Air Medical Journal xxx (2017) 1–6

Contents lists available at ScienceDirect

Air Medical Journal

journal homepage: http://www.airmedicaljournal.com/

Characteristics of Fixed Wing Air Ambulance Transports in Victoria, Australia

Ashleigh J. Delorenzo, BSc (Hons) [1,*], Jeremy W. Abetz, BMedSci (Hons) [2], Emily Andrew, BSc (Biomedical), MBiostat [3], Anthony de Wit, BHlthSci (Paramedicine), Grad Dip EmergHlth (MICA), Grad Cert EmergHlth (Aeromed Retrieval) [4], Brett Williams, BAVEd, Grad Cert ICP, Grad Dip EmergHlth, MHlthSc, PhD [5], Karen Smith, BSc (Hons), PhD [6]

[1] *Research Assistant, Department of Community Emergency Health and Paramedic Practice, Monash University, Victoria, Australia; Ambulance Victoria, Victoria, Australia*
[2] *Medical Student, Department of Community Emergency Health and Paramedic Practice, Monash University, Victoria, Australia; School of Rural Health, Faculty of Medicine, Nursing and Health Sciences, Monash University, Victoria, Australia*
[3] *Research Governance Manager, Ambulance Victoria, Victoria, Australia*
[4] *Air Operations Manager, Ambulance Victoria, Victoria, Australia*
[5] *Head of Department, Department of Community Emergency Health and Paramedic Practice, Monash University, Victoria, Australia*
[6] *Adjunct Professor, Department of Community Emergency Health and Paramedic Practice, Monash University, Victoria, Australia; Manager of Research and Evaluation, Ambulance Victoria, Victoria, Australia; Adjunct Professor, Department of Epidemiology and Preventive Medicine, Monash University, Victoria, Australia; Adjunct Professor, Discipline of Emergency Medicine, University of Western Australia, Perth, Western Australia, Australia*

A B S T R A C T

Objective: Air medical transport is important for the transfer of patients in the prehospital and interhospital environment. Few studies have described the services provided by fixed wing ambulances or the broader clinical profiles of patients they transport. Such information may be useful for the planning and allocation of resources, assistance with training, and refining clinical protocols. We sought to describe the characteristics of patients transported by fixed wing aircraft at Air Ambulance Victoria (AAV) and the service AAV provides in Victoria, Australia.
Methods: A retrospective data review of patients transported by AAV fixed wing aircraft between January 1, 2011, and June 30, 2015, was performed. Data were sourced from the Ambulance Victoria data warehouse. Retrievals involving physicians were excluded.
Results: A total of 16,579 patients were transported during the study period, with a median age of 66 years. Most patients were male (58.7%), and cardiovascular/hematologic conditions (27.2%) were most common. Overall, 51.7% of cases were prebooked routine transfers, 47.4% were interhospital routine transfers, and 0.9% were primary responses. Caseloads were largest in the regions furthest from the capital city.
Conclusion: The AAV fixed wing service in Victoria enables regional and remote patients to be transported to definitive care without major disruption to ground ambulances.

Air medical transport is useful for the transfer of patients in the prehospital environment and between hospitals in the event of a trauma or medical condition that requires specialized care.[1,2] Specialized medical services and technologies are usually concentrated in major cities. To offer this high level of care to the majority of the population, especially in rural areas, a specially equipped air transportation system may be required.[1] Air ambulance services include both fixed wing and rotary wing aircraft. Fixed wing air ambulances are recommended over their rotary wing counterpart for long-distance missions over 240 km.[1] Generally, they are

* Address for correspondence: *Ashleigh J. Delorenzo, BSc (Hons), Department of Community Emergency Health and Paramedic Practice, Monash University, Victoria, Australia; Ambulance Victoria, Victoria, Australia.*
E-mail address: ashleigh.delorenzo@outlook.com (A.J. Delorenzo).

1067-991X/$36.00

http://dx.doi.org/10.1016/j.amj.2017.02.008

considered safer for longer transports, and factors such as greater speed, more space allowing for multiple patients to be transported, absence of weight limitations, and a pressurized cabin are advantageous for patient care.[3,4]

The decision to use an air ambulance instead of a ground ambulance crew is generally multifactorial, and the decision to use fixed wing or rotary wing adds further complexity. The air medical environment has unique characteristics such as vibrations, turbulence, thermal changes, decreased humidity, forces of acceleration and deceleration, hypoxia, gas volume changes, and increased noise.[3,5] Thus, patient diagnosis/status, environmental and climatic conditions, distance, time of transfer, and cost are all factors that require attention.[3] Meticulous pretransfer preparation and stabilization of the patient undergoing air medical transport is crucial to prevent physiological deterioration and any other complications during flight.[5]

The benefits and challenges of fixed wing aircraft for long-distance patient transport have been previously described[6–11]; however, few studies have described the epidemiology of patients transported by fixed wing aircraft.[6] Such information may be useful for the planning and allocation of resources, assistance with training, and refining targeted clinical protocols. Therefore, we sought to describe the characteristics of patients transported by Air Ambulance Victoria (AAV) fixed wing air ambulances in Victoria, Australia, and the service AAV provides.

Methods

Study Design

A retrospective review was performed using data collected for all AAV fixed wing cases between January 1, 2011, and June 30, 2015. Patients were excluded if they were treated by a retrieval physician by Adult Retrieval Victoria, Paediatric Emergency Transport Services, Neonatal Emergency Transport Services, or Paediatric Infant Perinatal Emergency Retrieval.

Setting

Ambulance Victoria (AV) is the emergency service provider for the state of Victoria, Australia, servicing a population of more than 5.9 million people over 237,629 km^2.[12] AAV is a subsidiary of AV that operates 5 Augusta Westland 139 emergency helicopters and 4 Beechcraft King Air 200 fixed wing aircraft. The 5 helicopters are based at 4 strategically located bases throughout Victoria and attend over 2,000 medical and trauma emergencies each year.[13] The fixed wing aircrafts retrieve approximately 6,000 patients annually and are based in Melbourne.[13]

Each fixed wing aircraft is equipped to carry 2 stretcher patients and up to 2 seated patients. The aircraft are capable of reaching speeds of up to 500 km/h, have a range of 500 to 1,500 km, and reach a maximum altitude of 35,000 ft. Because of the vast land mass of Victoria, the fixed wing aircrafts are used primarily for patient transfers between rural and metropolitan hospitals traveling as far as the southern New South Wales border, northern Tasmania, and some parts of South Australia. Some missions require a transport distance of over 500 km in 1 direction. During routine air transfers, the fixed wing air ambulance will commonly transport multiple patients at once.

Fixed wing aircraft are primarily assigned to routine prebooked transports and interhospital transfers (IHTs). In addition, transport is provided to patients who are discharged from a hospital that is far from their home. AAV's fixed wing aircraft also attend cases as primary responders when the distance is too great for a helicopter to attend or if the helicopters are otherwise occupied. However, the aircraft is usually met by a road ambulance crew at an airfield. Occasionally, helicopters and fixed wing aircraft will rendezvous as part of a primary response mission, allowing the helicopter to remain at a regional site instead of flying into Melbourne. This prevents the regional area from being without a helicopter if required.

Fixed wing aircraft in Victoria may be staffed by either advanced life support (ALS) flight paramedics or intensive care flight paramedics (ICFPs) depending on the care required by the individual patient.[13] ALS flight paramedics are required to complete a 3-year paramedic undergraduate degree followed by a 12-month infield graduate year as well as a postgraduate certificate specializing in air medical and retrieval health. Experienced ALS paramedics can apply to undertake further postgraduate studies to become intensive care paramedics. After 2 years of operational road experience, intensive care paramedics are then eligible to become ICFPs. The skill set of AAV ICFPs has been described in detail previously.[13]

Data Sources

Data were sourced from the AV clinical data warehouse. Flight crews record clinical and operational data in a tablet at the conclusion of each case, with data subsequently uploaded into the data warehouse.[14] For the present study, the warehouse was searched for all cases transported by an AAV fixed wing aircraft during the study period. Importantly, because of industrial action during the study period, electronic data were not available for cases occurring between September 26, 2014, and December 20, 2014. Extracted data included patient demographics, clinical information, and operational data.

Definitions

Paramedic assessment represents the presumed etiology, pathological process, or indication for the patient encounter. If the clinical data were incomplete, the record was classified as not specified. Paramedic assessments were categorized into broad groups relating to the diagnosis or primary complaint. Cardiovascular/hematologic assessments were subdivided into the following groups: acute coronary syndromes (chest pain of cardiac cause, confirmed diagnosis of angina, acute myocardial infarction, emergent coronary artery bypass, or cardiac arrest), vascular (non-coronary vascular etiologies such as aortic aneurysms, intravascular thrombi, peripheral angiograms, and vascular surgery transfers), arrhythmias/structural defects (arrhythmias, valvular defects, valvular inflammation, septal defects, and pacemaker-related cases), cardiac failure (cardiac failure, unspecified echocardiograms, and heart transplants), blood pressure disorders (hypertension or hypotension), hematologic (anemia, clotting disorders, and other blood cell pathologies), and pericardial (pericardial effusions, pericarditis, and other pericardial pathologies).

Statistical Analysis

Continuous variables approximating a normal distribution were described using means (standard deviation) and compared across groups using an independent sample *t* test. Continuous variables with skewed distributions were described using medians (interquartile range [IQR]) with comparisons across groups performed using the Mann-Whitney *U* or Kruskal-Wallis tests. Categoric data are presented as frequencies and proportions, with comparisons made using the chi-square test. All statistical analyses were performed using SPSS version 22 (SPSS Inc, Chicago, IL). Geographic coordinates of case addresses were used to generate a map of fixed wing air ambulance caseloads across regions of Victoria using MapInfo Professional (Pitney Bowes, Stamford, CT).

Ethics

Ethics approval for this study was granted by the Monash University Human Research Ethics Committee, Melbourne, Australia, and organizational approval was granted by the Research Committee of AV.