21: 31 DOI: 10.1186/s13054-017-1603-7	Background: Pre-hospital basic airway interventions can be ineffective at providing adequate oxygenation and ventilation in some severely ill or injured patients, and advanced airway interventions are then required. Controversy exists regarding the level of provider required to perform successful pre-hospital intubation. A previous meta-analysis reported pre-hospital intubation success rates of 0.849 for non-physicians versus 0.991 for physicians. The evidence base on the topic has expanded significantly in the last 10 years. This study systematically reviewed recent literature and presents comprehensive data on intubation success rates. Methods: A systematic search of MEDLINE and EMBASE was performed using PRISMA methodology to identify articles on pre-hospital tracheal intubation published between 2006 and 2016. Overall success rates were estimated using random effects meta-analysis. The relationship between intubation success rate and provider type was assessed in weighted linear regression analysis. Results: Of the 1838 identified studies, 38 met the study inclusion criteria. Intubation was performed by non-physicians in half of the studies and by physicians in the other half. The crude median (range) reported overall success rate was 0.969 (0.616-1.000). In random effects meta-analysis, the estimated overall intubation success rate was 0.953 (0.938-0.965). The crude median (range) reported intubation success rates for non-physicians were 0.917 (0.616-1.000) and, for physicians, were 0.988 (0.781-1.000) (p = 0.003). Discussion: The reported overall success rate of pre-hospital intubation has improved, yet there is still a significant difference between non-physician and physician providers. The finding that less-experienced personnel perform less well is not unexpected, but since there is considerable evidence that poorly performed intubation carries a significant risk of morbidity and mortality careful consideration should be given to the training and experience required to deliver this intervention safely. Keywords: Airway management; Intubation; Pre-hospital emergency care; Systemic literature review.

Citation	Abstract / Executive summary
Critical Care Network-National Nurse Leads (2015). National Competency Framework for Registered Nurses in Adult Critical Care STEP 2 Competencies [Online]. London. CC3N UK.	These competencies are designed for use by registered nurses embarking on a career working in a Level 3 critical care area. Critical care nurses play a pivotal role in the assessment, care and recovery of those patients who experience critical illness. Their experience, competence and knowledge allow them to work both on their own and in partnership with wider multidisciplinary healthcare teams. www.cc3n.org.uk/uploads/9/8/4/2/98425184/01_new_step_1_final__1_.pdf
Croser JL. Trauma care systems in Australia. Injury. 2003;34:649–651.	The management of orthopaedic trauma in Australia varies from the urban model common to most developed countries to a model determined by the vast distances of the island continent. The effectiveness of this system is largely dependent on the retrieval system and treatment protocols of severe injuries often revolve around prolonged contamination of traumatic wounds. The place of the Royal Flying Doctor Service (RFDS) in providing the "Mantle of Safety" for remote and rural Australia is highlighted.
Davies G and Chesters A (2015) Transport of the Trauma patient. British Journal of Anaesthesia 115(1):33–37	The transport of the seriously injured patient is associated with risk and requires particular expertise and attention. The aim of this review is to provide a historical overview of transport services available to trauma patients in the UK, describe the various transport platforms that are used, identify risks from a system and disease perspective and how they may be mitigated, and make international comparisons. The transfer of patients requiring medical attention has developed over the years and now includes complex undertakings that undoubtedly confer a degree of risk on the patient. A number of different transport platforms are in regular use in the UK, and a number of different health-care professions of varying training, experience, and seniority undertake these transfers. The general principles are to provide no worse care en route than has been provided at the departure destination and to transport patients to a destination capable of delivering whichever intervention the patient is deemed to require. When deciding to transport an injured patient, there are risks, and appropriate mitigation must be in place, particularly if primary transfer to a major trauma centre involves bypassing a nearer facility. It is clear that those clinicians who undertake medical transfers must be appropriately trained and must have access to local or national guidelines. Medical transfers must be the subject of ongoing research, both to ensure that best practice is in place and to continue to understand the safest way of achieving essential transfers effectively.

Citation	Abstract / Executive summary
DeLorenzo A, St Clair T, Andrew E, Bernard S, Smith K (2018) Prehospital Rapid Sequence Intubation by Intensive Care Flight Paramedics. Prehospital Emergency Care 22(5): 595–601	Objective: Rapid sequence intubation (RSI) is an advanced airway procedure for critically ill or injured patients. Paramedic-performed RSI in the prehospital setting remains controversial, as unsuccessful or poorly conducted RSI is known to result in significant complications. In Victoria, intensive care flight paramedics (ICFPs) have a broad scope of practice including RSI in both the adult and pediatric population. We sought to describe the success rates and characteristics of patients undergoing RSI by ICFPs in Victoria, Australia. Methods: A retrospective data review was conducted of adult (≥ 16 years) patients who underwent RSI by an ICFP between January 1, 2011, and December 31, 2016. Data were sourced from the Ambulance Victoria data warehouse. Results: A total of 795 cases were included in analyses, with a mean age of 45 (standard deviation = 19.6) years. The majority of cases involved trauma (71.7%), and most patients were male (70.1%). Neurological pathologies were the most common clinical indication for RSI (68.3%). The first pass success rate of intubation was 89.4%, and the overall success rate was 99.4%. Of the 5 failed intubations (0.6%), all patients were safely returned to spontaneous respiration. Two patients were returned via bag/valve/mask (BVM) support alone, two with BVM and oropharyngeal airway, and one via supraglottic airway. No surgical airways were required. Overall, we observed transient cases of hypotension (5.2%), hypoxemia (1.3%), or both (0.1%) in 6.6% of cases during the RSI procedure. Conclusion: A very high RSI procedural success rate was observed across the study period. This supports the growing recognition that appropriately trained paramedics can perform RSI safely in the prehospital environment. Keywords: emergency medical services; intubation; prehospital.
Demaret P, Lebrun F, Devos P, Champagne C, Lemaire R, Loeckx I, Messens M, Mulder A (2016) Pediatric prehospital emergencies in Belgium: a 2-year national descriptive study. European Journal of Paediatrics 175: 921-930	This study aims to describe the pediatric physician-staffed EMS missions at a national level and to compare the pediatric and the adult EMS missions. Using a national database, we analyzed 254,812 interventions including 15,294 (6 %) pediatric emergencies. Less children than adults received an intravenous infusion (52.7 versus 77.1 %, $p < 0.001$), but the intra-osseous access was used more frequently in children (1.3 versus 0.8 %, $p < 0.001$). More children than adults benefited from a therapeutic immobilization (16.3 versus 13.2 %, $p < 0.001$). Endotracheal intubation was rare in children (2.1 %) as well as cardiopulmonary resuscitation (1.2 %). Children were more likely than adults to suffer from a neurological problem (32.4 versus 21.3 %, $p < 0.001$) or from a trauma (27.1 versus 16.8 %,

Citation	Abstract / Executive summary
	p < 0.001). The prevalence of the pediatric diagnoses showed an age dependency: the respiratory problems were more prevalent in infants (40.3 % of the 0–12-months old), 52.1 % of the 1–4-year-old children suffered from a neurological problem, and the prevalence of trauma raised from 14.8 % of the infants to 47.1 % of the 11–15 year olds. Conclusion: Pre-hospital pediatric EMS missions are not frequent and differ from the adult interventions. The pediatric characteristics highlighted in this study should help EMS teams to be better prepared to deal with sick children in the pre-hospital setting.
Department of Health (Victoria, Australia) Adult Emergency Retrieval Services In Victoria, Discussion Paper, December 2006. http://catalogue.nla.gov.au/Record/ 4224755 (accessed 15 Sep 2014).	This discussion paper reflects the work undertaken by the Adult Retrieval Services Working Group and the department in 2006 regarding adult emergency retrieval services in Victoria. The paper provides an overview of the current service scope, activity review and recommended framework for adult retrieval services in the future. The department has received feedback from stakeholders regarding the current level of adult emergency retrieval services and has identified areas for improvement that led to the review of the adult emergency retrieval services model. Opportunities for improving adult emergency retrieval services in Victoria described in this discussion paper are focused on addressing the set of agreed principles that underpin an effective retrieval service that were identified during stakeholder consultations.
Droogh J, Kruger H, Ligtenberg J, Zijlstra J. Simulator-Based Crew Resource Management Training for Interhospital Transfer of Critically Ill Patients by a Mobile ICU. The Joint Commission Journal on Quality and Patient Safety. 2012;38(12):554-559	Background: Transporting critically ill ICU patients by standard ambulances, with or without an accompanying physician, imposes safety risks. In 2007 the Dutch Ministry of Public Health required that all critically ill patients transferred between ICUs in different hospitals be transported by a mobile ICU (MICU). Since March 2009 a specially designed MICU and a retrieval team have served the region near University Medical Center Groningen, in the northeastern region of the Netherlands. The MICU transport program includes simulator-based crew resource management (CRM) training for the intensivists and ICU nurses, who, with the drivers, constitute the MICU crews. Methods: Training entails five pivotal aspects: (1) preparation, (2) teamwork, (3) new equipment, (4) mobility, and (5) safety. For example, the training accustoms participants to working in the narrow, moving ambulance and without benefit of additional manpower. The scenario-based team training, which takes about four hours, occurs in a training facility, with its reconstructed ICU, and then in the MICU itself. A “wireless” patient simulator that is able to mimic hemodynamic and respiratory patterns and to simulate lung and heart sounds is used. All scenarios can be adjusted to simulate medical, logistic, or technical problems.

Citation	Abstract / Executive summary
	Results: Since the start of MICU training in 2009, more than 70 training sessions, involving 100 team members, have been conducted. Quality issues identified include failure to anticipate possible problems (such as failing to ask for intubation of a respiratory-compromised patient at intake); late responses to alarms of the ventilator, perfusor pump, or monitor; and not anticipating a possible shortage of medication. Conclusions: Setting up and implementing simulator-based CRM training provides feasible and helpful preparation for an MICU team.
Droogh J, Smit M, Absolom AR, Ligtenberg JJM, Zijlstra JG (2015) Transferring the critical care patients: are we there yet? Critical Care 19:62. DOI:10.1186/s13054-0150749-4	During the past few decades the numbers of ICUs and beds has increased significantly, but so too has the demand for intensive care. Currently large, and increasing, numbers of critically ill patients require transfer between critical care units. Inter-unit transfer poses significant risks to critically ill patients, particularly those requiring multiple organ support. While the safety and quality of inter-unit and hospital transfers appear to have improved over the years, the effectiveness of specific measures to improve safety have not been confirmed by randomized controlled trials. It is generally accepted that critically ill patients should be transferred by specialized retrieval teams, but the composition, training and assessment of these teams is still a matter of debate. Since it is likely that the numbers and complexity of these transfers will increase in the near future, further studies are warranted.
Edwards KH, FitzGErald G, Franklin RC, Edwards MT (2020) Air ambulance outcome measures using Institutes of Medicine and Donabedian quality frameworks: protocol for a systematic scoping review. Systematic Reviews DOI:10.1186/s13643-020-013167	Background: Dedicated air ambulance services provide a vital link for critically ill and injured patients to higher levels of care. The recent developments of pre-hospital and retrieval medicine create an opportunity for air ambulance providers and policy-makers to utilize a dashboard of quality performance measures to assess service performance. The objective of this scoping systematic review will be to identify and evaluate the range of air ambulance outcome measures reported in the literature and help to construct a quality dashboard based on a healthcare quality framework. Methods: We will search PubMed, MEDLINE, CINAHL, Scopus, and Cochrane Database of Systematic Reviews (from January 2001 onwards). Complementary searches will be conducted in selected relevant journals. We will include systematic reviews and observational studies (cohort, cross-sectional, interrupted time series) in critically ill or injured patients published in English and focusing on air ambulance delivery and quality measures. Two reviewers will independently screen all citations, full-text articles, and abstract data. The study methodological quality (or bias) will be appraised using appropriate tools. Analysis of the characteristics associated with outcome measure will be mapped and described according to the proposed healthcare quality framework.

Citation	Abstract / Executive summary
	Discussion: This review will contribute to the development of an air ambulance quality dashboard designed to combine multiple quality frameworks. Our findings will provide a basis for helping decision-making in health planning and policy. Systematic review registration: PROSPERO CRD42019144652. Keywords: Air ambulance; Donabedian; Emergency system; Institutes of Medicine; Outcome measures; Quality framework; Service delivery.
Ellis D, Hooper M. Service development and special circumstances. In: Ellis D, Hooper M, eds. Cases in Prehospital and Retrieval Medicine, 1st edn. Sydney: Elsevier, 2010; 193–240.	Cases in Pre-hospital and Retrieval Medicine is a supplementary case book with a self directed approach, designed to complement core texts such as Cameron, or Sanders. The book focuses on the principles of PHC and Retrieval medicine and the continuum of care of the critically injured trauma patient in the field. It is case based and uses real pre-hospital and retrieval situations, presented in question format followed by an extensive discussion highlighting key areas of the specialty. The questions and answers are each 3 - 4 pages in length and most are accompanied by a photo from author archives/real events. The questions have been divided into those with a predominantly pre-hospital theme and those based around retrieval medicine. A third section covers service development and special situations.
Ellis D, Mazur S. Managing and leading a transfer. In: Low A, Hulme J, eds. ABC of Transfer and Retrieval Medicine, 1st edn. Oxford: BMJ Books, 2014; 107–10.	ABC of Transfer and Retrieval Medicine provides the key information required to help health care professionals involved in the movement of critically ill patients to do so safely, correctly and with confidence. Beginning with the practical and clinical considerations to be taken into account during patient transfer and an overview of transfer equipment, it then addresses pharmacological aspects of patient transfer, the roles and responsibilities of the transfer team, and the requirements of neonatal, paediatric and specialist transfers. Mapped against the syllabus for the Diploma of Retrieval and Transfer Medicine (Royal College of Surgeons of Edinburgh), it has been developed as a core resource for the diploma whilst providing an invaluable resource for any healthcare professional involved in the transfer of critically ill patients including anaesthetists, intensivists, nurses from ICU/ED and paramedics. It also includes frameworks for radiology and arterial blood gas interpretation, guidance on patient triage, transfer checklists and equipment checklists, and a summary of the relevant national guidelines. From a multidisciplinary international author team, this new addition to the ABC series is a useful resource for all health care professionals involved in the transfer of patients. It is relevant to anaesthetists, intensivists, paramedics, critical care and emergency department nursing staff who are required to take part in intra and inter hospital transfers.

Citation	Abstract / Executive summary
Evans C, Creaton A, Kennedy M, Martin T, eds. Oxford Specialist Handbook of Retrieval Medicine, 1st edn. Oxford: Oxford University Press, 2016; 21–59.	Retrieval Medicine is a core, concise and practical text covering the complex clinical and logistical problems experienced in the retrieval environment. Focusing on evidence-based management and clear clinical guidance, this easily portable handbook provides a comprehensive and accessible guide to this growing field for all health professionals involved in the retrieval and transfer of critically ill patients. Covering the practice of acute, emergency and critical care medicine in the transport environment, this handbook provides the practical guidance and clinical knowledge to enable medical practitioners to function independently in highly variable and resource limited environments with acutely unwell, unstable and often clinically undifferentiated patients over long durations. Closely mapped to the Royal College of Surgeons syllabus on retrieval and transfer medicine, this title comprehensively covers all aspects of retrieval medicine, from basic flight physiology to more complex retrievals and common pitfalls. Authored by an authoritative, international team of expert editors and specialist authors, this clinically focused text is complemented by a range of checklists and reference tools for practical and accessible use in the field. These deliver core information for use in the primary retrieval setting, allowing the retreivalist to structure their approach to a crisis and correct the problem with suggested interventions. Topics include retrieval systems and coordination, crisis resource management, shock, and a range of chapters focusing on responding to specific areas of medicine when encountered in the retrieval environment, such as cardiology and obstetrics and gynaecology.
Faculty of Intensive Care Medicine (2017). The CCT in Intensive Care Medicine (v2.3 2017)-part 111 pg68-69.[Online].London FICM UK. Available from: www.ficm.ac.uk/ sites/default/files/cct_in_icm_part_iii_-_syllabus_2017_v2.3.pdf Accessed 18.10.2018	This document identifies the purpose, content of learning, process of training, and the programme of assessment for postgraduate specialist training leading to a Certificate of Completion of Training [CCT] in Intensive Care Medicine (ICM).. Intensive Care Medicine [ICM], is the body of specialist knowledge and practice concerned with the treatment of patients with, at risk of, or recovering from potentially life-threatening failure of one or more of the body's organ systems. It includes the provision of organ system support, the investigation, diagnosis, and treatment of acute illness, systems management and patient safety, ethics, end-of-life care, and the support of families.

Citation	Abstract / Executive summary
Faculty of Intensive Care Medicine (UK) Guidance on The Transfer of The Critically Ill Adult 2019, www.ficm.ac.uk/sites/default/files/transfer_critically_ill_adult_2019.pdf	These guidelines have been produced as a collaboration between the Intensive Care Society (ICS) and the Faculty of Intensive Care Medicine (FICM). They follow three previous editions of similar guidelines produced by the ICS. As with the previous guidelines, the intention is to provide colleagues with up to date evidence based advice and to promote high standards of care during the transfer of critically ill patients. Prior to developing the guidelines, data relating to transfer activity was obtained from the Intensive Care National Audit and Research Centre, The Scottish Intensive Care Society Audit group and from Critical Care Operational Delivery Networks in England, Wales and Northern Ireland. A systematic literature review was carried out to identify articles relating to transfers published since the previous edition of the ICS guidelines was prepared. As previously, the quality of published evidence relating to transfers is poor comprising mostly case series from single centres. Recommendations are therefore based on a combination of available evidence, expert opinion and advice from patient representatives.
Fanara B, Manzon C, Barbot O, Desmettre T, Capellier G. Recommendations for the intrahospital transport of critically ill patients. Critical Care. 2010;14(3):R87.	Introduction: This study was conducted to provide Intensive Care Units and Emergency Departments with a set of practical procedures (check-lists) for managing critically-ill adult patients in order to avoid complications during intra-hospital transport (IHPT). Methods: Digital research was carried out via the MEDLINE, EMBASE, CINAHL and HEALTHSTAR databases using the following key words: transferring, transport, intrahospital or intra-hospital, and critically ill patient. The reference bibliographies of each of the selected articles between 1998 and 2009 were also studied. Results: This review focuses on the analysis and overcoming of IHPT-related risks, the associated adverse events, and their nature and incidence. The suggested preventive measures are also reviewed. A check-list for quick execution of IHPT is then put forward and justified. Conclusions: Despite improvements in IHPT practices, significant risks are still involved. Basic training, good clinical sense and a risk-benefit analysis are currently the only deciding factors. A critically ill patient, prepared and accompanied by an inexperienced team, is a risky combination. The development of adapted equipment and the widespread use of check-lists and proper training programmes would increase the safety of IHPT and reduce the risks in the long-term. Further investigation is required in order to evaluate the protective role of such preventive measures.

Citation	Abstract / Executive summary
Fatovich DM, Phillips M, Jacobs IG, et al. Major trauma patients transferred from rural and remote Western Australia by the Royal Flying Doctor Service. J Trauma. 2011;71:1816–1820.	Background: The "golden hour" of trauma care is irrelevant in rural areas. We studied the effect of distance and remoteness on major trauma patients transferred by the Royal Flying Doctor Service from rural and remote Western Australia. Methods: The Royal Flying Doctor Service retrieval and Trauma Registry databases were linked for the period of July 1, 1997, to June 30, 2006. Major trauma was defined as Injury Severity Score (ISS) >15. Remoteness was quantified using the Accessibility/Remoteness Index of Australia (ARIA) classes: inner regional, outer regional, remote, and very remote. The primary outcome was death. Results: Among 1328 major trauma transfers to Perth, mean age was 34.2 years ± 18.3 years (range, 0-87 years) and 979 (73.7%) were male. Over half were motor vehicle crashes. Mean transfer time was 11.6 hours (95% confidence interval [CI], 11.2-12.1). The median ISS was 25 (interquartile range [IQR], 18-29), and there were no differences within the ARIA classes for cause and injury patterns. After adjusting for ISS, age, and time, the risk of death increases as remoteness increases: outer regional odds ratio (OR), 2.25 (95% CI, 0.58-8.79); remote, 4.03 (95% CI 1.04-15.62); and very remote, 4.69 (95% CI, 1.23-17.84). Risk increases by 87% for each 1,000 km (OR, 1.87; 95% CI, 1.007-3.48; p = 0.05) flown. Despite long retrieval times, there were no deaths in flight. Conclusion: There is an excess of a fourfold increase in the risk of major trauma death in patients transferred to Perth from remote and very remote Western Australia. Remoteness, as measured by the ARIA, is more important than distance, in the risk of death.
Fatovich DM, Phillips M, Langford SA, Jacobs IG. A comparison of metropolitan vs rural major trauma in Western Australia. Resuscitation. 2011;82:886–890.	Background: Metropolitan and rural Western Australia (WA) major trauma transport times are extremely different. We compared outcomes from these different systems of care. Methods: Major trauma (Injury Severity Score, ISS>15) data from the Royal Flying Doctor Service (RFDS) and Trauma Registries, 1 July 1997-30 June 2006. Two groups were studied: Metro (metropolitan major trauma transported directly to a tertiary hospital), and Rural (rural major trauma transferred by the RFDS to a tertiary hospital in Perth). The primary endpoint was death. We used logistic regression and multiple imputation. Results: 3333 major trauma patients were identified (mean age 40.1 ± 22.6 yrs; Metro=2005, Rural=1328). The rural patients were younger, had a larger proportion of motor vehicle crashes, and higher median ISS (25 vs 24, p<0.001). Mean times to definitive care were 59 min versus 11.6h, respectively (p<0.0001). After adjusting for age, injury severity and the effect of time with the initial rural deaths,

Citation	Abstract / Executive summary
	there was a significantly increased risk of death (OR 2.60, 95% CI 1.05-6.53, p=0.039) in the Rural group. For those rural patients who reached Perth, the adjusted OR for death was 1.10 (95% CI 0.66-1.84, p=0.708). Conclusion: There is more than double the risk of major trauma death in rural and remote WA. However, if a major trauma patient survives to be retrieved to Perth by the RFDS, then mortality outcomes are equivalent to the metropolitan area.
Flabouris A, Hart GK, George C. Outcomes of patients admitted to tertiary intensive care units after interhospital transfer: comparison with patients admitted from emergency departments. Crit Care Resusc 2008;10:97–105.	Objectives: To compare outcomes of patients admitted to tertiary-level intensive care units after interhospital transfer (IHPT) with those of similar patients admitted from the emergency department (ED). Design: Historical case-control study using data from the Australian and New Zealand Intensive Care Society Adult Patient Database (ANZICS APD), a quality-assurance dataset. Participants and setting: 28882 patients aged 16 years or older admitted to an adult tertiary ICU in Australia or New Zealand between 1 January 1994 and 31 December 2003 with one of the eight most common diagnoses for IHPT patients. Patients admitted directly to the ICU from another hospital (DIHPT group) (n=9203) were matched by age, sex, APACHE II score and diagnosis with non-IHPT patients admitted from the ED (ED group). Results: Hospital mortality was higher in the DIHPT group than in the ED group for patients with a diagnosis of multiple trauma (11.0% v 5.1%; odds ratio [OR], 2.3; 95% CI, 1.6- 3.34), respiratory infection (28.1% v 19.1%; OR, 1.66; 95% CI, 1.34-2.05), sepsis (38.7% v 28.7%; OR, 1.57; 95% CI, 1.34-1.83), intracranial haemorrhage (49.9% v 42.6%; OR, 1.34; 95% CI, 1.14-1.58), head injury alone (16.9% v 13.7%; OR, 1.28; 95% CI, 1.01-1.62), and cardiac arrest (59.3% v 53.2%; OR, 1.28; 95% CI, 1.06-1.56), but not overdose (3.9% v 3.6%; OR, 1.09; 95% CI, 0.72-1.67) or chronic obstructive pulmonary disease (19.8% v 22.5%; OR, 0.85; 95% CI, 0.63-1.15). Overall, the DIHPT group had a higher intubation rate, longer ICU stay and higher rate of discharge to another hospital. Conclusions: Patients admitted to an ICU from another hospital have higher hospital mortality and longer stay than those admitted from the ED, with the differences varying between diagnoses. These differences are important considerations for resource allocation and triage, and as a measure of quality.

Citation	Abstract / Executive summary
Floccare DJ, Lyng JW et al) Appropriate Air Medical Services Utilization and Recommendations for Integration of Air Medical Services Resources into the EMS System of Care: A Joint Position Statement and Resource Document of NAEMSP, ACEP, and AMPA Prehosp Emerg Care . Nov-Dec 2021;25(6):854-873.	This update to the 2013 joint position statement, Appropriate and Safe Utilization of Helicopter Emergency Medical Services, provides guidance for air medical services utilization based on currently available evidence. Air medical services utilization considerations fall into three major categories: clinical considerations, safety considerations, and system integration and quality assurance. Clinically, air medical services should accomplish one or more of three primary patient-centered goals: initiation or continuation of locally unavailable advanced or specialty care; expedited delivery to definitive care for time-sensitive interventions; and/or extraction from physically remote or otherwise inaccessible locations that limit timely access to necessary care. Ground-EMS (GEMS) transport is preferred when it is able to provide the necessary level of care and timely transport to definitive care.Risk identification and safety of both the patient and crew must be uniformly balanced against the anticipated degree of patient medical benefit. While auto-ready and auto-launch practices may increase access to air medical services, they also risk over-use, and so must be rigorously reviewed. Safety is enhanced during multi-agency emergency responses by coordinated interagency communication, ideally through centralized communication centers. Helicopter shopping and reverse helicopter shopping both create significant safety risks and their use is discouraged.Regional EMS systems must integrate air medical services to facilitate appropriate utilization in alignment with the primary patient goals while being cognizant of local indications, resources, and needs. To maximize consistent, informed air medical services utilization decisions, specific indications for and limitations to air medical services utilization that align with local and regional system and patient needs should be identified, and requests routed through centralized coordinating centers supported by EMS physicians.To limit risk and promote appropriate utilization of air medical services, GEMS clinicians should be encouraged to cancel an air medical services response if it is not aligned with at least one of the three primary patient-centered goals. Similarly, air medical services clinicians should be empowered to redirect patient transport to GEMS. Air medical services should not routinely be used solely to allow GEMS to remain in their primary service area.

Citation	Abstract / Executive summary
Ford D et al, Does Direct Helicopter Retrieval Improve Survival of Severely Injured Trauma Patients From Rural Western Australia? Air Medical Journal 39 (2020) 183–188	Objective: In remote Western Australia, mortality from major trauma is more than 4 times higher than mortality rates from major trauma in the capital city of Perth. The objective of this study was to determine whether direct helicopter emergency medical service (HEMS) retrieval from an incident scene within the zone 50 to 250 km of Perth to a tertiary hospital improves survival in severely injured trauma patients. Direct HEMS retrieval was compared with indirect retrieval whereby patients were transferred by ambulance to a nearby rural hospital before retrieval to a tertiary hospital in Perth. Methods: A retrospective analysis (2006-2015) was undertaken of all Western Australia trauma registries, and coronial data were collected for all major trauma patients who died before retrieval to a tertiary hospital in Perth. Results: A total of 1,374 major trauma patients (indirect retrieval = 1,031 and direct HEMS = 343) met the study inclusion criteria. There was a 51% increased risk of death in the indirect patients compared with the direct HEMS patients (15.3% vs. 10.2%, P ≤ .001). Conclusion: Direct HEMS retrieval from the incident scene to a tertiary hospital substantially improves the chances of survival for severely injured trauma patients in rural locations in the zone 50 to 250 km of Perth.
Franklin RC et al, Aeromedical retrievals in Queensland: A five-year review, Emergency Medicine Australasia (2021) 33, 34–44	Objective: Aeromedical services are an essential part of the healthcare system. Centralised coordination of aeromedical retrieval tasking offers benefits for safety, timeliness and efficiency in service delivery. The aim of the present study is to review aeromedical retrievals in Queensland exploring patient demographics, temporal patterns and usage characteristics. Methods: This is a retrospective cases series for the period 1 January 2010 to 31 December 2014 incorporating data from Retrieval Services Queensland and Queensland Newborn Emergency Transport Service. Ethics approval was obtained (JCU-HREC H6137 and Public Health Act #RD005673). Descriptive analysis of the de-identified data was undertaken included patient demographics, referral and receiving locations, retrieval platform and acuity of transport request. Results: There were 73 042 aeromedical retrievals undertaken during the period, with an average of 40 cases per day (range 16-89). The majority (95%) of retrievals were for Queensland residents. Overall 23.1% of cases were cardiology-related and 12.7% were injury-related. Older adults aged 75-84 years had the highest rate of retrievals relative to the population with a crude rate of 942.4 per 100 000 per annum. Overall 14.9% of cases were Priority 1, which represents the tasking with the highest acuity but majority were Priority 4 (41.6%). One third (37.6%) of all patients were from inner regional locations.

Citation	Abstract / Executive summary
	Conclusions: Potential investments in health service planning may alleviate the burden on aeromedical services, particularly related to cardiology services in inner and outer regional Queensland. Aeromedical services are pivotal in enabling all sick and injured residents' access to the highest quality of care regardless of the remoteness of their residence. Keywords: Australia; Queensland; air ambulance; pre-hospital; transportation of patient.
Gabbe BJ, Cameron PA, Hannaford AP, et al. Routine follow up of major trauma patients from trauma registries: What are the outcomes? J Trauma 2006;61:1393–9.	Background: Routine measurement of outcomes other than mortality in trauma is needed to monitor trauma care, benchmark trauma hospitals and systems, and to guide resource provision. Trauma registries are ideally placed to capture morbidity outcomes such as functional loss, disability, and handicap. This study aimed to provide a broad description of the 6-month outcomes of major trauma patients captured by a population-based trauma registry, establish the follow-up rate of registry patients, and determine any biases associated with loss to follow up. Methods: The Victorian State Trauma Registry (VSTR) is a population-based registry in Victoria, Australia. Major trauma patients captured by the VSTR with a date of injury from October 1, 2003 to September 30, 2004 were followed up at 6 months postinjury by telephone to collect information about their living status, functional levels, and return to work. Results: Of the 1,102 eligible patients, 67% were successfully followed up at 6 months postinjury. Eighteen patients had died since discharge. Patients lost to follow up were less severely injured ($p = 0.004$) and younger ($p = 0.010$) at baseline than those followed up. The vast majority of major trauma patients are independent with respect to locomotion (78%), feeding (93%), and expression (93%) by 6 months postinjury. Of those working before injury, 60% had returned to work. Conclusions: The findings show that follow up of registry patients is feasible, results in few biases in the follow-up population, and reports similar findings to individual studies of trauma populations.
Gabbe BJ, Lyons RA, Fitzgerald M, et al. Reduced population burden of road transport-related major trauma after introduction of an inclusive trauma system. Ann Surg 2015;261:565–72.	Objective: To describe the burden of road transport-related serious injury in Victoria, Australia, over a 10-year period, after the introduction of an integrated trauma system. Background: Road traffic injury is a leading cause of death and disability worldwide. Efforts to improve care of the injured are important for reducing burden, but the impact of trauma care systems on burden and cost of road traffic injury has not been evaluated.

Citation	Abstract / Executive summary
	Methods: All road transport-related deaths and major trauma (injury severity score >12) cases were extracted from population-based coroner and trauma registry data sets for July 2001 to June 2011. Modeling was used to assess changes in population incidence rates and odds of in-hospital mortality. Disability-adjusted life years, combining years of life lost and years lived with disability, were calculated. Cost of health loss was calculated from estimates of the value of a disability-adjusted life year. Results: Incidence of road transport-related deaths decreased (incidence rate ratio 0.95, 95% confidence interval: 0.94-0.96), whereas the incidence of hospitalized major trauma increased (incidence rate ratio 1.03, 95% confidence interval: 1.02-1.04). Years of life lost decreased by 43%, and years lived with disability increased by 32%, with an overall 28% reduction in disability-adjusted life years over the decade. There was a cost saving per case of A$633,446 in 2010-2011 compared with the 2001-2002 financial year. Conclusions: Since introduction of the trauma system in Victoria, Australia, the burden of road transport-related serious injury has decreased. Hospitalized major trauma cases increased, whereas disability burden per case declined. Increased survival does not necessarily result in an overall increase in nonfatal injury burden.
Gabbe BJ, Simpson PM, Sutherland AM, et al. Improved functional outcomes over time for major trauma patients in an inclusive, regionalised trauma system. Ann Surg 2012;255:1009–15.	Objective: To describe outcomes of major trauma survivors managed in an organized trauma system, including the association between levels of care and outcomes over time. Background: Trauma care systems aim to reduce deaths and disability. Studies have found that regionalization of trauma care reduces mortality but the impact on quality of survival is unknown. Evaluation of a trauma system should include mortality and morbidity. Methods: Predictors of 12-month functional (Glasgow Outcome Scale-Extended) outcomes after blunt major trauma (Injury Severity Score >15) in an organized trauma system were explored using ordered logistic regression for the period October 2006 to June 2009. Data from the population-based Victorian State Trauma Registry were used. Results: There were 4986 patients older than 18 years. In-hospital mortality decreased from 11.9% in 2006-2007 to 9.9% in 2008-2009. The follow-up rate at 12 months was 86% (n = 3824). Eighty percent reported functional limitations. Odds of better functional outcome increased in the 2007-2008 [adjusted odds ratio (AOR): 1.22; 95% CI: 1.05, 1.41] and 2008-2009 (AOR: 1.16; 95% CI: 1.01, 1.34) years compared with 2006-2007. Cases managed at major trauma services (MTS) achieved better functional outcome (AOR: 1.22; 95%

Citation	Abstract / Executive summary
	CI: 1.03, 1.45). Female gender, older age, and lower levels of education demonstrated lower adjusted odds of better outcome. Conclusions: Despite an annual decline in mortality, risk-adjusted functional outcomes improved over time, and cases managed at MTS (level-1 trauma centers) demonstrated better functional outcomes. The findings provide early evidence that this inclusive, regionalized trauma system is achieving its aims.
Galvagno, S., Mabry, R., Maddry, J., Kharod, C., Walrath, B., Powell, E., & Shackelford, S. (2018, January). Measuring US Army medical evacuation - Metrics for performance improvement. Journal of Trauma and Acute Care Surgery, 84(1), 150-156.	Background: The US Army medical evacuation (MEDEVAC) community has maintained a reputation for high levels of success in transporting casualties from the point of injury to definitive care. This work served as a demonstration project to advance a model of quality assurance surveillance and medical direction for prehospital MEDEVAC providers within the Joint Trauma System. Methods: A retrospective interrupted time series analysis using prospectively collected data was performed as a process improvement project. Records were reviewed during two distinct periods: 2009 and 2014 to 2015. MEDEVAC records were matched to outcomes data available in the Department of Defense Trauma Registry. Abstracted deidentified data were reviewed for specific outcomes, procedures, and processes of care. Descriptive statistics were applied as appropriate. Results: A total of 1,008 patients were included in this study. Nine quality assurance metrics were assessed. These metrics were: airway management, management of hypoxemia, compliance with a blood transfusion protocol, interventions for hypotensive patients, quality of battlefield analgesia, temperature measurement and interventions, proportion of traumatic brain injury (TBI) patients with hypoxemia and/or hypotension, proportion of traumatic brain injury patients with an appropriate assessment, and proportion of missing data. Overall survival in the subset of patients with outcomes data available in the Department of Defense Trauma Registry was 97.5%. Conclusion: The data analyzed for this study suggest overall high compliance with established tactical combat casualty care guidelines. In the present study, nearly 7% of patients had at least one documented oxygen saturation of less than 90%, and 13% of these patients had no documentation of any intervention for hypoxemia, indicating a need for training focus on airway management for hypoxemia. Advances in battlefield analgesia continued to evolve over the period when data for this study was collected. Given the inherent high-risk, high-acuity nature of prehospital advanced life support and emphasis on the use of nonphysician practitioners in an out-of-hospital setting, the need for ongoing medical oversight and quality improvement assessment is crucial.

Citation	Abstract / Executive summary
Galvagno SM, Thomas S, Stephens C, Haut ER, Hirshon JM, Floccare D, Pronovost P (2013) Helicopter emergency medical services for adults with major trauma (review). www.cochranelibrary.com	Background: Although helicopters are presently an integral part of trauma systems in most developed nations, previous reviews and studies to date have raised questions about which groups of traumatically injured people derive the greatest benefit. Objectives: To determine if helicopter emergency medical services (HEMS) transport, compared with ground emergency medical services (GEMS) transport, is associated with improved morbidity and mortality for adults with major trauma. Search methods: We ran the most recent search on 29 April 2015. We searched the Cochrane Injuries Group's Specialised Register, The Cochrane Library (Cochrane Central Register of Controlled Trials; CENTRAL), MEDLINE (OvidSP), EMBASE Classic + EMBASE (OvidSP), CINAHL Plus (EBSCOhost), four other sources, and clinical trials registers. We screened reference lists. Selection criteria: Eligible trials included randomized controlled trials (RCTs) and nonrandomized intervention studies. We also evaluated nonrandomized studies (NRS), including controlled trials and cohort studies. Each study was required to have a GEMS comparison group. An Injury Severity Score (ISS) of at least 15 or an equivalent marker for injury severity was required. We included adults age 16 years or older. Data collection and analysis: Three review authors independently extracted data and assessed the risk of bias of included studies. We applied the Downs and Black quality assessment tool for NRS. We analyzed the results in a narrative review, and with studies grouped by methodology and injury type. We constructed 'Summary of findings' tables in accordance with the GRADE Working Group criteria. Main results: This review includes 38 studies, of which 34 studies examined survival following transportation by HEMS compared with GEMS for adults with major trauma. Four studies were of inter-facility transfer to a higher level trauma center by HEMS compared with GEMS. All studies were NRS; we found no RCTs. The primary outcome was survival at hospital discharge. We calculated unadjusted mortality using data from 282,258 people from 28 of the 38 studies included in the primary analysis. Overall, there was considerable heterogeneity and we could not determine an accurate estimate of overall effect. Based on the unadjusted mortality data from six trials that focused on traumatic brain injury, there was no decreased risk of death with HEMS. Twenty-one studies used multivariate regression to adjust for confounding. Results varied, some studies found a benefit of HEMS while others did not. Trauma-Related Injury Severity Score (TRISS)-based analysis methods were used in 14 studies; studies showed

Citation	Abstract / Executive summary
	survival benefits in both the HEMS and GEMS groups as compared with MTOS. We found no studies evaluating the secondary outcome, morbidity, as assessed by quality-adjusted life years (QALYs) and disability-adjusted life years (DALYs). Four studies suggested a small to moderate benefit when HEMS was used to transfer people to higher level trauma centers. Road traffic and helicopter crashes are adverse effects which can occur with either method of transport. Data regarding safety were not available in any of the included studies. Overall, the quality of the included studies was very low as assessed by the GRADE Working Group criteria. Authors' conclusions: Due to the methodological weakness of the available literature, and the considerable heterogeneity of effects and study methodologies, we could not determine an accurate composite estimate of the benefit of HEMS. Although some of the 19 multivariate regression studies indicated improved survival associated with HEMS, others did not. This was also the case for the TRISS-based studies. All were subject to a low quality of evidence as assessed by the GRADE Working Group criteria due to their nonrandomized design. The question of which elements of HEMS may be beneficial has not been fully answered. The results from this review provide motivation for future work in this area. This includes an ongoing need for diligent reporting of research methods, which is imperative for transparency and to maximize the potential utility of results. Large, multicenter studies are warranted as these will help produce more robust estimates of treatment effects. Future work in this area should also examine the costs and safety of HEMS, since multiple contextual determinants must be considered when evaluating the effects of HEMS for adults with major trauma.
Garner A et al, Addition Of Physicians To Paramedic Helicopter Services Decreases Blunt Trauma Mortality, Aust. N.Z. J. Surg. (1999) 69, 697–701	Background: The authors hypothesized that the addition of critical care physicians to the flight crew of paramedic helicopter services would decrease mortality in blunt trauma, and that this would be due to the greater procedural capability and clinical judgement of the physician. Methods: Retrospective comparison was undertaken of patients flown directly from the accident scene over a 28-month period by the paramedic-staffed Westpac Hunter region helicopter to John Hunter Hospital, and the physician-staffed NRMA CareFlight helicopter to Westmead or Nepean Hospitals. Inclusion criteria were blunt trauma and an Injury Severity Score of > 10. Mortality was compared by trauma score-injury severity score (TRISS) methodology. Results: There were 140 patients in the paramedic treatment group and 67 in the physician group. There were no significant differences between the groups in age, mechanism of injury, distance transported, response, scene or transport times. Physicians intubated a greater proportion of patients (51 vs 10%; P < 0.001)

Citation	Abstract / Executive summary
	including all patients with a Glasgow Coma Score of < 9. Physicians gave significantly greater volumes of fluids to hypotensive patients (median: 5035 vs 1475 mL: P < 0.001) and performed thoracic decompressions on a larger proportion of patients (12 vs 1%; P < 0.01). The Z statistic for the physician treatment group was 2.72 (P < 0.01) compared with -1.16 (P = 0.25) in the paramedic group. The adjusted W statistic was 13.44 (95% CI: 7.80-19.08) suggesting that there would be between eight and 19 extra survivors per 100 patients treated in the physician group compared with the paramedic group. Conclusions: Physicians perform a greater number of procedures at accident scenes without increasing scene time. This results in significantly lower mortality. Critical care physicians should be added to paramedic helicopter services for scene response to blunt trauma.
Garner A, Lee A, Weatherall A, Langcake M, Balough ZJ (2016) Physician staffed helicopter emergency medical service case identification – a before and after study in children. Scandanavian Journal of Trauma, Resuscitation and Emergency Medicine 24:92 DOI 10.1186/s13049-016-0284-6	Background: Severely injured children may have better outcomes when transported directly to a Paediatric Trauma Centre (PTC). A case identification system using the crew of a physician staffed helicopter emergency medical service (P-HEMS) that identified severely injured children for P-HEMS dispatch was previously associated with high rates of direct transfer. It was theorised that discontinuation of this system may have resulted in deterioration of system performance. Methods: Severe paediatric trauma cases were identified from a state based trauma registry over two time periods. In Period A the P-HEMS case identification system operated in parallel with a paramedic dispatcher (Rapid Launch Trauma Co-ordinator-RLTC) operating from a central control room (n = 71). In Period B the paramedic dispatcher operated in isolation (n = 126). Case identification and direct transfer rates were compared as was time to arrival at the PTC. Results: After cessation of the P-HEMS system the rate of case identification fell from 62 to 31 % (P < 0.001), identification of fatal cases fell from 100 to 47 % (P < 0.001), the rate of direct transfer to a PTC fell from 66 to 53 % (P = 0.076) and the time to arrival in a PTC increased from a median 69 (interquartile range 52 - 104) mins to 97 (interquartile range 56 - 305) mins (P = 0.003). When analysing the rate of direct transfer to a PTC as a function of team composition, after adjusting for age and injury severity scores, there was no change in the rate between the physician and paramedic groups across the two time periods (relative risk 0.92, 95 % CI: 0.44 to 1.41). Discussion: The parallel identification system improves case identification rates and decreases time to arrival at the PTC, whilst requiring RLTC authorisation preserves the safety and efficiency benefits of centralised dispatch. The model could be extended to adult patients with similar benefits.

Citation	Abstract / Executive summary
	Conclusions: A case identification system relying solely on RLTC paramedics resulted in a significantly lower case identification rate and increased prehospital time with a non-significant fall in direct transfer rate to the PTC. The elimination of the P-HEMS input from the tasking system resulted in worse performance indicators and has the potential for poorer outcomes. Keywords: Dispatch; HEMS; Paediatric; Physician; Prehospital; Trauma.
Garner A. The role of physician staffing of helicopter emergency medical services in prehospital trauma response. Emerg. Med. Australas. 2004; 16: 318–23.	The crewing of Helicopter Emergency Medical Service (HEMS) for scene response to trauma patients is generally considered to be controversial, particularly regarding the role of physicians. This is reflected in HEMS in Australia with some services utilizing physician crewing for all prehospital missions. Others however, use physicians for selected missions only whilst others do not use physicians at all. This review seeks to determine whether the literature supports using physicians in addition to paramedics in HEMS teams for prehospital trauma care. Studies were excluded if they compared physician teams with basic life support teams (BLS) teams rather than paramedics. Ambulance officers were considered to be paramedics where they were able to administer intravenous fluids and use a method of airway management beyond bag-valve-mask ventilation. Studies were excluded if the skill set of the ambulance team was not defined, the level of staffing of the helicopter service was not stated, team composition varied without reporting outcomes for each team type, patient outcome data were not reported, or the majority of the transports were interhospital rather than prehospital transports.
Garner AA, Mann KP, Fearnside M, Poynter E, Gebski V (2015) The Head Injury Retrieval Trial (HIRT): a single-center randomised controlled trial of physician prehospital management of severe blunt head injury compared with management by paramedics only. Emergency Medical Journal 32: 869-875	Background: Advanced prehospital interventions for severe brain injury remains controversial. No previous randomised trial has been conducted to evaluate additional physician intervention compared with paramedic only care. Methods: Participants in this prospective, randomised controlled trial were adult patients with blunt trauma with either a scene GCS score <9 (original definition), or GCS<13 and an Abbreviated Injury Scale score for the head region ≥3 (modified definition). Patients were randomised to either standard ground paramedic treatment or standard treatment plus a physician arriving by helicopter. Patients were evaluated by 30-day mortality and 6-month Glasgow Outcome Scale (GOS) scores. Due to high non-compliance rates, both intention-to-treat and as-treated analyses were preplanned.

Citation	Abstract / Executive summary
	Results: 375 patients met the original definition, of which 197 was allocated to physician care. Differences in the 6-month GOS scores were not significant on intention-to-treat analysis (OR 1.11, 95% CI 0.74 to 1.66, p=0.62) nor was the 30-day mortality (OR 0.91, 95% CI 0.60 to 1.38, p=0.66). As-treated analysis showed a 16% reduction in 30-day mortality in those receiving additional physician care; 60/195 (29%) versus 81/180 (45%), p<0.01, Number needed to treat =6. 338 patients met the modified definition, of which 182 were allocated to physician care. The 6-month GOS scores were not significantly different on intention-to-treat analysis (OR 1.14, 95% CI 0.73 to 1.75, p=0.56) nor was the 30-day mortality (OR 1.05, 95% CI 0.66 to 1.66, p=0.84). As-treated analyses were also not significantly different. Conclusions: This trial suggests a potential mortality reduction in patients with blunt trauma with GCS<9 receiving additional physician care (original definition only). Confirmatory studies which also address non-compliance issues are needed. Trial registration number: NCT00112398. Keywords: Trauma, head; comparitive system research; emergency ambulance systems, effectiveness; prehospital care, doctors in PHC; prehospital care, helicopter retrieval.
Garwood J et al. / Air Medical Journal 39 (2020) 35–43 Air Ambulance and Emergency Retrieval Services in Western Australia: Caseload Analysis Over 5 Years Air Med J, Jan-Feb 2020;39(1):35-43.	Objective: The Royal Flying Doctor Service Western Operations (RFDSWO) provides critical care transfer and retrieval services across 2.5 million km2 to a population of 2.58 million people, providing both primary and secondary retrievals across Western Australia. Flying on average 26 million km/y, retrievals are undertaken with the use of rotary and fixed wing aircraft. Our current fleet includes 16 Pilatus PC-12NGs turboprops, 2 Pilatus PC-24 jets, and access to 1 helicopter (Bell 412). A Hawker XP800 Jet was retired in 2019 after 10 years of service. Our retrieval teams are formed of either a doctor and a nurse or a nurse only on fixed wing missions and a doctor and critical care paramedic for helicopter emergency medical services missions. We present our experiences and caseload statistics over the past 5 years. Methods: We performed an analysis of our retrieval database looking at the workload from January 1, 2012, to December 31, 2016. This included the number of patients, age, ethnicity, type of retrieval, priority, diagnosis, and distances covered.

Citation	Abstract / Executive summary
	Results: Forty-three thousand forty-one patients underwent Royal Flying Doctor Service air transfer over a 5-year period. Aboriginal patients comprise around 3.1% of the Western Australian population but accounted for 33% of RFDSWO retrieval missions. There was a mean transfer rate of 8,608 patients per year, which was relatively consistent across the study period. The modal age was 55 to 59 years, but Aboriginal patients were younger with a mean age of 36.5 years (Aboriginal) versus 49.7 years (non-Aboriginal). The types of retrieval undertaken were as follows: primary (17.3%), secondary (81%), and repatriation (1.7%). The urgency/priority of missions was as follows: immediate (7.3%), urgent (54.5%), and semiurgent (38.1%). The 3 most common diagnosis (International Statistical Classification of Diseases, 10th Revision) categories were trauma/ injury (22.9%), cardiovascular (22.3%), and gastrointestinal (10.5%). The modal distance flown was 700 km per mission. Conclusion: RFDSWO has 1 of the largest retrieval workloads in the world, covering a landmass comparable with Western Europe. This brings with it a variety of challenging cases and complex logistics, often in extremely harsh and remote environments. We bring a wide breadth of experience in the area of retrieval medicine, and our aim is to share these experiences with other teams.
Glasheen J, Hooper J, Donohue A, Finn E, Murray-Smith B, Bolot R, Edwards M (2020) Successful Endotracheal Intubation following a failed first attempt during aeromedical retrieval. Emergency Medicine Journal 37(5): 314-318	Introduction: First attempt intubation success is used by many prehospital services as a marker of quality and safety. An increasing complication rate is associated with repeated intubation attempts. The aim of this study was to identify changes to intubation technique following a failed intubation attempt. Methods: LifeFlight Retrieval Medicine provides aeromedical retrieval services in Queensland, Australia. This retrospective study identified cases of failed intubation attempts from an electronic database registry over a 41-month period from March 2015 to July 2018. These data were analysed using descriptive statistics. Results: Of the 762 patients who required intubation 758 (99.5%) were successfully intubated, with 684 intubated at the first attempt (89.8%; 95% CI: 0.87 to 0.92). There was no difference in first attempt success between direct and video laryngoscopy (511/563 (90.8%) vs 172/194 (88.6%) p=0.38), trauma or medical (374/419 (89.3%) vs 310/343 (90.4%), p=0.61), primary or interhospital missions (329/370 (88.7%) vs 355/392 (90.8%), p=0.33). 78 cases of failed first attempt intubations were identified. In 65 of these cases, intubation was successful at the second attempt. A single change was made to the intubation procedure prior to a second successful attempt in 28/78 cases (35.9%), and more than one change was made in 41/78 (52.6%). The changes included the operator, intubation device, patient position, intubating aid and external laryngeal manipulation.

Citation	Abstract / Executive summary
	No change between attempts was recorded in 9/78 (11.5%). 9 cases were successfully intubated at the third attempt, and changes prior to the third attempt included operator, device and intubating aid. Conclusion: Although a high overall intubation success was found, one in ten patients who were intubated had a failed first attempt. The majority of successful subsequent attempts were preceded by at least one change to intubating technique. Intubating clinicians need the ability to identify and correct issues leading to a failed first attempt. Keywords: airway; critical care transport; prehospital care, helicopter retrieval.
Government of Western Australia, Department of Health: WA Health Clinical Services Framework 2014–2024 (and Addendum 2020).	The WA Health Clinical Services Framework (CSF) continues to be the principal, government endorsed clinical service planning document for Western Australia's public health system. The CSF is designed to describe medium to long-term horizons and the strategic parameters that can be used by individual health services, hospitals and non-hospital service providers to inform and guide their individual clinical service/s plans.. In contrast to previous iterations of this service framework, CSF 2014 is more explicit in acknowledging the importance of disease prevention and control measures and providing care in the most appropriate place in any forward planning. To reflect the increasing importance of non-hospital services provided in the community, a major revision and expansion of the previous Non-Hospital Matrix has resulted in the inclusion of a Community and Integrated Services Matrix. In this suite of services as in all services provided in hospital, the CSF 2014 configuration continues to be underpinned by considerations of safety and quality in responding to the significant growth in demand.
Grier S, Brant G, Gould TH, von Vopelius-Feldt J, Thompson J. Critical care transfer in an English critical care network: Analysis of 1,124 transfers delivered by an ad-hoc system. Journal of the Intensive Care Society (2019) https://doi.org/10.1177/1751143719832175	Background: Critical care transfers between hospitals are time critical high-risk episodes for unstable patients who often require urgent lifesaving intervention. This study aimed to establish the scale, nature and safety of current transfer practice in the South West Critical Care Network (SWCCN) in England. Methods: The SWCCN database contains prospectively collected data in accordance with national guidelines. It was interrogated for all adult (>15 years of age) patients from January 2012 to November 2017. Results: A total of 1124 inter-hospital transfers were recorded, with the majority (935, 83.2%) made for specialist treatment. The transferring team included a doctor in 998 (88.8%) and nurse in 935 (93.7%) transfers. In 204 (18.1%) transfers, delays occurred, with the commonest cause being availability of transport. Critical incidents occurred in 77 (6.9%).

Citation	Abstract / Executive summary
	Conclusions: This is the first published data on the transfer activity of a UK adult critical care network. It demonstrates that current ad-hoc provision is not meeting the longstanding expectations of national guidelines in terms of training, clinical experience and timeliness. The authors hope that this study may inform national conversation regarding the development of National Health Service commissioned inter-hospital transfer services for adult patients in England. Keywords: Critical care; inter-hospital transfer; patient transfer; retrieval; transportation of patients.
Gunning M, Perkins Z, Crilly J, von Rahden R (2013) Paramedic rapid sequence induction (RSI) in a South African emergency medical service: a retrospective observational study. South African Medical Journal 103(9): 632-637	Background: Early access to critical care interventions may improve outcomes for severely ill and injured patients. South Africa (SA) faces the unique challenges of prolonged pre-hospital times and limited access to physicians. In 2008, the Health Professions Council of SA introduced paramedic rapid sequence induction (RSI), the gold standard critical care intervention for emergency airway management; however, the risk to benefit ratio in this context is unclear. Objective: We conducted a pilot study to identify if paramedic RSI in the SA pre-hospital care setting is effective and safe. Methods: We undertook a retrospective observational study of paramedic RSI performed by an emergency medical service, between 12 December 2009 and 12 December 2011. Results: Eighty-six RSIs were performed during the study period. No failed intubations were reported. Heart rate was significantly reduced from a median baseline value of 112 to 90 bpm, and oxygen saturations improved from 92% to 99% at handover following RSI. Nineteen patients (22%), however, had an adverse event (AE). Female patients (odds ratio (OR) 18.3; 95% confidence interval (CI) 3.46 - 99.38; p=0.001) and patients subsequently transported by helicopter (OR 7.24; 95% CI 1.44 - 36.32; p=0.016) remained independently associated with AEs after adjusting for confounders. Conclusions: RSI performed by specially trained paramedics is effective in terms of self-reported success. However, the 1 in 5 AE rate highlights safety concerns. The importance of a robust clinical governance programme to identify problems, refine practice and improve the quality of care is underscored.
Hankins DG, Air Medical Transport Of Trauma Patients Prehospital Emergency Care 2006;10:324–327	This report reviews the current status of air medical transportation of trauma patients. Aspects reviewed include patient care, dispatch, safety, and possible future directions in air medical patient care.

Citation	Abstract / Executive summary
Hannon L, St Clair T, Smith K, Fitzgerald M, Mitra B, Olaussen A, Moloney J, Braitberg G, Judson R, Teague W, Quinn N, Kim Y, Bernard S (2020) Finger thorocostomy in patients with chest trauma perfoemd by paramedics on a helicopter emergency medical service. Emergency Medicine Australasia 32: 650-656	Objective: To determine the frequency of finger thoracostomy performed by intensive care flight paramedics after the introduction of a training programme in this procedure and complications of the procedure that were diagnosed after hospital arrival. Methods: This was a retrospective cohort study of adult and paediatric trauma patients undergoing finger thoracostomy performed by paramedics on a helicopter emergency medical service between June 2015 and May 2018. Hospital data were obtained through a manual search of the medical records at each of the three receiving major trauma services. Additional data were sourced from the Victorian State Trauma Registry. Results: The final analysis included 103 cases, of which 73.8% underwent bilateral procedures with a total of 179 finger thoracostomies performed. The mean age of patients was 42.8 (standard deviation 21.4) years and 73.8% were male. Motor vehicle collision was the most common mechanism of injury accounting for 54.4% of cases. The median Injury Severity Score was 41 (interquartile range 29-54). There were 30 patients who died pre-hospital, with most (n = 25) having finger thoracostomy performed in the setting of a traumatic cardiac arrest. A supine chest X-ray was performed prior to intercostal catheter insertion in 38 of 73 patients arriving at hospital; of these, none demonstrated a tension pneumothorax. There were three cases of potential complications related to the finger thoracostomy. Conclusion: Finger thoracostomy was frequently performed by intensive care flight paramedics. It was associated with a low rate of major complications and given the deficiencies of needle thoracostomy, should be the preferred approach for chest decompression. Keywords: air ambulance; helicopter emergency medical service; paramedics; thoracostomy.
Haugland H, Uleberg O, Klepstad P, Kruger A, Rehn M (2019) Quality measurement in physician-staffed emergency medical services: a systematic literature review. International Journal for Quality in Health Care 31(1): 2-10	Purpose: Quality measurement of physician-staffed emergency medical services (P-EMS) is necessary to improve service quality. Knowledge and consensus on this topic are scarce, making quality measurement of P-EMS a high-priority research area. The aim of this review was to identify, describe and evaluate studies of quality measurement in P-EMS. Data sources: The databases of MEDLINE and Embase were searched initially, followed by a search for included article citations in Scopus. Study selection: The study eligibility criteria were: (1) articles describing the use of one quality indicator (QI) or more in P-EMS, (2) original manuscripts, (3) articles published from 1 January 1968 until

Citation	Abstract / Executive summary
	5 October 2016. The literature search identified 4699 records. 4543 were excluded after reviewing title and abstract. An additional 129 were excluded based on a full-text review. The remaining 27 papers were included in the analysis. Methodological quality was assessed using an adapted critical appraisal tool. Data extraction: The description of used QIs and methods of quality measurement was extracted. Variables describing the involved P-EMSs were extracted as well. Results of data synthesis: In the included papers, a common understanding of which QIs to use in P-EMS did not exist. Fifteen papers used only a single QI. The most widely used QIs were 'Adherence to medical protocols', 'Provision of advanced interventions', 'Response time' and 'Adverse events'. Conclusion: The review demonstrated a lack of shared understanding of which QIs to use in P-EMS. Moreover, papers using only one QI dominated the literature, thus increasing the risk of a narrow perspective in quality measurement. Future quality measurement in P-EMS should rely on a set of consensus-based QIs, ensuring a comprehensive approach to quality measurement.
Haxby E, Hunter D, Jaggar S, eds. An Introduction to Clinical Governance and Patient Safety. Oxford; New York: Oxford University Press, 2010.	Clinical governance is integral to healthcare and all doctors must have an understanding of both basic principles, and how to apply them in daily practice. Within the Clinical Governance framework, patient safety is the top priority for all healthcare organizations, with the prevention of avoidable harm a key goal. Traditionally, medical training has concentrated on the acquisition of knowledge and skills related to diagnostic intervention and therapeutic procedures. The need to focus on non-technical aspects of clinical practice, including communication and team working, is now evident; ensuring tomorrow's staff are competent to function effectively in any healthcare facility. This book provides a guide to how healthcare systems work; their structure, regulation and inspection, and key areas including risk management, resource effectiveness, and wider aspects of knowledge management. This book presents a simple overview of clinical governance in context, highlighting important principles required to function effectively in a pressurized healthcare environment. It is presented in short sections based on the original seven pillars of clinical governance. These have been expanded to include the fundamental principles of systems, team working, leadership, accountability, and ownership in healthcare, with examples from everyday practice. Examples from all branches of medicine are presented to facilitate understanding.

Citation	Abstract / Executive summary
Heschl S, Andrew E, deWit A, Bernard S, Kennedy M, Smith K (2017) Prehospital transfusion of red-cell concentrates in a paramedic-staffed helicopter emergency medical service. Emergency Medicine Australasia, DOI: 10.1111/1742-6723.12910	Objective: The optimal volume and type of intravenous fluid for the treatment of blood loss in the prehospital setting is controversial. The use of red cell concentrates (RCCs) may be associated with improved outcomes; however, the administration of blood products is limited to physicians in many jurisdictions. We sought to describe the characteristics of RCC transfusions in a paramedic-staffed helicopter emergency medical system in Victoria, Australia. Methods: We performed a retrospective analysis of all cases where paramedics consulted the responsible physician for approval of RCC transfusion between July 2011 and December 2015 in Victoria, Australia. Ambulance data was retrieved from electronic patient care records and hospital and outcome data was retrieved from a state-wide trauma registry. Results: A total of 180 primary missions was identified where paramedics requested approval for transfusion of RCCs during the study period. A total of 150 patients received prehospital RCCs, of which 136 had suffered trauma. The majority of these patients were male (66.7%) and were involved in a car accident (62.5%). Most (97.4%) patients had an Injury Severity Score ≥12. There were improvements in median systolic blood pressure (80 mmHg vs 94 mmHg, P < 0.001) and shock index (1.50 vs 1.23, P < 0.001) between time of consultation and arrival at hospital. Overall, mortality for trauma patients was 37.7%. There were no transfusion-related complications identified. Conclusion: Prehospital transfusion of RCC by paramedics is feasible. Future studies should compare the outcomes of patients receiving prehospital RCCs with outcomes for patients in which RCCs are administered in hospital. Keywords: helicopter ambulances; paramedics; red blood cell transfusion.
High K, Brywczynski J, Guillamondegui O (2016) Safety and efficacy of Thoracostomy in the Air Medical Environment. Air Medical Journal 35: 227-230	Objective: The use of thoracostomy to treat tension pneumothorax is a core skill for prehospital providers. Tension pneumothoraces are potentially lethal and are often encountered in the prehospital environment. Methods: The authors reviewed the prehospital electronic medical records of patients who had undergone finger thoracostomy (FT) or tube thoracostomy (TT) while under the care of air medical crewmembers. Demographic data were obtained along with survival and complications.

Citation	Abstract / Executive summary
	Results: During the 90-month data period, 250 patients (18 years of age or older) underwent FT/TT, with a total of 421 procedures performed. The mean age of patients was 44.8 years, with 78.4% being male and 21.6% being female; 98.4% of patients had traumatic injuries. Cardiopulmonary resuscitation was required in 65.2% of patients undergoing FT/TT; 34.8% did not require cardiopulmonary resuscitation. Thirty percent of patients exhibited clinical improvement such as increasing systolic blood pressure, oxygen saturation, improved lung compliance, or a release of blood or air under tension. Patients who experienced complications such as tube dislodgement or empyema made up 3.4% of the cohort. Conclusion: The results of this study suggest that flight crews can use FT/TT in their practice on patients with actual or potential pneumothoraces with limited complications and generate clinical improvement in a subset of patients.
Hill A et al, Interhospital transfer of critically ill patients: Demographic and outcomes comparison with nontransferred intensive care unit patients, Journal of Critical Care (2007) 22, 290–295	Purpose: We examined the association between access to intensive care services and mortality in a cohort of critically ill patients. Materials and methods: We conducted an observational study involving 6298 consecutive admissions to the intensive care units (ICUs) of a tertiary care hospital. Data including demographics, admission source, and outcomes were collected on all patients. Admission source was classified as “transfer” for patients admitted to the ICU from other hospitals, “ER” for patients admitted from the emergency room, and “ward” for patients admitted from non-ICU inpatient wards. Results: Transfer patients had higher crude ICU and hospital mortality rates compared with emergency room admissions (crude odds ratio [OR], 1.51; 95% confidence interval [CI], 1.32-1.75). After adjusting for age, sex, diagnosis, comorbidities, and acute physiology scores, the difference in ICU mortality remained significant (OR, 1.30; 95% CI, 1.09-1.56); however, hospital mortality did not (OR, 1.19; 95% CI, 1.00-1.41). Compared with ward patients, transfer from other hospitals was associated with lower hospital mortality after adjusting for severity of illness and other case-mix variables (OR, 0.81; 95% CI, 0.68-0.95). Conclusions: We found some evidence to suggest that differential access to intensive care services impacts mortality within this case mix of patients. These findings may have implications for current efforts to centralize and regionalize critical care services.

Citation	Abstract / Executive summary
Hill AD, Fowler RA, Nathens AB. Impact of interhospital transfer on outcomes for trauma patients: a systematic review. J Trauma 2011;71:1885–900.	Background: Evidence suggests that there may be an association between transfer status (direct admission or interhospital transfer) and outcomes in trauma patients. The purpose of this study was to systematically review the current evidence of the association between transfer status and outcomes for patients. Methods: Systematic search of Medline and EMBASE databases to identify eligible control trials or observational studies that examined the impact of transfer status on trauma patient outcomes. Data were extracted on study design, quality, participants, outcomes, and risk estimates reported. Pooled odds ratio based on data from retrieved studies was calculated using a random effect model. Results: Thirty-six observational studies were identified. There were no significant differences in length of stay (LOS) between transfer and direct admissions although costs were marginally higher for transferred patients, (relative increase, 1.09; 95% confidence interval, 1.08-1.09). We found no significant association between transfer status (transfer vs. direct) and in-hospital mortality (pooled odds ratio, 1.06; 95% confidence interval, 0.90-1.25); however, heterogeneity of the studies was high (I2 = 82%). Conclusion: Available evidence suggests there is no difference in mortality between transfer and direct admissions. However, the significant heterogeneity across studies precludes deriving any definitive conclusions regarding the impact of interhospital transfer on mortality after major trauma. Moreover, most studies excluded patients dying at outlying hospitals, which may underestimate the association of transfer status with mortality. Prospective studies that address the limitations of the current evidence, including use of population-based trauma registries, are warranted to establish whether the process of interhospital transfer to higher level care when compared with direct admission to a trauma center negatively impacts clinical outcomes for trauma patients.

Citation	Abstract / Executive summary
Holland SR, Apodaca A, Mabry RL (2013) MEDEVAC: Survival and physiological parameters improved with higher level Flight Medic training. Military Medicine 178(5): 529-536	Objective: Determine if a higher level of Army flight medic (AFM) training was associated with improved physiological state on arrival to a combat support hospital (CSH). Methods: A retrospective study comparing casualties who were evacuated by two AFM units with only Emergency Medical Technicians-Basic (EMT-Bs) to an Army National Guard unit with Critical Care Flight Paramedics (CCFPs) in Afghanistan with an injury severity score >16 in different time periods looking at their 48-hour mortality, hematocrit (HCT), base deficit (BD), oxygen saturation (SpO2), and physiological parameters on arrival to the CSH. Results: The CCFP group had better HCT [36.5 (8.8)] than the EMT-B group [33.1 (11.4); p ≤ 0.001]. BD and SpO2 were better in the CCFP group [-3.2 (4.7)]/[97.8 (4.8)] than the EMT-B group [-4.4 (5.5)]/[96.3 (10.9)] [p ≤ 0.014]. The CCFP group had a 72% lower estimated risk ratio of mortality with an associated improvement in 48-hour survivability of 4.9% versus 15.8% for the EMT-B-group. Conclusions: There is a statistically significant improvement in the HCT, BD, SpO2, and 48-hour survivability at the CSH in the cohort transported by the CCFP group when compared to the cohort transported by the EMT-B group.
Intensive Care Society. Levels of critical care for adult patients. Intensive Care Society.London, UK 2009	This document is a consensus statement which sets out to re-define 'Levels of Adult Critical Care' to reflect the modern delivery of critical care and the changing demands upon it. Levels of Adult Critical Care Second Edition, as in the original guidance, describes the care a patient requires, not where they are receiving it, nor does it measure the actual care being delivered. It does not recommend any changes in staffing ratios, until such time that appropriate critical care staffing tools and evidence base are available, and we support the continued research in this area. It merges the pre-existing level 0 and level 1 into ward care. This frees up 'level 1' of critical care to represent the emerging Enhanced Care, with Level 2 and 3 remaining. Level 2 and 3 have subtle changes to reflect the current picture of critical care, in particular the addition of delirium. Many of these changes may seem subtle, but they reflect current practice. These changes also signal a move towards a changing landscape with Intensive Care 2020 and Beyond[1] which considers our shared vision of the future of critical care, the development of Enhanced Care2 and the ongoing staffing ratio research. 1. Background to 'Levels of Critical Care for Adult Patients' (2009) In 2009, the Intensive Care Society (ICS) published 'Levels of Critical Care for Adult Patients'.3 The document aimed to help identify those ward patients who may benefit from higher staffing ratios than were available on wards, immediate access to senior clinical decision-makers and organ support. It described varying levels of such care of hospitalised critically ill patients, and the interventions associated with each.

Citation	Abstract / Executive summary
Iwashyna T, The incomplete infrastructure for interhospital patient transfer, Crit Care Med 2012 Vol. 40, No. 8	Objective: Interhospital transfer of critically ill patients is a common part of their care. This article sought to review the data on the current patterns of use of interhospital transfer and identify systematic barriers to optimal integration of transfer as a mechanism for improving patient outcomes and value of care. Data source: Narrative review of medical and organizational literature. Summary: Interhospital transfer of patients is common, but not optimized to improve patient outcomes. Although there is a wide variability in quality among hospitals of nominally the same capability, patients are not consistently transferred to the highest quality nearby hospital. Instead, transfer destinations are selected by organizational routines or non-patient-centered organizational priorities. Accomplishing a transfer is often quite difficult for sending hospitals. But once a transfer destination is successfully found, the mechanics of interhospital transfer now appear quite safe. Conclusion: Important technological advances now make it possible to identify nearby hospitals best able to help critically ill patients, and to successfully transfer patients to those hospitals. However, organizational structures have not yet developed to insure that patients are optimally routed, resulting in potentially significant excess mortality.
Jones A, Donald MJ, Jansen JO Evaluation of the provision of helicopter emergency medical services in Europe. Emergency Medicine Journal 2018;35:720-725.	Background: Helicopter emergency medical services (HEMS) are a useful means of reducing inequity of access to specialist emergency care. The aim of this study was to evaluate the variations in HEMS provision across Europe, in order to inform the further development of emergency care systems. Methods: This is a survey of primary HEMS in the 32 countries of the European Economic Area and Switzerland. Information was gathered through internet searches (May to September 2016), and by emailing service providers, requesting verification and completion of data (September 2016 to July 2017). HEMS provision was calculated as helicopters per million population and per 1000 km2 land area, by day and by night, and per US$10 billion of gross domestic product (GDP), for each country. Results: In 2016, the smallest and least prosperous countries had no dedicated HEMS provision. Luxembourg had the highest number of helicopters by area and population, day and night. Alpine countries had high daytime HEMS coverage and Scandinavia had good night-time coverage. Most helicopters carried a doctor. Funding of services varied from public to charitable and private. Most services performed both primary (from the scene) and secondary (interfacility) missions.

Citation	Abstract / Executive summary
	Conclusions: Within Europe, there is a large variation in the number of helicopters available for emergency care, regardless of whether assessed with reference to population, land area or GDP. Funding of services varied, and did not seem to be clearly related to the availability of HEMS. Keywords: emergency care systems; global health; prehospital care, doctors in PHC; prehospital care, helicopter retrieval; trauma, majot trauma management.
Jurkovich GJ, Mock C. Systematic review of trauma system effectiveness based on registry comparisons. J Trauma 1999;47(3 Suppl):S46–55.	Background: Trauma registries offer distinct advantages and disadvantages when assessing the effectiveness of trauma systems. Detailed injury data and statistical comparisons that use TRISS methodology and the Major Trauma Outcome Study norms provide advantages over population-based or preventable death studies. However, miscodings and registry differences in injury severity coding limit the validity and generalizability of findings. The purpose of this study was to identify these strengths and weaknesses and to determine whether registry studies provide evidence of trauma system efficacy. Methods: A systematic review of published literature assessing trauma systems effectiveness by using registry-based data. Results: Eight of 11 articles reviewed provided comparable data and consistently demonstrated a 15 to 20% reduction in the risk of death comparing trauma system outcomes to Major Trauma Outcome Study norms. Conclusion: These studies provide evidence of the effectiveness of trauma systems. However, future studies that use trauma registries would be strengthened by including both prehospital and postdischarge trauma deaths, standardizing trauma registry inclusion criteria and developing a contemporary national reference norm for trauma outcome.
Kennedy M, Elcock M, Ellis D, Tall G (2017) Pre-hospital retrieval medicine: clinical governance and workforce models. Emergency Medicine Australasia 29: 467-469	Pre-hospital and retrieval medicine (PHARM) has developed significantly in the past decade. This perspective article proposes that PHARM should develop with a clear focus on contemporary health governance principles, and that its workforce and models of care adopt modern interdisciplinary approaches. Many of the older systems of managing clinical standards, and outdated cultural approaches to professional 'turf', workforce and scope of practice have little place in high-performance organisations. This paper calls us to attention with a recommendation that best and safest systems of care, structured to optimise patient outcomes and system performance should be our goal. Keywords: clinical governance; pre-hospital; retrieval; workforce.

Citation	Abstract / Executive summary
Kennedy M, Gabbe B, McKenzie B. Impact of the introduction of an integrated adult retrieval service on major trauma outcomes. Emergency Medicine Journal. 2015;32(11):833-839.	Objectives The primary aim of this study was to examine the impact of the introduction of an integrated adult critical care patient retrieval system in Victoria, Australia, on early clinical outcomes for major trauma patients who undergo interhospital transfer. The secondary aims were to examine the impact on quality and process measures for interhospital transfers in this population, and on longer-term patient-reported outcomes. Methods This is a cohort study using data contained in the Victorian State Trauma Registry (VSTR) for major trauma patients >18 years of age between 2009 and 2013 who had undergone interhospital transfer. For eligible patients, data items were extracted from the VSTR for analysis: demographics, injury details, hospital details, transfer details, Adult Retrieval Victoria (ARV) coordination indicator and transfer indicator, key clinical observations and outcomes. Results There were 3009 major trauma interhospital transfers in the state with a transfer time less than 24 h. ARV was contacted for 1174 (39.0%) transfers. ARVcoordinated metropolitan transfers demonstrated lower adjusted odds of inhospital mortality compared with metropolitan transfers occurring without ARV coordination (OR 0.39, 0.15 to 0.97). Adjusting for destination hospital type demonstrates that this impact was principally due to ARV facilitation of a Major Trauma Service as the destination for transferred patients (OR 0.41, 0.16 to 1.02). The median time spent at the referral hospital was lower for ARV-coordinated transfers (5.4 h (3.8 to 7.5) vs 6.1 (4.2 to 9.2), p
Kennedy MP. Retrieval medicine. In: Cameron P, Jelinek G, Kelly A, et al, eds. Textbook of adult emergency medicine. Sydney: Churchill Livingstone, 2014:846–51.	Mature retrieval systems act as a single point of entry for the referrer, preferably providing services by initiation of a single call to a systemwide phone number. 2 Retrieved patients are often unstable, at the margin of physiological compensation, and in need of specialized investigation and intervention. They are often at that phase of an emergency presentation where diagnosis is incomplete, treatment is problem-focused and risk is high. This setting therefore requires special expertise, risk-averse processes, and fail-safe systems characterized by anticipation, redundancy, rapid response and reliability. 3 The retrieval environment poses particular risk, and technical training regarding platforms, procedures, relevant legislation, communication methods, rescue and escape procedures and equipment performance characteristics is needed. 4 Retrieval crew members must be trained to critical care standard. The skill set they provide must meet the clinical needs of the patient. 5 It is likely that the most complex patients receiving the highest levels of support are also the most likely to be exposed to in-transit critical incidents or equipment failure. Clinical practice in this setting requires the anticipation of such events, vigilance to detect them, and rehearsed and standardized problem-solving algorithms to rectify them.

Citation	Abstract / Executive summary
King J, Franklin RC, Robertson A, Aitken P, Elcock MS, Gibbs C, Lawton L, Mazur SM, Edwards KH, Leggat P (2010) Review article: primary aeromedical retrievals in Australia: an interrogation and search for context. Emergency Medicine Australasia 31: 916-929	Primary aeromedical retrievals are a direct scene response to patients with a critical injury or illness using a medically equipped aircraft. They are often high-acuity taskings. In Australia, information on primary retrieval taskings is housed by service providers, of which there are many across the country. This exploratory literature review aims to explore the contemporary peer-reviewed literature on primary aeromedical retrievals in Australia. The focus is on adult primary aeromedical retrievals undertaken in Australia and clinical tools used in this pre-hospital setting. Included articles were reviewed for research theme (clinical and equipment, systems and/or outcomes), data coverage and appraisal of the evidence. Of the 37 articles included, majority explored helicopter retrievals (n = 32), retrieval systems (n = 21), compared outcomes within a service (n = 10) and explored retrievals in the state of New South Wales (n = 19). Major topics of focus included retrieval of trauma patients and airway management. Overall, the publications had a lower strength of evidence because of the preponderance of cross-sectional and case-study methodology. This review provides some preliminary but piecemeal insight into primary retrievals in Australia through a localised systems lens. However, there are several areas for research action and service outcome improvements suggested, all of which would be facilitated through the creation of a national pre-hospital and retrieval registry. The creation of a registry would enable consideration of the frequency and context of retrievals, comparison across services, more sophisticated data interrogation. Most importantly, it can lead to service and pre-hospital and retrieval system strengthening. Keywords: advanced trauma life support care; helicopter ambulances; pre-hospital emergency care; transportation of patients.
Langdalen H, Abrahamsen EB, Sollid SJM, Sorskar LIK, Anrahamsen AB (2018) A comparative study of the frequency of simulation-based training and assessment of non-technical skills in the Norwegian Ground Ambulance Services and Helicopter Emergency Medical Services. BMC Health Services Research 18(1): 509 DOI:10.1186/s12913-018-3325-1	Background: Inadequate non-technical skills (NTSs) among employees in the Norwegian prehospital emergency medical services (EMSs) are a risk for patient and operational safety. Simulation-based training and assessment is promising with respect to improving NTSs. The frequency of simulation-based training in and assessment of NTSs among crewmembers in the Norwegian helicopter emergency medical service (HEMS) has gained increased attention over recent years, whereas there has been much less focus on the Norwegian ground emergency medical service (GEMS). The aim of the study was to compare and document the frequencies of simulation-based training in and assessment of seven NTSs between the Norwegian HEMS and GEMS, conditional on workplace and occupation.

Citation	Abstract / Executive summary
	Method: A comparative study of the results from cross-sectional questionnaires responded to by employees in the Norwegian prehospital EMSs in 2016 regarding training in and assessment of NTSs during 2015, with a focus on the Norwegian GEMS and HEMS. Professional groups of interest are: pilots, HEMS crew members (HCMs), physicians, paramedics, emergency medical technicians (EMTs), EMT apprentices, nurses and nurses with an EMT licence. Results: The frequency of simulation-based training in and assessment of seven generic NTSs was statistically significantly greater for HEMS than for GEMS during 2015. Compared with pilots and HCMs, other health care providers in GEMS and HEMS undergo statistically significantly less frequent simulation-based training in and assessment of NTSs. Physicians working in the HEMS appear to be undergoing training and assessment more frequently than the rest of the health trust employees. The study indicates a tendency for lesser focus on the assessment of NTSs compared to simulation-based training. Conclusion: HEMS has become superior to GEMS, in terms of frequency of training in and assessment of NTSs. The low frequency of training in and assessment of NTSs in GEMS suggests that there is a great potential to learn from HEMS and to strengthen the focus on NTSs. Increased frequency of assessment of NTSs in both HEMS and GEMS is called for. Keywords: Ambulance; Assessment; Emergency medical service; Helicopter; Learning; Non-technical skills; Simulation-based training.
Langford SA. The first medical jet aircraft for the Royal Flying Doctor Service. Med J Aust. 2009;191:609–610.	The Royal Flying Doctor Service (RFDS) has provided aerial emergency services to patients in the remote Kimberley and Pilbara regions of Western Australia since 1935. Until the 1980s, most evacuations were regional, and only small numbers of patients were transferred to Perth. Demand for long-distance transfers from northern WA has increased as a result of economic growth, improved resuscitation of the seriously ill, advances in treatment only available in major cities, and community expectations of more equitable access to tertiary care.

Citation	Abstract / Executive summary
Lansink KW, Leenen LP. Do designated trauma systems improve outcome? Curr Opin Crit Care 2007;13:686–90.	Purpose of review: Trauma systems are introduced world wide with the goal to improve survival and outcome of the injured patient. This review is focused on the influence of trauma systems on the survival and outcome of injured patients. Recent findings: Large population-based studies have been published over the last 2 years strengthening the hypothesis that trauma systems indeed improve survival rates in injured patients. Mortality was reduced by 15-25% when severely injured patients were treated at a trauma center. Although 'inclusive' trauma systems have been advocated since 1991 only recently did the first population-based study prove that 'inclusive' trauma systems do better than 'exclusive' trauma systems. Because further improvements in survival in mature trauma systems are likely to be small, more focus should be given to quality of life studies, rather than to survival in trauma system evaluation. Summary: Trauma systems indeed improve survival rates in injured patients. Inclusive trauma systems do better than exclusive trauma systems. More attention should be given to quality of outcome.
Lockey DJ, Crewsaon K, Lossius HM (2014) Prehospital anaesthesia: the same but different. British Journal of Anaesthetics 113(2): 211-219	Advanced airway management is one of the most controversial areas of pre-hospital trauma care and is carried out by different providers using different techniques in different Emergency Medical Services systems. Pre-hospital anaesthesia is the standard of care for trauma patients arriving in the emergency department with airway compromise. A small proportion of severely injured patients who cannot be managed with basic airway management require pre-hospital anaesthesia to avoid death or hypoxic brain injury. The evidence base for advanced airway management is inconsistent, contradictory and rarely reports all key data. There is evidence that poorly performed advanced airway management is harmful and that less-experienced providers have higher intubation failure rates and complication rates. International guidelines carry many common messages about the system requirements for the practice of advanced airway management. Pre-hospital rapid sequence induction (RSI) should be practiced to the same standard as emergency department RSI. Many in-hospital standards such as monitoring, equipment, and provider competence can be achieved. Pre-hospital and emergency in-hospital RSI has been modified from standard RSI techniques to improve patient safety, physiological disturbance, and practicality. Examples include the use of opioids and long-acting neuromuscular blocking agents, ventilation before intubation, and the early release of cricoid pressure to improve laryngoscopic view. Pre-hospital RSI is indicated in a small proportion of trauma patients. Where pre-hospital anaesthesia cannot be carried out to a high standard by competent providers, excellent quality basic airway management should be the mainstay of management.

Citation	Abstract / Executive summary
Lossius HM, Roislien J, Lockey DJ (2012) Patient safety in prehospital emergency tracheal intubation: a comprehensive meta-analysis of the intubation success rates of EMS providers. Critical Care 16(1): R24. DOI: 10.1186/cc11189	Introduction: Pre-hospital airway management is a controversial subject, but there is general agreement that a small number of seriously ill or injured patients require urgent emergency tracheal intubation (ETI) and ventilation. Many European emergency medical services (EMS) systems provide physicians to care for these patients while other systems rely on paramedics (or, rarely, nurses). The ETI success rate is an important measure of provider and EMS system success and a marker of patient safety. Methods: We conducted a systematic search of Medline and EMBASE to identify all of the published original English-language articles reporting pre-hospital ETI in adult patients. We selected all of the studies that reported ETI success rates and extracted information on the number of attempted and successful ETIs, type of provider, level of ETI training and the availability of drugs on scene. We calculated the overall success rate using meta-analysis and assessed the relationships between the ETI success rate and type of provider and between the ETI success rate and the types of drugs available on the scene. Results: From 1,070 studies initially retrieved, we identified 58 original studies meeting the selection criteria. Sixty-four per cent of the non-physician-manned services and 54% of the physician-manned services reported ETI success rates but the success rate reporting was incomplete in three studies from non-physician-manned services. Median success rate was 0.905 (0.491, 1.000). In a weighted linear regression analysis, physicians as providers were significantly associated with increased success rates, 0.092 (P=0.0345). In the non-physician group, the use of drug-assisted intubation significantly increased the success rates. All physicians had access to traditional rapid sequence induction (RSI) and, comparing these to non-physicians using muscle paralytics or a traditional RSI, there still was a significant difference in success rate in favour of physicians, 0.991 and 0.955, respectively (P=0.047). Conclusions: This comprehensive meta-analysis suggests that physicians have significantly fewer pre-hospital ETI failures overall than non-physicians. This finding, which remains true when the non-physicians administer muscle paralytics or RSI, raises significant patient safety issues. In the absence of pre-hospital physicians, conducting basic or advanced airway techniques other than ETI should be strongly considered.
MacKenzie E, Rivara F, Jurkovich G, et al. A national evaluation of the effect of trauma-center care on mortality. New Engl J Med 2006;354:366–78.	Background: Hospitals have difficulty justifying the expense of maintaining trauma centers without strong evidence of their effectiveness. To address this gap, we examined differences in mortality between level 1 trauma centers and hospitals without a trauma center (non-trauma centers).

Citation	Abstract / Executive summary
	Methods: Mortality outcomes were compared among patients treated in 18 hospitals with a level 1 trauma center and 51 hospitals non-trauma centers located in 14 states. Patients 18 to 84 years old with a moderate-to-severe injury were eligible. Complete data were obtained for 1104 patients who died in the hospital and 4087 patients who were discharged alive. We used propensity-score weighting to adjust for observable differences between patients treated at trauma centers and those treated at non-trauma centers. Results: After adjustment for differences in the case mix, the in-hospital mortality rate was significantly lower at trauma centers than at non-trauma centers (7.6 percent vs. 9.5 percent; relative risk, 0.80; 95 percent confidence interval, 0.66 to 0.98), as was the one-year mortality rate (10.4 percent vs. 13.8 percent; relative risk, 0.75; 95 percent confidence interval, 0.60 to 0.95). The effects of treatment at a trauma center varied according to the severity of injury, with evidence to suggest that differences in mortality rates were primarily confined to patients with more severe injuries. Conclusions: Our findings show that the risk of death is significantly lower when care is provided in a trauma center than in a non-trauma center and argue for continued efforts at regionalization.
MacKenzie E, Rivara F, Jurkovich G, et al. The impact of trauma-center care on functional outcomes following major lower limb trauma. J Bone Joint Surg 2008;90-A:101–9. 2018.	Background: Although studies have shown that treatment at a trauma center reduces a patient's risk of dying following major trauma, important questions remain as to the effect of trauma centers on functional outcomes, especially among patients who have sustained major lower-limb trauma. Methods: Domain-specific scores on the Medical Outcomes Study Short Form Health Survey (SF-36) supplemented by scores on the mobility subscale of the Musculoskeletal Function Assessment (MFA) and the Revised Center for Epidemiologic Studies Depression Scale (CESD-R) were compared among patients treated in eighteen hospitals with a level-I trauma center and fifty-one hospitals without a trauma center. Included in the study were 1389 adults, eighteen to eighty-four years of age, with at least one lower-limb injury with a score of >/=3 points according to the Abbreviated Injury Scale (AIS). To account for the competing risk of death, we estimated the survivors' average causal effect. Estimates were derived for all patients with a lower-limb injury and separately for a subset of patients without associated injuries of the head or spinal cord.

Citation	Abstract / Executive summary
	Results: For patients with a lower-limb injury resulting from a high-energy force, care at a trauma center yielded modest but clinically meaningful improvements in physical functioning and overall vitality at one year after the injury. After adjustment for differences in case mix and the competing risk of death, the average differences in the SF-36 physical functioning and vitality scores and the MFA mobility score were 7.82 points (95% confidence interval: 2.65, 12.98), 6.80 points (95% confidence interval: 2.53, 11.07), and 6.31 points (95% confidence interval: 0.25, 12.36), respectively. These results were similar when the analysis was restricted to patients without associated injuries to the head or spine. Treatment at a trauma center resulted in negligible differences in outcome for the subset of patients with injuries resulting from low-energy forces. Conclusions: This study provides evidence that patients who sustain high-energy lower-limb trauma benefit from treatment at a level-I trauma center.
Mackenzie P, Smith E, Wallace P. Transfer of adults between intensive care units in the United Kingdom: postal survey. BMJ. 1997;314(7092):1455-1456.	Introduction: In 1986, at least 10 000 seriously ill patients in the United Kingdom required secondary transfer to adult intensive care units in other hospitals.1 Although 75 of 181 (41%) intensive care consultants were dissatisfied with transfer arrangements, only 10% (number not provided) ever refused a request for transfer. The establishment of dedicated regional transport services was recommended. It has also been recommended that patients should be retrieved by teams from receiving intensive care units, and that local capabilities be maintained for urgent transfer of patients with head injuries.2 3 We reviewed current secondary transfer facilities and numbers and established the main indications for transfers. Methods and results: Late in 1994 we surveyed 278 general or mixed intensive care units in the United Kingdom by postal questionnaire; 198 (71%) responded. The mean annual admission rate to intensive care units was 353 (range 40-1540) patients, and annually an average of 23 patients were transported to each unit. The most frequently quoted reasons (not mutually exclusive) for such transfers were lack of intensive care beds (125; 63%) and of renal support services (45; 23%) in referring hospitals. Only 25 intensive care units admitted more than 40 transferred patients a year. On average, 19 patients were transported from each unit each year. The most common indications for these transfers were referral for neurosurgical care (109; 55%), lack of beds in the intensive care unit (87; 44%), and lack of renal support services (54; 27%). Only 12 intensive care units transferred more than 40 patients a year to another hospital.

Citation	Abstract / Executive summary
	Staff and equipment for transfers were available in 191 (97%) hospitals. The 24 (12%) intensive care units which provided retrieval teams received on average 55 transferred patients a year. Only two hospitals provided "regional" transport teams. Table 1) shows equipment and staff resources. Eighty two (41%) respondents considered that arrangements for transfer were unsatisfactory. Despite this, only 19 (10%) stated that lack of facilities ever prevented patient transfer.
Mainroads Western Australia. Emergency landing strips. (2020) www.mainroads.wa.gov.au/technical-commercial/technical-library/road-traffic-engineering/guide-to-road-design/additional-road-design2/emergency-landing-strips/	The purpose of this document is to specify standards for the design of emergency runway strips in Western Australia and to provide practical guidelines for the application of these standards. Emergency runway strips are constructed in remote areas where access to medical facilities by road may not be a viable option due to flooding of roads or distance/time constraints. This combined facility is recommended in those remote areas where there are no runway strips for the Royal Flying Doctor Service (RFDS) or State Emergency Services (SES) emergency evacuations and construction of a permanent runway strip is not warranted due to the limited usage of the facility. However, if a suitable permanent runway strip is available nearby then the RFDS are required by law to use it and an emergency runway strip should not be provided.
Martin T. Aeromedical Transportation: A Clinical Guide. Surrey, UK: Ashgate Publishing Ltd; 2006:77–97.	The only book published anywhere in the world which is devoted entirely to the principles of aeromedical transport, Aeromedical Transportation has rightly become known as the sole reference for the industry. This second edition has been radically revised and updated; featuring the latest research, updated references and new chapters on the transport of intensive care patients, and medical emergencies/death in flight. Since the first edition was published in 1996, the concept of 'evidence-based medicine' has been accepted as essential in any book which endeavours to be the accepted knowledge base in its subject area. A very practical text, international in its approach, much of its content is devoted to clinical matters. Administration and organisation are also discussed, but are addressed from the standpoint of the clinical aeromedical escort. The text is suitable for medical, paramedical and nursing personnel and for those working in organizations whose duties include the transportation of the sick and injured by air.

Citation	Abstract / Executive summary
Masterson et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine (2020) 28:28, What clinical crew competencies and qualifications are required for helicopter emergency medical services? A review of the literature	Background: Patients served by Helicopter Emergency Medical Services (HEMS) tend to be acutely injured or unwell and in need of stabilisation followed by rapid and safe transport. It is therefore hypothesised that a particular clinical crew composition is required to provide appropriate HEMS patient care. A literature review was performed to test this hypothesis. Methods: MEDLINE, EMBASE, Web of Science and the Cochrane Database of Systematic Reviews were systematically searched from 1 January 2009 to 30 August 2019 to identify peer-reviewed articles of relevance. All HEMS studies that mentioned 'staffing', 'configuration', 'competencies' or 'qualifications' in the title or abstract were selected for full-text review. Results: Four hundred one studies were identified. Thirty-eight studies, including one systematic review and one randomised controlled trial, were included. All remaining studies were of an observational design. The vast majority of studies described clinical crews that were primarily doctor-staffed. Descriptions of non-doctor staff competencies were limited, with the exception of one paramedic-staffed model. Conclusions: HEMS clinical crews tended to have a wider range of competencies and experience than ground-based crews, and most studies suggested a patient outcome benefit to HEMS provision. The conclusions that can be drawn are limited due to study quality and the possibility that the literature reviewed was weighted towards particular crewing models (i.e. primarily doctor-staffed) and countries. There is a need for trial-based studies that directly compare patient outcomes between different HEMS crews with different competencies and qualifications. Keywords: Clinical assessment; Competence; Helicopter retrieval; Prehospital care.

Citation	Abstract / Executive summary
Mathews KA, Elcock MS, Furyk JS. The use of telemedicine to aid in assessing patients prior to aeromedical retrieval to a tertiary referral centre. Journal of Telemedicine and Telecare. 2008;14(6):309-314. doi:10.1258/jtt.2008.080417	We evaluated the effect of telemedicine compared with traditional telephone conversations when evaluating patients for aeromedical retrieval. A convenience sample of consecutive patients referred for retrieval from Palm Island over a six-month period was compared retrospectively with patients referred during the previous six months. There was a significant difference (P = 0.014) in the number of patients referred in the telemedicine period (113) compared to the previous six months (78), which may have been a seasonal fluctuation. There was a smaller proportion of aeromedical retrievals in the telemedicine period (78%) compared to the control period (92%), P = 0.009. Other significant differences between the telemedicine and control period included a larger proportion of patients not transferred at all (16% compared to 5%, P = 0.022) and a smaller percentage of rotary flights (52% compared with 73%, P = 0.004). Retrieval coordinators perceived that telemedicine use prevented 10 aeromedical flights and six night flights. The coordinators and referrers felt that telemedicine improved patient care in 75% and 65% of consultations, respectively. The coordinators felt that it improved communication with the referring doctor for 84% of the consultations.
Mathieson DJ, Berg E, Beaver M (2013) Variations in interfacility transport: approach to call intake, team composition, and mode of transport. Clinical Pediatric Emergency Medicine 14(3): 193-205	As regionalization of neonatal and pediatric care increases, so does the demand for neonatal-pediatric interfacility transport. Transport teams capable of performing highly sophisticated procedures and medical decision making bring the capabilities of the tertiary care center to the patient's bedside at referring institutions. Despite the maturation of transport medicine, there continues to be tremendous variability in the functionalities and operational procedures of transport programs nationally. This article explores some of the common variations in practice of these specialty teams, particularly in the realms of managing intake calls, selecting team configurations, and choosing modes of transportation.
Potentially preventable trauma deaths: A retrospective review Ben Beck 1, Karen Smith 2, Eric Mercier 3, Stephen Bernard et al Injury. 2019 May;50(5):1009-1016	Background: Reviewing prehospital trauma deaths provides an opportunity to identify system improvements that may reduce trauma mortality. The objective of this study was to identify the number and rate of potentially preventable trauma deaths through expert panel reviews of prehospital and early in-hospital trauma deaths. Methods: We conducted a retrospective review of prehospital and early in-hospital (<24 h) trauma deaths following a traumatic out-of-hospital cardiac arrest that were attended by Ambulance Victoria (AV) in the state of Victoria, Australia, between 2008 and 2014. Expert panels were used to review cases that had resuscitation attempted by paramedics and underwent a full autopsy. Patients with a mechanism of hanging, drowning or those with anatomical injuries deemed to be unsurvivable were excluded.

Citation	Abstract / Executive summary
	Results: Of the 1183 cases that underwent full autopsies, resuscitation was attempted by paramedics in 336 (28%) cases. Of these, 113 cases (34%) were deemed to have potentially survivable injuries and underwent expert panel review. There were 90 (80%) deaths that were not preventable, 19 (17%) potentially preventable deaths and 4 (3%) preventable deaths. Potentially preventable or preventable deaths represented 20% of those cases that underwent review and 7% of cases that had attempted resuscitation. Conclusions: The number of potentially preventable or preventable trauma deaths in the pre-hospital and early in-hospital resuscitation phase was low. Specific circumstances were identified in which the trauma system could be further improved. Keywords: Emergency medical services; Mortality; Pre-hospital care; Preventable; Trauma; Trauma systems.
Meadley B, Henschl S, deWit A, Bernard S, Smith K (2015) A paramedic-staffed helicopter emergency medical service's response to winch missions in Victoria, Australia. Prehospital Emergency Care, 20(1):106-10. DOI:10.3109/10903127.2015.1037479	Winching emergency medical care providers from a helicopter to the scene enables treatment of patients in otherwise inaccessible locations, but is not without risks. The objective of this study was to define characteristics of winch missions undertaken by Intensive Care Flight Paramedics (ICFP) in Victoria, Australia with a focus on extraction methods and clinical care delivered at the scene. A retrospective data analysis was performed to identify all winch missions between November 2010 and March 2014. Demographic data, winch characteristics, physiological parameters, and interventions undertaken on scene by the ICFP were extracted. Out of 5,003 missions in the study period, 125 were identified as winch operations. Winter missions were significantly less frequent than those of any other season. Patients were predominantly male (78.4%) and had a mean age of 38 years (±17.6). A total of 109 (87.2%) patients were identified as experiencing trauma with a mean Revised Trauma Score of 7.5288, and isolated limb fractures were the most frequently encountered injury. Falls and vehicle-related trauma were the most common mechanisms of injury. The total median scene duration was 49 minutes (IQR 23-91). Sixty-three patients (50.4%) were extracted using a stretcher, 45 (36.0%) using a hypothermic strop, and 6 (4.8%) via normal rescue strop. Eleven patients (8.8%) were not winched to the helicopter. Vascular access (38.4%), analgesia (44.0%), and anti-emetic administration (28.8%) were the most frequent clinical interventions. Forty-nine patients (39.2%) did not receive any clinical intervention prior to winch extraction. Winch operations in Victoria, Australia consisted predominantly of patients with minor to moderate traumatic injuries. A significant proportion of patients did not require any clinical treatment prior to winching, and among those who did, analgesia was the most frequent intervention. Advanced medical procedures were rarely required prior to winch extraction.

Citation	Abstract / Executive summary
	Keywords: aerial rescue; helicopter emergency medical system; hoist; prehospital care; winch.
Milligan JE, Jones Cn, Helm DR, Munford BJ (2011) The principles of aeromedical retrieval of the critically ill. Trends in Trauma and Critical Care 1:22-26	With the development of highly sophisticated tertiary care facilities, the need to move critical care patients between hospitals is becoming an increasing common phenomenon. In many areas the distances involved in these transfers and the urgency of the cases has led to the use of aerial transport of retrieval teams and their patients.This article discusses the physiology of aeromedical transport and its effects on certain clinical conditions and the equipment used. The article also offers some practical advice on personnel, equipment and how to carry out a tasking in both fixed wing and rotary wing aircraft.
Mitchell, P., M. Wynia, R. Golden,B. McNellis, S. Okun, C.E. Webb,V. Rohrbach, and I. Von Kohorn. Core principles and values of effective team-based health care (Discussion Paper). Washington: Institute of Medicine, 2012.	This paper is the product of individuals who worked to identify basic principles and expectations for the coordinated contributions of various participants in the care process. It is intended to provide common reference points to guide coordinated collaboration among health professionals, patients, and families—ultimately helping to accelerate interprofessional team-based care. The authors are participants drawn from the Best Practices Innovation Collaborative of the Institute of Medicine (IOM) Roundtable on Value & Science-Driven Health Care. The Collaborative is inclusive—without walls—and its participants are drawn from professional organizations representing clinicians on the front lines of health care delivery; members of government agencies that are either actively involved in patient care or with programs and policies centrally concerned with the identification and application of best clinical services; and others involved in the evolution of the health care workforce and the health professions. Teams in health care take many forms, for example, there are disaster response teams; teams that perform emergency operations; hospital teams caring for acutely ill patients; teams that care for people at home; office-based care teams; geographically disparate teams that care for ambulatory patients; teams limited to one clinician and patient; and teams that include the patient and loved ones, as well as a number of supporting health professionals. Teams in health care can therefore be large or small, centralized or dispersed, virtual or face-to-face—while their tasks can be focused and brief or broad and lengthy. This extreme heterogeneity in tasks, patient types, and settings is a challenge to defining optimal team-based health care, including specific guidance on the best structure and functions for teams. Still, regardless of their specific tasks, patients, and settings, effective teams throughout health care are guided by basic principles that can be measured, compared,

Citation	Abstract / Executive summary
	learned, and replicated. This paper identifies and describes a set of core principles, the purpose of which is to help enable health professionals, researchers, policy makers, administrators, and patients to achieve appropriate, high-value team-based health care.
Nagpal K, Abboudi M, Fischler L, Schmidt T, Vats A, Manchanda C et al. Evaluation of Postoperative Handover Using a Tool to Assess Information Transfer and Teamwork. Annals of Surgery. 2011;253(4):831-837.	Objective: To assess the feasibility, validity, and reliability of a postoperative Handover Assessment Tool (PoHAT) and to evaluate the current practices of the postoperative handover at 2 large European hospitals. Background: Postoperative handover is one of the most critical phases in the care of a patient undergoing surgery. However, handovers are largely informal and variable. A thorough understanding of the problem is necessary before safety solutions can be considered. Methods: Postoperative Handover Assessment Tool (PoHAT) was developed through task analysis, semistructured interviews, literature review, and learned society guidelines. Subsequent validation was done by the Delphi technique. Feasibility and reliability were then evaluated by direct observation of handovers at 2 large European hospitals. Outcomes measures included information omissions, task errors, teamwork evaluation, duration of handover, and number of distractions. Results: The tool was feasible to use and inter-rater reliability was excellent ($r = 0.96$, $P < 0.001$). Evaluation of handover at the 2 study sites revealed a median of 8 information omissions per handover at both the centers (IQR 7-10). There were a median of 3 task errors per handover (IQR 2-4). Thirty-five percent of handovers had distractions, which included competing demands for nurse attention, bleeps, and case-irrelevant communication. Conclusion: This study has established the feasibility, validity, and reliability of a tool for evaluating postoperative handover. In addition to serving as an objective measure of postoperative handover, the tool can also be used to evaluate the efficacy of any intervention developed to improve this process. The study has also shown that postoperative handover is characterized by incomplete transfer of information and failures in the performance of key tasks.

Citation	Abstract / Executive summary
NASA: Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team, 2016, Link	Human performance errors may occur due to problems associated with working in the space environment and incidents of failure of crews to cooper ate and work effectively with each of her or with flight controllers have been observed. Interpersonal conflict, misunderstanding and impaired communication will imp act performance and mission success. The history of spaceflight crews regarding team cohesion, training and performance has not been systematically documented. Tools, training and support methods should be provided to reduce the likelihood of this risk and improve crew performance. – Human Research Program Requirements Document, HRP-47052, Rev. C, dated Jan 2009. Shared diversions on the Inter-national Space Station, including musical performances and movie nights, provide rest and relaxation while promoting team cohesion
National Standards for Aeromedical Evacuation http://www.rfds.info › National_Standards_for_A...	This document outline Standards established by the Royal Flying Doctor Service of Australia for the clinical care of patients during aeromedical evacuations. The Standards are endorsed by all sections of the Service directly providing air medical transport and medical retrieval services. The Standards form a consensus on the minimum requirements for best practice in our aeromedical services based on many decades of experience. Individual Sections may course operate at a higher level in specific areas.
NETS WA website. http://netswa.net.au/about-us/air-retrievals/. Accessed June 7, 2019.	Western Australia is the largest state in the country, spanning over 2.5 million square km. This is the largest area in the world in which a transport service operates. NETS WA partners with the Royal Flying Doctor Service to retrieve babies from country WA. RFDS Western Operations are based at Jandakot airport and air retrievals are undertaken using PC-12 Pilatus fixed-wing turboprop aircraft. A NETS doctor undertakes these transports with an RFDS Flight nurse; for very preterm or sick babies, a NETS nurse will accompany the team. Transports from the Pilbara & Kimberley are generally undertaken by local NETS-accredited paediatric staff. Most patients from the Kimberley are transferred to Darwin, given the relative proximity of that centre to Broome. The RFDS also operates a Hawker 200 aeromedical jet aircraft, which NETS primarily uses to transport neonates interstate to Melbourne or Brisbane for complex cardiac surgery. NETS is also pleased to be working with Medical Air, a new aeromedical jet service provider. Their Learjet 35A is used to transport babies interstate, but also to rapidly reach remote areas of Northwest WA.

Citation	Abstract / Executive summary
NSW Ministry of Health, 2013, Reform Plan for Aeromedical (Rotary Wing) Retrieval Services in NSW. www.health.nsw.gov.au/about/nswhealth/Publications/helicopter-reform-plan.pdf	"The Reform Plan for Aeromedical (Rotary Wing) Services addresses the second part of the Review of Aeromedical (Rotary Wing) Retrieval Services and was developed following a period of extensive stakeholder consultation on the report and recommendations prepared by Ernst & Young and further consultation with clinicians, helicopter operators and aviation experts."
Ong M, BiomedE M, Coiera E. A Systematic Review of Failures in Handoff Communication During Intrahospital Transfers. The Joint Commission Journal on Quality and Patient Safety. 2011;37(6):274-284	Background: Handoffs serve a critical function in ensuring patient care continuity during transitions of care. Studies to date have predominantly focused on intershift handoffs, with relatively little attention given to intrahospital transfers. A systematic literature review was conducted to characterize the nature of handoff failures during intrahospital transfers and to examine factors affecting handoff communication and the effectiveness of current interventions. Methods: Primary studies investigating handoff communication between care providers during intrahospital transfers were sought in the English-language literature between 1980 and February 2011. Data for study design, population characteristics, sample size, setting, intervention specifics, and relevant outcome measures were extracted. Data synthesis: Study results were summarized by the impact of communication breakdown during intrahospital transfer of patients, and the current deficiencies in the process. Results of interventions were summarized by their effect on the quality of handoff communication and patient safety. Findings: The initial search identified 516 individual articles, 24 of which satisfied the inclusion criteria. Some 19 were primary studies on handoff practices and deficiencies, and the remaining 5 were interventional studies. The studies were categorized according to the clinical settings involved in the intrahospital patient transfers. Conclusions: There is consistent evidence on the perceived impact of communication breakdown on patient safety during intrahospital transfers. Exposure of handoffs at patient transfers presents challenges that are not experienced in intershift handoffs. The distinct needs of the specific clinical settings involved in the intrahospital patient transfer must be considered when deciding on suitable interventions.

Citation	Abstract / Executive summary
Ornge Canada, "Ornge Business Plan". Feburary,2021. www.ornge.ca/Media/Ornge/Documents/Publications/Business%20Plan/Business-Plan-FY22.pdf	Ornge is a not-for-profit charitable organization that provides air ambulance and critical care transport services to the province of Ontario. We are Canada's largest air ambulance and critical care transport provider. Ornge is part of a province-wide hub-and-spoke model of care that links communities to hospitals, and local community hospitals to tertiary care centres. To do this, Ornge employs over 640 employees, including paramedics, pilots, communication officers, physicians, aircraft maintenance engineers, educators, researchers and support staff.
Ornge, Ontario, Canada: www.ornge.ca/home. Annual reports and strategic plans.	Ornge is a not-for-profit charitable organization that provides air ambulance and critical care transport services to the province of Ontario. We are Canada's largest air ambulance and critical care transport provider. Ornge is part of a province-wide hub-and-spoke model of care that links communities to hospitals, and local community hospitals to tertiary care centres. To do this, Ornge employs over 640 employees, including paramedics, pilots, communication officers, physicians, aircraft maintenance engineers, educators, researchers and support staff.
Parmentier-Decrucq E, Poissy J, Favory R, Nseir S, Onimus T, Guerry M et al. Adverse events during intrahospital transport of critically ill patients: incidence and risk factors. Annals of Intensive Care. 2013;3(1):10.	Background: Transport of critically ill patients for diagnostic or therapeutic procedures is at risk of complications. Adverse events during transport are common and may have significant consequences for the patient. The objective of the study was to collect prospectively adverse events that occurred during intrahospital transports of critically ill patients and to determine their risk factors. Methods: This prospective, observational study of intrahospital transport of consecutively admitted patients with mechanical ventilation was conducted in a 38-bed intensive care unit in a university hospital from May 2009 to March 2010. Results: Of 262 transports observed (184 patients), 120 (45.8%) were associated with adverse events. Risk factors were ventilation with positive end-expiratory pressure >6 cmH2O, sedation before transport, and fluid loading for intrahospital transports. Within these intrahospital transports with adverse events, 68 (26% of all intrahospital transports) were associated with an adverse event affecting the patient. Identified risk factors were: positive end-expiratory pressure >6 cmH2O, and treatment modification before transport. In 44 cases (16.8% of all intrahospital transports), adverse event was considered serious for the patient. In our study, adverse events did not statistically increase ventilator-associated pneumonia, time spent on mechanical ventilation, or length of stay in the intensive care unit.

Citation	Abstract / Executive summary
	Conclusions: This study confirms that the intrahospital transports of critically ill patients leads to a significant number of adverse events. Although in our study adverse events have not had major consequences on the patient stay, efforts should be made to decrease their incidence.
Paton L, Stenhouse J, Ruddy J, Howie N. Still Preparing to Fail by Failing to Prepare? A Survey of Trainees' Experience of and Training in Interhospital Transfers. Journal of the Intensive Care Society. 2014;15(1):43-47.	Interhospital transfer of critically ill patients is a task frequently delegated to doctors-in-training. However, previous studies have shown them to be ill prepared for this task, prompting the inclusion of transfer medicine as a domain in both anaesthesia and intensive care curricula, though not as yet in emergency medicine. Given the change and variation in curricula, we surveyed anaesthesia and emergency medicine trainees in the West of Scotland to gauge their experience of and training in interhospital transfers. Our results showed trainees continuing to conduct solo interhospital transfers from an early stage in their careers without specific training. Redressing this shortfall in training is imperative, particularly as centralisation of services will require more frequent transport of greater numbers of critically ill patients by trainees. We speculate about why these deficits in transfer training persist and how they might be remedied, particularly given the proposed integration of specialist transport teams in Scotland
Peters J, Beekers C, Eijk R, Edwars M, Hoogerwerf N (2014) Evaluation of Dutch helicopter Emergency Medical Services in transporting children. Air Medical Journal 33(3): 112-4	Objective: In the Netherlands, helicopter emergency medical services (HEMS) function as an adjunct to paramedic ambulance service delivering hospital-level medical care to a prehospital location. The main goal of Dutch HEMS is to provide on-scene medical expertise and not primarily to serve as transport. The transportation of patients to specialized hospitals is sometimes mandatory, especially in cases of critically ill or wounded children. In the literature, no support can be found to support the safety of transportation by helicopter. We retrospectively evaluated the safety of this type of transportation and if any problems were encountered transporting children by helicopter. Methods: We reviewed our local HEMS database for all children (, 16 years) transported by helicopter to a level 1 trauma center between January 2007 and December 2012. Results: A total number of 430 patients were transported by helicopter to a hospital (0-87 years, mean 5 31.6 years). Of these patients, 83 (19%) were younger than 16 years (0-15.7 years, mean 5 6.6 years). Causes for HEMS transport in children varied, but the main groups were road traffic accidents (40%), cardiopulmonary arrests (15%), falls from height (12%), and horse riding accidents (7%). In the children group, 1 accidental extubation of the orotracheal tube was noted while lifting the patient (10 years old) into the helicopter. This was immediately noticed, and the patient was reintubated without complications. No further adverse events were

Citation	Abstract / Executive summary
	encountered during transportation time. The accidental extubation is not a specific complication of helicopter transportation but is inextricably linked with moving severely injured and intubated patients/children. Conclusion: We conclude that transporting children by helicopter is a safe method of transportation for critically ill children to adequately equipped medical centres.
Queensland Health Policies and Papers:	Department of Health (Queensland), "Retrieval Services Queensland", V1.3, January,2020.Credentialing and scope of clinical practice definition for medical coordination and prehospital and retrieval medicine 2020 Retrieval Services Queensland - Use by Hospital and Health Services 2018 Queensland Health: Clinical Standards for retrieval Services 2021 Aeromedical Operations Tasking considerations 2020 Queensland Health Aeromedical Aviation Standard 2020 Retrieval Services Queensland – Standard Operating Procedures 2021
Rasmussen K, Langdalen H, Sollid SJ, Abrahamsen EB, Sorskar LI, Bondevik GT, Abrahamsen HB (2019) Training and assessment of non-technical skills in Norweigian Helicopter Emergency Services: a cross-sectional and longitudical study. Scandanavian Journal of Trauma and Resuscitation and Emergency Medicine 29(1):1. DOI:10.1186/s13049-018-0583-1	Background: Deficient non-technical skills (NTS) among providers of critical care in helicopter emergency medical services (HEMS) is a threat to patient and operational safety. Skills can be improved through simulation-based training and assessment. A previous study indicated that physicians underwent less frequent training compared to pilots and HEMS crew members (HCM) and that all professional groups in Norwegian HEMS received limited training in how to cope with fatigue. Since then, training initiatives and a fatigue risk management project has been initiated. Our study aimed to explore if the frequency of simulation-based training and assessment of NTS in Norwegian HEMS has changed since 2011 following these measures. Methods: A cross-sectional web-based survey from October through December 2016, of physicians, HCM and pilots from all civilian Norwegian HEMS-bases reporting the overall extent of simulation-based training and assessment of NTS. Results: Of 214 invited, 109 responses were eligible for analysis. The frequency of simulation-based training and assessment of NTS has increased significantly for all professional groups in Norwegian HEMS, most prominently for the physicians. For all groups, the frequency of assessment is generally lower than the frequency of training.

Citation	Abstract / Executive summary
	Conclusions: Physicians in Norwegian HEMS seem to have adjusted to the NTS training culture of the other crew member groups. This might be a consequence of improved NTS training programs. The use of behavioural marker systems systematically in HEMS should be emphasized.
Rasmussen K, Roislien J, Solid SJM (2018) Does medical staffing influence perceived safety? An international survey of medical crew models in Helicopter Emergency Medical Services. Air Medical Journal 37: 29-36	Objective: The competence, composition, and number of crewmembers have generally been considered to influence the degree of patient care and safety in helicopter emergency medical services (HEMS), but evidence to support the advantages of one crew concept over another is ambiguous; additionally, the benefit of physicians as crewmembers is still highly debated. Methods: To compare perceived safety in different medical crew models, we surveyed international HEMS medical directors regarding the types of crew compositions their system currently used and their supportive rationales and to evaluate patient and flight safety within their services. Results: Perceived patient and flight safety is higher when HEMS is staffed with a dual medical crew in the cabin. Tradition and scientific evidence are the most common reasons for the choice of medical crew. Most respondents would rather retain their current crew configuration, but some would prefer to add a physician or supplement the physician with an assistant in the cabin. Conclusion: Our survey shows a wide variety of medical staffing models in HEMS and indicates that these differences are mainly related to medical competencies and the availability of an assistant in the medical cabin. The responses suggest that differences in medical staffing influence perceived flight and patient safety.
RFDS governance. www.flyingdoctor.org.au/about-the-rfds/governance/	The Royal Flying Doctor Service (RFDS) is made up of seven legal entities operating around Australia, under a federated structure, and working together under a joint venture agreement. Each of the entities are independent, both financially and operationally, with their own Board and management. Each entity is a charity, registered with and regulated by the Australian Charities and Not-for-profit Commission. The entities are: RFDS Central Operations, RFDS Queensland Section, RFDS South Eastern Section, RFDS Victorian Section, RFDS Tasmania, RFDS Western Operations, and the last is RFDS of Australia (located in Canberra).

Citation	Abstract / Executive summary
RFDS History of the RFDS. www.flyingdoctor.org.au/about-the-rfds/history/. Accessed June 6, 2019.	The Royal Flying Doctor Service has a rich and vibrant Australian history. Before there was the Flying Doctor there was little medical help for people who lived in places far from cities. If they were seriously injured they had to travel hundreds of kilometres by horse, cart, or camel to reach a doctor. They often died before they got there. www.flyingdoctor.org.au/about-the-rfds/history/
RFDS National Standards for Aeromedical Evacuation 2011.	This document outlines Standards established by the Royal Flying Doctor Service of Australia for the clinical care of patients during aeromedical evacuations. The Standards are endorsed by all Sections of the Service directly providing air medical transport and medical retrieval services. The Standards form a consensus on the minimum requirements for best practice in our aeromedical services based on many decades of experience. Individuals Sections may of course operate at a higher level in specific areas.
RFDS Western Australia. Dealing with your flight request. www.flyingdoctor.org.au/wa/clinical/aeromedical-retrieval/organising-flight/behind-scenes/. Accessed June 6, 2019.	Call Identification When you call on our 1800 number, it is identified in our Coordination Centre communications system as an evacuation or medical advice request and will be answered as quickly as possible. During the middle of the day we may have large numbers or calls occurring which could cause a brief delay. During the night we have less staff on duty and a sudden surge in calls may also cause short delays. The Coordinator who initially answers your call is not clinically trained but experienced in the logistics of tasking and coordinating aero medical flights. They will ask you if your call is just for medical advice, or a definite flight request (we handle hundreds of medical advices calls from remote settings every week). Basic Information If your call is a flight request, they will ask for eight core pieces of information. These include who you are and where you are calling from (so we can call back). They will also ask for basic details about your patient to assist in identifying them (name, age and a rough diagnosis), their weight (important for loading), their location and destination (if known).

Citation	Abstract / Executive summary
RFDS Western Australia. Priority system. www.flyingdoctor.org.au/wa/ clinical/aeromedical-retrieval/organising-flight/priority-system/. Accessed June 6, 2019. J. Garwood et al. / Air Medical Journal 39 (2020) 35–43	Objective: The Royal Flying Doctor Service Western Operations (RFDSWO) provides critical care transfer and retrieval services across 2.5 million km2 to a population of 2.58 million people, providing both primary and secondary retrievals across Western Australia. Flying on average 26 million km/y, retrievals are undertaken with the use of rotary and fixed wing aircraft. Our current fleet includes 16 Pilatus PC-12NGs turboprops, 2 Pilatus PC-24 jets, and access to 1 helicopter (Bell 412). A Hawker XP800 Jet was retired in 2019 after 10 years of service. Our retrieval teams are formed of either a doctor and a nurse or a nurse only on fixed wing missions and a doctor and critical care paramedic for helicopter emergency medical services missions. We present our experiences and caseload statistics over the past 5 years. Methods: We performed an analysis of our retrieval database looking at the workload from January 1, 2012, to December 31, 2016. This included the number of patients, age, ethnicity, type of retrieval, priority, diagnosis, and distances covered. Results: Forty-three thousand forty-one patients underwent Royal Flying Doctor Service air transfer over a 5-year period. Aboriginal patients comprise around 3.1% of the Western Australian population but accounted for 33% of RFDSWO retrieval missions. There was a mean transfer rate of 8,608 patients per year, which was relatively consistent across the study period. The modal age was 55 to 59 years, but Aboriginal patients were younger with a mean age of 36.5 years (Aboriginal) versus 49.7 years (non-Aboriginal). The types of retrieval undertaken were as follows: primary (17.3%), secondary (81%), and repatriation (1.7%). The urgency/priority of missions was as follows: immediate (7.3%), urgent (54.5%), and semiurgent (38.1%). The 3 most common diagnosis (International Statistical Classification of Diseases, 10th Revision) categories were trauma/injury (22.9%), cardiovascular (22.3%), and gastrointestinal (10.5%). The modal distance flown was 700 km per mission. Conclusion: RFDSWO has 1 of the largest retrieval workloads in the world, covering a landmass comparable with Western Europe. This brings with it a variety of challenging cases and complex logistics, often in extremely harsh and remote environments. We bring a wide breadth of experience in the area of retrieval medicine, and our aim is to share these experiences with other teams.

Citation	Abstract / Executive summary
RFDS World-first aero medical PC-24 jet lands in WA. www.flyingdoctor.org.au/ news/world-first-aero-medical-jet-lands-wa/. Accessed June 6, 2019.	On Sunday December 2, Rio Tinto Managing Director Pilbara Mines Stefan Buys joined RFDS Chief Executive Officer Rebecca Tomkinson to witness the historic touchdown of the RFDS' first Rio Tinto LifeFlight PC-24 jet aircraft at Broome International Airport. The RFDS' acquisition and aero medical fit-out of two jet aircraft is an investment of $26M and is funded with the assistance of Rio Tinto ($10M over four years), the Commonwealth Government ($4.5M) and a Lotterywest grant ($6.5M). RFDS in Western Australia re-purposed the Pilatus PC-24 jet with state-of-the-art aero medical fit out that serves as an in-flight emergency ward. It has capacity for three stretchered patients and two medical teams, can fly at a top speed of 815kms per hour and, has capability for short landings and take-offs on unsealed airstrips. On individual performance, the PC-24 jet aircraft will almost halve the time for long-haul, patient critical scenarios and, boost response capacity of the RFDS fleet within the state's regions. The jets signal a new era for RFDS following significant preparation and transition to a new fleet structure and capability. RFDS pilots and engineers have undertaken advanced training for the operation and maintenance of the aircraft in the United States and Switzerland. RFDS doctors and nurses will take part in aero medical in-flight training over the coming weeks. The first jet will commence service in early 2019. The second jet aircraft arrived in February.
Risgaard B, Draegert C, Baekgaard J, Steinmetz J, Rasmussen L (2020) Impact of physician-staffed helicopters on prehospital patient outcomes: a systematic review. Acta Anaesthesiologica Scandinavica 64:691-704	Background: Management of pre-hospital patients remains a challenge. In developed countries a physician-staffed helicopter emergency medical service (PS-HEMS) is used in addition to ground emergency medical service (GEMS), but the effect is debated. This systematic review aimed to evaluate the effect of PS-HEMS compared with GEMS on patient outcomes based on the published scientific literature. Methods: Medline, EMBASE and the Cochrane Library were systematically searched on November 15, 2019 for prospective, interventional studies comparing outcomes of patients transported by either PS-HEMS or GEMS. Outcomes of interest were mortality, time to hospital and quality of life.

Citation	Abstract / Executive summary
	Results: The majority of 18 studies included were observational and difficult to summarize because of heterogeneity. Meta-analysis could not be carried out. Three studies found reduced mortality in patients transported by PS-HEMS compared with GEMS with Odds ratios (OR) of 0.68 (0.47-0.98); 0.29 (0.10-0.82) and 0.21 (0.06-0.73) respectively. Another two studies found improved survival with OR 1.2 (1.0-1.5) and 6.9 (1.48-32.5) in patients transported by PS-HEMS compared with GEMS. In three studies, PS-HEMS was associated with shorter time to hospital. Three studies reported quality of life and found no benefit of PS-HEMS. Conclusion: In this systematic review the studies comparing PS-HEMS with GEMS were difficult to summarize because of heterogeneity. We found a possible survival benefit of PS-HEMS but were unable to conduct a meta-analysis. The overall quality of evidence was low.
Royal College of Anaesthetists.(2010) CCT Curriculum. [Online]. London RCoA, UK. Available from www.rcoa.ac.uk/careers-training/training-anaesthesia/the-trainingcurriculum/CCT2010. Accessed 18.10.2018	This document identifies the aims and objectives, content, experiences, outcomes and processes of postgraduate specialist training leading to a CCT in Anaesthetics. It defines the structure and expected methods of learning, teaching, feedback and supervision. The expected knowledge, skills, attitudes and behaviours are described as learning outcomes that are specific enough to be a precise guide for trainers and trainees. A system of assessments is used to monitor the trainee's progress through the stages of training.
Safer Care Victoria	Our aim is to improve healthcare in Victoria so it is safer, more effective and person-centred by 30 June 2023. While we know the vast majority of healthcare interactions are safe, avoidable harm does occur across our system causing death, disability, pain and distress. We work with those receiving and providing care to reduce these preventable incidents. In striving to make healthcare more effective we are focused on ensuring that care is delivered in the right way, at the right time, with the right outcomes. Always. As well as driving better patient outcomes, our focus on making care more effective means we are all making best use of our resources. Reducing harm, waste and unnecessary procedures, and supporting the embedding of best practice, means our health workers can better serve Victorians when and where they need care. A person-centred system understands that people are at the heart of every healthcare interaction and is respectful of the many cultures, values, beliefs and contexts of Victorians. We need to continue evolving to ensure we support all health consumers to be as informed and as engaged they wish to be about decisions relating to their care. To achieve this aim, our strategy is that our Safer Care Victoria (SCV) workforce will partner with you to concentrate on four strategic domains: •

Citation	Abstract / Executive summary
	Leadership is critical to enabling a culture where quality and safety is continuously improving • Partnership and planning ensures we have the right people, information, processes and resources assembled to understand the system's needs and create appropriate responses • Monitoring is essential to tracking outcomes and experiences and ensures swift recognition of quality and safety signals, as well as supporting oversight of the sustainability of system changes • Improvement via a robust, results-oriented methodology means our purposeful work to embed best practice and reduce waste leads to sustainable changes. The success of each of these strategic domains relies heavily on the others. With each of these four areas of work humming and connected we are confident that over the next three years we will achieve our aim to shift Victorian healthcare outcomes and experiences for the better.
Sherren PB, Hayes-Bradley C, Reid C, Burns B, Habig K (2014) Are physicians required during winch rescue missions in Australian helicopter emergency medical service? Emergency Medical Journal 31: 229-232	Background: A helicopter emergency medical service (HEMS) capable of winching offers several advantages over standard rescue operations. Little is known about the benefit of physician winching in addition to a highly trained paramedic. Objective: To analyse the mission profiles and interventions performed during rescues involving the winching of a physician in the Greater Sydney Area HEMS (GSA-HEMS). Methods: All winch missions involving a physician from August 2009 to January 2012 were identified from the prospectively completed GSA-HEMS electronic database. A structured case sheet review for a predetermined list of demographic data and physician-only interventions (POIs) was conducted. Results: We identified 130 missions involving the winching of a physician, of which 120 case sheets were available for analysis. The majority of patients were traumatically injured (90%) and male (85%) with a median age of 37 years. Seven patients were pronounced dead at the scene. A total of 63 POIs were performed on 48 patients. Administration of advanced analgesia was the most common POI making up 68.3% of interventions. Patients with abnormal RTSc(2) scores were more likely to receive a POI than those with normal RTSc(2) (84.8% vs 15.2%; p=0.03). The performance of a POI had no effect on median scene times (45 vs 43 min; p=0.51). Conclusions: Our high POI rate of 40% (48/120) coupled with long rescue times and the occasional severe injuries support the argument for winching Physicians. Not doing so would deny a significant proportion of patients time-critical interventions, advanced analgesia and procedural sedation.

Citation	Abstract / Executive summary
Simpson N, Bartley B, Corfield AR, Hearns S (2012) Performance measurement in British Helicopter Emergency Medical Services and Australian Air Medical Services. Emergency Medicine Journal 29(3): 243-246	Background: Performance outcome measures are an essential component of health service improvement. Whereas hospital critical care services have established performance measures, prehospital care services have less well-established outcome measures and this has been identified as a key issue for development. Individual studies examining long-term survival and functional outcome measures have previously been used to evaluate prehospital care delivery. There is no set of standardised patient outcome measures for Helicopter Emergency Medical Services (HEMS) in the UK or Air Medical Services (AMS) in Australia. The aim of this study is to document the patient outcome measures currently in use within British HEMS and Australian AMS. Methods: This is an observational study analysing point prevalence of practice as of November 2009. A structured questionnaire was designed to assess the method of routine patient follow-up, and the timing and nature of applied patient outcome measures. Results: Full responses were received from 17/21 (81%) British services and 6/7 (86%) Australian services. The overall response rate was 82%. Conclusions: HEMS in Britain and Australian aeromedical retrieval services do not have uniform patient outcome measures. Services tend not to follow-up patients beyond 24 h post transfer. Patient outcome data are rarely presented to an external organisation and there is no formal data comparison between surveyed services. Services are not satisfied that the data currently being collected reflects the quality of their service.
Singh J, MacDonald R, Ahghari M. Critical Events During Land-Based Interfacility Transport. Annals of Emergency Medicine. 2014;64(1):9-15.	Study objective: The risks associated with urgent land-based transport of critically ill patients are not well known and have important implications for patient safety, care delivery, and policy development. We seek to determine the incidence of in-transit critical events and associated patient- and transport-level factors. Methods: We conducted a retrospective cohort study using clinical and administrative data. We included adults undergoing urgent land-based critical care transport by a dedicated transport provider between January 1, 2005, and December 31, 2010. The primary outcome was in-transit critical event, defined by adverse events or resuscitative procedures. Results: In-transit critical events were observed in 333 (6.5%) of 5,144 urgent land transports. New hypotension (4.4%) or new vasopressors (1.6%) were the most common critical events, with fewer respiratory events (1.3%). Advanced care paramedics had a higher rate compared with critical care paramedics (odds ratio [OR]

Citation	Abstract / Executive summary
	1.6; 95% confidence interval [CI] 1.1 to 2.2), especially for patients with baseline hemodynamic instability. In multivariate analysis, mechanical ventilation (adjusted OR 1.7; 95% CI 1.3 to 2.2), baseline hemodynamic instability (adjusted OR 3.7; 95% CI 2.8 to 4.9), out-of-hospital duration (adjusted OR 3.6; 95% CI 2.9 to 4.5 per log-fold increase in time), and neurologic diagnosis (adjusted OR 0.5; 95% CI 0.3 to 0.7 compared with that of medical patients) were associated with critical events. Conclusion: Critical events occurred in approximately 1 in 15 transports and were associated with mechanical ventilation, hemodynamic instability, and transport duration, and were less frequent in neurologic patients. The finding that hypotension is common and predicted by pretransport hemodynamic instability has implications for the preparation and management of this patient group.
Stevenson A, Fiddler C, Craig M, et al. Emergency Department organisation of critical care transfers in the UK. Emerg Med J 2005;22:795–8.	Objectives: Transport of the critically ill patient to or from the emergency department (ED) is a frequent occurrence. This study was designed to determine whether UK EDs currently have appropriate equipment, monitoring, staff training systems, and processes of care for transportation of the critically ill patient. Methods: A postal questionnaire regarding ED transfer patients was sent to 247 UK EDs, followed by repeat mailing and telephone follow up of non-responders. Results: In total, 139 EDs (56%) responded. An estimated 20–30 critically ill patients are transferred from and <20 are received by each ED annually. Processes of care are poorly developed; only 79 EDs (56%) have transfer guidelines available. Audit of transfers is ongoing in 59 EDs (42%), and critical incident reporting is ongoing in 122 (88%). There is a lack of immediately available transport equipment; for example, 17 EDs (12%) have no transport ventilator, 9 (6%) have no transport monitor, and 9 (6%) have no syringe pump. Transport equipment is invariably not standardised. Anaesthetic staff of specialist registrar (74 doctors; 53%) or senior house officer (36 doctors; 26%) grades carry out the majority of ED transfers accompanied by a D or E grade nurse. Both invariably have no formal transfer training. Conclusions: This study highlights inadequacies in provision of equipment and monitoring during interhospital transfer from the ED. Training and processes of care for transport of the critically ill are also suboptimum. Many departments are currently reviewing these processes to formalise and improve transfer training procedures and protocols.

Citation	Abstract / Executive summary
Tasmanian Dept Health. Tasmanian Medical retrieval services Review, Sharly, 2007.	Future Health – Tasmania's Health Plan, released by the Tasmanian Government in May 2007, recommends a comprehensive review of the State's ambulance, medical retrieval and patient transport services. It suggests consideration of a "state-wide service for central coordination of the Patient Transport Service and medical retrieval services to enhance service quality, optimise appropriate resource utilisation and improve service efficiencies". This external review was commissioned as a result of this recommendation. In this review, the term 'Tasmanian medical retrieval services' refers to both the Tasmanian Medical Retrieval Service (TMRS), which currently serves the adult and paediatric populations, and the Neonatal Emergency Transport Service (NETS). It is important to distinguish between the TMRS and overall representation of all retrieval services in the state.
Thomas S, Brown K, Oliver ZJ, Spaite D, Lawner BJ, Sahni R, Weik TS, Falck-Ytter Y, Wright JL, Lang ES (2014) An evidence-based guideline for the air medical transportation of prehospital trauma patients. Prehospital Emergency Care 18 Suppl 1: 35-44	Background: Decisions about the transportation of trauma patients by helicopter are often not well informed by research assessing the risks, benefits, and costs of such transport. Objective: The objective of this evidence-based guideline (EBG) is to recommend a strategy for the selection of prehospital trauma patients who would benefit most from aeromedical transportation. Methods: A multidisciplinary panel was recruited consisting of experts in trauma, EBG development, and emergency medical services (EMS) outcomes research. Representatives of the Federal Interagency Committee on Emergency Medical Services (FICEMS), the National Highway Traffic Safety Administration (NHTSA) (funding agency), and the Children's National Medical Center (investigative team) also contributed to the process. The panel used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology to guide question formulation, evidence retrieval, appraisal/synthesis, and formulate recommendations. The process followed the National Evidence-Based Guideline Model Process, which has been approved by the Federal Interagency Committee on EMS and the National EMS Advisory Council. Results: Two strong and three weak recommendations emerged from the process, all supported only by low or very low quality evidence. The panel strongly recommended that the 2011 CDC Guideline for the Field Triage of Injured Patients be used as the initial step in the triage process, and that ground emergency medical services (GEMS) be used for patients not meeting CDC anatomic, physiologic, and situational high-acuity criteria. The panel issued a weak recommendation to use helicopter emergency medical services (HEMS) for higher-acuity patients if there is a time-savings versus

Citation	Abstract / Executive summary
	GEMS, or if an appropriate hospital is not accessible by GEMS due to systemic/logistical factors. The panel strongly recommended that online medical direction should not be required for activating HEMS. Special consideration was given to the potential need for local adaptation. Conclusions: Systematic and transparent methodology was used to develop an evidence-based guideline for the transportation of prehospital trauma patients. The recommendations provide specific guidance regarding the activation of GEMS and HEMS for patients of varying acuity. Future research is required to strengthen the data and recommendations, define optimal approaches for guideline implementation, and determine the impact of implementation on safety and outcomes including cost.
Thompson J, Rehm M, Sollid SJM, European HEMS and Air Ambulance Committee (2018) EHAC medical working group best practice advice on the role of Air Rescue and prehospital critical care at major incidents. Scandanavian Journal of Trauma, Resuscitation and Emergency Medicine. 26(1): 65 DOI 10.1186/S13049-018-0522-1	Background: Helicopter EMS (HEMS) teams may perform a variety of clinical, managerial and transport functions during major incident management. Despite national and international variations in HEMS systems, the rapid delivery of HEMS personnel with advanced skills in major incident management and clinical scene leadership has been crucial to the delivery of an effective medical response at previous incidents. This document outlines the Best Practice Advice of the European HEMS and Air Ambulance Committee (EHAC) Medical Working Group on how HEMS and Pre Hospital Critical Care teams may maximise the positive impact of their resources in the event of Major Incidents. Methods: Narrative literature review and expert consensus. Results: To ensure a safe, coordinated and effective response, HEMS teams require suitable, proportionate and up to date major incident plans that are integrated into the major incident plans of other regional emergency and healthcare services. Role specific protocols, training and equipment should be adapted to the expected HEMS role in the major incident plan and likely regional threats. System and incident factors will influence HEMS utilisation during the major incident response and can include patient and staff transfer, equipment resupply, aerial assessment, search and rescue, clinical leadership and advanced care. During the recovery phase of a major incident there is a need to ensure restoration of conventional service and address the welfare of involved HEMS personnel. Standardised reporting of major incidents is strongly recommended for clinical governance, legal and research reasons. Conclusions: The rapid delivery of HEMS personnel with advanced skills in Major Incident management and clinical scene leadership is crucial to the delivery of an effective medical response at Major Incidents.

Citation	Abstract / Executive summary
Tien H, Sawadsky B, Lewell M, Moore S, Peddle M, Ackery A, Nolan B, MacDonald RD (2018) Can a single primary care paramedic configuration safely transport low acuity patients in air ambulances? Canadian Journal of Emergency Medicine 20(2): 247-255	Objective: To determine if utilizing a single paramedic crew configuration is safe for transporting low acuity patients requiring only a primary care paramedic (PCP) level of care in Air Ambulances. Methods: We studied single-PCP transports of low acuity patients done by contract air ambulance carriers, organized by Ornge (Ontario's Air Ambulance Service) for one year. We only included interfacility transports. We excluded all scene calls, and all Code 4 (emergent) calls. Our primary outcome was clinical deterioration during transport. We then asked a panel to analyze each case of deterioration to determine if a dual-PCP configuration might have reasonably prevented the deterioration or have better treated the deterioration, compared to a single-PCP configuration. Results: In one year, contract carriers moved 3264 patients, who met inclusion criteria. 85% were from Northern Ontario. There were 21 cases of medical deterioration (0.6%±0.26%). Paper charts were found for 20 of these cases. Most were self-limited cases of pain or nausea. A small number of cases (n=5) were cardiorespiratory decompensation. There was 100% consensus amongst the panel that all cases of clinical deterioration were not related to team size. There was also 100% consensus that a dual-PCP team would not have been better able to deal with the deterioration, compared to a single-PCP crew. Conclusions: We found that using a single-PCP configuration for transporting low acuity patients is safe. This finding is particularly important for rural areas where air ambulance is the only means for accessibility to care and where staffing issues are magnified.
Tollefsen WW, Brown CA, Cox KL, Walls RM (2013) Two hundred and sixty pediatric emergency airway encounters by air-transport personnel: a report of the Air Transport Emergency Airway Management (NEAR IV: A Team) Project. Paediatric Emergency Care 29(9):963-8	Background: Effective airway management is the cornerstone of resuscitative efforts for any critically ill or injured patient. The role and safety of pediatric prehospital intubation is controversial, particularly after prior research has shown varying degrees of intubation success. We report a series of consecutive prehospital pediatric intubations performed by air-transport providers. Methods: We retrospectively reviewed intubation flight records from an 89-rotorcraft, multistate emergency flight service during the time period from January 1, 2007, to December 31, 2009. All patients younger than 15 years were included in our analysis. We characterized patient, flight, and operator demographics; intubation methods; success rates; rescue techniques; and adverse events with descriptive statistics. We report proportions with 95% confidence intervals and differences between groups with Fisher exact and x tests; $P < 0.05$ was considered significant.

Citation	Abstract / Executive summary
	Results: Two hundred sixty pediatric intubations were performed consisting of 88 medical (33.8%) and 172 trauma (66.2%) cases; 98.8% (n = 257) underwent an orotracheal intubation attempt as the first method. First-pass intubation success was 78.6% (n = 202), and intubation was ultimately successful in 95.7% (n = 246) of cases. Medical and trauma intubations had similar success rates (98% vs 95%, Fisher exact test P = 0.3412). There was no difference in intubation success between age groups (x = 0.26, P = 0.88). Three patients were managed primarily with an extraglottic device. Rescue techniques were used in 11 encounters (4.2%), all of which were successful. Cricothyrotomy was performed twice, both successful. Conclusions: Prehospital pediatric intubation performed by air-transport providers, using rapid sequence intubation protocols, is highly successful. This effect on patient outcome requires further study.
Trauma Education, Adult Retrieval Victoria and the Department of Health (Victoria, Australia) Trauma Victoria—education and clinical guidelines, [Internet]; September 2014. https://trauma.reach.vic.gov.au (accessed 3 Oct 2014).	These guidelines are designed to push for quality improvement using evidence-based practice across the entire care pathway. They aim to achieve consistent advancement in people's health and lead to access of good-quality care. Putting these guidelines into practice benefits everyone; this includes the staff directly involved in patient care, those involved in managing the health facility, local healthcare organisations and members of the public. It can help to monitor service improvements, demonstrate that high-quality care is being provided and also highlight areas for improvement. One of the most difficult aspects of working with guidelines is how best to implement them into routine daily practice. Many of us provide patient care according to usual routines ('how it's always been done') instead of looking at developments and change in practice to reflect the latest evidence-based research. Barriers to implementation can include organisational constraints, such as a lack of time, obstructive opinions of key people who may not agree with the evidence or do not want to change their practice, and lack of leadership to effect change. Additionally, there may be a perceived poor sense of competence by staff who question their skills. In order for change to be effective there must be an identified need, a willingness to adapt and promote current practices, a driving force behind it and acceptance from all levels, be it individual, team or organisational . For these guidelines to be successfully implemented, the following is recommended.

Citation	Abstract / Executive summary
Van Zwanenberg G, Dransfield M, Juneja R. A consensus to determine the ideal critical care transfer bag. Journal of the Intensive Care Society. 2016;17(4):332-340.	Background: Familiarity with environment, processes and equipment reduces the risk inherently associated with critical care transfers. Therefore, the North West London Critical Care Network decided to create a standardised ideal transfer bag and contents to improve patient safety. Methods: A four-round modified Delphi survey developed a condensed and clinically tested content list. An expert panel then designed an ideal transfer bag based on agreed important principles. Results: Participants completed two rounds of an electronic survey. Round 3 comprised an expert clinical panel review, while round 4 tested the contents over 50 clinical transfers. The prototype bag's design was adjusted after clinical use and feedback. Discussion: This project has introduced a standardised critical care transfer bag across our network. A similar technique could be used for other healthcare regions. Alternatively, the above critical care transfer bag could be adopted or adapted for regional use by clinicians.
Venkategowda P. Rao S, Mutkule D, Taggu A, Unexpected events occurring during the intra-hospital transport of critically ill ICU patients. Indian Journal of Critical Care Medicine. 2014;18(6):354-7.	Background: Intra-hospital transport of critically ill patients is a challenging task. However, despite the improvements in intra-hospital transport practices, adverse event incidents remain high and constitute a significant risk for the transport of the critically ill ICU patients. Objectives: To observe the number and types of unexpected-events (UEs) occurring during intra-hospital transport of critically ill ICU patients. Interventions provided along with outcome. Materials and Methods: This was a prospective observational study of 254 intra-hospital critically-ill ICU patients of our hospital transported for diagnostic purposes during April 2012 – March 2013. The escorting intensivist completed the data of unexpected events during transport. Results: A total of 254 patients were observed prospectively for UEs during intra-hospital transfer of critically ill patients. The overall UEs observed were 139 among 64 patients. Among the UEs which occurred, the maximum were miscellaneous causes [89 (64.00%)] like oxygen probe [38 (27.33%)] or ECG lead displacement [27 (19.42%)]. Major events like fall in spo2 >5% observed in 15 (10.79%) patients, BP variation > 20% from baseline in 22 (15.82%) patients, altered mental status in 5 (3.59%), and arrhythmias in 6 (4.31%) patients. Among 64 (100%) patients with UEs, 3 (2.15%) patients with serious adverse events have been aborted from transport.

Citation	Abstract / Executive summary
	Conclusion: Unexpected-events (UEs) are common during transport of critically ill ICU patients and these adverse events can be reduced when critically ill patients are accompanied by intensivist/medically qualified person during transport and following strict transport guidelines.
Vic DHS – Review of Trauma and Emergency Services (RoTES), Victoria. Final report of the ministerial taskforce on trauma and emergency services and the department working party on emergency and trauma services. Melbourne: Department of Human Services Victoria, 1999.	Support has grown over recent years for the development of an integrated trauma system in Victoria. There are some indications that major trauma outcomes in Victoria are better than those in North America (Cameron et al., 1995), however research over the last five years has identified a number of system-wide deficiencies adversely impacting on the outcomes for severely injured patients. A number of studies have drawn attention to this issue. The Consultative Council on Road Traffic Fatalities identified potentially preventable outcomes contributing to death in up to 38 per cent of road traffic fatalities in Victoria (McDermott et al. 1996, McDermott et al., 1998). The Major Trauma Management Study (Danne et al., 1998) identified similar potentially preventable outcomes from all aetiologies of trauma, as well as potentially preventable complications in survivors. Both of these studies demonstrated recurring deficiencies in trauma management and system response. Problems were identified from the initial response through to definitive treatment, in both metropolitan and rural areas. Examples of these deficiencies were: Inadequate availability of prehospital and emergency department advanced life support skills. Prolonged times at the scene of accidents. Inadequate reception in emergency departments by junior staff and delayed investigation and surgical consultation. Triage of patients to hospitals without optimal skills or resources to manage timecritical major trauma patients. Delays in, and inadequate medical escort for, rural and metropolitan interhospital transfer of major trauma patients. Recognising the size and complexity of the task of developing an integrated trauma system across Victoria, the Minister for Health, the Hon Robert Knowles MP, established a review of trauma and emergency services in July 1997. The purpose of the review is to advise Government on an appropriate system-wide structure, arrangements for ongoing monitoring of the accessibility and responsiveness of emergency and trauma services, and education and training issues.

Citation	Abstract / Executive summary
	The benefits of creating an integrated trauma and emergency system were foreshadowed in the Metropolitan Health Care Services Plan, released by the Department of Human Services in 1996. The concept of an integrated trauma system that matches the needs of injured patients to an appropriate level of treatment is formally supported by a number of colleges and organisations, including the Royal Australasian College of Surgeons, the Australasian College for Emergency Medicine, the Consultative Council on Emergency and Critical Care Services, the Australian and New Zealand College of Anaesthetists, Metropolitan Ambulance Service, and the Neurosurgical Society of Australasia.
WA – Western Australia Country Health Service. Improving clinical handover in interhospital patient transfers – public report on pilot study. Perth, Australia: WACHS; 2009.	Complex processes are involved in both referral and the arranging of patient transport in the WA health system. WACHS in partnership with Royal Perth Hospital (RPH) undertook a project to identify the risk factors involved in acute patient transfers and to trial strategies that would assist in addressing the risk factors identified. A minimum dataset form was developed, specifically for care of the deteriorating adult medical patient, involuntary mental health patients and obstetric emergency patients. RPH also created an educational toolkit based on the mnemonic iSoBAR to aid training on standardising interhospital transfers. Trials were held across the seven regions of WACHS, with encouraging initial feedback from staff. WACHS encountered an environment both ready for an opportunity to streamline process and improve communication, but also resistant to change due to perceived duplication of the form. A small qualitative audit of the project six months after implementation found support for the iSoBAR toolkit, however further evaluation of these trials are needed. Some sites have adopted it across into other areas. This study recommends ongoing training and development on iSoBAR, and creating practical guidelines to ensure its implementation.
WA Burden of Disease 2015 Regional Summary Western Australian Burden of Disease Study 2015 Summary report for Health Regions (PDF 1.4MB)	Burden of disease studies provide a comprehensive assessment of the impact of diseases, injuries and risk factors on a population. This impact is measured as 'disability-adjusted life years' (DALY); that is, the sum of 'years of life lost prematurely' (YLL) and 'years lived with disability' (YLD). The Western Australian Burden of Disease Study (WABoDS) 2015, is a collaboration between the AIHW and the Epidemiology Branch of the WA Department of Health. The study aimed to provide disease group- and disease-level data for the whole state, health regions and the Aboriginal population. This report focuses on the ten health regions in Western Australia (WA) and comparisons between them.

Citation	Abstract / Executive summary
WA Burden of Disease 2015 Western Australian Burden of Disease Study 2015 Summary report (PDF 1MB)	Burden of disease studies provide an assessment of the impact of diseases, injuries and risk factors on a population. This impact is measured as 'Disability-adjusted Life Years' (DALY); that is, the sum of 'Years of Life Lost Prematurely' (YLL) and 'Years Lived with Disability' (YLD) (Prüss-Üstün, Mathers, Corvalán, & Woodward, 2003). YLL represents the number of deaths by sex and age multiplied by an 'ideal life span' (according to a reference life table) (Australian Institute of Health and Welfare, 2019). YLD is a measure of years lived with ill-health or disability, which accounts for the person-time with the condition multiplied by a weight representing the severity of the condition (Australian Institute of Health and Welfare, 2019).
WA Coroner: Inquest into the death of Maung PU (11037/2012) 2012	The deceased was a seaman on board a vessel travelling between China and Western Australia when he died on 30 September 2012. His body was flown to the nearest port, being Port Hedland. The deceased was 49 years old. The deceased was working as a second engineer on board the Equator Prosper when he became acutely unwell with abdominal pain and vomiting on the morning of 29 September, 2012. His condition deteriorated over the next 24 hours and he repeatedly requested to be transferred to hospital. This request was supported by other crew members on board the vessel, however, the request was denied by the Ship's Captain. The Captain did eventually contact the Port Hedland Harbour Tower and request a medical evacuation at approximately 1.00pm on 30 September 2012. The deceased was by then either moribund or dead. The Port Hedland Authority acted promptly and provided some assistance by sending a security officer with first aid training in a helicopter. However, by the time the helicopter arrived at the ship, it would seem the deceased had already died and they were transporting a body. The security officer did the best he could do in the circumstances, and gave the deceased oxygen and transported the deceased immediately to the Port Hedland Hospital, where upon arrival it was confirmed he was already deceased. The Coroner noted the inquest highlighted the limitations in the services available for medical evacuations from ships in the Pilbara and the Coroner made a recommendation.

Citation	Abstract / Executive summary
WA Government Department of Health, "Review of the clinical governance of Public Mental Health Services in Western Australia, Final Report". October, 2019. ww2.health.wa.gov.au/-/media/Files/Corporate/Reports-and-publications/Review-of-clinical-governance-of-public-mental-health/Review-of-the-Clinical-Governance-of-Public-Mental-Health-Services.pdf	This report presents the findings of a review of the clinical governance of public mental health services in WA. Past reports raised issues including the Review of the Admission or Referral to and the Discharge and Transfer Practices of Public Mental Health Facilities/Services in Western Australia (2012) (the Stokes Review) (2) and the Western Australian Auditor General's Report (2014) Licensing and Regulation of Psychiatric Hostels (3). System function was reviewed in 2019 by the WA Auditor General in Access to State Managed Adult Mental Health Services (4). The Review of Safety and Quality in the WA Health System: A strategy for continuous improvement (2017) (Mascie-Taylor Review) raised concerns with the governance arrangements of WA public mental health services. It reported a complex system, which lacked clarity and was composed of numerous agencies with overlapping roles and in which no one agency had a complete picture. It recommended a review of clinical governance to simplify and clarify organisational arrangements to provide direction, consistency and facilitation across service providers. The Sustainable Health Review: Final Report to the Western Australian Government (2019) (5) supported this Recommendation.
WA Government Department of Health, 2012. Review of the admission or referral to and the discharge and transfer practices of public mental health facilities/services in Western Australia Professor Bryant Stokes, AM. July 2012 ww2.health.wa.gov.au/~/media/Files/Corporate/Reports%20and%20publications/Review%20of%20admission%20or%20referral%20MH/mental_health_review_2012.pdf	In November 2011, the Minister for Mental Health requested three reviews about the suicides of people who had been discharged from mental health services in Western Australia (WA): 1. The Chief Psychiatrist's examination of four cases of patients who died unexpectedly following presentation at Fremantle Hospital. 2. The Chief Psychiatrist's review of the clinical decisions made around the admissions and discharges at Fremantle Hospital over the past 12 months in which people have died subsequent to their discharge. 3. This independent statewide review of the admission or referral to and the discharge and transfer practices of public mental health facilities/services in WA. (See Terms of Reference, Appendix 1). While this Review has revealed an array of challenges and imperatives for mental health care in WA, it is important to acknowledge that the all-pervasive and multifaceted nature of psychiatric illness and required support and care is not the responsibility of any one person, service or agency (Coid 1994). Mental health treatment is one component of a broader framework to support people with mental illness. Other components, such as social support, housing and employment, each play a crucial part. This Review considered the efforts of staff, observing that staff are committed to the care and rehabilitation of people who are mentally unwell. In the context of limited resources, the mental health system is under considerable stress, particularly in relation to staff already stretched, endeavouring to adhere to formal policies, procedures, legislative requirements and their own professional expectations and the expectations of patients and carers.

Citation	Abstract / Executive summary
WA Government Department of Health, 2021, From Death We Learn. ww2.health.wa.gov.au/Reports-and-publications/From-Death-We-Learn	From Death We Learn is an annual publication that has been available since 2006. It provides summaries of health-related coronial inquest findings. High quality organisations and systems routinely utilise both internal and external processes to review and improve their services, with coronial inquests being one important external mechanism from which to learn. Key messages for a case, or for a theme of cases, are included to raise awareness of concerns relating to the circumstances of the death and/or possible contributing factors. A series of discussion points are highlighted to encourage reflection, promote education across health services as well as to initiate quality improvement discussions. Acknowledgements to the friends and families of loved ones whose deaths have been investigated by the Coroner. It is with the utmost respect to them that this publication is collated in the hope that it will complement the death prevention and public safety role of the Coroner, and ultimately improve the safety and quality of care delivered to patients.
WA Health: East Metropolitan Health Service (EMHS) Inter-hospital Transport of Critically Ill Patients (IHPT): Final Report, 2018	Unlike other Australian jurisdictions, Western Australia does not have a coordinated system for inter-hospital patient transport. Risks associated with the current ad hoc system were documented as long ago as 2000and again in 2008 and 2010.The greater role delineation of tertiary hospitals and more emergency department presentations to the general hospitals have now increased the need for inter-hospital patient transport of patients sick enough to need a nurse ora medical escort (or both) to approximately 35 each week in the metropolitan area. A meeting of the EMHS Intensive Care Unit (ICU) Heads of Department and Nurse Unit Managers in April 2017 noted the shortcomings of the current system. The Chief Executive of EMHS was advised of the concerns and on 1stMay 2017 approved the formation of a Working Group to further identify the issues and make recommendations. A gap analysis against the Australasian College for Emergency Medicine, Australian and New Zealand College of Anaesthetists and College of Intensive Care Medicine of Australia and New Zealand joint guidelines for transport of critically ill patients (2015) identified significant deficiencies in relation to current practice in Western Australia. Further evidence of the shortcomings of the current system were demonstrated in a simulated inter-hospital patient transport of a complex patient that identified multiple logistic, patient safety and staff safety issues related to the current ad hoc arrangements.

Citation	Abstract / Executive summary
WA Report on Trauma Services 2007 ww2.health.wa.gov.au/~/media/Files/Corporate/general%20documents/Trauma/PDF/trauma_system_and_services_report.pdf	The Trauma Working Group was established in 2005 at the request of Dr Neale Fong, Director General Health to review and advise on the implementation of Recommendation 33 of the Report of the Health Reform Commission (HRC). "The Northern Tertiary Hospital should be designated as the State centre for major adult trauma, and Princess Margaret Hospital as the State centre for major paediatric trauma. Emergency departments should be expanded in each of the four general hospitals to accommodate emergency adult and paediatric care, excluding only major trauma." The terms of reference for the Trauma Working Group (TWG) are attached in Appendix 1. Ultimately, the mandate bestowed upon the TWG was to consider current trauma service delivery, determine what needs to change in order to implement Recommendation 33, consider the impact on patients with 'special needs', consider the impact on trauma workforce, education and training and identify areas that are strongly associated with trauma that should be included in planning a comprehensive state-wide trauma service. In fulfilling its mandate the TWG has developed a suite of initiatives that will provide a robust trauma system to WA via Emergency Department role delineation aligned with pre-hospital triage and retrieval systems and access to specialist care for paediatric, adolescent, maternity, burns, hyperbaric and spinal injured patients. The special needs of patients requiring rehabilitation have also been considered.
Waach J, Shepherd M, Andrew E, Bernard S, Smith K (2018) Delayed Sequence Intubation by Intensive Care Flight Paramedics in Victoria, Australia. Prehospital Emergency Care, DOI: 10.1080/10903127.2018.1426665	Objective: Delayed sequence intubation (DSI) involves the administration of ketamine to facilitate adequate preoxygenation in the agitated patient. DSI was introduced into the Clinical Practice Guideline for Intensive Care Flight Paramedics in Victoria in late 2013. We aimed to describe the clinical characteristics of patients receiving DSI. Methods: A retrospective analysis was undertaken of patients who received DSI between January 1, 2014, and December 31, 2016, during both primary response and retrieval missions. Patients' clinical characteristics, DSI success rates, and complications were determined from electronic patient care records. Results: Forty patients received DSI during the study period. Of these, 32 were intubated to manage traumatic injury and the remaining 8 were intubated for medical reasons. On arrival of the first road ambulance, median oxygen saturation was 96.5%, and immediately prior to DSI the median was 98.0%. One patient had a period of self-limiting apnea (< 15 seconds) following ketamine administration. Oxygen saturation was either maintained or increased prior to laryngoscopy in all patients. Post-intubation, one patient experienced bradycardia (heart rate < 60 beats per minute), two patients had a systolic blood pressure drop of > 20 mm Hg, one patient experienced an increase in heart rate of > 20 beats per minute, and two patients

Citation	Abstract / Executive summary
	had transient oxygen desaturation (< 85%). No patients experienced cardiac arrest or required surgical airway intervention. All patients were successfully intubated. After DSI, the median oxygen saturation was 100%. Conclusions: DSI provides a reasonably safe and effective approach for intensive care flight paramedics in the preoxygenation of agitated, hypoxic patients in order to decrease the risk of peri-intubation desaturation and related hypoxic injury.
WACHS Maternal and Newborn Care Capability Framework Policy 5/3/2020 www.wacountry.health.wa.gov.au/~/media/WACHS/Documents/About-us/Policies/Maternal-and-Newborn-Care-Capability-Framework-Policy.pdf	The WA Country Health Service (WACHS) is geographically the largest Western Australian health service and the largest health system in Australia with 70 hospitals, 39 remote area nursing posts and community and child health services in 221 locations. Around 4500 women are admitted to our 18 Maternity hospitals to give birth each year and over 890 of these are Aboriginal women. In addition, approximately 1050 country women travel to the metropolitan area annually to access more complex care and help them birth safely. WACHS has five special care nurseries who admit around 400 babies for higher level care and additionally another 200 babies are transferred to the metropolitan for intensive care. WACHS maternity and newborn clinical service framework (CSF) levels are based on the WA Health Clinical Services Framework, 2010 – 2024 and the WA Framework for the Care of Neonates in Western Australia 2009 levels. Our emergency departments need to be equipped to safely manage unplanned emergency presentations by pregnant or postnatal women and neonates. Where birthing services are not provided, WACHS is committed to ensuring women have access to antenatal and postnatal care for themselves and their babies that meets their health and social needs.
WACHS Strategic Plan 2019-2024 www.wacountry.health.wa.gov.au/About-us/Publications/Strategic-plans	This strategic plan sets the direction of the WA Country Health Service (WACHS) for the next five years, laying the foundations to achieve a re-imagining of country healthcare over the next 15 years. While our core focus is always improving the quality of care, we deliver to country communities in the here and now, we are planning for the future; a future where we unlock the transformative potential of new and emerging technologies.

Citation	Abstract / Executive summary
Warren J, Fromm RE, Orr RA, et al., American College of Critical Care Medicine. Guidelines for the inter-hospital transport of critically ill patients. Crit Care Med 2004;32:256–62.	Objective: The development of practice guidelines for the conduct of intra- and interhospital transport of the critically ill patient. Data source: Expert opinion and a search of Index Medicus from January 1986 through October 2001 provided the basis for these guidelines. A task force of experts in the field of patient transport provided personal experience and expert opinion. Study selection and data extraction: Several prospective and clinical outcome studies were found. However, much of the published data comes from retrospective reviews and anecdotal reports. Experience and consensus opinion form the basis of much of these guidelines. Results of data synthesis: Each hospital should have a formalized plan for intra- and interhospital transport that addresses a) pretransport coordination and communication; b) transport personnel; c) transport equipment; d) monitoring during transport; and e) documentation. The transport plan should be developed by a multidisciplinary team and should be evaluated and refined regularly using a standard quality improvement process. Conclusion: The transport of critically ill patients carries inherent risks. These guidelines promote measures to ensure safe patient transport. Although both intra- and interhospital transport must comply with regulations, we believe that patient safety is enhanced during transport by establishing an organized, efficient process supported by appropriate equipment and personnel.
Weller JM, Janssen AL, Merry AF, Robinson B. Interdisciplinary team interactions: a qualitative study of perceptions of team function in simulated anaesthesia crises. Med. Educ. 2008; 42: 382–8.	Objectives: We placed anaesthesia teams into a stressful environment in order to explore interactions between members of different professional groups and to investigate their perspectives on the impact of these interactions on team performance. Methods: Ten anaesthetists, 5 nurses and 5 trained anaesthetic assistants each participated in 2 full-immersion simulations of critical events using a high-fidelity computerised patient simulator. Their perceptions of team interactions were explored through questionnaires and semi-structured interviews. Written questionnaire data and interview transcriptions were entered into N6 qualitative software. Data were analysed by 2 investigators for emerging themes and coded to produce reports on each theme. Results: We found evidence of limited understanding of the roles and capabilities of team members across professional boundaries, different perceptions of appropriate roles and responsibilities for different members of the team, limited sharing of information between team members and limited team input into decision making. There was a perceived impact on task distribution and the optimal utilisation of resources within the team.

Citation	Abstract / Executive summary
	Conclusions: Effective management of medical emergencies depends on optimal team function. We have identified important factors affecting interactions between different health professionals in the anaesthesia team, and their perceived influences on team function. This provides evidence on which to build appropriate and specific strategies for interdisciplinary team training in operating theatre staff.
Western Australia Tomorrow population forecasts, Medium and long term population and household forecasts. https://www.wa.gov.au/government/document-collections/western-australia-tomorrow-population-forecasts	The WA Tomorrow Population Report No. 11 forecasts are now presented in Storymap incorporating PowerBI. The Storymap section is an infographic summary of the forecasts at the state level. It explains the components of population change and provides an overview of what the future population may look like. The forecast data can be explored further with interactive tables, charts and maps in the PowerBI section. The trend-based age and sex forecasts in WA Tomorrow are undertaken every five years. While these forecasts predate COVID-19, it is currently unknown the extent that any impact may have on the forecasts. This may be evident in future WA Tomorrow reports. WA Tomorrow Population Report No. 11 contains the latest population forecasts by age and sex, for Western Australia and its regions. They represent the official WA State Government forecasts to 2031. These forecasts supersede WA Tomorrow Population Report No. 10 (2015). WA Tomorrow is a series of population forecasts based on demographic trends. The forecasts represent the best estimate of future population size if trends in fertility, mortality and migration continue. The forecasts refer to the 30 June in each stated year. The WA Tomorrow trend forecasts are distinct from government strategies, frameworks and scenarios such as Perth and Peel @ 3.5 million, which are generally longer term in their outlook and seek to guide future growth to deliver desired patterns of urban form. WA Tomorrow includes a forecast range (A to E), indicating five probable futures. A and B contain the lower forecasts, C is the median forecast and D and E represent the higher forecasts. For the user who requires the best estimate of future population size, C should be used.

Citation	Abstract / Executive summary
Wiegersma J, Droogh J, Zijlstra J, Fokkema J, Ligtenberg J. Quality of interhospital transport of the critically ill: impact of a Mobile Intensive Care Unit with a specialized retrieval team. Critical Care. 2011;15(1):R75.	Introduction: In order to minimize the additional risk of interhospital transport of critically ill patients, we started a mobile intensive care unit (MICU) with a specialized retrieval team, reaching out from our university hospital-based intensive care unit to our adherence region in March 2009. To evaluate the effects of this implementation, we performed a prospective audit comparing adverse events and patient stability during MICU transfers with our previous data on transfers performed by standard ambulance. Methods: All transfers performed by MICU from March 2009 until December 2009 were included. Data on 14 vital variables were collected at the moment of departure, arrival and 24 hours after admission. Variables before and after transfer were compared using the paired-sample T-test. Major deterioration was expressed as a variable beyond a predefined critical threshold and was analyzed using the McNemar test and the Wilcoxon Signed Ranks test. Results were compared to the data of our previous prospective study on interhospital transfer performed by ambulance. Results: A total of 74 interhospital transfers of ICU patients over a 10-month period were evaluated. An increase of total number of variables beyond critical threshold at arrival, indicating a worsening of condition, was found in 38 percent of patients. Thirty-two percent exhibited a decrease of one or more variables beyond critical threshold and 30% showed no difference. There was no correlation between patient status at arrival and the duration of transfer or severity of disease. ICU mortality was 28%. Systolic blood pressure, glucose and haemoglobin were significantly different at arrival compared to departure, although significant values for major deterioration were never reached. Compared to standard ambulance transfers of ICU patients, there were less adverse events: 12.5% vs. 34%, which in the current study were merely caused by technical (and not medical) problems. Although mean Acute Physiology and Chronic Health Evaluation II (APACHE II) score was significantly higher, patients transferred by MICU showed less deterioration in pulmonary parameters during transfer than patients transferred by standard ambulance. Conclusions: Transfer by MICU imposes less risk to critically ill patients compared to transfer performed by standard ambulance and has, therefore, resulted in an improved quality of interhospital transport of ICU patients in the north-eastern part of the Netherlands.

Citation	Abstract / Executive summary
Wilkinson B, Garwood J, Langford SA. In-flight pharmacological management of patients with acute mental health disturbance. Air Med J. 2018;37:115–119.	Objective: Patients can be transferred many hundreds of kilometers with acute mental health disturbance for specialist mental health services in Western Australia. Methods: A retrospective notes review of Royal Flying Doctor Service Western Operations records was undertaken over a 4-month period. Patients were identified from the transfer database by mental health diagnosis. Benzodiazepine and antipsychotic doses were converted into a reference drug per class for comparison. Results: One hundred ten patients underwent air transfer in a total of 130 flights. Over 80% of patients were involuntary patients being transferred for specialist psychiatric evaluation and management in an inpatient mental health unit. Over half of the patients required no in-flight sedation, and around 80% of patients were managed with standard doses of first-line agents (haloperidol, midazolam, and diazepam). A small number of patients required alternative agents for refractory sedation, most commonly ketamine and propofol. There were no statistically significant differences for in-flight medication by sex, ethnicity, or substance misuse status. Conclusions: The rate of in-flight incidents including violence remained low. Transfers of patients with acute mental health disturbance are challenging, and quality preflight assessment and in-flight care are required to minimize the associated risks.
Zalstein S, Danne P, Taylor D, et al. The Victorian major trauma transfer study. Injury 2010;41:102–9.	Aims: To comprehensively examine the inter-hospital transfer of major trauma patients—including the reason for transfer, duration, escorts, interventions and unexpected events. Methods: This was a detailed study of the transfer of major trauma cases in the State of Victoria, Australia, between April 16, 2003 and December 31, 2004. Twenty-three hospitals and seven transfer/retrieval services participated. Defined major trauma cases that were transferred between participating hospitals for the purpose of definitive care were eligible for enrolment. The transfer phase extended from 30 min before until 30 min after the transfer. The transferring and receiving hospitals and the transfer escorts were asked to record data on a specifically designed data collection form. Results: A total of 451 cases were enrolled (mean Injury Severity Score 22.2). Transfers originated mainly from Regional Trauma (42.8%) and Metropolitan Trauma (31.3%) Services and most (90.5%) terminated at a Major Trauma Service. Median time from injury to arrival at the receiving hospital was 8 h 30 min. Median time from arrival at referring hospital to request for transfer was 3 h 25 min. Escorts comprised ambulance and medical/nursing staff in 67.0% and 30.4% of cases, respectively. Metropolitan retrieval services were involved in only 10% of cases. Medical escorts were mainly

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	(62.9%) from the referring hospital and the majority of these were registrars (49.4%) and hospital medical officers (HMOs, 16.9%). Overall mortality was 6.2%. Mortality rates for cases escorted by referring hospital doctors, Mobile Intensive Care Ambulance (MICA), non-MICA and any other escorts were 14.5%, 6.0%, 2.6% and 4.3%, respectively. HMO escorts had the highest mortality risk (OR 3.67, 95%CI 1.00–13.49, p < 0.001). Mortality risk was greatest for cases that required administration of vasopressor drugs (OR 11.4, 95%CI 3.78–34.36, p < 0.001), intubation prior to arrival at the referring hospital (OR 10.36, 95%CI 3.51–30.52, p < 0.001), any interventions at the referring hospital (OR 8.3, 95%CI 3.1–22.2, p < 0.001), administration of blood at the receiving hospital (OR 4.91, 95%CI 1.5–16.1, p = 0.01), and cases using escorts from the referring hospital (OR 3.8, 95%CI 1.69–8.39, p = 0.001). Conclusion: Considerable variability in request for transfer and transfer times, transfer escorts and mortality risk exist. The single greatest issue identified that most severely injured group were escorted by the most junior doctors (HMOs) and had the highest mortality. This crucial issue must be addressed by the State Trauma System and by any redesigned retrieval service in Victoria. A detailed review of activation and responsiveness criteria and the nature of the transfer escort is indicated. The establishment of Adult Retrieval Victoria may address many of the concerns raised by this study.

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