



INFORMING THE PUBLIC DIALOGUE AROUND MEDICAL TIERED RESPONSE IN ONTARIO

An Independent Evidence-Based Review

SEPTEMBER 2011

Commissioned by



TABLE OF CONTENTS

	<u>Page</u>
<i>Executive Summary</i>	<i>ii)</i>
<i>A. The Emerging Dialogue Around EMS/Fire Tiered Response: Setting the Scene</i>	<i>1</i>
<i>B. Clarifying the EMS/Fire Tiered Response Public Dialogue: An Evidence-Based Factual Review</i>	<i>6</i>
<i>C. Dispatch Issues Within the EMS/Fire Tiered Response Dialogue</i>	<i>15</i>
<i>D. Fire Department Tiered Response Medical Interventions</i>	<i>19</i>
<i>E. Dialogue to Optimize Fire Tiered Response to Emergency Medical Calls: Research Findings</i>	<i>24</i>
<i>F. Tiered Response Agreements – Towards “Best Practice” Design & Implementation</i>	<i>27</i>
<i>G. Next Steps: Strengthening the AMEMSO/OAFC Evidence Based Dialogue</i>	<i>30</i>

EXECUTIVE SUMMARY

The EMS/Fire Public Dialogue Around Tiered Response

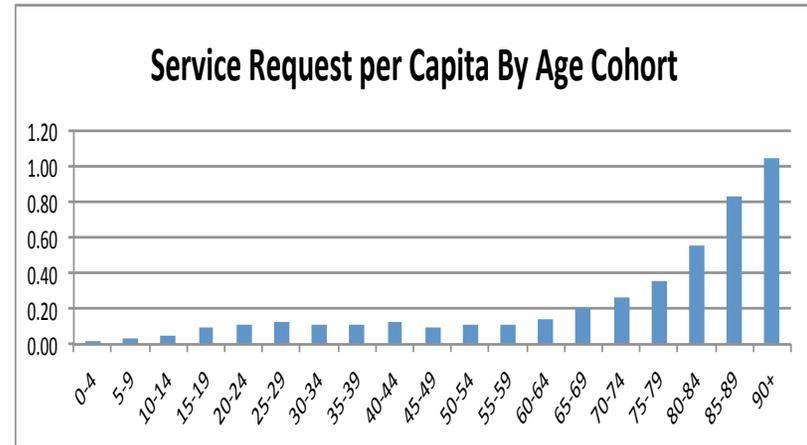
Stakeholders in Ontario’s pre-hospital emergency medical community are engaged in an increasingly public dialogue around how best to safeguard system response times, and improve patient care outcomes. In some corners, this dialogue has focused on improving the EMS/Fire tiered response model. In other corners, the focus has been on securing municipal budget savings via EMS/Fire organization mergers or restructuring. The evolving public dialogue among stakeholders around tiered response system improvement is a good thing.

To date, the Fire community has largely defined the tone and content of the public dialogue. AMEMSO believes the timing is opportune for its members to enter the discussion around roles and responsibilities for EMS/Fire in delivering pre-hospital emergency services. Consistent with the science-based foundations of EMS, AMEMSO believes a factual, evidence-based perspective will add balance and legitimacy to the current stakeholder dialogue. To that end, AMEMSO has

commissioned this independent, evidence-based discussion paper.

There is universal agreement across Ontario’s EMS and Fire communities that the pre-hospital emergency medical system faces significant resource, response time and patient care challenges. The combination of ongoing population growth and the emerging “aging tsunami” of patient demographics are driving service demand ever upwards. EMS system capacity is being challenged across the province.

“Aging Tsunami” Drives Demand for Emergency Medical Service: A Typical EMS Demand Profile



Conversely, urban fire departments in Ontario are experiencing a long-term trend of declining numbers of actual structure fires. This positive public safety trend is rooted in successful fire prevention programs and building code improvements. Fire departments do not approach the high levels of “system busy-ness” exhibited by Ontario ambulance services (referred to as unit hour utilization or UHU). In fact, urban Fire departments feature significant excess resource capacity relative to structure fire and rescue/MVA call volume demand. In recent years urban Fire departments in Ontario have addressed their excess resource capacity, in part, by functioning as tiered responders within the pre-hospital emergency medical system. Medical calls represent a growing share of overall Fire department call volumes province-wide. In fact, the Fire Marshall has recently reported that 41% of all urban fire department calls in Ontario are medical tiered responses – the single largest component of total fire department call volumes.

The landmark OPALS research project has documented the statistically significant benefit of Fire participation in pre-hospital emergency medical tiered response for a distinct subset of EMS Code 4 calls dealing with life threatening cardiac

events. These OPALS related cardiac calls typically represent approximately two percent of EMS dispatched Code 4 emergency service requests. It is this 2% of total EMS call volume that the Fire community references when discussing their time sensitive contribution to Ontario’s pre-hospital emergency medical system.

Fire Community “Saving Lives” Position Paper – An Evidence Based Correction

The Ontario Association of Fire Chiefs (O AFC) and the Ontario Professional Fire Fighters Association (OPFFA) have issued a joint position paper entitled “*Saving a Life in 6.0 Minutes or Less*”. This position paper claims Ontario fire departments can respond to life threatening medical calls in an average of 6.0 minutes – and much faster in some large urban areas.

For Ontario’s 174 composite Fire departments, the 6-minute average response time cited in “*Saving Lives*” has not been validated with published response time data. Upon receipt of a dispatched life-threatening CTAS 1 emergency medical call, the part-time firefighters in a composite model must first travel to the fire hall from work or home, assemble as a group and

put on their gear, then leave the hall and travel to the site of the call. After consulting a range of composite Fire service experts, it has been determined by Performance Concepts Consulting that the composite model cannot physically deliver 6-minute average response times from dispatch receipt to on-site arrival. In fact, composite fire departments across Ontario are struggling to meet the traditional “ten men in ten minutes” response standard for structure fires recommended over the past decade by the Ontario Fire Marshall for communities with pressurized water systems.

In the case of Ontario’s 31 full-time urban fire departments, the “Saving Lives” position paper suggests that average response times to CTAS 1 cardiac calls are “...much less in some urban areas”. The specific urban areas being referenced are not set out in the “Saving Lives” paper – nor are their reported response times. If “...much less” were assumed to represent a one-minute reduction over the 6.0-minute province-wide average, then an urban response time of 5.0-minutes would require call dispatch in less than one minute, firefighter turnout to occur in less than one minute, and apparatus travel times to average 3.0 to 3.5 minutes. Again, independent fire department deployment experts consulted by Performance

Concepts Consulting do not find this urban response time scenario to be credible. Recent OMBI response time reporting for all categories of fire emergency calls does not support the “Saving Lives” position paper statements concerning fire response times. (OMBI 2009 public report)

Finally, the assertion in the “Saving Lives” position paper that EMS response times across Ontario average 13.1 minutes is factually incorrect according to Performance Concepts independent review. EMS uses high-reliability 90th percentile response times as its industry-standard reporting tool – not average response times. In a 2005 report reviewing the performance of the Ontario EMS system, Ontario’s Auditor General noted that the 75th percentile response time across the province for Code 4 emergency calls was 10.5 minutes. By statistical definition, the average EMS response time was significantly less than the 10.5-minute 75th percentile response time cited by the Auditor General. Publicly reported OMBI 90th percentile response time data also refutes the “Saving Lives” claim of an average 13.1-minute EMS response time.

AMEMSO recognizes that on-scene EMS and fire response time comparisons should be an important facet of the public

dialogue around tiered response improvement. To this end, Performance Concepts Consulting was directed by AMEMSO to design an independently executed comparative case study of “apples to apples” EMS/Fire response times as part of this review. Urban fire departments within eight AMEMSO EMS jurisdictions were invited to participate in the comparative case study. Fire departments in six of the eight EMS jurisdictions declined to participate in an independent comparison of response times.

The Fire Union (OPFFA) Position – Understanding the Impacts

On its website and Facebook page, the Ontario Professional Firefighters Association (OPFFA) has advanced its own position (not endorsed by the Ontario Association of Fire Chiefs) that fire departments should respond to ALL Code 4 emergency EMS calls dispatched across Ontario. The OPFFA has been actively engaged in a public relations campaign advocating its tiered response position with provincial and municipal politicians and candidates running for higher office.

The OPFFA position represents a radical departure from the EMS/Fire tiered response models now employed across the province. *The OPFFA Code 4 expansion plan could require urban fire departments to deploy for an estimated half-million additional medical emergency calls across the Province (Performance Concepts projection based on OMBI 2009 data).* A local example is helpful to understand the scope and impact of this proposal. In the City of Ottawa, the impact of implementing the OPFFA position would be 65,000 new Code 4 “lights and sirens” responses by a 4-person pumper apparatus travelling at relatively high speeds through an urban road network. No impact analyses on expected apparatus collision rates, or acknowledgement of new taxpayer costs, accompany the OPFFA position statement on their website or Facebook page. In fact, the OPFFA claims that implementing their expanded Code 4 tiered response model would generate NO new costs for taxpayers.

Performance Concepts has conducted an independent costing analysis of the OPFFA tiered response position. The independent costing analysis yields the following conclusions:

-
- AMEMSO urban members like Hamilton, Toronto, Ottawa, Peel, York and Durham each deal with Code 4 call volumes that would generate annual multi-million dollar marginal cost impacts (i.e. fuel, medical supplies, fire fighter injury downtime, added training costs) for their respective Fire services. Million dollar impacts could result for Fire services associated with other moderate-sized AMEMSO urban EMS services.
 - The spike in Code 4 medical call responses would significantly compress the fire apparatus capital cost life cycle experienced by urban fire departments. Annual budgeted reserve fund contributions for pumper apparatus replacement would likely double, as planned life cycles are cut in half. The annual capital cost impacts on a large urban Fire department fleet of pumper apparatus could be measured in the millions of dollars. For instance, the Mississauga Fire department currently features 18 pumpers – and an estimated annual replacement reserve budget increase of \$900,000 if the OPFFA position were implemented in Peel.
 - Significant new firefighter resources/manpower would be required to preserve existing structure fire and rescue response capacity/travel times. Twenty percent staffing increases for large urban Fire departments are deemed a prudent municipal budget contingency by Performance Concepts in order to implement the OPFFA position - while also maintaining optimal apparatus positioning to protect response times for structure fire/rescue calls.

Simultaneous Dispatch Issues – Case Study Evidence

The OAFIC and the OPFFA believe the Province's EMS dispatch-centre processes and technologies are eroding the timeliness of fire department responses to Code 4 emergency medical calls. The urban fire community asserts that they are "first-on-scene" for a majority of Code 4 calls – arriving well before EMS paramedics. The OAFIC and OPFFA believe they would be first on scene for virtually all Code 4 calls, were it not for notification delays at the Provincially controlled dispatch-centres.

It is possible to use EMS data sources to test the assertion that Fire dispatch notification is being unnecessarily delayed – with the result that Code 4 response times are being eroded by "several minutes". This can be accomplished by comparing point-in-time data for Fire notification to point-in-time data on paramedic crew notification. Performance Concepts has done so for a sample of urban AMEMSO members.

AMEMSO Member	% Calls Where Fire Dispatch Notified At/Before EMS Unit	Average Time Difference (+ or -) Between Fire Dispatch Notification & EMS Crew Notification
Peel	Fire notified At/Before 68% of sample EMS Calls	Average Fire notification is 15 seconds before EMS crew notification
SMEMS (T-Bay)	Fire notified At/Before 59% of sample EMS Calls	Average Fire notification is 10 seconds before EMS crew notification
Essex	Fire notified At/Before 50% of sample EMS Calls	Average Fire notification is 10 seconds after EMS crew notification
Peterborough	Fire notified At/Before 29% of sample EMS Calls	Average Fire notification is 20 seconds after EMS crew notification

The 2010 data extract/evidence from a sample of AMEMSO members contradicts a core position being advanced by the Fire community – that fire response times suffer when compared to EMS due to an unfair dispatch lag. In the sample of AMEMSO jurisdictions, provincial EMS dispatch call-takers are in fact notifying fire dispatch and EMS paramedics virtually simultaneously (Thunder Bay, Essex) or significantly faster (Peel). There is no evidence of a significant Fire dispatch lag in the sample jurisdictions selected from across the province.

It should be recognized that simultaneous dispatch technology (e.g. Ministry TIF software) could actually eliminate a first-on-scene response time “head start” for fire departments (relative to EMS) now occurring within some dispatch-centres (e.g. Ottawa, Peel, Durham). The elimination of the delay in EMS crew notification would be beneficial to patients, since EMS dispatchers would receive the call from EMS call-takers at the same time as fire dispatchers. EMS T0-T4 response times (i.e. from dispatch to paramedics on-scene) could improve in these instances, once a simultaneous dispatch technology is in place.

Understanding Clinical Impacts of Fire Tiered Response

The evolving public dialogue around the future role/scope of fire departments in medical tiered response should be informed by the current impact of fire patient interventions. Performance Concepts Consulting has conducted an evidence-based examination of 2010 EMS/Fire clinical data sets extracted from selected AMEMSO members from across the province. Three representative case studies are presented in this paper. The Peterborough case study is presented here for illustrative purposes – all three AMEMSO case study

clinical data sets have generated similar trends and conclusions.

EMS Procedure Types	132
FD Procedure types	24
FD Procedure types Prior to EMS arrival	10
EMS Call in Sample	7,545
EMS Procedures Performed	107,989
Calls with FD Procedures or Assist	225
FD Procedures or Assist	397
FD Procedures Prior to EMS arrival	96
Total FD Procedures	493
% FD Calls with No Procedures	93%

Existing tiered response data sets from the AMEMSO case studies demonstrate that fire departments provide a very minor share of the large volume of patient procedures delivered in the field by EMS. This limited scope of existing fire department activity is not problematic, since OPALS research demonstrates that time-sensitive truly life-threatening calls represent approximately 1-2% of total Code 4 calls (i.e.

cardiac arrest or “pre-arrest” calls). The vast majority of EMS calls and clinical procedures are in fact not “life and death” time sensitive, and therefore do not require rapid deployment of firefighter defibrillation and CPR capabilities – capabilities which OPALS documented are also provided by other actors such as police, bus drivers and the general public. In fact, OPALS documented the statistical fact that firefighter survival impacts on patients were positive yet limited. Public defibrillation was deemed the highest priority for additional resources in the pre-hospital emergency medical system.

Despite relatively large volumes of Fire tiered responses in the 2010 sample period, the proportion of calls where fire departments deliver patient procedures is small. In the Peterborough example, 93% of fire department tiered response calls did not involve the delivery of any patient procedures. When patient procedures are delivered by Fire – 493 in the Peterborough case - only a minority are actually delivered prior to EMS arrival. Most fire department patient procedures are delivered in tandem with EMS. There is no clinical evidence emerging from the AMEMSO case studies that an expanded scope of fire department tiered medical response would deliver an increase in meaningful fire patient

procedures, improve patient outcomes, or provide relief to paramedic workload burdens.

Highlights of Medical Tiered Response Scientific Research

The body of this paper contains an independent review by Performance Concepts of published scientific research articles on EMS/Fire tiered response. The following observations from this independent review of the tiered response science are noteworthy:

- Good evidence does exist for fire department and other first responders (police, volunteer first responders in rural areas, and the general public) to be activated to a small sub-set of critical “time sensitive” calls only. Due to declining structure fire workloads, fire departments have surplus resource capacity and can respond quickly to the subset of time sensitive calls typically comprising 1-2 percent of EMS call volumes.
- Studies have suggested that dispatch systems and triage algorithms like MPDS can accurately triage which patients suffer from “time sensitive” conditions that would benefit from rapid response and Fire first responder presence.
- Statistical analysis suggests a strategic reduction in the number of emergency medical calls executed by large

urban fire departments. Statistical research by Craig/Verbeek/Schwartz suggests that tiered medical responses delivered by Toronto Fire could be reduced by 83% without adverse patient impacts.

Towards EMS/Fire Tiered Response “Best Practices”

Collaboration between EMS and Fire organizations can yield important insights around tiered response model design and current practices. Continuous improvement in tiered response design and execution are possible. Performance Concepts has reviewed urban EMS/Fire tiered response agreements across selected AMEMSO members. These agreements feature widely differing portfolios of Code 4 call types that trigger a dispatched fire department response.

The table on the following page documents the diversity of Code 4 triggers identified across AMEMSO members’ tiered response agreements with urban fire departments. The following observations can be made:

- There are only two or three “core” EMS call types that are consistent triggers across urban AMEMSO tiered response agreements. These include VSA, unconscious, and delayed EMS call categories.
-

AMEMS Member Sample	Call Types in Urban Tiered Response Agreement													
	Severe Bleeding	VSA	Unconscious	Chest Pain	Seizures	Unknown	MVA with EMS	Delayed EMS	Burns & Electrocutation	Bariatric Unit	Absence Breathing	Choking Short Breath	Other Trauma (5 Types)	Heart Attack
Hamilton			■		■			■	■		■	■	■	
Ottawa		■	■					■	■	■				
Lambton/Sarnia		■	■	■			■							
Sudbury		■	■		■			■						
Thunder Bay SNEMS		■						■			■			■
Waterloo	■	■	■	■	■	■	■	■			■	■		
Durham	■		■				■				■			■

- There is a wide range of other EMS Code 4 call types that trigger an urban fire department tiered response across various AMEMSO member agreements. It is unclear whether or not these call types are derived from medical/empirical data sets in each AMEMSO jurisdiction. Differences in these Code 4 call triggers generate measurably higher/lower medical call volumes for urban fire departments.
- It is also unclear whether the DPCI II and MPDS triage algorithms used in Ontario EMS dispatch-centres trigger significantly different levels of fire department tiered response activity. For instance some DPCI II Code 4 calls are categorized as “Charlie” calls in MPDS and therefore may not trigger a fire department tiered response.

A “best practices” tiered response model does not require uniform call triggers across AMEMSO members. What is required is a consistent evidence-based commitment re. the design and implementation of a “best practice” tiered response management process. This “best practice” management process would be cyclical and incorporate distinct plan-deliver-evaluate components. The tiered response “best practice” process would be coordinated and managed according to evidence-based medical oversight – supplied by a Base

Hospital Medical Director. Science-based evaluation and cost-benefit review of potential Code 4 triggers would be the sole criteria in tiered response agreement re-design – not any resulting impacts on call volume trends for Fire, EMS or Police. First responder services would comply with the evidence-based direction of the Base Hospital in terms of call “triggers” and response practices. A science-based *plan-deliver-evaluate* process, as opposed to an arbitrary duplication or differentiation of code 4 triggers would constitute a “best practice” advancement in tiered response design.

Next Steps: Formalizing the AMEMSO/OAFC Evidence-Based Dialogue

This AMEMSO-commissioned discussion paper has attempted to introduce an evidence-based perspective into the evolving EMS/Fire tiered response dialogue. There is a consensus across the EMS and Fire communities concerning the valued contribution of fire department first response to the “life and death” CTAS 1 emergency calls as identified in the OPALS and other published independent noted in this paper. There is also a consensus across EMS organizations that the OPFFA position advocating fire response to all Code 4 calls is not supported by science, would carry significant fiscal impacts, and would generate public safety risk in terms of fire apparatus collision incidents. Finally, the OPFFA position would compromise response times for the core business of structure fire suppression and rescues.

This AMEMSO-commissioned discussion paper also provides evidence/data on simultaneous dispatch issues, and the frequency of fire patient procedures – evidence that can inform a new collaborative dialogue. Although fire departments declined to participate in the preparation of this paper, a jointly

designed and managed research project is still desirable and achievable. Performance Concepts recommends that AMEMSO be prepared to work in close collaboration with the OAFC in this regard. A quantitative, evidence-based research collaboration between AMEMSO and the OAFC could encompass an on-scene response time comparative analyses. It could also include a “best practices” review of tiered response agreements consistent with the medical oversight and *plan-deliver-evaluate* model set out in this paper.

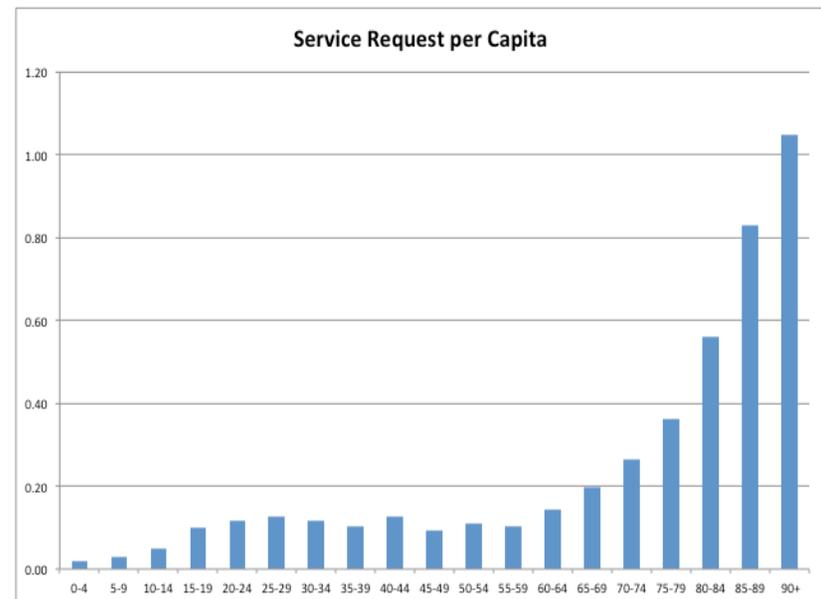
A. The Emerging Dialogue Around EMS/Fire Tiered Response: Setting the Scene

Stakeholders in Ontario's pre-hospital emergency medical community are engaged in an increasingly public dialogue around how best to safeguard system response times, and improve patient care outcomes. In some corners, this dialogue has focused on EMS/Fire tiered response restructuring. In other corners, the focus has been on securing municipal budget savings via EMS/Fire organization restructuring. The emerging public dialogue among stakeholders around system improvement is a good thing – if it is driven by evidence.

There is universal agreement across Ontario's EMS and Fire organizations that the pre-hospital emergency medical system faces significant resource, response time and patient care challenges. These challenges are systemic and unavoidable. The combination of population growth and the emerging "aging tsunami" of patient demographics are driving service demand ever upwards. Patient aging impacts are a particular concern moving forward. EMS patient age data profiles collected from AMEMSO members reveal that per capita Code 3-4 ambulance emergency service requests are significantly

higher in age 65+ population cohorts. Ontario's large baby boomer population is now entering these 'higher per capita service request' age cohorts. The demographic "aging tsunami" guarantees that emergency medical service demand pressures are not going away any time soon. In fact, service demand pressures on EMS providers are going to accelerate for the foreseeable future.

"Aging Tsunami" Drives Demand for Emergency Medical Service: A Typical EMS Provider Profile



The capacity of Ontario's EMS organizations to respond to escalating levels of patient demand is being sorely challenged.

The following examples are instructive:

- Ambulance utilization levels (UHU) are escalating beyond accepted industry norms in many urban EMS jurisdictions. Once unit hour utilization (UHU) "busyness" rates creep upwards beyond the 30-35 percent range, 90th percentile response times erode and patient safety risk increases.
- The incidence of critical shortages in ambulance availability during times of peak demand load - the so called "Code Red" level of zero available units - is increasing across urban EMS jurisdictions. In the City of Thunder Bay for instance, more than 1,000 "zero available unit" shortfall incidents occurred in 2010.
- Patient offload delays in hospital emergency departments (caused by hospital bed shortages and patient flow problems) continue to erode EMS system resources and response times. OMBI data confirms

the ongoing problem of hospital patient offloads exceeding the industry's unofficial 30-minute standard.

- EMS 90th percentile response time erosion has been widely reported by both individual EMS systems and the Provincial Auditor General – despite ongoing municipal paramedic staffing investments upgrading the sub-standard land ambulance model originally transferred by the Province.

The EMS system in Ontario is functioning at or beyond its currently resourced capacity, and is clearly under stress from an evidence-based system performance perspective.

Conversely, urban fire departments in Ontario are experiencing a long-term trend of declining numbers of actual structure fires. This positive public safety trend is rooted in successful fire prevention programs and building code improvements. Urban fire departments in Ontario typically deploy station location patterns that ensure relatively low travel times to a declining number of structure fire calls as well as rescue and motor vehicle accident (MVA) calls.

Fire departments do not approach the high levels of unit hour utilization (UHU) *system busy-ness* exhibited by emergency medical services. In fact, urban fire departments feature significant excess resource capacity relative to structure fire and rescue/MVA call volume demand.

In recent years urban fire departments in Ontario have addressed their excess resource capacity, in part, by functioning as tiered responders within the pre-hospital emergency medical system. In Durham region for instance, the various Fire services respond to approximately 11,500 EMS calls annually – constituting 40% of total fire call volumes. This medical call workload executed by Fire corresponds to only 13 percent of total Durham EMS calls. Call volume analyses in other AMEMSO jurisdictions feature a similar pattern of workload distribution. EMS call volumes are always significantly higher than Fire call volumes, and Fire call volumes are composed of a growing proportion of emergency medical calls and a declining proportion of actual structure fires.

OPALS research has documented the statistically significant benefits of Fire participation in pre-hospital emergency medical

tiered response for a distinct sub-set of EMS Code 4 calls dealing with life threatening cardiac events. The OPALS cardiac calls typically represent approximately just two percent of EMS dispatched Code 4 emergency service requests. According to OPALS research, fire department defibrillation/CPR ranks third behind EMS and community defibrillation/CPR in terms of life saving benefits. As noted in the OPALS report, expanded community CPR represents the optimal tactic for improving cardiac arrest survivability in urban Ontario:

“Resources for the management of out-of-hospital cardiac arrest should be preferentially allocated to early defibrillation and citizen CPR, where the greatest impact can be realized.”

- OPALS

While not delivering the same cost/benefit return as citizen defibrillation/CPR, fire department interventions re. the OPALS cardiac calls deliver measurable and statistically significant benefits. Fire department involvement in the Ontario pre-hospital emergency medical system (as a tiered responder to this small sub-set of calls) saves lives. Performance Concepts

agrees that firefighters, along with other first responders, are a valued tiered response support to the EMS system.

To date, the public dialogue around how best to improve pre-hospital emergency response times and system performance has largely been driven by fire industry opinion leaders.

The Ontario Association of Fire Chiefs (O AFC) and the Ontario Professional Fire Fighters Association (OPFFA) have issued a joint discussion paper *“Saving a Life in 6.0 Minutes or Less”*. The “Saving a Life” paper globally compares fire and EMS response time performance, calls for enhanced levels of Fire department involvement in pre-hospital emergency medical responses, and advocates for dispatch system restructuring. The dispatch restructuring issue is noteworthy because many in the fire services believe that EMS dispatch processes/technologies used by the Ministry of Health and Long-Term Care result in delayed fire department response to code 4 life threatening requests for service.

On their website, the Ontario Professional Firefighters Association (OPFFA) has advanced its own position (not endorsed by the Ontario Association of Fire Chiefs) that fire

departments should respond to ALL Code 4 emergency ambulance calls dispatched across Ontario. The OPFFA position would require a dramatic restructuring of the current tiered response protocols now in place between urban EMS and Fire organizations across Ontario. The OPFFA has been actively engaged in advocating its position with elected provincial and municipal officials, and candidates running for higher office. The OPFFA position is perceived as controversial and somewhat extreme across the Ontario EMS community, including EMS unions.

AMEMSO believes the timing is opportune for its members to enter the emerging public dialogue around roles and responsibilities for EMS and Fire organizations in delivering pre-hospital emergency services. AMEMSO also believes that a factual, evidence-based perspective will add balance and legitimacy to the existing public dialogue. To that end an objective third party – Performance Concepts Consulting – was commissioned by AMEMSO to prepare this independent, evidence-based discussion paper. This paper will review existing evidence/research on the optimal scope of fire department participation in pre-hospital emergency medical response. This paper will also provide a counter-point to some

aspects of the current fire community dialogue around expanded tiered response. Factual, evidence-based clarification is required due to the positioning of the issue by the OPFFA. Finally, the paper will utilize research and set out a “best practices” framework for fine-tuning existing EMS/Fire tiered response agreements across the Province. Continuous improvement in managing tiered-response frameworks will benefit EMS and fire services, but most importantly it will ensure Ontario residents receive efficient and effective pre-hospital emergency services.

This AMEMSO-commissioned paper will not deal with the issue of EMS/Fire organization mergers or restructuring – an issue that is clearly within the purview of individual municipalities and their elected Councils.

B. Clarifying the EMS/Fire Tiered Response Public Dialogue: An Evidence-Based Factual Review

AMEMSO believes it can add value to the emerging public dialogue among Fire and EMS stakeholders by offering an evidence-based perspective on issues that have already been raised by fire community stakeholders. Once this “fact check” has been accomplished, an AMEMSO perspective on how to achieve “best practice” tiered response frameworks among EMS/Fire providers can be advanced.

Factual clarification and commentary is warranted concerning key fire community position papers and union advocacy positions.

O AFC & OPFFA “Saving Lives in 6.0 Minutes or Less” Joint Discussion Paper

As already noted, the O AFC and the OPFFA have issued a joint position paper “*Saving a Life in 6 Minutes or Less By Utilizing the Efficiencies of the Ontario Fire Service*”. The paper was originally released in 2008 and updated in 2009. The paper claims that Ontario fire services can respond to the most serious CTAS 1 emergency medical calls in an average

of 6.0 minutes – and much faster in some large urban areas. The fire service response time of 6.0 minutes is footnoted to source data from the Ontario Fire Marshall Standard Incident Reports. The “Saving Lives” paper also claims that Ontario EMS services average 13.1 minute response times for these same CTAS 1 cardiac calls.

“With ambulance response times averaging 13.1 minutes for life threatening emergencies, standalone EMS providers seem to be having difficulty improving upon response times.”

When reviewing this data in “Saving Lives” a reader might infer that a Fire based response to these truly life threatening calls is superior to an EMS response across urban Ontario – after all the document is correct in asserting that “...every minute counts” for cardiac arrest calls.

The Fire Marshall data supporting the paper’s assertion that Ontario’s Fire departments typically respond to potentially life-threatening CTAS 1 emergency medical calls in 6 minutes or less was not issued along with the “Saving Lives” paper. Therefore, some pertinent questions remain unanswered.

Approximately 174 Ontario municipalities deliver fire services using a composite staffing model, featuring a small full-time management team and a larger group of part-time fire fighters typically paid by the call. Upon receipt of a dispatched CTAS 1 emergency medical call, these part-time firefighters must first travel to the fire hall from work or home, assemble as a group and put on their gear, then leave the hall and travel to the site of the call. After consulting a range of composite fire service experts, it has been determined that the composite model simply cannot physically deliver 6-minute average response times from dispatch receipt to on-site arrival. The same conclusion holds for rural and remote “pure volunteer” fire departments across the province.

In the case of the 31 full-time urban fire departments in Ontario, the “Saving Lives” paper suggests that average response time to CTAS 1 cardiac calls are “much less in some urban areas”. The specific urban areas being referenced are not referenced in the paper. If “much less” were assumed to represent a one minute reduction over the 6 minute average, then urban fire department averages of 5 minutes would require calls to be dispatched in less than one minute, firefighter turnout to occur in less than one minute, and on-

scene drive times to average 3.0 to 3.5 minutes. Independent fire department deployment experts consulted by Performance Concepts Consulting (confidential assessment) do not find this urban response time scenario to be credible.

On the EMS side, the assertion in the “Saving Lives” paper that response times to a CTAS 1 cardiac arrest incident average 13.1 minutes is factually incorrect. This alleged EMS average response time is not attributed to any specific source in “Saving Lives”. EMS services do not typically measure response times using averages – they employ an industry standard 90th percentile response time performance indicator. The 90th percentile indicator captures Code 4 response times achieved in nine-out-of-ten calls – thereby providing a much more reliable sense of the real-world response times a patient can expect to receive. This statistic, by definition, is always slower than the average response time. EMS 90th percentile response times in Ontario have been reported to be below the 13-minute range by most urban service providers. In 2005, the Ontario Auditor General noted that the 75th percentile response time in Ontario for Code 4 calls was 10.5 minutes. By definition the average EMS response time was significantly less than the 10.5-minute 75th percentile response time.

Technical care and precision is required when attempting to compare Fire and EMS response times. The “Saving Lives” discussion paper mixes “apples and oranges” by comparing Fire department average response times to what appear to be mislabeled 90th percentile EMS response times. Technically accurate “apples to apples’ comparisons of performance data will advance the EMS/Fire tiered response public dialogue.

The “Saving Lives” position paper update released in 2009 did not solve the problem of “apples to oranges” response time comparisons. The “Saving Lives” update asserts the following:

“...Fire crews with defibrillators and lifesaving medical skills, and ***who typically would arrive several minutes sooner than a land ambulance***, are not being dispatched right away.”

No data is offered in the “Saving Lives” update to document the assertion that fire departments could typically arrive on-scene at Code 4 emergency medical calls several minutes before EMS. Therefore the assertion is not evidence-based.

AMEMSO believes that on-scene EMS and Fire response time comparisons should be an important facet of the emerging

stakeholder dialogue around tiered response system improvement. The relative performance of EMS/Fire tiered response partners is critical to generating system performance improvement. To this end, Performance Concepts Consulting was directed by AMEMSO to carry out a 3rd party comparative case study component to this review. Performance Concepts selected eight urban EMS jurisdictions from across the province for impartial comparative analysis of detailed 2010 EMS/Fire Code 4 response times. Urban fire departments within these eight EMS jurisdictions were invited to participate in the comparative case studies. Fire departments in six of the eight case study jurisdictions declined to participate in an independent comparison of EMS/Fire response times.

In the absence of independent and technically appropriate comparative case studies, it is not clear how fire and EMS providers perform across the Province in terms of “first on scene” response times. Reporting and measurement regimes are entirely different across Fire and EMS.

A useful effort in bridging the reporting regime gap has been attempted by the Ontario Municipal Benchmarking Initiative (OMBI). OMBI has reported 90th percentile emergency call

response times for a select number of participating fire departments (i.e. structure fires, rescues, MVA, medical). Cities such as Hamilton, Ottawa, Toronto, Thunder Bay, London, Barrie and Windsor have reported “station notification” post-dispatch response times that correspond to OMBI reporting of EMS post-dispatch response times. To repeat, OMBI EMS and Fire response time measures do not include respective dispatch times. This reporting framework could provide the basis for future comparative analyses. OMBI could produce a future specialized report for Fire response times to emergency medical calls - using 90th percentile “station notification” data that is roughly comparable to T2-T4 EMS reporting. The contentious issues around Provincial dispatch-centre processes and time reporting would not be an issue.

Potentially informative comparative data is already available in some selected EMS jurisdictions. The case in Durham region is instructive. Durham EMS has prepared a short analysis/discussion paper entitled “The Facts of the Matter”. The paper compares Durham EMS 2009 average urban response times (T3-4 Vehicle Mobile to Arrive Scene) to the 6.0 minute “apples to apples” Fire Marshall urban standard

that would apply to the Whitby, Oshawa, Ajax and Pickering urban fire services (same Fire response time definition not including dispatch). The Durham EMS city-by-city average response times (using this common definition) currently range from 4:49 to 6.21 minutes. The Durham paper therefore concludes,

*“...These EMS response times would be **very comparable, if not better than, the average response times reported by the fire services** if they utilized the same criteria and calculated the call response time from the time the call is received until the time they arrive on the scene.”*

- Facts of the Matter 2011

While the Durham EMS analysis may not be definitive because an impartial 3rd party did not execute it, it does represent a technically appropriate and informative attempt to engage in a fact-based discussion of tiered response improvement. The results in Durham suggest that the “Saving Lives” speculation around superior Fire on-scene times remains to be proven. Clearly, a multi-jurisdictional 3rd party case study analysis would be helpful in this regard. Performance Concepts Consulting is optimistic that members of the fire community will reconsider the decision not to

participate in a 3rd party comparative analysis of EMS/Fire response times.

OPFFA Position on Expanding Fire Tiered Response to Code 4 Medical Calls

The OPFFA has publicly advocated for a significant restructuring of fire department tiered response to emergency medical calls. The OPFFA advocacy campaign has escalated recently into a high profile public relations campaign being coordinated by a contracted professional PR firm. Facebook, website and other promotional portals/tools are being utilized. The OPFFA website sets out the following two-part position of the union:

“Whenever someone in medical distress dials 911, they expect the closest trained emergency responder to be sent as soon as possible, regardless of whether that first responder arrives in an ambulance or a fire truck.”

*“It is the Ontario Professional Fire Fighters Association’s position that fire **fighters should be dispatched, simultaneously with EMS, to all life-and-limb threatening medical emergencies.** (i.e. those that meet Code 4 EMS dispatch criteria)”*

The statement by the OPFFA that distressed patients are indifferent as to whether paramedics or firefighters attend a Code 4 medical emergency call may, or may not, reflect actual public sentiment. The public may not be aware of the significant differences in scope of practice and medical competencies between paramedics and fire fighters.

Logic would dictate that a distressed patient requiring emergency medical attention would prefer the timely attention of a paramedic. This paramedic has graduated from a 2-3 year community college program, has passed the Emergency Medical Care Assistant examination, and can deliver a wide range of medications and clinical interventions. The paramedic also attends significantly more calls on a daily basis, and is therefore field-tested in the community.

The OPFFA position statement infers a rough equality of training/competencies between paramedics and firefighters, when in fact that is not the case. The key difference between EMS and Fire first responders attending medical calls is knowledge, training and experience – not the vehicle they arrive in. A Primary Care Paramedic or an Advanced Care Paramedic each offer a scope of practice and a range of

emergency medical competencies that outweigh a standard firefighter's first aid training and limited set of patient interventions.

Conversely, logic would also dictate that a homeowner would prefer a firefighter highly trained in fire suppression and rescue techniques to attend a structure fire or a rescue situation or motor vehicle accident extrication. The competencies of the two groups of first responders are complimentary, but not interchangeable, for the vast majority of pre-hospital medical calls that are not time-sensitive.

The second component of the OPFFA position, calling for fire departments to be simultaneously dispatched to ALL Code 4 medical calls in Ontario, represents a radical departure from the tiered response status quo across the Province. According to a Performance Concepts call volume analysis, the OPFFA Code 4 expansion plan would require fire departments to deploy for an estimated half-million additional urban medical emergency calls across the Province. No financial or

The OPFFA Code 4 expansion plan could require Fire departments to deploy for an estimated half-million additional urban emergency medical calls across the Province. No impact analysis accompanies the OPFFA position statement on their website or Facebook page.

resourcing impact analysis accompanies the OPFFA position statement on their website or Facebook page. The Ontario Association of Fire Chiefs has not endorsed the OPFFA position.

The Province's DPCI II dispatch triage tool categorizes a significant majority of emergency medical calls as Code 4. The proportion of total emergency medical calls classified as life threatening Code 4 incidents accounts for least 70 percent of total Code 3-4 emergency calls across EMS urban jurisdictions. The provincially mandated DPCI II triage tool in fact does very little triaging – a reality that the OPFFA position fails to consider. The majority of Code 4 calls are in fact not life threatening in nature – nor are they intensely time-sensitive. The DPCI II dispatch triage tool generates this “Code 4 heavy” call distribution for 21 of the 23 dispatch-centres across Ontario. Two remaining dispatch-centres directly managed by Niagara and Toronto EMS do not use the DPCI II triage tool, and therefore do not generate Code 3-4 call designations. Toronto and Niagara

employ the industry-standard MPDS dispatch triage tool widely used across Canada and the United States. It is unclear which MPDS call designations (i.e. Echo, Delta, Charlie) the OPFFA position would address in calling for an expanded response by firefighters in Niagara and Toronto. It is also unclear whether the OPFFA public position applies to the 174 composite and volunteer departments across Ontario, or whether it is limited to the 31 full-time urban fire departments.

The real-world impacts of the OPFFA position are best understood when evaluated against a specific EMS jurisdiction, and its Code 4 call volume data. The City of Ottawa example is instructive, and representative of the universal impacts that would be experienced across AMEMSO urban service providers. In the City of Ottawa (2010) there were approximately 80,000 Code 4 emergency calls and 110,000 total Code 3-4 emergency calls. An Ottawa Fire Department response to 80,000 annual Code 4 emergency medical calls would represent a seven-fold increase over current medical tiered response activity levels (approximately 10,000 annual medical calls).

Under current Ottawa Fire Department response protocols these 70,000 new Code 4 medical calls would generate a “lights and sirens” response by four fire fighters riding on a pumper truck traveling across urban Ottawa at relatively high speeds. The public safety risk associated with 65,000-70,000 additional “lights and sirens” 4-firefighter pumper truck responses travelling rapidly across urban Ottawa (or Hamilton or Mississauga or Markham or Toronto) ought to be carefully considered by municipal decision-makers, Base Hospital Medical Directors, and union memberships. Using the 2010 Ottawa Code 4 call volume data, the City’s current ratio of fire vehicle collisions per 1,000 emergency medical responses could generate a seven fold proportional increase in collision incidents – along with a potential seven-fold increase in liability risk (\$) for the municipality.

A limited proportion of these 70,000 new Code 4 medical calls would require a rural response (i.e. part time fire fighters paid per call) by the composite component of the Ottawa Fire Department. These part time firefighters are paid per response. It is doubtful that the less expensive composite staffing model within Ottawa Fire could be sustained under the OPFFA expanded Code 4 plan. The OPFFA model

presumably requires a 24/7 four-person pumper truck/fire apparatus response to all Code 4 calls – no mention is made of deploying fast-response single responder vehicles like those employed by EMS. Replacement of the composite staffing model with a more expensive full time urban fire response (24/7 four-person pumper trucks) would be required to implement the OPFFA model.

Call volume evidence across AMEMSO members suggests the replacement of many of the 174 composite fire departments across Ontario - with more expensive 24/7 full-time resources - would be required to implement the OPFFA Code 4 expansion plan.

The financial impacts of the OPFFA Code 4 expansion plan can be understood from three basic “cost of service “ perspectives:

- Marginal cost impacts
- Capital Cost impacts
- Total Cost impacts

Urban Fire department marginal costs would increase significantly under the OPFFA Code 4 expansion plan. If \$100 dollars in new marginal costs per Code 4 response were applied against 10,000 new Code 4 calls, an urban Fire department would face an additional budget requirement of \$1 million. AMEMSO urban members like Hamilton, Toronto, Ottawa, Peel, York and Durham grapple with Code 4 call volumes that would generate multi-million dollar marginal cost impacts for their Fire services.

Urban fire department marginal costs would increase significantly under the OPFFA expansion plan. Thousands of new Code 4 medical responses would generate significant new fuel, WSIB (injury) lost-time, training and medical supply costs. An example is appropriate. If an estimated \$100 dollars in new marginal costs per Code 4 response (derived from Performance Concepts analysis) were applied against 10,000 new Code 4 calls, an urban fire department would face an additional annual operating budget increase of \$1 million. AMEMSO urban members Hamilton, Toronto, Ottawa, Peel,

York and Durham deal with Code 4 call volumes that would generate multi-million dollar marginal cost impacts for their respective fire services. Million dollar impacts would be quite common for fire services associated with moderate size AMEMSO EMS services.

The capital cost impacts for urban fire departments implementing the OPFFA Code 4 expansion would

also be significant. Existing fire truck life cycles would be

significantly compressed by the wear-and-tear associated with a doubling or tripling (or more) of Code 4 tiered responses. Costing “what if” simulations prepared by Performance Concepts are instructive in this regard. A \$500,000 pumper truck with an estimated asset life cycle of 10 years depreciates by \$50,000 annually (using straight-line depreciation). Therefore an annual replacement reserve contribution of \$50,000 is required. The OPFFA Code 4 expansion plan could cut a \$500,000 pumper truck’s life cycle in half to approximately five years. The annual budgeted replacement reserve contribution would increase to \$100,000 (using straight-line depreciation). When applied to a fleet of twenty pumper trucks, the impact would be \$1 million in new life-cycle replacement costs for a large urban fire department.

Total cost impacts would include the marginal and capital cost impacts already evaluated. Total cost estimates associated with the OPFFA Code 4 expansion plan should also include unavoidable firefighter staffing adjustments. Fire deployment is based on a risk management model. Firefighters are situated in stations that are carefully positioned at the centre of planned deployment circles/polygons. This careful positioning of firefighters ensures that travel times to structure fires are

short and burn curves can be interrupted. Short travel times improve the ability of fire fighters to limit loss of life and property associated with these structure fires. Insurance rates for residential and commercial properties are premised on the integrity of these planned deployment circles/polygons - and their ability to generate short travel times. If firefighter utilization and travel activity were to spike upwards due to the OPFFA Code 4 expansion plan, then firefighters will eventually be out of their planned position. They will not be optimally located within their deployment circles/polygons when structure fire calls occur. The result will be eroded average response times in the delivery of the core business of structure fire suppression. Residential and commercial insurance rates could be negatively impacted.

Performance Concepts believes it is prudent to forecast additional front-line firefighter resources in order to: i) implement the OPFFA Code 4 expansion plan and ii) ensure adequate firefighter resources remain optimally positioned within planned deployment circles/polygons. CFAI Standards of Cover – the Fire industry’s accepted approach to risk based coverage – suggests added resources would be required. Coverage limited to existing firefighter apparatus and

manpower would not be sufficient - the excess capacity of existing firefighter resources would be entirely consumed during implementation of the OPFFA Code 4 expansion. Performance Concepts confidential consultations with Fire deployment experts have generated the following risk management recommendation - *a twenty-percent increase in total front-line firefighter resources would be prudent for urban Fire departments in high call volume EMS environments attempting to implement the OPFFA Code 4 expansion plan.* Even modified (i.e. scaled-back) versions of an ambitious OPFFA Code 4 expansion plan could generate a multi-million dollar financial impact for an urban fire department - consisting of marginal operating, capital replacement, and new coverage cost components (Performance Concepts analysis).

C. Dispatch Issues Within the EMS/Fire Tiered Response Dialogue

The OAFC and the OPFFA believe the Province's EMS dispatch-centre processes and technologies are eroding the timeliness of fire department responses to Code 4 emergency medical calls. The urban fire community periodically asserts they are "first-on-scene" for a significant number of Code 4

calls – arriving well before EMS. They believe they would be first on scene for virtually all Code 4 calls were it not for notification delays at the Provincial dispatch centres. As the OAFC and OPFFA asserted in the 2009 update to the "Saving Lives" discussion paper:

"Fire crews with defibrillators and lifesaving medical skills, and who typically would arrive several minutes sooner than a land ambulance, are not being dispatched right away."

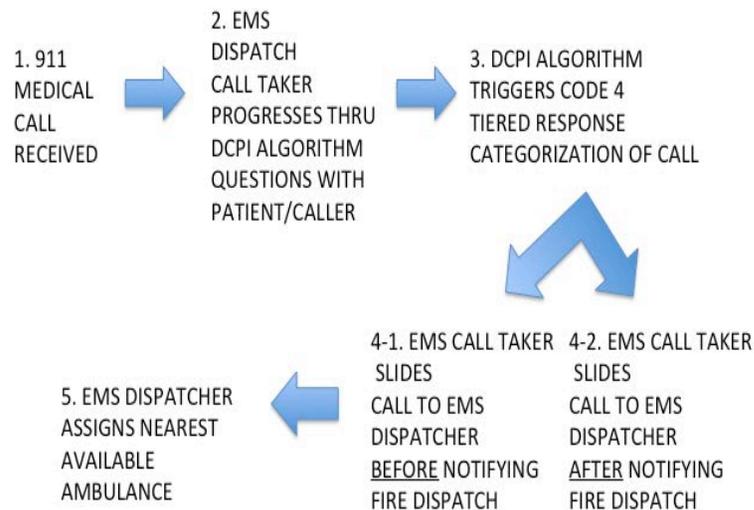
In preparation of this evidence-based discussion paper, AMEMSO advocated a comparative analysis of "first-on-scene" response time performance data (i.e. Fire Department supplied data) across eight EMS case study locations. Urban fire departments within six of the eight EMS case studies declined an invitation to participate. Therefore, it is not possible at this time to empirically test the fire community assertions about first-on-scene response time performance.

However, it is possible to use EMS data sources to test the assertion that fire dispatch notification is being unnecessarily delayed – with the result that Code 4 response times are being eroded by "several minutes". This can be accomplished by

comparing point-in-time data for fire dispatch notification to point-in-time data on paramedic unit/crew notification. Performance Concepts has done so for a sample of urban AMEMSO members. Performance Concepts acknowledges that the depth and precision of this analysis would benefit from the use of detailed CAD response time data that urban Fire departments in the case study jurisdictions have at their disposal.

Before reviewing the results of the EMS/Fire dispatch point-in-time data analysis, it is useful to briefly review the Provincial dispatch-centre workflow and technology to understand the source of fire community concern. When a 911 medical emergency call is transferred to the EMS dispatch-centre the following sequence of events takes place:

- The dispatch-centre call-taker initiates the DPCI II triage tool algorithm of questions with the individual placing the 911 call;
 - At a given point in the DPCI II algorithm, the answers to the call-taker's questions trigger the classification of the call as either Code 4 or Code 3 in terms of patient acuity;
 - In some centres... Having classified the call as Code 4 or Code 3, the call-taker slides the call to the dispatcher. After sliding the call to the dispatcher, the call-taker then phones Fire dispatch and triggers a tiered response;
 - In other centres... having classified the call as Code 4, the call-taker phones the fire dispatch and triggers a tiered response. The call-taker then slides the call to the EMS dispatcher;
 - The EMS dispatcher assigns the call to the nearest available ambulance (Ambulance Act legal requirement).
-



In centres where the EMS call-taker phones fire dispatch and triggers a Code 4 tiered fire response - prior to sliding the call to EMS dispatcher – there is no response time lag whatsoever. In fact, Fire may enjoy a first-on-the-scene response time head start.

In centres where the EMS call-taker phones fire dispatch and triggers a Code 4 tiered response – after sliding the call to the EMS dispatcher – there may be a response time lag for Fire versus EMS in terms of *first-on-the-scene* response times. However, it must also be reported that fire dispatchers in some

jurisdictions that deliver 911 dispatch remain on the line and “listen in” on the EMS call (e.g. Thunder Bay) - subsequently “self-dispatching” to EMS calls ahead of, and without regard to, the tiered response agreement.

Other than in the Niagara dispatch-centre, there is no technology that ensures simultaneous notification of the fire dispatch and the EMS dispatcher by the EMS call-taker – the technology to enable simultaneous notification has not yet been deployed by the province.

In terms of first responder deployment models, it should be noted that EMS often deploys from fluid posts (i.e. mobile) rather than an imbedded base location – an entirely different model than Fire departments utilize. The efficiencies of fluid deployment may create an anecdotal impression in the Fire community that a “head start” exists for EMS units in the dispatching process.

It should also be noted that in some EMS dispatch centres, the high volume on 911 calls being received by call-takers at peak times of the day may delay the phone call notification to fire dispatch. The result may be a delayed trigger for a fire tiered

response during time periods of peak volumes in dispatch centres. The conscious call-taker decision to delay the tiered response call to fire dispatch (during very high 911 call periods) may be justified according to dispatch experts consulted (in confidence) in the preparation of this paper. The call-taker's priority may be to process the next backed-up 911 Code 4 call in the queue, and thereby support the EMS dispatcher in quickly assigning a highly trained EMS paramedic to the call. A single paramedic responding in a PRU rapid response car to the current call may be deemed a higher priority than assigning a less highly trained fire fighter traveling in a slower 4-person pumper on the previous call.

Finally, it should be recognized that simultaneous dispatch technology (i.e. TIF software) could actually eliminate a first-on-the-scene response time "head start" for fire departments (relative to EMS) occurring within some dispatch centres (e.g. Ottawa, Peel, Durham). The elimination of the delay in paramedic notification would be beneficial to patients, since EMS dispatchers would receive the call from the EMS call-taker at the same time as fire dispatch. EMS dispatch to on-scene response times could improve in these instances, once a simultaneous dispatch technology or process is in place.

In order to test the reality of a perceived dispatch "lag" in fire notification times, point-in-time data sets from 2010 were analyzed for a range of AMEMSO members from across different regions of the province. Fire dispatch notification times (from provincial call-takers) were compared to EMS paramedic crew notification times. The following table sets out the results of the point-in-time analysis:

AMEMSO Member	% Calls Where Fire Dispatch Notified At/Before EMS Unit	Average Time Difference (+ or -) Between Fire Dispatch Notification & EMS Crew Notification
Peel	Fire notified At/Before 68% of sample EMS Calls	Average Fire notification is 53 seconds before EMS crew notification
SMEMS (T-Bay)	Fire notified At/Before 59% of sample EMS Calls	Average Fire notification is 7 seconds before EMS crew notification
Essex	Fire notified At/Before 50% of sample EMS Calls	Average Fire notification is 14 seconds after EMS crew notification
Peterborough	Fire notified At/Before 29% of sample EMS Calls	Average Fire notification is 22 seconds after EMS crew notification

The data/evidence from a sample of AMEMSO members contradicts a core position being advanced by the Fire community – that Fire response times on tiered response calls suffer compared to EMS due to an unfair dispatch lag. In the

sample AMEMSO jurisdictions, provincial EMS dispatch call-takers are in fact notifying fire dispatch and EMS crews virtually simultaneously (Thunder Bay, Essex) or significantly faster (Peel). There is no evidence of any significant fire dispatch lag in these sample jurisdictions that were selected from across the Province.

Discussion with other AMEMSO members (i.e. not included in the data/evidence sample) indicate that dispatch call-taker procedures feature Fire notification prior to EMS crew notification in a number of large urban jurisdictions (e.g. Ottawa)

Continued evidence-based analysis of tiered response dispatch practices, and the impacts on EMS and Fire relative response times would be beneficial. Fire department participation in such a project would generate wider acceptance across the fire community. Due to the decision of invited fire departments not to participate in the preparation of this discussion paper, a comparison of EMS and Fire independent dispatch data was not possible.

D. Fire Department Tiered Response Medical Interventions

The evolving public dialogue around the future role/scope of fire departments in medical tiered response should be informed by the current impact of Fire medical interventions on patients. Fire impacts on patient care can be compared to EMS patient impacts in order to understand relative cost/benefit relationships.

Performance Concepts Consulting has conducted an evidence-based examination of 2010 EMS/Fire clinical data sets (6 month sample) extracted from selected AMEMSO members. This analysis represents a first-attempt within the Ontario EMS community to quantify the relative impact of EMS/Fire first responders on pre-hospital emergency patient care in Ontario. The analysis can be expanded in a future research project with the Fire community.

Three case studies are presented in the following tables.

The Durham Case Study

EMS Procedure Types	155
FD Procedure types	34
FD Procedure types Prior to EMS arrival	13
EMS Call in Sample	25,737
EMS Procedures Performed	230,514
Calls with FD Procedures or Assist	417
FD Procedures or Assist	777
FD Procedures Prior to EMS arrival	156
Total FD Procedures	933
FD Calls with No Procedures	NA

The Durham profile demonstrates that firefighters in this tiered response program perform relatively few patient care procedures. Paramedics executed 230,514 distinct patient procedures linked to 25,737 calls. Firefighters executed 933 distinct patient procedures linked to 417 tiered response calls. The data infers that all remaining fire department tiered response calls in Durham do not involve the delivery of patient procedures by firefighters – instead focusing on secondary activities like stabilizing motor vehicle accident sites or

providing stretcher lifts. Of the 933 total fire department patient procedures, firefighters executed only 156 procedures prior to paramedic arrival – approximately 17% of total firefighter procedures delivered to patients. In Durham, the limited impact of fire first responders on patient care, and the limited number of fire tiered response total calls featuring any patient care procedures, do not support the OPFFA Code 4 expansion position.

The Thunder Bay Case Study (Superior North EMS)

EMS Procedure Types	131
FD Procedure types	32
FD Procedure types Prior to EMS arrival	20
EMS Call in Sample	12,711
EMS Procedures Performed	150,956
Calls with FD Procedures or Assist	465
FD Procedures or Assist	827
FD Procedures Prior to EMS arrival	372
Total FD Procedures	1,199
FD Calls with No Procedures	84%

The Thunder Bay profile demonstrates that firefighters in this tiered response program perform relatively few patient care procedures. Paramedics executed 150,956 distinct patient procedures linked to 12,711 calls. Of total firefighter tiered response calls in the sample period – approximately 84% involved no patient procedures delivered by firefighters. Fire executed 1,199 distinct patient procedures linked to only 465

tiered response calls. All remaining fire department tiered response calls in Thunder Bay do not involve the delivery of patient procedures by firefighters – instead focusing on secondary activities like stabilizing motor vehicle accident sites or providing stretcher lifts. Of the 1,199 total fire department patient procedures, firefighters executed only 372 procedures prior to paramedic arrival – approximately 31% of total firefighter procedures delivered to patients. In Thunder Bay, the limited impact of fire first responders on patient care, and the limited number of fire tiered response total calls featuring any patient care procedures, do not support the OPFFA Code 4 expansion position.

The Peterborough Case Study

EMS Procedure Types	132
FD Procedure types	24
FD Procedure types Prior to EMS arrival	10
EMS Call in Sample	7,545
EMS Procedures Performed	107,989
Calls with FD Procedures or Assist	225
FD Procedures or Assist	397
FD Procedures Prior to EMS arrival	96
Total FD Procedures	493
% FD Calls with No Procedures	93%

The Peterborough profile demonstrates that firefighters in this tiered response program perform relatively few patient care procedures. Paramedics executed 107,989 distinct patient procedures linked to 7,545 calls. Firefighters executed 493 distinct patient procedures linked to only 225 tiered response calls. Approximately 93% of fire department tiered response calls in Peterborough do not involve the delivery of any patient

procedures by firefighters – instead focusing on secondary activities like stabilizing motor vehicle accident sites or providing stretcher lifts. Of the 493 total fire department patient procedures, firefighters executed only 96 procedures prior to paramedic arrival – approximately 19% of total firefighter procedures delivered to patients. In Peterborough, the limited impact of fire first responders on patient care, and the limited number of fire tiered response total calls featuring any patient care procedures, do not support the OPFFA Code 4 expansion position.

Summary Observations Across AMEMSO Case Studies

Existing tiered response protocols across the AMEMSO sample sites demonstrate that Fire departments deploy to large numbers of medical tiered response calls, but generate patient procedures for a very small portion of these calls. Fire provides a very minor share of total patient interventions delivered in the six-month sample period. This is not problematic, since OPALS research demonstrates that time-sensitive truly life-threatening calls represent approximately 1-2% of total Code 4 calls. The vast majority of EMS calls and clinical procedures are not “life and death” time sensitive, and therefore do not require rapid deployment of firefighter defibrillation and CPR capacity.

Once Fire does deliver clinical procedures, the vast majority of these procedures are delivered in tandem with EMS paramedics. A small minority of Fire department patient procedures (less than 1/3 at the three case study sites) is actually delivered prior to EMS arrival on scene. Finally, the case studies reveal that most fire department tiered response

calls do not feature any patient interventions. There is no clinical evidence from the AMEMSO case studies that expanded Fire department participation in tiered medical responses would actually deliver a meaningful increase in Fire clinical procedures, improve patient outcomes, or provide relief to EMS crew workload burdens.

There is no clinical evidence from the AMEMSO case studies that expanded Fire department participation in tiered medical response would actually deliver a meaningful increase in Fire patient procedures, improve patient outcomes, or provide relief to EMS crew workload burdens.

E. Dialogue to Optimize Fire Tiered Response to Emergency Medical Calls: Research Findings

The go-forward dialogue around a “best practices” EMS/Fire tiered response framework will benefit from a review of medical research evidence accumulated to date. The following highlighted studies may provide relevant insights:

Vancouver Tiered Response Study (Berringer, Canadian Journal of Emergency Medicine, 1999)

- Vancouver Fire/BC EMS tiered response study (1999) with on-site trained observers posted in City Fire Halls reviewing “lights and sirens” call response times and intervention effectiveness.
- The study team concluded that “...it seems an unnecessary and potentially dangerous duplication of services to routinely dispatch both a fire apparatus and an ambulance code 3, only to have first responders render no necessary services in the majority of cases, although there may be a subset of calls where illness severity (i.e. cardiac arrest) justifies a dual response. The brevity of the interval

between first responder and ambulance arrival, the infrequency of first responder interventions, and the time and cost required for training...argue against extensive training of first responders in advanced medical protocols.”

Mid-size City Fire Response Times Study (Lerner, Journal of Emergency Medicine, 2003)

- Mid-size American City (pop. 328,000) with 911 and simultaneous dispatch. Fire average response time of 4 minutes and EMS 5.3 minutes. Fire arrived first 69% of time. Study made no observations about the nature or impact of Fire medical interventions. The study team made the following comments in the study conclusion “...the incremental costs of using more densely staged, yet potentially more expensive, fire apparatus rather than less densely staged and relatively inexpensive vehicles should be investigated. Evaluations of fire apparatus use should include both direct and indirect costs, such as any decrease in vehicle life expectancy.”
-

***Toronto Evidence-Based Urban Firefighter Optimization Study
(Craig/Verbeek/Schwartz Journal of Pre-hospital Emergency Care, 2010)***

This study reviewed a 16-month retrospective sample of 220,000 calls attended by Toronto Fire and EMS. The study noted that truly critical medical emergency calls represented 1.2% of the sample call volume. The study contended that the dangers inherent in sending large fire apparatus through downtown traffic to provide medical call response should be weighed against the benefits of a Fire first responder being on-scene before EMS.

Craig et al concluded that Fire first responder “lights and sirens” responses could be reduced by 83% while maintaining superior patient risk/benefit profiles. This reduction would be accomplished by limiting Fire responses to 27 of 509 MPDS dispatch determinants. Fire call volumes would drop from approximately 93,000 to 16,000 with no adverse medical outcomes, and a reduction in Fire apparatus collision safety risk for the public. Fire first response would be limited to 7% of total EMS calls.

***Fire Tiered Response Literature Review
(Dr. McNamara CCFP/EM)***

The literature review compiled by Dr. McNamara represents a serious effort to compile and assess peer-reviewed articles on tiered response - against an evidence-based statistical research standard. Dr. McNamara has conducted a search of Medline, Index Medicus, Healthstar, Cinahl, and Fire Doc publications. The University of London and McMaster University medical libraries were also searched.

Dr. McNamara notes the following emerging evidence-based themes in the published research:

- Good evidence does exist for fire department and other first responders to be activated to a small sub-set of critical “time sensitive” calls only. Due to declining structure fire workloads, fire departments have surplus resource capacity and can respond quickly to the subset of calls typically comprising 1-2 percent of EMS call volumes.
-

- Studies have suggested that dispatch systems and algorithms can accurately triage which patients suffer from “time sensitive” conditions that would benefit from rapid response and first responder presence.
 - These same studies also recognize the potential challenges of higher costs and vehicle collision safety risks associated with using the fire service for non-fire related duties. There is therefore, statistically valid research data to consider a strategic reduction in the number of medical calls responded to by fire departments.
-

F. Tiered Response Agreements – Towards “Best Practice” Design & Implementation

Provincial legislation (Ambulance Act) is clear in terms of overall accountability for pre-hospital emergency medical response system performance. It is EMS service providers (Designated Delivery Agents – upper or single tier municipalities, District Social Service Boards, and some First Nations) that must report on system performance, establish response time targets, and collaborate with base hospitals and medical directors on clinical outcomes. EMS providers are also required to report on fire department and public CTAS 1 interventions involving defibrillation – the “life and death” time sensitive calls the OPFFA and other Fire stakeholders correctly assert they add value on. It is tiered response agreements, approved by Councils of EMS jurisdictions, that mandate fire departments to participate in pre-hospital medical responses.

Performance Concepts has reviewed urban fire department tiered response agreements from across AMEMSO members. These agreements feature a differing portfolio of Code 4 call types that trigger a dispatched fire department response –

occasionally within a specific AMEMSO service and often across various AMEMSO members.

The table on the following documents similarities and diversity across selected AMEMSO member tiered response agreements with urban fire departments. The following observations can be made:

- There are only two or three “core” EMS call types that are consistent across AMEMSO urban fire department tiered response agreements. These include VSA, unconscious, and delayed EMS call categories.
 - There is an inconsistently applied range of other EMS call types that trigger an urban fire department tiered response in various AMEMSO member agreements. It is unclear whether or not these inconsistently applied EMS call types are derived from medical/empirical data in each AMEMSO jurisdiction. Differences in these call type “triggers” can generate higher/lower medical call volumes for urban fire departments.
-

A “*best practices*” tiered response model does not require uniform call types across AMEMSO members. What is required is a uniform process for designing and implementing a “best practice” tiered response process/model. This “best practice” process would be cyclical and incorporate distinct *plan-deliver-evaluate* components. It would be coordinated and driven by evidence based medical oversight within each distinct EMS service - supplied by the Base Hospital and its Medical Director. Science-based evaluation regarding the decision to include/exclude various DCPI II or MPDS triage triggers would be the driver in tiered response agreement design – not the resulting impact on call volume trends for either Fire or EMS or Police. Individual first responder organizations would comply with the evidence-based direction of the Base Hospital or Medical Director in term of call type “triggers”.

Science based evidence would be reviewed regularly by an active and engaged tiered responder working group staffed by representatives of EMS, Police and Fire. Call type triggers would be evaluated and refined on an ongoing basis. Presumably, urban fire department tiered response agreements would be consistent within each EMS jurisdiction.

Across EMS jurisdictions there would likely be increased uniformity of triggers– although not necessarily if community health issues and demographics differ significantly across the province.

A *plan-deliver-evaluate* cyclical process based on medical science, rather than the actual call type triggers, would constitute a new “best practice” model.

G. Next Steps: Strengthening the AMEMSO/OAFC Evidence Based Dialogue

This AMEMSO-commissioned discussion paper has attempted to introduce an evidence-based perspective into the evolving EMS/Fire tiered response dialogue. There is a consensus across the EMS and Fire communities concerning the valued contribution of fire department first response to the “life and death” CTAS 1 emergency calls as identified in the OPALS and other published independent noted in this paper. There is also a consensus across EMS organizations that the OPFFA position advocating fire response to all Code 4 calls is not supported by science, would carry significant fiscal impacts, and would generate public safety risk in terms of fire apparatus collision incidents. Finally, the OPFFA position would compromise response times for the core business of structure fire suppression and rescues.

This AMEMSO-commissioned discussion paper also provides evidence/data on simultaneous dispatch issues, and the frequency of fire patient procedures – evidence that can inform a new collaborative dialogue. Although fire departments

declined to participate in the preparation of this AMEMSO commissioned paper, a jointly designed and managed research project is still desirable and achievable. Performance Concepts recommends that AMEMSO be prepared to work in close collaboration with the OAFC in this regard. A quantitative, evidence-based research collaboration between AMEMSO and the OAFC could encompass an on-scene response time comparative analyses. It could also include a “best practices” review of tiered response agreements consistent with the medical oversight and *plan-deliver-evaluate* model set out in this paper.

Ontario residents deserve a tiered response system that sends the right resources to the right pre-hospital emergency calls at the right time. A collaborative dialogue across EMS and fire system leaders will ensure the tiered response system delivers timely, science based, affordable, low risk benefits to patients and taxpayers.

APPENDIX

GLOSSARY OF TERMS

Term	Description
OPALS	<i>Landmark scientific research project gauging impacts of pre-hospital emergency medical interventions on cardiac patient survival (18,000 patients in 17 Ontario Cities). Study documented the statistically significant impact of Fire first responders on cardiac event survivability. OPALS type EMS calls constitute 1-2% of EMS call volumes.</i>
Code 4 Calls	<i>According to the provincial dispatch model, Code 4 calls are deemed “life threatening” in nature. In reality, Code 4 calls account for 2/3 or more of all EMS emergency calls – including the relatively small set of truly time-sensitive life threatening emergencies dealt with in the OPALS research.</i>
90th Percentile Response Time	<i>EMS 90th percentile captures Code 4 response time achieved in “nine calls out of ten”. The 90th percentile response time metric reflects the need to measure response time reliability, not just response time speed (i.e. average). By definition, the 90th percentile response time (90 percent of calls) is always slower than an average response time based on the arithmetic mean (50% of calls).</i>

Unit Hour Utilization (UHU)	<i>UHU measures the percentage of an hour that EMS ambulances are actively engaged in responding to calls – as opposed to being deployed waiting for calls. Urban EMS systems target 30-35% UHU as an ideal level of system busy-ness that balances system efficiency and response time performance. Many urban EMS systems are currently operating at UHU levels exceeding the 30-35% benchmark – as a result 90th percentile response times are eroding. Fire department UHU rates are significantly lower than those experienced by EMS.</i>
CTAS 1	<i>CTAS is a patient illness (acuity) measurement tool used by Canadian hospitals and EMS services. There are five categories of patient acuity, with CTAS 1 being the most severe. Each category is based on specific observable patient criteria/symptoms. The CTAS patient acuity tool is used for EMS response performance reporting, but NOT for EMS dispatching.</i>
DPCI II	<i>The 21 provincially operated ambulance dispatch-centres use this “made in Ontario” triage algorithm to assess patient acuity and assign a Code 3 or Code 4 urgency level to dispatched EMS calls. DCPI II transfers patient acuity risk to EMS service providers by triaging 2/3 or more of all emergency medical calls into a single Code 4 call designation for “life threatening” emergencies.</i>
MPDS	<i>MPDS is the North American industry-standard triage algorithm used to assess patient acuity. It assigns calls into five distinct EMS response categories – Alpha through Echo. Echo calls represent the most serious level of patient acuity and EMS response urgency. Ontario EMS providers are involved in an ongoing dialogue with the Ministry of Health to replace DCPI II with MPDS. MPDS is already utilized by Toronto EMS and Niagara EMS.</i>

OMBI	<i>The Ontario Municipal Benchmarking Initiative is a municipal performance measurement consortium. The OMBI mission is to engage in technically sophisticated “apples to apples” performance benchmarking across municipalities. The identification and emulation of municipal management/operating best practices is the OMBI return-on-investment for its participating regional and city governments.</i>
T0-T4	<i>EMS response times are measured province-wide according to a critical path of intervention points during a call. The system runs according to T0-T8 cycle. T0 represents the EMS dispatch receipt of a call. T4 represents the ambulance crew on-scene. T0-T4 are the relevant critical path points used to gauge EMS response time performance. T3-T4 (post dispatch) represents an “apples to apples” definition of EMS response data that could be used to compare to Fire “post notification” response time data.</i>
Composite Fire	<i>A Fire department staffing model consisting of a full-time Chief and Fire Prevention Officer, plus a cadre of part-time firefighters that assemble and travel to each call. The cadre of part-time firefighters is typically paid by the call, or some sort of volume-based honorarium. Composite models are challenged to deploy adequate numbers of firefighters during workday hours.</i>
EMS Procedure	<i>EMS patient data software packages collect a wide range of medical procedures delivered by paramedics or firefighter first responders. Examples of the 150+ procedure types include defibrillation, ventilation, intubation, saline IV. Patient data software reports on the frequency of total procedures across categories, as well as within procedure types.</i>

PRU “Zip” Fast Response Car	<i>EMS services improve system “stop the clock” performance by delivering a single paramedic to Code 4 calls in a car instead of an ambulance. Having arrived more quickly at scene, the lone paramedic can begin patient treatment while waiting for an ambulance to arrive on scene for transport. The EMS community compares the relative cost and public safety impacts of the zip car model to the 4-man pumper apparatus response model utilized by Fire departments.</i>
Deployment Circle/Polygon	<i>Fire departments deliver a risk based “readiness” model of deployment. While utilization may be low, apparatus positioning generates short travel times. Base and apparatus positioning are critical to disrupt structure fire burn curves and save property. Time-defined deployment circles/polygons are used to plan apparatus deployment and base positioning. Medical calls represent a potential risk to this optimal positioning of resources for structure fire response. The risk increases as the incidence of medical calls go up.</i>
Simultaneous Dispatch	<i>Fire departments are calling for the provincial EMS dispatch-centres to deploy software ensuring the EMS call-taker simultaneously informs the EMS dispatcher and the Fire Dispatcher of Code 4 tiered response calls. Simultaneous dispatch software is already applied by Niagara EMS, who run their own state-of-the-art dispatch-centre using the MPDS triage algorithm, Head Start software, and medical oversight driven tiered response agreements.</i>

Tiered Response Agreement	<i>Signed agreements between EMS jurisdiction Councils and Fire department Councils, or between EMS and Fire within the same municipality. The agreement sets out the EMS triage triggers for a Fire tiered response. The agreements typically contain an escape clause for Fire to interrupt/suspend tiered response in the instance of structure fires or other workload priorities. For instance many GTA Fire departments suspended tiered medical response during the SARS epidemic.</i>
Science Based Evaluation of First Responders	<i>Science based research on EMS/Fire first responder performance features empirical data collected from the field. This data is tested using statistical analyses to prove/disprove an experimental hypothesis. Science based research is evidence based. Narrative articles do not qualify as science based research. Controlled environment "simulations" such as the NIST studies of Firefighter response often cited by Fire department community do not meet the scientific research criteria utilized by EMS researchers. These simulation studies do not base their conclusions on real-world performance data, or before/after study methodologies like those underlying the OPALS research.</i>
