October 2019

# Current State and Best Practices Review


## Nova Scotia Department of Health and Wellness
## Emergency Health Services

## Emergency Health Systems

*Prepared by:*

FITCH & ASSOCIATES

*FITCH* & ASSOCIATES, LLC
2901 Williamsburg Terrace #G ▪ Platte City ▪ Missouri ▪ 64079
816.431.2600 ▪ www.*fitch*assoc.com

**CONSULTANT REPORT**

# Current State and Best Practices Review
# Nova Scotia, Canada
# Table of Contents

# EXECUTIVE SUMMARY

The Nova Scotia Department of Health and Wellness ("DHW"), Emergency Health Services ("EHS"), issued a Request for Proposals ("RFP") for a review of the Province's emergency medical services ("EMS") system design. The review is to ". . . provide an evaluation of the current model and provide recommendations for the most efficient, effective and sustainable EMS system in Nova Scotia for the next ten to fifteen years."[1]

EHS's key mandate is to "ensure the delivery of collaborative health care to communities through the EHS system, including medical communications, medical first response, ground and air ambulance, and other innovative programs."[2]

The Department awarded the project contract to Fitch & Associates in the fall of 2018, and work commenced soon thereafter. An Information and Data Request ("IDR") document was forwarded to EHS and initial on site meetings took place in early December 2018. EHS acted as the point of contact to gather data and other information from the various emergency providers in the Province, Emergency Medical Care, Inc., ("EMC") being the primary ambulance service provider.

By late March 2019, sufficient data was provided to Fitch consultants to allow the project to move forward with the initial assessment and findings. The assessments of ground and air services are provided in two distinct report sections but, are integrated in the Key System Findings.

## Key System Findings

### *Ground Services*

- Current system operations result in significant ambulance time (dollars) spent in non-productive activities, specifically waiting in hospitals to off-load patients in emergency departments. On average, EMC ambulances spend one and one half hours off-loading patients for Category 1 calls or three hours 15 minutes measured at the 90th percent. These resources can be better utilized within the system, which would result in more efficient and effective services to patients and the community at large. The cost of lost time due to off-load delays is estimated at redacted in 2018 and appears to grow exponentially. The cost of lost time over the past three years (2016 to 2018) is estimated at redacted.

[1] Nova Scotia, Request for Proposa s for System Design Review of Emergency Hea th Services (EHS) For the Department of Hea th and We ness, Request for Proposa Number: Doc156812464, June 7, 2019, p. 3.
EHS Annua Report 2011-2012, page 2, accessed December 2018.

- The Province's contract with Emergency Medical Care, Inc. includes redacted . This amount covers wage and benefit increases along with specific indexed increases on direct consumables. redacted

- Pay raises for EHS/EMC paramedics conform to Province-wide negotiated raises for all Province employees. As such, the system paramedics do not feel that their pay is on par with other high-performance EMS systems, resulting in personnel morale issues.[3]

- The ambulance provider contract imposes the same response time expectations for emergency medical incidents as for interfacility transfer ("IFT") requests. Resources (dollars and ambulances) that could be dedicated to emergency responses are unnecessarily deployed to the IFT system to meet the contract demands. This is inefficient and ineffective.

- The Provincial system does not fully take advantage of the medical sophistication that paramedics can provide. Although some marginal programs are present, the system relies largely on two outcomes when a patient contact occurs — either the patient is transported to the hospital or the patient must refuse transport.

### *Air Services*

- Eliminating pilot on call staffing will be required under Transport Canada's Flight Risk Management Systems ("FRMS") upcoming regulations. The impact FRMS will have on pilot retention and recruitment is more urgent for the Fixed Wing service due to anticipated Fixed Wing pilot migration to the commercial airlines as they also comply with the new regulations.
- There are response delays to assemble the Critical Care team during peak hour and at shift change.

## Key System Recommendations

### *Ground Services*

- Seek ways to engage the entire health care system to solve the issues of extremely long duration patient off-load times.

- Amend policies or adopt legislation, as needed, to allow patients to be treated in-home or transported to alternative treatment destinations, and/or with other transport modes.

[3] redacted

- Initiate policy and/or regulatory changes, as needed, to allow paramedics to operate to their full scope of practice (with the Provincial Medical Director's oversight), in order to facilitate potential alternative pathways for treatment.

- Establish a hospital transfer centre to coordinate all patient discharges using an established medical necessity process to ensure the appropriate mode of transport.

- Establish a nurse call-in line in the Communications Centre that can manage low acuity calls and determine alternate treatment modes and/or transport to alternative facilities.

- Establish an Extended Care Paramedic ("ECP") program that would allow ECPs to respond to both scheduled and 911 low acuity calls. The program would ensure proper treatment of patients on scene or would determine alternative destinations and/or transport modes. The response would be one paramedic in a non-ambulance vehicle.

- Ensure that response time expectations align with call density risk; review and evaluate response time expectations and call density risk annually.

- Expand clinical metrics to include both process and system outcomes.

- Review of patient transport fees which may lead to opportunities for increases, particularly as they apply to non-Canadians residents. Additionally, amounts unpaid by Canadian residents could be collected by other means such as at the time of driver's and other license renewals.

- Develop new billing structures for the other treatment modalities such as in home care and transport to alternate destinations. The structure should incentivize alternate care pathways.

***Air Services.***

- Add a 12-hour adult Critical Care team (Registered Nurse and Critical Care Paramedic) during peak hours from 1100- 2300 to minimize delays during high demand and at shift change. This will also require adding at least 12 hour Fixed Wing pilot staffing at the base. The additional annual cost for the medical crew is estimated to be redacted plus the cost of redacted if EHS opts for limiting Fixed Wing on-site pilot staffing to 12 hours.

- To deal with upcoming regulation changes to Transport Canada's Flight Risk Management Systems, it is recommended to change Fixed Wing pilot staffing from 24/7 on-call to 24/7 staffing at the base; the additional annual cost to EHS for the 24/7 staffing plan is estimated at redacted. Additional revenue captured from New Brunswick and Prince Edward Island transports will offset some of the additional expense.

- Less immediate but warranting action in the immediate term is to convert the eight hours of Rotor Wing pilot on call to on-site staffing at the base. The additional cost is redacted for the 24/7 Rotor Wing pilot staffing plan.

- Re-calibrate the vehicle activation decision for Fixed Wing to be first up for flights that are greater than 110 statute miles one way from Halifax. Code 1 patients are currently being service by Fixe Wing in these areas. The re-prioritization of a 24/7 pilot staffed Fixed Wing aircraft will reduce the number of Rotor Wing flight minutes and support managing Rotor Wing costs within the contractual guaranteed minutes.

- Following Fix Wing pilot staffing to 24/7 on-site, examine a limited Fixed Wing service for scheduled, non-emergent IFT transports during non-peak critical care transport hours (0500 – 1100) using an advanced life support medical crew.

# METHODOLOGY – GROUND AND AIR SERVICES

From a qualitative perspective, Fitch consultants participated in several on-site visits over a six-month period. On-site visits included direct interaction with key management and agency stakeholders, observations of operations and facilities for both ground and air operations. Information and Data Request ("IDR") documents, one specific to ground services and another for air services, were completed by the relevant agencies. EHS coordinated the collection of information from EMC and other sources, as needed.

One on-site visit focused solely on data collection and achieving confidence regarding data privacy issues. Numerous phone and electronic communications took place over several months, and on April 17, 2019, Fitch consultants presented initial assessments and findings in person and via teleconference.

Fitch's guiding principle for the project was to guide the Province from a solely operationally focused contract to a balanced, operationally and clinically driven contract that focuses on a timely response and improved patient outcomes.

In assessing ground ambulance operations, Fitch utilized the EMC's geographic deployment locations to determine the call capture at eight, 10, and 14 minute drive times. Fitch determined the average call demand by hour-of-day and normalized the data to determine average time-on-task. Ambulance deployment was evaluated for both the geographic volume capture and the normalized demand. Detailed response evaluations and staffing to demand analyses are provided in Attachment A.

# SERVICE AREA AND CURRENT SYSTEM OVERVIEW

## Geography

The Nova Scotia Province covers 55,300 square kilometers (21,300 square miles) that include a rugged coastline, rivers, streams and lakes, hills, and low mountain ranges that are part of the Appalachian Mountain chain. The Province is roughly 580 kilometers, or 360 miles long, and is no wider than 130 kilometers, or 80 miles, at any one point. The Province comprises the peninsula of Nova Scotia, Cape Breton Island, (separated from the mainland to the southwest by the narrow Strait of Canso), and a number of small adjacent islands.[4]

Nova Scotia's geography presents many challenges for emergency services. The Bay of Fundy, that fronts the west central coastline, is famous for its high vertical tidal range, and Cape Breton Island is separated from Nova Scotia mainland by the Strait of Canso. Sable Island, part of the Halifax municipality, is a crescent shaped sandbar about 160 kilometers, or 99 miles, from the mainland.[5] There are more than 3,000 lakes across the Province and forests occupy about four-fifths of the land area.[6] A map of the Province is provided in Figure 1.

**Figure 1. Map of Nova Scotia Province**


[4] Barry Moody and Brendan Anthony O'Grady, Nova Scotia Province, Canada, Updated December 13, 2018, Encyc opedia Britannica, Britannica.com, accessed January 15, 2019.

[5] "Nova Scotia Geography, Nova Scotia, Canada, North America, Wor d Map," Wor dat as.com, accessed January 11, 2019.

[6] Beck, J. Murray, Nova Scotia, The Canadian Encyc opedia.ca, updated January 22, 2019, www.thecanadianencyc opedia.ca. Accessed September 2018.

Nova Scotia connects to the mainland via a land boundary with New Brunswick to the west.

## Population Distribution Across Service Area

According to 2016 census data, only five of 37 Nova Scotia urban areas/population centres have populations of greater than 10,000.[7] The Figure 2 provides the population data for those five areas and the Province as a whole, and indicates the population change between May 2011 census and May 2016 census.

**Figure 2. Major Urban Areas/Population Centres with Population Greater Than 10,000 Persons**

| Major Urban Area/Population Centre | Population Census 2016 | Change +/- from 2011 Census | % Change +/- from 2011 Census |
|---|---|---|---|
| Halifax | 316,701 | +11,722 | +4% |
| Cape Breton – Sydney | 29,904 | (271) | (<1%) |
| Truro | 22,954 | +484 | +2% |
| New Glasgow | 18,665 | (958) | (5%) |
| Kentville | 12,088 | (36) | (<1%) |
| **Nova Scotia Province** | **923,598** | **+1,871** | **+ < 1%** |

Halifax, the Province's capital and the most populated urban area, grew by some four percent between the 2011 and 2016 census. While urbanization was an important trend in the 20th century, slightly more than one-half of Nova Scotians still live outside these major population centres.

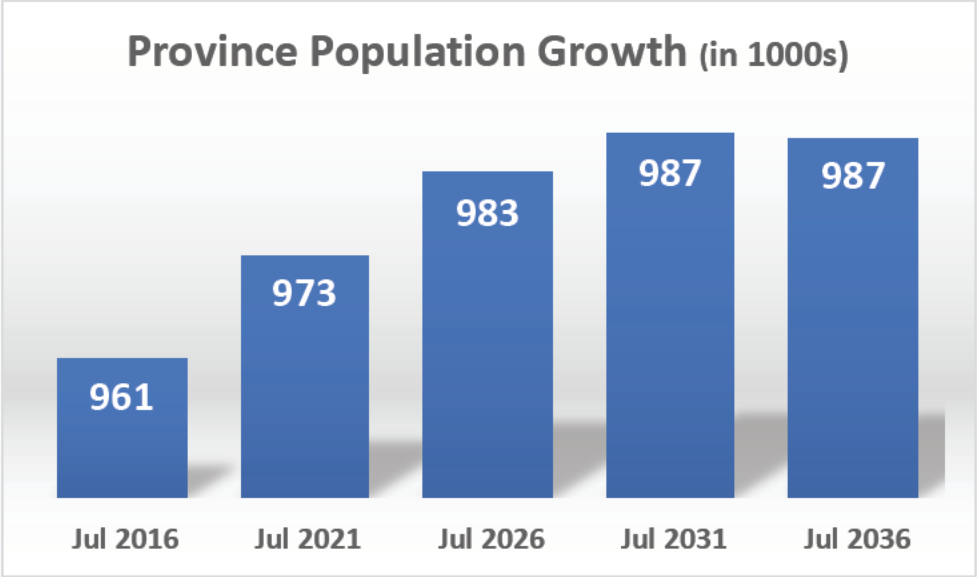
## Population Projections

The Province provides multiple versions of population statistics on its website, www150.statcan.gc.ca. Fitch accessed the components of population growth for the periods 2009-2010 to 2035-2036 in a low growth scenario, and population by age group for a low growth scenario, July 1st, 2010 to 2036.

The Province's overall population growth for the 20 years from 2016 to 2036 is projected to be three percent. Figure 3 reflects the growth projections for that 20 year period.

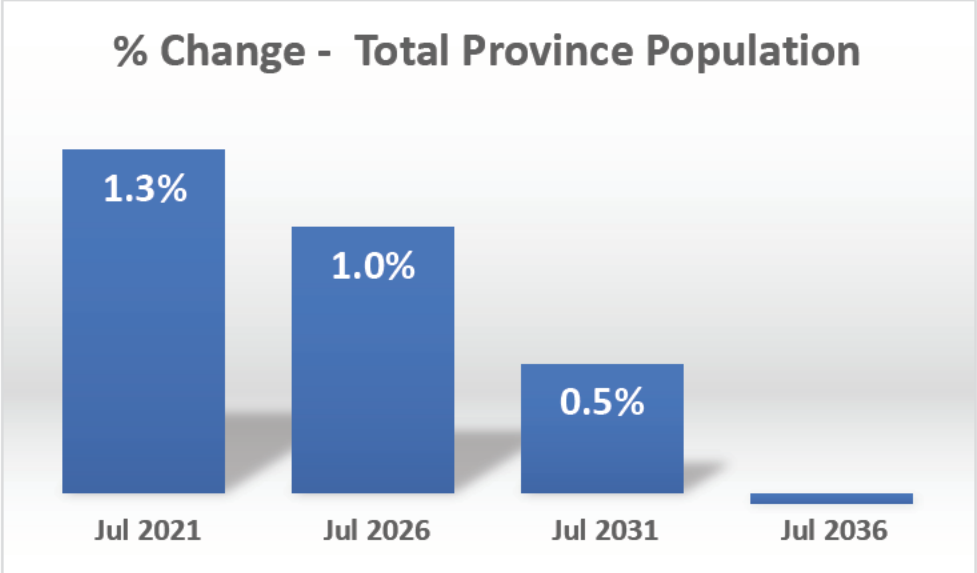
[7] Canada, Nova Scotia Province, www.citypopu ation.de. Accessed January 31, 2019.

**Figure 3. Province's Overall Population Growth in 5 Year Segments (in 1000s)**




The five year segment between 2031 and 2036 is projected to show no change or zero growth in overall population. Figure 4 graphically represents the percent change in five year segments.

**Figure 4. Percent Change in Province's Population Growth in 5 Year Segments**




The population in Nova Scotia, like the rest of North American, is aging. The age cohort of 65+ years of age has been found to be the more impactful to EMS systems than all other age cohorts. While this may seem to be intuitive, several studies in EMS systems in Chapel Hill, North Carolina, and Pinellas County, Florida, analyzed their historical data and confirmed that the 65+ age cohort utilized emergency medical services proportionately more than other age

cohorts. In the Pinellas County system, some 22 percent of the population is over 65 years of age, and that cohort made up approximately 50 percent of all transports.

Figures 5, 6, and 7 are graphic representations of population growth of the 65+ years age cohort, the percent growth of the cohort, and the percent of the overall population that is attributed to this cohort.

**Figure 5. Growth of 65+ Age Cohort in 5 Year Segments**

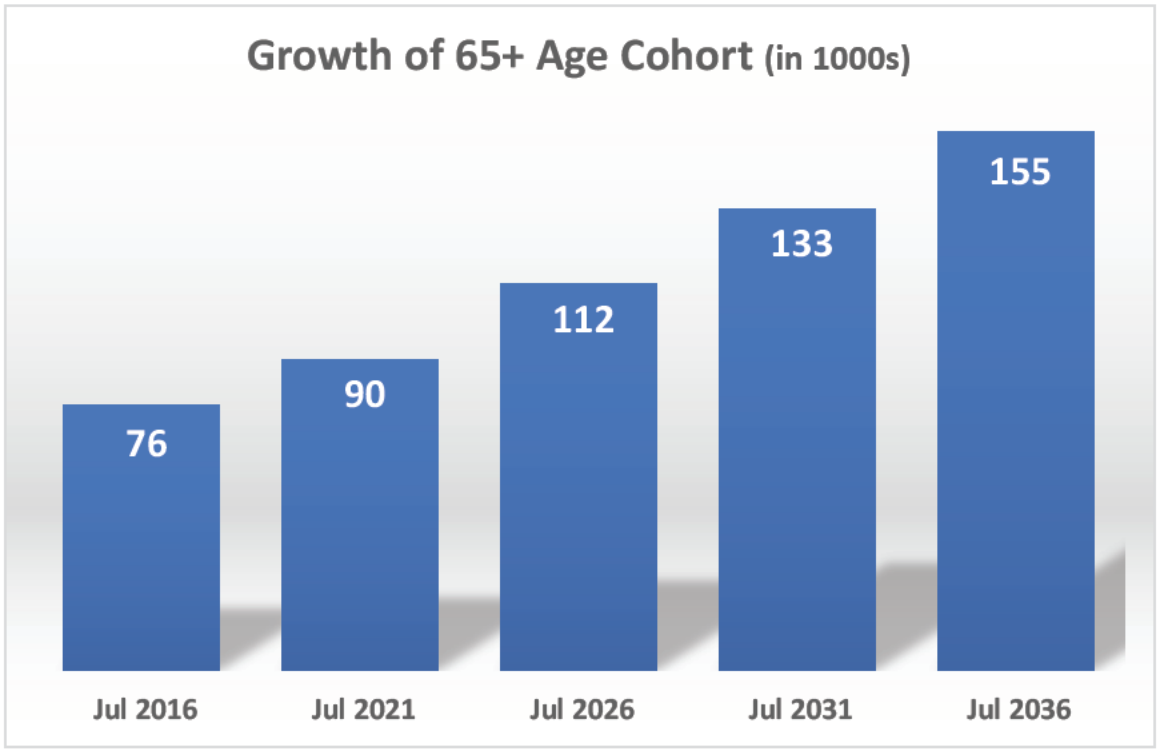



**Figure 6. Percent Change for 65+ Age Cohort in 5 Year Segments**

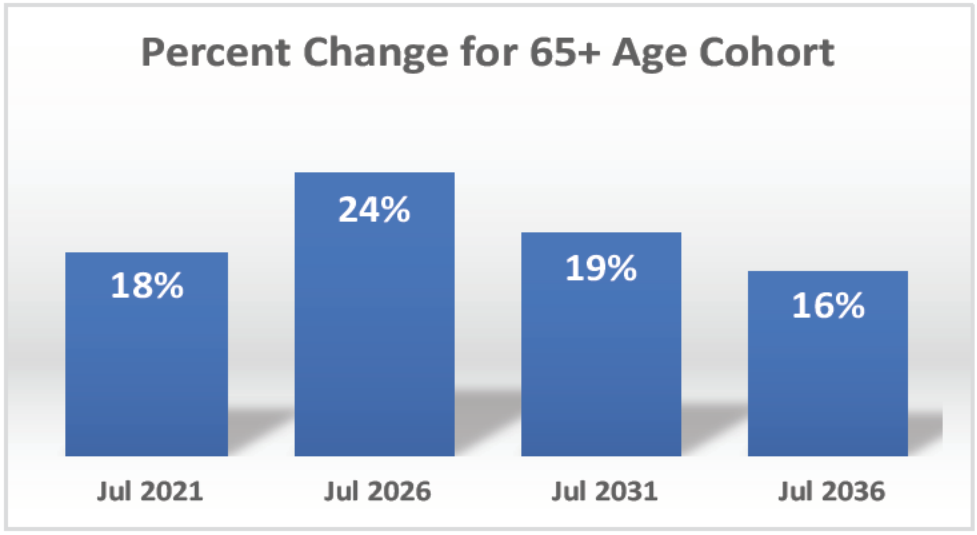


**Figure 7. Age Cohort 65+ Years as Percent of Province Total Population**

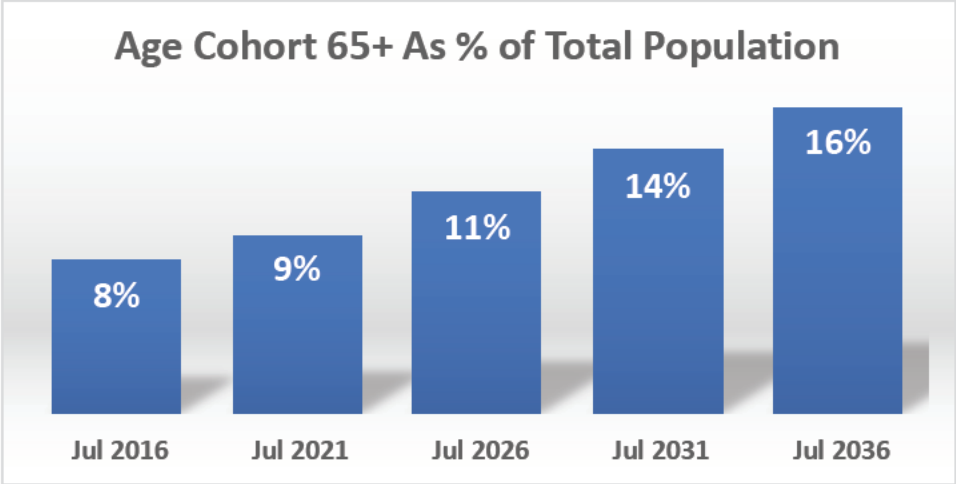
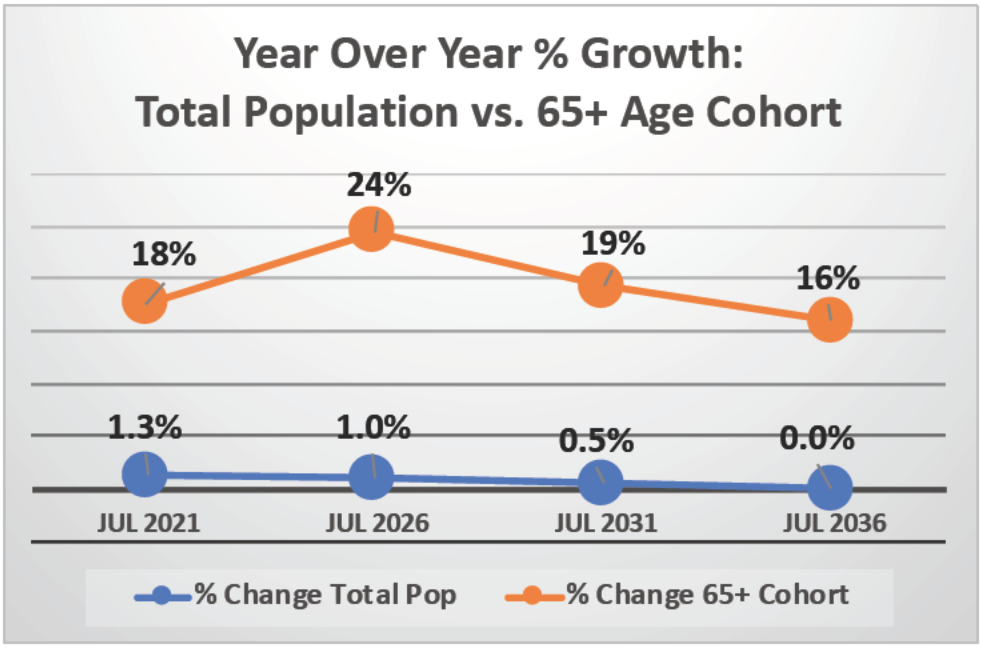



Figure 8 overlaps the percent growth in the five year segments for the overall population and the 65+ years cohort.

**Figure 8. Comparison of 65+ Years Cohort and Overall Population Growth**




In planning for the future Nova Scotia system, understanding the health needs of persons over 65 years of age is critical. Implementing programs such as Community Care Paramedics and others that more closely align services with needs, is key for the system to be more effective and more efficient.

## Economy

Nova Scotia's economy is diversified based on both land and sea resources. Maritime activities of fishing, shipbuilding, and transatlantic shipping are important activities. However, the traditional industries of fishing, forestry, and mining are in decline. Tourism and other service industries are becoming much more significant components of the economy.[8] Tourism is a particularly strong service industry, with more than a million people visiting the Province each year.

Provincial income is derived from two main sources: 1) various Provincial taxes and fees and, 2) the federal government. The Province levies personal and corporate income taxes, a sales tax and a fuel tax.

## Health and Welfare

In 1969 Nova Scotia joined the federal medical care program. Premiums are paid from the Province's general revenues, and insured services include all medically necessary procedures and care. The Province provides facilities for mental health, dental care, tuberculosis control, and other public health services. Nova Scotia's welfare services, similar to those in other Provinces, cover old-age assistance, allowances for the blind and disabled, social assistance, social development, child welfare and adoptions, and services for single parents.

## Governance Structure

The Department of Health and Wellness is described in the project Request for Proposals as the "regulator of the EHS system, responsible for system design, policy development and supervision of service providers." EHS is an integral player in three distinct systems:

1. Hospital/fixed based hospital system
2. Community/EHS public health system
3. Public safety/out of hospital system[9]

[8] Barry Moody and Brendan Anthony O'Grady, Nova Scotia Province, Canada, Updated December 13, 2018, Encyc opedia Britannica, Britannica.com, accessed January 15, 2019.

[9] Crewson, Director EHS, "EHS Operations 2020", September 2018, PowerPoint.

The various EHS system components are as noted below:

- Ground Ambulance Services ("EMC")
- LifeFlight Rotor-Wing Aircraft ("CHL")
- LifeFlight Fixed-Wing aircraft ("PAL")
- LifeFlight Management
- Medical Communications Centre
- Paramedic staffing of Collaborative Emergency Centres
- Community Based Paramedics
- Medical First Responders
- Interfacility transport
- Extended Care Paramedic Program
- Special Patient Program
- Falls Referral Program
- Automatic External Defibrillator Device Management Program

To operate the system, EHS maintains contracts with many of the above organizations for services as follows:

- Ground and Air Operations (Emergency Medical Care, Inc./EMC)
- Rotary Wing (Canadian Helicopters Limited/CHL)
- Fixed Wing (Provincial Aerospace Ltd./PAL)
- System Vehicle Manufacturers (Tri-Star)
- Physicians
- IWK Health Centre Specialist teams
- Suppliers/vendors (fuel, oxygen, etc.)

In addition, there are agreements between EHS and the Halifax Port Authority, the Rescue Coordination Centre, and Provincial Agreements with Prince Edward Island and New Brunswick.[10] EHS's focus is on policy (clinical care), investment (financial stability) and accountability (performance management).[11]

EHS currently contracts with Emergency Medical Care, Inc. that provides the following key services that support the system:

- Manages and develops service delivery
- Hires and manages all human resources including occupational health and safety
- Develops and delivers post-employment education
- Maintains the system status plan and manages programs
- Manages and maintain assets, facilities and technologies
- Reports on performance requirements of DHW
- Manages media and public inquires (the face of EHS)

## Financial Overview

The Province's 2018-19 budget includes an allocation of $19.6 million as part of a $39.6 million multi-year plan to recruit and train more doctors and increase access to primary healthcare. In

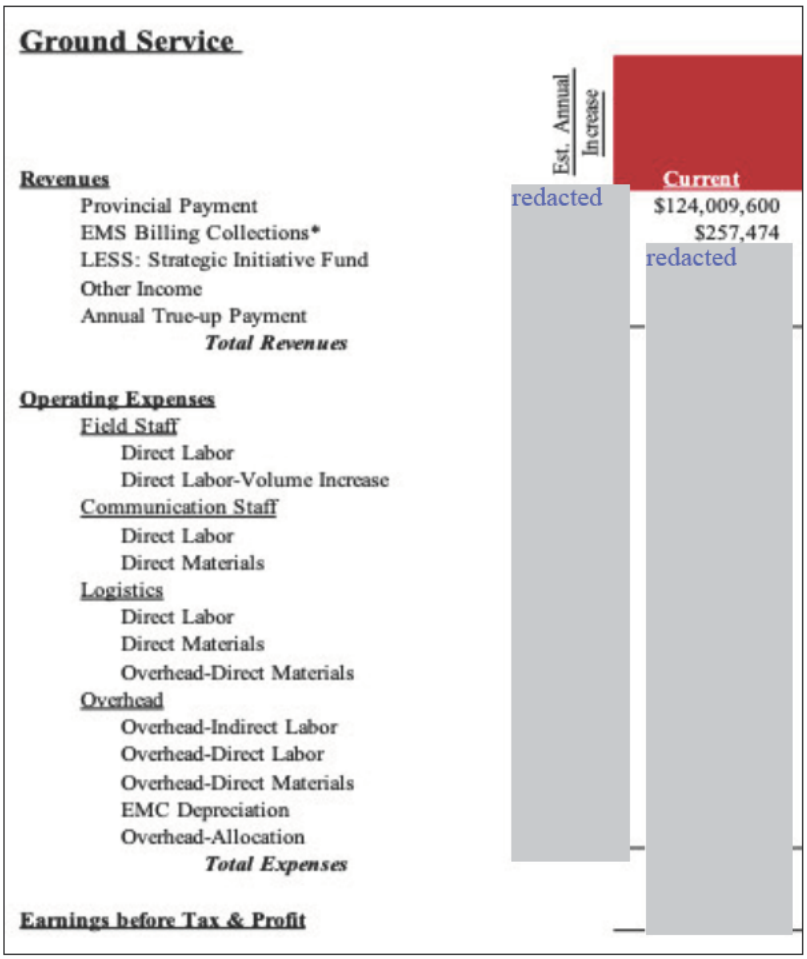
[10] Crewson, Director EHS, "EHS Operations 2020", September 2018, PowerPoint.

[11] Ibid.

addition to this and other programs, $8 million is allocated to enhance and expand the new collaborative care teams across the Province and $5 million for EHS to "meet the growing call volume for ground ambulance services across the Province".[12]

Figure 9 indicates the details of EMC's ground services revenues and expenses based on information provided in the service's financial reports.

**Figure 9. EMC Current Year Revenues and Expenses**




[1] Nova Scotia Budget High ights, 2018-2019, page 2.

EHS charges patients for ambulance transports pursuant to the fee schedule in Figure 10.

**Figure 10. EHS/EMC Patient Transport Fee Schedule[13]**

| | Medically Essential Transportation | Inter-facility Transportation |
|---|---|---|
| Most Nova Scotians with a valid health card | $146.55 | $0.00 |
| Non-Nova Scotians | $732.95 | $0.00 |
| Non-Canadians & New Canadians | $1,099.35 | $1,099.35 |
| People who are defined as third party insured (This includes people in a motor vehicle accident, covered by Worker's Compensation, or the federal government.) | $732.95 | $732.95 |
| Nova Scotians who are mobility challenged | $108.95 | N/A |
| Fee to transport to hospital from approved long term care and residential care facilities | $54.50 | $0.00 |

The EHS website notes that the fee schedule is as of April 1, 2015 and that Nova Scotia residents with a valid Nova Scotia health card, are not charged for transfers between approved facilities.

The current EMC contract provides for redacted . The consequences of this and other financial arrangements between the Province, EHS, and EMC, are discussed in detail in the Ensuring Optimal System Value section of this report.

## Ambulance Services

Nova Scotia patients are currently served by EMC, in a high-performance agency under contract with EHS. The agency utilizes dynamic deployment principles to manage 128 peak-of-day ambulances from 63 station locations. Ambulances are deployed in four regions of the service area, North, East, Central, and West. Response time expectations for EMC begin once the call is received from the primary PSAP and handed off to EMC.

[13]Department of Health and Wellness, Emergency Health Services, Ambulance Fees, www.novascotia.ca. accessed January 2019 and updated May 2019.

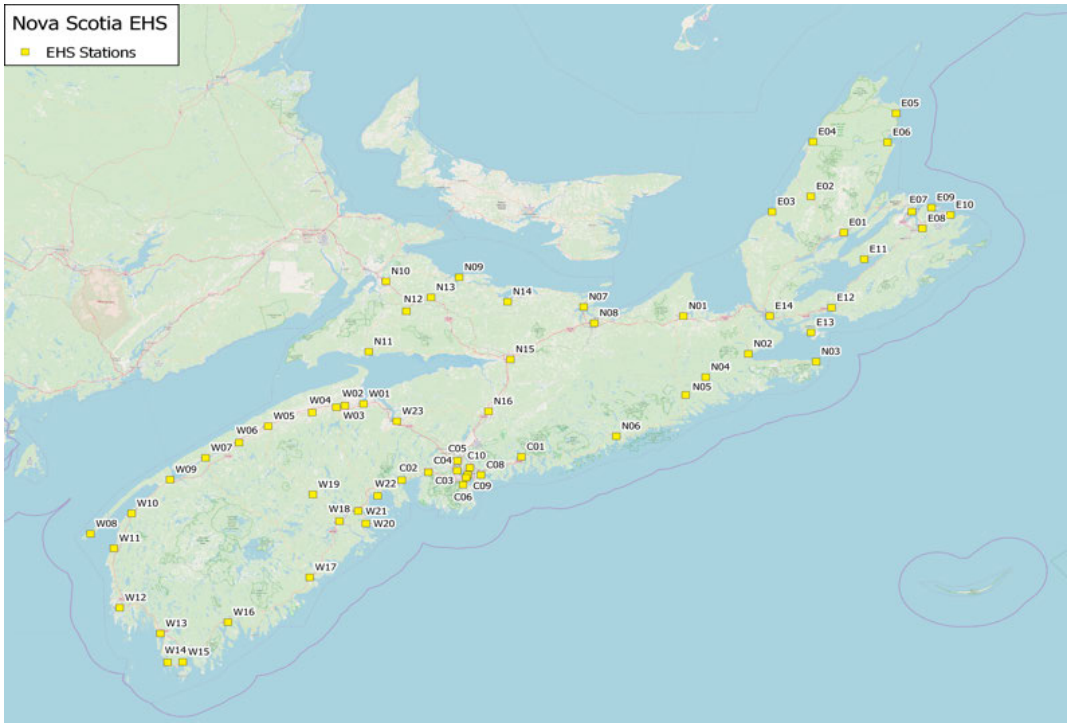
Within the three response category designations of 1) urban, 2) suburban, and 3) rural, ambulances are expected to meet response time requirements for the following three types of calls:

- Emergency-911
- Urgent-911
- Interfacility hospital transfers

Interfacility transfer are grouped within each of the response types above.

There are various configurations of response units housed in the 63 stations across the Province. Figure 11 indicates station locations across the area.

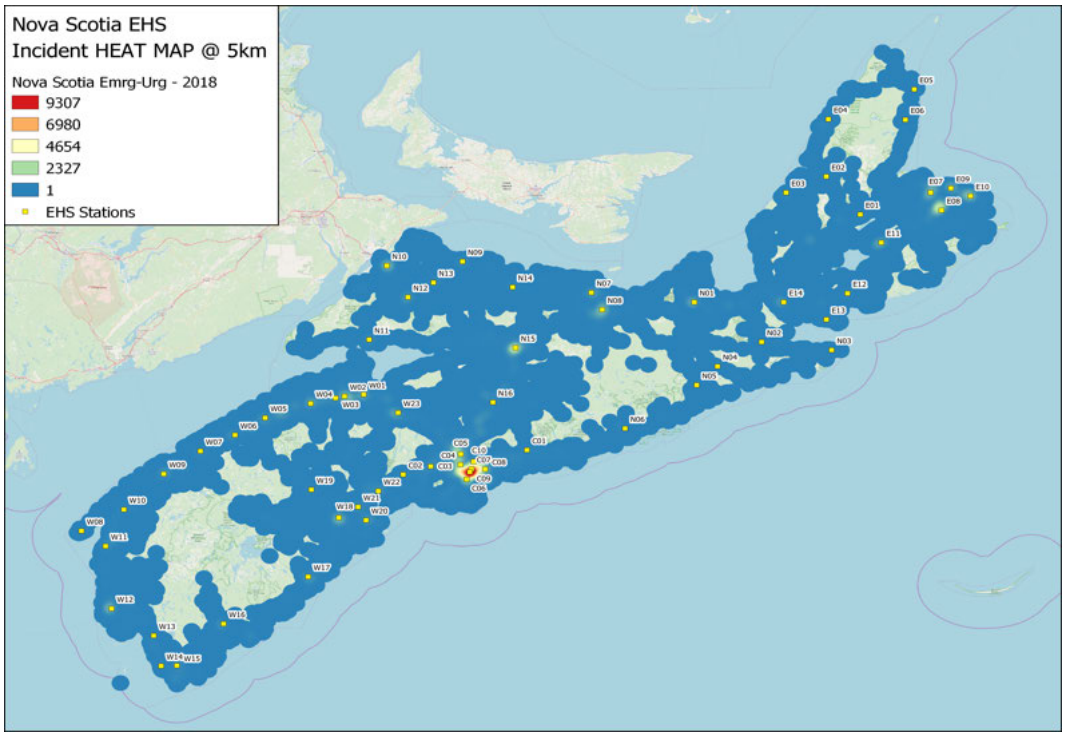
**Figure 11. EHS Station Locations**




Unit designations were assigned by Fitch to facilitate identification. The letters that precede unit numbers indicate the geographic zones of West ("W"), North ("N"), Central ("C"), and East ("E").

As noted previously, there are large rural areas across Nova Scotia that experience very little emergency response activity. Figure 12 is a visual representation of emergency and urgent ambulance response activity in 2018.

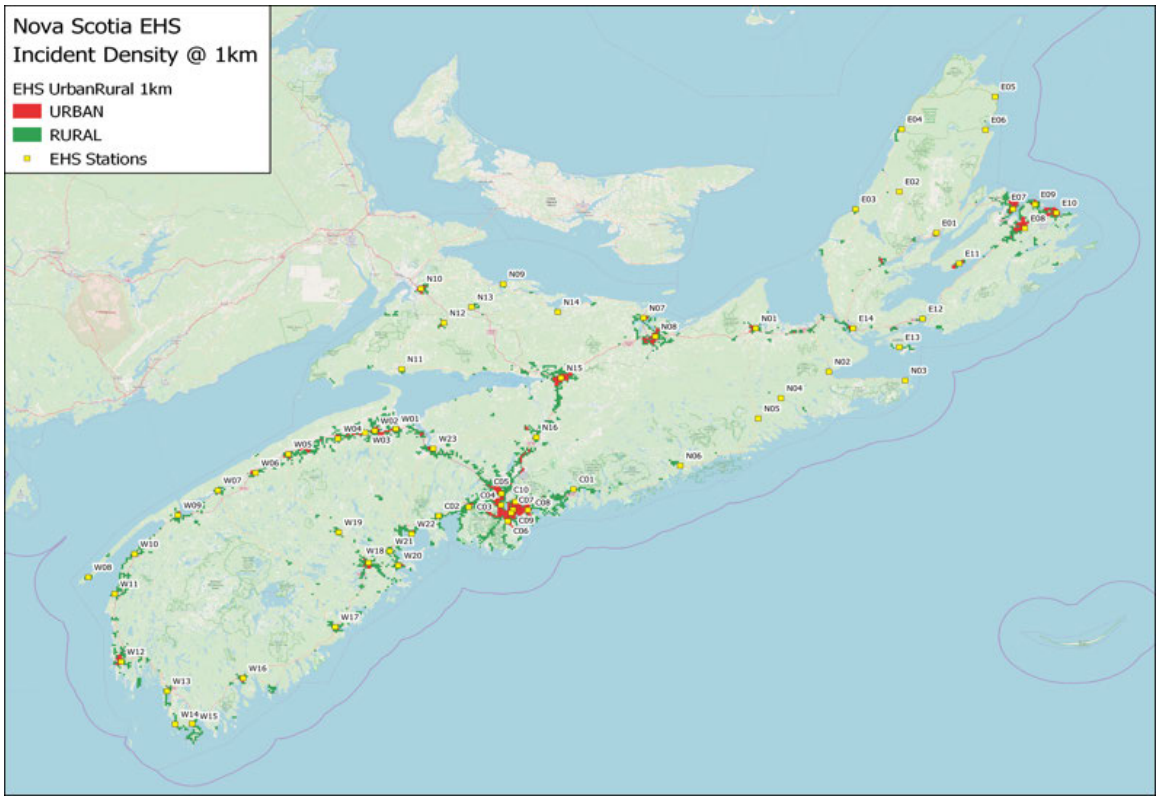
**Figure 12. EHS Emergency and Urgent Response Map for 2018**




Color coding indicates various levels of response with one area in red (the Halifax metropolitan area), that indicates a "hot spot" of 9,000 responses in 2018. Most notably, the blue areas indicate only one response during that year. The Province supports emergency services readiness in these areas as part of its overall health and welfare responsibilities to the public at large.

A more refined perspective of response activity is provided in Figure 13 that reflects the density of responses.

**Figure 13. EHS Urban and Rural Incident Density for 2018**




A different way of viewing call activity is a commensurate risk model. This model allows the Province to see which areas have like risk, which then allows the Province to make informed decisions on response. Areas designated as urban response density (in red) represent one call per kilometer per month along with at least 50 percent of its adjacent sides having similar call requirements. Rural designated areas are coded in green and represent one call within the square kilometer and 50 percent of its adjacent sides, for a four month period in 2018. Where there is no color, these areas do not meet either of the above criteria (less than 1 call every four months) and are considered wilderness response density.

Looking at ambulance activity in the EHS system, ground ambulances responded to 182,142 calls for service in CY2018, which represented a three percent increase over the prior year's response volume. The number of patients transported was nearly level for the two years 2017 and 2018, with an increase of only 795 transports, representing an increase of less than one percent. Figure 14 indicates the responses, transports, and related response activity for the three calendar years, 2016, 2017, and 2018

**Figure 14. Response and Transport Volumes**

| Call Type | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|
| | Responses | Transports | Responses | Transports | Responses | Transports |
| Emergency | 64010 | 43083 | 68319 | 45681 | 71823 | 47020 |
| Urgent | 33799 | 18992 | 38175 | 20251 | 40650 | 20785 |
| Interfaci ity | 66470 | 60119 | 67884 | 61062 | 67218 | 59678 |
| Standby/Emergency | 495 | 45 | 517 | 44 | 281 | 31 |
| Community Paramedic | 852 | 19 | 969 | 39 | 1586 | 313 |
| Admin Detai | 412 | 378 | 531 | 491 | 584 | 536 |
| Grand Tota | ***166038*** | ***122636*** | ***176395*** | ***127568*** | ***182142*** | ***128363*** |

The response volume projections in Figure 15 and Figure 16 are based on the forecasted historical growth of four percent.

**Figure 15. Response Volume Projections to 2021**

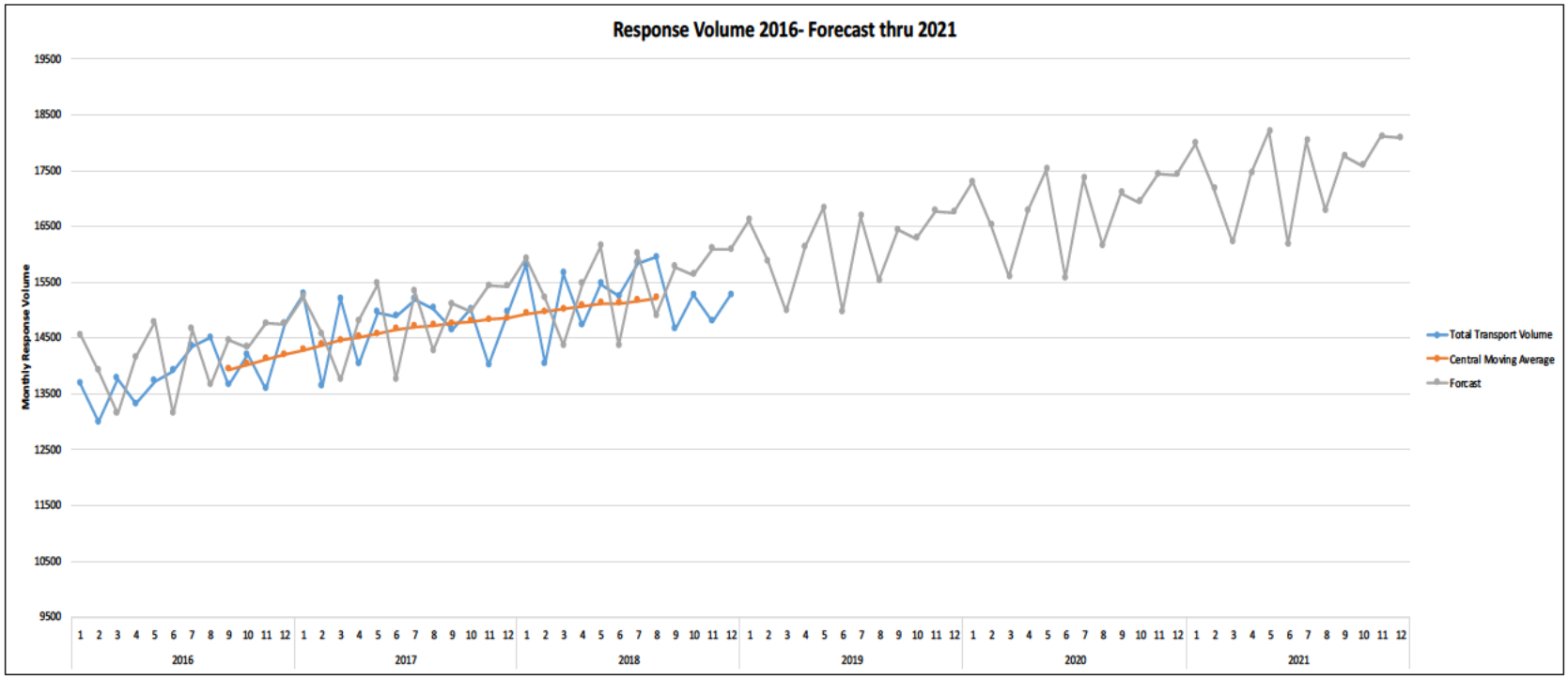
***RESPONSE VOLUME 2016 - FORECASTED 2021 SUMMARY***

| | Volume | | | Percent Growth | |
|---|---|---|---|---|---|
| | Actual | Forecast | Difference | Actual | Projected |
| **2016** | 166038 | 169852 | 3814 | 6% | 4% |
| **2017** | 176395 | 177631 | 1236 | 3% | 4% |
| **2018** | 182142 | 185410 | 3268 | | 4% |
| **2019** | | 193189 | | | 4% |
| **2020** | | 200967 | | | 4% |
| **2021** | | 208746 | | | |

The volume projections assume no changes in current patient transport regulations and policies.

EMC transport volumes appear to move in sync with the overall call volume changes. Figure 16 indicates ambulance responses projected to 2021 and includes actual patient transport history from January 2016 through December 2018.

**Figure 16. Ambulance Response Projections and Patient Transport History**



Current operational policy indicates that most, if not all, EMC ambulance interfacility transports are accomplished by ambulances staffed with paramedics and equipped with advanced life support equipment. Currently, there is no medical necessity policy or procedure to match a specific patient to the proper mode of transport.

Figure 17 reflects patient transfers (interfacility, non-emergency) for three years.

**Figure 17. Interfacility/Non-Emergency Patient Transfers**

| Call Type | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|
| | Responses | Transports | Responses | Transports | Responses | Transports |
| BLS of Other Transfer Modes | 64900 | 58702 | 66343 | 59684 | 65636 | 58298 |
| | **97.6%** | **97.6%** | **97.7%** | **97.7%** | **97.6%** | **97.7%** |
| ALS Transfers Mode | 1570 | 1417 | 1541 | 1378 | 1582 | 1380 |
| | **2.4%** | **2.4%** | **2.3%** | **2.3%** | **2.4%** | **2.3%** |
| Total Transfers | 66470 | 60119 | 67884 | 61062 | 67218 | 59678 |

Total transfers represent 47 percent of all ambulance transports in 2018. Some 98 percent of these transports require only basic life support ("BLS") staffing and equipment. For that 98 percent, a medical necessity policy and procedure could be developed so that many of these transports could be handled by other transportation modes such as multi-patient buses, wheelchair vans, or car services. The use of ALS ambulances is placing unnecessary stress on the system as in-hospital patients compete for the scarce resources in the field. This creates a paradoxical situation where patient movement is creating potentially negative outcomes on patients experiencing emergencies outside of medical facilities.

## Ground Performance and Response Analysis

The current contract includes response time expectations for Category 1 (Urban), Category 2 (Suburban), and Category 3 (Rural) calls. It is noteworthy that the response times expectations for interfacility transfers and Urgent 911 calls are the same. Requests to transfer patients between medical facilities or to home do not typically involve emergency situations. Obligating the ambulance provider to respond at the same response level to IFTs as to medical emergencies results in a misuse of resources. This causes the provider to unnecessarily dedicate ambulances to the IFT system to the detriment of the 911 system. Further, special consideration should be given to using transport modes other than ambulances to return patients home. By definition, a patient that is stable enough to be returned home negates the need for an ambulance.

Figure 18 reflects performance expectations and EMC's performance for the three categories of 1) Urban, 2) Suburban, and 3) Rural calls over a three year period.

**Figure 18. Performance Expectations and EMC Actual Performance**

*Percentile Total Response Time*

| Zone | Contracted Performance | Actual Performance via Percentile mm:ss 2016 | 2017 | 2018 |
|---|---|---|---|---|
| **Category 1** | | | | |
| Emergency-80th Percenti e | 9 minutes | 0:09:04 | 0:08:56 | 0:09:36 |
| Emergency-90th Percenti e | 9 minutes | 0:11:08 | 0:11:11 | 0:13:28 |
| Urgent-80th Percenti e | 15 minutes | 0:13:21 | 0:14:14 | 0:14:44 |
| Urgent-90th Percenti e | 15 minutes | 0:17:42 | 0:18:38 | 0:20:48 |
| Interfaci ity Transports-80th Percenti e | 15 minutes | 0:23:36 | 0:20:37 | 0:24:25 |
| Interfaci ity Transports-90th Percenti e | 15 minutes | 0:33:05 | 0:29:10 | 0:36:18 |
| **Category 2** | | | | |
| Emergency-80th Percenti e | 15 minutes | 0:10:05 | 0:09:47 | 0:10:06 |
| Emergency-90th Percenti e | 15 minutes | 0:13:05 | 0:12:54 | 0:13:31 |
| Urgent-80th Percenti e | 20 minutes | 0:13:04 | 0:13:02 | 0:13:42 |
| Urgent-90th Percenti e | 20 minutes | 0:17:07 | 0:16:58 | 0:18:24 |
| Interfaci ity Transports-80th Percenti e | 20 minutes | 0:22:59 | 0:18:10 | 0:24:51 |
| Interfaci ity Transports-90th Percenti e | 20 minutes | 0:42:03 | 0:33:48 | 0:46:22 |
| **Category 3** | | | | |
| Emergency-80th Percenti e | 30 minutes | 0:18:04 | 0:19:00 | 0:18:36 |
| Emergency-90th Percenti e | 30 minutes | 0:23:41 | 0:24:52 | 0:24:30 |
| Urgent-80th Percenti e | 40 minutes | 0:22:13 | 0:21:44 | 0:23:09 |
| Urgent-90th Percenti e | 40 minutes | 0:29:05 | 0:28:28 | 0:30:31 |
| Interfaci ity Transports-80th Percenti e | 40 minutes | 0:25:30 | 0:24:40 | 0:28:52 |
| Interfaci ity Transports-90th Percenti e | 40 minutes | 0:40:13 | 0:36:47 | 0:45:51 |

Most important is that EMC's unadjusted performance does not meet response time expectations for Category 1 calls. However, EMC is operating at this level today and it appears to be acceptable performance for the system.[14]

As mentioned throughout the report, the unnecessarily long time that ambulances are tied up off-loading patients to hospital emergency departments ("ED") hampers EMC's ability to effectively deploy ambulances to meet response time expectations. Fitch estimates that the system needlessly wastes the equivalent of 13.5 ambulance 12 hour shifts per day waiting at hospital EDs to off-load patients.

Typical off-load times should be measured to 20 minutes at the 90th percent from the ambulance time of arrival to the time the ambulance is available for another response. On Category 1 calls, EMC ambulances currently spend three hours and 15 minutes at the 90th percent or an average of one and one half hours off-loading patients.

[14] Unadjusted response time represents response times before auditing for ate ca exemptions.

# THE OPTIMAL EMS SYSTEM/OPERATIONS REVIEW

An optimal EMS system is best designed from the patient's perspective. There are multiple models for delivering these services throughout the world. Most have several common elements that are noted here as optimal. In short, patients should expect that the system will be engaged in illness and injury prevention, health education, and early symptom recognition, in addition to responding to emergency and non-emergency transportation requests. The EMS system should provide a rapid and appropriate response when a caller dials 911 and routinely provide scripted medical instructions until help arrives. Community volunteers and other first responders should be able to provide medically approved first-aid/self-help measures prior to the ambulance's arrival.

A patient's needs should be evaluated beginning with the 911 call intake. Procedures for immediate interrogation of the caller to determine the level of acuity should be evaluated. High acuity patients determined through interrogation (Echo and Delta calls) should have an ambulance dispatched immediately. Lower acuity patients (Charlie, Bravo, Alpha, and Omega calls) should be further evaluated by the call-taker to determine that the right resource is dispatched, whether the patient needs to be transported, or if transport can be by means other than an ambulance. Response times should be based on historical call density and the level of acuity. All response times should be at a fractile measurement and reported monthly.

Patients should be transported to a hospital or medical facility, such as urgent care facilities or doctors' offices, that is best suited to treat their specific condition. Furthermore, the patient determination of care at scene or at home should be done by the paramedic following specific protocols. No one would dictate to a physician or a nurse on what treatment modality should be used, rather the medical professional determines the right level of care including to transport or not, and to where. The current model of patient refusal or transport to hospital is an antiquated model that represents a time when ambulance drivers had 110 hours of training. This cannot be compared to a college degree and an independent professional order that the paramedics represent today.

The system should be externally and independently monitored with the system's participating agencies and personnel held accountable for their responsibilities. Sophisticated systems should be developed to provide specific metrics for each underlying component. Metrics should include both operations, and clinical/outcomes for process, and systems metrics. Finally, the system must deliver solid value for the resources invested.

System outcomes are defined as the link between hospital outcomes and EMS treatments with measurable performance. Process outcomes are defined as the link between EMS protocols and appropriate treatment methods with measurable performance.

This review focuses on how the Emergency Health Services EMS System performs against certain benchmarks using the framework for an optimal EMS System. There is no single source for international standards of practice. Governmental EMS regulations reflect minimum performance requirements. Other commonly accepted "standards" are drawn from a variety of sources including research references outlined in the US National Academies of Science: Institute of Medicine's *EMS at the Crossroads*; the United Kingdom's NHS Taking Healthcare to the Patient: *Transforming the NHS Ambulance Service*; the Ontario, Canada, *Pre-hospital Advanced Life Support Study*; *10 EMS Standards* currently used to evaluate EMS systems and the *EMS Agenda for the Future* developed by the US Department of Transportation; the *Community Guide to Ensure High Performance Emergency Ambulance Services*, published by the American Ambulance Association, and the standards developed by the International Academies of Emergency Dispatch, the Commission on the Accreditation of Ambulance Services and the US National Fire Protection Association.

Specific benchmarks and the service's performance are described in each of the following report sections.

- 911/Medical Communications
- Medical Volunteers and First Response
- Operations and Medical Transportation
- Medical Accountability
- Community and Customer Accountability (Legislation and Regulation)
- Prevention and Community Education
- Organizational Structure, Culture, Leadership and Human Resources
- Ensuring Optimal System Value

## 911/Medical Communications

## Benchmarks

- Public has access through a single number, preferably enhanced 911.
- Coordinated 911 Public Safety Access Points ("PSAP"s) exist for the system.
- Certified personnel provide pre-arrival instructions and emergency medical dispatching ("EMD"), and this function is fully medically supervised.
- Data collection exists allowing for key service elements to be analyzed.
- Technology supports interface between 911, dispatching, and administrative processes.
- Radio linkages between dispatch, field units, and medical facilities provide adequate coverage and facilitate communications.
- System has a coordinated method to screen low-acuity patients either via the 911 call, unit on scene via phone conference, or telecommunication, for purposes of screening and approval of treatment on scene or alternative transport location and/or means.

## Description of Best Practices

Best practice EMS systems are organized to facilitate wire-line, cellular, voice over internet protocol, automatic crash notification, patient alerting system devices, and other public 911 access to the Emergency Medical Services System. Voice, video, telemetry, and other data communications conduits are utilized, as necessary, to best enhance real-time information management for patient care. In a transformative manner, commercially available applications integral to Apple smart watches, Fit Bits, and others, will be prevalent and will include early symptom alert systems. Modern EMS systems need to consider how the integration of such systems will work.

A medically directed system of protocol based emergency medical dispatch (EMD) and communications is in place. The call reception and EMS call processes are designed logically and should not delay activation of medical resources. Technology supports the caller being directed to the appropriate Public Safety Access Point (PSAP) for the geographic location of the call.

All 911 callers should receive call prioritization and pre-arrival instructions in accordance with International Academies of Emergency Dispatch ("IAED") protocol or a similar process. Screening of low acuity patients can occur either at 911 call intake or via phone teleconference, or by on scene personnel to determine what the right resource for response is, whether treatment can be done on site, or there is an alternative transport location and/or means. Automated quality improvement ("QI") processes are used for facilitating results being reported to clinical and operations executives in a concise manner.

Data collection facilitates the analysis of key service elements and these data are routinely benchmarked and reported. Technology supports interface between 911 medical dispatch functions and administrative processes. Radio/cellular linkages between dispatch, field units, and medical facilities provide adequate coverage and facilitate both voice and data communications. There is interoperability between allied public safety agencies (e.g., civil defense).

## Benchmark Comparisons

Figure 19 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 19. Comparison of Nova Scotia 911 Medical Communications with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Public access through a single number, preferably enhanced 911. | D | yes |
| Coordinated PSAPs exist for the system. | D | There are four regional PSAPs with one button transfer into the Nova Scotia EHS Secondary PSAP. |
| Certified personnel provide pre-arrival instructions and priority dispatching (EMD); this function is fully medically supervised. | D | The EHS Medical Communications Centre is accredited and as such provides EMD services. Dispatchers determine the response based on medical protocols and can dispatch Medical First Responders, EHS ground ambulances or the LifeFlight's helicopter and fixed wing aircraft. |
| Data collection which allows for key service elements to be analyzed. | D | EHS has the ability to collect and review data but the sharing of data between the EHS and EMC is not transparent. There is no verification of the data between EHS and EMC, or by a third party. EMC provides reports to the Province, but the Province does not independently verify or reconcile report data with the Communications Centre data. |
| Technology supports interface between 911, dispatching & administrative processes. | D | There is no software or technology for resource deployment, i.e., Marvlis, Pulse Genesis, Deccan, Optima, etc. |
| Radio linkages between dispatch, field units & medical facilities provide adequate coverage and facilitate communications. | D | EHS has a coordinated approach for response and documentation, however there is no singular point of contract or physical Nova Scotia Health Authority ("NSHA") Transfer Centre for the hospital system to coordinate facility closures, patient transfers or data analysis. |
| System has a coordinated method to screen low-acuity patients either via the 911 call, unit on scene via phone conference or telecommunication, for purposes of screening and approval of alternative transport location and/or means. | PD | A portion of the communication centre should be established to interface with 911-phone line to facilitate low-acuity callers for potential alternative pathways. This methodology could be expanded utilizing personnel or software such as Emergency Communication Nurse ("ECN") to facility alternative transport modes or destinations. |

## Findings

To date, the EHS Medical Communications Centre does not have real-time deployment software such as, Marvlis, Pulse Genesis, Deccan, or Optima. Most high-performance EMS agencies that are held to response time standards utilize this software to ensure geographic coverage. The software tracks resources in real-time and can automate the recommendation process for closest units for dispatch. It also allows for predictive modeling.

The salary costs at the EHS Communications Centre are approximately 50 percent higher per hour than other comparable centres. Call takers at the EHS Centre are paramedics, and as such have a higher salary structure than civilians. The International Academies of Emergency Dispatch (IAED), the organization that awards accreditation status to agencies, has found that civilians that utilize emergency medical dispatch protocols, generally perform better than paramedics as they are less likely to deviate from the protocols. IAED has only one prerequisite prior to training to become an Emergency Medical Dispatcher, which is to have a valid CPR card.

Currently, each hospital contacts the EHS Communications Centre individually to schedule a discharge. The process is a time consuming, manual process. Software exists that can automate this process such that the hospitals would have access to the program residing at the Communications Centre. Hospitals would enter their requests for transfers directly and NSHA and EHS could then coordinate transfers for the system.

The Province currently staffs an 811 call line with a registered nurse ("RN") 24 hours a day, 7 days a week. According to the Provinces 811 website, (811.novascotia.ca), the RN staff answer approximately 325 calls each day, or nearly 120,000 calls annually. The 811 registered nurses answer basic heath questions and direct callers to available services. In the case of more acute situations, callers are transferred directly to 911 call takers. This process requires a bi lateral pathway.

The 811 call line concept could be expanded to include an Emergency Communications Nurse (ECN) system. The ECN system is a comprehensive nurse triage system comprised of over 200 protocols. It is designed to be implemented within the EMS communications centre such as the Province's centre and used alongside the Medical Priority Dispatch System ("MPDS").[15] The ECN program manages low acuity 911 requests for services and determines whether, how, and to where patients need to be transported. The goal is to treat patients in-home, at scene, or transport to varying levels of care based on medical necessity. The end result is that paramedic ambulances are more available to respond to life-threating events where patient outcomes are shown to benefit from advanced level care.

[15]Emergency Communications Nurse System, internationa Academies of Emergency Dispatch, website: https://www.emergencydispatch.org/about_ecns, accessed Apri 2019.

This approach has two benefits. First, it represents the best care for the patient, because low acuity patients do not receive the best care in a hospital setting which is designed for the most sick and injured. Second, it is the most cost effective way to treat patients by giving the patient the right level of care at the right place.

The EHS Medical Communications Centre also supports the Province's Collaborative Emergency Centres ("CEC") and the Extended Care Paramedic Program. The CECs provide expanded access to primary health care and ensure that emergency care is available 24 hour a day, seven days a week. The CECs are staffed with a registered nurse and a paramedic working under the direction of an EHS medical oversight physician.

The Province is well positioned to integrate the existing 811, Collaborative Emergency Centres, the Extended Care Paramedic Program, and an Emergency Communications Nurse program. The result would be better, more efficient and effective use of the current paramedic ambulance system.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 20.

**Figure 20. 911/Medical Communications - Recommendations**

| Recommendations — |
| --- |
| ▪ Consider a big data source, such as FirstWatch, to show provider's performance in real-time.<br>▪ Consider an annual independent performance review of contractor expenses and performance.<br>• Consider an annual review of management zones and categories utilizing predictive modeling to ensure proper response to relative risk.<br>▪ Establish an Emergency Communications Nurse (ECN) program to manage low-acuity requests for service.<br>▪ Consider adding software to automate the transport scheduling process between the hospital and EMS dispatch. |

## Medical Volunteers and First Response

## Benchmarks

- First responders are part of a coordinated response system and medically supervised by a single system Medical Director.
- Defined response time standards exist for first responders.
- First response agencies report out and meet fractile response times.

- Automatic External Defibrillators ("AED") capabilities are on all first line apparatus.
- Integrated patient reporting with ambulance service.
- Smooth transition of care is achieved.

## Description of Best Practices

Community volunteers and first responders are organized, as appropriate, in an integrated response system guided by legislative authority for accepted medical practice. Formal (paid) first responders are certified at a minimum of EMT-Defibrillator or Medical Fire Responder ("MRF") level. They are medically supervised by the system Medical Director and participate in performance improvement audits/activities.

Defined response time standards exist for formal first responders and those response times are reported with those of the system. Early defibrillation capabilities are available for first responders and in areas of high density responses, such as airports and hotel complexes. When community or first response personnel are involved in patient care, a smooth transition of care is achieved. All documentation by the first response agency must be easily captured by the primary ambulance service.

## Benchmark Comparisons

Figure 21 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 21. Comparison of Nova Scotia Medical Volunteers & 1st Responders with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| First responders are part of a coordinated response system and medically supervised by a single system Medical Director. | PD | The Medical First Response (MFR) program has 241 sponsored agencies. The program consists of fire departments and community-based response teams. EMC has developed outreach programs to teach first response and coordinates their responses; MFR scope of practice is defined by the Provincial Medical Director. |
| Defined response time standards exist for first responders. | ND | Not documented |
| First response agencies report/meet fractile response times. | ND | Not documented |
| AED capabilities on all first line apparatus. | D | EHS provides all sponsored agencies with AEDs and maintenance as part of their issued equipment. |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Smooth transition of care is achieved. | D | Continued ongoing training with the MFR teams and continue training with the MFR agencies for multi-patient events. A formalized QI process is handled internally by EMC. The formal MFR QI policy is being developed. EMC should continue working with MFR and the Provincial Medical Director for the policy establishing Medical Director approval. |

## Findings

First response agencies are recertified every two years. EMC provides training opportunities to responders at no cost. EHS provides all participating agencies an AED and EHS completes associated maintenance. However, there is limited tracking or reporting of first response agency activities or performance within the system. MFR agencies utilize paper call reports and should look to move MFR agencies to the Electronic Medical Records ("EMR"). EHS performs QA with the participating MFR agencies. EHS and the Medical Directors are in the process of developing a formalized QA process.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 22.

**Figure 22. Medical Volunteers and First Responders - Recommendations**

| Recommendations — |
|---|
| ▪ Formalize a QA process for the Medical First Responders.<br>▪ Evaluate moving MFR to EHS's electronic medical record platform.<br>▪ Develop data to track activity of medical first responders as they interact with EMS and provide reports at least semi-annually.<br>▪ Engage with the MFR Stakeholders Committee Agency to develop synergies among the providers as the system moves to a future state. (Both EHS and EMC have representatives on this committee). The Committee, EHS and EMC should work together to synchronize equipment purchases and clinical protocols for seamless patient treatment and on scene transfer of care. |

## Operations and Medical Transportation

## Benchmarks

- Defined response time standards exist.
- Agency reports/meets fractile response times.

- Units meet staffing and equipment requirements.
- Resources are efficiently and effectively deployed.
- Fleet maintenance and supply distribution.
- Planning is in place for asset replacement and provides an adequate number of assets.
- There is a smooth integration of first response, air, ground and hospital services.
- Develop/maintain coordinated disaster plans.

## Description of Best Practices

In a best practice EMS system, a mechanism exists to identify and assure adequate deployment of ground, air, and marine transportation resources meeting specific standards of quality, to assure timely response scaled to the nature of event. There is an ability to monitor safety and response time issues. Defined response time targets exist by severity of call, and individual response components are measured by using fractile measures.

Units are staffed and equipped to meet the identified service requirements. Procurement, maintenance, and logistics processes function to optimize unit availability. Resources are efficiently and effectively deployed to achieve response time performance for projected demand. When multiple agencies are involved, a smooth integration and transition of care is achieved.

The system is capable of scaling up day-to-day operations to meet the needs of larger all-hazards events. Threat and capabilities assessments identify the likeliest events to occur and the capabilities required and available to address them. It is essential that mass casualty responses involve logical expansion and extension of daily practices and not the establishment of new practices reserved for large scale events.

## Benchmark Comparisons

Figure 23 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 23. Comparison of Nova Scotia Operations and Medical Transportation with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Defined response time standards exist. | D | The community response expectations for each specific community do not align with the relative risks. |
| Agency reports/meets fractile response times. | PD | EMC does meet the unadjusted fractile response times in one of three response zones. |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Units meet staffing and equipment requirements. | D | Nova Scotia should consider installing electronic stretchers in the ambulances to decrease provider and patient injury, increase bariatric lifting capabilities, and improve safety of the patient. |
| Resources are efficiently and effectively deployed. | PD | Dispatch response is based on MPDS but the number of dispatch options are too complex. EMC and EHS should evaluate and adjust a unit's response to the MPDS response determinates using transport rates and outcomes. Low-acuity call response should be adjusted to allow for ECN or ECP to evaluate prior to an ambulance response for treat in-place, alternative destination transports, or alternative transport modes. |
| Fleet maintenance and supply distribution. | D | A fleet maintenance shop in Halifax handles all major issues and is operational 24/7. Cape Breton fleet maintenance shop is utilized 12/7. The current contract does not outline specific workflows to handle fleet maintenance, vehicle purchasing and quality issues. Workflows are currently created through ongoing relationships between the fleet vendor, EMS contractor, and the Province. |
| Planning is in place for asset replacement and provides an adequate number of assets. | PD | redacted Typically, an ambulance fleet ratio is 120% to 130% of peak-of-day units. redacted |
| There is a smooth integration of first response, air, ground and hospital services. | PD | There is a need for better integration of critical care and air services for long distance transports of patients needing follow up or maintenance care. Suggest scheduling patients within a time window to arrive in a holding area to await transport via a multi-patient transport unit, fixed-wing aircraft, ambulances, or wheelchair van.<br>Excessive time was noted in the off-load zone decreasing system response capacity. Off-load times should be measured to 20 minutes 90% of the time. |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Develop/maintain coordinated disaster plans. | D | Plans exist but do not address surge capacity; currently there is limited surge capacity for mass casualty, multiple patient events as off-load times are consuming the system capacity. |

## Findings

There is no coordinated method for handling patient transfers. Transfer coordination comes from each hospital without a coordinated method to ensure the right patients is matched with the right resource. Although 47 percent of the response volume is related to the interfacility transport system, an ALS ambulance is the only method for deployment. Patient transports should be arranged utilizing the proper resource type such as wheelchair or car services, a multi-patient transport bus for long-distance transports, or BLS ambulances. Furthermore, there is no Province wide hospital bed management. Staff explained how specialty beds are unused and hospital closures occur without planning and coordination for patient distribution. This creates delays in patient discharge as patients are moved from the emergency department to an in-patient bed. Having a "transfer centre" to coordinate Province-wide bed management would improve throughput and enhance patients flows to ensure the right patient, in the right facility, and when required, transported in the right mode.

Current response times and management zones are based on three categories as they relate to urban, suburban, and rural areas. Response times related to the categories were then determined in 2009. There have been no adjustments to the management zones or categories in the decade since 2009.

The current response time expectations do not align with the current call density and the relative risk. EMC's unadjusted fractile response times do not meet contract expectations of 8:59 mm:ss at the 90$^{th}$ percentile. The current response time performance is 13:98 mm:ss for emergency 911 calls, while the contract calls for performance at 8:59 mm:ss. Attachment A indicates several drive time maps of the current system of staffing to demand, whereby EMC can meet response times of 14:59 mm:ss.

The drive time mapping analyses provide two distinct conclusions:

1. EMC cannot meet the 8:59 mm:ss expectation from the current station locations, even if off-load delays did not occur. Current station locations need to be optimized.
2. The current performance can be achieved with significantly fewer resources than are currently scheduled on the road. This means that reinvestment in other program areas can occur from reallocation of dollars.

Expanding on the second conclusion, it is clear that the population of Nova Scotia has accepted the current response time (what is achieved is not what is prescribed). The literature does not

correlate response times with outcomes in most cases. This means that the Province is better served reallocating resources in better medicine under the EMC umbrella, rather than investing in resources in an unsupported response time.

Within each of the four regions, an evaluation was completed comparing current staffing to demand without the correction off-load times, against staffing to demand with corrected off-load times. With corrected off-load times, each region had improved capacity. Patient off-load delays at hospitals are estimated to unnecessarily tie up ambulances for the equivalent of 13.5 12 hour shifts. This diminishes EMS surge capacity during high-demand periods or mass casualty events.

Major maintenance issues with the EMC fleet are handled at a fleet maintenance shop located in Halifax. This shop operates 24 hours a day, seven days a week. A second shop that operates 12 hours a day, seven days a week is located in Cape Breton. Generally, EMC will plan maintenance 24 hours in advance and pull units out of service when they transport near to one of the facilities. However, with such a large territory and only two maintenance shops, it is inevitable that units will be deadheading (traveling without a patient) to or from the shop.

redacted

. However, most large systems strive for a coverage factor of at least 120 percent. A larger reserve fleet allows for more efficient scheduling for maintenance, reduces unnecessary deadheading of units for maintenance, and provides for fleet depth in the event of a major incident or disaster.

Within the current contract, there is no language that formalizes how fleet challenges should be addressed and new vehicle designs could be adopted. However, EHS has established working groups comprised of members from EMC and the contracted fleet vendor Tri-Star, to discuss leasing of new vehicles and fleet maintenance challenges. The Province should add language in the next contract that formalizes the workflows between the EMS contractor, the fleet vendor and the province.

Currently, the Nova Scotia fleet is not fully outfitted with power stretchers and Commission on Accreditation of Ambulance Services (CAAS) standard mounting brackets.[16] Research by agencies has seen a significant reduction of back injuries as it relates to the lift and moving of patients following the institution of power stretchers. Three specific studies were completed following the implementation of power stretchers that showed the percent injury reduction and the cost-benefit return on investment (ROI): Niagara Ontario showed a 78% injury reduction and

[16] http://www.groundvehic estandard.org/wp-content/up oads/2016/03/CAAS-GVS-v.1.0-Fina -3-28-16.pdf

an ROI of 5.8 years, Winnipeg Manitoba showed a 71% injury reduction and an ROI of 3 years, and Austin Texas showed a 52.9% injury reduction.[17] [18] [19]

For the Nova Scotia Province, the Workers Compensation Board (WCB) sets the fees. These are calculated based on a Basic Industry Rate +/- Experience Rating Adjustment (+/- 30% of basic industry rate based on cost ratios of prior 3 years). If the 30% rate was fully captured in 2018 and 2019, a rate difference of redact and redact, respectively, could have been captured in injury avoidance. This would have resulted in an annual cost avoidance of redact and redact million, respectively. In 2018, EMC completed an internal evaluation and reported that total workers compensation claims were $5.08 for every $100. Of the $5.08 approximately 52.9% or $2.69 for every $100 could be attributed to patient movement injuries. Estimating that reda of patient movement injuries could be avoided, annual costs estimated at redacted would also be avoided. Furthermore, and not factored into this calculation when responders are side-lined due to injuries, other personnel must cover the position either through overtime or the hiring of additional "relief" staff. There is also the human cost of injuries to be considered. Lingering (and avoidable) life-time injuries are also likely contributors to personnel turnover.

The cost of a power stretcher and power lift system (PLS) combination is approximately $45,000. To institute these throughout the 139 unit fleet would cost approximately $6.3 million. Based on the Nova Scotia Province 30% rate, EMC calculated that the ROI for purchase of the PLS could be expected in reda years and based on the WCB of Nova Scotia, the ROI could be expected in reda years as shown in Figure 24. However, pending on purchasing timelines and implementation, the ROI timeline could be extended.

**Figure 24. Workers Compensation Calculations**

| | Based on EMC Internal Review | Based on 2018 WCB Policy | Based on 2019 WCB Policy |
|---|---|---|---|
| Rate | $ 5.08 | red | red |
| Rate Change | 52.90% | 30% | 30% |
| Rate D ffe ence | $ redacted | | |
| Pe cent Change/$100 | | | |
| Assessab e Pay o 2019 est | $ | | |
| Potent a Cost Avo dance | $ | | |
| | | | |
| Powe ft St etche s | $ 45,000 | $ 45,000 | $ 45,000 |
| eet | 139 | 139 | 139 |
| Cost St etche s | $ 6,255,000 | $ 6,255,000 | $ 6,255,000 |
| | | | |
| Retu n on nvestment n Yea s | red | | |

[17] Armstrong D.P., Ferron R., Tay or C., et a . "Imp ementing powered stretcher and oad systems was a cost effective intervention to reduce the incidence rates of stretcher re ated injuries in a paramedic service. *Applied Ergonomics.* 2017; 62: 34-42.

[18] Debreui , C. Safe C ient Hand ing and Power Stretcher Tria Fina Report. 2015. Southern Hea th, Manitoba Canada.

[19] Studnek, J.R., Mac Crawford, J., Fernandez, A.R. Eva uation of occupationa injuries in an urban emergency medica services system before and after imp ementation of e ectrica y powered stretchers. *Applied Ergonomics.* 2012; 43(1): 198-202.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 25.

**Figure 25. Operations and Medical Transportation - Recommendations**

| Recommendations — |
| --- |
| ▪ Add language within the EMS contract for fleet maintenance and leasing that formalizes the workflows for handing new vehicle designs and maintenance challenges.<br>▪ Modify CAD to track out of service unit hours to better measure lost capacity due to vehicle movements.<br>▪ Ambulance reserve ratio should be increased redacted to at least 120%.<br>▪ With the introduction of new or expanded programs, such as the ECP program, SUVs would be added to the fleet and ambulances used previously for deployment could be placed in reserves thereby expanding surge capacity.<br>▪ Forty-seven percent of all transports are IFTs; 98% of those are considered basic level care; some portion of these patients could be handled by alternative transport modes based on medical necessity.<br>▪ Implement the power stretchers with the power lift system to reduce provider and patient injuries. |

## Medical Accountability

## Benchmarks

- Single point of physician medical direction for entire system.
- Written agreement (Job description) for medical direction exists.
- Specialized Medical Director training/certification.
- Physician is effective in establishing local care standards that reflect current national standards of practice.
- Proactive, interactive and retroactive medical direction is facilitated by the activities of the Medical Director.
- Patient Care Report/Quality Improvement ("PCR/QI") data transparency for MD review.
- Clinical Education/Development Effectiveness and Efficiency.
- Quality assurance and other clinical performance data is shared and transparent.

## Description of Best Practices

There is clearly defined legal authority and responsibility for the medical direction within the EMS system. There is a clear-cut organization of information flow, authority, and responsibility for clinical governance and medical direction from the regional level through the individual service level.

The lead agency oversees and enforces all clinical practices utilizing well-defined standards, policies, procedures, and authority. It employs a documented, effective system of performance improvement which has specific points of integration with, and separation from, EMS agency, facility, and personnel disciplinary and other licensure/certification/permissions actions. It is well coordinated with the medical direction for the larger system.

Operationally, medical direction occurs proactively, interactively, and retrospectively. Detailed job descriptions guide the Medical Director's responsibility and EMS physicians have received specialized training equivalent to that sanctioned by the International Committee of the (USA) National Association of EMS Physicians.

Physician directed clinical education for the system is coordinated and managed effectively and efficiently. A comprehensive clinical quality assurance program is in place that incorporates proactive, interactive (in field), and retrospective elements. The Medical Director has complete access to patient care records and uses data from those records to develop and guide an effective, up-to-date clinical education program that reflects actual needs.

## Benchmark Comparisons

Figure 26 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 26. Comparison of Nova Scotia Medical Accountability with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Single point of physician medical direction for entire system. | D | There are designated primary and multiple secondary Medical Directors; 1st responders have access to Medical Directors as needed. |
| Written agreement (job description) for medical direction exists. | D | Yes, written contracts. |
| Specialized Medical Director training/certification. | D | |
| Physician is effective in establishing local care standards that reflect current national standards of practice. | D | |
| Proactive, interactive and retroactive medical direction is facilitated by the activities of the Medical Director. | PD | Need to develop *process outcomes* (the link between EMS protocols and appropriate treatment methods with measurable performance) and *system outcomes* (link between hospital outcomes and EMS treatments with measurable performance) and include language in the upcoming contract for the Medical Director and |

| | | |
|---|---|---|
| | | all system providers. |
| PCR/QI data transparency for MD review. | PD | Currently, not transparent as QI program was handed over to contractor. MD is not able to function as the regulator and or facilitator. |
| Clinical Education/Development Effectiveness. | D | Moving forward, the system should align education with process and system outcomes to enhance clinical delivery. |
| Quality assurance and other clinical performance data is shared and transparent. | | Software such as FirstPass by FirstWatch would create a transparent workflow. This software would help automate process and system outcome measures. |

## Findings

The current system focus on response time performance does not necessarily incorporate patient outcomes. The system uses response times as a surrogate measure for clinical measurement, which ultimately should be patient outcome and well-being. As medical tracking systems advance, more emphasis needs to be given to the clinical perspectives and less to response time metrics. Clinical outcome improvements are the result of focusing on medical provider's conformance to clinical protocols and procedures, along with robust quality improvement programs. Currently there is no transparent quality oversight between the Provincial Medical Director and EMC. Finally, the current contract does not have specific clinical language as it relates to outcomes or clinical performance.

There is no software that automatically flags documentation or protocol deviation. Contract language should be adopted to ensure that the Provincial Medical Director has full oversight of QA program. Software should be adopted such as FirstWatch's FirstPass program that automates review of documentation and protocol compliance giving the Provincial Medical Director final review for QA.

As health information systems progress such that they tie EMS performance to hospital data that evaluates patient outcomes, EMS will need to progress into measuring its clinical processes to improve patient outcomes. Access to system outcomes and EMS treatments are currently unavailable due to lack of a full data connection between EMS and patient data. However, process outcomes can be managed contractually to improve overall patient outcomes. Process outcomes as described in Figure 27, should be adopted within the next contract to begin aligning operations and clinical performance measures that ensure that the contractor is providing appropriate clinical care.

To provide a robust ECP model, paramedics from the ECP units and ambulances should utilize telemedicine to connect the patient to a physician. This connection could be established by a

secure weblink, provided by the on-location EMS provider, connecting to the physician. EMS providers would utilize protocols set by the Provincial Medical Director to determine when a physician-to-patient telemedicine conference is required. The physician can help with patient treat-in-place protocol, alternative destination decisions, or the approval for patient scheduling of treatment at a later date and time. The physician that is providing the service could be staffed utilizing one of three methods.

In the first method, the physician could be located within the EMS dispatch centre. In this situation, the physician would assist with telemedicine and help the ECN; they would complete follow-up for patients that were seen by the ECP or part of a community paramedic program for recently discharged patients. The physician would help EMS when arranging critical care transports with outlying community hospitals creating a physician-to-physician dialog. The physician's cost would be covered by the Province for the time they are working with the EMS contractor. One a concern may be with labour relations as the physician would be working in the dispatch centre but is not part of the current labour staff.

The second method involves a dedicated/delegated model whereby the physician is located within a hospital transfer centre. The primary role would be for EMS telemedicine consults, but they could perform other duties such as discharge patient follow-up or consult with outlying hospitals when arranging a critical care transport. Currently, the Province does not have a transfer centre however if the province and/or NSHA began utilizing a transfer centre, this approach would be a viable option.

In the third method, the physician would be on-call and answer telemedicine calls when needed. This would allow flexibility for the physician and still provide the telemedicine services that are needed. The Province would need to ensure proper workload balance and that salaries are distributed appropriately for actual worked time. Key Performance Indicators (KPIs) should be established if working off-site to provide transparent and actual worked time.

Hospital census data and real time information regarding bed counts and ED status are not available and not coordinated which causes ongoing inefficiencies in ambulance deployment.

As community paramedicine programs expand, the Provincial Medical Director will need to provide oversight to facilitate the potential for alternative pathways for treatment.

Software is available that can automate much of the QI process, but it is not fully implemented in the EHS system.

The system Medical Director is working towards process outcomes and system outcomes. The Medical Director provided the following information in Figure 27 that indicates progress in this area.

**Figure 27. EHS Progress Toward Process and System Outcomes**

| | Subgroup | Structure: People | Structure: Equipment | Structure: Education | Process: Policy | Process: Procedure | Intra-system | Inter-system | Patient Safety Outcomes | Patient Quality Outcomes | Patient Satisfaction Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10. Chest Pain / Chest Discomfort (Non-Traumatic) | General | [1] licensed/registered paramedic staffing (100% fractile); [2] responding crew configuration of two paramedics (100% fractile) | [1] Functioning monitor/defibrillator available for patient >99% fractile; [2] full EHS formulary available for patient >99% fractile | [1] 'up-to-date' trained crews >95% of the time | [1] Charting compliance >95%; [2] Overall protocol compliance > 95%; [3] Overall policy compliance (e.g. no transport cases) > 95% | [1] Procedure compliance > 95% | [1] ePCR reconciliation rate > 98% | [1] ePCR copy provision to receiving centre within recovery interval > 95%; [2] alternative disposition to transfer arrangements TBD | [1] No One Brought In (NOBI) relapse to EHS < 10%; [2] post NOBI compliance of discharge plan TBD | | |
| | COMM Centre | | | | [1] COMM centre documenting chest pain onset 95% fractile; | | | [1] COMM centre provision of PAI for ASA administration | | [1] Interfacility STEMI transfer for PMC to PCI < 120 min 95% of the time | |
| | Nonischemic | | | | [1] Paramedic documenting FMC onset 95% of the time; [2] paramedic documenting CP onset 95% of the time | [1] 99% ECG reconciliation rate with ePCR | | | | | |
| | Ischemic | | | [1] Up to date ischemic CPG education compliance of responding crews > 95% fractile | [1] Paramedic documenting FMC onset 95% of the time; [2] paramedic documenting CP onset 95% of the time; [3] documentation of CV triad status (ischemia, CHF, dysrhythmia) > 95% fractile | [1] 99% ECG completion rate with ischemic chest pain CPG; [2] 99% ECG reconciliation rate with ePCR | [1] FMC to ECG < 10 min 95% of the time; [2] Time to and proportion of appropriate ASA administration; [3] Time to and proportion of appropriate anti-ischemic | | | [1] Appropriate management of dysrhythmias and CHF components of ischemic event | |
| | STEMI: BLS | | | [1] Up to date STEMI CPG education compliance of responding crews> 95% | [1] Paramedic documenting FMC onset 95% of the time; [2] paramedic documenting CP onset 95% of the time | [1] 99% ECG completion rate with ischemic chest pain CPG; [2] 99% ECG reconciliation rate with ePCR; [3] Reperfusion checklist completion >95% fractile; | [1] ALS intercept (secondary fibrinolysis) vs ED transfer determination >95% fractile; [2] FMC to anti-platelet Rx < TBD | [1] Prehospital identification and notification of patient arrival > 95% fractile; [2] ED-TNK < 30 min within ED arrival; [3] prehospital cath lab activation if within catchment area >95%; [4] FMC to PCI < 90 min > 90% | [1] Activation of lifeflight for cardiogenic shock STEMI cases >95%; [2] Appropriate management of dysrhythmias and CHF components of ischemic event | [1] 30d survival; [2] rescue PCI rate & time to transfer TBD; [3] pharmacoinvasive rate and time to transfer TBD | |
| | STEMI: ALS | | | [1] Up to date STEMI CPG education compliance of responding crews > 95% | [1] COMM centre documenting chest pain onset 95% fractile; [2] Paramedic documenting FMC onset 95% of the time; [3] paramedic documenting CP onset 95% of the time | [1] 99% ECG completion rate with ischemic chest pain CPG; [2] 99% ECG reconciliation rate with ePCR; [3] Reperfusion checklist completion >95% fractile | [1] FMC to ECG < 10 min 95% of the time; [2] STEMI CPG protocol compliance 99% of the time | [1] ECG to decision < 10 min 95% of the time; [2] Decision to TNK < 10 min 95% of the time; [3] FMC < 30 min 95% of the time; [4] FMC to PCI < 90 min 95% of the time (depends on PCI related time delay) | [1] Appropriate management of dysrhythmias and CHF components of ischemic event | [1] TIMI-III blood flow in ????; [2] failed lysis rate TBD; [3] re-infraction rate TBD; [4] aborted MI rate | [1] Adequate consent for prehospital fibrinolysis (assessment of autonomy, capacity, disclosure, comprehension) of the patient >95% |

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 28.

**Figure 28. Medical Accountability - Recommendations**

| Recommendations — |
| --- |
| ▪ Medical Director could lead an effort to develop medical necessity guidelines for ambulance use to avoid inefficient use of ambulances for patient transfers.<br>▪ The Province needs to develop a system to manage ED closings in the same manner as other Provinces.<br>▪ Develop a strong information connection between EMS and hospitals to understand outcomes in a timely manner.<br>• Add software to automate the quality improvement ("QI") processes allowing for transparency between the contractor and the Provincial Medical Director.<br>• redacted<br>▪ Construct the new contract to align processes with improved outcomes.<br>• System outcomes should be considered in the following contract once an established data connection is developed between the EMS contractor and all hospitals.<br>• Medical necessity and resource type criteria should be set by the Provincial Medical Director. |

## Customer/Community Accountability, Legislation and Regulation

## Benchmarks

- Legislation and/or policy authority to provide service and written service agreements are in place.
- Units and crews have a professional appearance.
- Formal mechanisms exist to address patient and community concerns.
- Independent measurement and reporting of system performances are utilized.
- Internal customer issues are routinely addressed.

## Description of Best Practices

In an optimal system, a single lead agency is statutorily charged with the comprehensive leadership, development, and regulation of the Emergency Medical Services System. It has developed the system based on an accountable system of clinical care and operational processes and has the authority and funding to lead these efforts. It utilizes a multi-disciplinary, broadly representative, stakeholder body, and committee structure in the oversight of the

system. The statutory regulations are evaluated and adjusted to the new realities for healthcare ensuring patient access and treatment. Newer regulations are beginning to address population health with community specific legislation which allows for treatment in place and transporting to alternative destinations.

At the operations level, community and customer accountability involves developing administrative processes to ensure that patient and community (external) concerns are addressed in a timely fashion. Written agreements, where necessary, are clear, up-to-date, and regularly reviewed. Internal customer issues (employees, staff, co-responders, other public safety agencies, health care facilities) are routinely benchmarked and addressed in a timely fashion. Units and crew members present a positive and professional image to the public on behalf of the system. Independent measurement and reporting of system performance are regularly conducted, published, and utilized to guide the service provider's decisions. The system participates with and is responsive to a wide variety of community stakeholders.

## Benchmark Comparisons

Figure 29 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 29. Comparison of Nova Scotia Customer/Community Accountability with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Legislative/policy authority to provide service and written service agreements are in place. | D | Currently, ambulances can only transport to Emergency Departments; the emerging best practice is to allow alternative destinations such as CEC, stand-alone Emergency Departments, and primary care. Need to add language to existing policies or regulations to allow for transport to facilities other than hospital Emergency Departments. |
| Units and crews have a professional appearance. | D | Crews are professional; recent wage issues have frayed relationships. |
| Formal mechanisms exist to address patient and community concerns. | PD | EMC has a database to track complaints and follow-up. There is an EHS policy and language in the contract, however, all parties are not aligned in the process. Should outline expectations with a new contract. |
| Independent measurement and reporting of system performance are utilized. | D | Need to establish a baseline percentage of customers surveyed by an independent third party or approved internal process and include a satisfaction level in the provider's |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| | | contracts. |
| Internal customer issues are routinely addressed. | D | Employee unions report good working relationships with management; personnel safety and off-load times are priority issues. |

## Findings

With the coming expansion of EMS services into the community, policy and legislation changes will be required to allow paramedics to operate to their full scope of practice. Current legislation and policy do not allow the EMS system to transport patients to alternative treatment destinations, treat in place, and/or utilize other transport modes. Regulations and policy should be adjusted allowing for EMC to evaluate patients on scene, via the traditional ambulance model and the ECP model, and patients either treated in place or transported to the appropriate destination. This destination could be a CEC, stand-alone ED, Urgent Care facility or Primary Care Physician.

By instituting this policy, low-acuity patients that make up between 30 to 75 percent of the total 911 transports, could be treated outside the emergency departments. This would help decrease off-load delays and overcrowding within the emergency department.

Modes of transport should be added within policy and regulations to ensure the right mode of transport for the right patient. The NSHA should be ordering resources based on "medical necessity" defined as ensuring that the right mode of transport is dispatched for the right patients such as car service, wheelchair van, BLS ambulance, or multi-patient bus. The Provincial Medical Director should help set policy for both NSHA and EMC to follow.

Currently, EMC tracks complaints and how they are addressed, but within the EHS policy and the EMS contract there is language on Provincial notification of complaints. EHS and EMC appear to have a misalignment of the process for notification of complaints and how they are addressed.

To address community concerns, best practice agencies utilize a proactive mechanism to obtain customer feedback. These agencies utilize a third-party customer service company to evaluate provider's performance through the patient's eyes. Customer service companies such as the Baldridge Group or EMS Survey can conduct surveys and provide feedback of provider performance. The provider should ensure that customer satisfaction is at the highest levels. If a patient provides a negative satisfaction survey answer, the contractor should be notified by the survey company and provide follow-up with the patient and crews on the issues identified. Any negative survey answer from the patient should be provided to the Province monthly outlining the issues and the contractor's follow-up action(s).

Moving forward, EMC monthly reports should include complaints received and complaint resolutions. EHS should also require in the next contract that the provider use a third-party customer survey company and randomly require a minimum of five percent of patient contacts be evaluated and reported monthly. The contract should be held to a minimum of 95 percent compliant to top tier patient satisfaction.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 30.

**Figure 30. Customer/Community Accountability - Recommendations**

| Recommendations — |
| --- |
| ▪ Adjust policies and/or legislation to allow EMS to treat in place, transport to alternative destinations, and/or use different transport modes.<br>▪ A medical necessity process should be established to ensure NSHA and EMC utilize the appropriate resource for patient transport.<br>▪ Introduce policy and legislative changes to allow for different modes of treatment and transportation as well as expanded scope of practice as needed.<br>▪ Realign the customer complaint process to ensure transparency between EMC and EHS on handling of complaints.<br>▪ Add a third-party customer service survey company to evaluate provider performance and report monthly. |

## Prevention and Community Education

## Benchmarks

- System personnel provide positive role models.
- Programs are targeted to "at risk" populations.
- Formal and effective programs with defined goals exist.
- Targeted objectives are measured and met.

## Description of Best Practices

In best practice systems, consumers expect seamless integration throughout the continuum of healthcare from prevention and primary care initiatives, first response and EMS systems to emergency departments, hospital admission and patient discharge. The EMS system should facilitate those goals to the maximum extent possible. There is a written descriptive, graphic, and tabular comparison of the *top ten* leading causes of emergent illness/injury death using local, regional, and country-wide data. An attempt is made to compare data to facilitate EMS system improvement efforts.

Collaboration exists between the EMS system and public health leaders to complete emergency illness/injury risk assessments. The system works with public health authorities to identify emergency illness/injury at-risk populations. In addition to risk assessments for age and cultural/ethnic cohorts, geographic distribution of emergency illness/injury within the EMS system is analyzed.

EMS system leaders are engaging policy makers in discussion about emergent illness/injury prevention and EMS. Examples are evident of media awareness and media messaging targeted at emergent illness/injury prevention activities. The EMS lead agency has developed or adopted community outreach informed, self-determination program to help communities determine the type of local EMS system and level of public cost they prefer.

The EMS lead agency routinely distributes public information education and relations support. This program raises the profile of the agency and emergency illness/injury prevention efforts in the community and enables agency leaders to explore opportunities to become involved in directly meeting preventive health, primary care, and other needs in the community. The efforts strengthen the clinical base and response capabilities of the agency. Community CPR and automatic external defibrillator access programs are delivered regularly. These programs are specific, measurable, and have targeted outcomes that are measured and met, or modified for improvement.

## Benchmark Comparisons

Figure 31 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 31. Comparison of Nova Scotia Prevention and Community Education with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| System personnel provide positive role models. | D | Interaction with social media is robust and positive. |
| Programs are targeted to "at risk" populations. | D | Community paramedic programs (CPP) are based on local concerns and community needs; current programs could be expanded to include in-home safety assessments, hospital discharge support, medication checks, in-home telemedicine PCP check-up, assist with appointments for alternative doctor visits, mental health assessments, and low-acuity 911 response. Metrics will need to be developed to measure success. Include Public Health agencies in the |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| | | program development. |
| Formal and effective programs with defined goals exist. | PD | Measurable process and system outcomes must be defined as part of program expansion. |
| Targeted objectives are measured and met. | D | |

## Findings

The Nova Scotia health system provides several programs that are targeted to vulnerable populations. These include the Special Patient Program for persons with complex or rare illness or injury that requires specific medical protocols. The program manages approximately 4,000 patients across the system and provides paramedics with quick access to information about the specific needs of these patients. There is a Mental Health Mobile Crisis Team available 24/7. In addition, Mobile Integrated Healthcare programs are developing slowly and will be the key to more efficiencies in the future.

In addition to programs targeted to at-risk populations, EMC currently supports a community paramedic program and utilizes Extended Care Paramedics ("ECP"s) to complete in-home patient checks and treatments. In 2018, ECPs handled 1,586 responses to patients. The program uses one ECP responding in a single vehicle. The program was recently expanded to in-home treatments addressing falls and in-home hospice monitoring. Currently, ECPs do not handle low-acuity 911 responses.

Key to further expanding this program is the introduction of Emergency Communication Nurses (ECNs) into the Communications Centre to handle clinical assessments. As low acuity calls come into the centre they can be first evaluated by an ECN to determine the right resources to utilize.

The ECP models can be expanded for the community paramedic program (CPP) focusing on local concerns of the community. In review of EMC data, programs can be developed to address specific patient populations. An example is that falls consume 12.6 percent of the total call volume and is number two behind the general sick person. The number three and four most frequent calls are breathing problems and chest pain, making up a combined 16.1 percent of the total volume. Rounding out the tops six call types are transfer/interface/palliative care with 6.3 percent and mental illness at 6.2 percent. The ECP program can be expanded for programs such as in-home safety checks, hospital discharge support, medication checks, in-home telemedicine PCP check-up, assist with doctor's office scheduling, mental health assessments, and low-acuity 911 response. The CPP responses can be adopted for both the ECP and ambulance models as the ambulances should be able to complete some portions of the ECP model to address low-acuity 911 responses and in-home checks with telemedicine capabilities.

An Automatic External Defibrillator (AED) Registry provides a map with addresses locating AEDs held by individuals or companies, as well as those residing with Medical First Responders. As of March 13, 2019, there are 527 registered AED, 209 of which are held by Medical First Responders.

Research indicates that people have the highest chance of survival of a sudden cardiac arrest if CPR and AED is initiated early in the event. EHS has taken an active role to develop programs and produce informational videos for social media, teaching citizens the importance of CPR and how to use an AED. Opportunities exist to improve public awareness, education, and capabilities by mandating CPR education as a condition of high school graduation. Over time, this will increase the public's awareness, capabilities, and opportunities to intervene in the event of a cardiac arrest.

Currently, Narcan, a drug used to reverse exposure to opioids, is distributed to police personnel but utilized only in the event of a police officer exposure. At times, an officer may be the first on scene of a medical event where an overdose has occurred and where Narcan could be utilized to save a life. The Province should expand policy to allow police officers to deliver Narcan to patients. EMC could assist with education and replace used Narcan on a one-of-one exchange.

Moving forward, process outcomes and system outcomes should be measured monthly. For the CPP program, metrics need to be developed to show overall system improvement.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 32.

**Figure 32. Prevention and Community Education - Recommendations**

| Recommendations — |
| --- |
| ▪ Launch education programs regarding the changes anticipated with community paramedicine and alternative transport destination programs.<br>▪ Seek to involve and train police in the basic first aid and Narcan programs.<br>▪ Implement robust CPR and basic first aid programs in schools as a requirement for graduation.<br>▪ Integrate ECN, CPP and ECP programs with the several Provincial programs that currently address at-risk populations. |

## Governance, Leadership and Human Resources

## Benchmarks

- A lead agency is identified and coordinates system activities.

- Organizational structure and relationships are well defined.
- Human resources are developed and otherwise valued.
- Business planning and measurement processes are defined and utilized.
- Operational and clinical data informs/guides the decision process.
- A structured and effective performance-based quality improvement (QI) system exists.

## Description of Best Practices

In best practice systems, a single lead agency is legislatively charged with the comprehensive leadership, development, and regulation of the Emergency Medical Service System.

Organizational governance, structure, and relationships are well defined. Human resources are developed and otherwise valued. Internal processes are designed to facilitate achievement of performance with due regard for effective development, involvement, and motivation of personnel at multiple levels within the organization. The agency assures an on-going needs assessment for areas of personnel shortage, trends in personnel utilization, and generalized health or safety issues. The agency has either documented that no significant workforce or provider agency management issues exist as a result of the needs assessment.

Agency leaders have established measurable program goals and outcome-based, time-specific, quantifiable, and measurable objectives that guide system effectiveness and system performance. Clinical outcomes and patient experience are clear drivers in the organization. Business planning and measurement process are defined and utilized. An internal or external examination of the EMS system, including a performance and needs assessment, is performed every three to five years.

Operational, clinical, financial, human resources, and other data is used to guide decision-making. Comprehensive annual reports on the status of the EMS system including the effectiveness of all subsystems routinely report system data and performance measures. A structured performance/quality improvement (QI) system exists and addresses administrative as well as clinical issues. The EMS lead agency maintains clear procedures for enforcing personnel compliance with laws, regulations, and policies pertaining to provider licensure/certification.

## Benchmark Comparisons

Figure 33 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 33. Comparison of Nova Scotia Governance, Leadership and HR with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| A lead agency is identified and coordinates system activities. | PD | Contract outlines performance but there is no validation or oversight verification of the data. A 3rd party data verification company or process should be utilized. |
| Organizational structure and relationships are well defined. | D | Yes. |
| Human resources are developed and otherwise valued. | D | Field employees are currently unhappy about a several year wage freeze. Recruitment of medics is a challenge. There are three collective bargaining groups under EMC with various operational restrictions. |
| Business planning and measurement processes are defined and utilized. | PD | The contract needs to be specific regarding performance metrics and financial arrangements. |
| Operational and clinical data informs/guides the decision process. | PD | Process outcomes should be included within the next contract. System outcomes should be included once a single data repository is set up for all hospitals, and metrics can be defined that EMS controls. |
| A structured and effective performance based quality improvement (QI) system exists. | PD | Develop process for contractor to review clinical performance and MD to have final review for defined treatments outside protocols; potentially implement technology such as FirstPass for transparent QI. |

## Findings

The organizational structure and relationship between EHS and EMC are well defined and provides good value. EMC appears to be good stewards of the Province with both compliance to the contract, operational performance, and financial accountability. EMC provides reports to the Province monthly in accordance with the contract. However, beside their reports, there is no independent verification of the reports provided.

There is no software implemented that shows the real-time performance of EMC for EHS. This hinders the Province's oversight of the contractor. EHS should implement a big data source, such as FirstWatch, to monitor real-time operational and clinical performance. EHS should review reports to determine if monitoring through triggers, or the utilization of FIrstWatch's Online Compliance Utility ("OCU"), should be adopted to independently monitor monthly performance. This independent monitoring evaluates all calls and exemptions, and independently reports performance monthly to the contract holder.

During the next contract cycle, operational and clinical performance measures should be established to align with current performance while adding clinical performance measures to the contract. Performance measures should be updated to the following:

redacted

To ensure clinical measures are being performed appropriately by the contractor, software should be established to transparently monitor process outcomes. The FirstWatch program called FirstPass, can automatically review the EMR evaluating for correct documentation and protocol deviations. Deviations can be evaluated using an established process flow from the EMC to EHS Medical Director for final review. This allows for Provincial oversight, transparency with addressing clinical concerns, and education programs to be established improving overall patient care.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 34.

**Figure 34. Governance, Leadership and Human Resources - Recommendations**

| Recommendations — |
| --- |
| ▪ Establish FirstWatch OCU and FirstPass software to independently monitor both operational and clinical performance of the contract.<br>▪ Align new operational performance standards, as mentioned, to the redacted for each category and give a redacted if all process outcomes are completed and redacted<br>▪ redacted<br>▪ Address field personnel safety issues to include stretcher safety/injuries and excessive personnel overtime.<br>▪ The next EMS contract should outline the expected relationship and workflow with fleet maintenance and leasing of vehicles for the contractor as it relates to the Province and fleet manufacture. |

| Recommendations — |
| --- |
| ▪ Update and continue to provide annual reports to the public.<br>▪ Any new contract should clearly state intentions and be well documented so that a historical record is available for future years. |

## Ensuring Optimal System Value

## Benchmarks

- Clinical outcomes are enhanced by the system.
- Ambulance Response Utilization and transport utilization ("UHU") are measured and hours are deployed in a manner to achieve efficiency and effectiveness.
- Ambulance cost per unit hour and transport document good value.
- Service agreements represent good value.
- Non-emergency ambulance service is effective and efficient.
- System facilitates appropriate medical access.
- Financial systems accurately reflect system revenues and both direct and indirect costs.
- Revenues are collected professionally and in compliance with regulations.
- Subsidies, when required, are minimized.

## Description of Best Practices

In a best practice system, in addition to financial measures, it is recognized that the term "ensuring optimal value" includes clinical and customer satisfaction outcomes that are enhanced by the EMS System.

The governing body identifies and appropriates sufficient infrastructure funding from general funds, insurance recoveries, and other non-lapsing sources for the EMS system to function in a manner consistent with its legislated mandates. Unit Hour Utilization (UHU) is measured and resources are deployed in a manner to achieve efficiency and effectiveness. Cost per unit hour, per transport, and per capita are both measured and document good value for money. Financial systems accurately reflect system revenues and direct and indirect costs.

Financial data are routinely derived from the EMS data, insurers, emergency department, hospital discharge, death certificate and rehabilitation data, and along with data on general EMS infrastructure costs. All are used to assess cost/benefit of the system. A method exists to investigate, diagnose, and intervene in any identified problems. The EMS service provider's financial systems accurately document costs, and revenues are collected professionally and in compliance with regulations. Subsidies are managed according to system needs and funds are managed appropriately to ensure funding impacts to taxpayers are minimized.

Non-emergency and non-ambulance medical transportation services are evaluated and meet community standards. The system facilitates appropriate medical access by transporting patients to appropriate facilities capable of caring for specific conditions by the appropriate modes of transport. A systems approach is used to ensure the appropriate transport resource is utilized for the right patient. Finally, there is coordination with health authority partners to coordinate transport to ensure timely discharge while utilizing proper resources that are cost effective.

## Benchmark Comparisons

Figure 35 summarizes best practice benchmarks, notes whether the benchmarks are documented (D), partially documented (PD) or not documented (ND) in the EHS system.

**Figure 35. Comparison of Nova Scotia Ensuring Optimal System Value with Benchmarks**

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| Clinical outcomes are enhanced by the system. | PD | Need to develop contractual system and process outcome goals. Change contract/regulation to enhance OMD oversight. |
| Ambulance Response Utilization and transport Utilization (UHU) is measured and hours are deployed in a manner to achieve efficiency and effectiveness. | D | redacted All calculations need to be documented in the contract and allow for specific incremental changes. |
| Ambulance cost per unit hour and transport document good value. | D | redacted |
| Service agreements represent good value. | D | Include alternative destination for non-critical patients (low CTAS scores). Contract value can be enhanced by utilizing alternative destinations; metrics to improve hospital off-load times; single hospital transfer centre arranging transports for all hospitals within the Province and documenting for data analysis and coordinated bed management for patients; utilization of NET demand smoothing principles by the transfer centre and EMC dispatch. |
| Non-emergency ambulance services are effective and efficient. | PD | A patient transfer centre is needed. System should include wheelchair |

| Comparison to Benchmarks | Status | Comments |
|---|---|---|
| | | vans that are specific to only wheelchair transports and are staffed with one person (non-paramedic). The system could add a car service, coordinated via the transfer centre or EMS ; it can be an EMS or hospital-owned service. A multi-patient transport unit, such a small bus, could be used to transport a number of patients at once. This could be used locally or for long distance transfers picking up multiple people. I.E. Cape Breton to Halifax. Automation of scheduled transports should be considered with new software. Potential private partnerships with other third-party transport mediums such as taxi agencies. |
| System facilitates appropriate medical access. | D | Access is mainly via 911, needs the ability for alternative response modes, alternative destination transports, or in-home care. |
| Financial systems accurately reflect system revenues and both direct and indirect costs. | D | There is limited controller oversight as EMC provides information without EHS having independent verification |
| Revenues are collected professionally and in compliance with regulations. | D | redacted |
| Subsidies when required are minimized. | D | Yes, however need to ensure that marginal costs are the basis for unit reinvestment. |

## Findings

**Current operations have become challenged with emergency department overcrowding and the increased demand for service related to the EMS system. Furthermore, policies have not been**

changed to allow EMS to transport to alternative destinations or treat with in home care allowing for paramedics to operate at their full scope of practice and distribute patients to locations other than the emergency department. These challenges have resulted in an increased staffing of ambulances to overcome volume burdens and emergency department overcrowding.

To ensure the EMS contract provides value for the next 10 to 15 years, changes starting with the call intake through operational deployments will be required. Addressing these areas independently will not have the full effect but can singularly show marginal benefits to the EMS system. To discuss future options, we will outline the following sections: 911 Emergency and Urgent Response, Interfacility Response, and Extended Care Paramedic Model.

### *911 Emergency and Urgent Response*

Currently, when a 911 response is determined, EHS sends an ambulance to evaluate and if required transports to the emergency department. Current Total Response Time Performance indicates that EMC's unadjusted response time performance doesn't meet the contracted response expectation. Further evaluation noted that current staffing and funds provided to EMC would not be able to meet the current emergency Category 1 contracted 8:59 mm:ss response time. In evaluating current funding to expected performance, the EMS system could perform for a Total Response Time of 10:59 mm:ss at a minimum of 80 percent of the time and if the off-load issues were corrected, a contractor could perform 10:59 mm:ss at 90 percent of the time.

As mentioned in the above section of Governance, Leadership, and Human Resources, the next contract should include the following response time requirements.

redacted

Understanding that the off-load times will not change immediately, the redacted if all process outcomes are completed appropriately.

### *Interfacility Response*

The interfacility response system needs to be reorganized to ensure mechanisms are in place to transport the patients timely by the right mode, without hindering the 911 response. Current contractual response time expectations for the interfacility calls are the same as an Urgent 911 response. This pulls resources from the 911 system. Response times should be adjusted to ensure the 911 response system is a higher priority for resources than the interfacility system.

Forty-seven percent or 67,218 of EMC responses are related to the interfacility system. Of those responses, 96.6 percent could be handled by a BLS ambulance or other transport modes. Other transport modes could be considered such as car services, wheelchair vans, multi-patient buses, or a BLS unit. Presently, these patients are being transported by an ALS ambulance. To improve efficiency and cost effectiveness for patient transport the Province would need to create wheelchair van services and a car service. The car service could be operated by EMC or contracted to taxi agency. Multi-patient buses could be utilized for long-distance transports, to schedule pick-up, and drop-off of patients to outlying regions, freeing up ALS units that currently transport one patient in one ambulance. As mentioned previously, a medical necessity process should be established outlining which patients receive which transport mode. This process should be set legislatively and through policy with the Provincial Medical Director and monitored by the contractor for compliance.

To measure performance of the inter-transport system, Fitch recommends removing all interfacility response time expectations from the current categories and create a new Category 4. Furthermore, response time expectations should be established based on whether or not the call was prescheduled more than 24 hours in advance. redacted

To schedule an interfacility transport today, each individual requesting hospital or facility, calls EMC to schedule a transport. Also, hospitals do not have a single location to discharge, plan, or manage patient bed movements within the NSHA hospitals. With hospital closures becoming more frequent, patient distribution for specialty care is not coordinated utilizing a systems approach. During discussions with physicians, it was noted there is no census tracking for each hospital, and that beds in specialty areas are unfilled due to the “potential” for a specific physician needing it. Finally, scheduling for discharges is a manual process where the requestor contacts a call intake person at EMC to schedule a transport.

To mitigate these issues, the Province could create a singular “Transfer Center” for the entire NSHA. The Transfer Center would manage all patient movements, discharge, or bed movements within the health system. By having a single repository for discharge, data connections between EMC and the Transfer Center should be established to automate discharge scheduling, census

tracking, and outcome data transfers. The Transfer Center can manage the entire discharge scheduling to ensure the patient is receiving the right mode of transport based on medical necessity, being the first point to improve bed management and discharge planning for the health authority, potentially creating substantial cost avoidance.

### *Extended Care Paramedic Model*

In 2018, EMC completed 1,586 Extended Care Paramedics (ECP) in-home patient assessments, which has recently been expanded to in-home treatments and monitoring. Further evaluation was completed on all 911 responses evaluating transports based on the provider documented Canadian Triage Acuity Score ("CTAS"). The CTAS is a 1 to 5 acuity score that is approved and utilized in nursing based on the level of patient acuity and need for patient reassessment. The higher the CTAS score the lower acuity level of the patient.

These scores match the current IAED MPDS five response determinates with Echo equaling level 1 and Alpha equaling level 5. Upon evaluation of EMC transport data, CTAS levels 4 and 5 (Bravo and Alpha IAED MPDS response determinates) represent 31.8 percent of the total transports and could be considered low acuity. Level 3 CTAS scores (Charlie IAED MPDS response determinates) could be added to Levels 4 and 5, totaling 75.8 percent. This shows the range of 31.8 to 75.8 percent of the current patient population that could be evaluated within the ECP model or transported to a destination outside an emergency department. Figure 36 indicates the EMC Transports as CTAS scores.

**Figure 36. EMC Transports and CTAS Scores**

CTAS Scores

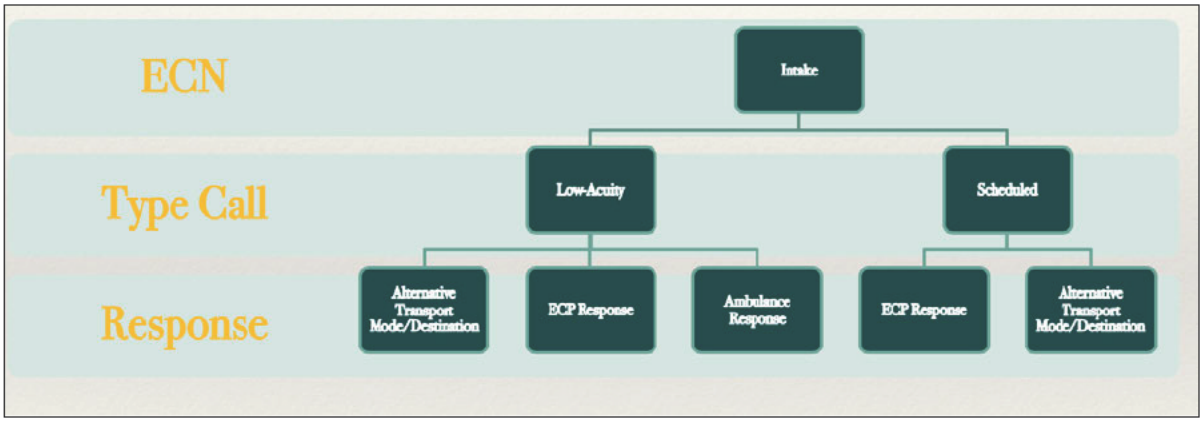
| Paramedic CTAS Scores | 2016 | 2017 | 2018 | Percent/ CTAS Type | Cumm-ulative | |
|---|---|---|---|---|---|---|
| Five | | | | | | |
| Emergency | 4256 | 4258 | 4135 | 5.5% | 10.2% | |
| Urgent | 3541 | 3770 | 3723 | 4.8% | | |
| Four | | | | | | 31.8% |
| Emergency | 9272 | 9424 | 9347 | 12.1% | 21.5% | |
| Urgent | 7141 | 7334 | 7287 | 9.4% | | |
| Three | | | | | | 75.8% |
| Emergency | 23112 | 23896 | 24074 | 30.7% | 44.0% | |
| Urgent | 9649 | 10312 | 10708 | 13.3% | | |
| Two | | | | | | |
| Emergency | 12732 | 14150 | 15549 | 18.3% | 22.7% | |
| Urgent | 2992 | 3329 | 3777 | 4.4% | | |
| One | | | | | | |
| Emergency | 1060 | 1039 | 1243 | 1.4% | 1.5% | |
| Urgent | 73 | 67 | 60 | 0.1% | | |
| | | | | | | |
| Grand Total | 73828 | 77579 | 79903 | | | |

| Canadian Triage Acuity Score (CTAS) | Patient Reassessment Guidelines |
|---|---|
| Level 5 – Non – Urgent | Every 120 Minutes |
| Level 4 – Less Urgent | Every 60 Minutes |
| Level 3 - Urgent | Every 30 Minutes |
| Level 2 Emergent | Every 15 Minutes |
| Level - 1 Resuscitation | Continuous |

The ECP model would establish an Emergency Communications Nurse within the Communications Centre to interview the caller to determine if the patient is a candidate to enter the ECP process. The ECP process could be activated from either the 911 system or as a

hospital discharge follow-up. If from the 911 system, specific response determinates could be outlined by the Provincial Medical Director, utilizing the IAED ECN software as a protocol base. Once the ECN has evaluated the patient, they can determine a mode of treatment or transport. The ECN may assist in scheduling with a doctor at a later time, send an ECP to evaluate, or send an ambulance. Response times would begin following the interview by the ECN and have one hour for the unit to arrive. A physician telemedicine line should be established to create the patient-to-physician connect. Figure 37 indicates the flow of a call through ECN Call In-take.

**Figure 37. ECN Call-Intake Flow**




To develop an ECP program, an evaluation of current public reasons for calling 911 was evaluated (see Figure 38). Following an evaluation of CTAS scores, an evaluation of 911 call types showed that 15.7 percent or 17,469 of patients annual were described as a sick person that is considered to be a low acuity level. The second highest was falls at 12.6 percent or 14,027. The third and fourth highest were Breathing Problem and Chest Pain respectively, totaling 16.1 percent. Fifth was Transfer/Interfac/palliative care mostly coming from long-term care facilities and in sixth was mental health. These six call types make up approximately 54 percent of the total volume. Programs for ECP should allow for 911 low-acuity response and in-home care should be based around highest call volumes to assist hospitals with out-of-hospital care reducing readmissions.

**Figure 38. ECN Call Types**

| Call Type | 2018 | Percent |
|---|---|---|
| Sick Person | 17469 | 15.7% |
| Falls | 14027 | 12.6% |
| Breathing Problems | 9382 | 8.4% |
| Chest Pain | 8617 | 7.7% |
| Transfer/Interfac/Palliative | 7052 | 6.3% |
| Psych/Abnor. Beha/Suicide Att | 6932 | 6.2% |
| Unconscious/Fainting | 6466 | 5.8% |
| Traffic/Transport Collisi | 6394 | 5.7% |
| Abdominal Pain/Problems | 4308 | 3.9% |
| Hemorrhages/Lacerations | 3521 | 3.2% |
| Unknown Problem (Man Down) | 3490 | 3.1% |
| Assault/Sexual Assault | 3116 | 2.8% |
| Convulsions/Seizures | 2903 | 2.6% |
| Stroke (CVA) | 2685 | 2.4% |
| Overdose/Poisoning | 2661 | 2.4% |
| Back Pain-Non Traumatic | 1966 | 1.8% |
| Traumatic Injuries, Specific | 1915 | 1.7% |
| Diabetic Problems | 1560 | 1.4% |
| Card/Resp Arrest/Death | 1480 | 1.3% |
| Heart Problem/Internal Defib | 1400 | 1.3% |
| Allergies/Envenomations | 820 | 0.7% |
| Headache | 803 | 0.7% |
| Burns/Explosion | 457 | 0.4% |
| Choking | 414 | 0.4% |
| Pregnancy/Childbirth/Mis | 348 | 0.3% |
| Incoming 911 Call | 229 | 0.2% |
| Heat/Cold Exposure | 182 | 0.2% |
| Stab/Gunshot/Penet Trauma | 156 | 0.1% |
| Standby Request/Fire | 148 | 0.1% |
| Eye Problems/Injuries | 139 | 0.1% |
| Carbon Monoxide/Inhal/Hazma | 138 | 0.1% |
| Standby Request/Police | 136 | 0.1% |
| Animal Bites/Attacks | 99 | 0.1% |
| Drowning/Diving/Scuba Incident | 79 | 0.1% |
| Inaccessible Incidents / Entra | 56 | 0.1% |
| Automatic Crash Notification | 16 | 0.0% |
| Test / Procedure | 14 | 0.0% |
| Electrocution/Lightning | re | 0.0% |
| Admission | dr | 0.0% |
| Return to Residence | r | 0.0% |
| Total | 111594 | 100.0% |

ECP protocols have been established to allow Community Paramedic Programs (CCP) for low acuity 911 responses to include, but not limited to, the following activities:

- include in-home safety assessments,
- hospital discharge support,

- medication checks,
- in-home telemedicine PCP check-up,
- assist with appointments for alternative doctor visits,
- mental health assessments.

In an attempt to expand the current ECP model, Fitch identified eight current ambulances that could be reassigned to fully institute the ECP program. These units are: redacted The Province should reassign current two person staffed ambulances into one person SUV's.

## Recommendations

Recommendations to address findings for this component of the EMS system are summarized in Figure 39.

**Figure 39. Ensuring Optimal Value - Recommendations**

| Recommendations — |
| --- |
| • Create a sub-response category titled "low-acuity" with a redacted response time expectation, from time ECN determines resource type to resource on-scene.<br>• Expand services to utilize Emergency Communication Nurse (ECN) to facilitate alternative transport modes or destinations for low-acuity patients.<br>• Establish alternative transport modes to include car service, wheelchair, BLS, and multi-patient transport units for long distance transports.<br>• Modify CAD data to include Canadian Triage Assessment and Acuity Scale (CTAS).<br>• Add a new Category 4 for response times:<br>  ○ Unscheduled IFT response time: redacted performance<br>  ○ Scheduled IFT response time: redacted performance<br>• Create a medical necessity process to ensure the patient is transported by an appropriate resource.<br>• Establish a Province-wide transfer centre to manage the scheduling of patient transports and hospital bed management.<br>• Revise financial arrangements in new contract for long-term sustainability and efficiencies. |

# OPTIONS FOR FUTURE NOVA SCOTIA MODEL

The first and most important piece that literature has given EMS after years of debate is a clear path forward. EMS for years has had a foot in two worlds. It has never been clearly determined if it had more commonality with emergency responders, such as police or fire, or with health care. As EMS has evolved, the need has clearly directed EMS towards a medical model that also responds to emergencies rather than the other way around. Below are two excerpts of the EMS Agenda for the Future. The first is a statement of where EMS is currently, and the second is a statement of where EMS needs to be.

## Future State and the EMS 2050 Agenda

As a component of the health care delivery system, EMS addresses all possible injuries and illnesses, and treats all ages. It is a component of, and is also comprised by, systems intended to provide care for specific diseases and population segments. Contemporary EMS systems were created to meet the immediate needs of the acutely ill and injured; to provide "stabilization" and transportation. EMS, in general, meets these objectives in relative isolation from other health care and community resources. Reports have been published regarding public health surveillance by EMS personnel and referral to social services agencies. However, most EMS systems are disconnected from other community resources, except perhaps other public safety agencies, and are not involved in the business of ensuring follow-up by social service agencies or other community agencies/resources potentially able to intervene when patients need support. Thus, the potential positive effects of EMS, in terms of improved health for individual patients and the community, remain unrealized.[20]

Emergency medical services (EMS) of the future will be community-based health management that is fully integrated with the overall health care system. It will have the ability to identify and modify illness and injury risks, provide acute illness and injury care and follow-up, and contribute to treatment of chronic conditions and community health monitoring. This new entity will be developed from redistribution of existing health care resources and will be integrated with other health care providers and public health and public safety agencies. It will improve community health and result in more appropriate use of acute health care resources. EMS will remain the public's emergency medical safety net.[21]

[20] Integration of Health Services, Emergency Medical Services Agenda for the Future 2010, page 9. www.nhtsa.gov.

[21] The Vision, Emergency Medical Services Agenda for the Future 2010, page iii. www.nhtsa.gov.

## Clinical Components Driving the Change

EMS like all emergency services was driven to action before truly understanding the consequences or even what was possible. This approach created a series of expensive and folkloric results that left the industry in no man's land. The most significant of these was the moment that 8:59 seconds was enshrined as best practice. This consensus "best practice" response time survived for many decades until the truth was discovered through scientific rigor. Figure 40 addresses the question of response times versus morbidity.

**Figure 40. Response Times and Mortality Odds**

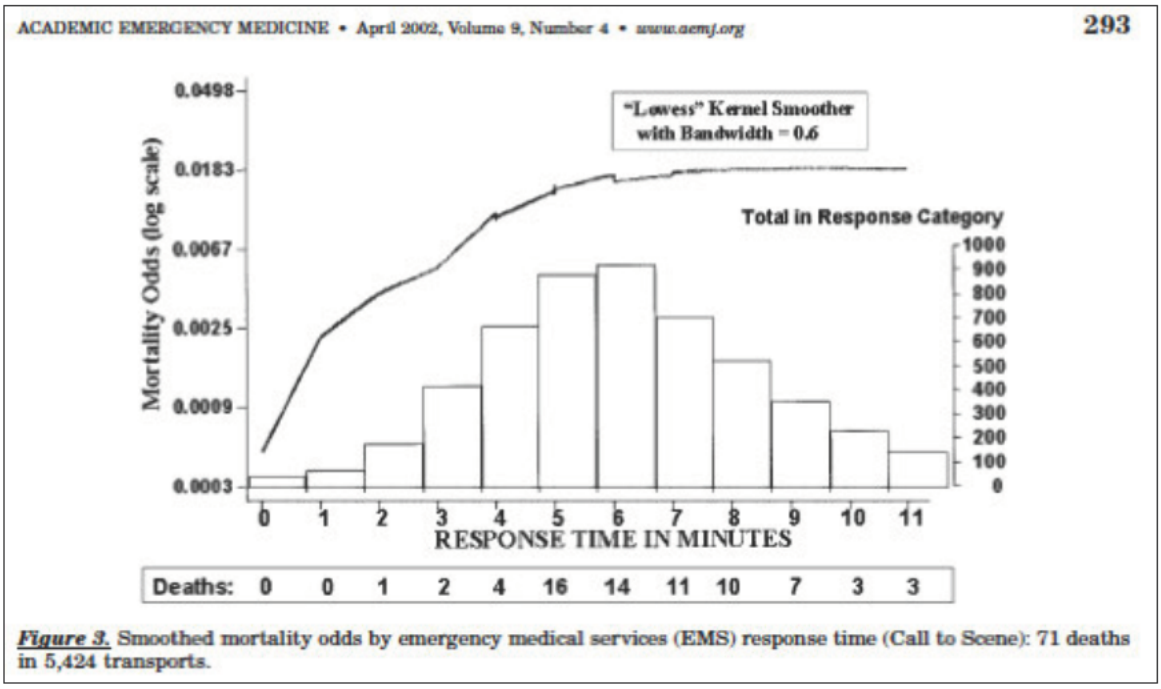



*Figure 3.* Smoothed mortality odds by emergency medical services (EMS) response time (Call to Scene): 71 deaths in 5,424 transports.

In cardiac arrest, it became clear that if you could be at a patient's side in under five minutes you had some degree of survivability, but after five minutes survivability was improbable. This caused all EMS services to reevaluate what was possible and that several factors had to be considered.

1. Someone had to recognize the patient was in cardiac arrest.
2. Someone had to call 911.
3. 911 had to dispatch the unit.
4. The unit has to arrive on scene.
5. Action needed to be initiated.

Recognizing that the first three elements would take more than three minutes, a different pathway to survivability needed to be created. This was the advent of AED, by stander CPR, pre-arrival instructions by phone, etc. Consequently, this removed the driving factor for the 8:59 response time goal since, if the other elements are not in place, the rolling fleet cannot get

there in time. Therefore, 9, 10, or 11 minutes are now understood to be the same response regarding survivability. Figure 41 provides a list of reference regarding response times to cardiac arrests and patient outcomes.

**Figure 41. References Regarding Response Time in Cardiac Arrests and Patient Outcomes**

| Author | Density | Sample Size | Response Time Threshold | Does Response Time Impact Patient Outcome |
|---|---|---|---|---|
| Blackwell (2002)[6] | ALS Urban | 5,424 | 5 minutes | Yes < 5 minutes<br>No >5 |
| Pons (2005)[7] | ALS Urban | 9,559 | 4 minutes &<br>8 minutes | No < 8 minutes<br>Yes < 4 minutes in intermediate-high risk of mortality |
| Blackwell (2009)[8] | ALS Urban<br>BLS MFR | 746 | 10:59 | No > or < 10:59 |
| Blanchard (2012)[9] | ALS Urban | 7,760 | 8 minutes | No > or < 8 minutes |
| Weiss (2013)[10] | Metro – Urban and Rural | 559 | N/A Continuous Variable | No relationship between time and clinical outcomes |

The logical next step was to evaluate response time to trauma responses that represented a much larger patient category and could potentially have a larger impact. The motivating factor was that a number of medical doctors were realizing that not-withstanding the prescribed response time goals, many agencies simply did not meet the time. As a case in point, in Nova Scotia the MD's started to ask the legitimate question of whether or not response time matters. At face value, the MD's were not seeing deleterious effects from varying response times.

Figure 42 provides a limited compilation of the major studies and the conclusions regarding response times and trauma.

**Figure 42. References Regarding Response Time and Evidence-Based Trauma Research**

| Author | Density | Sample Size | Response Time Threshold | Does Response Time Impact Patient Outcome? |
|---|---|---|---|---|
| Pons (2002)[11] | ALS Urban | 3,490 | 8 minutes | No > or < 8 minutes after controlling for severity of injury |
| Newgard (2010)[12] | ALS Urban | 3,656 | 4 minutes & 8 minutes & Golden Hour | No time intervals were statistically related to mortality including response time, on-scene time, transport time, or total EMS time |
| Band (2014)[13] | ALS Urban BLS MFR | 4,122 | N/A Continuous Variable | Adjusted for severity of injury, no significant difference between PD and EMS. |

What became clear through the research, is that response time was not an elegant surrogate for clinical performance or outcomes. Treatment on scene and where the patient is taken for definitive care is significantly more important than a minute or two of speed to arrive at the patient's side. This should not be interpreted that time is infinite, but rather that systems have some latitude in design.

## Recommendations

System design today is significantly more complex in that it involves designing responses to all categories of calls in a tailored and focused way. The approach of sending the same unit screaming across the road for the stubbed toe, in the same way as responding to chest pain, makes no intuitive sense. Risk matrices allow for system design to start reclassifying risk and response.

### *Evaluating Risk*

The first step to evaluating risk is to titrate (continuously measure and balance) risk and frequency. Designing systems for the one percent of calls requires building excessive readiness into a system and having ambulances idle and at the ready. Under designing a system means people are waiting excessively long for a response or receive the wrong response when they call. Sophisticated medical systems are always balancing risk mitigation with cost effectiveness. Figure 43 is a strategic assessment tool that allows for systems to ask the right question.

**Figure 43. Guide to Evaluating Risk**

| SEVERITY | | |
|---|---|---|
| Verbal | Numeric | Description |
| Catastrophic | 5 | Likely to result in death |
| Critical | 4 | Potential for severe injury |
| Moderate | 3 | Potential for moderate injury |
| Minor | 2 | Potential for minor injury |
| Negligible | 1 | No significant risk of injury |

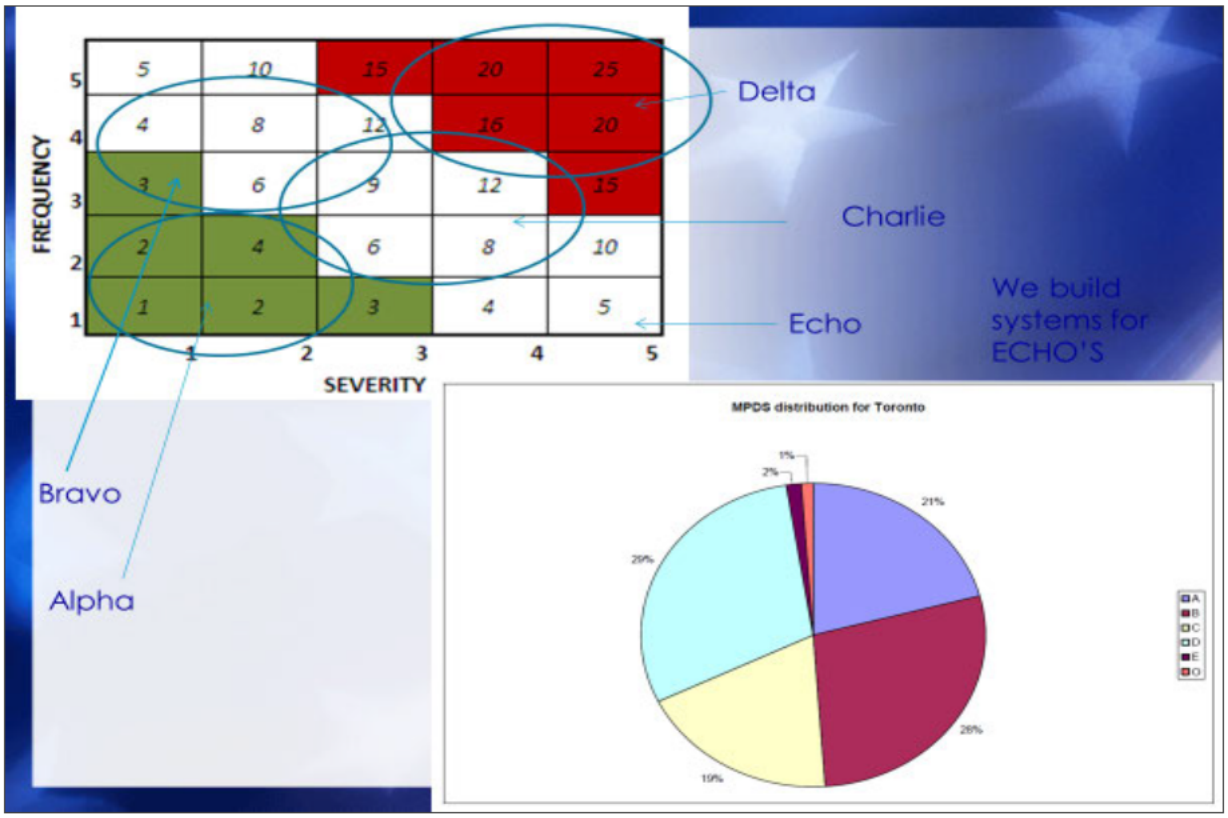
| FREQUENCY | | |
|---|---|---|
| Verbal | Numeric | Description |
| Frequent | 5 | Hazard likely to occur |
| Probable | 4 | Hazard will be experienced |
| Occasional | 3 | Some manifestations of the hazard are likely to occur |
| Remote | 2 | Manifestations of the hazard are possible, but unlikely |
| Improbable | 1 | Manifestations of the hazard are very unlikely |

Using MPDS (medical priority dispatch), we can cross tabulate the severity with the frequency of an occurrence. This along with solid geospatial risk assessment (where risk occurs) and temporal distribution (when risk occurs), allows for the identification of an appropriate response to risk.

Figures 44 and 45 cross reference MPDS codes with severity and frequency.

**Figure 44. Scoring Risk Factors**

**Figure 45. Applying Risk Evaluation to EMS**




Following the rules of system design we can answer four major categories of deductive science:

- Where is risk? (geospatial analysis )
- When is risk occurring? (temporal analysis)
- What type of medical risk? (categorization analysis )
- How often is it occurring? (frequency analysis)

## Conclusion

Nova Scotia will need to rethink how they deliver service to their population. The one size fits all approach is over servicing some patient categories to the detriment of other, potentially life-threatening patient categories. The new system design has to think of all four elements and introduce every aspect of mobile medicine to satisfy the needs of the community.

# OPTIMIZING AIR MEDICAL SERVICES

EHS LifeFlight ("LifeFlight") provides critical care transport services to the Provinces of Nova Scotia ("NS'), Prince Edward Island ("PEI"), and New Brunswick ("NB"), for adult, pediatric, neonatal, and obstetric patients. The services to all three Provinces include interfacility transport (IFT) by Fixed Wing ("FW"), Rotor Wing ("RW"), or ground Mobile Intensive Care Unit ("MICU"); and transport from a scene by RW in NS.

The adult air medical team is employed by EMC and is based at Halifax Stanfield International Airport 24/7. The adult team is comprised of a Registered Nurse ("RN") and a Critical Care Paramedic ("CCP"). EMC employs an operator (driver) for the dedicated ground MICU. EHS contracts with IWK to provide a pediatric/neonatal and obstetric specialty medical team for response 24/7 from IWK. The specialty team is comprised of a cross trained Neonatal/Pediatric Registered Nurse, Respiratory Therapist, and an Obstetrics Nurse, when applicable.

The RW pilots staff the helicopter 16 hours/day (0700- 2300) at the base at Halifax Stanfield International Airport, and for 8 hours (2300 – 0700) are on call, with a 60-minute response time to wheels up when called in. The FW pilots staff the airplane on call only, 24/7 with 60-minute response time to wheels up. The RW and the FW are staffed with a pilot and co-pilot for LifeFlight missions.

The LifeFlight fleet consists of two RW medically configured aircraft (one primary and one back up on-site in Halifax), one FW aircraft, and one MICU. The two RW aircraft are Sikorsky 76C+, operated dual pilot, and full Instrument Flight Rules (IFR). The FW is a medically configured King Air 200 turboprop airplane, operated dual pilot. The ground MICU is a Freightliner King Cab owned by EHS and dedicated to LifeFlight.

EHS contracts with Canadian Helicopters Limited ("CHL") for the primary and dedicated backup Sikorsky 76C+ RW aircraft, pilots, and engineers. The contract includes an upgrade to the Sikorsky 76C+ helicopters for compliance with Transport Canada Air Regulation 325.19(1(a) takeoff and landing requirements, particularly for operations on elevated helipads. The two RW aircraft went on line January 2018, and the contract term ends in 2032.

EHS contracts with Provincial Airlines (PAL) to provide the FW King Air 200 turboprop airplane, pilots, engineers, and the contract term ends in 2020.

Medical control consists of a dedicated Provincial Medical Director, a medical director for LifeFlight for up to 65 hours/month, 4 lead physicians, one for each specialty (adult, pediatric, neonatal, obstetrics), and five to eight physicians under each lead.

EHS LifeFlight incoming calls for transport services are handled by the provincial Medical Communications Center ("MCC"), which is managed by EMC for all ground and air transports

requested under EHS. The centre has a dedicated console and staff for LifeFlight, with a backup system in place to meet demand. The MCC utilizes a vehicle use matrix approved by EHS and the medical directors to determine the most appropriate asset and team, based on patient acuity, weather, time of day, distance, etc. The MCC is in the process of implementing a new CAD system, Flight Vector, which will provide a more robust, user friendly system that will include advanced reporting functionalities that are currently not readily available.

EHS LifeFlight is fully integrated with the EHS ground ambulance and deployed according to patient's medical need to ensure the right resource is being deployed at the right time. EHS LifeFlight's mission is to provide care to those critically ill or injured that require highly trained medical teams, with specialized equipment, and often have time critical diagnosis in need of rapid transport to a higher level of care. These patients are of the highest acuity and often most vulnerable, spanning the age spectrum from pre-term infants to the elderly.

EHS LifeFlight is the only critical care transport service available to the NS, PEI, and NB Provinces so there are no competitive factors in this operating environment.

Figure 46 and Figure 47 illustrate the transport activity by mode of transport and by team.

**Figure 46. Transport Volume by Mode**

| | FY2016-17 | FY2017-18 | FY2018-19 |
|---|---|---|---|
| RW | 394 | 354 | 486 |
| FW | 248 | 355 | 319 |
| MICU/Other | 101 | 151 | 171 |
| *Total* | *743* | *860* | *976* |

**Figure 47. Transport Volume by Team**

| | FY2016-17 | FY2017-18 | FY2018-19 |
|---|---|---|---|
| Adult | 472 | 523 | 592 |
| Neo | 125 | 140 | 160 |
| OB | 55 | 62 | 60 |
| Peds | 91 | 135 | 164 |
| *Total* | *743* | *860* | *976* |

Transport mode volumes shifted in FY2018-19: LifeFlight had a 10.8% increase in rotor wing transports, while the less expensive modes of transport experienced a 6.4% decrease (fixed wing) and a 3.7% decrease (MICU).

The total missed calls for FY2018-2019 were 610. Of this total, 119 were related to the inability of preferred vehicle to respond or inability of preferred medical crew to respond; the remaining missed requests are undefined. The highest percent of missed flights were adult patients, followed by pediatrics.

Transports into New Brunswick and PEI have increased each year, projecting 120 and 86 respectively in FY2018-19. New Brunswick transports are primarily neonatal and pediatric patients and transported by fixed wing. PEI transports are primarily adult and peds, accessing fixed wing for 2/3 of the transports and rotor wing for 1/3 of them.

In January of this year, EHS LifeFlight received full accreditation by the Commission on Accreditation of Medical Transport Systems ("CAMTS") for rotor wing, fixed wing, and ground critical care services. The CAMTS accreditation status is one of the most prestigious industry designations that may be achieved and requires reaccreditation every three years. This successful reaccreditation is a testament to EHS LifeFlight's commitment to providing the best in quality patient care and aviation safety to the patients and communities they serve.

## Medical Team Staffing

## Benchmarks

- Critical care patient demand defines adult and specialty team staffing.
- Scene patient responses require immediate launch, thus medical staff co-located with the aircraft.
- Specialty transport teams to staffing with cross trained Neonatal and Pediatric Nurses are experiencing pediatric ICU RN shortages.

## Description of Best Practices

Best practice air medical systems match the patient medical need with the appropriate clinical expertise based on patient age, condition, and distance. In some patient populations, such as neonatal, the time to the patient can be more emergent than the transport to tertiary care.

Adult medical teams provide the full scope of care for adult interfacility and scene response for patients of all ages. This team is trained to provide care for most pediatric scene and interfacility patients in all modes of transport.

Children's hospitals' flight teams are typically staffed with RNs (or nurse practitioners) and Respiratory Therapists cross trained to care for neonates and pediatrics. The addition of an obstetrics nurse for high risk OB patients is a more recent evolution for critical care of high risk mothers. With air transport volumes exceeding 300 combined neonatal/pediatric patients, the children's teams are generally co-located with the aircraft to ensure immediate response capabilities. These cross trained clinicians maintain currency in their advanced clinical procedures and complex patient management by coupling scheduled rotations into the ICU and monitoring each clinicians transport patient contact.

While age is a common benchmark for differentiating a pediatric versus adult team, the actual age will vary from 8 to 18. More sophisticated transport systems are using their core team (e.g.,

adult team) for all pediatric emergency department transfers, while having the ability to "escalate" complex pediatric emergency department as well as all ICU transfers to a level requiring a pediatric ICU nurse and Respiratory Therapist ("RT").

## Benchmark Comparisons

EHS LifeFlight has one adult team on duty 24/7 that covers interfacility transports by FW, RW, and MICU for patients that are over 16 years of age. By RW, the adult team responds to all scene flights regardless of patient(s)' age.

IWK has one neonatal/pediatric specialty team on 24/7 which is an RN and a RT who are cross trained and provide care for all patients up to 16 years of age.

The neonatal/pediatric and obstetrical ("OB") teams are not co-located at the airport with the aircraft; they respond from the IWK where they are working in the ICU or OB areas. The total neonatal/pediatric transport volume completed by the IWK neonatal/pediatric team in FY2018-19 was 324 transports. The OB team completed 60 transports.

## Findings

LifeFlight's peak volume hours are similar to other air transport programs: 1100 – 2300 hours: 70% (n=1,118) of the transport requests occur during this time of day. Of the 27 missed requests due to no Adult Medical Crew available, only two fell outside of the 1100 – 2300 time period.

The medical team and RW pilots change shift at the same time: 0700 and 1900 hours. Also, similar to other air programs, the two hours leading up to the change of shift are the more vulnerable for flights to be missed or held until the next medical and aviation crew arrive. For LifeFlight, this time period is 1700 – 1900 hours. There were 115 requests during this time—of which 84 patients were transferred but delayed. The most common reason for a request to be missed was a Medical Control Physician ("MCP") decision.

Bedside times for the adult team averages 28 minutes; for the neonatal patient was is 1 hour and 29 minutes, and the pediatric patient was 1 hour and 10 minutes.

Specialty teams are based at and responding from IWK. Time on task for these teams is somewhat extended by logistics to accommodate ground transport to, and from the airport. The basing at IWK also results in an extended launch time.

There are more available transport assets than medical teams on duty to staff them (RW, FW, and ground MICU).

A 12-hour adult Critical Care team (RN and CCP) to staff an aircraft during peak hours is estimated to cost redacted per year.

In FY2018-19, overtime incurred by the IWK team was reported at $165,000. While there is some overtime occurring at the change of shift, position vacancies and covering for sick and vacation time is estimated to be the larger expense. There is reported difficulty in recruiting and retaining ICU nurses in the cross trained role, and the onboarding for new personnel can take up to seven months.

Previously, the IWK team was based at the airport, and pulled back to the units in 2005-06 by request of the neonatal and pediatric medical directors, as the number of patient encounters needed to be significantly raised. At that time, the team was not crossed trained.

## Recommendations

1. Add a 12-hour adult Critical Care team (RN and CCP) during peak hours from 1100- 2300 to minimize delays during high demand and at shift change. The annual cost is estimated to be redacted .
2. Expand the scope of service for adult critical care team to include pediatric patients but build in an escalation process to include a specialty trained pediatric ICU RN for specific cases, when applicable.
3. Consider eliminating the cross training of the neonatal and pediatric ICU nurses, while creating a small group of each specialty to be trained for flight.

## Medical Helicopter Aviation Response (Rotor Wing Services)

## Benchmarks

- Match the aircraft to clinical mission, geography and weather and within affordable resources.
- Aircraft dedicated to the critical care medical mission.
- Operates in a state of readiness as an emergency response unit with safe, efficient launch times 24/7.
- Pilot staff on-site in 12 hour shifts 24/7.
- Dual pilot operations for larger class RW aircraft.
- Aided night flying.

## Description of Best Practices

In best practice RW services, the pilots are on-duty 24/7 with the aircraft and medical team.

The helicopter is medically configured for the clinical mission, with twin engine, Instrument Flight Rule ("IFR") operations, and configured for aided night flight, e.g., Night Vision Goggles ("NVG"), particularly if doing responses into unfamiliar landing zones, such as scene responses.

Reliability is defined by aircraft availability — pilot staffing, access to a backup aircraft during maintenance, and pilots trained in an aircraft equipped appropriately to safely manage/react to expected weather conditions (e.g., IFR).

## Benchmark Comparisons

The LifeFlight RW pilots are on site with aircraft from 0700- 2300 hours, then off site in an on-call status from 2300 –0700 hours, which is unusual given the medical team is on-site 24/7 and the critical care services it provides.

The twin engine, Sikorsky 76+ is equipped for IFR and is operated dual pilot. LifeFlight added Night Vision Goggles in April 2019.

The contract with CHL financially aligns within the range for similar S76C+ helicopters and services on a monthly fee basis, inclusive of comparable flight time. However, the guaranteed variable fees in the CHL agreement (e.g., guaranteed number of minutes per year, with a substantial exceedance penalty) is atypical. Of note, the full amount of contracted variable fees is incurred even if the aircraft flies less than the guaranteed amount.

## Findings

The upgrade to S76C+ increased aircraft performance, compliance with elevated helipads, and subsequently increased RW volume. The increased number of transports also led to consumption of more flight minutes and exceeded the annual guarantee. The RW contract increased $1,660,544 or 27 percent in FY2018-19 following the aircraft upgrades, and placement of a dedicated RW on-site. The increase was inclusive of a guaranteed number of flight minutes. Following the RW upgrade, FW volume declined.

Transport Canada regulations for pilot fatigue management (e.g., Flight Risk Management Systems) will impact LifeFlight's RW and FW air providers. Essentially, compliance with the FRMS will eliminate pilot on-call time as it will be considered duty time.

The use of NVGs was implemented in April 2019, and the impact on flight volume is not yet recorded. Several figures follow and all data reported is representative of FY2018-19 (1 April 2018 – 31 March 2019) only.

Figure 48 illustrates the distribution of patient transports for FY2018-19 from the further points of patient origination with airport capabilities. From 2300 – 0700 hours, the RW and the FW pilots are on-call with the same 60-minute response time. The launch time of the aircraft was used for placement into the time categories.

**Figure 48. Patient Transports FY2018-19**

| | | Rotor Wing Transports | | | Fixed Wing Transports | |
|---|---|---|---|---|---|---|
| | | 0700 - 2300 | 2300 - 0700 | | 0700 - 2300 | 2300 - 0700 |
| Sydney | NS | 57 | 0 | | 42 | 80 |
| Yarmouth | NS | 25 | | | 20 | |
| Charlottetown | PEI | 17 | | | 26 | |
| Summerside | PEI | 8 | | | 13 | |
| Moncton | NB | | 0 | | 15 | |
| Saint John | NB | | 0 | | 15 | |
| Miramachi | NB | 0 | | | 8 | |
| | | 114 | 13 | | 139 | 103 |

Of note, all of the RW and the FW transports accepted by the Medical Control Physician during the hours 2300 – 0700 were identified as Code 1.

Converting RW transports to FW transports for the longer distance flights will reduce the amount of RW minutes consumed. Based on the flight log, it is projected that 50 percent of the 127 RW transports in Figure 49 could have been done by FW. Based on this volume estimate, Figure 49 illustrates an annual reduction of 9,230 RW minutes. In FY2017-18, LifeFlight exceeded its annual contracted flight minutes by 4,708 at a penalty cost of $362,657.

**Figure 49. Converting RW Transports to FW: Reduction in RW Minutes**

| | | RW Transports | Convert to FW | RW Minutes Round trip | Reduction in RW minutes |
|---|---|---|---|---|---|
| Sydney | NS | 57 | 29 | 170 | 4,845 |
| Yarmouth | NS | 30 | 15 | 150 | 2,250 |
| Charlottetown | PEI | 20 | 10 | 95 | 950 |
| Summerside | PEI | 11 | 6 | 105 | 578 |
| Moncton | NB | [redacted] | [redacted] | 105 | 105 |
| Saint John | NB | [redacted] | [redacted] | 135 | 338 |
| Miramachi | NB | [redacted] | [redacted] | 165 | 165 |
| | | 127 | 64 | | 9,230 |

*Note: Numbers may not add due to rounding of decimals.*

This cost avoidance of experiencing penalty RW minutes would be partially offset by the increase in cost for additional miles for the FW, see Figure 50.

**Figure50. Converting RW Transports to GW: Additional FW Miles**

| | | RW Transports | Convert to FW | FW Miles Round trip | Additional FW Miles |
|---|---|---|---|---|---|
| Sydney | NS | 57 | 29 | 388 | 11,058 |
| Yarmouth | NS | 30 | 15 | 274 | 4,110 |
| Charlottetown | PEI | 20 | 10 | 222 | 2,220 |
| Summerside | PEI | 11 | 6 | 240 | 1,320 |
| Moncton | NB | [redacted] | [redacted] | 232 | 232 |
| Saint John | NB | [redacted] | [redacted] | 258 | 645 |
| Miramachi | NB | [redacted] | [redacted] | 376 | 376 |
| | | 127 | 64 | 1990 | 19,961 |

The cost of the additional FW miles is $62,278 at the contract rate of $3.12/mile.

While 94 flight requests were received in the 2300 – 0700 time frame; 22 resulted in a transport. Of the missed flight requests, 52 were physician decision, two for weather, two for FW pilot duty time, and 16 were scene requests (no RW available). This equates to a 23 percent fill rate compared to the program's overall 60% fill rate for the full 24 hours of operation. Had the RW been staffed, the 16 scene flights would have likely resulted in transports—increasing the fill rate to 40 percent. The demand for RW services during these hours is low, and the requests accepted by the MCPs are being served by the FW.

The additional cost to staff RW pilot coverage at the base 24/7 is $451,000.

The FRMS impact on EHS recruitment and retention will be an emergent retention issue, and a long-term recruitment issue if FW and RW pilot positions outside of EHS LifeFlight have guaranteed hours, and therefore better pay. LifeFlight FW and RW pilots currently do not receive full wages during on call hours, unless they are called in.

## Recommendations

1. Amend CHL contract in FY2020-21 in preparation for Transport Canada's fatigue regulations to address the eight hours of RW pilot on-call scheduling. This should be accomplished as soon as economically prudent.
2. Open the CHL contract to support implementing RW pilot on-site coverage during the hours 2300 – 0700 to accomplish 24/7 coverage.
3. The annual cost is estimated to be redacted
4. Once the CHL agreement is opened, also redacted

## Medical Airplane Aviation Response (Fixed Wing Services)

## Benchmarks

- Match the aircraft to clinical mission, geography, clinical demand and airport proximity, weather, and within affordable resources.
- Aircraft is provided to achieve an emergent response for the critical care mission, given the ground support resources required.
- Operates in a state of readiness as an emergency response unit with safe, efficient launch times 24/7.
- Pilot staff on-site in 12 hour shifts 24/7.
- Dual pilot operations.

## Description of Best Practices

In best practice FW services, the pilots are on-duty 24/7 with the aircraft and medical team.

The airplane is medically configured for the clinical mission, typically a twin turbo-engine with a safe and efficient loading and unloading system for the patient and heavy medical equipment.

Reliability is defined by aircraft availability—pilot staffing, access to a backup aircraft during maintenance, and pilots trained in an aircraft equipped appropriately to safely manage/react to expected weather conditions, efficient coordination of ground transport and aircraft landings, and airport proximity to the sending facility.

## Benchmark Comparisons

LifeFlight FW pilots currently are on-call from home 24/7 and not based with the aircraft and medical team.

The FW aircraft is configured to meet the LifeFlight mission and is operated dual pilot.

The PAL contract aligns with the monthly and per mile fees associated with provisions of a King Air 200 and related aviation services.

The PAL backup is based in Newfoundland, and PAL has interest in relocating it to Nova Scotia to immediately support a maintenance out of service event.

## Findings

The PAL contract aligns with the monthly and per mile fees associated with provision of a King Air 200 and related aviation services. This contract increased $128,831 or by six percent in FY208-19.

PAL costs would increase in FY2019-2020 to redacted more than current) to base pilots at the aircraft hangar and eliminate on-call response. This would achieve immediate response to flight requests, and an early compliance with upcoming Transport Canada fatigue regulations. PAL's proposal is based on pilots working eight hour shifts for a total of 11 pilots. Twelve-hour shifts would reduce this cost as it would reduce the number of pilots required. PAL has also indicated interest in relocating its backup aircraft to Nova Scotia, however, no costs were disclosed.

The FW aircraft could provide the critical care mission by converting RW missions that are over 110 statute miles from Halifax to having the FW as first call and reducing the number of RW minutes (see previous Figures 49 and 50).

The time of day required to support scheduled non-emergent interfacility transports by FW would likely require the dispatch of the FW and crew as early as 0500 to pick up the patient(s) and deliver them in Halifax for 0800 scheduled appointments/transfers. The FW is equipped to handle two stretcher patients. Scheduled non-emergent IFT peak hours are typically 0800 – 1700. This would raise conflict for use of the FW for emergent, critical IFT during LifeFlight's peak hours, which is within the same time period. Further, the readiness of the NS hospitals to facilitate an expeditious patient hand off will define the on-time success for the next scheduled transfer.

There is interest in establishing a FW scheduled transport service between PEI and NS. The average total time to transfer a patient via FW from PEI to Halifax is estimated at 4.5 hours, from lift off to back in service as is detailed in Figure 51.

**Figure 51. Time Projection for Scheduled IFT by FW from PEI**

| For One Patient | Minutes |
|---|---|
| Pre and launch from Halifax | 15 |
| Flight time to PEI | 60 |
| Ground transport to patient, patient bedside pick up, ground transport to aircraft, patient loading (1,2) | 60 |
| Flight time to Halifax | 60 |
| Ground transport to Halifax hospital (morning traffic) | 30 |
| Patient Hand off (2) | 45 |
| Total time in minutes | 270 |
| | |
| Notes: | |
| *1 – Time can be shortened if medically acceptable to have patient(s) waiting at the PEI airport* | |
| *2 – Increase times if more than one patient* | |

The FRMS impact on EHS recruitment and retention will be an emergent retention issue, and a long-term recruitment issue if FW pilot positions outside of EHS LifeFlight have guaranteed hours, and therefore better pay. LifeFlight FW pilots currently do not receive full wages during on call hours, unless they are called in.

The FRMS pilot regulations will take affect first on the commercial side, and that will potentially draw the FW PAL pilots to the commercial airlines. So, the immediate competitive threat is for the FW service staffing—particularly as these pilots do not have guaranteed hours per se as it is currently staffed as on-call and they will naturally seek the stable hours and higher pay of the commercial airline jobs.

## Recommendations

1. Transition the FW aircraft to 24-hour pilot staffing at the base, using 12-hour pilot shifts.
2. The pilot shift change should occur consistent with LifeFlight's peak hours: at 1100 and 2300 hours.
3. The cost for the increased FW aviation is estimated to increase current fixed fees by redacted

4. Additional revenue captured from New Brunswick and Prince Edward Island transports will offset some of the additional expense.
5. The cost of the additional FW miles is redacted at the contract rate of $3.12/mile.
6. Converting RW flights to FW will decrease annual RW flight minutes.
7. PAL relocation of their backup FW to Nova Scotia will minimize missing flights during pilot change of shift and maintenance events. It may also provide a means to further explore serving the scheduled, non-emergent FW transports as it would not take the primary FW out of its critical care mission objective.
8. Consider a limited FW service for scheduled, non-emergent IFT transports during non-peak hours using an advanced life support ("ALS") medical crew.
9. FW service operating during the hours 0500 – 1100 may prove to align with sending and receiving hospital schedules and still place the FW into service at 1100 for the emergent, critical care requests.
10. The morning FW availability would accommodate one multi-patient transfer flight.

# ATTACHMENT A: RESPONSE EVALUATIONS AND STAFFING VS. DEMAND ANALYSES

FITCH
& ASSOCIATES

# Attachment A
# Response Evaluations and Staffing Vs. Demand Analyses

One of the key elements in evaluating performance is understanding the relationship between available ambulances and possible response times. The more ambulances that are required to meet response times the more costly the system. There is a direct relationship between available ambulances, response time expectations, and cost. The added complexity in the Nova Scotia system is that it is primarily a station based design, but with post locations when resources are scarce. This approach (dynamic deployment) is best practice but requires continuous monitoring. Monitoring a system is typically accomplished with specific software applications yet, Nova Scotia lacks this software.

This section of the report provides the foundational layer that Fitch used to evaluate Nova Scotia's deployment evaluation. Using the street level mapping with posted road speeds and impediments, Fitch uses simulation to predict both the reliability of the system and the marginal contribution of the system.

The simulator is based on the post/station location and creates drive time polygons over the call activity of the system. This allows the simulator to evaluate the ability of each post to get to historic call activity in a prescribed time. It also sums the risk reduction (calls that are captured by the posts/stations) and ranks them in order of which station captures the most call volume and how many stations are required to meet the prescribed response time . This cumulative approach also determines the marginal risk reduction of every additional post/station.

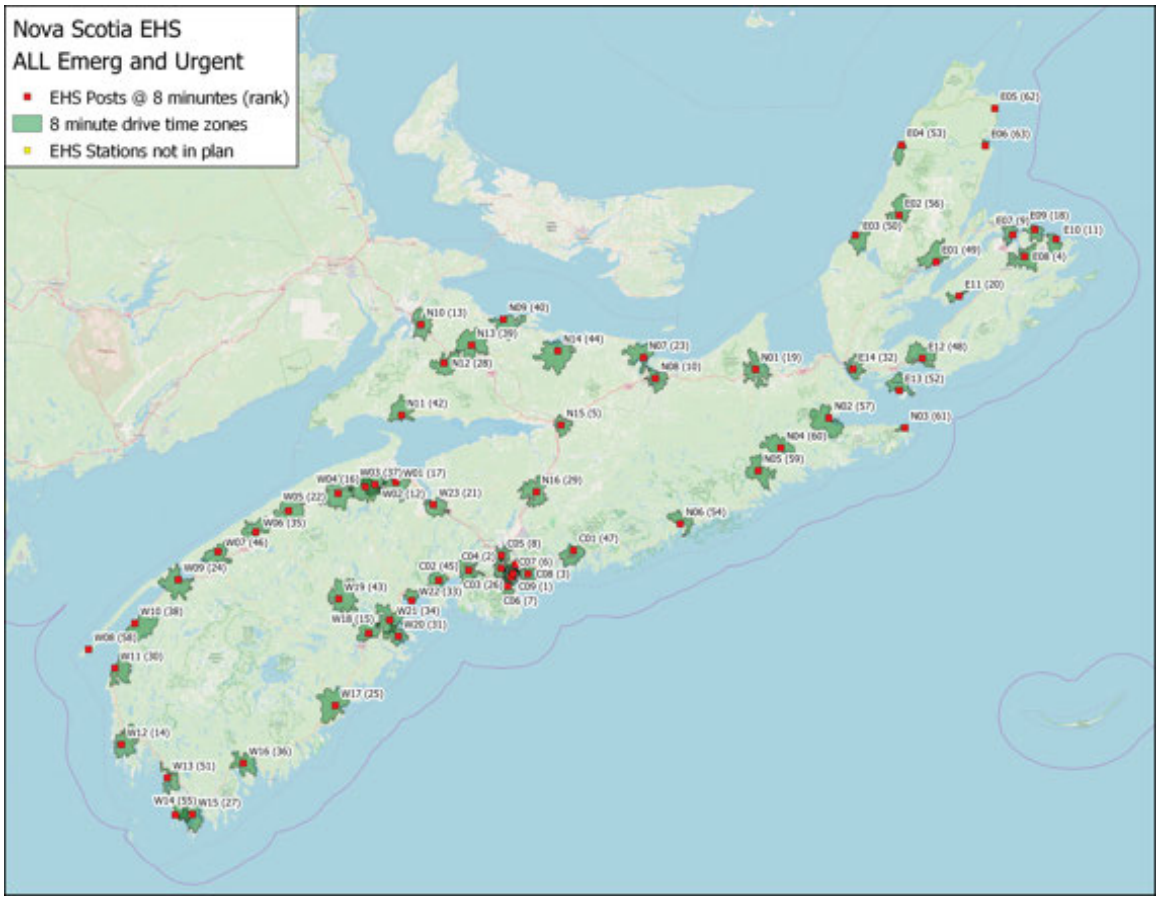
## Full System Evaluations

### *Full System - Eight Minute Response Evaluation*

The contractor is bound to an 8:59 mm:ss response time allowing one minute for the crew to leave the station and start driving the vehicle and driving for eight minutes. The evaluation below gives the net result of the eight minute evaluation. From 63 locations, only 72.45% of the historical volume is captured within an eight minute drive time.

This tells us that notwithstanding the off-load delays, the contractor would not be able to meet that contractual obligation from the current station locations and with the current number of ambulances. Figure 52 is a graphic representation of the eight minute drive time capture geographic capture of calls.

**Figure 52. Full System - Eight Minute Response Evaluation Map**




The key to understanding Figure 53 below and those that follow is to look at both the post capture and the station capture.

For example, the busiest station, C09, captures 14,521 of the historic calls or 13.05 percent of the total system requests for service within 8 minutes. The next busiest station is C04 and it captures an additional 5,600 calls or an additional five percent (subtract the percent captured line for C09 from the percent captured for C04). The total call capture between those two stations is 20,121 calls or 18.08 percent of the entire system activity within eight minutes.

As we find with all systems, each additional resource contributes less than the resource before it which is known as marginal contribution. This continues until at some point additional resources contribute very little if at all to the system's capability. In Figure 53, with 54 stations the system captures 72 percent of all the call activities within eight minutes. The additional nine stations add less than one half of one percent (0.45 percent) and takes the system capture to a total of 72.45 percent of the total activity.

## Figure 53. Full System - Eight Minute Response Capture

| Rank | PostNumber | Location | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | C09 | near Bach's Cafe/Bach's Cafe | 145 1 | 145 1 | 13.05% |
| | C04 | near oward Johnson nn- alifax/609 wy- . alifax NS | 5600 | 01 1 | 18.08% |
| 3 | C08 | near Classic Fish & Chips/ | 53 0 | 5441 | .86% |
| 4 | E08 | near Dozays Native Art Gallery/1494 wy- . Sydney NS | 46 8 | 30069 | 7.0 % |
| 5 | N15 | near arvey Woods/37 wy-311. Truro NS | 4009 | 34078 | 30.6 % |
| 6 | C07 | near Pho- oang-Minh Vietnamese Restaurnt/196 Wyse Rd. Dartmouth NS | 4003 | 38081 | 34. % |
| 7 | C06 | near New Asia Restaurant/New Asia Restaurant | 800 | 40881 | 36.73% |
| 8 | C05 | near King Town Chinese Restaurant/39 Freer n. ower Sackville NS | 669 | 43550 | 39.13% |
| 9 | E07 | near Canton Restaurant/59 Memorial Dr. North Sydney NS | 409 | 45959 | 41. 9% |
| 10 | N08 | near Artgems Framing and Gallery/379 Stewart St. New Glasgow NS | 377 | 48336 | 43.43% |
| 11 | E10 | near uang Family Restaurant/37 wy- 55. Glace Bay NS | 48 | 50584 | 45.45% |
| 1 | W0 | near Grand Street nn B&B/90 Aberdeen St. Kentville NS | 47 | 5 831 | 47.47% |
| 13 | N10 | near Dragon nn Restaurant/46 Albion St. Amherst NS | 1780 | 54611 | 49.07% |
| 14 | W1 | near Prince Arthur Steak & Seafood ouse/ Enterprise St. Yarmouth NS | 1769 | 56380 | 50.66% |
| 15 | W18 | near Comfort nn-Bridgewater/91 North St. Bridgewater NS | 17 0 | 58100 | 5 . 0% |
| 16 | W04 | near idden Gardens B&B/10 Brown St. Berwick NS | 15 9 | 596 9 | 53.58% |
| 17 | W01 | near Tempest Restaurant/5 ocust Ave. Wolfville NS | 130 | 60931 | 54.75% |
| 18 | E09 | | 1 48 | 6 179 | 55.87% |
| 19 | N01 | near Antigonish Victorian nn/145 St Andrews St. Antigonish NS | 1139 | 63318 | 56.89% |
| 0 | E11 | near Ketkunimk Motel/ Arena Rd. Eskasoni NS | 11 9 | 64447 | 57.90% |
| 1 | W 3 | near Super 8-Windsor/98 Morrison Dr. Windsor NS | 11 9 | 65576 | 58.9 % |
| | W05 | near ouse of Cheng Restaurant/467 Evangeline Trail. Middleton NS | 1084 | 66660 | 59.89% |
| 3 | N07 | near ionstone nn/ 6 Pine Tree Rd. Pictou NS | 870 | 67530 | 60.67% |
| 4 | W09 | near Coastal nn/ wy-303. Digby Municipal District NS | 739 | 68 69 | 61.34% |
| 5 | W17 | near ane's Privateer nn/ wy-8. iverpool NS | 708 | 68977 | 61.97% |
| 6 | C03 | near Moon Tong Restaurant/5048 St Margaret's Bay Rd. Upper Tantallon NS | 696 | 69673 | 6 .60% |
| 7 | W15 | | 691 | 70364 | 63. % |
| 8 | N1 | near JB Steakhouse/101 Drummond St. Springhill NS | 667 | 71031 | 63.8 % |
| 9 | N16 | | 663 | 71694 | 64.4 % |
| 30 | W11 | | 640 | 7 334 | 64.99% |
| 31 | W 0 | near omeport Motel/ omeport Motel | 6 6 | 7 960 | 65.55% |
| 3 | E14 | near China King Family Restaurant/65 Macinnis Rd. Port awkesbury NS | 595 | 73555 | 66.09% |
| 33 | W | near Amicus Gallery/136 Central St. Chester NS | 541 | 74096 | 66.57% |
| 34 | W 1 | near eart's Desire B&B/14 Aberdeen n. Mahone Bay NS | 491 | 74587 | 67.01% |
| 35 | W06 | | 476 | 75063 | 67.44% |
| 36 | W16 | near Cape Cod Colony Motel/131 wy-3. Shelburne NS | 476 | 75539 | 67.87% |
| 37 | W03 | near Kentville Visitor nformation Ctr/ wy-1. Coldbrook NS | 396 | 75935 | 68. 3% |
| 38 | W10 | | 35 | 76 87 | 68.54% |
| 39 | N13 | near Parkview Family Restaurant & nn/5155 wy-3 1. Oxford NS | 3 5 | 7661 | 68.83% |
| 40 | N09 | near Shillelagh Sheila's Country nn/Church St. Pugwash NS | 3 4 | 76936 | 69.13% |
| 41 | C10 | near Best Western-Dartmouth otel & Sts/ alifax | 3 1 | 77 57 | 69.41% |
| 4 | N11 | | 313 | 77570 | 69.70% |
| 43 | W19 | | 307 | 77877 | 69.97% |
| 44 | N14 | near Chowder's Famous Fish & Seafood/1 5 Blair Ave. Tatamagouche NS | 79 | 78156 | 70. % |
| 45 | C0 | | 64 | 784 0 | 70.46% |
| 46 | W07 | near Charlie's Place/Charlie's Place | 57 | 78677 | 70.69% |
| 47 | C01 | near Elephant's Nest B&B/7 4 Marine Dr. alifax NS | 55 | 7893 | 70.9 % |
| 48 | E1 | near St Peters Canal National ist Site/10018 Grenville St. St Peter's NS | 1 | 79144 | 71.11% |
| 49 | E01 | near ynwood nn/ 8 Big Baddeck Rd. Victoria NS | 03 | 79347 | 71. 9% |
| 50 | E03 | near nverness odge otel & Motel/1603 wy-19. nverness NS | 183 | 79530 | 71.46% |
| 51 | W13 | | 181 | 79711 | 71.6 % |
| 5 | E13 | | 165 | 79876 | 71.77% |
| 53 | E04 | near Oceanview Motel & Chalets/14 apointe Rd. nverness NS | 134 | 80010 | 71.89% |
| 54 | N06 | | 1 4 | 80134 | 7 .00% |
| 55 | W14 | | 9 | 80 6 | 7 .08% |
| 56 | E0 | | 77 | 80303 | 7 .15% |
| 57 | N0 | near Desbarres Manor/10153 wy-16. Guysborough NS | 65 | 80368 | 7 . 1% |
| 58 | W08 | near Brier sland odge & Restaurant/77 wy- 17. Freeport NS | 6 | 80430 | 7 . 6% |
| 59 | N05 | | 54 | 80484 | 7 .31% |
| 60 | N04 | | 48 | 8053 | 7 .36% |
| 61 | N03 | near Canso slands and Grassy sland Fort/194 School St. Canso NS | 44 | 80576 | 7 .40% |
| 6 | E05 | | 35 | 80611 | 7 .43% |
| 63 | E06 | near Keltic odge/37865 wy-19. ngonish NS | 5 | 80636 | 7 .45% |

### *Full System – Fourteen Minute Response Evaluation*

As stated in the report, the system is currently responding at about 13:30 mm:ss at the 90th percentile. Fitch simulated the results and found that the system could produce the results from 57 locations. The 57 stations produce capture  90.01 percent of the historical volume within a 14-minute drive time.

This aligns with current performance and not surprisingly describes the relationship that happens between off-load delays and the current performance. The simulator predicts that the 14 minutes can be met with six fewer ambulances, 24 hours a day. Off-load delays cost the system 13.5, 12-hour ambulances a day.  Figure 54 indicates that system's call capture within 14 minutes. The marginal utility explanation of additional resources is the same as above.

**Figure 54. Full System – Fourteen Minute Response Evaluation Map**

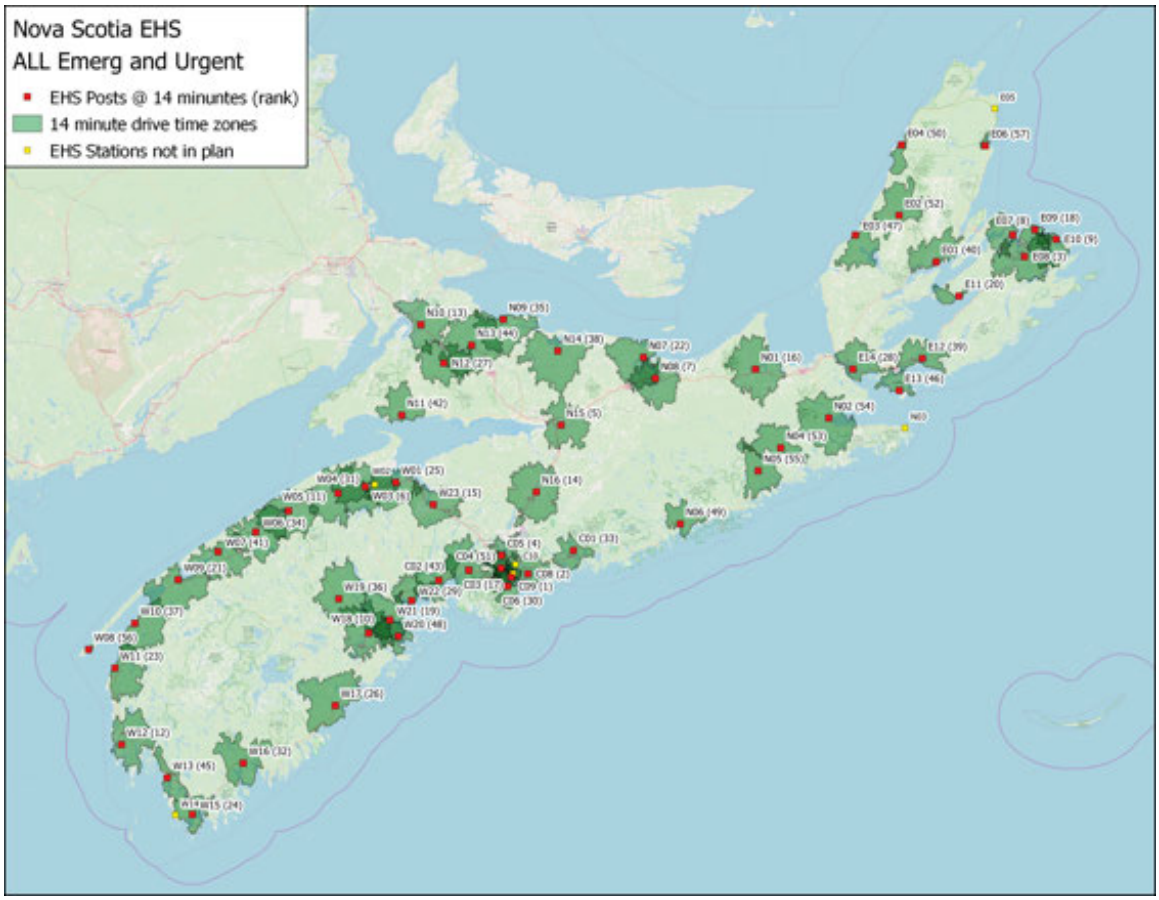



Figure 55 indicates that post and call capture as units are added into the system.

## Figure 55. Full System - Fourteen Minute Response Capture

| Rank | Pos_Number | _oca_ion | Pos_Cap_ure | To_alCap_ure | Percen_Cap_ure |
|---|---|---|---|---|---|
| 1 | C09 | near Bach s Cafe/Bach s Cafe | 28215 | 28215 | 25.35% |
| 2 | C08 | near Classic ish & Chips/1129 Cole Harbour Rd. Dartmouth NS | 6335 | 34550 | 31.04% |
| 3 | E08 | near Dozays Native Art Gallery/1494 Hwy 22. Sydney NS | 6080 | 40630 | 36.51% |
| 4 | C05 | near King Town Chinese Restaurant/39 reer n. ower Sackville NS | 6033 | 46663 | 41.93% |
| 5 | N15 | near Harvey Woods/37 Hwy 311. Truro NS | 4974 | 51637 | 46.39% |
| 6 | W03 | near Kentville Visitor nformation Ctr/Hwy 1. Coldbrook NS | 4925 | 56562 | 50.82% |
| 7 | N08 | near Artgems raming and Gallery/379 Stewart St. New Glasgow NS | 3603 | 60165 | 54.06% |
| 8 | E07 | near Canton Restaurant/59 Memorial Dr. North Sydney NS | 2617 | 62782 | 56.41% |
| 9 | E10 | near Huang amily Restaurant/37 Hwy 255. Glace Bay NS | 2524 | 65306 | 58.68% |
| 10 | W18 | near Comfort nn Bridgewater/91 North St. Bridgewater NS | 2333 | 67639 | 60.77% |
| 11 | W05 | near House of Cheng Restaurant/467 Evangeline Trail. Middleton NS | 2178 | 69817 | 62.73% |
| 12 | W12 | near Prince Arthur Steak & Seafood House/2 Enterprise St. Yarmouth NS | 2170 | 71987 | 64.68% |
| 13 | N10 | near Dragon nn Restaurant/46 Albion St. Amherst NS | 1880 | 73867 | 66.37% |
| 14 | N16 | | 1859 | 75726 | 68.04% |
| 15 | W23 | near Super 8 Windsor/98 Morrison Dr. Windsor NS | 1683 | 77409 | 69.55% |
| 16 | N01 | near Antigonish Victorian nn/145 St Andrews St. Antigonish NS | 1451 | 78860 | 70.85% |
| 17 | C03 | near Moon Tong Restaurant/5048 St Margaret s Bay Rd. Upper Tantallon | 1362 | 80222 | 72.08% |
| 18 | E09 | | 1246 | 81468 | 73.20% |
| 19 | W21 | near Heart s Desire B&B/ 18 | 1206 | 82674 | 74.28% |
| 20 | E11 | near Ketkunimk Motel/2 Arena Rd. Eskasoni NS | 1182 | 83856 | 75.34% |
| 21 | W09 | near Coastal nn/Hwy 303. Digby Municipal District NS | 1046 | 84902 | 76.28% |
| 22 | N07 | near ionstone nn/26 Pine Tree Rd. Pictou NS | 961 | 85863 | 77.15% |
| 23 | W11 | | 917 | 86780 | 77.97% |
| 24 | W15 | | 914 | 87694 | 78.79% |
| 25 | W01 | near Tempest Restaurant/5 ocust Ave. Wolfville NS | 893 | 88587 | 79.59% |
| 26 | W17 | near ane s Privateer nn/Hwy 8. iverpool NS | 863 | 89450 | 80.37% |
| 27 | N12 | near JB Steakhouse/101 Drummond St. Springhill NS | 782 | 90232 | 81.07% |
| 28 | E14 | near China King amily Restaurant/65 Macinnis Rd. Port Hawkesbury NS | 762 | 90994 | 81.76% |
| 29 | W22 | near Amicus Gallery/136 Central St. Chester NS | 748 | 91742 | 82.43% |
| 30 | C06 | near New Asia Restaurant/New Asia Restaurant | 630 | 92372 | 82.99% |
| 31 | W04 | near Hidden Gardens B&B/102 Brown St. Berwick NS | 584 | 92956 | 83.52% |
| 32 | W16 | near Cape Cod Colony Motel/131 Hwy 3. Shelburne NS | 573 | 93529 | 84.03% |
| 33 | C01 | near Elephant s Nest B&B/7224 Marine Dr. Halifax NS | 547 | 94076 | 84.53% |
| 34 | W06 | | 534 | 94610 | 85.01% |
| 35 | N09 | near Shillelagh Sheila s Country nn/Church St. Pugwash NS | 447 | 95057 | 85.41% |
| 36 | W19 | | 414 | 95471 | 85.78% |
| 37 | W10 | | 397 | 95868 | 86.14% |
| 38 | N14 | near Chowder s amous ish & Seafood/125 Blair Ave. Tatamagouche NS | 381 | 96249 | 86.48% |
| 39 | E12 | near St Peters Canal National Hist Site/10018 Grenville St. St Peter s NS | 374 | 96623 | 86.81% |
| 40 | E01 | near ynwood nn/28 Big Baddeck Rd. Victoria NS | 347 | 96970 | 87.13% |
| 41 | W07 | near Charlie s Place/Charlie s Place | 341 | 97311 | 87.43% |
| 42 | N11 | | 338 | 97649 | 87.74% |
| 43 | C02 | | 321 | 97970 | 88.02% |
| 44 | N13 | near Parkview amily Restaurant & nn/5155 Hwy 321. Oxford NS | 318 | 98288 | 88.31% |
| 45 | W13 | | 280 | 98568 | 88.56% |
| 46 | E13 | | 240 | 98808 | 88.78% |
| 47 | E03 | near nverness odge Hotel & Motel/16032 Hwy 19. nverness NS | 201 | 99009 | 88.96% |
| 48 | W20 | near Homeport Motel/Homeport Motel | 184 | 99193 | 89.12% |
| 49 | N06 | | 170 | 99363 | 89.28% |
| 50 | E04 | near Oceanview Motel & Chalets/142 apointe Rd. nverness NS | 166 | 99529 | 89.42% |
| 51 | C04 | near Howard Johnson nn Halifax/609 Hwy 2. Halifax NS | 134 | 99663 | 89.55% |
| 52 | E02 | | 133 | 99796 | 89.66% |
| 53 | N04 | | 95 | 99891 | 89.75% |
| 54 | N02 | near Desbarres Manor/10153 Hwy 16. Guysborough NS | 84 | 99975 | 89.83% |
| 55 | N05 | | 71 | 100046 | 89.89% |
| 56 | W08 | near Brier sland odge & Restaurant/77 Hwy 217. reeport NS | 70 | 100116 | 89.95% |
| 57 | E06 | near Keltic odge/ 56 | 65 | 100181 | 90.01% |
| 58 | N03 | near Canso slands and Grassy sland ort/194 School St. Canso NS | 47 | 100228 | 90.05% |
| 59 | E05 | | 41 | 100269 | 90.09% |
| 60 | W14 | | 23 | 100292 | 90.11% |
| 61 | W02 | near Grand Street nn B&B/90 Aberdeen St. Kentville NS | 18 | 100310 | 90.13% |
| 62 | C10 | near Best Western Dartmouth Hotel & Sts/Halifax | 3 | 100313 | 90.13% |

### *Staffing vs. Demand Design Components*

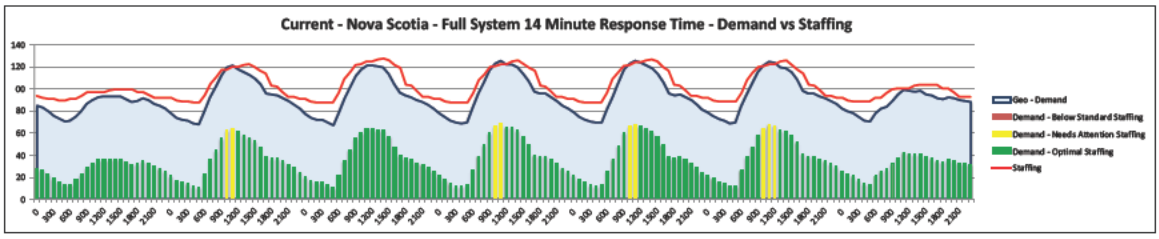
Two primary factors influence the design of the emergency response systems: 1) the desired travel time performance and, 2) the level of demand for service (call volume). Travel time performance is accomplished through the appropriate "distribution" of resources throughout the community. Demand for service accounts for historical demand, by hour-of-day, to create the temporal demand. Once a baseline desired response time and demand for service is established, a marginal utility analysis is performed. The marginal utility analysis determines the agency's ability to cover the historical demand from their current fixed locations within each specified travel time performance. This helps identify the number of locations needed to meet the desired level of performance and provide geographic coverage.

This study considers response time models for 10-minute and 14-minute travel times. Once the response time has been determined, an analysis is performed to strategically match supply with demand and ensure the appropriate number of locations are utilized for ambulance deployment, to meet the prescribed response objective. The primary objective is to ensure that geographical deployment and demand are staffed appropriately with the correct level of resources. Modeling is produced showing the current resources deployed for the entire system and then by each region matched to the personnel staffing levels, and an optimized station location model that recommends new station location to cover historical volumes.

Due to the lengthy off-load times averaging one hour and 27 minutes, models were produced comparing the current demands for service per hour against the demands for service per hour, correcting turnaround times at hospitals to 20 minutes.

As mentioned, geographic coverage plus the average hourly demand provides the total number of staffed ambulances required per hour. Figure 56 is an example of a staffing to demand chart. It reads Sunday to Saturday, reviewing each hour's demand. The light blue area chart indicates how many units are required, per the marginal resources required to capture the prescribed response time. The bar indicates the average hourly demand and change colors demanding whether the staffing line (red line) is above or below the dark blue geographic plus the average demand line. If the staffing line is above the dark blue line and there is "space" between the lines that indicates there is capacity within the system. If the staffing line falls below the geographic plus demand line (dark blue), this indicates that there are not enough resources during that hour and the bar lines will change colors.

**Figure 56. Staffing vs. Demand Example**




### *Full System: Fourteen Minute Response Evaluation – Staffing vs. Demand*

Reviewing the resources required to deploy and meet a 14-minute travel time performance from the current stations being deployed, the contractor could capture 90% of the historical volume from 57 stations. Figure 57 shows that current staffing levels indicate the contractor would have enough resources but should adjust staffing from times of over capacity to the high-volume periods during midday. Correcting the off-load time to 20 minutes adds the 13.5 12 hour shifts back into the system. Figure 58 displays the capacity within the system.

**Figure 57. Full System – Staffing vs. Demand: Fourteen Minute Response Evaluation**

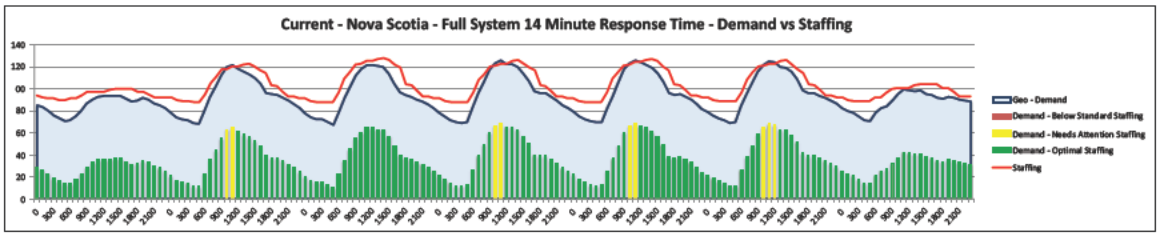
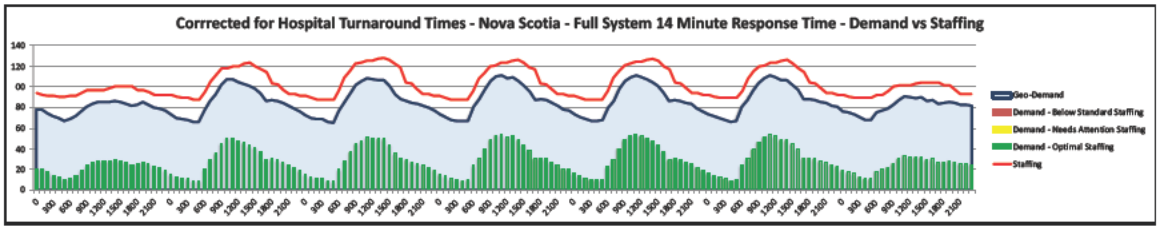



**Figure 58. Full System – Staffing vs. Demand: Corrected for Off-Load**




## Central Region Evaluations

### *Central Region - Fourteen Minute Response Evaluation*

In review of the Central Region, the resources to deploy and meet a 14-minute travel time performance from the current stations, the contractor could capture 92.8 percent of the historical volume from four stations. Currently, the contractor deploys from nine stations. At the point of five stations utilized, their marginal benefit for each station of less than 0.5 percent. Figure 59 is the drive time map for the Central Region and Figure 60 that follows indications the post and total activity capture as stations are added.

**Figure 59. Central Region – Fourteen Minute Response Evaluation Map**

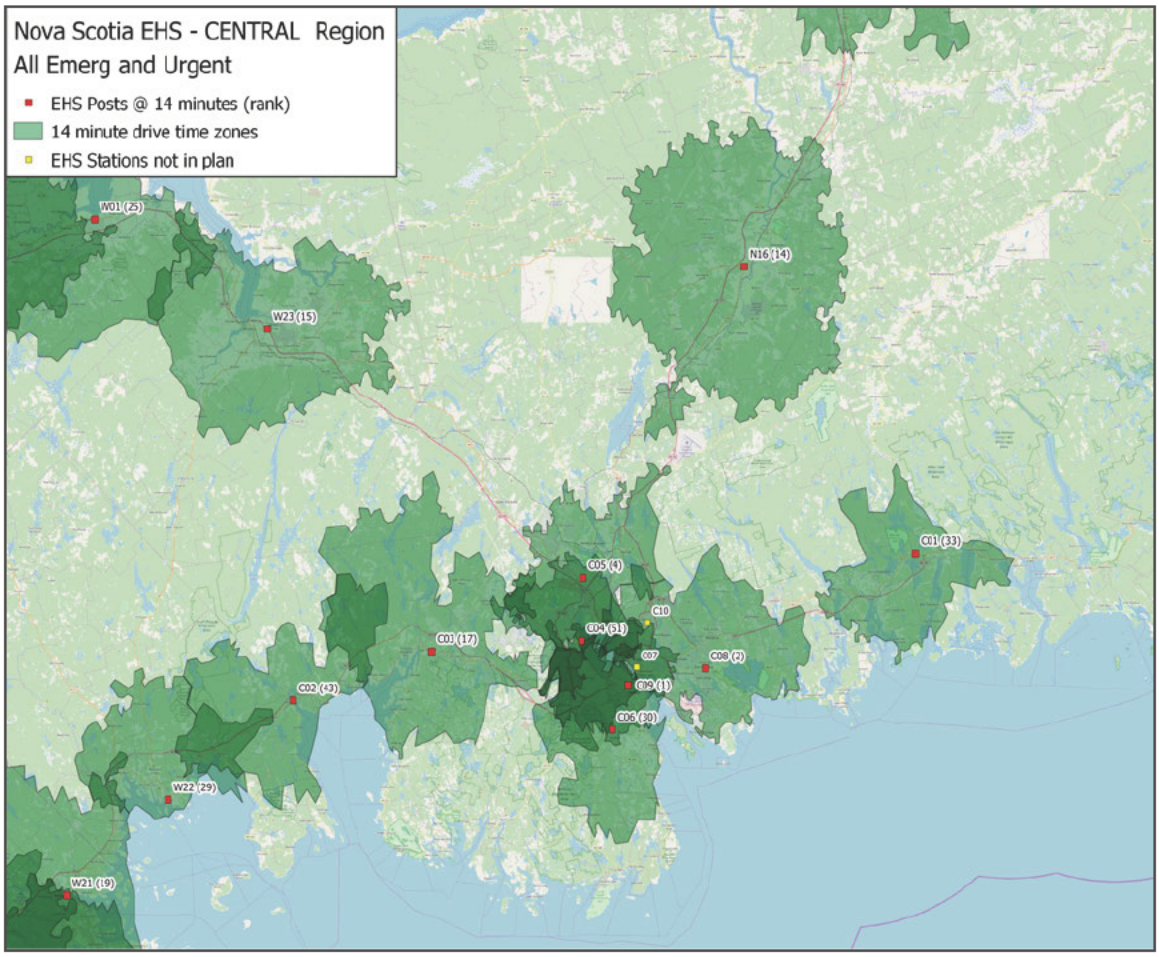



**Figure 60. Central Region – Fourteen Minute Response Capture**

| Rank | PostNumber | Location | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | C09 | near Bach s Cafe/Bach s Cafe | 28211 | 28211 | 62.48% |
| 2 | C08 | near Classic Fish & Chips/1 | 6307 | 34518 | 76.45% |
| 3 | C05 | near King Town Chinese Restaurant/39 Freer Ln. Lower Sackville NS | 6025 | 40543 | 89.79% |
| 4 | C03 | near Moon Tong Restaurant/5048 St Margaret s Bay Rd. Upper Tantallon N | 1357 | 41900 | 92.80% |
| 5 | C06 | near New Asia Restaurant/New Asia Restaurant | 630 | 42530 | 94.20% |
| 6 | C02 | | 220 | 42750 | 94.68% |
| 7 | C04 | near Howard Johnson nn Halifax/609 Hwy 2. Halifax NS | 134 | 42884 | 94.98% |
| 8 | C01 | near Elephant s Nest B&B/7224 Marine Dr. Halifax NS | 18 | 42902 | 95.02% |
| 9 | C10 | near Best Western Dartmouth Hotel & Sts/8 | 3 | 42905 | 95.03% |

### *Central Region – Staffing vs. Demand*

Current staffing levels indicate the contractor does not have enough resources to cover a 14-minute travel time, without correcting the off-load times, purchasing more unit hours, or adjusting resources from other areas of the system. Correcting the off-load issues would greatly

improve this region's capacity at no cost to the Province. Figure 61 indicates the Staffing vs. Demand for the Central Region in the current system and Figure 62 represents the Central Region with off-load corrections.

**Figure 61. Central Region – Staffing vs. Demand: Current**

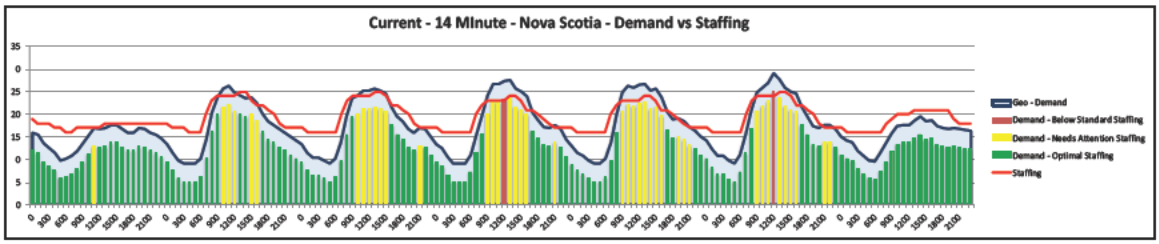
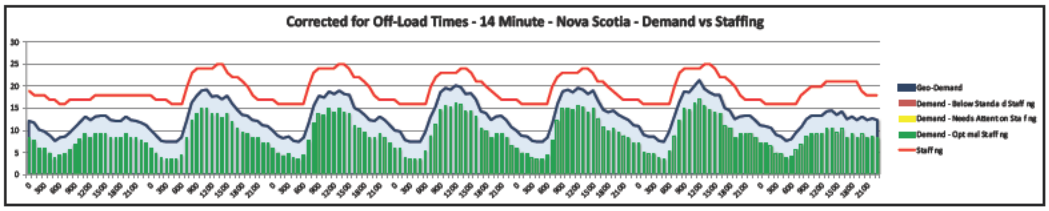



**Figure 62. Central Region – Staffing vs. Demand: Corrected for Off-Load**




## East Region Evaluations

### *East Region - Fourteen Minute Response Evaluation*

The current 14 stations within the Eastern Region do not capture 90 percent of the historical demand within 14 minutes travel time. From 14 locations, 88.69% of the historical volume is captured. This modeling aligns with current performance. Figure 63 reflects the 14-minute drive time map for this region and Figure 64 represents the response capture at fourteen minute drive times.

**Figure 63. East Region – Fourteen Minute Response Evaluation Map**

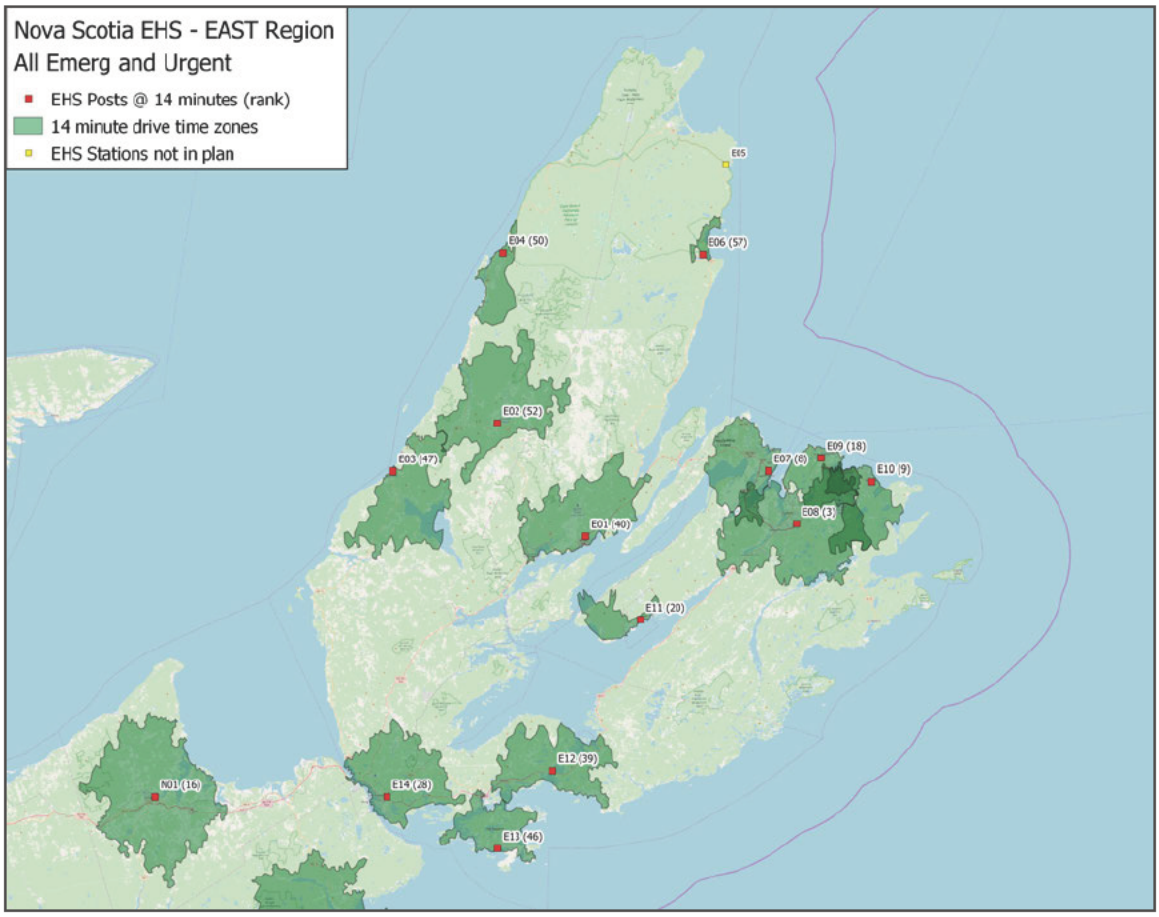



**Figure 64. East Region – Fourteen Minute Response Capture**

| Rank | PostNumber | ocation | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | E08 | near Dozays Native Art Gallery/1494 Hwy 22. Sydney NS | 6080 | 6080 | 33.75% |
| 2 | E07 | near Canton Restaurant/59 Memorial Dr. North Sydney NS | 2617 | 8697 | 48.28% |
| 3 | E10 | near Huang amily Restaurant/37 Hwy 255. Glace Bay NS | 2524 | 11221 | 62.29% |
| 4 | E09 | | 1246 | 12467 | 69.20% |
| 5 | E11 | near Ketkunimk Motel/2 Arena Rd. Eskasoni NS | 1182 | 13649 | 75.76% |
| 6 | E14 | near China King amily Restaurant/65 Macinnis Rd. Port Hawkesbury NS | 762 | 14411 | 79.99% |
| 7 | E12 | near St Peters Canal National Hist Site/10018 Grenville St. St Peter s NS | 374 | 14785 | 82.07% |
| 8 | E01 | near ynwood nn/28 Big Baddeck Rd. Victoria NS | 347 | 15132 | 84.00% |
| 9 | E13 | | 240 | 15372 | 85.33% |
| 10 | E03 | near nverness odge Hotel & Motel/16032 Hwy 19. nverness NS | 201 | 15573 | 86.44% |
| 11 | E04 | near Oceanview Motel & Chalets/142 apointe Rd. nverness NS | 166 | 15739 | 87.37% |
| 12 | E02 | | 133 | 15872 | 88.10% |
| 13 | E06 | near Keltic odge/ ngonish Beach | 65 | 15937 | 88.47% |
| 14 | E05 | | 41 | 15978 | 88.69% |

### *East Region – Staffing vs. Demand*

Current staffing indicates there is resource capacity and sufficient resources within this region. Resources should be shifted either to other regions that are under resourced or resources should be considered for the ECP model. Figures 65 and 66 indicate Staffing vs. Demand for 14-minute drive times both for the current system and with corrections for off-load delays.

**Figure 65. East Region – Staffing vs. Demand: Current System**

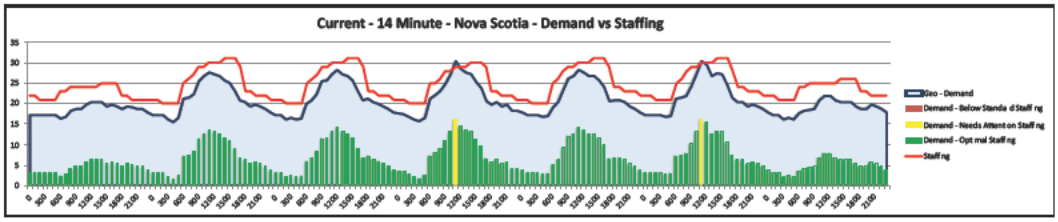
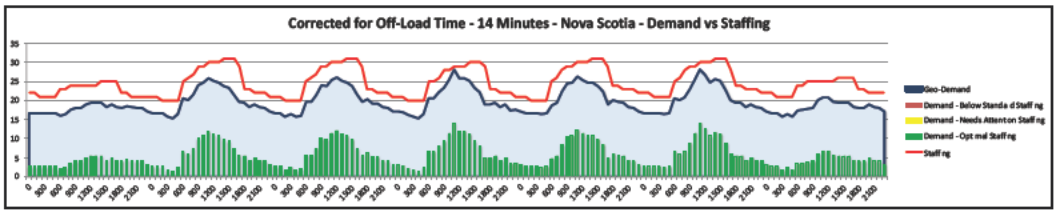



**Figure 66. East Region – Staffing vs. Demand: Off-Load Corrections**




## North Region Evaluations

### *North Region - Fourteen Minute Response Evaluation*

The current 16 stations in the Northern Region do not capture 90 percent of the historical demand within 14 minutes travel time. From 16 locations, 79.36% of the historical volume is captured. This modeling aligns with current performance. Figure 67 is a map of the current capture of activity for a 14-minute drive time and Figure 68 that follows indicates the activity capture by station.

**Figure 67. North Region – Fourteen Minute Response Evaluation Map**

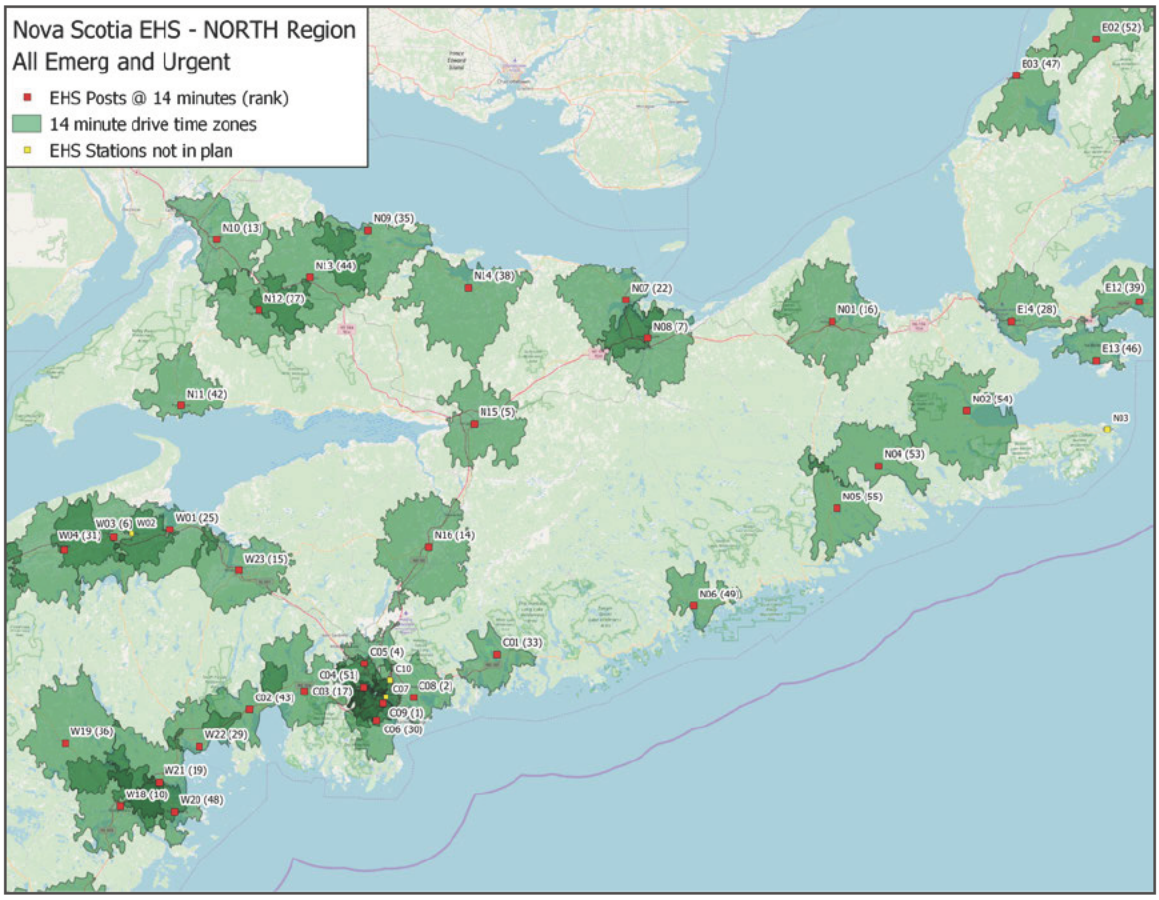



**Figure 68. North Region – Fourteen Minute Response Capture**

| Rank | PostNumber | _ocation | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | N15 | near Harvey Woods/37 Hwy-311. Truro NS | 4974 | 4974 | 22.67% |
| 2 | N08 | near Artgems raming and Gallery/379 Stewart St. New Glasgow NS | 3603 | 8577 | 39.09% |
| 3 | N10 | near Dragon nn Restaurant/46 Albion St. Amherst NS | 1880 | 10457 | 47.66% |
| 4 | N16 | | 1813 | 12270 | 55.92% |
| 5 | N01 | near Antigonish Victorian nn/145 St Andrews St. Antigonish NS | 1451 | 13721 | 62.53% |
| 6 | N07 | near Lionstone nn/26 Pine Tree Rd. Pictou NS | 961 | 14682 | 66.91% |
| 7 | N12 | near JB Steakhouse/101 Drummond St. Springhill NS | 782 | 15464 | 70.47% |
| 8 | N09 | near Shillelagh Sheila s Country nn/Church St. Pugwash NS | 447 | 15911 | 72.51% |
| 9 | N14 | near Chowder s amous ish & Seafood/125 Blair Ave. Tatamagouche NS | 381 | 16292 | 74.25% |
| 10 | N11 | | 338 | 16630 | 75.79% |
| 11 | N13 | near Parkview amily Restaurant & nn/5155 Hwy-321. Oxford NS | 318 | 16948 | 77.24% |
| 12 | N06 | | 170 | 17118 | 78.01% |
| 13 | N04 | | 95 | 17213 | 78.44% |
| 14 | N02 | near Desbarres Manor/10153 Hwy-16. Guysborough NS | 84 | 17297 | 78.83% |
| 15 | N05 | | 71 | 17368 | 79.15% |
| 16 | N03 | near Canso slands and Grassy sland ort/194 School St. Canso NS | 47 | 17415 | 79.36% |

### *North Region - Staffing vs. Demand*

The North Region matches supply and demand well. With the corrected off-load issues and a shift of specific resources to the ECP model, the Northern region would be staffed and deployed appropriately. Figures 69 and 70 indicate Staffing vs. Demand for 14-minute drive times both for the current system and with corrections for off-load delays.

**Figure 69. North Region – Staffing vs. Demand: Current**

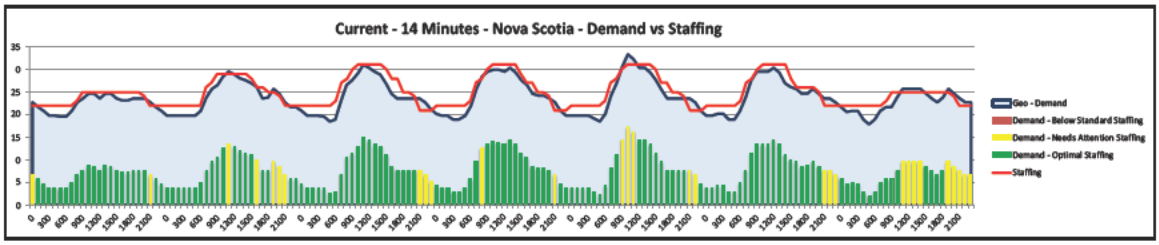
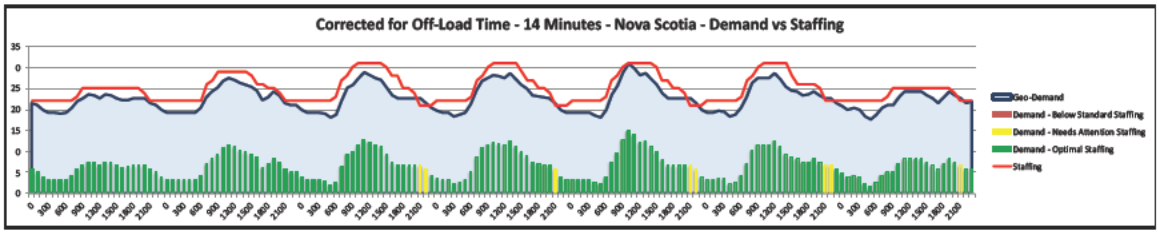



**Figure 70. North Region – Staffing vs. Demand: Off-Load Corrections**




## West Region Evaluations

### *West Region - Fourteen Minute Response Evaluation*

The current 23 stations in the Western Region do not capture 90 percent of the historical demand within 14 minutes travel time. From 23 locations, 88.87% of the historical volume is captured. This modeling aligns with current performance. Figure 71 is a map of the current capture of activity for a 14-minute drive time and Figure 72 that follows indicates the activity capture by station.

**Figure 71. West Region – Fourteen Minute Response Evaluation Map**

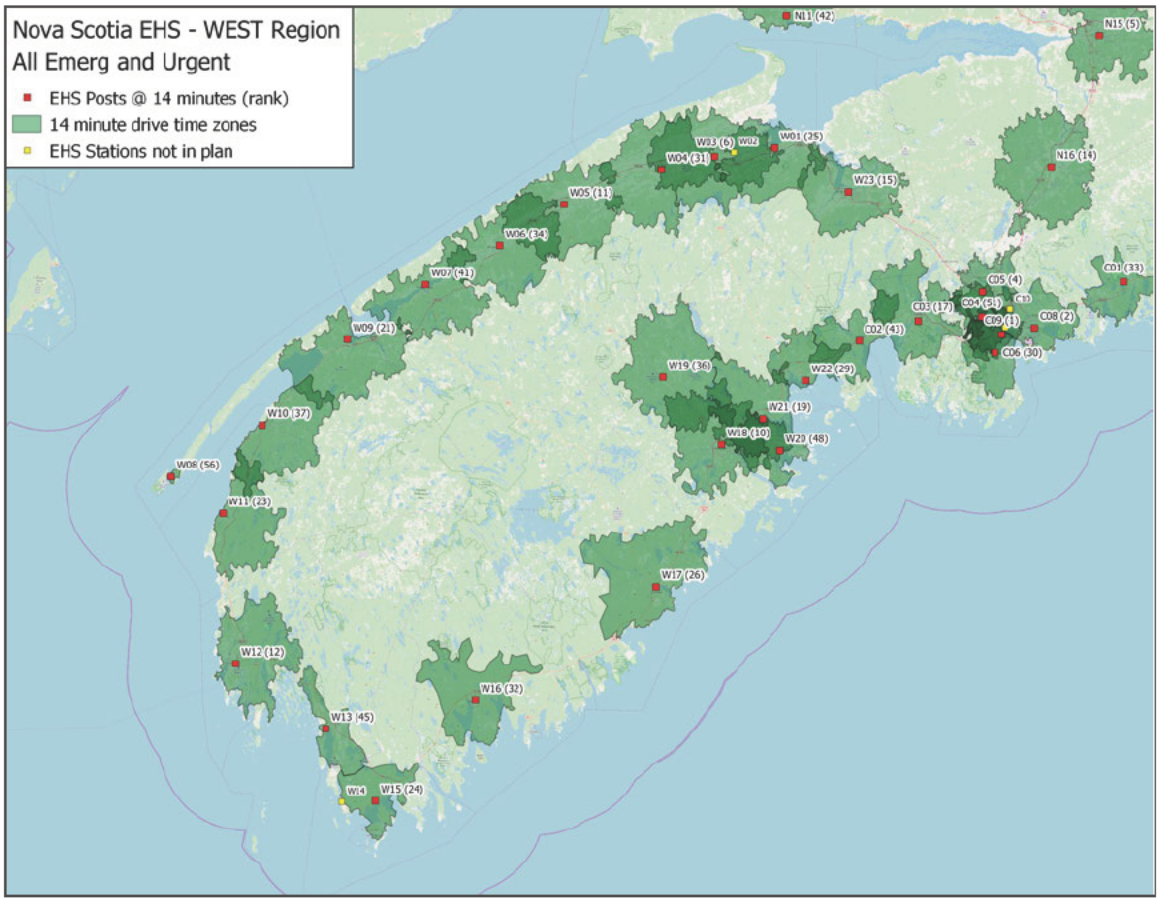


**Figure 72. West Region – Fourteen Minute Response Capture**

| Rank | PostNumber | _ocation | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | W03 | near Kentville Visitor nformation Ctr/Hwy 1. Coldbrook NS | 4925 | 4925 | 18.80% |
| 2 | W18 | near Comfort nn Bridgewater/91 North St. Bridgewater NS | 2333 | 7258 | 27.71% |
| 3 | W05 | near House of Cheng Restaurant/467 Evangeline Trail. Middleton NS | 2178 | 9436 | 36.03% |
| 4 | W12 | near Prince Arthur Steak & Seafood House/2 Enterprise St. Yarmouth N | 2170 | 11606 | 44.31% |
| 5 | W23 | near Super 8 Windsor/98 Morrison Dr. Windsor NS | 1683 | 13289 | 50.74% |
| 6 | W21 | near Heart s Desire B&B/14 Aberdeen Ln. Mahone Bay NS | 1206 | 14495 | 55.35% |
| 7 | W09 | near Coastal nn/Hwy 303. Digby Municipal District NS | 1046 | 15541 | 59.34% |
| 8 | W11 | | 917 | 16458 | 62.84% |
| 9 | W15 | | 914 | 17372 | 66.33% |
| 10 | W01 | near Tempest Restaurant/5 Locust Ave. Wolfville NS | 893 | 18265 | 69.74% |
| 11 | W17 | near Lane s Privateer nn/Hwy 8. Liverpool NS | 863 | 19128 | 73.04% |
| 12 | W22 | near Amicus Gallery/136 Central St. Chester NS | 729 | 19857 | 75.82% |
| 13 | W04 | near Hidden Gardens B&B/102 Brown St. Berwick NS | 584 | 20441 | 78.05% |
| 14 | W16 | near Cape Cod Colony Motel/131 Hwy 3. Shelburne NS | 573 | 21014 | 80.24% |
| 15 | W06 | | 534 | 21548 | 82.28% |
| 16 | W19 | | 414 | 21962 | 83.86% |
| 17 | W10 | | 397 | 22359 | 85.37% |
| 18 | W07 | near Charlie s Place/Charlie s Place | 341 | 22700 | 86.67% |
| 19 | W13 | | 280 | 22980 | 87.74% |
| 20 | W20 | near Homeport Motel/Homeport Motel | 184 | 23164 | 88.45% |
| 21 | W08 | near Brier sland Lodge & Restaurant/77 Hwy 217. Freeport NS | 70 | 23234 | 88.71% |
| 22 | W14 | | 23 | 23257 | 88.80% |
| 23 | W02 | near Grand Street nn B&B/90 Aberdeen St. Kentville NS | 18 | 23275 | 88.87% |

### *West Region - Staffing vs. Demand*

Within the Western Region, there is noted capacity before and after correcting the off-load times. The current over capacity should be utilized within the recommend ECP model. Furthermore, resources from this region could be shifted to address under resourcing within other regions. Figures 73 and 74 indicate Staffing vs. Demand for 14-minute drive times both for the current system and with corrections for off-load delays.

**Figure 73. West Region – Staffing vs. Demand: Current**

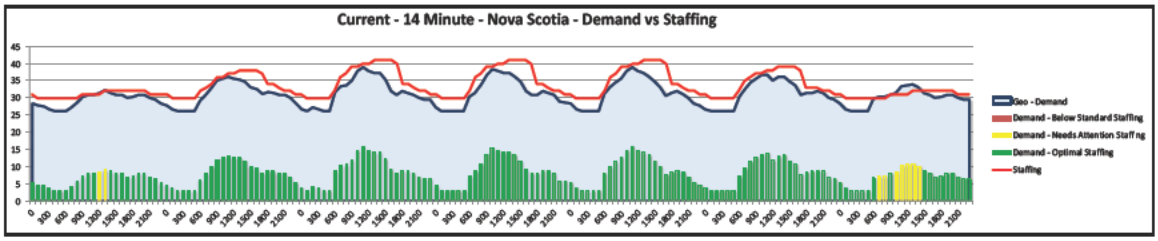
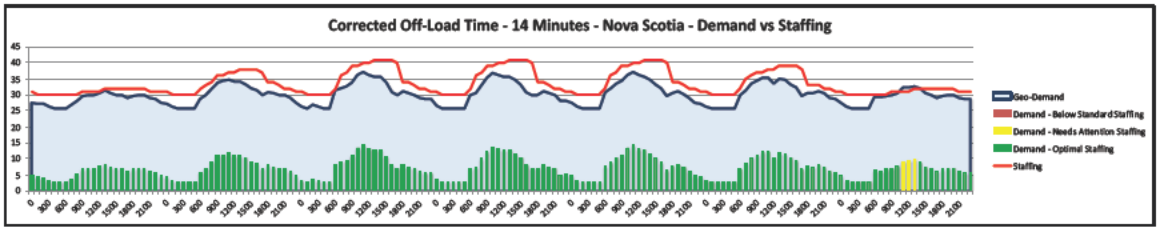


**Figure 74. West Region – Staffing vs. Demand: Off-Load Correction**

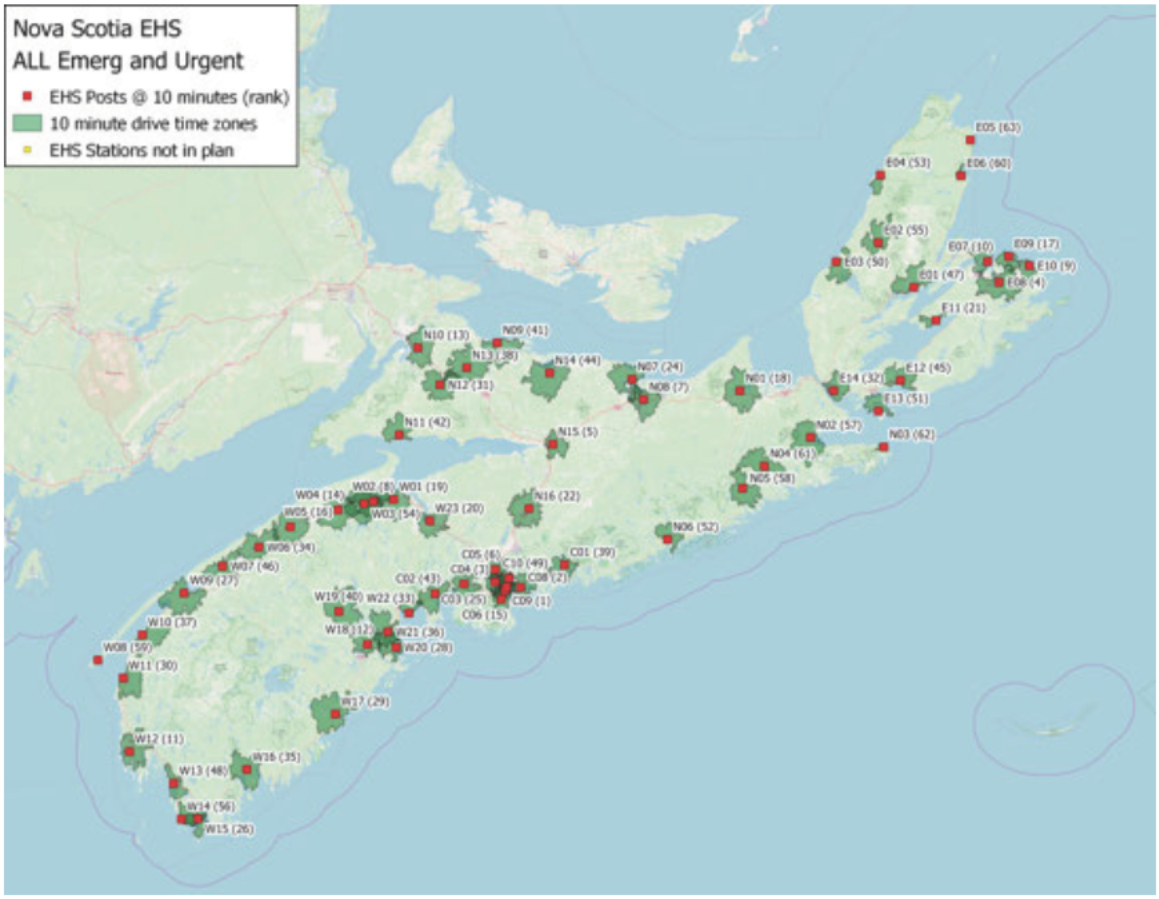



## Full System Evaluations - Client

### *Full System: Client - Ten Minute Response Evaluation*

From the current 62 station locations, 80.78% of the historical volume is captured within a 10-minute travel time. This response level could be considered as a minimum level acceptable level of response for Category 1 travel times. Figure 75 is the ten minute drive time map for the full system and Figure 76 indicates the post and total activity capture as stations are added.

**Figure 75. Full System: Client – Ten Minute Response Evaluation Map**



## Figure 76. Full System: Client – Ten Minute Response Capture

| Rank | Pos_Number | _oca_ion | Pos_Cap_ure | To_alCap_ure | Percen_Cap_ure |
|---|---|---|---|---|---|
| 1 | C09 | near Bach s Cafe/Bach s Cafe | 20380 | 20380 | 18.31% |
| 2 | C08 | near Classic ish & Chips/1129 Cole Harbour Rd. Dartmouth NS | 6965 | 27345 | 24.57% |
| 3 | C04 | near Howard Johnson nn Halifax/609 Hwy 2. Halifax NS | 5149 | 32494 | 29.20% |
| 4 | E08 | near Dozays Native Art Gallery/1494 Hwy 22. Sydney NS | 4904 | 37398 | 33.60% |
| 5 | N15 | near Harvey Woods/37 Hwy 311. Truro NS | 4497 | 41895 | 37.64% |
| 6 | C05 | near King Town Chinese Restaurant/39 reer n. ower Sackville NS | 3304 | 45199 | 40.61% |
| 7 | N08 | near Artgems raming and Gallery/ 6 | 3125 | 48324 | 43.42% |
| 8 | W02 | near Grand Street nn B&B/90 Aberdeen St. Kentville NS | 2914 | 51238 | 46.04% |
| 9 | E10 | near Huang amily Restaurant/37 Hwy 255. Glace Bay NS | 2589 | 53827 | 48.36% |
| 10 | E07 | near Canton Restaurant/59 Memorial Dr. North Sydney NS | 2574 | 56401 | 50.68% |
| 11 | W12 | near Prince Arthur Steak & Seafood House/2 Enterprise St. Yarmouth NS | 1900 | 58301 | 52.38% |
| 12 | W18 | near Comfort nn Bridgewater/91 North St. Bridgewater NS | 1879 | 60180 | 54.07% |
| 13 | N10 | near Dragon nn Restaurant/46 Albion St. Amherst NS | 1834 | 62014 | 55.72% |
| 14 | W04 | near Hidden Gardens B&B/102 Brown St. Berwick NS | 1804 | 63818 | 57.34% |
| 15 | C06 | near New Asia Restaurant/New Asia Restaurant | 1723 | 65541 | 58.89% |
| 16 | W05 | near House of Cheng Restaurant/467 Evangeline Trail. Middleton NS | 1630 | 67171 | 60.35% |
| 17 | E09 | | 1282 | 68453 | 61.50% |
| 18 | N01 | near Antigonish Victorian nn/145 St Andrews St. Antigonish NS | 1282 | 69735 | 62.66% |
| 19 | W01 | near Tempest Restaurant/ 18 | 1248 | 70983 | 63.78% |
| 20 | W23 | near Super 8 Windsor/98 Morrison Dr. Windsor NS | 1238 | 72221 | 64.89% |
| 21 | E11 | near Ketkunimk Motel/ 20 | 1172 | 73393 | 65.94% |
| 22 | N16 | | 1164 | 74557 | 66.99% |
| 23 | C07 | near Pho Hoang Minh Vietnamese Restaurnt/196 Wyse Rd. Dartmouth NS | 971 | 75528 | 67.86% |
| 24 | N07 | near ionstone nn/26 Pine Tree Rd. Pictou NS | 909 | 76437 | 68.68% |
| 25 | C03 | near Moon Tong Restaurant/5048 St Margaret s Bay Rd. Upper Tantallon NS | 909 | 77346 | 69.49% |
| 26 | W15 | | 847 | 78193 | 70.25% |
| 27 | W09 | near Coastal nn/Hwy 303. Digby Municipal District NS | 810 | 79003 | 70.98% |
| 28 | W20 | near Homeport Motel/Homeport Motel | 782 | 79785 | 71.69% |
| 29 | W17 | near ane s Privateer nn/Hwy 8. iverpool NS | 755 | 80540 | 72.36% |
| 30 | W11 | | 726 | 81266 | 73.02% |
| 31 | N12 | near JB Steakhouse/101 Drummond St. Springhill NS | 692 | 81958 | 73.64% |
| 32 | E14 | near China King amily Restaurant/65 Macinnis Rd. Port Hawkesbury NS | 647 | 82605 | 74.22% |
| 33 | W22 | near Amicus Gallery/136 Central St. Chester NS | 611 | 83216 | 74.77% |
| 34 | W06 | | 540 | 83756 | 75.25% |
| 35 | W16 | near Cape Cod Colony Motel/131 Hwy 3. Shelburne NS | 528 | 84284 | 75.73% |
| 36 | W21 | near Heart s Desire B&B/14 Aberdeen n. Mahone Bay NS | 453 | 84737 | 76.13% |
| 37 | W10 | | 397 | 85134 | 76.49% |
| 38 | N13 | near Parkview amily Restaurant & nn/5155 Hwy 321. Oxford NS | 367 | 85501 | 76.82% |
| 39 | C01 | near Elephant s Nest B&B/7224 Marine Dr. Halifax NS | 362 | 85863 | 77.15% |
| 40 | W19 | | 359 | 86222 | 77.47% |
| 41 | N09 | near Shillelagh Sheila s Country nn/Church St. Pugwash NS | 344 | 86566 | 77.78% |
| 42 | N11 | | 315 | 86881 | 78.06% |
| 43 | C02 | | 315 | 87196 | 78.34% |
| 44 | N14 | near Chowder s amous ish & Seafood/125 Blair Ave. Tatamagouche NS | 307 | 87503 | 78.62% |
| 45 | E12 | near St Peters Canal National Hist Site/10018 Grenville St. St Peter s NS | 285 | 87788 | 78.88% |
| 46 | W07 | near Charlie s Place/Charlie s Place | 281 | 88069 | 79.13% |
| 47 | E01 | near ynwood nn/28 Big Baddeck Rd. Victoria NS | 211 | 88280 | 79.32% |
| 48 | W13 | | 211 | 88491 | 79.51% |
| 49 | C10 | near Best Western Dartmouth Hotel & Sts/Halifax | 198 | 88689 | 79.69% |
| 50 | E03 | near nverness odge Hotel & Motel/16032 Hwy 19. nverness NS | 184 | 88873 | 79.85% |
| 51 | E13 | | 166 | 89039 | 80.00% |
| 52 | N06 | | 143 | 89182 | 80.13% |
| 53 | E04 | near Oceanview Motel & Chalets/142 apointe Rd. nverness NS | 134 | 89316 | 80.25% |
| 54 | W03 | near Kentville Visitor nformation Ctr/ 53 | 125 | 89441 | 80.36% |
| 55 | E02 | | 94 | 89535 | 80.45% |
| 56 | N02 | near Desbarres Manor/10153 Hwy 16. Guysborough NS | 70 | 89605 | 80.51% |
| 57 | N05 | | 65 | 89670 | 80.57% |
| 58 | W08 | near Brier sland odge & Restaurant/77 Hwy 217. reeport NS | 59 | 89729 | 80.62% |
| 59 | E06 | near Keltic odge/37865 Hwy 19. ngonish NS | 49 | 89778 | 80.66% |
| 60 | N04 | | 48 | 89826 | 80.71% |
| 61 | N03 | near Canso slands and Grassy sland ort/194 School St. Canso NS | 43 | 89869 | 80.75% |
| 62 | E05 | | 37 | 89906 | 80.78% |

### *Full System: Client – Staffing vs. Demand*

Current staffing would not meet a 10-minute travel time to the 90%. However, current staffing could meet at 10 minute travel time to the 80%. If off-load times were corrected, the system would have capacity. Figures 77 and 78 indicate Staffing vs. Demand for 10-minute drive times both for the current system and with corrections for off-load delays

**Figure 77. Full System: Client - Staffing vs. Demand: Current**

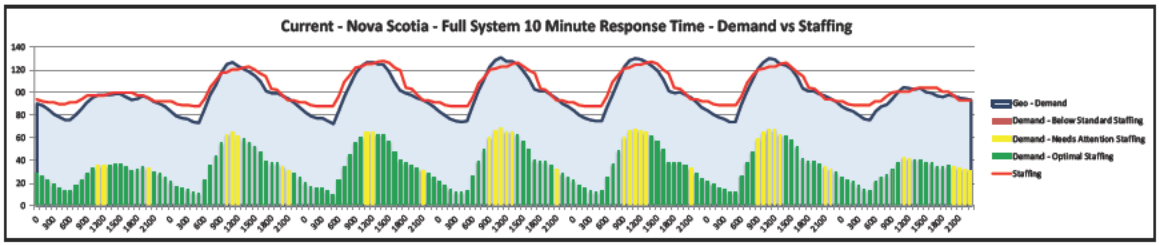
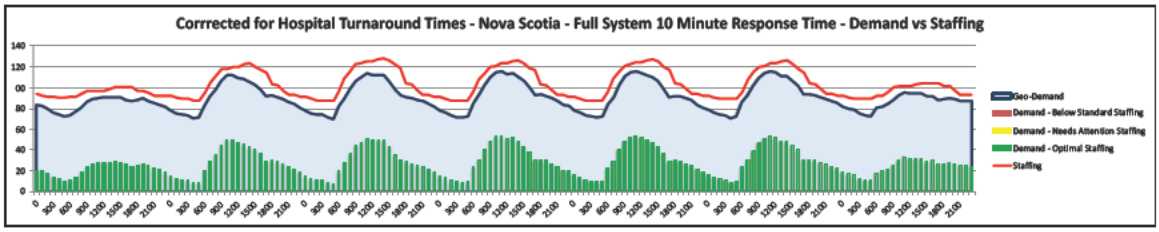



**Figure 78. Full System: Client Staffing vs. Demand: Off-Load Correction**

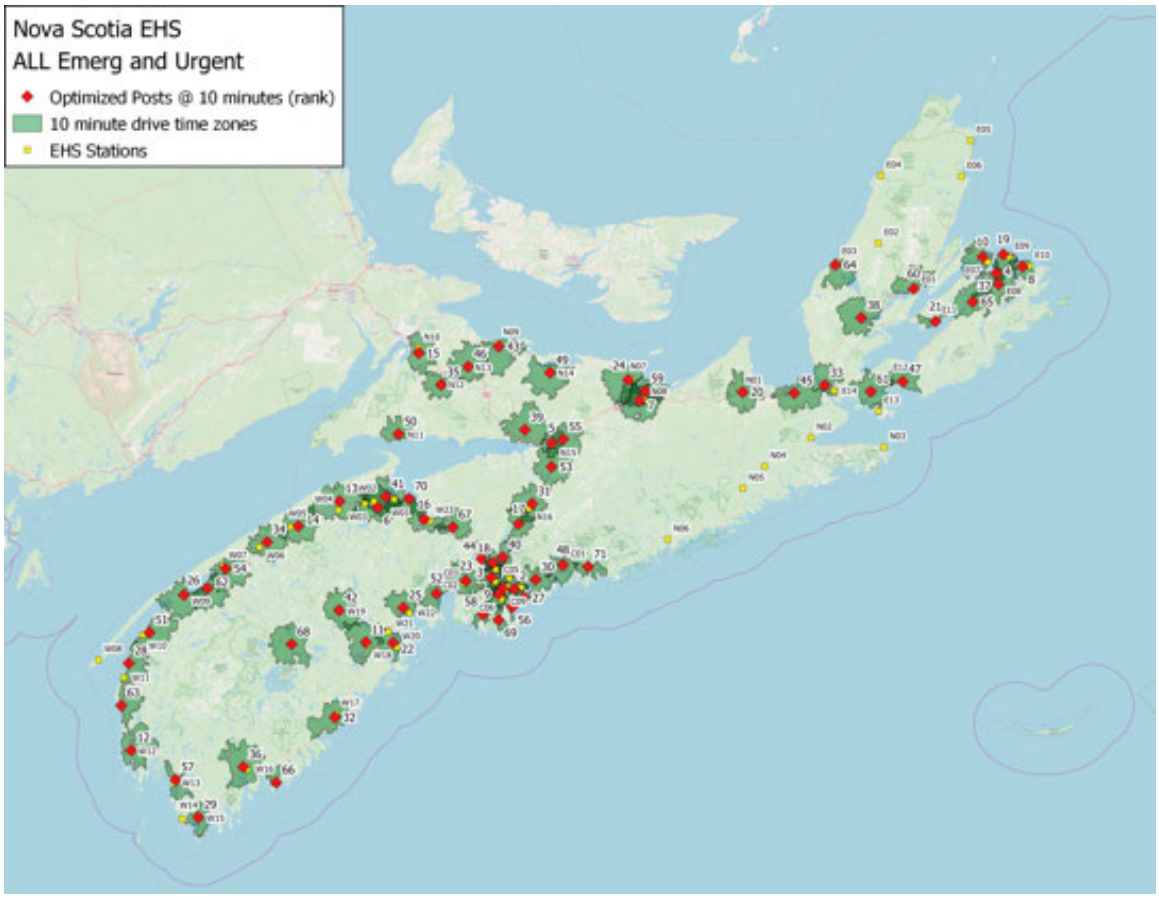



## Full System - Optimized

### *Full System: Optimized - Ten Minute Response Evaluation*

Utilizing the computer-based models for stations and deployment locations different from the current location, the computer-based models indicate that from 71 locations, 90.11 percent of the historical volume could be captured achieved with a 10-minute travel time. This would require hard assets and stations to be moved to meet this level of performance. Figure 79 is the ten minute drive time map for the full system optimized and Figure 80 indicates the post and total activity capture as stations are added.

**Figure 79. Full System: Optimized - Ten Minute Response Evaluation Map**



## Figure 80. Full System: Optimized – Ten Minutes Response Capture

| Rank | PostNumber | Location | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | 61- 87 | near Chebucto nn/6044 ady ammond Rd. alifax NS | 1068 | 1068 | 18.93% |
| | 61- 81 | near Boomerang's Steak ouse/ wy-111. Dartmouth NS | 9013 | 30081 | 7.03% |
| 3 | 55- 93 | near Szechuan Restaurant/ alifax | 5559 | 35640 | 3 .0 % |
| 4 | 100- 6 | near Dozays Native Art Gallery/ 3 | 5134 | 40774 | 36.63% |
| 5 | 18 - 6 | near Eagles anding B&B/Marshland Dr. Truro NS | 45 7 | 45301 | 40.70% |
| 6 | 18-35 | near Grand Street nn B&B/401 ighbury School Rd. Kings NS | 3797 | 49098 | 44.11% |
| 7 | 159- 16 | near Comfort nn-New Glasgow/ wy-104. Pictou County NS | 3464 | 5 56 | 47. 3% |
| 8 | 91-13 | near Cedarwoods B&B/Cape Breton sland | 7 3 | 55 85 | 49.67% |
| 9 | 64- 89 | near Best Western-Chocolate ake otel/NW Arm Dr. alifax NS | 704 | 57989 | 5 .10% |
| 10 | 85-34 | near Annfield Manor/ 30 Villa Dr. Bras d'Or NS | 636 | 606 5 | 54.47% |
| 11 | 91-357 | near Comfort nn-Bridgewater/ wy-10. Cookville NS | 034 | 6 659 | 56.30% |
| 1 | 353-475 | near Prince Arthur Steak & Seafood ouse/Nova Scotia | 1974 | 64633 | 58.07% |
| 13 | 15-37 | near idden Gardens B&B/4599 Brooklyn St. Kings NS | 19 1 | 66554 | 59.80% |
| 14 | 9-393 | near ouse of Cheng Restaurant/Nova Scotia | 1895 | 68449 | 61.50% |
| 15 | 134-33 | near Super 8-Amherst/ 14 | 1853 | 7030 | 63.16% |
| 16 | 4-3 8 | near Signature Glass/ wy-101. Falmouth NS | 1455 | 71757 | 64.47% |
| 17 | 6- 79 | near Briarwood Bed & Breakfast/ wy-10 . Elmsdale NS | 1447 | 73 04 | 65.77% |
| 18 | 47- 9 | near May Garden Chinese Food/ alifax | 1 88 | 7449 | 66.93% |
| 19 | 84- 3 | | 1 60 | 7575 | 68.06% |
| 0 | 155-16 | near Antigonish Victorian nn/ wy-4. Antigonish County NS | 1 43 | 76995 | 69.18% |
| 1 | 119-60 | near Ketkunimk Motel/4757 wy- 16. Eskasoni NS | 1150 | 78145 | 70. 1% |
| | 91-343 | near omeport Motel/545 wy-3 4. unenburg Municipal District NS | 1049 | 79194 | 71.15% |
| 3 | 57-306 | near Moon Tong Restaurant/ wy-103. Stillwater ake NS | 956 | 80150 | 7 .01% |
| 4 | 148- | near ionstone nn/ wy- 56. Pictou County NS | 908 | 81058 | 7 .83% |
| 5 | 7 -338 | near Sword & Anchor/ 4 | 873 | 81931 | 73.61% |
| 6 | 68-451 | near Coastal nn/Nova Scotia | 858 | 8 789 | 74.38% |
| 7 | 66- 76 | near Boondocks Dining Room & ounge/ alifax | 857 | 83646 | 75.15% |
| 8 | 306-478 | | 850 | 84496 | 75.9 % |
| 9 | 388-440 | | 8 3 | 85319 | 76.66% |
| 30 | 56- 70 | | 806 | 861 5 | 77.38% |
| 31 | 15- 7 | | 768 | 86893 | 78.07% |
| 3 | 33 -37 | near ane's Privateer nn/Nova Scotia | 749 | 8764 | 78.74% |
| 33 | 15 -119 | near NS Visitor nfo Ctr-Port astings/Cape Breton sland | 7 5 | 88367 | 79.40% |
| 34 | 38-409 | | 708 | 89075 | 80.03% |
| 35 | 151-3 0 | near JB Steakhouse/ Mason St. Springhill NS | 694 | 89769 | 80.66% |
| 36 | 360-418 | near MacKenzie's Motel & Cottages/74 Ohio Rd. Shelburne NS | 539 | 90308 | 81.14% |
| 37 | 94- 7 | near North Star nn/164 E James St. Sydney NS | 474 | 9078 | 81.57% |
| 38 | 116-99 | near Trailsman Motel/11 Reservation Rd. Whycocomagh NS | 44 | 91 4 | 81.96% |
| 39 | 175- 76 | near Barnhill's Superette/1094 Plains Rd. Colchester NS | 4 | 91646 | 8 .34% |
| 40 | 44- 87 | | 41 | 9 058 | 8 .71% |
| 41 | 1 -348 | near Carwarden Bed & Breakfast/1190 wy-358. Port Williams NS | 396 | 9 454 | 83.07% |
| 4 | 74-371 | | 376 | 9 830 | 83.41% |
| 43 | 130- 90 | near Shillelagh Sheila's Country nn/ 761 Crowley Rd. Cumberland NS | 371 | 93 01 | 83.74% |
| 44 | 45- 98 | | 361 | 9356 | 84.06% |
| 45 | 156-135 | | 354 | 93916 | 84.38% |
| 46 | 141-306 | near Parkview Family Restaurant & nn/Oxford | 348 | 94 64 | 84.69% |
| 47 | 151-78 | near St Peters Canal National ist Site/5 Kavanaugh St. Richmond NS | 339 | 94603 | 85.00% |
| 48 | 48- 56 | near Elephant's Nest B&B/ aven n. alifax NS | 330 | 94933 | 85.30% |
| 49 | 144- 63 | near Chowder's Famous Fish & Seafood/151 wy-6. Tatamagouche NS | 3 6 | 95 59 | 85.59% |
| 50 | 178-34 | | 3 5 | 95584 | 85.88% |
| 51 | 89-468 | | 3 5 | 95909 | 86.17% |
| 5 | 64-3 1 | | 316 | 96 5 | 86.46% |
| 53 | 195- 6 | | 31 | 96537 | 86.74% |
| 54 | 53-430 | near illsdale ouse nn/64 wy- 01. Annapolis NS | 89 | 968 6 | 87.00% |
| 55 | 180- 56 | near Smokey's Restaurant/1 6 Salmon River Rd. Valley NS | 78 | 97104 | 87. 5% |
| 56 | 71- 8 | near York Redoubt National istoric Site/ alifax arbour | 74 | 97378 | 87.49% |
| 57 | 368-45 | | 49 | 976 7 | 87.7 % |
| 58 | 75- 97 | near Anchors Gate B&B/Woodridge n. alifax NS | 46 | 97873 | 87.94% |
| 59 | 154- 13 | near Trenton Airport/ 58 | 0 | 98093 | 88.13% |
| 60 | 101-71 | near Silver Dart odge/9 | 16 | 98309 | 88.33% |
| 61 | 156-95 | | 11 | 985 0 | 88.5 % |
| 6 | 64-439 | | 03 | 987 3 | 88.70% |
| 63 | 3 9-481 | | 197 | 989 0 | 88.88% |
| 64 | 87-11 | near nverness odge otel & Motel/6 Park St. nverness NS | 183 | 99103 | 89.04% |
| 65 | 109-40 | | 183 | 99 86 | 89. 1% |
| 66 | 368-401 | | 179 | 99465 | 89.37% |
| 67 | 8-313 | | 171 | 99636 | 89.5 % |
| 68 | 93-395 | | 167 | 99803 | 89.67% |
| 69 | 78- 89 | | 164 | 99967 | 89.8 % |
| 70 | 13-336 | near Grand Pre National istoric Site/Nova Scotia | 163 | 100130 | 89.96% |
| 71 | 49- 43 | near not much of anything | 163 | 100 93 | 90.11% |

### *Full System: Optimized - Staffing vs. Demand*

Without correcting the off-load delays the 10-minute travel time to the 90 percent could not be achieved. However, if the off-load delays were corrected, then the system would be staffed sufficiently to performance at the 10-minute travel time to the 90th percent. Figure 81 indicates the Staffing vs. Demand for the full system optimized and Figure 82 represents the full system optimized with off-load corrections.

**Figure 81. Full System: Optimized – Staffing vs. Demand: Current**

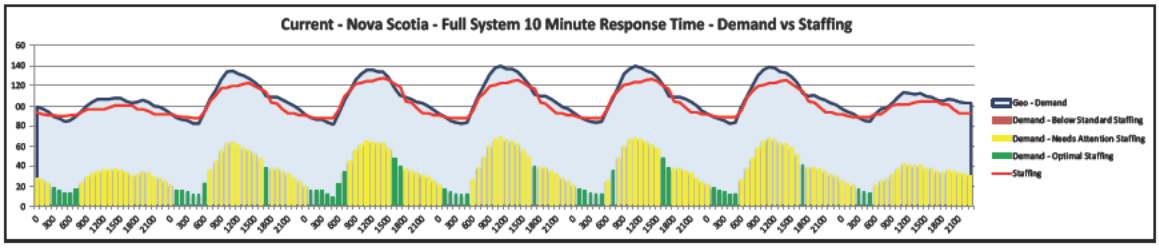
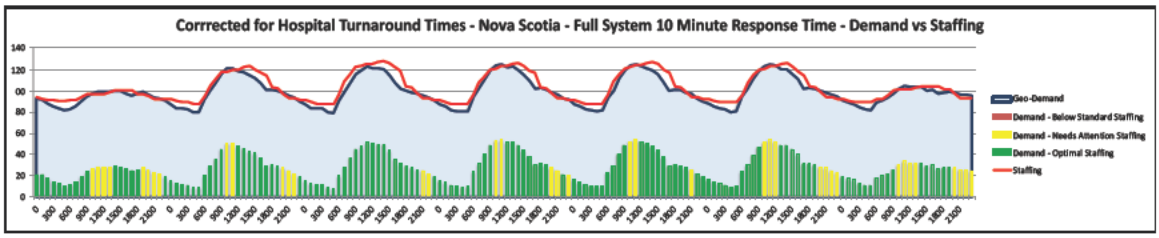



**Figure 82. Full System: Optimized – Staffing vs. Demand: Off-Load Correction**




## Extended Care Paramedic - Optimized

### *Extended Care Paramedic: Optimized – 60 minute Response time*

Following a caller being determined by the ECN to need an ECP response, the units will be deployed to meet a response time of 60 minutes 90% of the time. Utilizing a computer-based model, only six units would be needed to cover 60 minutes 90%. To cover the full geography to ensure rural coverage, it was determined a minimum of nine geographically staffed units from current staffed stations would be required and would capture 95.92% of the total volume in 60 minutes. In total, demand required 126,971-unit hours or 28.98, 12-hour units staffed to cover the base geographic needs and the peak-of-day requirements. Figure 83 is the 60 minute drive time map for ECP optimized and Figure 84 indicates the post and total activity capture as units are added.

**Figure 83. Extended Care Paramedic - 60 Minute Response Evaluation Map**

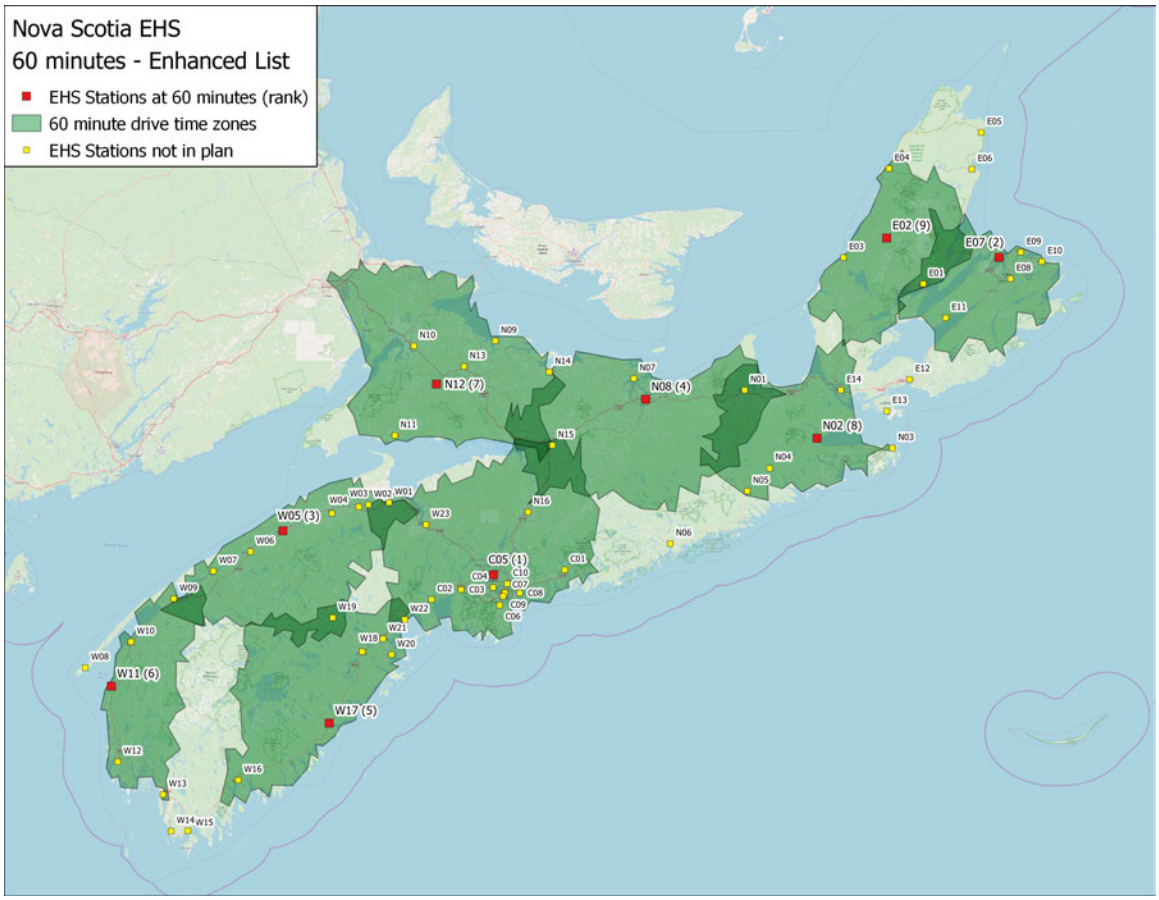



**Figure 84. Extended Care Paramedic: Optimized – 60 Minutes Response Capture**

| Rank | PostNumber | ocation | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | C05 | near King Town Chinese Restaurant/39 reer n. ower Sackville NS | 58965 | 58965 | 52.98% |
| 2 | E07 | near Canton Restaurant/59 Memorial Dr. North Sydney NS | 14646 | 73611 | 66.14% |
| 3 | W05 | near House of Cheng Restaurant/467 Evangeline Trail. Middleton NS | 7820 | 81431 | 73.16% |
| 4 | N08 | near Artgems raming and Gallery/379 Stewart St. New Glasgow NS | 7532 | 88963 | 79.93% |
| 5 | W17 | near ane s Privateer nn/Hwy 8. iverpool NS | 5773 | 94736 | 85.12% |
| 6 | W11 | | 4705 | 99441 | 89.35% |
| 7 | N12 | near JB Steakhouse/101 Drummond St. Springhill NS | 4649 | 104090 | 93.52% |
| 8 | N02 | near Desbarres Manor/10153 Hwy 16. Guysborough NS | 1420 | 105510 | 94.80% |
| 9 | E02 | | 1247 | 106757 | 95.92% |

## Wheelchair - Optimized

### *Wheelchair: Optimized – 120 minute Response time*

In determining the level of response for wheelchair services, for an unscheduled wheelchair transport a 120-minute response time is utilized. In distributing wheelchair resources throughout the Province to ensure geographic coverage, 93.73% of all projected wheelchair responses could be covered from three locations. To ensure Province-wide response, a six unit coverage would allow for geographic coverage up to 98.46%. To ensure both the geographic area and the normalized demand for service is covered (total demand), an estimated 70,281 unit hours or 16.05, 12-hour units staffed to cover the base geographic needs and the peak-of-

day requirements. Figure 85 is the 120 minute drive time map for Wheelchair optimized and Figure 86 indicates the post and total activity capture as units are added.

**Figure 85. Wheelchair - 120 Minute Response Evaluation Map**

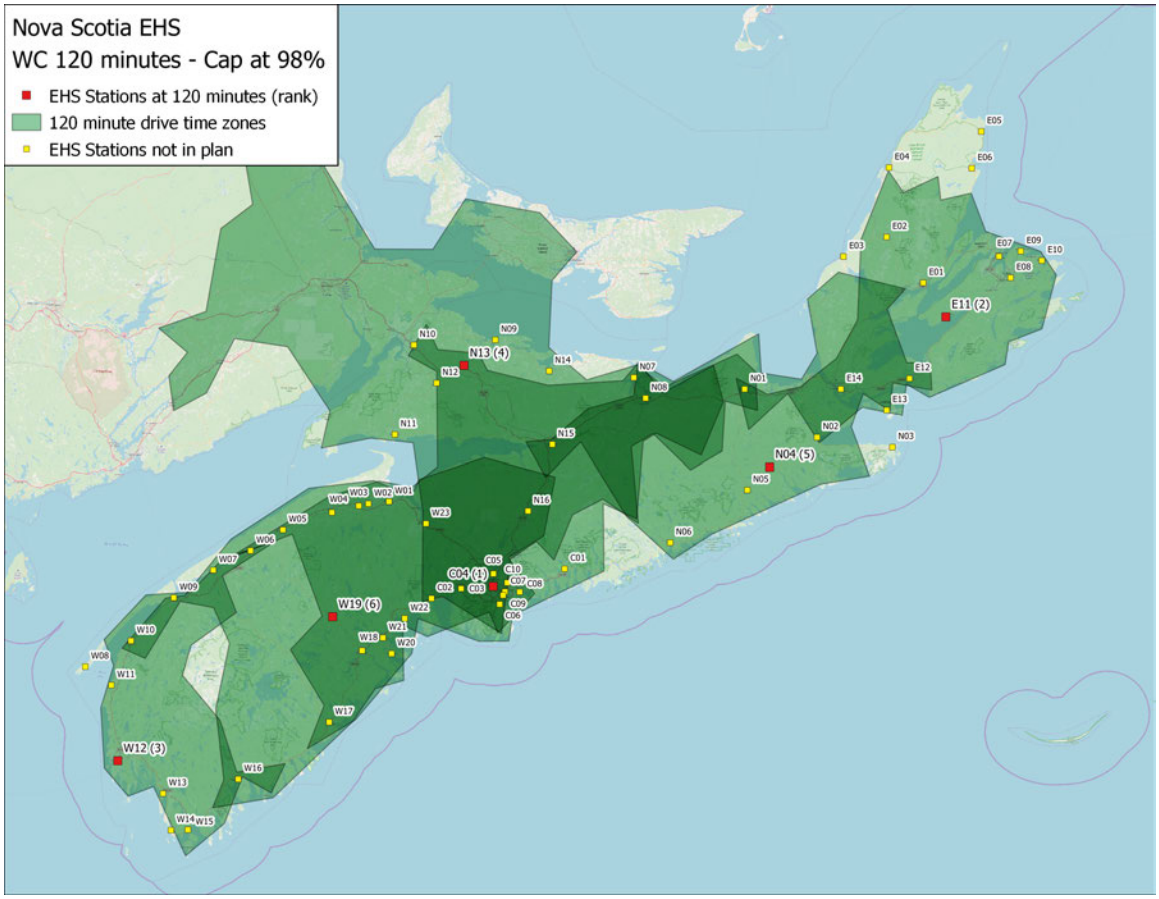



**Figure 86. Wheelchair: Optimized – 120 Minutes Response Capture**

| Rank | PostNumber | ocation | PostCapture | TotalCapture | PercentCapture |
|---|---|---|---|---|---|
| 1 | C04 | near Howard Johnson nn Halifax/609 Hwy 2. Halifax NS | 78286 | 78286 | 70.34% |
| 2 | E11 | near Ketkunimk Motel/2 Arena Rd. Eskasoni NS | 18687 | 96973 | 87.13% |
| 3 | W12 | near Prince Arthur Steak & Seafood House/2 Enterprise St. Yarmouth NS | 7350 | 104323 | 93.73% |
| 4 | N13 | near Parkview amily Restaurant & nn/5155 Hwy 321. Oxford NS | 3185 | 107508 | 96.59% |
| 5 | N04 | | 1040 | 108548 | 97.53% |
| 6 | W19 | | 1036 | 109584 | 98.46% |
| 7 | E01 | near ynwood nn/28 Big Baddeck Rd. Victoria NS | 456 | 110040 | 98.87% |
| 8 | N15 | near Harvey Woods/37 Hwy 311. Truro NS | 326 | 110366 | 99.16% |

# ATTACHMENT B: FINANCIAL REVIEW AND SCENARIOS

FITCH
& ASSOCIATES

# Attachment B
# FINANCIAL REVIEW AND SCENARIOS

## The Cost of Excessive Off-Load Time

Fitch found that the hours lost due to unproductive time waiting for patients to be off-loaded at hospitals has grown year over year from the equivalent of seven 12-hours shifts in 2016 to the equivalent of 13+ shifts in 2018. The calculations regarding lost unit hours and costs due to patient off-load time is shown in the Figure 87.

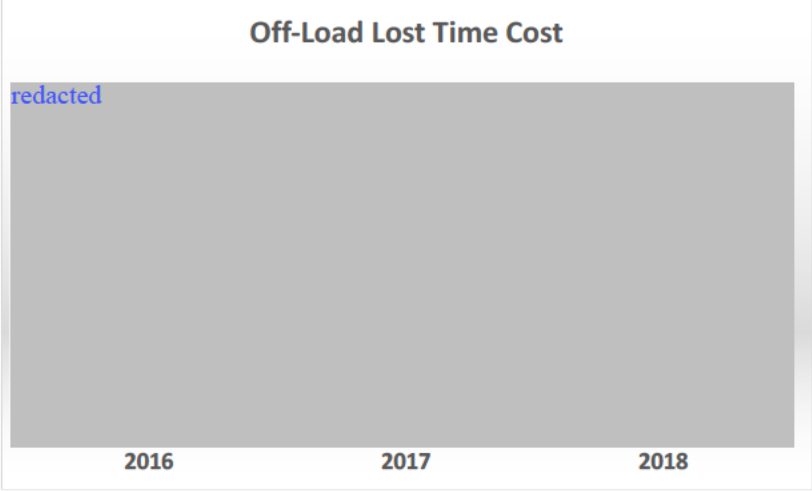
**Figure 87. Calculations of Off-Load Times, Unit Hours Lost and Cost Impact**

***Off-Load Times Cost***

| Offload Times | 2016 | 2017 | 2018 |
|---|---|---|---|
| Lost Unit Hours due to Off-load Time (hh:mm:ss) | 31107:44:59 | 44698:06:57 | 58933:15:57 |
| One 12 hour shifts Unit Hours | 4380 | 4380 | 4380 |
| Number of Lost 12 Hour Shifts | 7.10 | 10.21 | 13.46 |
| Marginal cost per unit hour | redacted | | |
| Cost for Off-load Time | redacted | | |

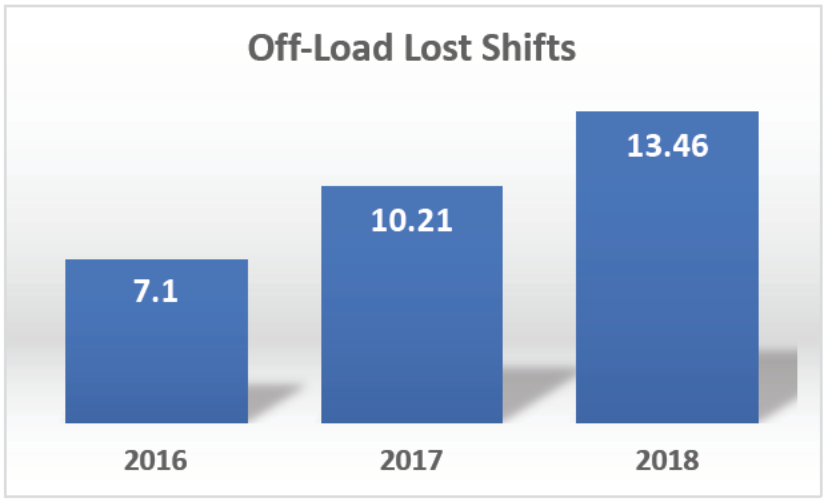
Using the current marginal cost per unit hour of redacted, the cost of ambulance time waiting for patient off-loads is redacted for 2018 and a total of redacted over the three year period of 2016, 2017 and 2018.[22] The annual cost of lost time and lost shifts are shown graphically in Figures 88 and 89.

**Figure 88. Cost of Long Duration Off-Load Times**




[22] Calculations for the costs per unit hour are provided in the Marginal and Fully Loaded Unit Hour Costs section of this attachment.

**Figure 89. Equivalent Shifts Lost Due to Long Duration Off-Load Time**




Lost time and costs have nearly doubled in the three years between 2016 and 2018. Based on the current volume projections and if off-load times are not corrected, estimates show an added redacted in annual cost increases due to lost, unproductive ambulance time.

## Cost Projections and Financial Analyses

The current contract stipulates that redacted Figure 90 projects the revenues and expenses for EMC based on the current year, CY 2018, and projects forward to Year 4. Off-load expenses are identified as a separate line item and are held constant at the 2018 cost of redacted.

redacted and there is no increased staffing due to increased call volume. This projection results in redacted for the contractor.

**Figure 90. Current Cost Projection –** redacted

**Ground Service ***

| | Est. Annual Increase | Current | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|---|---|
| **Revenues** | redacted | | | | | |
| Provincial Payment | | $124,009,600 | redacted | | | |
| EMS Billing Collections** | | $257,474 | $265,198 | $273,154 | $281,349 | $289,789 |
| LESS: Strategic Initiative Fund | | redacted | | | | |
| Other Income | | | | | | |
| Annual True-up Payment | | | | | | |
| ***Total Revenues*** | | | | | | |
| **Operating Expenses** | | | | | | |
| Field Staff | | | | | | |
| Direct Labor | | | | | | |
| Communication Staff | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Logistics | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Overhead-Direct Materials | | | | | | |
| Overhead | | | | | | |
| Overhead-Indirect Labor | | | | | | |
| Overhead-Direct Labor | | | | | | |
| Overhead-Direct Materials | | | | | | |
| EMC Depreciation | | | | | | |
| Overhead-Allocation | | | | | | |
| ***Total Expenses*** | | | | | | |
| **Earnings before Tax & Profit** | | | | | | |
| **Off-load Expense** | | | | | | |
| **EHS/DHW** | | | | | | |
| EHS Billing Collections*** | 2.0% | $10,029,898 | $10,230,496 | $10,435,106 | $10,643,808 | $10,856,684 |
| LESS: EHS Average Depreciation | | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 |
| | | $4,501,993 | $4,702,591 | $4,907,201 | $5,115,903 | $5,328,779 |
| **Cumulative Funds (Off-load/DHW)****** | | redacted | | | | |
| **Provincial Spend** | | | | | | |

* Provincial spend does not include all costs incurred by the Province to run the EHS System.
** Billing Collections obtained by "Billing Collections"/"Provincial Payment"
*** Percent obtained by "Volume Projections"/"EHS Billing Collections"
**** Under the current contract, off-load expense cannot be isolated from contractual payments to EMC, and therefore, payment provisions would limit the ability of the province to fully achieve cost reductions.

The Intent of Public Utility Models (PUM) is to shelter the EMS agency from other government pressures. It was recognized 30 years ago that EMS employees represent such a small portion of health care systems that often their voices are not heard during pecuniary negotiations. They are often bundled as part of other collective bargaining units. PUM's are designed to carve the EMS out of that concern and bundle the salary and earnings as one.

The financial arrangement between EHS and EMC provides profitability to EMC, but that profit cannot be shared with employees. The sharing of profits is a hallmark of the public utility model ("PUM") after which the EHS system is fashioned. There are built-in constraints in the EHS model in that EHS paramedics receive raises in parity with all other Nova Scotia employees – regardless

of working title. Unfortunately, raises for the EHS paramedics are not matching those in the EMS industry, which contributes to morale issues.

EMC currently is operating at a redacted profit margin. EMC appears to be reinvesting excess funds into the system as they recently built the Communications Centre from the excess funds. redacted Billing collections that are completed by EMC and passed through to EHS were $10.02 million in 2018. EHS documented $5.5 million in depreciation for capital purchases. By adding both the billing collection revenue and the reduction of off-load time, then subtracting depreciation, there are cumulative funds that are greater than redacted [23]

As shown in the staffing section, there is capacity within the system to diminish the need for reinvestment with volume growth if the off-load times are corrected and the ECP model is established. This allows both EMC and EHS the ability to reinvest the $6.2 million into effectiveness improvements for both parties.

EHS needs to manage three distinct, but complimentary issues:

1) It is difficult to discern the true profitability as all three EMC contracts are merged into one financial report. redacted

If the Province chooses to take the ambulance program to market it should expect to pay redacted percent profits.

Figure 91 is a modified profit and loss statement explaining the net effect of redacted with the current off load delays and the net effect of removing the off load delays and the redacted. Figure 92 that follows indicated the profit and loss with no change in off-load and the redacted.

[23] Cumulative funds may not be fully realized within the first year as correcting off-load times relies on hospital process changes to support this recommendation.

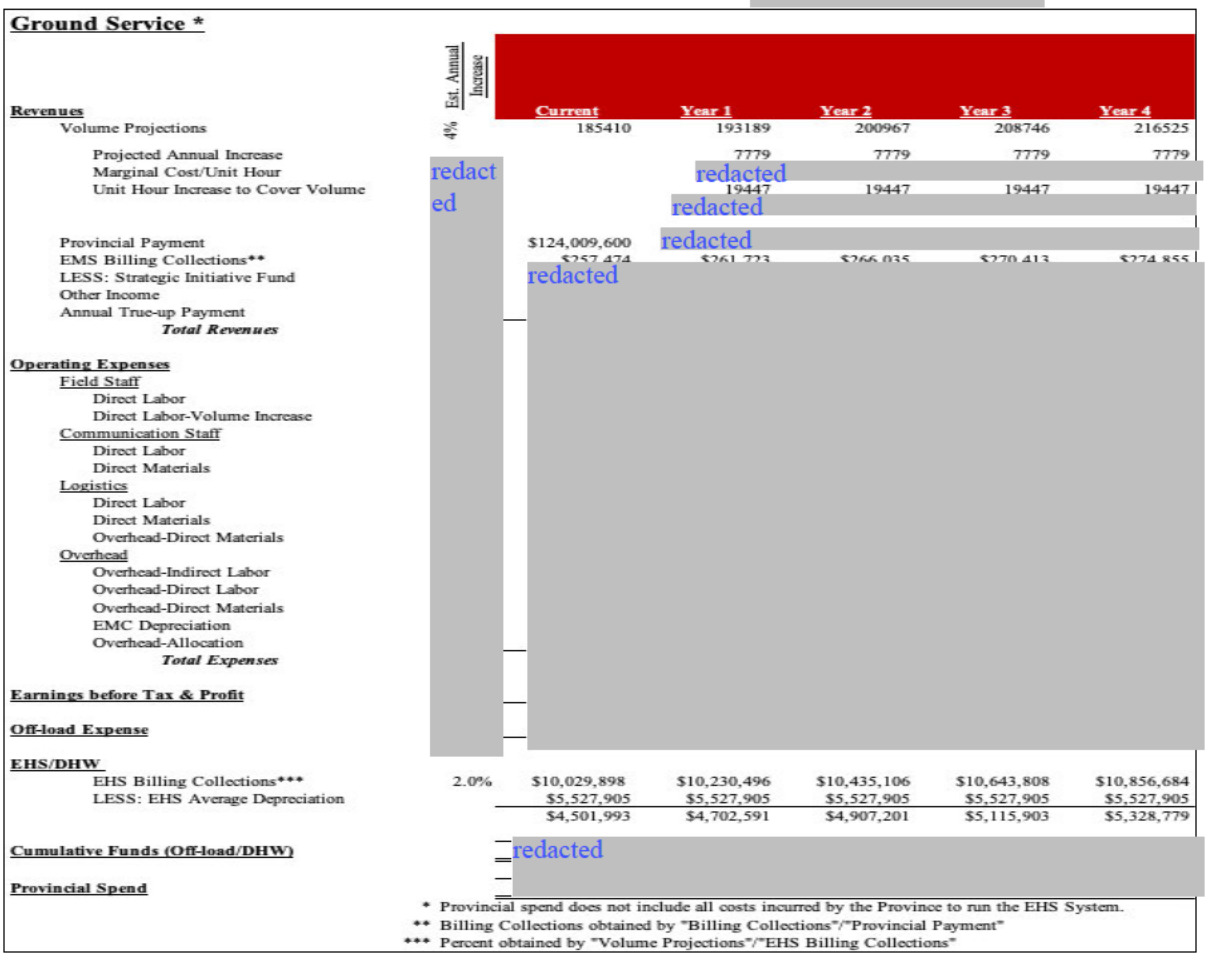
**Figure 91. Current Cost Projections –** redacted

**Ground Service***

| | Est. Annual Increase | Current | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|---|---|
| **Revenues** | | | | | | |
| Provincial Payment | redacted | $124,009,600 | redacted | | | |
| EMS Billing Collections** | | $257,474 | $257,474 | $257,474 | $257,474 | $257,474 |
| LESS: Strategic Initiative Fund | | redacted | | | | |
| Other Income | | | | | | |
| Annual True-up Payment | | | | | | |
| ***Total Revenues*** | | | | | | |
| **Operating Expenses** | | | | | | |
| Field Staff | | | | | | |
| Direct Labor | | | | | | |
| Direct Labor-Volume Increase | | | | | | |
| Communication Staff | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Logistics | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Overhead-Direct Materials | | | | | | |
| Overhead | | | | | | |
| Overhead-Indirect Labor | | | | | | |
| Overhead-Direct Labor | | | | | | |
| Overhead-Direct Materials | | | | | | |
| EMC Depreciation | | | | | | |
| Overhead-Allocation | | | | | | |
| ***Total Expenses*** | | | | | | |
| **Earnings before Tax & Profit** | | | | | | |
| **Off-load Expense** | | | | | | |
| **EHS/DHW** | | | | | | |
| EHS Billing Collections*** | 2.0% | $10,029,898 | $10,230,496 | $10,435,106 | $10,643,808 | $10,856,684 |
| LESS: EHS Average Depreciation | | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 |
| | | $4,501,993 | $4,702,591 | $4,907,201 | $5,115,903 | $5,328,779 |
| **Cumulative Funds (Off-load/DHW)****** | | redacted | | | | |
| **Provincial Spend** | | | | | | |

* Provincial spend does not include all costs incurred by the Province to run the EHS System.
** Billing Collections obtained by "Billing Collections"/"Provincial Payment"
*** Percent obtained by "Volume Projections"/"EHS Billing Collections"
**** Under the current contract, off-load expense cannot be isolated from contractual payments to EMC, and therefore, payment provisions would limit the ability of the province to fully achieve cost reductions.

**Figure 92. Cost Projection – No Change In Off-Load Times and** redacted



**Ground Service ***

| | Est. Annual Increase | Current | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|---|---|
| **Revenues** | | | | | | |
| Volume Projections | 4% | 185410 | 193189 | 200967 | 208746 | 216525 |
| Projected Annual Increase | | | 7779 | 7779 | 7779 | 7779 |
| Marginal Cost/Unit Hour | redacted | | redacted | | | |
| Unit Hour Increase to Cover Volume | | | 19447 | 19447 | 19447 | 19447 |
| | | | redacted | | | |
| Provincial Payment | | $124,009,600 | redacted | | | |
| EMS Billing Collections** | | $257,474 | $261,723 | $266,035 | $270,413 | $274,855 |
| LESS: Strategic Initiative Fund | | | redacted | | | |
| Other Income | | | | | | |
| Annual True-up Payment | | | | | | |
| ***Total Revenues*** | | | | | | |
| **Operating Expenses** | | | | | | |
| Field Staff | | | | | | |
| Direct Labor | | | | | | |
| Direct Labor-Volume Increase | | | | | | |
| Communication Staff | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Logistics | | | | | | |
| Direct Labor | | | | | | |
| Direct Materials | | | | | | |
| Overhead-Direct Materials | | | | | | |
| Overhead | | | | | | |
| Overhead-Indirect Labor | | | | | | |
| Overhead-Direct Labor | | | | | | |
| Overhead-Direct Materials | | | | | | |
| EMC Depreciation | | | | | | |
| Overhead-Allocation | | | | | | |
| ***Total Expenses*** | | | | | | |
| **Earnings before Tax & Profit** | | | | | | |
| **Off-load Expense** | | | | | | |
| **EHS/DHW** | | | | | | |
| EHS Billing Collections*** | 2.0% | $10,029,898 | $10,230,496 | $10,435,106 | $10,643,808 | $10,856,684 |
| LESS: EHS Average Depreciation | | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 | $5,527,905 |
| | | $4,501,993 | $4,702,591 | $4,907,201 | $5,115,903 | $5,328,779 |
| **Cumulative Funds (Off-load/DHW)** | | | redacted | | | |
| **Provincial Spend** | | | | | | |

* Provincial spend does not include all costs incurred by the Province to run the EHS System.
** Billing Collections obtained by "Billing Collections"/"Provincial Payment"
*** Percent obtained by "Volume Projections"/"EHS Billing Collections"

## Marginal and Fully Loaded Unit Hour Costs

Several cost per unit hour metrics are commonly used for comparisons between EMS agencies. There are several layers of the cost per unit hour metrics that vary depending on whether management and administrative costs are included. It is important to understand the organization's "marginal costs" and "fully loaded costs, "as they are used for different purposes.

The question that needs to be asked is whether adding an additional ambulance requires more supervision, dispatch time, fleet time, etc. Generally the answer is "no" so using the marginal cost is more appropriate.

Moving forward, unit hours should be purchased at a marginal cost per unit hour. An example would be if the Province purchased a fully staffed 12 hour ambulance for EMC to operate it would cost redacted multiplied by annual hours worked of 4,380, which would result in a cost to the Province of redacted .

These costs should be adjusted annually to ensure the percent of personnel and direct materials increases are included.

## Financial Costs and Benefits of Extended Care Paramedic ("ECP") Model

One of the key recommendations made by Fitch is the conversion of Advanced Care Paramedic ambulances to ECP vehicles, the principle reason being improved care for the patient. In many ,if not all low acuity calls, the patient does not want to leave their home. They simply want care and in the rare occasions they need to be transported. They certainly do not want to leave the rural community to travel to a city hospital because that is the only option. The ECP is an elegant assessment and treatment modality. The other reason for doing the right thing is that it is also significantly more cost effective.

The direct cost of an ECP unit comprised of one paramedic and one non-ambulance response unit such as an SUV, is redacte compared to the direct cost of an ambulance of redacted . With an expanded scope of practice and additional support in the Communications Centre, the ECP can respond to low acuity 911 calls ,thereby providing more capacity for ambulances to respond to higher acuity emergency calls that have a reasonable expectation of transport.

With expanded scope and new protocols, the ECP can enhance community outreach with the community paramedic program to treat in-home, at scene treat and release and/or assist with determining alternative destination or modes of transport.

Fitch mapping analyses identified eight locations that could be considered for switching ambulances to ECP units as follows: redacted . Now, the eight, two-person units could be split to result in 16 ECP units or some variation that amount. Based on earlier recommendations, the more SUVs that replace the current ambulances, the fewer ambulances will need to be purchased.

## Financial Costs and Benefits of Wheelchair, Car, Multi-Patient Transport Services Model

Another key finding regarding patient hospital discharge is the limited use of wheelchair vans. During discussion it was perceived that a minimum of 15 percent and a maximum of 20 percent of the BLS transports could be transported by a wheelchair van. Wheelchair vans can be staffed with one BLS or Medical First Responder. To ensure program support, a marginal cost of redacte (ECP Model, Admin Support, and Communications Cost all per hour) was utilized. To cover the maximum geographic area for a two-hour response time, the estimated 20 percent of BLS inter-facility normalized demand, is projected to require 70,281 hours of staffed wheelchair vans. The cost is estimated at approximately redacted annually. This cost is minimized by utilizing the current contractor's infrastructure such as the communications centre, logistics, and administration. Outsourcing to another service, may increase provincial costs as the infrastructure may need to be created.

With no current data being collected to determine how many discharges could be handled by a car service or multi-patient transport service, the Province should collect the data point with the addition of the "medical necessity." Next, the Province should consider adding the car and/or multi-patient transport services. To evaluate the cost per unit hour an redacted was considered for staffing, provided by the province and fleet direct labor per hour was added for a total cost per unit hour of redacte .

## Buyback Cost Corrections

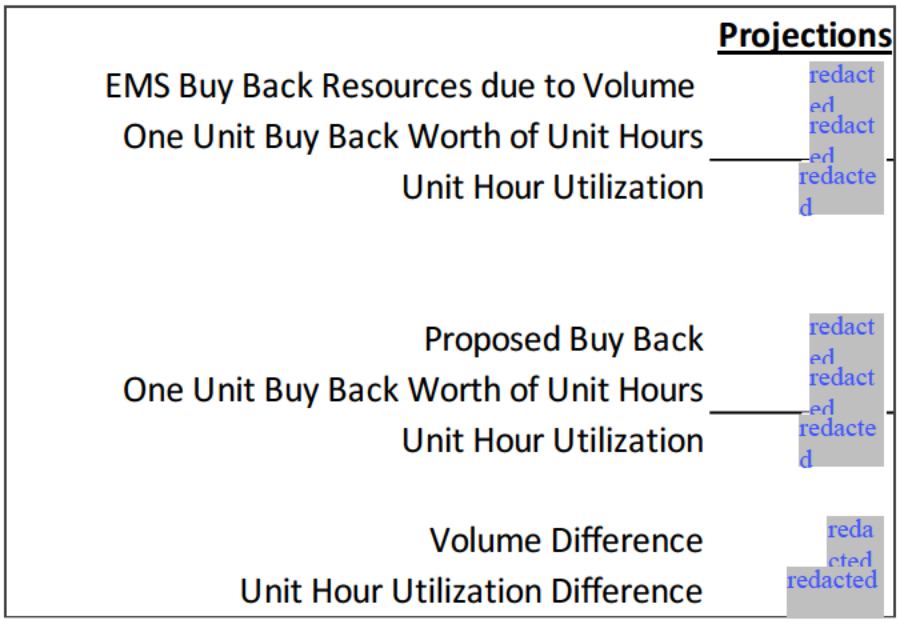
Currently, when volumes increase by 1,250 responses, EMC can request the Buyback of a 12 hour ambulance. This Buyback model is in place to ensure EMC's ability to maintain response time performance. Current practice allows EMC to write off or claim an exemption when volumes increase in a region above 0.4 UHU. The 0.4 UHU is based on the busy ambulances divided by staffed unit hours. redacted

As indicated in the report, the ECP model at a minimum could handle greater than 30 percent of the current volume. When buying back units, EHS should consider buying back ECP units, which is cost effective, adds capacity, and adds personnel with an expanded scope of practice.

- redacted
- Need to ensure no units can be reallocated from another region
- redacted
- Consider buying back an ECP vs. Ambulance

Figure 93 indicates the proposed buyback method.

**Figure 93. Proposed Unit Buyback Method**



## Communications Center Costs

Fitch noted that the Communications Centre utilizes paramedics for call taking and dispatch. The EHS Communications Centre is accredited by the International Academy of Emergency Dispatch ("IAED") and follows its protocols for call intake and for deployment of resources based of the call determinates. However, it utilizes paramedics as dispatchers which is costly as staffing with paramedics vs. civilians can add approximately 50 percent more labor costs.

The IAED software is designed to be operated by civilians. This is evident as the IAED only requires a call taker to have CPR certification prior to initial training. Also, IAED has found that civilian call takers often performed better then paramedics as they are less likely to deviate from protocols and try to rely on their past field experience. EHS should adjust staffing with the Communications Centre to allow for civilian dispatchers and call takers.

The Communications Centre marginal costs are noted to be double the costs of other, similar sized communications centres. Cost per response typically averages redacted per response. The Communications Centre Cost section in Figure 94 will outline the Provinces ability to reduce costs while, maintaining current performance.

**Figure 94. Financial Costs Per Unit Hour**

| | |
|---|---|
| 2018 Response Volume | 182,670 |
| Scheduled Unit Hours | 892,112 |
| Field-Ambulance Marginal Cost/UH (Two Field Staff + Logistics)/Scheduled UH) | redacted |
| Field-ECP Marginal Cost/UH (One Field Staff + Logistics)/Scheduled UH) | |
| Field-Car or Multi-patient Unit Marginal Cost/UH (One field staff at $18/Hour + Fleet Direct Cost/Hour) | |
| Communications-Marginal Cost(Communications/2018 Response Volume) | |
| Administration-Marginal Cost (Overhead/Unit Hours) | |
| Fully Loaded (Annual Cost/Scheduled Unit Hours) | |

## Future Scenarios If all Recommendations are Adopted

To provide a financial model based on adoption of all recommended changes, Fitch assumed the following: offload times are corrected to 20 minutes 90 percent of the time, an ECP model is utilized with an ECN, telemedicine physician and ECP units utilizing a 60 minute response time, a wheelchair and car service model is adopted and deployed to meet a two hour response time, BLS inter-facility transports have a two hour response time, emergency and urgent calls are handled with the new Category 1 through 3 response times, and transfer centre is adopted by the NSHA to manage all transports utilizing a medical director approved medical necessity process to ensure the right resource is dispatched.

Each deployment mode is constructed to ensure the geography and the normalized demand for service is covered. In building the financial models, a maximum and minimum financial approach was utilized. Two evaluations are presented: a pricing model for each response type and a level of effort model, which is utilized currently.

### *Level of Effort Model*

Currently, EHS is provides resources and funding to the contractor, which staffs and operates toward a specified level of effort. The contractor is held accountable to standards outlined within the contract. However, resource limitations or outside forces could alter the contractor's ability to perform if the contractor is not given full autonomy to locate and staff resources as the contractor deems appropriate. As mentioned in the "Buy Back Cost Correction" section, resources are purchased as volumes increases. For the future consideration, resources should consider for buy back into the ECP model or the conversion of specific ambulances into ECP units to manage the low-acuity calls, which can decrease the both the need for expensive resources and decrease the intake of patients into the emergency department.

## Financial Review and Scenarios - Recommendations

- Correct off-load times to potentially avoid annual costs of approximately redacted . Correcting off-load times will likely occur over several years, therefore full cost avoidance will take time to be fully realized.
- Convert some ambulances to the ECP model.
- Renegotiate the redacted within the contract to ensure viability for the contractor and cost avoidance for the Province.
- Ensure contractor separates financials to show costs of each contract that's held within the Province.
- redacted
- Change to a civilian model for staffing of the Communications Centre.


www.fitchassoc.com