

## **Re-defining the Provincial Air Ambulance Support in British Columbia**

**Sunny Dhaliwal, MPA Graduate Student**  
**Mark Armitage, MPA Graduate Student**

**School of Public Administration**  
**University of Victoria**  
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**Client:** Ms. Jodi Jensen, Chief Operating Officer (COO)  
British Columbia Emergency Health Services

**Supervisor:** Dr. Richard Marcy, Assistant Professor and  
MPA Master's Project Advisor  
School of Public Administration, University of Victoria

**Second Reader:** Dr. Jim MacGregor  
School of Public Administration, University of Victoria

**Chair:** Dr. Thea Vakil  
School of Public Administration, University of Victoria

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Sunny Dhaliwal  
Mark Armitage

## EXECUTIVE SUMMARY

### Background

British Columbia Emergency Health Services (BCEHS) is the sole agency in BC legislated to provide pre-hospital emergency health services. Para 5.1 of the Emergency and Health Services Act, 2013, defines the purpose, roles and responsibilities of BCEHS. The Act specifies that BCEHS is responsible “to provide, in British Columbia, ambulance services and emergency health services”. Though the provision of air and ground ambulance services to residents of BC is one of the important purposes of BCEHS, the Act does not specify the type of air ambulance services that need to be provided to the residents of BC (pre-hospital emergency transports vs. inter-facility transfers of patients, level of patient acuity, inter- and intra-provincial repatriations, etc.) (Emergency and Health Services Act, 2013). As a result, BCEHS provides air ambulances across a spectrum of clinical and operating environments, including inter-provincial transfers of patients.

BCEHS provides this service through ground and air ambulances based out of 183 ground stations and five air ambulance bases (BCEHS, 2015). Given present and anticipated patient demand for pre-hospital emergency service, site-to-site transfers and repatriation of patients to their home communities, there is a considerable and anticipated pressure on the BC Ambulance system as the demand is outpacing the growth in resources. Unless the goals and objectives of the services provided by BCEHS are re-defined and innovative care models developed, these challenges are likely to increase (Operational Research in Health, 2015).

Publicly funded air ambulance services all over the world are used for transporting primarily the most acute patients or those for whom transport to another medical facility is time-critical. Through the Emergency and Health Services Act, BCEHS serves as both a regulator (i.e., providing system design and oversight) and service provider (i.e., operator) of the air ambulance service. This dual role can “complicate lines of accountability” and potentially lead to practices that have evolved over a number of years without being formally sanctioned by BCEHS and/or formally recorded as a clear policy or standard operating procedure (Nickerson, 2014, p. 3). As a result, many of the practices for transporting patients by air in BC are based on historic practices or practices that have simply evolved over a period of time, independent of a structure and/or methodical policy review.

With an increased demand on air ambulance resources, there is a requirement to analyze the provincial air ambulance system to make sure that the resources are used in the most effective and efficient manner.

## **Project Objective**

The objective of this project is to contribute to understanding the air ambulance operations in BC and how the program can be further improved based on global best practices, legislation, regulation and BCEHS' mandate. The project's aim is to assist BCEHS in re-defining the goals and objectives of its air ambulance program in order to keep it effective, efficient and sustainable. The project has provided an overview and comparative analysis of similar air ambulance services in Canada and abroad, with an intention of understanding how other jurisdictions provide the service. These inputs can be used for exploring alternate and innovative methods of service delivery in order to ensure the availability of an effective and efficient service for patient care in the province. Recommendations from this study, based on a thorough re-examination of the existing care model and comparable services, is likely to assist BCEHS with re-defining the goals and objectives of its air ambulance program in order to keep this model viable, sustainable, efficient, and effective.

## **Methods and Methodology**

In conducting this research, a mixed-methods approach that draws on both quantitative and qualitative data was used to understand if the BCEHS air ambulance service is providing effective, efficient, safe, appropriate and accessible service to patients, as defined by the BC Health System (Setting Priorities for BC Health, 2015, p. 12). It included completing a literature review, conducting an analysis of relevant and guiding documents, issuing an online survey to leaders of other air ambulance operators, and conducting a series of semi-structured interviews with participants from the Ministry of Health (MoH), the Provincial Health Services Authority (PHSA), BCEHS, Northern Health, Island Health, BC Children's Hospital, and BC Mental Health and Substance Use Services.

This program evaluation was approved by the Human Research Ethics Board, University of Victoria, British Columbia, via the harmonized ethics review process. Additionally, operational approval was obtained from all of the required informants.

Key documents produced by the Ministry of Health, PHSA and BCEHS were also reviewed to understand the strategic and operational imperatives of the BC health system, and in particular the future direction of the BCEHS air ambulance service. In addition, through the online survey and the semi-structured interviews, a series of national and international documents were identified, and reviewed. This information was used to understand the current context and environment in which air ambulance services are delivered, and provided insight into the potential issues and solutions necessary to ensure the BCEHS air ambulance service provides effective and efficient services within the allocated budget and resources available presently and into the future.

## Findings/Discussion

BCEHS operates a medium-sized air ambulance fleet of nine contracted aircraft. Currently, BCEHS transports approximately 6,500 patients per year by air or an average of 17 patients per day. 92.4% of these patient transfers are inter-facility, with the remaining 7.6% being pre-hospital. The BCEHS air ambulance system is currently operating at capacity (Operational Research in Health, 2015, p. 14).

BCEHS is publicly funded and is the sole ambulance provider of air ambulance services in the province, with most service provided by critical care and infant transport team paramedics. BCEHS also has inter-provincial agreements with Yukon and Alberta for the transportation of patients to and from these provinces. Legislated rates, which have remained unchanged for almost a decade, are charged to the beneficiaries of the service.

Most of the air ambulances in Canada and abroad use a combination of critical, advanced, or primary care paramedics and flight nurses.

There are only a few examples of provincial and publicly funded air ambulances. Most air ambulance systems are hybrid models of registered charities, private operators and publicly funded air ambulances working in conjunction.

There were common themes from interviews conducted with leaders from BCEHS, MoH, health authorities, and other stakeholders. Most of the participants agreed that there is tremendous pressure on the provincial air ambulance system and that innovative and creative methods need to be introduced, based on national and international best practices, to improve efficiency and sustainability. Most respondents were also of the opinion that most of these challenges being faced by the BCEHS air ambulance program cannot be addressed in isolation. Enhanced collaboration, integration and a systems approach to problem solving would help address some of the challenges.

## Recommendations

Some common themes emerged as part of this research, related to the air ambulance service delivery model in BC, including:

- BCEHS has been the sole provider of air ambulance service in the province ever since its inception. This model of being the sole provider of service is not common and has associated fiscal, delivery and sustainability challenges.
- Prior to 2010, BCEHS (then the Emergency and Health Services Commission), operated directly under the MoH. Since 2010, BCEHS has been transitioned to PHSA. However, BCEHS is still in the process of fully integrating within the provincial health care system. Until such time as BCEHS is fully integrated into the provincial health

care system, the true potential of collaboration with various health care entities cannot be fully realized.

- There are a number of system issues that can be improved to make the air ambulance system efficient, safer, and more responsive to patient needs.

In order to address these challenges, the following recommendations have been identified through this project:

#### *Recommendation 1*

Develop innovative and strategic partnerships:

- partnerships with charities, not-for-profit groups, and the private sector, for provision of air ambulance services;
- partnerships with Emergency Management BC (EMBC) and Search and Rescue (SAR) groups for patient transfers by air in BC;
- repatriations through insurance providers;
- revision of inter-provincial agreements;
- use of alternate service providers and other agencies for patient transfers; and
- use of commercial aircraft for intra- and inter-provincial patient transfers.

#### *Recommendation 2*

Enhance collaboration and integration of BCEHS within the provincial health care system:

- alignment with policy papers and directives from the Ministry of Health, clarifying service expectations and priorities; and
- modify the BCEHS air ambulance staffing model.

#### *Recommendation 3*

Use a systems approach to improving the patient journey, and for measuring efficiencies:

- implementation of Night Vision Imaging System (NVI) for BCEHS air ambulances;
- improvements in BCEHS air dispatch system;
- process improvements within the BC Patient Transfer Network (BCPTN);
- regular review of BCEHS air ambulance operating and staffing model; and
- revision of BCEHS policy for patient escorts for air ambulance transfers.

Many of these recommendations potentially have far-reaching consequences related to process changes, capacity within the organization to implement these changes, support required from the MoH and various other stakeholders, negotiations, and labor management implications. It is hoped that these recommendations are adopted by BCEHS and a road map developed for implementing the same within the next three to five years.

Implementation of these recommendations in a phased manner is likely to improve the overall efficiency, effectiveness, and service delivery sustainability required to meet patient care over the next fifteen (15) to twenty (20) years.

## TABLE OF CONTENTS

|  |      |
|--|------|
| ACKNOWLEDGEMENTS.....  | i    |
| EXECUTIVE SUMMARY .....  | i    |
| Background .....   | i    |
| Project Objective .....  | ii   |
| Methods and Methodology.....                                       | ii   |
| Findings/Discussion .....  | iii  |
| Recommendations .....  | iii  |
| Recommendation 1 .....   | iv   |
| Recommendation 2 .....   | iv   |
| Recommendation 3 .....   | iv   |
| TABLE OF CONTENTS.....   | v    |
| List of Tables .....   | viii |
| List of Figures.....   | viii |
| 1.0 INTRODUCTION AND BACKGROUND.....                               | 1    |
| 1.1 Introduction to the Project .....                              | 1    |
| 1.2 Problem Definition .....                                       | 3    |
| 1.2.1 Aging Population .....                                       | 3    |
| 1.2.2 Shift from Metro to Rural Locations .....                    | 5    |
| 1.2.3 Geography and Weather .....                                  | 5    |
| 1.2.4 Improving Patient Experience of Care in Rural/Remote BC..... | 5    |
| 1.2.5 Contributing to a Sustainable Health Care System in BC ..... | 6    |
| 1.3 Project Objective.....   | 6    |
| 1.4 Purpose of the Project.....                                    | 6    |
| 1.5 Background.....  | 7    |
| 1.5.1 Rationale/Importance.....                                    | 7    |
| 1.5.2 Background.....  | 10   |
| 1.6 Argument and Major Findings.....                               | 12   |
| 1.6.1 Argument .....   | 12   |
| 1.6.2 Major Findings.....  | 12   |
| 1.7 Organization of the Report .....                               | 14   |
| 2.0 LITERATURE REVIEW.....   | 14   |

|       |  |    |
|-------|--|----|
| 2.1   | Air Ambulance Operations in Canada .....                         | 15 |
| 2.1.1 | Alberta .....  | 15 |
| 2.1.2 | Ontario .....  | 16 |
| 2.1.3 | Saskatchewan .....   | 17 |
| 2.1.4 | Manitoba .....   | 17 |
| 2.1.5 | Other Provinces in Canada .....                                  | 18 |
| 2.2   | Comparable Air Ambulance Operations in the Developed World ..... | 19 |
| 2.2.1 | Australia .....  | 19 |
| 2.2.2 | United Kingdom .....   | 21 |
| 2.2.3 | New Zealand .....  | 24 |
| 2.2.4 | United States of America (US) .....                              | 25 |
| 2.3   | Literature Review Conclusion .....                               | 25 |
| 2.4   | Conceptual Framework .....                                       | 26 |
| 2.4.1 | Legislative, Regulatory and Policy Framework .....               | 28 |
| 2.4.2 | Patient and Provider Expectations .....                          | 30 |
| 2.4.3 | Standardization .....  | 31 |
| 2.4.  | Efficient Resource Allocation .....                              | 31 |
| 2.5   | Logic Model .....  | 31 |
| 3.0   | METHODOLOGY AND METHODS .....                                    | 34 |
| 3.1   | Program Evaluation Methodology and Methods .....                 | 34 |
| 3.2   | Literature and Document Review .....                             | 34 |
| 3.3   | Online Survey .....  | 35 |
| 3.4   | Semi-Structured Interviews .....                                 | 36 |
| 3.5   | Data Analysis .....  | 36 |
| 3.6   | Project Limitations and Delimitations .....                      | 37 |
| 4.0   | FINDINGS .....   | 38 |
| 4.1   | Literature Review Findings .....                                 | 38 |
| 4.2   | Document Review Findings .....                                   | 40 |
| 4.3   | Online Survey Findings .....                                     | 40 |
| 4.4   | Semi-Structured Interview Findings .....                         | 44 |
| 5.0   | DISCUSSION ON FINDINGS .....                                     | 51 |
| 5.1   | Innovative and Strategic Partnerships .....                      | 51 |
| 5.2   | Collaboration and Integration .....                              | 51 |

|       |  |    |
|-------|--|----|
| 5.3   | Systems Improvements .....   | 52 |
| 6.0   | RECOMMENDATIONS .....  | 52 |
| 6.1   | Recommendation 1: Develop Innovative and Strategic Partnerships.....   | 53 |
| 6.1.1 | Partnerships with Charities, Not-for-Profit Groups and Private Sector for<br>Provision of Air Ambulance Services ..... | 53 |
| 6.1.2 | Partnerships with Emergency Management BC and Search and Rescue<br>Groups for Patient Transfers by Air .....           | 54 |
| 6.1.3 | Repatriations through Insurance Providers.....   | 54 |
| 6.1.4 | Revision of Inter-Provincial Agreements .....  | 55 |
| 6.1.5 | Use of Alternate Service Providers and Other Agencies for<br>Patient Transfers .....                                   | 56 |
| 6.1.6 | Use of Commercial Aircraft for Intra- and Inter-provincial<br>Patient Transfers .....                                  | 56 |
| 6.2   | Enhancing Collaboration and Integration of BCEHS within the Provincial Health<br>Care System .....                     | 57 |
| 6.2.1 | Policy Paper from the Ministry of Health Clarifying Service Expectations<br>and Priorities .....                       | 57 |
| 6.2.2 | Modify BCEHS Air Ambulance Staffing Model .....  | 58 |
| 6.3   | Systems Approach to Improving the Patient Journey and for Measuring<br>Efficiencies .....                              | 59 |
| 6.3.1 | Implementation of Night-Vision Imaging System for BCEHS air<br>ambulances.....   | 59 |
| 6.3.2 | Improvements in BCEHS Air Dispatch System .....  | 59 |
| 6.3.3 | Process Improvements within the BC Patient Transfer Network .....  | 60 |
| 6.3.4 | Regular Review of BCEHS A. Ambulance Operating and Staffing Model ..   | 60 |
| 6.3.5 | Revision of BCEHS policy for patient escorts for air ambulance transfers ..  | 60 |
| 6.4   | Implementation of Recommendations .....  | 61 |
| 7.0   | CONCLUSION .....   | 62 |
|       | REFERENCES .....   | 64 |
|       | APPENDICES .....   | 72 |
|       | Appendix 1 – Air Ambulance Program Logic Model.....  | 72 |
|       | Appendix 2 – Interview Questions.....  | 74 |
|       | Appendix 3 – Survey Questions.....   | 75 |
|       | Appendix 4 – Emergency Health Services Regulation 471/74 .....   | 80 |

## **List of Tables**

- Table 1: Anticipated Increase in Demand on Air Ambulance Service in BC  
Table 2: Trauma Centre Designation by Trauma Association of Canada 2011  
Table 3: BCEHS 2014 Demand Summary

## **List of Figures**

- Figure 1: BC Population and Aging Population Projections (2000 to 2020)  
Figure 2: Average Annual Population Growth by Development Regions  
Figure 3: Trauma Centre Designation by Trauma Association of Canada 2011  
Figure 4: Location of Orange Air and Land Ambulance Bases in Ontario, Canada  
Figure 5: Visual Representation of Conceptual Framework

# Re-defining the Provincial Air Ambulance Support in British Columbia

## 1.0 INTRODUCTION AND BACKGROUND

### 1.1 Introduction to the Project

Ambulance services all over the world are meant to provide immediate lifesaving care and transportation to appropriate medical services, making these services an integral and essential component of the health care system. Ambulance services are typically divided into ground and air ambulance services. Within the air ambulance services, there are rotary wing (helicopter) operations and fixed wing (jet or turbo-propeller aircraft) operations.

Different types of ambulance service models are prevalent in developed countries. These services can either be publicly funded and/or operated privately. Within the publicly funded models, the ground and air ambulance services are either funded by the province, or operated by municipalities and counties. There may or may not be one operator for the ground and air ambulance services. For example, in Alberta, the ground ambulance services are provided by the provincial health authority, Alberta Health Services (AHS). AHS also contracts fixed wing airplanes to provide air ambulance services throughout the province. With respect to rotary wing air ambulances, AHS has an affiliation agreement with Shock Trauma Air Rescue Society (STARS) (Alberta Health, 2016). In Australia, there are different models for the different states/territories. While there are a number of government-operated statutory authorities providing ambulance services, there are also a number of private operators as well. To a large extent, these arrangements are dictated by the governing legislation in the states and territories (Eburn, 2012, pp. 2-3). For the air ambulance services, different provinces depend on a number of contracted air ambulance operators and other emergency service providers like police, search and rescue groups, emergency management organizations or other ambulance operators. For example, in Australia, publicly funded and other charitable ambulance services are complemented by the Royal Flying Doctor Service (RFDS), which provides 24-hour aeromedical emergency services throughout Australia (Royal Flying Doctor Service, 2016).

The service models in various parts of the world are dependent on different factors such as federal/provincial legislation and health support provided by various levels of government, the size of the province, location of tertiary care facilities, and funding arrangements. Ambulance models also differ around the world about whether they are engaged in pre-hospital work (immediate responses, motor vehicle accidents, first aid, etc.) and/or transports (inter-medical facility transfers to a higher level of care, home repatriations, etc.).

In British Columbia (BC), the ground and air ambulance services (delivered by rotary and fixed wing aircraft) are provided by British Columbia Emergency Health Services (BCEHS) and fully funded by the provincial government, with oversight provided by the Provincial Health Services Authority (PHSA). Responsibilities of BCEHS include providing pre-hospital and inter-hospital health services throughout BC. BCEHS oversees the BC Ambulance Service (BCAS), which is responsible for the care and transport of patients, and Patient Care Communications and Planning (PCCP), which is comprised of dispatch operations and the BC Patient Transfer Network (BCPTN). Through the operation of BCPTN, PCCP manages the three provincial dispatch centres responsible for planning and dispatch of air and ground ambulances. BCEHS also provides these services to residents of BC who require transportation to/from neighbouring provinces, such as Alberta and Yukon. In addition to responding to acute emergencies, BCEHS also provides patient transport services for the pediatric population, bariatric patients, those afflicted with mental health challenges, and other speciality patient needs (BCEHS, 2015).

Para 5.1 of the Emergency Health Services, 2013, (the Act) defines the purpose, roles and responsibilities of BCEHS. The provision of air and ground ambulance services to residents of BC is one of the important purposes of BCEHS (Emergency Health Services Act, 2013, 2013). The service is also unique in the way that it provides care and transportation for critical pre-hospital incidents, such as motor vehicle accidents, as well as air transportation between hospitals for patients requiring a higher level of care than is available in their local community. Therefore, the service is an integral part of a larger continuum of patient care that contributes to patient health outcomes.

These outcomes are directly linked to the quality, timeliness and safety of the air ambulance services that are provided by BCEHS. It means that these services need to be operated in the most efficient, effective and timely manner in order to meet distinct needs of a well-defined patient population. While the ground ambulance services are meant to respond to all types of emergencies and patient transportation, the air services need to be reserved for serious or time-critical cases. However, the Act does not spell out clearly what type of patient population is required to be transported either within the province, or outside it. The Act is also silent on home repatriations, transportation of low-acuity patients or transportation of specialized patient populations. As a result, the BCEHS air ambulance service is engaged in all type of patient transports.

This research project will examine the challenges for the BCEHS air ambulance service within the context of the pressures on the overall health care system, including an analysis of the unique needs and challenges for transporting speciality patient populations by air (i.e., mental health and substance use patients, bariatric patients, neonatal and pediatric patients, and low-acuity patients). The project will provide an overview and comparative analysis of similar air ambulance services around the world, with an aim of understanding

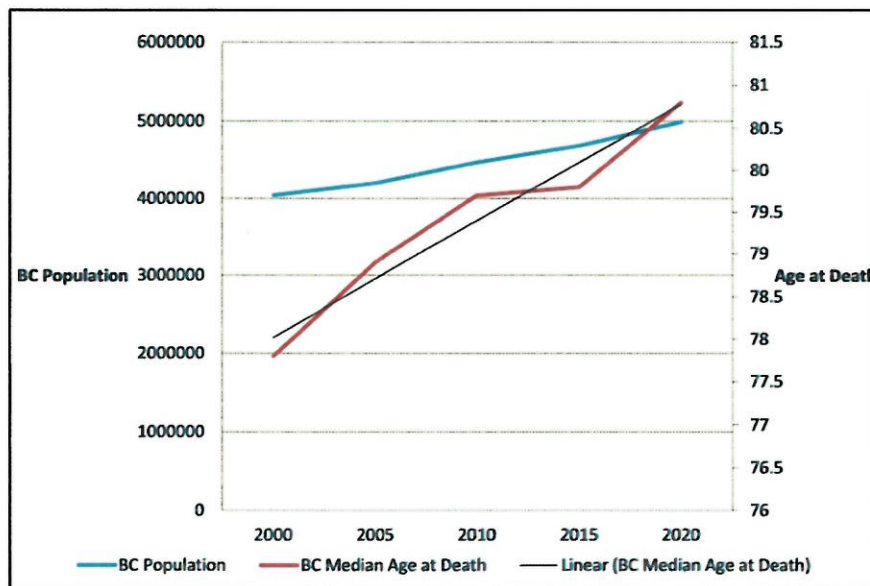
how other jurisdictions provide this service. Finally, the project will also provide recommendations to define appropriate goals and objectives for an innovative, efficient and a sustainable provincial air ambulance service in BC.

## 1.2 Problem Definition

### 1.2.1 Aging Population

Between 2016 and 2021, BC's population is expected to rise by 1.28% (BC Population Projections , 2015). Additionally, the 80 years+ cohort is expected to increase by 3.65%, resulting in this sub-population group representing 3.96% of the total population (BC Population Projections , 2015).

Population growth based on these projections, combined with an increase in median age at death to 80.8 years by 2020 (Figure 1), is likely to create additional pressure on the pre-hospital and the health care system in BC.



**Figure 1: BC Population and Aging Population Projections (2000 to 2020)**  
(BC Population Projections , 2015)

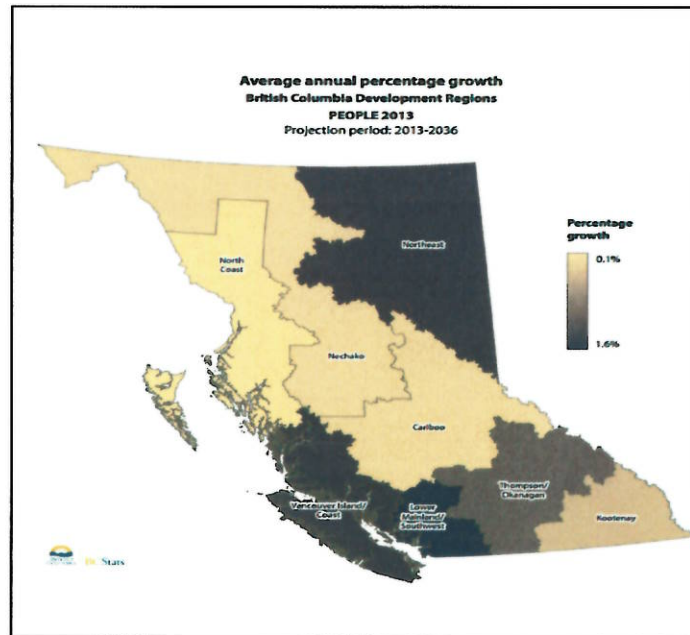
Given the aging population and the anticipated increase in patients with complex and chronic health care conditions, there will be growing demands on the ambulance service, including the air ambulance service. It is anticipated that between 2014 and 2020, the demand on the air ambulances in BC is likely to grow by more than 11% (Operational Research in Health, 2015, p. 26), with the highest demand coming from the northern region (Table 1). This anticipated demand is based on expected increase in population by age, gender and health authority in BC.

| Health Authority  | 2015 | 2017 | 2020  |
|-------------------|------|------|-------|
| Fraser            | 1.7% | 5.0% | 10.0% |
| Interior          | 1.5% | 4.4% | 8.7%  |
| Northern          | 2.1% | 6.6% | 13.3% |
| Vancouver Coastal | 2.0% | 6.3% | 13.0% |
| Island Health     | 1.3% | 4.1% | 8.5%  |
| Total %           | 1.8% | 5.6% | 11.2% |
| Total Patients    | 6134 | 6362 | 6704  |

**Table 1: Anticipated Increase in Demand on Air Ambulance Service in BC**  
(Operational Research in Health, 2015, p. 26)

However, this demand projection is based purely on anticipated growth in population, and does not take into account the increase in population in a given region due to other factors such as the potential of liquefied natural gas projects in northeastern BC.

The current air ambulance assets of BCEHS are operating at full capacity and there is strong evidence that it cannot meet any additional demand without a significant compromise in the response time as well as the response area (Operational Research in Health, 2015, p. 36). As many of the communities where there is projected growth are remote and located away from tertiary care facilities (Figure 2), patients are likely to be reliant on an effective air ambulance system, thereby further adding pressure on the already stretched air ambulance system in BC.



**Figure 2: Average Annual Population Growth by Development Regions**  
(Grundlingh & IP, 2013, p. 2)

### *1.2.2 Shift from Metro to Rural Locations*

It has been observed that as population ages, many retirees move away from urban areas into rural areas. As there is often a direct correlation between age and requirement of medical care, this shift of an aging population to rural and remote areas will increase the dependence on air ambulances from these communities. This will also put additional pressure on limited air ambulance resources in order to expeditiously transport these patients to tertiary care facilities, all of which are located in urban areas (Ogilvie, 2009, p. 1).

### *1.2.3 Geography and Weather*

BC is Canada's third largest province, with a number of isolated and coastal communities. The vast expanse and harsh winter conditions, especially in northern and interior BC, presents some unique challenges to providing appropriate access to health care. Geographic remoteness, long distances, low population densities, less availability of other health care providers in some of remote communities and location of tertiary care facilities in only a few metro/urban centres, increase the reliance on air and ground ambulances. Trauma victims, in particular, have the most to gain by getting expert care within the first 60 minutes – which experts call the “golden hour” (Ogilvie, 2009, p. 1). All these factors place an increased reliance on air ambulance services.

### *1.2.4 Improving Patient Experience of Care in Rural/Remote BC*

It has been observed that individuals who reside in predominantly rural communities tend to have comparatively poorer health outcomes when compared to their urban counterparts. The populations of rural British Columbia are often small, dispersed, and fluctuating in number. Against this backdrop, three specific health care challenges stand out in rural and remote BC:

- ensuring access to quality primary care services;
- ensuring pathways to accessing specialized perinatal, medical, and surgical services when they are required; and,
- best supporting an aging population in place.

Access to specialized acute care services and access to ancillary health services is especially challenging, so residents in these rural and remote communities are often required to travel for care. In rural and remote communities, it is imperative there are well-defined and clear patient transfer pathways to trauma care centres, bypassing centres that do not have the capacity to provide the necessary trauma care. Access to pre-hospital care, stabilization, and patient transportation to higher level of care as quickly as possible is also

considerably important (Ministry of Health, 2015, pp. 2-3). All of these issues require an efficient and very responsive air ambulance system in the province.

### *1.2.5 Contributing to a Sustainable Health Care System in BC*

In the Ministry of Health's "*Setting Priorities for the B.C. Health System*", one of the challenges which has been clearly highlighted is sustainability of the health system. Though BC and Canada compare favorably against other countries in the Organization for Economic Co-operation and Development (OECD), there is a recognized need to be making efforts to make the health system more sustainable in order to account for ageing demographics (Ministry of Health, 2015, pp. 14-15).

One of the overarching goals set out by BC has been to "reduce the per capita cost of health by focusing on quality, especially effectiveness and appropriateness and the efficiency of health care delivery" (Ministry of Health, 2015, p. 2). It is imperative that as part of this effort, air ambulance resources are used in the most economical and efficient manner.

Due to the changing demographics, increasing health needs and other factors highlighted above, it is necessary to look at the legislative, regulatory, policy and governance structures of the ambulance service. While there is a broader review needed of the entire ambulance service, this research project will focus solely on the air ambulance program because of the unique service it provides, and some of the unique opportunities and challenges inherent in ensuring the service is efficient and effective.

### **1.3 Project Objective**

The objective of this project is to contribute to understanding the air ambulance operations in BC and how the system can be further improved based on global best practices, expectations of demand, and the current and proposed legislation, regulations and policies that define its mandate. The project will also aim to assist BCEHS in re-defining the goals and objectives of its air ambulance program and explore alternate and innovative methods of service delivery in order to keep it effective, efficient and sustainable.

### **1.4 Purpose of the Project**

The purpose of this project is to examine the air ambulance service model in BC with comparable models in Canada and abroad, with a view to providing suitable recommendations to make the system better. Specifically, the study aims to:

- examine the challenges for the current model of the BCEHS air ambulance service, in the context of the pressures on the overall BC health care system;

- provide an overview and comparative analysis of similar air ambulance services around the world, with an aim of understanding how other jurisdictions provide the service;
- examine the legislative and regulatory framework governing the air ambulance operations;
- provide recommendations in response to the above findings to define appropriate goals and objectives for an innovative, efficient and a sustainable provincial air ambulance service in BC.

The scope of this project consists of four phases:

1. Provision of background information concerning the project client, the current state of the air ambulance program, and current and potential challenges faced or likely to be faced by the client.
2. A literature review that provides insight into operations of comparable air ambulance models in the world.
3. Provision of inputs based on focus group interviews from senior leaders within BCEHS, the Ministry of Health and those representing the health authorities, about the regulations, expectations and future direction of the service.
4. Provide a series of recommendations which will contribute to an efficient air ambulance system in the province, and which is aligned with current and future needs of the patients.

## 1.5 Background

### 1.5.1 Rationale/Importance

The client for this study is BCEHS, which is the sole agency in BC legislated to provide pre-hospital emergency health services. Para 5.1 of the Emergency and Health Services Amendment Act, 2013 (the Act), defines the purpose, roles and responsibilities of BCEHS. The Act specifies that BCEHS is responsible “to provide, in British Columbia, ambulance services and emergency health services”. The Act does not specify the type of air ambulance services that need to be provided to the residents of BC (pre-hospital emergency vs inter-facility transfers of patients, type of patient acuity, inter- and intra-repatriations, etc.) (Emergency and Health Services Act, 2013). As a result, BCEHS provides air ambulances across a spectrum of clinical and operating environments, including inter-provincial transfers. These services include providing emergency responses to rural and remote communities, providing on-scene response by rotary wing aircraft (either independently or in support of ground ambulance operations), and providing inter-facility transport across all patient demographics and needs, including transfers to/from Alberta and other provinces. The service provided encompasses the entire spectrum of clinical care.

For pre-hospital calls, this includes providing all types of care, from specialized critical care transport to basic life support care. For inter-facility work, it includes transporting very serious and time-critical cases to non-urgent prescheduled appointments (Nickerson, 2014, p. 3).

It is generally accepted that air medical transport should be utilized primarily for the most critical patients, and covering the complete spectrum of care and disease processes. Clinical situations for air transport in inter-facility transfers are generally accepted as the most appropriate when patients have “diagnostic and/or therapeutic needs” which cannot be met at the sending facility, and when factors such as time, distance, and/or level of care requirements render ground transport non-feasible (American College of Emergency Physicians and National Association of EMS Physicians, 2006, p. 15).

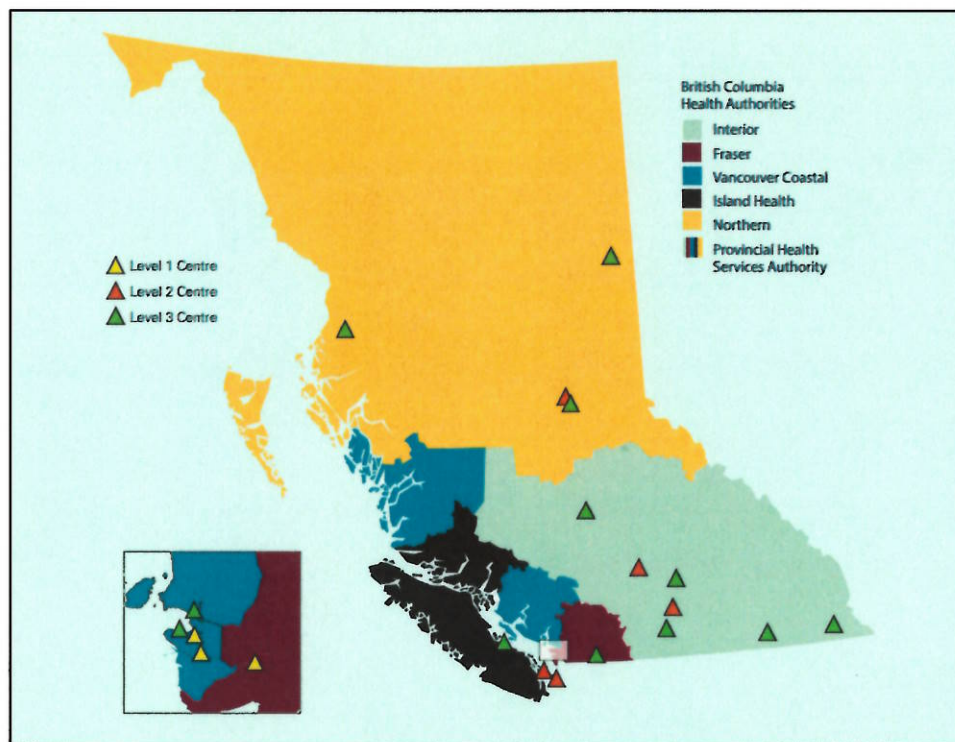
Air transportation of patients is also dictated by the location of trauma care facilities, normally designated from Level I (highest) to Level V (lowest). See Table 2 below for a description of trauma care facilities.

| Level     | Description  |
|-----------|--|
| Level I   | These trauma centres play a leadership role in a provincial trauma system and are central in a regional trauma system. They provide tertiary and major trauma care, including complex and unique (quaternary) trauma systems for the province. They also represent academic leadership, including trauma training and research programs usually located in large metropolitan areas. |
| Level II  | These trauma centres are required in areas without Level I trauma centres or where trauma caseload is high. They are large community-based medical centres that may or may not be university-affiliated.   |
| Level III | These trauma centres are required in areas without access to Level I or II trauma centres. They are typically in small urban or rural communities, and are not usually university-affiliated.  |
| Level IV  | These trauma centres divert major trauma to Level I or II trauma centres and provide care for secondary trauma cases. They are typically located in urban centres with nearby major trauma centres. They are large community-based or university-affiliated medical centres.   |
| Level V   | These trauma centres receive pediatric or adult cases within their catchment area if airway management is required, otherwise they divert trauma patients to the nearest appropriate trauma centre. They are usually located in rural, small community hospitals or treatment centres.   |

| Level                     | Description  |
|---------------------------|--|
| Level Pediatric-I (P-I)   | These trauma centres play a central role in provincial and regional pediatric trauma systems. They maintain academic leadership in research and training, and may serve as lead in jurisdictions of more than one Level I or II adult trauma centres. They also play an outreach role in education, advice, consultation, triage and clinical care. They are university-affiliated pediatric trauma centres with a full array of medical subspecialties and advanced technology, and may be recognized as a “children’s hospital”. |
| Level Pediatric-II (P-II) | These trauma centres typically exist as a separate administrative entity within a larger Level I or II trauma centre. They cover a comprehensive array of medical subspecialties and services dedicated to children, and may or may not be university-affiliated.  |

**Table 2: Trauma Centre Designation by Trauma Association of Canada 2011**  
 (Trauma Services BC, 2014, p. 6)

In the case of BC, other factors such as geography, road conditions, accessibility to remote and coastal communities, and location of tertiary and trauma centres (as evident from Figure 3 below), also dictate the utilization of air ambulance resources.



**Figure 3: Trauma Centre Designation by Trauma Association of Canada 2011**  
 (Trauma Services BC, 2014, p. 13)

BCEHS provides this service through ground and air ambulance system based out of 183 ground stations and five air ambulance bases (BCEHS, 2015). There is a considerable pressure on this system as the increased demand has outpaced the growth in resources in this sector (Operational Research in Health, 2015). For the first time in history, the Canadian population over 65 years of age is more than the population under 15 years of age. The population of seniors is likely to rise to 23.6% by 2030, compared to 15.3% at present. Of these, BC would have the largest proportion of seniors in its population (Statistics Canada, 2015). The demand on the pre-hospital service, which is provided by ground and air ambulances, is likely to grow in the future. Unless the goals and objectives of the services provided by BCEHS are re-defined and innovative care models developed, these challenges are likely to increase.

### *1.5.2. Background*

In 2014/15, BCEHS paramedics responded to over 545,000 patient events, including more than 446,000 instances of 911 medical emergencies and 96,000 inter-facility patient transfers. This included approximately 6500 patients transported by air ambulances (Factsheet BCEHS, 2015, p. 1). Though patients are prioritized for transport based on their acuity assessed through use of the Advanced Medical Priority Dispatch System (AMPDS), all patient acuities are transported, including repatriating low-acuity patients by air ambulance from within BC and the neighbouring provinces. Most of these transports are from/to tertiary care facilities located in Vancouver, Victoria, Kelowna, Kamloops and Prince George. Patients from southeastern and northeastern BC are also transported to/from Calgary and Edmonton respectively, as these cities have the closest tertiary care facilities to these regions (BCEHS, 2015).

For the air ambulance operations, BCEHS provides this service through a contracted fleet of four fixed wing and five rotary wing aircraft, staffed by a specialized team of BCEHS paramedics. These operations are undertaken from the five critical care bases located in Vancouver, Kamloops, Kelowna, Prince George and Prince Rupert. A critical care ground team is also located in Nanaimo, and is fully trained for complex aeromedical transports. In addition, BCEHS has arrangements with approximately 45 private air carriers to access air resources on “as required” basis throughout the province.

Publicly funded air ambulance services all over the world are used for transporting primarily the most acute patients, or those patients for whom transport to another medical facility is time-critical. Through the Emergency and Health Services Act, BCEHS serves as both a regulator (i.e., providing system design and oversight) and service provider (i.e., operator) of the air ambulance service. This dual role can “complicate lines of accountability” and potentially lead to practices that have evolved over a period of time without being attentive to the practical needs of the public (Nickerson, 2014, p. 3). As a

result, many of the practices for transporting patients by air in BC are based on historic practices, or practices that have simply evolved over time, independent of a structure and/or a methodical policy review.

BCEHS uses a transfer matrix, which is a colour-coded system for identifying the medical acuity of the patient to be transferred. In addition, clinically appropriate timeframes are used to guide the transport requirements for patients. While red and yellow are colour codes reserved for critical patients, green and blue codes are used for low-acuity patients. Those coded as green patients have neither serious or life-threatening illness, nor injuries. Examples of green patients are those requiring routine intervention, elective appointments, specialist consults, radiation therapy, diagnostics, rehabilitation, or treat and return transfers. Blue patients are those where there is no threat to life or limb, or where there are no scheduled appointment times. Examples of blue patients are repatriations, or routine patient transfers for admission to an equal or lower level of care (Patient Transfer Network, 2015, pp. 6,7).

Table 3 provides a one year summary (2014) of patients transported by air. More than 90% of the patients transported by BCEHS air ambulances are for inter-facility transfers and approximately 7.6% are for pre-hospital responses. Out of 92.4% transfers, blue and green patients account for about 25% of the transfers.

| <b>Incident Type</b>     | <b>Category</b> | <b>Patients per Day</b> | <b>% of Incident Type</b> | <b>% All</b>  |
|--------------------------|-----------------|-------------------------|---------------------------|---------------|
| Inter-facility transfers | Red             | 5.2                     | 34.1%                     | 31.5%         |
|                          | Yellow          | 6.0                     | 39.3%                     | 36.3%         |
|                          | Green           | 1.5                     | 10.2%                     | 9.4%          |
|                          | Blue            | 2.5                     | 16.4%                     | 15.2%         |
|                          | Sub Total       | 15.2                    | 100.0%                    | 92.4%         |
| Pre-Hospital             | Delta/Echo      | 1.0                     | 77.5%                     | 5.9%          |
|                          | Bravo/Charlie   | 0.2                     | 19.9%                     | 1.5%          |
|                          | Alpha/Omega     | 0.0                     | 2.6%                      | 0.2%          |
|                          | Sub Total       | 1.2                     | 100.0%                    | 7.6%          |
| <b>Total</b>             |                 | <b>16.4</b>             | <b>100.0%</b>             | <b>100.0%</b> |

**Table 3: BCEHS 2014 Demand Summary** (Operational Research in Health, 2015, p. 14)

With an increased demand on the air ambulance resources, changes in referral patterns, the evolution of local health care infrastructure and pressure on the health care system in a relatively flat economic environment for government revenues, there is a requirement to analyse the provincial air ambulance system to make sure the resources are used in the most

effective and efficient manner. Specifically, the service needs to examine whether it should be utilizing its limited air ambulance assets for pre-hospital responses and/or inter-facility transfers, or limit these transfers to only higher acuity patients. This study has attempted to provide answers to some of the challenges being faced by the BCEHS air ambulance service.

## **1.6 Argument and Major Findings**

### *1.6.1 Argument*

This research project argues that in view of the challenges facing the health care system in Canada and British Columbia, all critical health care resources must be used most appropriately. For areas where the definition of “appropriateness” is ambiguous, or where there are no clear legislative and regulatory guidelines, the use of these resources needs to be defined based on best practices, professional inputs and global research of comparable services. In light of this, it is argued that the scarce air ambulance resources in BC must be used to transport only the most acute and critical patients, with repatriations and low-acuity patients transported by alternate and economical means. A provincial service like BCEHS that is engaged in pre-hospital care as well as emergency aeromedical evacuations needs to balance its pre-hospital responses with inter-facility patient transfers. It is further argued that BCEHS needs to adapt its operating and staffing model to be in line with similar providers in Canada and abroad, and enter into innovative and strategic partnerships with other service providers to enhance its service, and make it sustainable and more efficient.

### *1.6.2 Major Findings*

The findings in the literature review suggest that most air ambulance operations in Canada are restricted to either pre-hospital care or inter-medical facility transfers of patients. On the contrary, many air ambulance services in Australia, New Zealand and the United Kingdom (UK) are also involved in search and rescue operations, and work in close collaboration with the police or other first responder agencies. Another significant difference is that unlike BC where the air ambulance services are provided by one provider (BCEHS), this is generally not the case in other provinces in Canada, or other countries with similar models. In Australia, for example, while there are many territorial and regional air ambulance services, the Royal Flying Doctor Service overlaps these services and operates throughout Australia to provide inter-hospital transfers of patients in less urgent cases and other non-emergency patient transfer services, for a fee. Similarly, the Scottish Air Ambulance Service works collaboratively with Scotland’s Charity Air Ambulance and Specialist Transport and Retrieval teams.

Funding sources for the ambulance services are another significant difference. Unlike most Canadian air ambulance operators which are publicly funded, most air ambulances in Australia, New Zealand and the UK are operated by trusts and rely heavily on donation and charities. While this creates a potential larger revenue base for those jurisdictions utilizing alternate revenue streams and allows for more creative partnerships and approaches to providing services, it potentially creates challenges as their revenue streams are not guaranteed. Time and resources are required to promote the value and importance of the service, and substantial fundraising efforts are required to meet the established service delivery capacity expected by the public and the service providers. This can prove challenging at times given that economic conditions inevitably fluctuate over time, and there are always new issues and needs that arise which could impact the financial support for air ambulance services.

Semi-structured interviews were conducted with senior functionaries at the Ministry of Health, Provincial Health Services Authority, BCEHS and other health authorities in BC; a number of themes were identified. Some of these themes were also evident after examination of the legislative and regulatory framework governing the provincial air ambulance service.

For BCEHS to maintain a viable, sustainable, efficient and effective air ambulance program, this report recommends the following:

- Recommendation 1: BCEHS to develop innovative and strategic partnerships with other ambulance operators, the private sector, other first responders, and commercial airline operators to provide pre-hospital and inter-facility care for patients.
- Recommendation 2: BCEHS to enhance collaboration and integration with the Ministry of Health and with other stakeholders within the provincial health care sector, in the delivery of patient care.
- Recommendation 3: BCEHS to utilize a systems approach with an aim to improving the patient journey, and for measuring efficiencies.

The details of recommendations are provided in the subsequent sections of the report. Like other publicly funded government departments, specifically health care organizations, BCEHS would have to balance its priorities between air and ground resources and other staffing/system improvements, while examining the implementation of these recommendations.

It is believed these recommendations will assist BCEHS to:

- understand the role and functioning of other air ambulance systems in the world;
- understand the legislative and regulatory expectations;

- examine alternate means of service delivery available for low-acuity patients; and
- define opportunities for system improvements for the provincial air ambulance system.

## 1.7 Organization of the Report

This report begins by outlining the overall project objective, the client information, the rationale, the background related to the client and the provincial air ambulance system, and an overview of the project. It identifies the need for this research and provides information explaining why the investigators decided to research this topic. Following the introduction, the methodology section of this report outlines the key methods for data collection that were used for this project. This section also identifies the investigators' rationale for selecting the comparable air ambulance services in Canada and elsewhere, and the focus group for the interviews. In the literature review section, the researchers examine other air ambulance services and their service delivery model. The literature review also examines the appropriate utilization of air medical transport in the pre-hospital setting, as well as in the inter-facility setting. A critical analysis of the literature related to air ambulance models is also provided.

The conceptual framework synthesizes findings from the literature review and the interviews, draws from the findings and puts them in a format that can be applied by BCEHS while re-examining its air ambulance program.

The findings and analysis section elaborates further on key themes found in the literature review, the online survey that was administered to other air ambulance operators in Canada and abroad, and from the semi-structured interviews.

Based on the deductions from the key findings, the recommendation section provides suggestions to BCEHS for further improving the air ambulance transport model. The report concludes with a short summary.

## 2.0 LITERATURE REVIEW

The literature reviewed for this research project included:

- websites of provincial and other air ambulances;
- online databases;
- literature from American College of Emergency Physicians and Aero-medical Physician Association;
- peer-reviewed articles in Air Medical Journal and other similar publications;

- previous reports on BC air ambulance and pre-hospital operations;
- BC Ministry of Health reports, plans and publications;
- BC legislative and regulatory framework for emergency medical services;
- Summons database found through the University of Victoria website;
- articles presented by various aeromedical associations; and,
- review of grey literature such as, relevant websites, online discussion boards and learning modules and reviews/discussions of other air ambulance services.

Within the literature, some of the main themes addressed the research question by outlining how other air ambulance services operate, specifically their roles, responsibilities and objectives, and the relevant national/provincial regulations. Details of the review are elaborated upon below, along with some of the important themes from the literature.

## **2.1 Air Ambulance Operations in Canada**

Canada's national health insurance program is designed to ensure that all insured persons have access to medically-necessary hospital and physician services on a prepaid basis. Ground and air ambulances services are not covered under the national insurance program; however, these services are offered by provinces and territories as part of "additional benefits" under their respective health insurance plans, funded and delivered on their own terms and conditions (Health Canada, 2011). Some of the prominent air ambulance services and their delivery model are discussed in the subsequent paragraphs.

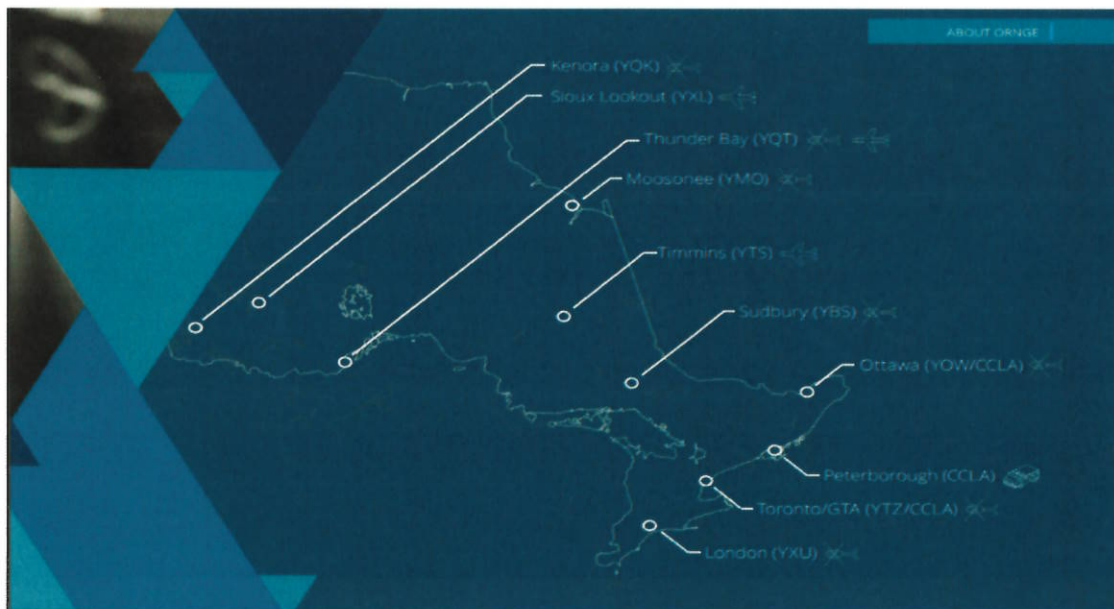
### *2.1.1 Alberta*

In Alberta, the Alberta Health Service (AHS) provides air ambulance services through a mix of fixed and rotary wing aircraft. The AHS contracts for 12 fixed wing aircraft to provide 24-hour air ambulance services throughout the province. These aircraft are strategically located across 10 different bases in the province. The responses for emergency medical service are coordinated through a central communication centre located in Edmonton (Alberta Health, 2016). These services are provided under the Emergency Health Services Act, 2008 and Emergency Health Service Regulations (Interim). Neither the Act nor the regulation specifies the type of patient acuity that determines their transportation (Alberta Health EHSA, 2009). AHS also has an affiliation agreement with Shock Trauma Air Rescue Society (STARS) to provide rotary air ambulance service from three bases located in Calgary, Edmonton, and Grande Prairie. STARS is a charitable, non-profit organization funded through donations received from individuals, service groups, businesses and corporations, municipalities, and through collaborative agreements with provincial governments. Approximately 24% of STARS' total mission costs are funded by AHS, with the remaining 76% funded by fundraising and community partnerships. AHS

air ambulances are staffed by advanced life support paramedics, critical care nurses and transport physicians (on an as required basis). It also uses Pediatric Intensive Care Unit (PICU) teams for pediatric patients, and Neonatal Intensive Care Unit (NICU) teams for newborn patients. STARS is also one of the first civilian air carriers to use night vision technology for its aircraft (STARS, 2016).

### 2.1.2 Ontario

In Ontario, the air ambulance services are provided by Ornge, a non-profit organization. Ornge has a team of flight and pediatric paramedics who provide air transport to all patients across Ontario through their fleet of 12 rotary wing and eight fixed wing aircraft, operating out of nine air bases across Ontario. The air assets are owned and operated by Ornge. Similar to emergency departments, Ornge prioritizes transports according to the urgency and medical condition of the patient. Ornge provides paramedics services to provide emergent and urgent inter-facility transfers, scene calls, and non-urgent transfers based on geographic and population needs as well as transportation related to organ transplants. Ornge does not typically repatriate patients who are discharged, unless they need further treatment in their community hospitals (Ornge, 2012). After two night crashes, including one fatal crash, Ornge has transitioned to using Night Vision Goggles (NVGs) (Campion-Smith, 2013, p. 1).



**Figure 4: Location of Ornge Air and Land Ambulance Bases in Ontario, Canada**  
(Annual Report, Ornge, 2015, p. 6)

### *2.1.3 Saskatchewan*

Saskatchewan Air Ambulance (also called Lifeguard) operates its own fixed wing air ambulance and also has a contract with STARS for rotary wing air ambulance service. It operates three King Air B200 aircraft from the Saskatoon airport. These aircraft are staffed by specially trained air medical crew members that include critical care flight nurses and advanced care paramedics. STARS operates out of two bases in Saskatchewan, located in Saskatoon and Regina. STARS' air medical teams consist of advanced care paramedics, critical care nurses and physicians (Government of Saskatchewan, 2016).

In addition to these services, Saskatchewan Health, through the Northern Medical Transportation Program, provides funding for emergent and non-emergent medical transportation for residents of northern Saskatchewan. The air ambulance service is provided either through Lifeguard or through approved private air operators. Non-emergency air transportation is also provided to assist clients with access to medical treatment and appointments outside their community. The program does not cover the costs of return flights, nor does the program cover the costs of air medical evacuation services received by Saskatchewan residents while outside the province except in certain exceptions. The free air ambulance service is also not provided to patients who are covered under the Worker's Compensation Board system or for motor vehicle accidents (which are paid by SGI, Saskatchewan driver's licensing and vehicle registration provider). If the patient is an eligible First Nations person or Inuit (registered Indian or Inuk), the Non-Insured Health Benefits program of Health Canada covers the costs related to the air ambulance program. The costs of return transportation or search and rescue flights are not covered (Saskatchewan Ministry of Health, 2011).

### *2.1.4 Manitoba*

Manitoba provides fixed wing and rotary wing air ambulance services to its residents. Manitoba's air ambulance service is divided into the Critical Care Air Ambulance Program and the Basic Air Ambulance Program. For fixed wing operations, the Critical Care Air Ambulance Program is operated by the Lifeflight Air Ambulance (Manitoba EMS, 2015).

Lifeflight is typically staffed by flight nurses with advanced critical care training and experience. Depending on patient needs, the air ambulance may also be staffed with physicians, obstetricians, neonatology physicians and respiratory therapists. For rotary wing services for critical patients, Manitoba has contracted with STARS to provide rapid and specialized emergency medical care and air transport with oversight being provided by Winnipeg Regional Health Authority.

The Basic Air Ambulance services are provided by a number of licensed commercial service providers (to provide inter-facility air ambulance transport from northern communities) and through the Southern Air Ambulance Program (to provide inter-facility transportation to patients in southern Manitoba where ground transportation would take more than 2.5 hours). The licensed operators transport patients for whom medical conditions, isolated locations and/or distance to appropriate care make road ambulance transport impractical. These basic air ambulances are staffed by flight nurses or advanced care paramedics, and are meant for patients who do not require critical or emergent care. The Southern Air Ambulance Program is a daytime-only service and is staffed by aeromedical attendants (Manitoba EMS, 2015).

Manitoba has very comprehensive Air Medical Response System Regulations. The Regulations provide a detailed framework for the air medical response system in the province, including license levels, qualification of the pilots, aeromedical equipment required for basic and specialized air medical response systems, and other provisions. The Regulations clearly define the purpose of basic air ambulance services, though they are silent on the specific provisions for repatriation of patients to their home communities after treatment. “Transfer of function” is a unique provision available under the Regulations, whereby a medical director can delegate or advise the air medical attendant about certain medical protocols or procedures to be performed on the patient (Government of Manitoba, 2016). Such a provision is currently not available in BC.

### *2.1.5 Other Provinces in Canada*

In Quebec, the air medical services are provided by Airmedic, which provides these services using three fixed wing aircraft and three helicopters. These services are exclusive to customers with valid coverage who become members by paying an annual premium. The medical plan of Quebec does not cover emergency aeromedical evacuations or critical inter-facility transfers. Each aeromedical crew consists of a nurse and a flight paramedic. In addition, Quebec operates a hospital plane service, which is designed to carry several patients at a time and operates as a shuttle service for non-emergency cases (Airmedic, 2015).

In Nova Scotia, the air ambulance is provided through the Emergency Health Services through EHS LifeFlight, consisting of fixed and rotary wing aircraft. The EHS LifeFlight team consists of critical care paramedics, critical care nurses and registered respiratory therapists. The obstetric, neonatal, and pediatric teams are also available to transport specialty patient populations (EHS LifeFlight, 2015).

Ambulance New Brunswick (ANB) provides the air ambulance services through AirCare, which is staffed by critical care flight nurses (Ambulance New Brunswick, 2014).

## 2.2 Comparable Air Ambulance Operations in the Developed World

### 2.2.1 Australia

In Australia, the air ambulance services are provided by a mix of publicly funded and charitable organizations. Some of the prominent services are provided Careflight, New South Wales Aeromedical, the Royal Flying Doctor Service, and Skymed Aeromedical.

#### 2.2.1.1 Careflight

Careflight is an aeromedical charity organization, operating 10 air ambulances, based in Sydney, New South Wales. The organization uses helicopters, airplanes and medi-jets to transport approximately 5,000 patients per year. Their operations include helicopter rapid response trauma service, fixed wing aeromedical service, helicopter aeromedical service, and pediatric and newborn transport service. The CareFlight model of care has a specialist doctor, nurse or paramedic, pilot and aircrew on board. Careflight operates in close conjunction and on behalf of the territorial and provincial health care system (CareFlight, 2016).

#### 2.2.1.2 New South Wales Aeromedical

New South Wales (NSW) air ambulance service uses a mix of fixed and rotary wing aircraft to provide care for approximately 6,000 patients a year. Care is provided by registered nurses, registered midwives or critical care and pre-hospital specialists. Their services include:

- Emergency care – Responding to patients who have experienced significant trauma, cardiac conditions and other serious medical conditions.
- Scheduled care – Transporting patients from one facility (for example, hospital) to another, in a non-emergency situation.
- Critical care – Caring for patients requiring considerable intervention, including patients with invasive devices, temporary pacing wires, vasoactive medications, in an induced coma on life support (some of these patients are transported using a specialist physician).
- Specialized care – Providing specialized care, including patients on cardiac bypass machines, patients who have a pump helping their heart to beat, overweight or obese patients, and maternity and neonatal patients. NSW air ambulance service also works closely with CareFlight’s newborn and pediatric Emergency Transport Service.

NSW ambulance service also includes the Greater Sydney Area Helicopter Emergency Medical Service (GSA HEMS). Through GSA HEMS, the largest patient retrieval service within NSW, more than 3,000 missions are undertaken every year. GSA HEMS operates three Agusta Westland 139 and two Eurocopter 145 helicopters (NSW Ambulance, 2016).

In 2014, NSW Health developed non-emergency patient transport (NEPT) to improve the coordination of service for patients requiring non-emergency transport. Previously, the non-emergency transport was provided by a combination of NSW ambulances and individual local health district fleets. With the creation of NEPT, the NSW Ambulance emergency vehicles are able to focus on emergency medical transports only. NEPT is only available for patients who require transport to or from a health facility, and who are assessed as “medically unsuitable for community, public or private transport by a medical practitioner or registered nurse”. NEPT is generally not permissible for patients who are ambulatory and living independently within the community. This service is also not provided to patients who may be “behaviorally unstable and require mechanical restraint” or are “assessed by a medical practitioner or registered nurse as unsuitable to be transported by NEPT” (NEPT, 2014).

#### *2.2.1.3 Royal Flying Doctor Service and Skymed*

The Royal Flying Doctor Service (RFDS) provides emergency aeromedical evacuations throughout rural and remote Australia for patients who are seriously or critically ill or injured, and requiring urgent medical intervention. RFDS provides primary care as well as a 24-hour emergency service to rural and remote communities throughout Australia. Since rural and remote Australia is characterized by small, widely dispersed populations, with limited access to primary health care services, RFDS also provides “fly-in, fly-out General Practitioner (GP), Nursing and Allied-Health Clinics” to rural and remote communities. Many of these services are provided in conjunction with telehealth consultations, mobile dental services, and a number of other health care services.

RFDS also provides inter-hospital transfers of patients in less urgent cases in many parts of Australia, including the transfer of patients from small hospitals in rural and remote areas to larger hospitals in regional centres or metropolitan areas where more specialist services are available. The non-emergency patient transfer service is available for a fee, and patients can request for a quote ahead of time for planning the transfer (Royal Flying Doctor Service, 2016).

Similar services for non-acute patients and for repatriations are also provided by Skymed Aeromedical. For aeromedical services, Skymed provides medical air escorts for commercial flights, contracted air ambulances, non-emergency medical transport, aeromedical retrieval and repatriation service, and commercial stretcher service by air.

Some of their services include:

- patient transfers from a nursing home to hospital, or hospital to nursing home;
- transporting patients with disabilities, mental health conditions, and surgical procedures or returning home to recover from illness/ surgery; and
- patient relocation/repatriation; locally, inter-provincially or internationally (Skymed Aeromedical , 2015).

### *2.2.2 United Kingdom*

Dedicated helicopter air ambulance services started in the UK in 1987 and evolved rapidly over the next two decades. The United Kingdom (UK) Helicopter Emergency Medical Services (HEMS), formed in 2007, is a collaboration of various helicopter air ambulances in the UK. HEMS was born out of a necessity to promote best practices in the air ambulance industry, standardize procedures, standards of care and training; and provide appropriate governance. The founding members were:

- London Air Ambulance Services (London HEMS);
- Surrey and Sussex Air Ambulance;
- Essex and Herts Air Ambulance;
- Great North Air Ambulance Service; and
- Kent Air Ambulance (UK HEMS, 2015).

#### *2.2.2.1 London HEMS*

Established in 1989, the London Air Ambulance Services, also known as London HEMS, provides aeromedical services in London. This service is provided by a team comprised of a doctor and a paramedic operating from two dedicated helicopters during the day, and from ground ambulances at night.

Operating from its base at the Royal London Hospital in east London, London HEMS has priority over the airspace over London and treats an average of five critical patients per day (London HEMS, 2015). The role and mission of London HEMS is to provide its patients with the world's "most innovative and effective pre-hospital care". It is not, therefore, involved in the inter-facility transfer of patients, or patient repatriations. In 2013, London HEMS also started the Institute of Pre-Hospital Care to further "drive excellence in pre-hospital care standards and practice through research, innovation and education". One of the current innovations underway at London HEMS is the appointment of a Patient Liaison Nurse, who provides face-to-face support to patients and identifies any unmet patient needs. These inputs are used to evaluate and improve medical interventions as guided by patient feedback (London Air Ambulance, 2015).

### *2.2.2.2 Scottish Air Ambulance Service*

The Scottish Ambulance Service is part of National Health Service, Scotland. It works alongside the Scotland ground ambulances, and predominantly serves rural, remote and isolated communities. The two primary functions of the service are pre-hospital calls and patient transport services. The non-emergency patient transport service performs the role of taking patients to and from their hospital appointments, transporting patients discharged from hospital, and other non-urgent transfers.

The service is the only government-funded air ambulance service in the UK. The air ambulance fleet is comprised of two helicopters and two fixed wing planes. Like most other services, the two Airbus H145 helicopters are primarily used to respond to emergency calls and requests from remote, rural or island communities, and the two King Air 200c planes respond to medical requests to transfer patients between hospitals. In addition, the Scottish Air Ambulance Service also operates Specialist Transport and Retrieval (SCOTSTAR) teams comprised of doctors, nurses and paramedics for specialist and/or the most critical patients (Scottish Ambulance Service, 2016).

One of the internationally recognized solutions to providing the rural population with equity of access to critical care is a centrally located, dedicated aeromedical retrieval service. Scotland's Emergency Medical Retrieval Service (EMRS) was born out of this philosophy and provides critical care transfer to medical facilities of definitive treatment, for patients in remote healthcare locations and at accident scenes. Some of the important services provided by EMSR are:

- critical care transport of patients from rural, remote and isolated communities;
- pre-hospital critical care of major trauma patients;
- critical care at multi-casualty incidents;
- tele-medicine advice; and
- outreach training, research relating to critical care retrieval, and post-graduate training in pre-hospital and retrieval medicine (Emergency Medical Retrieval Service, 2016).

Scotland's Charity Air Ambulance (SCAA) was launched in May 2013 to deliver frontline care to time-critical emergencies across Scotland. SCAA operates a fully-equipped Eurocopter EC 135 medical helicopter and works in close cooperation with the Scottish Air Ambulance Service, who provides the paramedic staff for this operation (SCAA, 2016).

### *2.2.2.3 Kent, Surrey and Sussex Air Ambulance*

The Kent, Surrey and Sussex Air Ambulance provides Helicopter Emergency Medical Service in the counties of Kent, Surrey and Sussex in the southeast of England, United Kingdom. The paramedics for the service are provided by South East Coast Ambulance Service, on secondment. The Trust receives no funding from the government and relies on voluntary donations. The primary goal is to provide appropriate service for high-acuity patients in the pre-hospital environment (Kent Surrey Sussex Air Ambulance, 2014, p. 21). The Trust operates two MD902 Explorer Helicopters from two bases in Kent and Surrey (KSS Air Ambulance, 2016).

### *2.2.2.4 Welsh Air Ambulance Service*

Established in 1998, the Welsh Ambulance Service is the national ambulance service for Wales, UK, providing emergency air coverage for those who face life-threatening illness or injuries. The Helicopter Emergency Medical Service (HEMS) of Wales operates three Eurocopter EC135 helicopters, staffed by advanced care paramedics. Another unique feature of HEMS Wales is their National Children's Air Ambulance (NCAA), which responds to both emergency incidents and urgent inter-hospital transfers for the children of Wales. HEMS Wales has also recently initiated an innovative emergency healthcare program of including "flying doctors", who have advanced expertise in emergency medicine, pediatrics, anesthesia and intensive care, in shifts on the charity's helicopters (Wales Air Ambulance, 2016).

### *2.2.2.5 Other Private and Low-Acuity Air Transport Services in UK*

There are other patient transport operators in the UK, providing repatriation services or transporting low-acuity patients using ground-based resources or fixed wing aircraft. Patient Transport (UK) Limited is one such organization engaged in inter-facility transfer work, in areas in and around London. They operate within the National Health Service (NHS) framework and are involved with transferring patients from hospitals to home, completing insurance repatriations, transporting bariatric and mental health patients, and providing support for NHS Frontline, bariatric patients, and patients detained under the mental health act (Patient Transport (UK) Ltd, 2016).

London Ambulance Service also provides low-acuity patient transport options through the Patient Transport Service, including for outpatient appointments, ad hoc transports not normally covered within a non-emergency patient transport service system (for example, long-distance transfers out of London), inter-facility transfers of neonates, transport for mental health and bariatric patients, or humanitarian transfers. However, most of these transfers are on ground ambulances (London Ambulance Service, 2016).

The Scottish Ambulance Service also operates a service for low-acuity patient transport. This service is primarily meant for supporting patients to reach their scheduled healthcare appointments, or for their admission to and discharge from, hospital. A “patient needs assessment” is done prior to providing this service (Scottish Ambulance Service, 2016). Wales has a similar Patient Care Service to deal with planned patient transfer needs between home and healthcare facilities, or some inter-hospital transfers. The Urgent Care Service of Wales Ambulance bridges the gap between the emergency medical service and the patient care service by providing appropriate equipment and advanced care paramedics. However, these services predominately use ground ambulances. Aircraft are rarely used for low-acuity transfers in the UK. (Welsh Ambulance Services, 2016).

### *2.2.3 New Zealand*

In New Zealand, the Emergency Air Ambulance Services (EAAS) is responsible for aeromedical response for medical and accident emergencies, including treating patients at the scene or transporting them to a hospital. EAAS also provides Inter-hospital Transfer (IHT) Services. In addition, EAAS also provides other services which are funded through separate arrangements with other agencies, and not included in the publicly funded model:

- search and rescue (SAR) missions funded by SAR Coordinating Authorities (Police and the New Zealand Rescue Coordination Centre);
- inter-hospital transfer missions funded by District Health Boards; and
- fire service missions funded by the New Zealand Fire Service.

Eight Emergency Rescue Helicopter / Fixed Wing Community Trusts and two air operators form part of New Zealand’s Air Rescue Group (ARG). The ARG works in partnership with the National Ambulance Sector Office for the provision and future development of New Zealand’s Emergency Air Ambulance services (New Zealand Ministry of Health, 2016).

#### *2.2.3.1 Life Flight*

Based in Wellington, Life Flight provides nation-wide air ambulance service in New Zealand through its two airplanes, a rotary wing rescue helicopter, and a fixed wing aircraft. In addition to attending to medical emergencies, the rescue helicopter is also used for search and rescue missions, by the police, for bomb squad operations, or in firefighting operations. Besides providing the aircraft and the staff, Life Flight also coordinates the bed-to-bed service. Its specialist services include the neonatal transfer service, inter-hospital transfers, and organ transfers. Life Flight is a charitable trust, and receives all of its funding through donations (Life Flight New Zealand, 2012).

### *2.2.3.2 Auckland Rescue Helicopter Trust*

The Auckland Rescue Helicopter Trust operates two BK117-850 D2 helicopters for providing critical, pre-hospital care to the greater Auckland community. The missions of the Trust include emergency/accident casualty transport, medical transfers, airlifts, and medical evacuations. It functions in close coordination with fire, police and search and rescue organizations to deliver this service (Auckland Rescue Helicopter Trust, 2013).

### *2.2.4 United States of America (US)*

There are a number of private air ambulance providers in the US. Air Methods Corporation is publicly owned, and is the biggest aeromedical operator in the US. The Domestic Air Medical Division of the company provides emergency medical services to approximately 100,000 people across US. Its air fleet includes 264 company-owned aircraft, 136 leased aircraft, and 55 aircraft owned by customers and operated under contract (Air Methods, 2016). However, since the pre-hospital and inter-facility patient transfer system is not publicly funded in the US, it is not comparable with the system in BC and is therefore not being discussed further for the purpose of this study.

## **2.3 Literature Review Conclusion**

Based on the jurisdictional scan of different air ambulance services in Canada and abroad, it can be concluded that there are a number of factors which define the operation of an air ambulance service in a particular region. These factors range from the funding model, size of the territory or region, geography, weather conditions, legislation, regulations and policies governing the service, other support services available to the public, and location of tertiary or specialized health care facilities, etc. Because of these variations, it is not possible to compare one model to another when evaluating the optimal functioning of an air ambulance service, because the models cannot be exactly the same. However, there are some common themes which can be seen in these services that point towards best practices, and can contribute to efficiency and sustainability. It is important that some of the best practices and operational peculiarities of other services be adopted in BC after carefully considering their applicability in the local environment.

Based on the review of similar services in the preceding paragraphs, some of the practices that would need a closer evaluation and may potentially benefit BCEHS in the future are:

- use of alternate service providers for low-acuity transfers over long distances;
- clarifying roles and responsibilities for patient repatriations;
- exploring partnership opportunities with not-for-profit groups, trusts, search and rescue organizations or other charities, for patient transportation;

- use of commercial aircrafts for patient transfers;
- working in conjunction with the Ministry of Health and health authorities for developing clear policy guidelines for patient repatriations, inter-provincial transfers, and for low-acuity transfers;
- exploring the feasibility of using private air ambulances paid for directly by the residents through insurance providers; and
- using a hybrid model of sharing staffing and/or air resources with other service providers.

As each of these practices have limitations, risks and/or legislative, regulatory and policy implications, these practices were addressed as part of the online survey and semi-structured interviews with senior officials from BCEHS, Ministry of Health (MoH), health authorities, BC Mental Health and Substance Use Services (BCMHSUS), BC Children’s Hospital (BCCH), and other emergency medical services. Their inputs guided the recommendations of this review.

Each of these themes identified as part of the literature review falls into one of the following categories, which helped the project team define its conceptual framework:

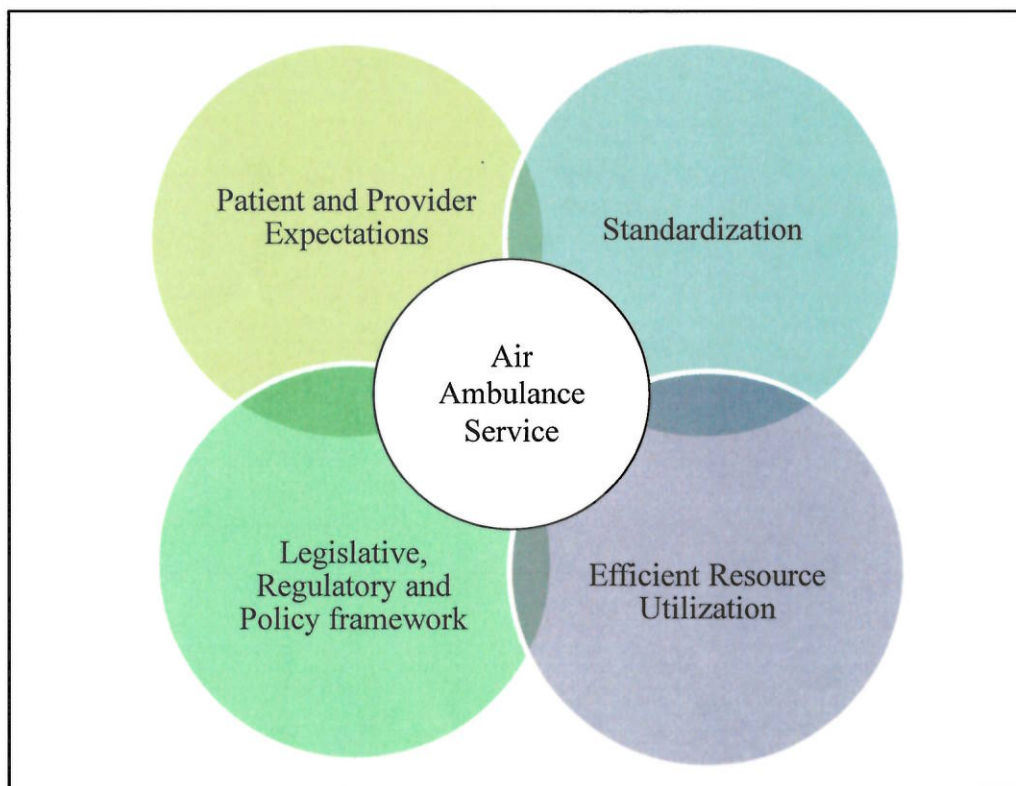
- Legislative, regulatory and policy framework
- Patient and provider expectations
- Standardization of service
- Efficient resource utilization

## **2.4 Conceptual Framework**

In recent years, researchers and program evaluators of the social sector have expanded their methodologies to include both quantitative and qualitative methods. This approach needs to be grounded in a theory that can meaningfully guide the design and implementation of mixed-method research evaluations (Greene, Caracelli, & Graham, 1989, p. 255). While there is no universal definition of a conceptual framework for the social sciences, one could be generally defined as any empirical or quasi-empirical theories of social and/or psychological processes that can be applied to the understanding of a phenomenon (Anfara, 2013, p. 6).

The elements of a conceptual framework typically include: a complete presentation of the variables to be observed; the ideas defined in a way the researcher wants them; the operationalization of the variables-concepts, the visible indicators and/or the variables-concepts; the scheme of measuring the variables; and a focus on the specific stipulated and operational definition of concepts and variables, with respect to the particular research problem (Thesis Notes, 2009).

Deductive reasoning moves from the general to the specific, and is focused on testing or confirming a hypotheses (Trochim & Donnelly, 2008, pp. 16 - 18). A deductive reasoning approach was chosen for analysis of the information gathered through the literature review, online survey and semi-structured interviews because the methodology supports the process of collecting a large amount of information, analyzing it to identify the specific themes and then developing recommendations to address them. Through applying logic, analysis and critical thinking to the information collected, it is possible to easily question the validity and quality of the information that has been collected. It provides a means to see patterns and underlying assumptions within the information (The Critical Thinking Co., 2005). Additionally, thematic analysis was used to objectively understand the data that was collected. It is a cluster methodology which focuses on identifying, analyzing and reporting patterns across data sets (Braun & Clarke, 2006, p. 6). Patterns and themes are identified through processes focused on data familiarization, coding, theming and revision (University of Auckland, New Zealand, 2016). The key areas of the conceptual framework include an analysis of the legislative, regulatory and policy framework that generally governs the BCEHS air ambulance service, and in particular, those policies and standard operating procedures that address the transportation and repatriation of low-acuity patients. It also requires a review of patient and provider expectations, standardization, and the effective and efficient use of resources. Figure 5 below provides a visual representation of the conceptual framework used for this program evaluation.



**Figure 5: Visual Representation of Conceptual Framework**

### *2.4.1 Legislative, Regulatory and Policy Framework*

At the federal level, health services are legislated and governed by the Canada Health Act (CHA). Canada's national health insurance program, often referred to as “Medicare”, is designed to ensure that all residents of Canada have reasonable access to medically necessary hospital and physician services, on a “prepaid basis”. This national program is closely integrated with interlocking provincial and territorial health insurance plans, all of which share certain common features and basic standards of coverage.

Under the Canada Health Act (CHA), specific criteria and conditions are specified that must be satisfied by the provincial and territorial health care insurance plans in order for them to qualify for their full share of the federal cash contribution, available under the Canada Health Transfer (CHT). Provincial and territorial governments are responsible for the management, organization and delivery of health services for their residents. However, ambulance services, including air ambulance services, are not covered through the Canada Health Act. These “additional benefits” may be included by respective provinces and territories (Health Canada, 2011).

Emergency health services in BC are required to be provided by BCEHS, as legislated by the Emergency Health Services Act, 2013 (the “Act”). As per the Act, BCEHS is a corporation of the government which has the sole authority to provide pre-hospital emergency health services in BC. Para 5.1 of the Emergency and Health Services Act, 2013, defines the purpose, roles and responsibilities of BCEHS. The Act specifies that BCEHS, among its other responsibilities, is “to provide, in British Columbia, ambulance services and emergency health services”. Though the provision of air and ground ambulance services to residents of BC is one of the important purposes of BCEHS, the Act does not specify the type of air ambulance services that need to be provided to the residents of BC (pre-hospital emergency vs inter-facility transfers of patients, type of patient acuity, inter- and intra-repatriations, etc.) As a result, BCEHS provides air ambulances across a spectrum of clinical and operating environments, including inter-provincial transfers of patients. BCEHS has established inter-provincial agreements with Alberta and Yukon for transporting patients to and from these provinces. Inter-jurisdictional service agreements are permissible under para 5.4 of the Act (Emergency and Health Services Act, 2013). The Emergency Medical Assistants Licensing Board (EMALB) is responsible for examining, registering and licensing all emergency medical assistants (EMAs) in BC, including first responders. The board, under the authority of the Emergency Health Services Act, sets license terms and conditions. In addition, the board investigates complaints and conducts hearings, where required (EMALB, 2015).

Issues related to the cost of providing the emergency health services are further elaborated upon in the Emergency Health Services Regulations. As per Emergency Services

Regulation 144/2013, the cost of providing ambulance service to residents in BC is required to be borne by BCEHS. However, this does not preclude BCEHS from obtaining contributions from other agencies, individuals or insurance providers where they may have the responsibility for paying for the ambulance service, towards the cost of services provided by BCEHS. Schedule 1 of Regulation 191/2010 provides the cost to be charged or reimbursed while these services are provided by BCEHS (Government of BC, 2013).

These statutes set the legislative and regulatory framework that determines what services are provided by the Province of BC and how they are regulated. In addition, the Critical Care Transport Standard Operating Procedures and the Patient Acuity for Transfer Policy outlines the standard operating procedures that the air ambulance service uses on a daily basis for determining when and how they respond to emergency situations around the province, as well as the repatriation of patients from their point of care back to their home community.

Under the Workers Compensation Act, all employers also carry a responsibility for ensuring the health and safety of their employees. While certain sections of the Act deal with rights and responsibilities of employers, workers, and other workplace parties, others deal with administrative provisions. Under Section 3.16 of the Workers Compensation Act (Occupational Health and Safety), every employer is required to keep up-to-date written procedures for providing first aid at the worksite, including arrangements for transporting injured workers out of the worksite. As per subsection 3.17.1 of the Act, if air transportation is the primary or only method for transporting an injured worker, all of the following requirements must be met:

- Before the start of operations in a workplace, arrangements must be made with an air service to ensure that an appropriate aircraft is reasonably available to the workplace during those operations.
- The above arrangements must include procedures for:
  - the employer to determine the availability of appropriate aircraft before the start of each work day, and
  - the air service to notify the employer if an appropriate aircraft ceases to be available (WorkSafe BC, 2016).

Therefore, employers engaged in activities such as mining, logging or similar operations in remote locations have a responsibility under the Workers Compensation Act to arrange for ground and air transportation for injured workers directly to a medical facility or to a place where the care can be taken over by BCEHS.

Similar expectations are also placed on those engaged in the tourism and hospitality industries. Besides the operators' responsibilities to their workers under the Workers Compensation Act, the operators also have a responsibility to keep their guests and patrons

safe. This includes having risk mitigation strategies and other mechanisms of providing first aid or evacuating guests to the appropriate medical facility as soon as possible (Webster, 2015).

There are a number of search and rescue (SAR) organizations in BC, some of which also carry out medical evacuations using helicopters. These SAR groups are required to operate under the guidelines issued by Emergency Management BC (EMBC). These provincial operating guidelines provide safe operating procedures to be used by SAR groups, including those for helicopter medical rescue (EMBC, 2012). However, since BCEHS is also responsible for collaborating, planning and coordination of emergency health services, urgent health services or other ancillary health services, these SAR agencies are expected to work closely with BCEHS for patient transports to the appropriate medical facilities by ground or air (Emergency and Health Services Act, 2013, section 5.1).

In conducting the program evaluation, it is critical to understand the legislative, regulatory and policy frameworks that govern access, deployment and utilization of the service, given that it is necessary to understand entitlements and restrictions on the use of patient transfer resources, and that any recommendations on how to modernize the service may need to address its governance structures.

#### *2.4.2 Patient and Provider Expectations*

The air ambulance service is managed provincially by British Columbia Emergency Health Services (BCEHS) and the Provincial Health Services Authority (PHSA). As a result, patients and providers (i.e., physicians, nurses, and health authorities) are users of the system. Their interests are to ensure that patients receive timely, high quality transportation and care, either from point of incident to point of care, or from point of care back to the patient's home community. The BC Ministry of Health defines quality as being comprised of five domains: Appropriate, Accessible, Safe, Acceptable and Effective Services (Government of British Columbia, 2015, p. 5). These domains of quality are defined by the Ministry of Health for the BC Health System as follows: *Effectiveness*: patient care that is known to achieve the intended outcomes. *Appropriateness*: care that provides evidence based treatment and is specific to individual patient needs. *Accessible*: patients are able to access health services easily. *Safe*: the services that are provided are done so in a safe manner and avoid harm resulting from care. *Acceptable*: care that is respectful to the patient and family preference, needs and values (Setting Priorities for BC Health, 2015, p. 12). Services need to be appropriate to meet the patient's presenting health needs. They have to be seen as being acceptable to patients and their families, and delivered in a safe and effective manner. The quality of care and the availability of services are critical to individual patients, their families and the overall health system.

### *2.4.3 Standardization*

The province of BC is the third most populous province in Canada, and covers 947,800 square kilometers (Harbour Publishing, 2016). Within BC, there are areas of dense population such as the lower mainland and vast areas of remote wilderness with few, if any, residents. The BC health system, and by extension the air ambulance fleet, has a fiduciary responsibility to provide a minimum level of service to all residents regardless of where they live. In addition, response time and access to services need to be constructed in a way that they support patient care and are delivered in a manner consistent with legislation, regulation, policy and standard operating procedures, as well as being fiscally responsible.

The standardization and consistent application of policies and procedures has been proven to ensure the most equitable effective and efficient utilization of resources. Through documenting the current best practice, standardized work forms the baseline for continuous improvement. As the standard is improved, the new standard becomes the baseline. The benefits of standardized work include documentation of the current process and reductions in variability. It adds discipline to the culture of the administration and management of the service. It is also a learning tool that supports audits and promotes problem solving (Lean Enterprise Institute, 2013).

### *2.4.4 Efficient Resource Allocation*

In addition to ensuring quality outcomes for patients and consistent application of the air ambulance service across the province to all BC citizens, it is important to ensure the effective and efficient use of resources. They need to be utilized consistently with the tax payer accountability principles (Government of British Columbia, 2016), and within budget allocations outlined in the provincial government's budget allocations for the service. Also, funding needs to be budgeted for in a manner that allows for 24/7 services, 365 days a year. Understanding the financial realities of providing the service is paramount to ensuring services are provided in a cost effective manner consistent with legislation, regulation and policy. This is the key to providing an effective, efficient and sustainable service to the public, and to meeting the most critical care needs of patients in a timely and effective manner.

## **2.5 Logic Model**

In addition to the development and utilization of a conceptual framework to guide the structure of the program evaluation, the development of a clear and concise logic model assists researchers to understand the inputs, activities, outputs and outcomes that are involved in the delivery of a service and the anticipated/expected outcomes that are being sought.

Logic models are a visual/graphic representation explaining the intended relationships between inputs, program components (aka activities), outputs, and the desired outcomes present within a program (McDavid, Huse, & Hawthorn, 2013, pp. 47, 50). The stated outcomes are often described as having short-, medium- and long-term benefits that participants are hoping to achieve. While often represented in a linear fashion, it is important to note the key components do not always occur in a sequential order, nor do programs occur in isolation. The components are linked and have relationship to one another. This can be represented through using arrows across the domains to demonstrate the linkages and dependencies between the variables (see Appendix 1). Additionally, Logic Models are open systems constantly impacted by their environment due to political, economic, and operational issues that increase or hinder a program's success (McDavid, Huse, & Hawthorn, 2013, pp. 48, 49). They play a key role in performance management because they describe a program's key activities and outcomes (McDavid, Huse, & Hawthorn, 2013, p. 50), which can be used to evaluate a program's effectiveness.

The air ambulance logic model (Appendix 1) contains the standard elements and provides a clear picture of the relationships between inputs, activities, outputs and the desired outcomes.

**Inputs** are resources required for the program to operate. They typically include money, people, equipment, facilities and knowledge (McDavid, Huse, & Hawthorn, 2013, p. 52). For the air ambulance service, inputs include the legislative, regulatory and policy framework governing the service. It also includes the resources available to provide the service (e.g., funding, personnel, and physical assets) required to govern, manage, administer, and operationalize the program.

This includes:

- Emergency Health Services Act;
- Emergency Health Services Regulation;
- Critical Care Transport Standard Operating Procedures;
- Patient Acuity for Transfer Policy;
- BCEHS Resource Allocation Plan (for pre-hospital calls);
- Inter-provincial transfer agreements for Alberta and Yukon;
- BCEHS Aviation Operations and Critical Care Strategic Plan;
- Budget/funding;
- PHSA/EHS staff time and resources ( administrative and clinical);
- Health authority referral patterns; and
- Aviation contracts with service providers.

**Program Components** are clusters of activities within a program (McDavid, Huse, & Hawthorn, 2013, p. 53) that occur to allow for the service to be provided. For the air ambulance service, they include the roles and functions completed by BCEHS to operationalize the program and provide services to the public, such as:

- receive calls;
- assess severity and priority of response;
- determine patient needs and requirement for transport;
- dispatch air ambulance resources where required;
- provide critical emergency care (on site or in the facility);
- confirm the best transportation mode for the patient;
- provide transport to the closest appropriate facility;
- receive requests for repatriation transportation;
- assess patient acuity and determine the most appropriate form of transportation;
- repatriate patients to their home community and/or the closest appropriate hospital/facility; and
- administer the service (budgeting/contract management, policy development, evaluation).

**Outputs** are units of service or activities that can be seen as the transition between the activities that are completed and the desired outcomes. They are normally tangible and can be counted and/or measured (McDavid, Huse, & Hawthorn, 2013, p. 55). While outputs can be used as a measure of productivity, they do not necessarily equate to the desired outcomes being achieved. For the air ambulance service, the outputs include:

- number of calls received;
- number of calls responded to;
- number of patients transported from location of incident to care facilities;
- number of patients transported between care facilities;
- number of patients repatriated; and
- tracking and evaluating the financial implications of the service.

**Program Outcomes** are the projected results that match to a program's objectives. There are often multiple outcomes identified for a program, which may also be distinguished by when they may be anticipated to occur (McDavid, Huse, & Hawthorn, 2013, p. 55). The air ambulance service has a number of expected outcomes from the patient perspective as well as from the point of view of administration:

- Patient:
  - received the appropriate response to meet the patient's health needs at the time of dispatch/response and repatriation, to avoid or minimize loss of limb, functioning, and/or life;
  - seamless patient journey;

- patients are repatriated in the appropriate manner that meets their assessed health care needs; and
- decreased/no inappropriate repatriation of low-acuity patients.
- Administration:
  - air ambulance fleet is deployed effectively across the province to meet patient service delivery demands and response times; and
  - resources are efficiently used within budget allocations.

Lastly, programs are open systems subject to influence by their environment. The air ambulance service is no different, as it is subject to the effects of political support for the service, the Ministry of Health's strategic and operational plans (which focus on maintaining clients/patients in their homes and communities), strong advocacy/support from individuals and/or challenges faced in the delivery of the program, and achieving the desired outcomes. It should also be noted that while the logic model depicts a provincial understanding of the program, it is delivered by different service centres around the province, each with its own degree of unique culture, service delivery system and financial challenges. These differences impact the delivery of the program and can result in regional variations on the outcomes of the program.

### **3.0 METHODOLOGY AND METHODS**

#### **3.1 Program Evaluation Methodology and Methods**

In conducting the program evaluation, a mixed-methods approach that draws on both quantitative and qualitative data was used to understand if the BCEHS air ambulance service is providing effective, efficient, safe, appropriate and accessible services. It included completing a literature review, conducting an analysis of relevant and guiding documents, administering an online survey and conducting a series of semi-structured interviews with staff from the Ministry of Health, the Provincial Health Services Authority, Emergency Medical Health Services, Northern Health, Island Health, BC Children's Hospital, and BC Mental Health and Substance Use Services.

This program evaluation was approved by the Human Research Ethics Board, University of Victoria, British Columbia, via the harmonized ethics review process. Additionally, operational approval was obtained from all of the required informants.

#### **3.2 Literature and Document Review**

The objective of the literature review was to examine and evaluate the national and international literature related to air ambulance services and the repatriation of low-acuity

patients. The review was completed to summarize and evaluate the present literature on the subject and develop the program logic model and conceptual framework.

Key documents produced by the Ministry of Health, PHSA and BCEHS were reviewed to understand the strategic and operational imperatives of the BC health system, and in particular the future direction of the air ambulance service. In addition, through the online survey and the semi-structured interviews, a series of national and international documents were identified and reviewed as well. This information was used to understand the current context and environment in which air ambulance services are delivered, and provided insight into the potential issues and solutions necessary to ensure the BCEHS air ambulance service provides effective and efficient services within the allocated budget and resources available presently and into the future.

### 3.3 Online Survey

As noted above, ethics and operational approval was sought and obtained to conduct an online survey of air ambulance services around the world. Online surveys were sent to twenty-six (26) leaders from twenty-one (21) Canadian and International Air Ambulance service providers. In total, 18 responses were received, representing a response rate of sixty-nine (69) percent.

The online survey was designed using the University of Victoria's Fluid Survey tool, and administered to representatives from the following services:

- Australia
  - Careflight
  - Royal Flying Doctor Service
  - Aeromedical (New South Wales)
- Canada
  - Alberta Health Services (Alberta)
  - STARS (Alberta)
  - BCEHS (BC)
  - Lifeflight (Manitoba)
  - New Brunswick Air Ambulance
  - East Coast (Newfoundland and Labrador)
  - Nova Scotia
  - North West Territories
  - Ornge (Ontario)
  - Airmedic (Quebec)
  - STARS (Saskatchewan)
  - Yukon

- New Zealand
  - Life Flight
  - Rescue Helicopter Services
- UK
  - HEMS UK (England)
  - Kent, Surrey and Sussex Air Ambulance (England)
  - Scottish Air Ambulance (Scotland)
  - Welsh Air Ambulance (Wales)

The online survey was sent primarily to other air ambulance providers in Canada, as part of a jurisdictional scan to understand some of the comparable challenges similar services are facing, and steps they have taken to address them. The air ambulance operators were also asked to comment on their respective governing legislation and regulations as a means to understand whether their strategies could be considered within the BC legislative, regulatory and/or policy context.

### **3.4 Semi-Structured Interviews**

Participants for the semi-structured interviews were selected based on either past or present understanding of the legislative, regulatory, policy and/or standard operating procedures that govern the air ambulance service, patient needs, and the patterns of practices used by physicians, associated with the transportation of low-acuity patients.

Invitations to participate in the interviews were sent via email from a facilitated contact. In the email invitation, participants were informed of the nature of the program evaluation, the anticipated time required to participate, the purpose of the research project, and the reason(s) why the participant had been identified to participate. Potential participants were advised they were under no obligation to participate and any comments made would be de-identified, aggregated, and reported at a provincial level only.

Twenty-one (21) individuals were asked to participate, with eighteen (18) agreeing to be interviewed; this represented an 86 percent response rate of individuals asked to participate. Additionally, it should be noted the participants were from all of the pre-identified organizations including: health authorities, BCEHS, the Paramedic Chiefs of Canada (PCC) and the Ministry of Health, thereby ensuring a broad range of information and opinions.

### **3.5 Data Analysis**

Quantitative data was collected from both national and international air ambulance services to understand how similar jurisdictions resource their respective fleets to meet the patient needs of their populations.

Additionally, qualitative data was collected via an online survey and through semi-structured interviews with senior management and executives. This information was then codified using word repetitions and key words in a context (Ryan & Bernard, 2016). The information was then grouped according to themes of the participants' responses and analyzed using thematic analysis, which is a method for identifying, analysing and reporting patterns within the collected data (Braun & Clarke, 2006, p. 6). It is used to understand the predominant issues and proposed solutions/recommendations for addressing them (University of Auckland, New Zealand, 2016).

### **3.6 Project Limitations and Delimitations**

The diversity of the participants involved in the program evaluation provided both a strength and limitation to the program evaluation. Participants were selected from different service delivery agencies around the province, working in different geographic settings. This allowed for the data to be diverse, and provided a provincial context to the needs and issues faced in the repatriation of low-acuity patients.

One limitation, however, was the challenge of getting operational approval from all of the health authorities to allow their respective staff to participate in the program evaluation. The data and analysis could have been richer if there had not been time constraints, and if all of the health authorities had been responsive to the Investigators' inquiries to obtain operational approval to conduct the study.

Another limitation identified by the project team was a lack of good literature on air ambulance operations. This limited the depth of analysis on certain aspects of this report and a number of findings. The recommendations were therefore primarily based on information about other air ambulance operators, the online survey and the thematic analysis of the semi-structured interviews.

Furthermore, the project team did not directly incorporate the "patient-voice" into the findings. The complexities of obtaining operational approvals, especially when interviewing patients prevented this input.

Lastly, the researchers are employed in the health sector in BC. It is acknowledged this may have impacted the assessment of the findings. Every attempt was made however to base the findings solely on the evidence available through research by using objective data analysis techniques to review the information that was collected through the review.

## **4.0 FINDINGS**

This section details the findings from the literature review, document review, online survey, and the semi-structured interviews. It includes general findings as well as the participants' views on transportation of low-acuity patients, repatriations, challenges facing the air ambulance's operations, and suggestions on how to generate further efficiencies in the system.

Questions for the online survey and semi-structured interviews are attached as Appendix 2 and 3 respectively.

### **4.1 Literature Review Findings**

Using the conceptual framework as an objective reference, it is possible to determine that in Canada, air ambulance services are not governed or funded under the national health insurance program. Each province and territory has to set up their own air and ground ambulance model. Many provinces have also set up inter-provincial agreements with neighboring provinces to generate efficiencies and contribute towards a sustainable system. While most of the provinces fund their air ambulance operations, a few also operate as charitable trusts, and are funded by donations received from individuals, service groups, businesses and corporations, municipalities, and through collaborative agreements with provincial governments. In a few provinces like Quebec, air ambulance operations are accessed through the purchase of appropriate insurance coverage for the same. While some air ambulance operators in Canada (e.g., Ornge) own and operate their own aircraft, most provinces do not own the aircraft used for air ambulance, and, as in BC, have contracts with air carriers who provide the aircraft. There is a mixed model as far as staffing is concerned. While some provinces like BC have their own critical care and specialized infant transport teams, other service providers such as STARS in Alberta provide aircraft and staff to Alberta Health Services for rotary wing air ambulances.

Review of the literature and analysis of air ambulance operations in Canada and of similar models in other parts of the world suggest that air ambulance operations are complex, highly specialized and expensive. Therefore, these resources are used for the most critical patients, either for pre-hospital scene responses or for inter-facility transfers of patients, based on their medical needs, which is consistent with the efficient resource allocation domain within the conceptual framework. Most of Canada and other parts of the world do not cover repatriation costs for patients or provide non-emergency transfers. Wherever these services are provided, the costs are borne by the patients, either directly or through their insurance provider.

While some provinces like Manitoba have very comprehensive regulations governing the air ambulance operations, most provinces in Canada do not have detailed regulations for this purpose. The ambulance services either have their own comprehensive guidelines or are governed by provincial emergency medical service regulations, which may or may not specify the air ambulance operations in detail.

Most air ambulance operators in Canada are restricted to either pre-hospital care or inter-facility medical transfers of patients. This is not the case, however, with many air ambulance services in Australia, New Zealand and the United Kingdom. In these countries, some of the air ambulance services are also engaged in search and rescue operations and work in close collaboration with the police, bomb disposal squads, or other first responder agencies. Unlike most provinces in Canada where the air ambulance services are provided by one provider, this is also not the case in other countries with similar models. For example, in BC, BCEHS is the sole provider of emergency pre-hospital and inter-facility air ambulance services. However, in Australia, while there are many territorial and regional air ambulance services, the Royal Flying Doctor Service overlaps services and operates throughout Australia to provide inter-hospital transfers of patients in less urgent cases and other non-emergency patient transfer services, for a fee. Similarly, the Scottish Air Ambulance Service works collaboratively with Scotland's Charity Air Ambulance and Specialist Transport and Retrieval teams. This highlights that while Air Ambulance Services may be provided in multiple jurisdictions, applying the conceptual framework there is little standardization across jurisdictions in who the service is provided to and how.

A key difference that is evident between the air ambulance models of Canada and other countries is the funding source. Unlike the majority of Canadian air ambulance operators which are publicly funded, most air ambulances in the UK are operated by trusts and are heavily reliant on donations and fundraising for their service. Scotland Air Ambulance is the only government-funded service in the UK. Collaboration models evident in the UK, Australia and New Zealand comprise another significant difference. HEMS is a collaboration of various helicopter air ambulances in the UK. In New Zealand, Emergency Rescue Helicopter organization, Fixed Wing Community Trusts and two air operators form part of the Air Rescue Group. However, there are no such collaborative groups in Canada.

Review of the literature also revealed that the legislative and regulatory framework in Canada and BC for ambulance operations is generally broad in nature. Corporations or organizations responsible for operating the ambulance services are expected to formulate policies, procedures and guiding principles for delivery of responsive air ambulance services. These are based on a number of factors, including the demand for these services, geographical and access challenges, location of tertiary care facilities, and resource availability.

Review of other air ambulance operators also suggested that there is inadequate information available on the repatriation of patients or on the low-acuity transfer of patients. It appears that most of the patient repatriations or low-acuity transfers are either left to patients to manage on their own, or the services are provided by alternate service providers. Information on transportation of specialty patient populations, such as bariatric or mental health patients, is also limited. It was therefore prudent that as part of this study, this information was gathered directly through the survey or semi-structured interviews of the leaders managing the air ambulance operations, or through leaders in health authorities and the MoH.

## **4.2 Document Review Findings**

Key documents produced by the Ministry of Health, PHSA and BCEHS were reviewed to understand the strategic and operational imperatives of the BC health system, and in particular the future direction of the BCEHS air ambulance service. This information was used to understand the current context and environment in which air ambulance services are delivered, and provided insight into the potential issues and solutions necessary to ensure the BCEHS air ambulance service provides effective and efficient services.

The primary findings were that the issues facing the air ambulance service are consistent with the broader issues and pressures facing the overall BC Health Care System, that is, an ageing population and an increased demand for services (Setting Priorities for BC Health, 2015, pp. 1-2). There is an emphasis on clarifying roles and mandates of key partners and stakeholders, aligning initiatives and activities, and the identification of five areas of strategic priority for the Ministry of Health, including: primary care access; the frail elderly with complex conditions; individuals struggling with mental health and substance use issues; surgical services; and, rural health care (Ministry of Health. 2016/17 - 2018/19 Service Plan, 2016, pp. 6-7).

## **4.3 Online Survey Findings**

The online survey results indicated the BCEHS air ambulance fleet is considered a medium-sized operation when considered against other jurisdictions in more populated provinces like Ontario. However, BC faces some unique challenges as patients are often required to be transported over large distances to tertiary care centres (for example, from communities in northern BC, to facilities in southwestern BC.) Like BC, most of the air ambulance operators in Canada have a mix of fixed wing and rotary wing aircraft. There is a consistent approach to using fixed wing aircraft for long distance inter-facility transfers, and rotary wing aircraft for emergency scene calls. Most air ambulance services contract aircraft with private air carriers and provide their own staff, though there are exceptions. Besides the dedicated air carriers, 55% the services also use ad hoc service providers,

which are used to address peak demand periods when an aircraft is required to a rural or remote location, and there is no contracted aircraft available. However, the total number of patients transported by air remains relatively low; most services are transporting less than 5% of their patients using ad-hoc aircrafts (Online Survey, pp. 3-4).

Approximately 84% of the air ambulances use a combination of critical, advanced or primary care paramedics to staff the aeromedical flights. The employment of registered nurses is also common, especially where a higher level of care is required and the dispatched paramedics do not have the required skills. For certain critical cases, or where a specific care need has been identified, physicians are also carried on board. Only 16% of the respondents stated using only critical care paramedics (Online Survey, p. 10).

Many of the respondents noted that a well-functioning communications centre is a critical element of a successful aeromedical system. Guidelines established by the Association of Air Medical Services suggest that all personnel of a dispatch centre must possess skills equivalent to at least a basic life support paramedic, and have specialized training in dispatch and communication. The skills gain even more importance when operated in a complex aeromedical dispatch environment (Martin, 2006, p. 94). It has also been a widely-documented fact that one of the important criteria for an HEMS team to be activated quickly and efficiently is an integrated dispatch system where the dispatcher is in charge of receiving the call as well as making “take off” decisions (Tomazin, 2012, p. 61). Several reports, including a review of BCEHS’ and Ornge’s air ambulance programs by the respective provincial Auditor Generals, have highlighted the importance of an efficient aeromedical dispatch system (McCarter, 2012, p. 32; Doyle, 2013, p. 7). In view of the importance of an efficient dispatch system to the overall performance of the air ambulance operation, respondents were asked to provide information on the dispatch operations for their service. In a majority of cases, the ground and air ambulance dispatch operations are combined together and are not part of the air ambulance operations. However, 49% of the respondents confirmed that the dispatchers forming part of aeromedical dispatch are either flight paramedics/flight nurses, or suitably certified for this type of specialized work (Online Survey, pp. 13-15).

*“The dispatch centre is the heart of an efficient aero-medical operation. The dispatchers need to be qualified in aero-medical dispatch, closely integrated with air ambulance operations and intimately aware of aero-medical logistics”  
-Interview respondent*

Efficiencies in aeromedical operations are also linked to location of multiple and appropriate bases to meet patient needs, location of adequate resources at each of these bases, and availability of spare resources (Tomazin, 2012, p. 61). Bases for air ambulance services could either be co-located with medical care facilities, or with airports, or at a

location determined by patient demand. Each of these options have their advantages and disadvantages. BCEHS operates its air ambulances from five bases, which have either fixed wing, rotary wing or both type of aircraft. The current location and configuration of the air ambulance bases in BC lends itself to an optimum and responsive system (Operational Research in Health, 2015, p. 38). Respondents of the survey were asked to comment on the location of their bases. In 17% of the cases, the air ambulances base was co-located to a major medical facility, 39% are co-located to an airport, and in 44% of the cases, the location is determined by the patient demand (Online Survey, p. 18).

Another important input sought from the respondents was regarding the specific legislative and regulatory frameworks under which they operate. On review of these statutes, it can be deduced that for most provinces, the legislative and regulatory requirements are broad-based for provision of ambulance services. The emergency health services in each of the provinces then sets the specific direction and mandate for its air ambulance service that defines the goals/objectives and type of patients to be transported by air. In keeping with its mission of delivering, coordinating and governing appropriate and effective pre-hospital care and inter-facility health services throughout BC, BCEHS has established one of the strategic goals of providing “appropriate care”: to ensure that “the right care is provided to the right patient with the right resource at the right time” (BCEHS, 2015, p. 2). Within the ambit of this goal, BCEHS is in the process of analyzing current and future service demand and implementing recommendations to optimize deployment of its resources, including air ambulances (BCEHS, 2015). Though 76% of the respondents confirmed that they have a clear mandate including the goals/objectives and the type of patients to be transported, the majority of them also confirmed that they are not dependent on government legislation or regulations for this, but are guided by internal policies endorsed by the government (Online Survey, p. 20).

With regard to regulations, BC’s Emergency Services Regulation 144/2013 defines the costs of ambulance services in BC. At the time of writing this report, as per these legislated rates, a flat rate of \$80 is to be charged for ambulance transport for all beneficiaries, whether the transport is done by ground or air (Government of BC, 2013). These legislated rates have also remained unchanged for more than a decade. Though BCEHS air ambulance operations charge a fee for the service, it is clearly much lower than the actual cost of transportation, especially for air ambulance transports. Since these are regulated rates, it is beyond the purview of BCEHS to revise these rates. Additionally, the system of cost recovery from non-beneficiaries is complicated. BC has inter-provincial agreements with Yukon and Alberta for inter-provincial transfer of patients; however, these agreements do not reflect the true cost of actual operations of transporting patients to and from these provinces. To understand some of these financial challenges, air ambulance operators were asked the following questions:

- Do you have legislated rates for patients transports (for ground or air ambulance)?
- Is it within your organization's mandate or control to revise these rates based on your operating costs?
- Are these flat rates, or do the rates differ depending on the mode of transport (ground/air) or type of platform used (rotary wing versus a fixed wing aircraft)?
- Do you have a system of cost recovery from patients who may be non-beneficiaries (non-residents, patients who may not be subscribers to the ambulance services, international tourists, etc?)
- Do you have any contractual arrangement with neighbouring provinces, countries or counties for cost recovery while transporting non-resident patients?

56% of the respondents mentioned that the rates for their air ambulance services are not legislated; however, they are governed by government policies. For more than 64% of the respondents, it is not within their organization's control to revise these rates. Flat rates are only charged by 38% of the respondents and are different for rotary wing and fixed wing air ambulances. 60% of the respondents confirmed that their organizations are in a position to recover fees from non-beneficiaries, though 60% of the respondents do not have formal agreements with neighbouring provinces or countries for cost recovery (Online Survey, pp. 21-24).

In terms of the number of patients being transported by air by Canadian EMS services, BCEHS has the second highest volume of patients transported by air (approximately 6500), with the highest in Ontario. Most of the other ambulance services in Canada transport less than 300 patients by air (Online Survey, pp. 26-27). Another important question that was asked from the respondents was related to the air ambulance work in pre-hospital versus inter-facility transfers. There was a wide variation in these responses as many of the services are engaged in one type of the activity or another. For instance, AHS is only engaged in inter-facility transfers using its fixed wing aircraft, whereas STARS rotary wing air ambulance contracted to AHS is primarily engaged in only pre-hospital work. Similarly, London HEMS only does pre-hospital work and does not have a responsibility for inter-facility transfers. Therefore, the information available in response to this question is not sufficient to draw any thematic conclusions. For the sake of comparison, it was observed that Ornge has a similar distribution of air ambulance responses- approximately 10% for pre-hospital and others being inter-facility transfers (Online Survey, pp. 26-28).

In terms of regulations governing pre-hospital work versus inter-facility transfers, only 13% of the respondents stated that they had exclusive responsibility for only pre-hospital care, with approximately 73% of the respondents responsible for pre-hospital as well as pre-

hospital and for all patient acuities. 25% of the respondents also stated that they have utilized commercial aircraft for low-acuity transfers (Online Survey, p. 29).

There was a substantial evidence of challenges in transporting mental health and potentially violent patients by air. 25% of the services contacted as part of this survey do not transport this patient population. More than 90% of the EMS services who transport these patients, either use special escorts or utilize some means of physical/chemical restraints. Another important finding was that more than 68% of the EMS services do not transport bariatric patients with their dedicated aircraft and either out-source this responsibility to other service providers or use ground ambulances/ad-hoc charter aircraft (Online Survey, pp. 30-31).

#### 4.4 Semi-Structured Interview Findings

For this study, a total of 18 semi-structured interviews were conducted with participants from BCEHS, Ministry of Health, health authorities, and the Paramedic Chiefs of Canada (PCC). The participants represented a broad spectrum of leaders, from policy makers to health care administrators, to physicians and senior executives responsible for actual ambulance operations:

|                      |          |
|----------------------|----------|
| • BCEHS              | 5        |
| • Ministry of Health | 2        |
| • Northern Health    | 4        |
| • Island Health      | 2        |
| • BCCH               | 2        |
| • BCMHSUS            | 2        |
| • PCC                | <u>1</u> |
| Total                | 18       |

Some of the interview questions from this group are summarized below.

#### ***What are the key pieces of legislation, regulation, policy that govern the operation of the air ambulance service in British Columbia?***

Respondents identified that the key piece of legislation that governs the operations of the ambulance services in BC is the Emergency and Health Service Act. Though the Act does not specifically elaborate on the air ambulance services, it is implied that these services are covered under section 5.1 (1) (a), which specifies the purpose of BCEHS is “to provide, in British Columbia, ambulance services and emergency health services” (Emergency and Health Services Act, 2013). In addition, the fee structure is set up under Emergency Health

Services Regulation 471/74 (Government of BC, 2013). Details of the same are provided at Appendix 4 to this report.

The legislative and the regulatory framework was mentioned as appropriate and flexible , thereby providing the required “nimbleness” for effecting the required modifications as per the changing conditions.

Some of the respondents highlighted that the following policy papers issued by the Ministry of Health, Government of BC, were also very valuable in establishing priorities for emergency health services in the province:

- Setting Priorities for the BC Health System, February, 2014;
- Ministry of Health 2015/16 – 2017/18 Service Plan;
- Rural Health Services in BC: A policy framework to provide a system of quality care, 2015; and
- Delivering a Patient-Centred, High Performing and Sustainable Health System.

In addition to offering the key pieces of legislation, regulations and policies that help in governing emergency health services in BC, respondents provided feedback from personal experience and acknowledged that irrespective of the governing legislation and the regulatory framework, there is a requirement for all stakeholders to understand expectations, local challenges, patient, physician and community needs, and work together to arrive at creative and innovative solutions. This was most evident from respondents from Northern Health, who expressed a strong desire to collaborate more closely with BCEHS to overcome some challenges associated with patient transfers, especially from remote and smaller communities with limited health care facilities.

### ***What are the strengths of the air ambulance service in BC?***

The majority of the respondents were very complimentary of the skills, training and professionalism of the critical care and infant transport paramedics who normally staff the air ambulances. Some of the respondents interviewed also highlighted that the experience built by the service operating a provincial air ambulance was a huge strength as well. Respondents, especially those from northern BC, further commented favorably on the service’s ability to triage calls appropriately, thereby ensuring air ambulances are used only for the most critical patients.

Within the last two to three years, BCEHS has implemented an Emergency Physician Online Support service (EPOS), which is available 24/7 to paramedics in the field. Respondents who were aware of this program complimented it.

Some of the respondents were aware of the logistics and the planning process that precedes an air ambulance call, and were appreciative of this process as well. Most of the respondents felt that BCEHS air resources are stretched to capacity; however, they were consistent in their view that being a provincial service is a strength, offering flexibility and capacity to cater to the needs of the most acute patients.

***What are the major weaknesses of the BC air ambulance service?***

Participants offered a tremendous number of suggestions based on their past experiences with the air ambulance program. Some common themes included:

- lack of adequate resources, both in terms of airplanes and critical care/infant transport teams; and
- concerns with the timeliness of response, especially while dealing with low-acuity patients, and the lack of highly trained paramedics in rural areas, where at times their skills may be required the most.

Most of the respondents from health authorities stressed the need for BCEHS to better understand their business and challenges in order to modify BCEHS’s internal processes and procedures. A few participants were concerned with the area that needs to be covered by BCEHS with its limited air resources. Participants suggested using collaborative decision-making and evidence-based decisions to improve service, coverage and patient transfer processes. A few participants also voiced concerns that at times, BCEHS does not “close the loop” in case of change of transfer plans, or when an issue has been brought to its attention.

Respondents familiar with air ambulance operations also observed that the dedicated or ad-hoc aircraft utilized by BCEHS are not equipped with night vision technology. Many air ambulance operators around the world are moving towards night vision goggles (NVG) technology. .

*“Use of NVG is absolutely critical in air ambulance environment. Without the availability of this technology, we are restricted in our operations at night, especially in coastal regions or in bad weather”*

*-Interview respondent*

Participants who were familiar with BCEHS operations also mentioned that the BC Emergency and Health Services Act does not clearly spell out what type of patient population is required to be transported, either within the province or outside it. The Act is also silent on home repatriations, transportation of low-acuity patients, or transportation of specialized patient populations. As a result, the BCEHS air ambulance service is engaged in all type of patient transports, putting additional pressure on the system. The participants

were of the opinion that BCEHS needs to re-define the role and objectives of its air ambulance operations, draw on lessons from comparable air ambulance services around the world, and make suitable changes.

***What are the major threats facing the air ambulance service over the next three to five years?***

Some of the leaders who had an intimate knowledge of the air ambulance operations expressed concerns over the pressure that is gradually increasing for the air ambulance program, due to increased demand and growing expectations from the public. Some of the respondents observed that due to an increased demand for the service, a number of small operators or other private air ambulance operators are likely to start exerting pressure to set up their own medivac aircraft operations. These operations, if done without collaborating with BCEHS or without appropriate medical oversight, could be detrimental for patient care. According to participants from rural BC, challenges for care of geriatric patients were expressed as a concern, especially if they need to be transported at short notice, and the resources were not readily accessible due to system capacity issues. Two respondents expressed apprehension about the increased demand on the air ambulance program linked to the liquefied natural gas (LNG) sector. While one of the respondents was concerned that the air ambulance service may not have additional capacity to meet the growing demand if the LNG sector were to get developed in northeast BC, the other respondent was equally concerned at the socio-economic impact of and the resultant health care issues, if the LNG or other natural resource sectors did not materialize.

***What opportunities do you see for the BC air ambulance service over the next three to five years?***

The majority of respondents from rural and remote BC were of the opinion that BCEHS needs to increase staffing, with paramedics with higher skill levels in rural/remote communities. Many participants were of the opinion there is an opportunity to evaluate availability of those resources which can assist in transporting low-acuity or repatriated patients. Some of the examples provided were the buses being operated by Northern Health through its Northern Health Connections program, the transportation of patients using commercial aircraft accompanied by appropriate skilled staff, and the use of ad hoc aircraft carriers.

A few respondents who had a good understanding of some of the challenges facing health care facilities in smaller communities were of the opinion that all stakeholders need to work together to avoid patient transfers from smaller facilities where these transfers are not based on patient needs, but due to administrative challenges (lack of staff availability, limited supply of blood products, “day only” facilities, etc.). Some of the participants suggested

that innovative methods need to be devised for increasing the capacity of the air ambulance service by entering into appropriate and strategic partnerships with air carrier operators, trusts/charitable organizations, first responder agencies, search and rescue organizations, mining companies, or similar organizations.

***Where do you think improvements could be made to improve the effectiveness, efficiency and/or sustainability of the BC air ambulance service?***

Some of the common themes that were brought forward by the participants in the semi-structured interviews while addressing this question were:

- using air ambulance resources for only high-acuity patients better monitoring and control through the BCEHS air dispatch system and BC Patient Transfer Network;
- using technology, system improvements, feedback from the “customers”, better collaboration and integration with the health authorities to improve responsiveness;
- undertaking a regular analysis of calls to ensure that the BCEHS air ambulances are only being tasked for appropriate calls; staff to be empowered to decline patient transport if and when these do not fit into a well-defined criteria;
- increasing the use of alternate service providers for routine calls, patient repatriations and for transport of low-acuity patients;
- entering into innovative and strategic partnerships for increasing resource capacity;
- evaluating options for using different staffing models to enable a bigger pool of paramedics, who can assist with air ambulance transfers of low-acuity patients;
- closely monitoring and pro-actively managing long-term staffing requirements of critical care and infant transport teams; and
- making system-wide improvements within the health care sector to improve the process for bed availability.

*“BCEHS air ambulance operations have evolved over a period of time. Fixed wing and rotary wing aircraft have been added to meet the growing population needs. Massive strides have also been made in adopting new technologies and cutting-edge medical practices. However, no attempt seems to have been made to change the basic operating and staffing model.”*

*-Interview respondent*

***Do you have any recommendations at a legislative, regulatory and/or policy level that you believe should be considered with regard to the ongoing operation of the BCEHS air ambulance service?***

Most respondents were unanimous in their opinion that no legislative changes are required to make the system of provincial air ambulance system more efficient, sustainable and effective. However, within the existing legislative and the regulatory framework, there needs to be a willingness on the part of all stakeholders to make the system more flexible and adaptable to patients' needs. Some of the respondents expressed a desire for clearer policy directive from the government to spell out the mandate, priorities and expectations of the emergency health services. These need to be communicated clearly to all the key stakeholders, including the health authorities. Some of the respondents opined that as BCEHS (previously Emergency and Health Services Commission) was a corporation under the Ministry of Health, it did not integrate fully with the health care system in BC. Though BCEHS continues as a corporation, it is now provided oversight by the Provincial Health Services Authority. These respondents were optimistic that because of this relationship, BCEHS would become more closely integrated within the health care system, and some of the existing policy gaps would be addressed.

Some of the respondents recommended that BCEHS should evaluate practices used in air ambulance models in other parts of Canada and in comparably developed countries, with the intent to adopt those strategies which would be applicable to the local environment in BC. Some of the specific options for evaluation include using insurance providers for air ambulance coverage, the provision of air ambulances through trusts, charitable and not-for-profit groups, and entering into consent agreements with appropriate groups for transfer of patients.

Some other additional and important lessons which were shared by the respondents through these interviews include:

- Currently, to skirt the established system for repatriations, sometimes patients who would otherwise be discharged are referred to a medical facility close to their home community. This “justifies” an air ambulance transfer, when in actual fact the patient could simply be discharged from the first facility. In some other provinces of Canada, or in other established medical systems in the world, patients who are discharged can access the air ambulance transport system by paying for the service and getting reimbursed through their insurance provider. However, this system does not currently exist in BC.
- The “Billing for Transfer Services” process was established in 2007/08 whereby budget was transferred from the then BC Ambulance Service to health authorities, to enable the health authorities to manage their own system for low-acuity inter-facility transfers of patients, and for repatriations. Some of the transfer offices in the health authorities or alternate service providers (for example, patient transfer buses) were established as a result of this change. This system needs to mature and become more efficient to take the pressure off of BCEHS.

- One of the challenges of the air ambulance service is the coverage it needs to provide in a province the size of BC, and with its unique weather patterns. Therefore, it is imperative that BCEHS is clear about the patient population that should be transported by the air ambulance program. Towards that end, BCEHS needs to clarify expectations regarding service, and clearly communicate the same to all stakeholders.
- Currently, a memorandum of understanding (MoU) is being drafted by the Provincial Access and Flow Committee about the repatriation of patients. As per the draft MoU, the sending health authorities would have to accept patients coming back to their home communities, and their transfer would be required to take place within 48-72 hours. Once the MoU is implemented, the pressure on BCEHS air and ground ambulances for repatriation of patients within the timelines laid out in the MoU will increase.
- Establish and measure key performance indicators for the air ambulance program.
- Establish a system of evaluating the overall costs to the health care system, and have funding transfer procedures in place based on financial savings. For example, if air transport of a patient because of bed availability is likely to result in savings for the health authority, these savings could be passed on to BCEHS to enable them to arrange for such transfers through contracting additional resources.

In conclusion, there were common themes identified from the semi-structured interviews conducted with leaders from BCEHS, MoH, health authorities and other stakeholders. The conceptual framework helped to categorize and record the themes, identifying:

- Most of the participants agreed that there is tremendous pressure on the provincial air ambulance system and that innovative and creative methods need to be introduced, based on national and international best practices, to improve efficiency and sustainability.
- Most respondents were also united in their opinion that the challenges being faced by the BCEHS air ambulance program cannot be addressed in isolation. Enhanced collaboration, integration and a systems approach to problem-solving would help address some of the challenges.

The interviews helped answer the research question by identifying some prominent issues and providing suggestions about adopting some of the innovative practices which are prevalent in other air ambulance services. Furthermore, the results of the interviews were compared to what was found on the online survey that was administered to leaders from other air ambulance services. These findings, along with the literature review, were used to develop the discussion of findings section.

## 5.0 DISCUSSION ON FINDINGS

The following section compares findings from the literature review, online survey and semi-structured interviews to assist BCEHS in re-defining the goals and objectives of its air ambulance program in order to keep it effective, efficient and sustainable. These common themes could be considered by leadership at BCEHS to evaluate, influence, develop and advocate for policy and practice changes to the provincial air ambulance program.

### 5.1 Innovative and Strategic Partnerships

Interviews with senior executives at BCEHS and the MoH helped with understanding some of the challenges that exist with limited air ambulance resources when compared to the size of the province, policy limitations, challenges to patient transportation in view of the geography, location of tertiary care facilities, and historical practices. The online survey conducted with experts from the air ambulance industry and the review of literature provided an insight into challenges facing other

*“There is much that is effective in the current health system, while recognizing there are some persistent challenges that have been resistant to any substantive and successful change over the past decade -“Setting priorities for the BC Health System”(BC Ministry of Health)*

similar operators, and varying models of service delivery, which can be considered for adoption in BC. These experts identified a number of different models that are operating successfully in the world, other than the publicly funded emergency health services. It was also identified that many of these systems continue to evolve and adapt, based the needs of patients and on the unique need of each territory/region they serve. Several of these services are functioning successfully in conjunction with the national/provincial air ambulance programs to create capacity, improve service and provide options for patient transfers. Most of the executives interviewed were of the opinion that as part of the evolution of a provincial ambulance service, it is time to identify potential alternate service providers for patient transfers, and to enter into innovative and strategic partnerships where these could benefit the patients.

### 5.2 Collaboration and Integration

It was also clear that the size of the province, limitations of health care expertise in some parts of the province and logistical complexities related to patient transfers present some unique challenges which can only be addressed by collaboration and very close integration of all the stakeholders engaged in patient care and patient transfers. Further collaboration and integration of BCEHS in the health care system of BC will enable all stakeholders to better understand each other’s business, challenges and expectations, and are likely to lead

to the development of policies and procedures that would ultimately serve the patients better.

### 5.3 Systems Improvements

Another common theme evident through the interviews, online survey and the literature review was the requirement of evaluating patient transport issues from a “systems” perspective. It was clear that actions and decisions of any one entity engaged in the patient transfer process is likely to positively or negatively impact another agency in the health care system; therefore, in order to improve the patient experience, it is imperative that all issues be viewed from a systems perspective, that suitable key performance measures be put in place, results shared, and processes improved collaboratively to generate efficiencies. Service/system voids and procedural/data challenges which impact the continuum of care and the “patient journey” need to be identified and eliminated.

Some of the common themes highlighted here have helped inform the development of recommendations for this study, which, if adopted, will further strengthen the air ambulance service for residents of BC, through a sustainable model.

## 6.0 RECOMMENDATIONS

It is evident there are tremendous demands on the provincial air ambulance system in BC. In discussion with a number of senior leaders within BC’s health care system, there was a general consensus that this pressure will only increase in the years ahead. Many leaders expressed that “business as usual” is not an option.

In 2010, BC implemented a strategy across the complete health care sector – the *Innovation and Change Agenda* – with an aim of driving meaningful change across the health system. One of the important strategic imperatives of this plan was “improving innovation, productivity and efficiency in the delivery of health services” (Ministry of Health , 2015, p. 17). In keeping with this direction, and in view of some of the challenges for the provincial air ambulance system as explained earlier, BCEHS would need to enter into innovative and strategic partnerships or find alternate means of transporting patients who are currently dependent on the BCEHS air ambulances.

Additionally, BC Ministry of Health’s *Patient-Centered Care Framework* proposes a vision in which the culture of “patient-centeredness is self-evident across the health system” (Ministry of Health, 2015). One of the guiding values for PHSA is “Patients First”. It is also imperative that the “care needs of British Columbians must be addressed in a way that encourages efficiency and maintains fiscal discipline while ensuring high quality, patient-centered care. This will ensure that British Columbians will continue to reap the benefits of

a world-class health system for generations to come” (PHSA, 2014, p. 10). In order for this vision to be realized, BCEHS and all stakeholders need to work collaboratively, and all services need to integrate more closely. This integration, collaboration and the innovative and strategic partnerships would have to be supported by enabling tools and processes that together will allow “innovation and flexibility in responding to the diversity of geographies” across BC (Ministry of Health, 2015, p. 3).

The recommendations below have been developed in keeping with these themes, and based on information gathered as part of this project. It is hoped that by implementing the recommendations in a phased manner, the BCEHS air ambulance service would continue to cater to growing needs of British Columbians in an efficient and a sustainable way.

## 6.1 Recommendation 1: Develop Innovative and Strategic Partnerships

BCEHS has been the sole provider of air ambulances in the province ever since its inception. A small percentage of air transfers are coordinated by BCEHS through ad hoc service providers or through inter-provincial agreements. However, this model of being the sole-provider of service is not common and has associated fiscal, delivery and sustainable challenges. **It is recommended that BCEHS explore entering into innovative and strategic partnerships with other organizations for the delivery of air transfers in BC.**

### 6.1.1 Partnerships with Charities, Not-for-Profit Groups and Private Sector for Provision of Air Ambulance Services

BCEHS air ambulance program is a publicly funded model. It currently operates five fixed wing and four rotary wing airplanes for provision of this service. On average, 16.4 patients are transported per day. The cost of adding one dedicated air ambulance aircraft is approximately \$3.5 million per year. On the other hand, there may be mining, forestry or other private/charitable organizations that may either be operating aircraft or potentially in a position to operate aircraft, for medevacs. In order to enhance the capacity of the provincial air ambulance model, and to keep it sustainable in the long run, it is recommended **BCEHS consider entering into strategic partnerships with charities, not-for-profit groups, or other private operators such as mining and forestry companies for the transportation of patients.**

*“UK currently has 32 air ambulances, spread across 18 air ambulance charities in England, Wales and Scotland. With the exception of Scotland and London, air ambulance organisations receive no public funding and must meet these costs through fundraising efforts. One major trend in the future will be greater collaboration between the separate organisations for delivery of air ambulance services”- (Lo, 2011)*

As was evident during the process of literature

review for this project, there are a number of charity organizations in New Zealand and Australia that are providing air ambulances in conjunction with the publicly funded operations. In the UK, Scottish Air Ambulance is the only service fully funded by the National Health Service, Scotland; all other services are funded by charitable organizations (Scottish Ambulance Service, 2016). Under Section 5.1(1) (d) of the Emergency and Health Service Act, 2013, BCEHS is authorized to collaborate, plan and coordinate provincial, regional and local integrated ambulance services, emergency health services, urgent health services and ancillary health services. As per Section 5.4(1) of the Act, BCEHS is also authorized to enter into agreements or arrangements, inside or outside BC, for provision of ambulance services, emergency health services, urgent health services or ancillary health services (Emergency and Health Services Act, 2013, para 5.1 and 5.3). **It is also recommended that the BCEHS Foundation, as and when fully functional, be used for accepting donations for enhancing the air ambulance coverage to the residents of BC.**

#### *6.1.2 Partnerships with Emergency Management BC and Search and Rescue Groups for Patient Transfers by Air*

Emergency Management BC works in close collaboration with various search and rescue groups in the province for coordinating backcountry search and rescue efforts. Some of these search and rescue groups have capabilities to transport injured/distressed patients or lost recreationalists by helicopters (EMBC, 2015). Vernon Search and Rescue and Emergency Management BC (EMBC) have recently partnered for a two year pilot project related to helicopter rescues (Waters, 2015). The North Shore Rescue Team Society, based in North Vancouver, is another search and rescue group that has the capability of using helicopters as part of Helicopter Flight Rescue Systems (HFRS) (Northshore Rescue, 2013). Many of these search and rescue groups also work closely with BCEHS for patient handovers after their extrication from remote locations and further transportation to appropriate care facilities. **BCEHS may benefit from entering into service or consent agreements with some of these search and rescue groups, in collaboration with EMBC, for using their air resources and staff for transportation of patients directly to hospitals, where required.** Factors related to appropriate medical oversight by BCEHS, integration with the provincial air ambulance dispatch systems, establishment of appropriate transfer protocols, clear financial accountability and implications, insurance/liability issues and formalizing consent agreements, will need to be considered while implementing this recommendation, if it is accepted.

#### *6.1.3 Repatriations through Insurance Providers*

In Quebec, the air medical services are provided by Airmedic, exclusive to customers with valid coverage, who become members by paying an annual premium. Similar models are

also used by many residents of Canada while using private air ambulances for repatriations out of province/country. In Manitoba, if a patient is an eligible First Nations person or Inuit (registered Indian or Inuk), the Non-Insured Health Benefits program of Health Canada covers the costs related to the air ambulance program. **It is recommended that BCEHS evaluate both these models to explore their applicability in the province.**

A number of residents from Alberta are transferred by BCEHS by ground or air, and charged the same legislated rates as BC Medical Services Plan beneficiaries. Some of these out-of-province patients potentially carry travel insurance. These patients may be transferred from one medical facility to another within BC as part of the inter-provincial agreements. However, if these patients are required to be transferred into Alberta from BC, **it is recommended that the actual costs of transportation be recovered by BCEHS through the patient's insurance provider (as applicable). It is also recommended that BCEHS and AHS carry out a joint public awareness campaign to make inter-provincial travelers aware about the air ambulance coverage, and the requirement to buy travel medical insurance for travel out of their home province. It is further recommended that similar recoveries be pursued from international travelers who access BCEHS air ambulances.**

#### *6.1.4 Revision of Inter-Provincial Agreements*

Currently, BCEHS has inter-provincial agreements with Yukon and Alberta for providing air ambulances to residents of these provinces when required. For Alberta, there are a number of historic and current agreements, including some in draft form. **It is recommended that all of the inter-provincial agreements be revised and consolidated into one agreement.** Clearly defined principles and responsibilities for patient transfers, including associated financial implications and processes for these inter-provincial transfers to/from Alberta, should be clearly stipulated in these agreements. **It is also recommended that the inter-provincial agreement with Yukon be revised to reflect true costs of business as per the current operating costs.**

Occasionally, the BCEHS air ambulance service is also tasked with transferring patients from a province other than Alberta and Yukon. During the interviews for this project, transfers from places as far as Toronto and Ottawa were reported. These are expensive transfers, and it is not clear if these transfers are truly the mandate of BCEHS air ambulances, especially when not accompanied by appropriate cost allocation by the sending/receiving facility, insurance provider or an alternate agency. **It is recommended that BCEHS streamline this process and work with the MoH to provide clear direction for these long-distance and out-of-province patient transfers.**

### *6.1.5 Use of Alternate Service Providers and Other Agencies for Patient Transfers*

Northern Health operates a total of 11 buses under their Northern Health Connections Program, which offers an affordable travel service for patients needing to travel for out-of-town medical appointments in northern BC and Vancouver (Northern Health, 2016). Island Health has also expressed interest in operating a similar bus service for patient repatriations. Both health authorities are also open to partnering with BCEHS for exploring options for transporting low-acuity patients accompanied by appropriate staff. These initiatives, if implemented, are likely to reduce reliance on BCEHS for patient transfers, and are recommended to be explored.

Currently, while transporting patients to/from the Edmonton International Airport (EIA) in Alberta to the appropriate medical facilities in Edmonton, BCEHS critical care paramedics transport patients using Alberta Health Services/contracted ground ambulances. However, there are alternate service providers (ASPs) in Edmonton who are in a position to both bring patients from health care facilities to the EIA for outgoing transport, and also receive inbound patients from BCEHS at the EIA then transport them onto the appropriate health care facility in Edmonton. This model thereby frees up the BCEHS crew, and the air ambulance waiting for their return, sooner. **It is recommended that BCEHS explore the feasibility of contracting these ASPs in Edmonton to reduce the time involved in patient handover and air ambulance downtime.**

### *6.1.6 Use of Commercial Aircraft for Intra- and Inter-provincial Patient Transfers*

Air Canada has a program for customers with special needs. In most cases, the attendant is permitted to travel free of cost. There is also provision for carrying medical oxygen, wheelchairs, battery operated mobility devices, or similar medically-necessary equipment (Air Canada, 2016). Other airlines are likely to have similar programs. **It is recommended that BCEHS explore the option of using commercial airlines for transporting low-acuity patients, along with appropriate staff.**

This initiative is recommended for long inter-provincial transfers, where medically feasible, in view of the substantial financial gains that are likely to accrue if the initiative is implemented. The program should include a suitable outreach program with the major tertiary care facilities, so that the sending facilities are aware of this program once implemented. Quebec operates a hospital plane service, which is designed to carry several patients at a time and operates as a shuttle service for non-emergency cases. It is recommended that BCEHS explore a similar service, with more inputs from Quebec. The service can commence as a pilot project in collaboration with Northern Health for repatriations/low-acuity transfers.

## 6.2 Enhancing Collaboration and Integration of BCEHS within the Provincial Health Care System

Prior to 2010, BCEHS (then the Emergency and Health Services Commission), was functioning directly under the MoH. Since 2010, BCEHS has transitioned over to PHSA; however, until such time as BCEHS is fully integrated into the provincial health care system, the true potential of collaboration with the various health care entities cannot be fully realized. As part of its vision, one of the strategic goals of BCEHS is to integrate fully with the provincial health care system, with an aim of creating a “seamless patient journey across the health system”. BCEHS is also working on shifting its focus from “transport” to providing patient-centered care, and aligning with health systems (BCEHS, 2015, p. 2). Full integration would require policy changes as well as local initiatives with other health authorities, which are mutually beneficial and contribute to better patient care.

### *6.2.1 Policy Paper from the Ministry of Health Clarifying Service Expectations and Priorities*

In the spring of 2015, the Ministry of Health released a series of policy papers on the future of the BC health care system. Two were of particular note: the “Primary and Community Care in BC: A Strategic Policy Framework” (Ministry of Health, Government of British Columbia, 2015), and “Rural Health Service in BC: A Policy Framework to Provide a System of Quality Care” (Ministry of Health, Government of British Columbia, 2015). These two documents outlined the need for changes in how community-based health care services should be provided, and culminated in the Ministry releasing a series of policy directives, one of which is entitled “Providing Quality Sustainable Rural Health Services for Patients” (Ministry of Health, Government of British Columbia, 2016). These documents outline the Ministry’s objectives to bring a higher level of integration, coordination and standardization to the clinical basket of services provided across the province, as well as the administrative, health human resources, and information technology and information management systems necessary to improve the quality and cost effectiveness of the BC health system. Given the numerous points of intersect between BCEHS and the larger health care system, **it is recommended that BCEHS senior executive and staff at MoH collaborate at developing future strategic policy directions to enable clear service expectations and priorities for emergency health services, and to enable active engagement with local, regional and provincial stakeholders on discussions regarding the future of BC’s health care system.**

In doing so, BCEHS’ senior executives will have an active voice in ensuring the issues associated with the management of the BCEHS air ambulance service is heard and understood within the greater context of the BC health system. This will hopefully mitigate

and/or address some of the issues identified in this report regarding the impact of individual clinical and administrative decisions on the air ambulance service.

### *6.2.2 Modify BCEHS Air Ambulance Staffing Model*

Based on the literature review, survey results and semi-structured interviews, BCEHS appeared to be the only service whose air ambulances are staffed solely by paramedics. Most of other similar models are operating on a mixed model of flight/critical care nurses, physicians and paramedics. BCEHS also provides in-house training to all its critical care and infant transport team paramedics. On average, it takes more than two years to train an advanced care paramedic to the critical care license level. With no lateral entry system into the BCEHS critical care/infant transport team pool, there is a major concern about potential staff shortages, especially if the service has to be expanded in the future to meet the growing needs of the population. In addition, the training is resource-intensive, and expensive. In 2013, Interior Health Authority, in partnership with BCEHS, piloted a High Acuity Response Team (HART) program in Trail, BC. This program was later expanded to three other sites in interior BC (Kamloops, Penticton and Cranbrook.) As part of this program, registered nurses who have specialized training and equipment provide expert inter-facility transport services at rural/remote facilities, in conjunction with BCEHS paramedics. Specialized respiratory therapists (RTs) are also available on-call to the HART members and accompany them when patients require advanced critical monitoring and intervention (Accreditation Canada, 2013, pp. 1-2). However, this program is restricted only to land transfers.

#### **It is recommended that:**

- **the HART program be expanded to air transfers as well, including for the pediatric population, after suitable training of registered nurses for providing care in aeromedical environment;**
- **BCEHS explore similar staffing models for using cross-functional teams (critical care paramedics, pediatric and neonatal nurses); and expanding the program provincially;**
- **BCEHS explore the possibility of permanently inducting critical care/pediatric and neonatal nurses, or other similarly trained nurses/other professionals, into its Critical Care Program to address staffing shortages, increase the availability of a pool of readily trained professionals, and reduce in-house training costs.**

### 6.3 Systems Approach to Improving the Patient Journey and for Measuring Efficiencies

There are a number of “system” issues that can be improved to make the air ambulance system efficient, safer and more responsive to patients’ needs.

#### 6.3.1 Implementation of Night-Vision Imaging System for BCEHS air ambulances

Currently, BCEHS rotary wing air ambulances are not equipped with Night Vision Imaging Systems (NVIS). In the absence of this technology, air ambulances are at times limited in their response during hours of darkness, in addition to the increased risk. NVIS is a technology recommended and accepted by Transport Canada and the U.S. Federal Aviation Authority. Use of Night Vision Goggles (NVG) for emergency medical helicopter operations during hours of darkness has also been recommended by Transport Canada, the Transport Safety Board of Canada, the U.S. Federal Aviation Authority, the Helicopter Association International and the Helicopter Association of Canada. Air ambulance services are trending towards using NVIS as part of their standard equipment- for example STARS and Ornge in Canada. **It is recommended that BCEHS consider adopting NVG technology for its current and future rotary wing air ambulances.**

#### 6.3.2 Improvements in BCEHS Air Dispatch System

BCEHS air ambulances are currently dispatched through a centralized Patient Transfer Coordination Centre (PTCC), located in Vancouver. The health of any emergency medical system (EMS) is dependent to a large extent on the appropriateness and efficient functioning of its dispatch system (Clawson, 1989, p. 3). PTCC is part of the BCEHS land dispatch system, with PTCC dispatchers having no specialized skills for aeromedical dispatch. A part of the dispatcher’s role also includes the coordination of ground transfer ambulances. Many EMS organizations are using specialized civil-aviation dispatch-type systems for their air ambulance programs.

Some of these organizations have flight

nurses/paramedics embedded in the dispatch centres for appropriate and efficient use of air resources. **In order to generate efficiencies in aeromedical dispatch, it is recommended that:**

- **BCEHS create a specialized aeromedical dispatch centre, with appropriate training and qualifications for PTCC dispatchers;**
- **BCEHS limit the PTCC functioning to air ambulance responses;**

*“A flight planning and optimization tool was developed for improving the logistics of medical transport in Ontario, by Cornell University in collaboration with Ornge. After the implementation of this tool, “empty legs” at Ornge were reduced by 21%.” (Eisner, 2010)*

- **Critical care/infant transport team paramedics be embedded into PTCC for providing guidance and logistical inputs for air transfers; and**
- **BCEHS implement a flight optimization software tool for planning low-acuity patient transfers.**

### *6.3.3 Process Improvements within the BC Patient Transfer Network*

In discussion with stakeholders from rural BC, it was expressed that though the patient transfer process at BC Patient Transfer Network (BCPTN), which plans and coordinates all the land and air inter-facility transfers in BC, has improved over the past, there are still some significant challenges, especially with regards to process complications, delays and a lack of real-time feedback. **It is recommended that BCPTN continue to work closely with all stakeholders and implement LEAN methodologies to streamline inter-facility transfer processes.** The Office of the Auditor General in its report on the BCEHS air ambulance program had also recommended that BCEHS “regularly identify and review a sample of air ambulance dispatch decisions to ensure resources are allocated with due consideration for patient needs and available resources”. It is recommended that this process be formalized within BCEHS, with regular reporting of the same to the Chief Operating Officer, BCEHS.

### *6.3.4 Regular Review of BCEHS Air Ambulance Operating and Staffing Model*

The BCEHS air ambulance service has evolved over a period of time, with the addition of rotary and fixed wing aircraft, enhancements in training, induction of modern equipment, and increased availability of well-trained staff. However, the basic model of staffing and operations has remained unchanged. **It is recommended that in addition to regularly updating its air ambulance operating procedures, BCEHS also review the air ambulance operating and staffing model to keep in current, innovative, sustainable and in line with global best practices.**

### *6.3.5 Revision of BCEHS policy for patient escorts for air ambulance transfers*

Benefits of family members or close friends/relatives accompanying patients have been well documented in medical journals. The benefits are much more evident in cases of pediatric patients, or mental health patients. Major benefits include emotional support during the transfer or assistance while in consultation with the physician (Andrades, Kausar, & Ambreen, 2013, p. 285). Some of the respondents interviewed as part of this project expressed concerns that BCEHS policy around accompanying patient escorts is not clear and/or not applied consistently. **It is recommended that BCEHS revise its policy for patient escorts, especially when dealing with neo-natal, pediatric and mental health patients.**

## 6.4 Implementation of Recommendations

It is understood that many of these recommendation have far reaching consequences related to process changes, capacity within the organization to implement these changes, support required from the MoH and various other stakeholders, negotiations and potential labor management implications. It is hoped that these recommendations are adopted by BCEHS and a roadmap developed for implementing the same within the next three to five years. If accepted, some of these recommendations can be implemented immediately, whereas others would be phased in gradually. In terms of the priority of implementation of these recommendations, if accepted, and considering the degree of complexity in implementing the same, the following is suggested:

- Priority 1
  - Revision of Inter-Provincial Agreements
  - Use of commercial aircraft for low-acuity patient transfers
  - Improvements in BCEHS Dispatch System
  - Process improvements within BC PTN
  - Revision of BCEHS policy for patient escorts for air ambulance transfers
- Priority 2
  - Policy paper from the Ministry of Health clarifying service expectations and priorities
  - Partnership with EMBC and SAR groups for patient transfers by air
  - Use of alternate service providers and other agencies for patient transfers
  - Implementation of NVIS for BCEHS air ambulances
  - Regular review of BCEHS air ambulance operating and staffing model
- Priority 3
  - Partnerships with charities, not-for-profit groups and private sector for provision of air ambulance services
  - Repatriations through insurance provides
  - Modify BCEHS air ambulance staffing model

As indicated earlier, these recommendations have been generated based on best practices, the literature review and valuable inputs of senior health care professionals in the province and operating air ambulance services in Canada and abroad. It is the researchers' belief that acceptance of these recommendations and creation of an action plan for implementing the same will go a long way in making the service efficient, effective, sustainable and in the best interest of our patients.

## 7.0 CONCLUSION

BCEHS is the sole agency providing air and ground ambulance services for residents of BC. The air ambulance service is provided through five air ambulance bases spread across the province, operating five fixed wing and four rotary wing air ambulances. Pressure on the provincial air ambulance system has increased manifold, due to the change in demographics, continuous efforts to provide better and comparable services to all residents of BC (including those residing in rural and remote BC), policy and process changes within the provincial health care system, changes to referral patterns, and public expectations. To meet these challenges, BCEHS has constantly strived to improve the service, understand current and future challenges, and position itself to meet growing future demand. The demand analysis of BCEHS air ambulance program undertaken recently through Operational Research in Health, UK, was one such endeavor. While these reviews have supported BCEHS air ambulance program to improve performance and its operations, and there is evidence of improved scope, capability, quality and reach, the basic model has remained unchanged. The then BC Ambulance System (BCAS) started as the sole air ambulance provider in the province, with contracted aircraft and in-house trained critical care and infant transport team paramedics. That model has remained unchanged and continues in BCEHS to this day.

The purpose of this review was to evaluate comparable air ambulance models across Canada and abroad, conduct a review of best practices based on literature review, and obtain insight from the leaders associated with health care, ambulance operators and policy makers with the view of recommending changes to the model of air ambulance operations currently being followed by BCEHS. The results of this research suggest that there are a number of practices, staffing and operating models which BCEHS can adopt to make the service better. Challenges to providing appropriate and efficient air ambulance services within BC are likely to remain, unless BCEHS explores other successful models and makes suitable but substantial changes to its current model of operating air ambulance operations.

A number of recommendations have been suggested in in this research paper, including innovative and strategic partnerships with other air ambulance operators, use of alternate and commercial service providers, collaboration and innovation within the provincial health care system, and making system and process improvements. These recommendations have been made after a review of the current practices, with the understanding of present challenges as well as potential changes that are possible within the short- to medium-term, and based on similar successful models elsewhere. In spite of making constant improvements in its air ambulance services, a major change by BCEHS to its operating, staffing and service delivery model has not occurred. It is also acknowledged that there are numerous challenges to questioning the status quo, especially in the complex aeromedical environment. Divergent views and established ways of doing business can often

overwhelm efforts to make significant transformational shifts. Attempts at change are also further complicated by the required legislative, regulatory and policy changes, labor management challenges, requirement and magnitude of stakeholder engagement, organizational capacity for implementing and managing change, and understanding the system-wide impact of change. However, it is believed that the changes as recommended in the paper are practical, achievable and result oriented. BCEHS would need to thoroughly review the recommendations, prioritize the implementation of those accepted, and make mid-course corrections as required. It is our belief that execution of these changes will substantially contribute to improved outcomes and make the air ambulance system in BC more efficient, effective, and sustainable to meet the present and anticipated service delivery needs.

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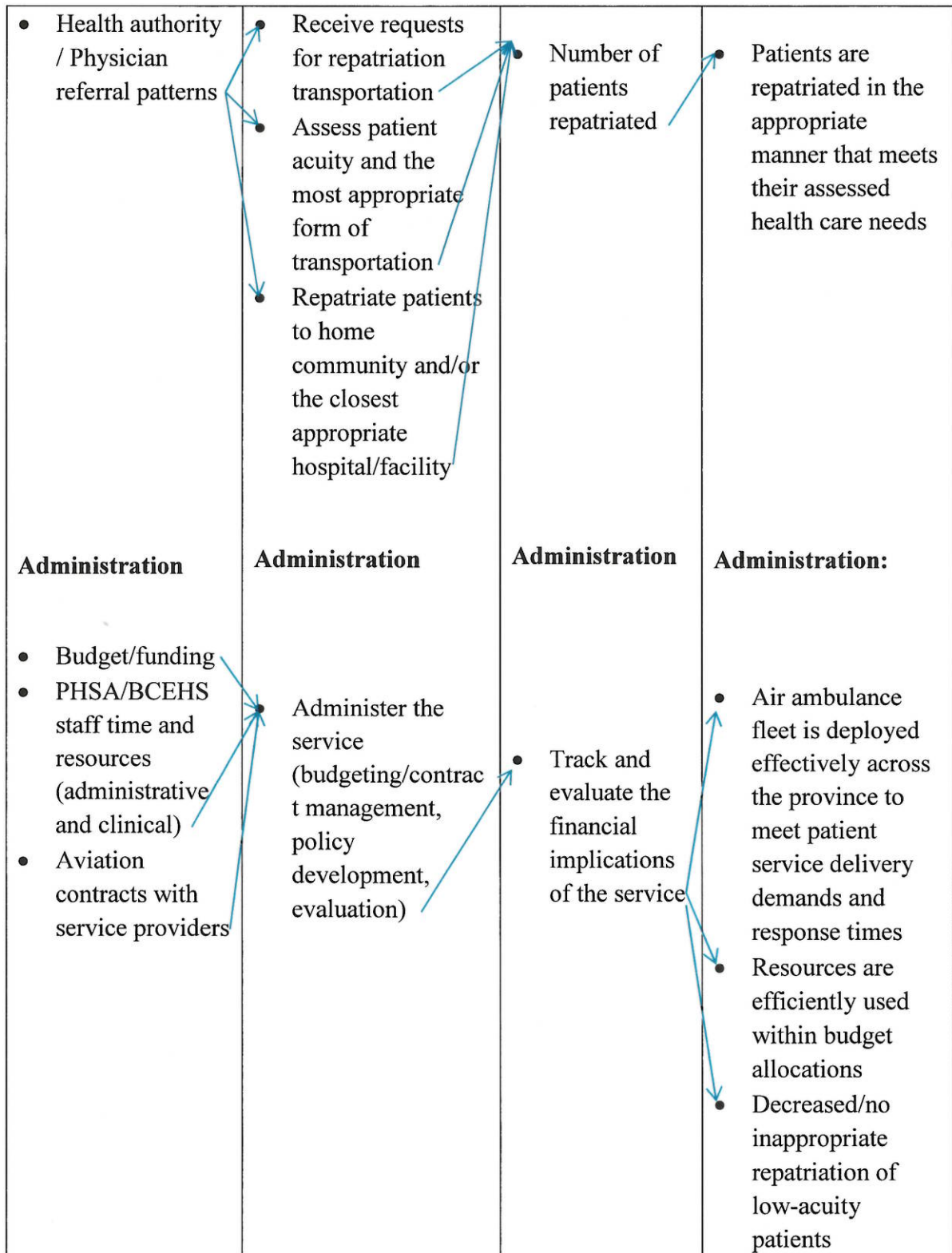
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**APPENDICES**

**Appendix 1 – Air Ambulance Program Logic Model**

| Program Implementation   |   |   | Outcomes  |
|--|---|---|---|
| Inputs   | Activities  | Outputs   | Service Delivery  |
| <p><b>Governance</b></p> <ul style="list-style-type: none"> <li>• EHSA</li> <li>• EHS Regulation</li> <li>• BCHES Aviation Operations and C Care Plan</li> </ul>   |   |   |   |
| <p><b>Service Delivery / Patient Care</b></p> <ul style="list-style-type: none"> <li>• Critical Care Transport Standard Operating Procedures</li> <li>• Patient Acuity for Transfer Policy</li> <li>• BCEHS Resource Allocation Plan (for pre-hospital calls)</li> <li>• Inter-Provincial Transfer Agreements for Alberta and Yukon</li> </ul> | <p><b>Service Delivery / Patient Care</b></p> <ul style="list-style-type: none"> <li>• Receive calls</li> <li>• Assess severity and priority of response</li> <li>• Determine patient needs' transport requirement</li> <li>• Dispatch air ambulance resources where required</li> <li>• Provide critical emergency care (on site) or in the facility</li> <li>• Confirm best transportation mode for the patient</li> <li>• Provide transport to the closest appropriate facility</li> </ul> | <p><b>Service Delivery / Patient Care</b></p> <ul style="list-style-type: none"> <li>• Number of calls received</li> <li>• Number of calls responded to</li> <li>• Number of patients transported from location of incident to care facilities</li> <li>• Number of patients transported between care facilities</li> </ul> | <p><b>Service Delivery / Patient Care</b></p> <ul style="list-style-type: none"> <li>• Received the appropriate response to meet the patient's health needs at the time of dispatch/response, and repatriation to avoid or minimize loss of limb, functioning, and/or life</li> <li>• Seamless patient journey</li> </ul> |



**Environmental Factors** include: political support; BCEHS' Strategic and Operational Plans; media attention; patient and public advocacy/support; and public expectations of the BC Health Care System.

## Appendix 2 – Interview Questions



*Board of Record: University of Victoria*

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### *Interview Questions*

#### *British Columbia Air Ambulance Review*

1. What are your roles and responsibilities within your organization as they pertain to the air ambulance service in British Columbia?
2. What are the key pieces of legislation, regulation, policy that govern the operation of the air ambulance service in British Columbia?
3. What are the strengths of the air ambulance service?
4. What are the major weaknesses of the BCEHS air ambulance service?
5. What are the major threats facing the air ambulance service over the next three to five years?
6. What opportunities do you see for the BCEHS air ambulance service over the next three to five years?
7. Where do you think improvements could be made to improve the effectiveness, efficiency and/or sustainability of the BCEHS air ambulance service?
8. Do you have any recommendations at a legislative, regulatory and/or policy level that you believe should be considered with regard to the ongoing operation of the BCEHS air ambulance service?
9. Are there key people in your organization that you believe are important to speak with regarding this research project? Individuals who would have critical observations and/or information to offer that could help inform this research project?
10. Any final comments you would like to provide?

## Appendix 3 – Survey Questions

### **BCEHS Air Ambulance Survey**

The purpose of this survey is to provide the Provincial Health Services Authority with a jurisdictional scan of similar air ambulance services around the world. This research is being conducted as part of a program evaluation of the BCEHS air ambulance service and will inform recommendations on how to improve the effectiveness, efficiency and sustainability of the service. You have been asked to participate in this survey because you have been identified as a key leader within your respective organization, who may have key information that could inform the data collection and findings of this research. Thank you for your participation in this survey. We sincerely value your time and input.

### **SECTION A: Background Information**

1. Please describe the size of your air ambulance service:
  - Number of dedicated rotor wing aircraft
  - Number of dedicated fixed wing aircraft
  - Number of non-dedicated aircraft
  
2. Do you make use of ad hoc (non-dedicated air ambulance) charter aircraft?
  - Yes
  - No
    - If yes, what percentage of your overall volume is being done with these aircraft?
  
3. Please provide more details of your air ambulance fleet (add more rows if required)
  - Type of dedicated rotor wing aircraft in the fleet
  - Number of this type of aircraft in the fleet
  - Type of dedicated fixed wing aircraft in the fleet
  - Number of this type of aircraft in the fleet
  - Do you own and operate your own aircraft?
    - Yes
    - No
  - How many air ambulance bases do you operate from?
  
4. What is the typical configuration of your flight crew for the air ambulance operation?
  - Physician and nurse
  - Physician and paramedic
  - Critical Care Paramedics
  - Advanced Care Paramedics
  - Primary Care Paramedics
  - A combination of Critical, Advanced and Primary Care Paramedics

- Registered Nurses
  - Other
5. Population and Area Served
- What is the size of population that this ambulance fleet is serving?
  - What is the size of area that this ambulance fleet is serving?
6. What is the average flight time of a typical air ambulance flight leg?
7. Are air ambulances dispatched from a central dispatch centre or are there multiple dispatch centres?
8. Is air ambulance dispatch integrated into the air ambulance program, or is it part of a separate program under land dispatch operations?
9. What are the qualifications of your air dispatchers?
- No specific qualifications
  - Physician and paramedic
  - Internally-certified dispatchers
  - Advanced Care Paramedics
  - Licensed air dispatchers
  - Paramedics
  - Flight Paramedics/flight nurses
  - Pilots
  - Other
10. Do you have a mechanism where flight crews give input or advise air ambulance dispatchers?
- Yes
  - No
    - If yes, can you please describe?
11. How is the location of your air ambulance base determined?
- Co-located to a major medical facility (trauma centre, tertiary care facility, etc.)
  - Co-located to an airport
  - Location determined by patient demand (population centres/communities, major highways, etc.)

## **SECTION B: Regulations/Legislation**

12. Is there legislation or a regulation that your company is required to operate under? For example, in British Columbia (BC) Canada, the BC Emergency Health Services provides this service to residents of BC under the Emergency Services Health Act ([http://www.bclaws.ca/Recon/document/ID/freeside/00\\_96182-01](http://www.bclaws.ca/Recon/document/ID/freeside/00_96182-01))
13. If so, is it possible for you to share the link or the regulation with us?
14. Does your air ambulance service have a clearly defined mandate (goals/objectives, type of patients to be transported, etc.)?
- Yes
  - No
    - If yes, is it possible for you to share the mandate/goals/objectives?

## **SECTION C: Financial Information**

15. Do you have legislated rates for patient transports? For example, as per the BC Emergency Health Services Act, a flat rate of \$80 is charged for ambulance transport for all the beneficiaries (primarily BC residents) whether the transport is done by ground or air ambulance.
- Yes
  - No
    - If yes, what are these rates?
16. Is it within your organization's mandate or control to revise these rates based on your operating costs?
- Yes
  - No
  - We can only recommend changes
17. Are these flat rates, or do the rates differ depending on the mode of transport (ground/air) or type of platform used (rotary wing versus a fixed wing aircraft)?
- Yes, these are flat rates
  - No, the rates differ (please specify)
18. Do you have a system of cost recovery from patients who may be non-beneficiaries (non-residents, patients who may not be subscribers to the ambulance services, international tourists, etc.)?
- Yes (please describe)
  - No

19. Do you have any contractual arrangement with neighbouring provinces/countries/counties for cost recovery while transporting non-resident patients?
- Yes (please describe)
  - No

**SECTION D: Type of Patients Transported**

20. Approximately what is the number of patients transported by your air ambulance service in a year?
21. Please indicate the approximate percentage of air ambulance work done by your organization in the following categories:
- Pre-hospital (mainly responding to emergencies)
  - Inter-facility (from one medical facility to another for a higher level of care, or similar reasons)
  - Repatriations
22. If you are governed by a specific regulation, are there specific rules, guidelines or expectations on the type of patients that you are required to transport?
- Only high-acuity pre-hospital
  - Only high-acuity inter-hospital
  - Both a) and b) above
  - Patients of all acuities pre-hospital
  - Patients of all acuities inter-facility
  - Repatriations/discharged patients (please provide more information; for example, discharged patients, but only those who are non-ambulatory)
  - Patients afflicted with mental health conditions, or potentially violent patients
23. Do you use commercial aircraft to transport low-acuity patients?
- Yes
  - No
  - Other/Comments
24. Do you transport potentially violent patients, or patients afflicted by mental health conditions, by air?
- Yes
  - No
  - Yes, but only with appropriate escorts
  - Yes, by using physical restraints
  - Yes, by using other means of restraint
  - Other/Comments

25. Do you transport bariatric patients with your own fleet, or do you have to make special arrangements with other providers for these transports?

- Yes
- No, we contract other providers to transport bariatric patients (please provide details)

## Appendix 4 – Emergency Health Services Regulation 471/74

### Summary of Costs as per the EHS Regulation in BC

| Service  | Costs  |
|--|--|
| Transportation of a “beneficiary” as defined in the <i>Hospital Insurance Act</i>  | \$80 for each call   |
| For transportation of a non-beneficiary  | \$530 for each ground call; \$2,746 per hour for each call by helicopter; \$7 per statute mile for each call by fixed wing aircraft                      |
| With the exception of calls made by Good Samaritans, if an ambulance is called to a residence or to a place of employment but transportation is not required or is refused | \$50 for each call   |
| For the hiring of an ambulance and its attendants to stand by at a location and be available in case a medical emergency occurs  | \$160 per hour (minimum 3 hours) that the ambulance and attendants remain at the location, and \$2.20 per km travelled to and from the ambulance station |
| For the hiring of emergency medical assistants without an ambulance present to stand by in case a medical emergency occurs   | \$92 per hour (minimum 3 hours) plus the applicable rate if ambulance transportation is required   |