Recommendations from the Provincial Municipal Land Ambulance Dispatch Working Group

Submission to the Minister of Health and Long-Term Care

May 28, 2015

Ontario

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Executive Summary

Ontario's Action Plan for Health Care is committed to ensuring patients receive timely access to the most appropriate care in the most appropriate places. Over the next decade the growth in the senior's cohort, will significantly test the health care system's ability to meet that commitment. There is a need to deliver care in a smarter way, to take steps to transform or retool the system for the challenges of tomorrow.[1] The emergency health care system, and more specifically the paramedic services and ambulance communication services within that system, have an important role to play in delivering on that commitment.

A strategy has been developed to transform the ambulance system, to realize system efficiencies and avoid future costs, by improving ambulance availability. Growth can be managed through four transformation priorities:

1. Reduce the number of patients transported to Emergency Departments.
2. Reduce ambulance offload delays.
3. Improve the prioritization of ambulance responses through a new triage tool.
4. Expand availability of real-time and retrospective dispatch information to municipalities.

In December of 2014, the Minister of Health and Long-Term Care requested a working group, made up of representatives from his ministry, the Ontario Association of Paramedic Chiefs (OAPC) and the Association of Municipalities of Ontario (AMO) be convened to discuss the third and fourth elements of the transformation strategy.[2] The resulting Provincial Municipal Land Ambulance Dispatch Working Group's (DWG) mandate was to provide advice on how to improve the utilization of ambulance resources by leveraging business process improvements and technology innovations. The DWG recommends the following initiatives be undertaken as part of the larger plan to transform the ambulance system:

- Improve the triaging of ambulance calls through the implementation of the Medical Priority Dispatch System in all Ambulance Communication Centres (ACCs).

- Enable paramedic service decision making and operational efficiencies by expanding access to ambulance dispatch information through streamlined business processes and improvements in technology tools.

- Assist ambulance communication officers with ambulance selection and system monitoring through the use of automated tools.

- Drive strategic system enhancements that put patients first by creating a new joint implementation group comprised of ministry and OAPC officials.

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[1] *Ontario's Action Plan for Health Care (2012)*
2 AMO staff were able to attend some of the meetings and were kept apprised of meeting discussions.

- Establish joint operating frameworks between each ambulance communication centre and the paramedic services they dispatch to work together on improvements to local operations.

Improved Ambulance Call Triage

There are two ambulance call triage tools in use in Ontario's ambulance communication centres, the Dispatch Priority Card Index (DPCI) and the Medial Priority Dispatch System (MPDS). DPCI, a ministry developed algorithm, is currently in use in 20 of the 22 communications centres. The other two centres in the City of Toronto and Regional Municipality of Niagara use MPDS. Recent studies have shown that MPDS is a superior triage algorithm that optimizes ambulance availability without compromising patient safety. The DWG recommends MPDS be expanded to all ACCs. The cost of this project is approximately $10M with implementation taking place over two years.

Access to Information and Dispatch Decision Making

Paramedic Services (PS) need timely access to the dispatch information captured at the ambulance communication centres to inform both real-time operational decisions and longer term strategic planning. PS can access dispatch information through the ministry's Ambulance Dispatch Reporting System (ADRS) or by submitting ad hoc requests to their local ACC. Due to concerns about protecting the patient's health record and related need to obtain the approval of different levels within the ministry, the responses to ad hoc requests were not always timely. It has been recently determined that PS should have unrestricted access to dispatch information as the PS fall within the circle of care as defined under the Personal Health Information Protection Act. This will improve the bi-lateral sharing of information between the PS and the ministry.

In order to drive system wide benefits and positively impact patient outcomes, the ministry and PS have been working in partnership and will continue to jointly understand and identify key opportunities for data integration to improve communication and information exchange. Initiatives are underway in the form of Business Proof of Concepts (BPOC) to understand the benefits of the various technology opportunities available as well as to inform considerations for further provincial planning and deployment.

Targeted demonstration sites have been jointly identified to participate and funding for these limited scope BPOCs have been managed from within the ministry's current operating envelope. As no funding has been identified for broader provincial deployments, business cases will need to be developed upon the completion of benefits assessment of the BPOCs. The business cases will identify value proposition and review technology options and recommendations.

The DWG acknowledges that introducing greater automation into the dispatch system can result in efficiencies for paramedic and ambulance communication services leading to improved

performance and cost effectiveness. Ambulance Communication Officers (ACOs) need the right tools to support their work. Deployment and status management tools can improve their ability to identify and select the most appropriate ambulance for the individual patient's need and ensure the best coverage over their service areas. Several initiatives have been completed or are underway throughout the province with the goal of assessing new tools to automate and improve certain aspects of the communication function and there are many opportunities to provide more automated decision tools to assist the ACO.

The DWG supports the implementation of additional technology tools and software that will continue to transform the ambulance system and recommends the creation of a working group to report back to the Minister with a registry of technology improvements including proposed timelines, required resources and financial impacts within 150 days of the acceptance of the report's recommendations.

Joint System Planning

The change envisioned within this report requires careful planning and consideration of the needs of the various delivery partners within a complex 24/7 operation. The partners need to work in concert to ensure public safety is sustained while improvements are managed in a measured and coordinated way. In order to support the changes presented in this report, the DWG is recommending that the ministry, OAPC and AMO create an implementation table. This group will provide reports to the Minister on the progress of the transformation every six months.

Building on the work of the DWG, there is an opportunity for continued quality improvement through the bilateral sharing of information on the health of the system. The new analytics that will be made available to the paramedic services through the various data access initiatives, combined with the system data housed in the ministry will facilitate informed decision making based on the best medical and operational evidence. Leveraging the improved information sharing, the DWG is recommending the adoption of joint operating frameworks at the local level; an agreement between each ACC and the paramedic services they dispatch to work together on improvements to local operations.

The Ontario Ambulance System

Ontario's ambulance system is a provincial model serving more than 13 million people within an area more than 1 million km² - it is the largest emergency medical system in Canada. Each year, approximately 11% of Ontario's population uses the ambulance system as their initial access point to Ontario's emergency health care system. Provincial and municipal governments annually invest over $1 billion[3] in the system. Ontario's ambulance system ensures that patients receive the **right care**, at the **right time**, in the **right place**.

The many components of the system provide care to approximately 1 million patients annually.

- 50 municipal paramedic services (PS) and six First Nations ambulance services
- Over 7,600 land ambulance paramedics
- More than 1,600 ambulances and support vehicles
- 22 ambulance communication centres (ACC)
- Nearly 900 ambulance communications officers (ACO)
- More than 40 First Nations First Response Teams
- Call-taking and dispatch functions for more than 100 fire departments
- Tiered notification to 290 fire departments to respond to medical emergencies along with PS
- 8 Regional Base Hospitals

This system is designed based upon five principles:

Seamless – Regardless of municipal geo-political jurisdiction, ambulance dispatch directs the closest ambulance in time to respond to emergencies. Ambulance movements are tracked, monitored and documented across jurisdictional boundaries maintaining paramedic contact with the closest ambulance dispatch centre. Standardized province-wide ambulance communications network and dispatch centre computerized seamless interconnectivity. Ambulance dispatch ensures ambulance resources are dispatched to major incidents while continuing to ensure local ambulance needs are met.

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[3] During the fiscal year ending March 31, 2014, the province and municipalities spent $1.008B on paramedic services. The province expended an additional $89M for dispatch.

Accessible – Ambulance dispatch ensures rapid province-wide access to land and air ambulance resources. This includes standardized call screening, prioritization, pre-arrival instructions and real-time language interpretation for system access by diverse populations.
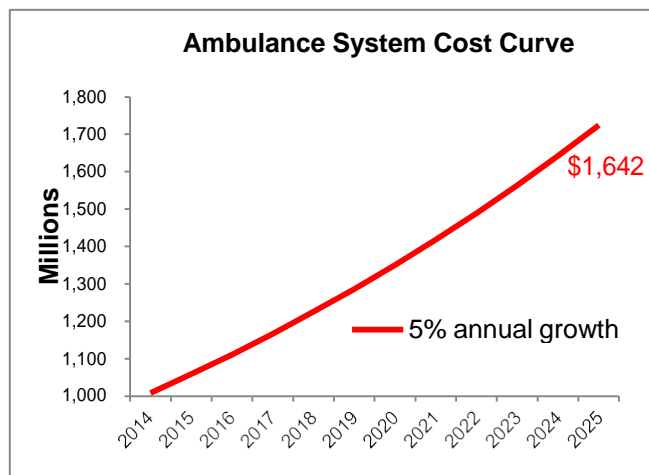
Integrated – Supports inter-jurisdictional government priorities such as transformation. Major health care components are interactive and linked through purpose and function. Inter-facility patient transfers demonstrate integration of all major components of the province's health care system and multi-agency responses demonstrate inter-governmental operational integration.

Accountable – Service delivery is monitored by ministry, base hospital program and municipal sector. Service and certification standards, policies, procedures, guidelines and legislation in place; the ministry reviews provider performance and certifies operators; and investigates complaints related to possible contraventions of the *Ambulance Act*. Performance management includes quality assurance (QA), continuous quality improvement (CQI), and training programs.

Responsive – Evidence-based changes in medicine and health care provision (e.g. stroke strategy, STEMI) contribute to the delivery of the right care, at the right time, at the right place. System is responsive to evolving health care, demographic, socio-economic, technological changes and stakeholder needs.

Ambulance Demand Growth

Ontario's population is set to enter a period of relatively rapid aging with the number of people over age 65 projected to double by 2036. Seniors make a disproportionate number of calls to 911 as 24 per cent of Canadians over the age of 65 are living with three or more chronic conditions.[4]

Ambulance System Cost Curve

Growth in the seniors' cohort over the course of the next decade will impact ambulance utilization rates as Paramedic Service (PS) providers will be required to respond to increases in overall call volumes and an increased severity in calls.

The province and municipalities currently invest over $1 billion dollars annually in support of ambulance delivery across the province.[5] Increasing costs combined

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[4] *Final Report of the Region of Peel's Aging Population Term of Council Priority Steering Committee: Recommendations to Regional Council, 2014.* Page 24.

[5] During the fiscal year ending March 31, 2014, the province and municipalities spent $1.008B on paramedic services. The province expended an additional $89M for dispatch.

with a relatively rapidly aging population will strain the ability of the system to maintain the existing level of service. As demand for ambulance services grow, PS must add ambulances to ensure sufficient resources are available to respond to those patients who need them the most. During the past five years, the cost of land ambulance delivery has increased an average of 5% annually. If this rate of growth continues, costs will increase over 60%, from $1 billion to $1.64 billion, in less than 10 years.

Transforming the Ambulance System through Improvements to Dispatch

In December of 2014, the Minister of Health and Long-Term Care requested a working group be convened to discuss specific improvements to ambulance dispatch as part of the larger strategy to address escalating land ambulance costs through system transformation. The resulting Provincial Municipal Land Ambulance Dispatch Working Group's (DWG) mandate was to provide advice regarding potential changes to improve the utilization of ambulance resources by leveraging business process improvements and technology innovations. The group was made up of representatives of the Ministry of Health and Long Term Care (MOHLTC), the Ontario Association of Paramedic Chiefs (OAPC), and the Association of Municipalities of Ontario (AMO).[6]

The DWG met throughout the first months of 2015, to identify ways to improve PS access to dispatch information, and to improve both the triaging, and dispatching of ambulance emergency calls based on a patient's medical condition. The meetings underscored the importance of the need to change the way 911 calls for assistance are triaged and how ambulances are dispatched, in order to make the system more efficient and cost effective.

The key discussion points and recommendation from those meetings are presented to the Minister of Health and Long-Term Care in this report.

Improving Ambulance Call Triage

The triaging of requests for ambulance service based on an assessment of the patient's medical condition began in Ontario in the 1980's. Today there are two medical triage algorithms in use in Ontario, the Dispatch Priority Card Index (DPCI) and the Medical Priority Dispatch System (MPDS).

DPCI was developed by the MOHLTC with the assistance of dispatch staff and experts in pre-hospital medical care and became part of the Computer Aided Dispatch system (CAD) in the early 1990s. The current version is referred to as DPCI II and is used in twenty of the province's

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[6] See appendix 1 for the working group's full terms of reference

twenty-two ACCs. DPCI II has four priority levels, two for emergency response and two for non-emergency response. Code 4 calls are considered the highest priority, authorize the use of lights and sirens and may precipitate the assistance from allied agencies such as police and fire, commonly referred to as tiered response. The level of care available to the patient, basic life support (BLS) or advanced life support (ALS) is determined by paramedic service deployment plans. The algorithm operates as a single dimensional model; the four levels indicate how quickly the response is needed.

Code	Required Response	
4	Urgent	The patient is at risk of losing their life or limb.
3	Prompt	Must proceed without unreasonable delay
2	Scheduled	Completed at a prescheduled time in order to facilitate patient treatments such as surgery appointments.
1	Deferrable	Can be delayed without risk to patient.

The two other centres, located in the City of Toronto and the Regional Municipality of Niagara, use the Medical Priority Dispatch System (MPDS), a commercial dispatch product developed by the Priority Dispatch Corporation of Salt Lake City, Utah. MPDS has six different priority levels: Echo, Delta, Charlie, Bravo, Alpha and Omega, with Alpha representing a minor problem and Echo an immediate threat to life. The sixth code, Omega, is used in some jurisdictions to transfer or divert callers to an alternate source of care such as a nurse, (e.g. Telehealth). The algorithm operates as a multi-dimensional model as the six levels indicate: how many responders will be dispatched; which levels of paramedic expertise are needed; and how rapidly they are needed. The highest priority calls are sent as "hot calls" or using lights and sirens and may necessitate assistance from allied agencies such as fire and police.[7] The creators of MPDS do not recommend a response level for each situation. Instead the multiple dimensions are mapped by each ambulance communication service, in partnership with its PS and medical experts to the most appropriate response priority given the PS's available resources and geography. Users of the MPDS have found the multi-dimensional nature of the algorithm provides a greater level of precision, accuracy and efficiency in medical triaging.

Callers to 911 are usually in a heightened state of emotion when as they are often seeking help for a family member, or may have just witnessed a traumatic event. ACOs use the questions contained within medical algorithms to obtain information from the caller concerning the nature of their emergency in a systematic and consistent manner. The answers determine the urgency level or prioritization and the type of medical care required. The initial questions are intended to assess if there is an obvious immediate threat to a person's life at which point an ambulance is assigned at the highest priority (authorizing lights and sirens). As more information is gathered, the priority of the call may be reassessed. Assigning a lower prioritization to a call than what the

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[7] *Determinant Codes versus Response Understanding How It Is Done excerpts from: The Principles of Emergency Medical Dispatch Fourth Edition (v12.0).* Jeff J. Clawson, MD. Kate Boyd Dernocoeur, EMT-P, B Rose. Priority Press 2009. (page 3.26)

patient needs is referred to as undertriaging; and a higher prioritization, overtriaging. Incorrect triaging has a negative impact on both system utilization and patient care.

In 2011, the MOHLTC requested the Sunnybrook Centre for Prehospital Medicine (SCPM) conduct a comparison of the two algorithms used in Ontario, DPCI II and MPDS, to identify if there were systemic differences that could result in either overtriaging or undertriaging patients. The SCPM study concluded that DPCI II overtriaged ambulance resources significantly more often than MPDS. It also found MPDS to be a more accurate algorithm to detect patient acuity, or the level of medical care required for the patient.[8]

It can be difficult for an ACO to assess the true nature of patient's condition based on the information provided by an excited or potentially distraught caller. Both algorithms were designed with an element of overtriaging to reduce the risk to the patient that can arise from undertriaging. Undertriaging a call puts the patient's health at risk as they may wait longer for an ambulance or not be provided with the most appropriate level of medical care available. Overtriaging mitigates some of the risk associated with this challenge, however too much overtriaging has a negative impact on resource availability.

Overtriaging reduces the availability of resources for critically ill patients. If ambulances are incorrectly dispatched to a patient whose condition does not require an urgent (lights and sirens) response, the next patient who is critically ill might not get access to paramedic care as quickly as needed. In some municipalities a Code 4 condition will require a response by both advance care and primary care paramedics; in these cases the incorrect assessment affects twice the amount of resources. PS base their resource planning decisions on call volume data provided by the ACCs. If the number of urgent calls is overstated, as occurs with overtriaging, then additional resources may be added earlier than necessary.

Overtriaging also results in unnecessary response by allied agencies such as police and fire. Many municipalities have tiered response agreements with allied agencies to ensure patients with the highest acuity medical need (e.g. cardiac arrest) are provided with care as soon as possible. In these cases, if the medical algorithm incorrectly identifies a patient as needing an urgent response, then both paramedic service and allied agency resources are being deployed with no benefit to the patient or the system. Overtriaging also reduces fire and police availability to respond to their primary responsibilities.

Responding to the highest priority calls requires paramedics to reach the patient as quickly as possible, usually while operating their vehicle's lights and sirens. This creates safety hazards for both paramedics and the public as ambulances travel through high traffic areas or proceed through intersections against traffic signals. Overtriaging can be a factor in increased collisions

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[8] *A Comparison of Two Structured Emergency Medical Dispatch Protocols in Ontario*. CAEP/ACMU 2014 Scientific Abstracts. May 31 to June 4, 2014. M. Feldman, MD PHD, J. Bryan, MD, L. Turner, PhD, R. Burgess, BSc. Sunnybrook Centre for Prehospital Medicine. http://caep.ca/sites/caep.ca/files/cjem_supp.pdf Pages S53-S54.

between ambulances and other vehicles. Overtriaging is also believed to be a factor in compassion fatigue and paramedic burn-out as the paramedics respond to high priority calls under stressful conditions only to find upon arrival that the patient's condition was not an emergency.

Having two different triage algorithms in the province also presents a number of other challenges to optimal system performance. Since the two systems use different response codes, it is difficult to compare performance data relative to response time, patient outcomes, and other measures of system performance. The seamless delivery of ambulance services across municipal boundaries is undermined as patient call information cannot be automatically transferred between the two different types of centres. In these cases, the patient information is transmitted over the phone which adds a delay to the response. The receiving centre will then retriage the call in its own system resulting in an additional delay in assigning an ambulance.
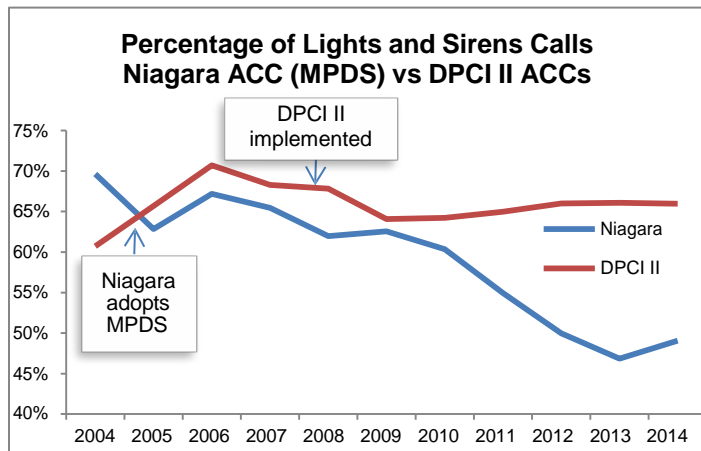
Medical Triage Algorithm Improvement Options

The DWG considered three options to address the need to improve the triaging of calls:

1. Redesign the existing medical triage algorithm;
2. Conduct an evaluation of current market offerings;
3. Expand the use of MPDS across the province.

The options were assessed against a variety of factors including ease of integration and adoption, patient impacts, project cost, and duration. Based on these factors, option 3, expanding the use of MPDS across the province is the best option.

Option 1: Improve the Existing Medical Triage Algorithm – DPCI II

In 2006, the ministry undertook a project to improve the existing DPCI protocols with the goal of reducing Code 4 calls. Using subject matter experts in DPCI dispatching and prehospital medical care, the project undertook a review of the full set of cards and changes were made in some areas. It took two years to determine how best to adjust the protocols and implement the changes within the existing software. A pilot was run in 2008 with the remainder of the DPCI centres adopting the new protocol in June of 2009.

in a reduction in Code 4 calls. However they remain higher than the percentage of Code 4 calls in the

The efforts to improve DPCI demonstrated the time requirements to revise the ministry's proprietary triage tool. DPCI cannot achieve a state of continuous improvement as it cannot evolving medical evidence easily. A project to revise and implement a new DPCI II would take approximately three years and would at best, achieve a one-time improvement, representing a snap shot in time from an evidence perspective.

Improving the existing algorithm at the DPCI II centres will not address the challenges the system faces with having two medical triage protocols in the province. Under this option, it will still be difficult to compare performance data relative to response time, patient outcomes, and other measures of system performance. The challenges to seamless delivery of ambulance services across municipal boundaries, in areas where the two different triage protocols are in use, will also continue.

Option 2: Conduct an Evaluation of Current Market Offerings

Ambulance services in developed countries typically use some form of medical triage algorithm to prioritize patient calls and dispatch their ambulances. Some jurisdictions have created their own algorithms due to their unique emergency response needs, while others have purchased commercial off the shelf solutions (COTS) that may offer some customization to address local operations. An initial scan of the market shows the majority of US and Canadian jurisdictions use MPDS. There are some other commercially available products which comprise a small market share. However these would create risk for Ontario which operates on a scale in which these products have no apparent demonstrated experience. There are very few emergency medical systems as large and complex as the one in Ontario.

A COTS solution must integrate with the CAD that is deployed across the province. It is not known how many or which of the various COTS are able to integrate with the current CAD. The province's current CAD vendor, TriTech, has deployed only one COTS solution in a seamless environment such as Ontario. That product was the Medical Priority Dispatch System. Integrating a solution other than MPDS would require significant testing and design time with no guarantee of compatibility.

Implementing a new algorithm to the Ontario dispatch system would impact all of the 22 ambulance communication centres, including the province's largest and highest call volume centre in Toronto. Undertaking a wholesale change such as this would produce the greatest risk to the system and be a longer and more expensive project than the other options. Based on the risk and complexity of introducing a new and unproven algorithm in the province, the DWG determined that this option was not desirable.

Option 3: Expand the Current Use of the Medical Priority Dispatch System (MPDS)

Both the City of Toronto and the Region of Niagara use MPDS and their experience, combined with the recent SCPM report, has shown that MPDS is superior to DPCI II. MPDS provides many more options for response, having six priority codes versus DPCI II's four codes. MPDS's more accurate assessment of the patient acuity (level of care needed) results in a more effective assignment of available resources (advanced care vs. primacy care paramedics) ensuring patients get the right care based on their medical condition. The improved efficiencies in resource assignment will also lead to more informed studies of the benefits of different levels of care which will have a beneficial impact on emergency care for all patients.

MPDS is an internationally recognized and widely used algorithm having been adopted by more than 3,000 dispatch sites in 23 countries. Users benefit from the collective experience of this large population who provide the clinical evidence to support continuous improvements to the algorithm. MPDS has undergone more than 1,000 changes since its inception in 1979 due to its intrinsic capacity to readily accept adjustments, maintaining alignment with science and medical evidence. Changes to the protocol are overseen by the National Academy of Emergency

Dispatch (NAED). The academy has a membership comprised of over 54,000 public safety professionals. Its College of Fellows includes more than 40 physicians, legal experts, emergency medical care providers, government administrators and educators.[9] Once approved by NAED, changes to the algorithm are easily implemented. During the recent Ebola outbreak, a new card set was available worldwide within four weeks of the first notice of need to address the crisis. A single DPCI II card change can take up to six months to implement.

MPDS includes an integrated quality assurance function (ACQUA) that assesses ACOs on six compliance categories. Compliance to the protocol is key to ensuring the correct patient priority and matching patient need to the appropriate level of patient care. ACQUA provides both individual and centre quality assurance assessment results that managers can use to report and improve upon performance.

Expanding MPDS use across the province would be a careful and proven approach to improving the triage algorithm in Ontario. Experience gained in Niagara and Toronto could be leveraged to support provincial adoption and to ensure that the tool is configured to meet the needs of the patients in Ontario. TriTech, the current land ambulance CAD vendor in Ontario, also has experience using MDPS in other ambulance systems and has proven the integration capabilities of MPDS with the Ontario CAD. The Province has the current license for MPDS in Niagara and can readily apply lessons learned from Toronto and Niagara into the other 20 Ontario ACCs.

Financial Benefit of Replacing DPCI II with MPDS

In 2009, the Regions of Peel, Durham, York and Halton, and the County of Simcoe engaged Pomax Consulting Inc. to review ways to improve dispatch services in their municipalities.[10] Pomax is a recognized industry leader in strategic planning for public safety organizations throughout North America. The Pomax report included a calculation of the estimated financial benefit of replacing DPCI II with MPDS.

The following tables replicate the financial modelling developed by Pomax, replacing their call volume data with 2014 call volume data from the twenty DPCI II ACCs. The cost per ambulance service hour of $188 was calculated by dividing the total 2014 municipal land ambulance grant budget submissions by the number of paramedic service hours these budgets would provide.[11] In each case, the most conservative assumptions in estimating cost avoidance associated with the potential improvements have been used.

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[9] *The Medical Priority Dispatch System – A system and product overview. Geoff Cady, Consultant and EMT-P* http://www.emergencydispatch.org/articles/ArticleMPDS(Cady).html

[10] *Greater Toronto Area Ambulance Communication and Dispatch Services Review,* Pomax Consulting Inc., December 2009

[11] The 2014 budget submissions totalled $842,456,939 with projected services hours of 8,943,972. The cost per ambulance hour varies amongst paramedic services dependent upon the number of ACP and PCP staff, the use of single paramedic emergency response vehicles as well as wages rates and other key cost drivers. For ease of calculation, the modelling assumes each ambulance carries two paramedics.

Reduction in Code 4 Calls

When call volumes increase, PS are required to add ambulance resources to ensure there is sufficient capacity to respond immediately to life threatening calls. When Code 4 (lights and sirens) call volumes increase as a proportion of the total call volume, the same effect is experienced, even if the overall volume of calls has not increased. The reverse is also true; when Code 4 calls decrease as a proportion of the total call volume more resources are available to the system even if the overall volume is unchanged. The anticipated benefit from implementing MPDS would be realized through this latter phenomenon.

PS deployment plans allow for a delay of between 30 and 60 minutes for Code 3 calls (prompt response) if there are higher priority calls waiting and there are insufficient resources to provide coverage. If a call is dispatched as Code 3, there is a greater chance an ambulance that is in the process of completing its current call can be assigned within that 30 to 60 minute window. Reducing the number of Code 4 calls will make more ambulances available to respond without incurring the cost of additional resources. The allowable delay for Code 3 calls becomes a time savings in terms of the total amount of ambulance service hours needed to meet demand.

Based on the information available in 2009, Pomax hypothesized that the adoption of MPDS would result in a 10% reduction in Code 4 calls. They also suggested that deferring a Code 3 call 20 minutes was an appropriately conservative estimate. In 2014, 66% of all calls dispatched by the DPCI II centres were Code 4 (lights and sirens). The other two ACCs using MPDS, Niagara and Toronto, had rates of 49% and 39% respectively[12]. It is reasonable to assume that improvements to the medical triage algorithm could result in a 10% reduction in Code 4 call volumes, from 66% of the total call volume to 60% within a reasonably short period of time.

The estimated annual system cost avoidance that could be achieved by a 10% reduction in Code 4 volumes is $3.6M

Cost avoidance generated by a 10% reduction in Code 4 calls

2014 Total Call Volume	Total Code 4 Calls	% Code 4 calls	Code 4 calls @ 60%	Reduction in Code 4 Calls	Capacity Generated by deferring calls 20 mins.	Cost Avoidance at $188/hour
A	B	(A)/(B)	C = (A)*0.60	(D) = (B) - (C)	(E) = (D)/3	(E)*$188
972,741	641,419	66%	583,645	57,774	19,258	$3.6M

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[12] The priority codes in MPDS and DPCI II do not align as MPDS provides greater flexibility in determining which level of response is most appropriate for the different medical conditions. In this example, the MPDS calls that required response with lights and sirens were compared to calls dispatched within DPCI II as Code 4.

Reduction in Multiple Vehicle Response

Pomax also looked at the impact a reduction in Code 4 calls would have on multi-vehicle responses. Multiple vehicles can be dispatched to Code 4 calls as part of a deployment plan that requires responses from both advanced care and primary care paramedics. To arrive at the impact of a 10% reduction in multi vehicle responses, Pomax assumed the extra vehicle would spend an hour at each call. A 10% reduction in multi-vehicle responses could generate upwards of $2.5 M cost avoidance annually for the system overall.
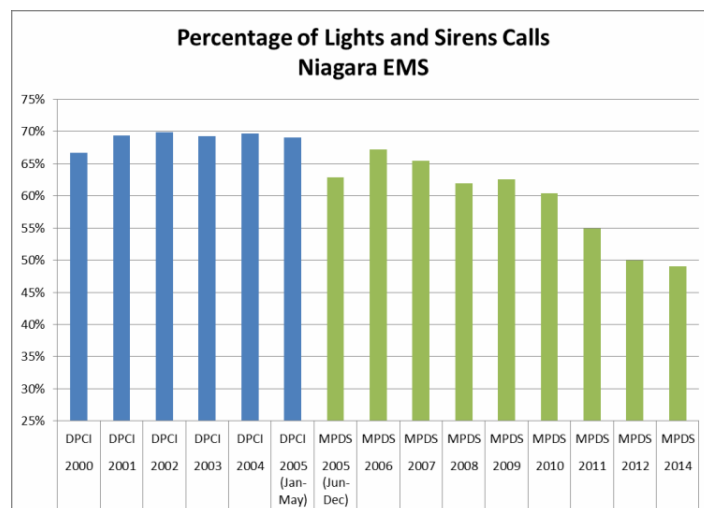
Cost avoidance generated by a 10% reduction in multi-vehicle responses

# of multi vehicle responses in 2014	10% reduction in multi vehicle response	Estimate 1 hour committed to call	Cost Avoidance at $188/hour
134,380	**13,438**	**13,438**	**$2.5M**

Total Estimated Financial Benefit of Implementing MPDS

The estimated one time cost to implement MPDS is approximately $10 million with implementation taking place within 24 months after Ministerial and Cabinet approval is received.

Annual maintenance and support, and ongoing ACO certification costs are estimated to be approximately $800,000 (see Appendix 2).

According to the Pomax modelling, a conservative estimate of the initial system benefit of implementing MPDS is $6.1M annually.[13] As the users becomes more familiar with the protocol, reductions in Code 4 calls and resulting system savings will continue. After adopting MPDS in 2006, the Niagara Emergency Medical Service reduced Code 4 calls from just over 67% to 49% in 2014. It is reasonable to assume the provincial system would also experience continuous improvement, and the resulting cost avoidance.

Percentage of Lights and Sirens Calls Niagara EMS

Recommendation 1:

The DWG recommends the ministry expansion of MPDS in Ontario to all 22 Dispatch centres.

That the expansion of the MPDS System be completed within 24 months after Ministerial and Cabinet approval is received.

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[13] Based on the current 50/50 funding methodology, the province and municipal system would each realize approximately $3M in annual cost avoidance.

Improving Access to Information & Dispatch Decision Making

Getting the right resource to the patient at the right time has a significant impact on positive patient outcomes. Optimizing the availability of existing resources and assigning the closest and most appropriate level of care available is key to ensuring patients receive the care they need. The DWG agrees that expanding Paramedic Service access to dispatch information will improve both day to day operational management and strategic resource planning. At the same time, improving the decision making capability of dispatchers through the addition of new or enhanced deployment and status management tools will assist with selecting the most appropriate ambulance for the patient while ensuring the best coverage over the service area.

Paramedic Service Access to Dispatch Information

Traditionally electronic data and reports were provided to PS for limited types of business usage such as cross border billing between municipalities and call volume statistics. Over time, as changes were made to legislation (e.g. response time standards) and decision support and analytics tools matured to support evidenced based decision making, there has been an increased demand for data. Authoritative retrospective reports and data are still required but there has been a surge in the need for "real-time" data to support operations. The increasing strains on the system from rising call volumes has also resulted in new demand for information which can support quick response to a variety of system stresses.
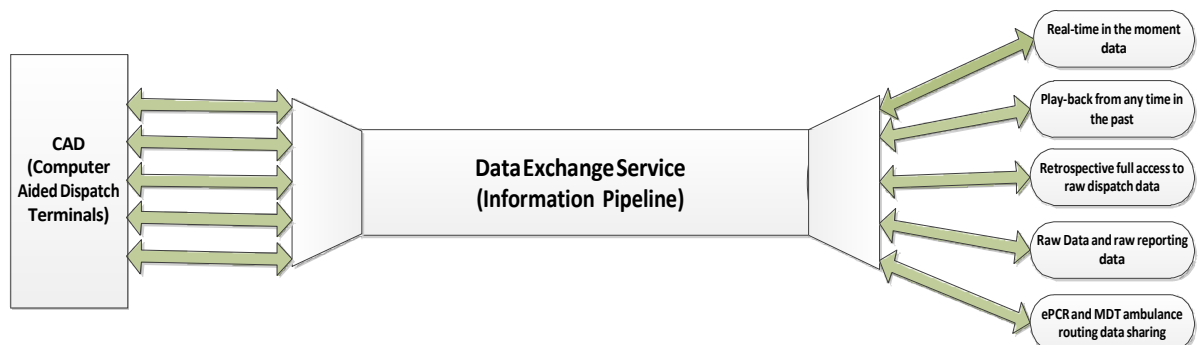
PS can currently access dispatch information that is captured through the ministry's Computer Aided Dispatch (CAD) application in several ways. Traditionally real-time information during an ambulance call is exchanged through voice communications. Once the call and response is completed, PS can request information on a call-by-call basis (e.g. for investigative purposes) or by logging onto the ministry reporting system also known as Ambulance Dispatch Reporting System (ADRS). Ambulance call information is made available on ADRS once the call information has been verified and closed by the dispatch center but this is not always timely.

Until recently, individual PS could submit ad-hoc data request to their respective dispatch centres and receive limited amounts of call information. This required the approval of different levels within the ministry due to concerns about protecting the patient's personal health information. It has been recently determined that PS should have unrestricted access to data contained within the dispatch record as they fall within the circle of care as defined under the Personal Health Information Privacy Protection Act. The ACCs no longer need to seek additional approvals to share information and data with the PS. This will improve the bi-lateral sharing of information, assist with investigations, media requests, and system performance analysis.

Guided by the MOHLTC-OAPC Technology Working Group, a joint partnership between the ministry and the Ontario Association of Paramedic Chiefs, the ministry has launched and

completed several initiatives to provide paramedic services with improved and more real-time access to information. Some of the accomplishments and initiatives underway as a result of working collaboratively to identify opportunities through enhancements and/or demonstrations and pilots are:

- **Real Time View (RTV)** is technology that allows PS to view their ambulance location and status at all times. It enables improved ambulance resource decision support information such as real time ambulance location, status, and alerts. RTV has been successfully deployed in six PS with nine more planned for 2015/16 bringing the provincial total to 15. PS that have subscribed for this service are able to see off load delays as they occur for all calls of all priority types. This enables PS with real-time decision making capabilities to proactively manage offload delays. The ministry will continue to make RTV available to PS that wish to adopt it.

- There are three **Coverage Alert** tools currently used in the province to identify the ambulance most appropriate to be dispatched to maintain emergency coverage based upon municipal deployment plans. Building on previous deployments of the different tools in the province, Optima in Toronto, MARVLIS in Niagara and System Status Manager (SSM) in Ottawa the ministry opted to do a business assessment of SSM the module that exists within the ministry's CAD. SSM provides a visual reminder to ACOs of where ambulances are relative to predefined posts documented in PS deployment plans. It also helps to ensure vehicles are positioned in the best place to respond to the next call. In 2014, the ministry further rolled out SSM successfully to two ACCs, Georgian and Mississauga, bringing the provincial total of ACCs with Coverage Alert tools to five. Business assessment is underway to determine applicability across the province.

- The ministry demonstrated the capability to share live information between the province's CAD systems and various PS technologies through a technology proof of concept for a **Real-Time Data Exchange Platform or "The Pipe"**. It established a central integration platform which is a foundational building block enabling RTV and Business Proof of Concept (BPOC) demonstrations for opportunity evaluation.

The additional proofs of concept initiatives described further below are currently underway and will use "the pipe" to communicate between ACCs and PS. These BPOCs

will define, baseline, and measure, business benefits that aim to align with the following goals:

i) Improve patient services
ii) Improve system efficiency & effectiveness
iii) Better visibility into health system performance

- A standardized **Paramedic Service Integration Specification Data Exchange** is critical to ensuring that the information shared through the Pipe meets all PS needs across the province while enabling sustainable and cost effective implementation of future information initiatives. In partnership with the OAPC, York PS has produced a draft specification which describes the data that needs to be shared in real-time. This will be used and further refined through feedback as a result of the various BPOCs.

- Electronic notification to paramedics of a call assignment and key information such as location, priority and call update is known as **Notification to Paramedics**. This is currently done through voice paging at ambulance bases. A digital paging BPOC is being established with York Region PS to validate and measure business benefits and outcomes. Intended benefits of digital paging include improved dispatch and response times and improved record management of call data.

- Several initiatives have been completed or are underway to improve operational efficiency information. One example is a BPOC with Essex-Windsor EMS, the **Auto-Population of the electronic Ambulance Call Report (eACR)**. This has the intended benefit of reducing administrative efforts while improving accuracy and timeliness through the reduction in manual transcription of voice communications and record matching between the organizations. Information that will auto-populate include call information such as priority, transfer of care time between the ministry CAD, and the PS eACR.

- The **Mobile Call Data Exchange** BPOC is another initiative underway to improve operational efficiency through information exchange with the intended benefits to improving dispatch and response times. The existing Mobile Area Routing and Vehicle Location Information System (MARVLIS) in Niagara ACC will be leveraged as a proof of concept while the implementation of a mobile CAD (MCAD) with York PS (an early adopter site) is underway. MCAD is a live digital display in the ambulance which shows paramedics the location and details for calls they are responding to, and allows the paramedic to interact with the digitally. This is expected to improve timeliness of information exchange while increasing accuracy of call data records.

- **Routable Streets** is a decision support module that will assist ACCs in choosing the best ambulance with the shortest actual travel time. This supports improved response times by providing the distance based on street routing instead of distance by "as the crow flies". Routable Streets can be made available within the province's CAD software and

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can also support turn-by-turn routing guidance to paramedics in their ambulance mapping systems. This initiative is being launched to enable this function in the ministry CAD.

- In an effort to **Improve Paramedic Services Data for Analytics & Reporting**, the ministry has established a new dispatch data sharing format that will contain a broader set of information and improve the format and timeliness of the data retrieved from the ministry ADRS. These enhancements were done in consultation with four PS who worked with the ministry to identify these improvement areas and they have been provided the 2013 dispatch data using this new format. The 2014 data will be provided to all PS using this new format and will be incorporated into the daily data feed provided to the municipalities via the provincial reporting system.

- The ministry now consistently accounts for the time spent by an ambulance at a hospital until the patient is accepted by recording the **Paramedic Transfer of Care Time (TOC)** in the CAD system in support of offload delay management. This was introduced and fully implemented across the province. This will enable reporting of the length of time paramedics have spent with the patient at a hospital until the transfer of care, as well as how much time the paramedics have spent at the hospital after the transfer of care prior to departing. In addition, enhancements to the Response Time Standard reports have been completed and made available on ADRS and will allow PS the ability to monitor response times by reviewing the percentage of calls that meet the legislated response-time measures for patients experiencing sudden cardiac arrest. The ministry has also provided Niagara PS with a nightly data extract of their call data to feed into their analytics tool.

- Other business benefit evaluations include the partnership between the ministry, Toronto Paramedic Service (TPS) and North York General Hospital (NYGH) through the **Patient Transport Info Sharing** project which saw the implementation of electronic sharing of patient information from ambulances to the emergency department. This provides NYGH with an ability to have an overview of incoming ambulances. In an upcoming release, the patient information will be provided automatically to patient charts in hospitals, further improving the timeliness and accuracy of patient information.

As part of ongoing improvement the ministry continues to work collaboratively with the OAPC to align priorities, ensure work addresses pressing needs of the PS community and improve communication. The estimated implementation timelines for each of these initiatives can be found in appendix 4.

Dispatch Decision Support Tools

Technologies available to dispatch systems are evolving and advancing rapidly as with all other technology sectors. It is difficult for jurisdictions to regularly change their technologies to remain current with the most modern system available to ambulance communication systems at any given time.

Dispatch technologies now available provide the ministry with an opportunity to improve ambulance communication centre technologies. This comes at a time when increasing system pressures demand constant improvement and system efficiencies to ensure sustainability of the health care system and Ontarian's access to emergency pre-hospital medical care.

The DWG considered the provincial dispatch technology current state as well as dispatch technologies used by other systems in order to develop an understanding of what the desired state should be. The desired state of technology within Ontario's ambulance dispatch system should be a state that is current, meaning its platforms, hardware and software are from the current generation of dispatch technologies; and that is agile, meaning it has an intrinsic capacity to evolve or adopt new and developing technologies as they become available.

Paramedic systems must provide clinical excellence, response time reliability, patient satisfaction, economic efficiency and continuous improvement, simultaneously to consistently provide excellent care for patients. The dispatch working group has concluded the current dispatch system can be enhanced with changes in technology to meet the increasingly complex demands on paramedic services.

Technology tools within the provincial dispatch system can be updated with new technology to meet increasing system demands and allow for greater efficiency, responsiveness, transparency and operational effectiveness. Inefficiencies in processing the call, dispatching the call or a delay by the crew in responding are system inefficiencies and not acceptable (to the public).

Introducing new or greater automation into the dispatch system will result in efficiencies for both paramedic and ambulance communication services, leading to improved performance and cost effectiveness. Ambulance communication officers should always have the best available deployment and status management tools to improve their ability to identify and select the most appropriate ambulance and to ensure the best coverage over their service areas. This element of a desired state becomes increasingly important as system demands continue to grow. The DWG recommends that initiatives to implement the best decision support tools be undertaken. The challenge will be introducing technological enhancements within a time period that is viewed as responsive and meeting the changing demands of paramedic systems.

As part of the DWG's review of technologies, the group considered technology capabilities versus looking at specific vendors, in order to determine the best technology. Several technology opportunity areas were explored during our meetings:

- Maximizing all tools (options) available within the current provincial dispatch software platform.

- Implementing new technology with the ability to intercept ANI/ALI data (caller location information), validate the location, pre-alert the dispatcher and automatically notify the closest ambulance.

- Advanced system status management software and systems that monitor deployment in real time and provide visual decision support to ambulance communication officers.

- Impedance monitoring software to provide dispatchers/CACC with information that improves vehicle selection options by automatically considering things such as road

closures, speed limits, one-way streets or other factors that affect the potential response time of responding ambulances.

- Predictive deployment software that leverages historic ambulance call data and incorporates current, real time ambulance position and incoming ambulance calls to provide recommended strategic positioning of ambulances in anticipation of the most probable call locations by time of day and day of week.

- Software that provides replay capability to enable a retrospective review of coverage and deployment conditions and provides improved tracking of system usage (in service units, units in offload delay, units out of service, etc.).

Recommendation 2:

The DWG recommends the following:

- Implementation of improved technology tools (software) that allows for improved patient care, more efficient, effective paramedic service and ambulance communication service operations and;

- That a Working Group be formed with membership from the AMO, OAPC, EHS Branch, I&IT Cluster and;

- That the Working Group report back to the Minister with a registry of recommended technology improvements within the provincial system, along with proposed timelines and financial impacts and required resources(short term/medium term and long term) and;

- That the report from the Working Group be presented to the Minister with a recommended plan of action no later than 150 days from acceptance of this recommendation.

Joint System Planning

The recommendations proposed within this report will generate significant change over the next few years. To support these changes, the cooperative work that was accomplished at the DWG should continue under a joint Ministry/OAPC table responsible for overseeing the implementation of the change initiatives. Membership of this Table would be comprised of OAPC/AMO and ministry officials (Emergency Health Services Branch and the Information and Information Technology Health Services Cluster senior managers). The group will support continued quality improvement through the bilateral sharing of information on the health of the system. The new analytics that will be made available to the PS through the various data access initiatives, combined with the system data housed in the ministry will facilitate informed decision making based on the best medical and operational evidence. The group will provide regular reports to the Minister on the progress of the transformation.

At the local level, the DWG is recommending the adoption of a joint operating framework; an agreement between each ACC and the PS they dispatch to work together on improvements to local operations. The agreements will contain clear definitions of the roles and responsibilities of both parties including their shared responsibilities and individual accountabilities, and escalation processes for resolving disputes. The agreements will also include performance measures based on mutually agreed interests such as timelines of response to enquiries, compliance to deployment plans and notification requirements. It is anticipated these agreements will be in place by the fall of 2015.

Recommendation 3:

The DWG recommends the ministry create an Implementation Table responsible for overseeing the continued implementation of change initiatives related to the recommendations contained within this report.

Recommendation 4:

The DWG recommends a Joint Operating Framework be established between each ACC and the paramedic services they dispatch to work together on improvements to local operations.

Recommendation 5:

That the Minster of Health direct the DWG report back directly to the Minister with a joint report on the status of the recommendations contained within this report at the 6 month and 12 month interval.

Appendix 1 - Provincial/Municipal Land Ambulance Dispatch Working Group Terms of Reference

Background

Recognizing the current legislative accountabilities and framework, and that multiple partners are responsible for delivering key elements of emergency services in Ontario, opportunities exist to leverage technology innovations and business processes to improve the dispatching of land ambulance services to all Ontarians.

Ontario's ambulance system is part of the provincial health care system which is integrated with other health care providers.

Improvements should be positioned within current accountability framework and contribute to:

- Improving patient outcomes
- Financial sustainability
- Government priorities
- Ministry transformation
- Alignment with ministry's response to Auditor General's 2013 Annual Report

Mandate

Establish a joint Provincial/Municipal Land Ambulance Dispatch Working Group to discuss specific improvements for land ambulance dispatch, including respective system accountabilities, in an open and constructive dialogue and provide its advice to the Ministry.

Scope

To improve the management and oversight of municipal ambulance resources by leveraging technology innovations and business processes including:

- Paramedic Services access to dispatch information
- Prioritization of ambulance emergency calls

Deliverables

The Provincial/Municipal Land Ambulance Dispatch Working Group will hold a kick-off meeting in December 2014 and complete its mandate by providing its advice as a co-authored report to the ministry by February 28, 2015.

Paramedic Services access to dispatch information

- Define required data to be accessible by Paramedic Services
- Quantify financial impacts
- Recommend an approach to implementation based on shared priorities

Prioritization of ambulance emergency calls

- Identify strategies to improve the prioritization of emergency calls
- Quantify financial impacts
- Recommend an approach to implementation based on shared priorities

Membership

The Provincial/Municipal Land Ambulance Dispatch Working Group will be comprised of ten persons:

- five municipal representatives (4 Ontario Association of Paramedic Chiefs (OAPC), 1 Association of Municipalities of Ontario (AMO))
- five ministry representatives (3 Emergency Health Services Branch (EHSB), 2 Health Services I&IT Cluster (HSC))

The working group will be co-chaired by Neal Roberts, Vice President OAPC and Chief Middlesex London Emergency Medical Services and Richard Jackson, Director Emergency Health Services Branch and Air Ambulance Program Oversight Branch.

Quorum is reached with the participation of 2 municipal members and 2 ministry members (1 EHSB and 1 HSC).

Participation in a working group meeting can be delegated when required.

Subject Matter Experts

Subject matter experts are invited at the discretion of members and approved by the co-chairs as trusted advisors on specific discussion items. The working group will draw upon resources in their respective organizations to assist with the preparation of the group's deliverables.

Secretariat

In consultation with the co-chairs, the ministry will coordinate the meetings, distribute meeting materials, coordinate the logistics and record the meeting minutes.

Formulation and Communication of Recommendations

Consensus is required to formalize a recommendation statement. Recommendations will be recorded in the meeting minutes.

Appendix 2 - Estimated Cost of Implementing MPDS

Estimated One-time DOE	
Dispatch Training	$ 1,860,000
MPDS one-time costs	3,416,000
Hardware/Software for Development, Test, Training	235,000
Tester	405,000
Business Analyst	530,000
I&IT Project Coordinator	471,000
Reporting Conversion	130,000
EHSB PM - 3 years	345,000
1 CISO - 2 years	169,000
3 ACO2s - 1 year	228,000
5 ACO1s - 1 year	358,000
Travel	131,000
Total one-time DOE	**$8,278,000**

Paramedic Service Training	$1,036,000
Dispatch Training	1,092,000
Medical Oversight	100,000
Total one-time TP	**$2,228,000**

Total One-time Costs	**$10,506,000**

Estimated On-Going Costs	
Support and Maintenance	$520,000
Dispatch Training	268,000
Medical Oversight	40,000
Total On-Going Cost	**$828,000**

Estimates are current as of April 2015

Appendix 3 - Paramedic Service Data Requirements Validation

Paramedic Service Validated Intended Information Usage	Data Type

"A" - Operational Decision Support (real-time operations decisions)
    1. Resource Management Decisions - Where are my units, what is their status to inform:
       • When to adjust unit levels (add unit, take unit out of service)
       • Manage staffing (overtime, meal breaks)
       • Site/Scene support (complex scene assistance)
       • Proactive offload management (non-conformance alerting)
       • Deployment plan coverage management (coverage alerts)
       • Patient Distribution (hospital destination, ED volumes, wait times)
    2. Surveillance Decisions (real-time dashboarding) – What are the problem type volumes to inform:
       • Alerts about changes from normal values that might indicate public health risk <i.e., spike in respiratory problem type calls that could be indicative of wider problem> to inform:
           • Adjustments to unit levels/staffing; Escalations to other health providers
"B" - Operational Efficiency Information
    a) Information to complete eACR more efficiently/accurately
    b) Information to augment voice communications for faster, more efficient call data exchanges
    c) Information for turn-by-turn route guidance for faster time on scene; reduced fuel/mileage; start point geocode
    d) Integrated scheduling/rostering to allow for faster rostering with reduced administration
    e) Pre-Alerting (nearest crew driving by a call)
    f) Hazardous flags & Notifications (10-2000 - police /red button)
	Real-time, in the moment data to support operations decision-making & efficiencies in operations
	(Live, Raw Data)

"C" - Business Analytics, Reporting & Modelling
    • Information to support deployment planning/fleet distribution (spikes / peaks)
    • Understanding response time performance, etc.
    • Interrogating specific incidents or point in time (replay / where was my unit Tues at 2pm/ call query)
    • Trends – how many inter-facility transfers (vs no patient) at certain dates /times; shifts in problem type calls to inform planning/resource estimates
    • Complex cases, repatriations, special events
	Authoritative, data that has been Q/A'd to support business analysis & reporting
	(Reporting & Planning Data)

Appendix 4 - Estimated Timelines for Planned Data Initiatives

Planned Data Initiatives	Operational Efficiency	Operational Decision Support (Resource Mgt / Surveillance)	Business Analytics, Reporting	Year 1	Year 2	Year 3
Call Data Via Mobile CAD	X	X		Early Adoption and Evaluaton	Phased Deployment and Adoption Approach	Broad Availability
Real-Time Notifications (Paging)	X	X		Early Adoption and Evaluaton	Phased Deployment and Adoption Approach	Broad Availability
Real-Time Data to PS tools (The Pipe)	X	X	X	Early Adoption and Evaluaton (ePCR)	Broad Availability (ePCR) / Early Adoption and Evaluation (Decision Support Data)	Broad Availability (Decision Support Data)
Real Time View (RTV)		X		Broad Availability		
CAD and Call Close Enhancements			X	Improved Data Input & Editing Capabilities		
Improved Provincial Reporting Tool			X	Expanded Data Extract	Increased Frequency	