AN INTERNATIONAL COMPARISON OF EMERGENCY MEDICAL SERVICES DELIVERY SYSTEMS: WHICH PRODUCES THE OPTIMUM OUTCOME FOR THE PATIENT?

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ABSTRACT

This thesis was written to address a problem with ambulance service delivery times in Victoria, Australia. For a number of years, ambulance response times have been increasing to unacceptable levels. As a result of the ever-increasing problem it was appropriate to see if the are other alternative solutions producing better results. There are a number of different service delivery models for Emergency Medical Services (EMS) around the world. The main two are the Anglo/American model (also known as scoop and run) and the Franco/German model (also known a stay and play). There are also two major delivery agencies; the British model of a separate third party public sector service as used in UK, Australia and New Zealand or the fire service model where the fire service is the main delivery agency such as most of Asia, Europe and North America. Which model provides the best outcome for the patient? Such research has not been done in the past. The research will also examine if the Metropolitan Fire brigade has capacity to undertake possible EMS roles.

A number of case studies were undertaken and explored with key issues of response times, patient outcomes, skills and new technologies compared. The results, particularly of response time show that in Victoria the response time for fire EMS (8.3 minutes) to medical emergencies is similar to that provided by fire services delivering EMS in North America. The MFB in Victoria is providing the equivalent of first responder; the American and Canadian fire services are delivering Advanced Life Support (ALS). The response times for Basic Life Support (BLS) in Victoria provided by ambulance service are over twice as long (8.3 minutes for fire compared to 18.2 minutes for Victorian Ambulance at the 90%). The US and Canadian Fire Services provide EMS response time considerably lower than Ambulance Victoria, some as low as 7.43 minutes. UK Ambulance (on which the Victorian model is based) also provides response time considerably less than Ambulance Victoria. The issue of whether the fire service in Victoria has capacity to undertake further EMS delivery was explored and whilst it has the capacity it is doubtful it could be delivered in the current industrial environment with the union having the capability of vetoing managerial decisions.

The research raised fundamental questions regarding the effective use of scarce public sector resources and agencies working across organisational boundaries in the interests of serving the public. Data analysis involved pattern matching, explanation

building and time series analysis to identify trends and commonalities across the cases. A number of themes emerged including continued increases in call volumes, challenges meeting response times and the development of proactive programs to reduce the impact of these trends.

STUDENT DECLARATION

I, Jeffrey Godfredson, declare that the DBA thesis entitled

An International Comparison of Emergency Medical Services Delivery Systems: Which Produces The Optimum Outcome For The Patient?

Is no more than 63,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature:  Date: 23 January 2018

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I would also like to dedicate this work to the men and women of the fire and ambulance services whose dedication to the communities they protect is an inspiration to me.

GLOSSARY

AFAC	Australasian Fire Authorities Council
ALS	Advanced Life Support
AV	Ambulance Victoria
BLS	Basic Life Support
BLSM	Basic Life Support Medic
CCU	Community Care Unit
CDC	Centre for Disease Control
CFA	Country Fire Authority, Victoria, Australia
EBA	Enterprise Bargaining Agreement
ECG	Electrocardiograph
EMR	Emergency Medical Response (as delivered by MFB Firefighters, Melbourne)
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EMT-A	Emergency Medical Technician-Advanced
EMV	Emergency Management Victoria
ESTA	Emergency Services Telecommunication Agency
Evidence-based guidelines	Developed to provide guidance on how best to treat a specific condition or situation based on the best available clinical research.

FR	First Responder
Golden Hour	Relates to survivability of patients who get to hospital within an hour of injury
HR	Human resources
IAFC	International Association of Fire Chiefs
IAFF	International Association of Fire Fighters
IBAC	Independent Broad-Based Anti-Corruption Commission
ICU	Intensive Care Unit
KPI	Key performance measures
LODD	Line of duty deaths
MASH	Mobile Army Surgical Hospital
MFB	Metropolitan Fire Brigade, Melbourne, Australia
NFPA	National Fire Protection Association
NHTSA	National Highway Traffic Safety Authority
NIST	National Institute of Standards and Technology

NQF	National Quality Forum is a non-profit organization in the USA that "works to catalyse improvements in healthcare," mostly through collaborative efforts to facilitate performance improvement and endorse performance measures.
Performance Measure	Assesses whether or not a specific process or outcome is being achieved.
PM	Performance Management
STEMI	ST Segment Elevation Myocardial Infarction (STEMI) is the name cardiologists currently use to describe a classic heart attack. "Myocardial infarction," or heart attack, refers to the death of a portion of the heart muscle (myocardium) caused by blood flow interruption.
UFU	United Fire Fighters Union, Victoria, Australia

PREFACE

YOU CANNOT REVIVE THE DEAD.

Some twenty years ago a young police officer was working in his front yard with his wife. He was using an electrical power tool, cut the power cord and was electrocuted. His wife witnessed the event and immediately called an ambulance. By the time the ambulance arrived about twenty minutes later the young man was dead. About 200 metres away was a fire station with the crew present.

Why is this event relevant to my research? At the time I was Chief Fire Officer of the Metropolitan Fire Brigade and was trying to introduce a concept called First Responder. The program would use trained firefighters equipped with automatic defibrillators and oxygen to respond to time-critical events such as heart attacks and events similar to that described above. I was getting enormous resistance from both senior staff and politicians within the Health Department, the Ambulance Union and the United Firefighters Union. As there was no logic to the resistance on the basis of patient care, I can only put it down to ego and "turf protection" by the parties involved.

With regards to the young man's electrocution he was a perfect candidate for resuscitation: he was young and healthy, and it was a witnessed event that resulted in an immediate call for an ambulance. Resuscitation in these circumstances can be achieved by use of an automatic defibrillator. The shorter the time between the event and the resuscitation attempt, the more likelihood of a successful outcome. The fire service personnel never responded, as it was not a task assigned to them. It took some time for the ambulance to arrive and when the ambulance crew attended to the patient they were unable to revive him.

Would a simultaneous response by the fire service with the ambulance have resulted in a shorter response time to the patient? The answer is yes. Would an earlier attempt at resuscitation have been successful? It is a question we can never answer. The only thing we can say with any certainty is that you cannot revive the dead.

I was determined to ensure this young man's death would not be in vain. I was eventually able to push through the case for First Responder and it is now an integral part of MFB response criteria. The program has conservatively saved in excess of 200 lives (Huggins et al. 2012). I now wish to explore if more should be done to enhance

EMS response in Victoria utilizing all the available resources in the interests of the community.

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1 INTRODUCTION

1.1. AIM

The aim of the research is to compare a number of different Emergency Medical Service (EMS) delivery models from around the world and determine which produces the optimum patient outcomes with a focus on response times. The first model is that provided by Ambulance Victoria, a state government agency (Ambulance Victoria 2013), in urban Melbourne, Australia.

The other models are from around the world but will include a focus on the system that provides EMS to urban environments in the USA and Canada by utilising local government fire service resources. The research will also explore current fire service capacity in Victoria to see if this resource could be utilized in any proposed future EMS delivery model.

1.2. RESEARCH CONTEXT

1.2.1. Background

The system of EMS delivery in Victoria follows an ambulance-based UK model, which is also used in Australia and New Zealand (Ambulance New Zealand 2013; National Audit Office 2011). There are many other models of EMS delivery used around the world, although most EMS providers in the developed world have fire service involvement.

In Japan the ambulance is run as a separate service but under fire service control (Japan Healthcare Info 2013). A similar system operates in Hong Kong (Fire Services Department Hong Kong 2013): most of the Asian EMS systems are fire service-based (Shin et al. 2012).

In the United States the most common provider of EMS in the urban environment is the fire service. The extent of the involvement of the fire service is demonstrated by the following quote: “Of the 200 most populated communities (in the USA), 97 percent have the fire service delivering pre-hospital emergency medical service response” (International Association of Fire Chiefs & International Association of Firefighters).

On the other hand, Germany places the responsibility for ambulance services on municipal government who may contract out to the fire service, not-for-profit organizations (such as St John's Ambulance) or the private sector. A serious medical case may also result in an emergency medicine doctor and nurse being sent to the scene (Westhoff et al. 2003).

France has a similar system to Germany with some unique variations. The fire service (which also provides EMS) in Paris is run by the Army, and in Marseille by the Navy. These arrangements date back to Napoleonic times (Potter 2008).

The Franco/German model involves provision of high level treatment at the scene whilst the Anglo/American model involves transport of the patient to hospital as soon as possible (Dick 2003). These alternate delivery systems are known as "scoop and run" (Anglo/American) and "stay and play" (Franco/German; Haas & Nathens 2008; McGonigal 2011; Smith & Conn 2009). The focus of this research will be on "scoop and run" (Anglo/American). In a comparison of ambulance-provided EMS services such as those operating in Victoria, Australia and the Fire Service EMS delivery in the USA, which model provides the shortest response time and the best outcome for the patient?

1.2.2. Context

Ambulance Victoria is failing to meet its current response time targets. It has also come under considerable government scrutiny regarding poor performance. The following quote, which is taken from the Victorian Auditor General's Report states that "Performance data shows that ambulance response times have worsened in both metropolitan and regional areas over the last six years" (Auditor General Victoria 2010, p. viii).

Response time is considered one of the key indicators of performance for emergency services. There has also been considerable public criticism of ambulance performance and their failure to meet response time targets (Herald Sun 2013) with demands that the Auditor General and Ombudsman investigate the organization (Herald Sun 2010, 2011, 2013; Payne 2015; The Daily Telegraph 2013; Tomazin 2013; Willingham 2013).

Are there alternate options to help reduce response times and possibly improve patient outcomes? Before any decisions can be made there is a need to benchmark current performance with international peers.

1.3. RESEARCH PROBLEM

Which EMS delivery system provides the optimum outcomes for the patient, the ambulance-based system used here in Victoria or the North American fire-based system? There will be a need to collect information regarding performance measures relating to patient outcomes, including response times used by Ambulance Victoria and North American Fire Services that also provide EMS, and the data will need to be validated to ensure that it is compatible.

1.3.1. Earlier Research

An extensive literature review was unable to identify any previous research comparing the Australian ambulance model for EMS delivery to the fire-based EMS system used in the USA. There are a number of peer-reviewed articles comparing the USA system with other systems and the earlier research will assist this project (Dick 2003; Hsien-Ho 2007; Ingolfson 2013; Lechleuthner et al. 1994; Roudsari et al. 2007; Fischer 2011). A significant amount of research has been done on EMS performance measures both in Australia (O'Meara 2005) and the USA and Canada (Moore 1999; Lambert 2009; Blackwell 2002). These comparative papers provide methodologies that may be able to be used as a basis for this research.

As part of the research it is also intended to examine fire service capacity in Metropolitan Melbourne compared to the fire-based Fire/EMS systems used in the US, and a similar model to the MFB as is delivered by UK-based Fire Services. In addition, there has been significant research into organizational change in other industries including productivity, optimum resource allocation and resistors to change that have implications for this paper. This material will also be explored in the context of this research.

1.3.2. Research Question and Objectives

This study intends to answer the following question: *which EMS delivery system provides the optimum outcomes for the patient, the ambulance-based system used here in Victoria or the USA and Canadian fire-based systems?* The research will consider case studies, each of which examines response times, survival rates from cardiac arrest, skill levels and use of new technologies. The intention is to then compare the case studies and provide an evaluation and to identify and explore themes that emerge from the research. It is also intended to examine fire service response times and work

volumes in Melbourne, Australia to see if the fire service could play a role in the future delivery of EMS in Victoria.

The research will be undertaken to answer the following questions:

1: Which EMS delivery system provides the optimum outcomes for the patient; the ambulance-based system used here in Victoria or the USA and Canadian fire-based systems?

2: Survival Rates from Cardiac Arrest

3: Skill Levels

4: Use of Advanced Technologies/Innovation

5: Does the Metropolitan Fire Brigade in Melbourne have the capacity to take on a supportive role in EMS?

When the research has been completed, reviewed and analysed it will be possible to make informed recommendations regarding the future delivery of EMS in Victoria.

1.4. PERFORMANCE MEASURES

The report *Emergency Medical Services: At the Crossroads,* published in the USA in 2006, highlighted the major challenges facing the EMS Community (Committee on the Future of Emergency Care 2006). Historically the modern EMS system in the USA came into being in the early 1970s. It was a result of the growing carnage on the roads as a result of traffic accidents and the lessons learnt in pre-hospital emergency care from the Vietnam War (Independent Ambulance Association 2015). Given the focus on road trauma, the first qualifications for EMS came out of the National Highway Traffic Safety Administration (NHSTA), Department of Transport. There are no mandated National Standards for EMS in the USA. The report demonstrated the fragmented nature of EMS delivery in the US with over 15,000 EMS systems and approximately 800,000 providers handling over 16 million transportation calls in 2007 (National Highway Traffic Safety Administration 2007). The report highlighted the need for mandated national qualifications and national performance measures. It recommended that the current performance measures (predominately response time) needed to evolve into outcome measures.

In Australia there has been a significant amount of work done on performance measures for the Ambulance Service. For example, O'Meara (2005) speaks of the need

for performance measures to extend beyond response time and to include outcomes. Similarly, there are a number of studies that discuss the need for performance measures which include outcomes in the USA. The articles identify information that it would be desirable to collect, but offer no mechanism for this to happen in the field.

1.5. CONTRIBUTION TO KNOWLEDGE AND STATEMENT OF SIGNIFICANCE

1.5.1. Academic Benefit

The main academic benefit will be to address an existing gap in the literature: whilst there is significant literature dealing with performance measures and outcomes regarding EMS in Australia, UK and USA and some comparisons between USA and European systems, there is no academic literature comparing outcomes between the USA and Australian EMS systems (McLay & Mayorga 2010; Myers 2008; National Audit Office 2011; Steering Committee for the Review of Government Service Provision 2012).

The research will bring together a significant body of literature relating to performance measures for EMS from diverse areas such as UK, USA and Australia. It may even be possible to create a new model encapsulating all of the elements identified.

The issue of EMS performance measures is very topical, with the Report on Emergency Medical Health Care Services by the National Quality Forum (NQF) – a not-for-profit organization with the aim of improving American healthcare – published in April 2012 (Committee on the Future of Emergency Care 2006; National Quality Forum 2012). The Australian Productivity Report 2012 also deals with performance measures for EMS (Steering Committee for the Review of Government Service Provision 2012).

1.5.2. Practical Contribution

The practical benefit of this research includes the capacity to benchmark the services provided in Victoria by an ambulance-based EMS system with a number of fire-based EMS systems in North America. Whilst the delivery systems are very different, it will be possible to compare the response times and outcomes produced by those different systems.

The research results have the potential to contribute to changes/improvements in public policy. They will enable a number of interested parties to assess if it is best to retain the status quo, change the delivery system to an alternate model or to use a combination of delivery methods. The information is likely to be important for the Victorian Government, Ministries of Health, emergency service agencies such as Ambulance Victoria and the Metropolitan Fire Brigade, and also to interested members of the public. The results would also have application in all other states and territories and be of interest in the international community.

The industry of public safety has significant economic impacts in the community. Progressive governments are directing more resources to prevention and mitigation as well as emergency response to improve outcomes for the community, both in terms of costs and results, as prevention is better than cure. EMS performs a significant part of the emergency services and it is appropriate to examine the economic demand and impact of possible efficiencies of this function in society.

The following table outlines details of costs and personnel involved in both EMS delivery (Ambulance) and Fire for Australia:

Ambulance	
Full-time staff	14,788
Volunteers	6,012
Responses	3.1 million
Cost	$2.5 billion
Fire	
Full-time staff	17,854
Volunteers	211,898
Responses	99,841
Cost	$3.4 billion

Note: The cost is the actual cost of providing services; it is not a measure, for example, of the cost of fire to the community (Productivity Commission 2013)

Any improvements in productivity as a result of the fire-service delivering elements of EMS would result in significant benefits to the community. A 10% increase in firefighter productivity would result in direct national benefits to the community in

excess of $340 million. The figure does not address the potential saving of lives, better outcomes for injured or sick patients in need of urgent intervention, or reduction of pain and suffering, all of which have significant community benefits.

1.6. CHAPTER 1 SUMMARY

This chapter has outlined the problem to be addressed, by including the comparison between the Anglo/American and Franco/German systems of EMS delivery and describing the problems Ambulance Victoria is having with response times. It has presented the research questions, and the benefits of this study to the community.

Chapter 2, which follows, explains the significant importance of the history of the evolution of EMS in the military and its impact on the creation and evolution of civilian EMS.

CHAPTER 2: LITERATURE REVIEW HISTORY AND EVOLUTION OF EMERGENCY MEDICAL SERVICES (EMS)

2.1. WHY IS THE HISTORY OF EMS IMPORTANT?

A considerable amount of research was undertaken detailing the history of the provision of EMS on the battlefield over time. A review of the history of the evolution of EMS is vital to understand the huge impact of the military medical experience on the evolution of the civilian EMS services, particularly to show the impact of warfare on the development of equipment, techniques and the evolution of civilian EMS provider models. It was important in the past but is even more important today. As technologies, drugs and procedures advance in the current battlefields they are almost simultaneously picked up by civilian EMS providers. There are many examples of joint military/EMS projects such as a Research Symposium of Military and civilian EMS providers regarding new methods of preventing people from bleeding to death after trauma (EMS World 2015).

2.1.1. Survival Rates

During the American War of Independence about 25% of the "patriots" admitted to hospital died. By the time of the American Civil War this figure had dropped to 14%. During the time of the First World War things had improved dramatically with slightly over 6% of those who made it to hospitals dying. The Second World War recorded a figure of 4.5%, Korea 2.55%, and Vietnam 1.8% (Stephenson 2013). As these lessons were learnt and innovations adopted on the battlefield they ultimately impacted the provision and evolution of Emergency Medicine in the civilian community through the ages.

2.1.2. Ancient Greece and Rome

Ancient Greece and Rome went to great lengths to provide medical treatment for their soldiers in the field. It is interesting to note that doctors on the battlefield of those times were forbidden to wear arms. There is evidence of medical schools that date back to the third and fourth centuries BC (Goniewicz & Bogucki 2013).

Under the Romans the systems developed further with the construction of special buildings called Valetudinarium, or Flying Field Hospitals, near places anticipated to have significant conflict. The buildings were provided with accommodation for the sick and wounded, hot and cold running water, baths and latrines that were flushed with running water. The waste was discharged outside the compound. These structures were also installed in Roman forts throughout the Roman Empire. The Roman Army was the first to provide specially trained medical staff to look after their wounded on the battlefield (Belfiglio 2014; Goniewicz & Bogucki 2013).

Figure 1 A wheeled carriage form Roman times that could be used for a multitude of tasks including transportation of the sick or injured

Source:http://wilsonancientrome.wikispaces.com/Founding+of+Rome+and+the+Early+Monarchy

The injured were transported from the battlefield to the ancient medical centres using the available means of transport; wheeled litters, specialized hammock wagons, chariots, horses and mules or they walked (Beebe, Myers & Kennamer 2010).

Figure 2 Specially trained Legionnaires assisting the wounded on the battlefield

Source: Photo from Trajan's Column (Gabriel 2011)

After the fall of the Roman Empire came the Dark Ages and a loss of knowledge and skills including emergency medicine. Medical care on the battlefield and elsewhere was almost non-existent until the Napoleonic wars.

2.1.3. Napoleonic Times

Baron Dominique Larrey (1766-1842) is credited by historians as the creator of a modern system of EMS using triage and transport. He was Chief Surgeon and Inspector General of the Office of Health of the Army. He was with Napoleon for 25 campaigns, 60 battles and over 400 skirmishes (Gajić 2011; Karamanou et al. 2011).

In 1792, Larrey (in conjunction with French surgeon Pierre Percy, who was also a professor of the military medical school in Paris) built a new type of medical transport. It was called a "flying ambulance" and consisted of a light, well-sprung horse drawn carriage. It could be drawn by one or two horses and was very manoeuvrable. These vehicles were used to bring casualties from the battlefields to field hospitals (D'Onofrio 2013; Goniewicz & Bogucki 2013; Howard 1994). They were manned by a battalion of "ambulance soldiers" made up of doctors, non-commissioned officers and stretcher-bearers.

During the Battle of Waterloo, Larrey set up a hospital a mere 400 metres from the front line. When Wellington became aware of the location of the hospital he ceased the bombardment of the area as a way of showing respect to the bravery of the doctors risking their lives to provide care to the wounded. After the battle was over Larrey was captured and sentenced to death, but was saved by the intervention of General Bulcher,

the leader of the Prussian army (D'Onofrio 2013; Goniewicz & Bogucki 2013; Skandalakis et al. 2006).

Larrey's system was based on the principle that the wounded should be treated on the basis of the severity of their wounds, not by rank or nationality. These principles have been adopted and modified to create civilian EMS as we know it today.

Figure 3 Baron Larrey's Flying Ambulance

Source: images.frompo.com

Whilst there were attempts by some in the British Army to copy the French system promoted by Sir James McGrigor, they were resisted by the army establishment for a further 60 years (Howard 1994).

In Napoleonic times the medical facilities could be close to the battlefield. As new technologies created longer range and more devastating weapons there was a need to move such medical facilities further from the battlefield with an increased need to improve transport. The scale of the task was daunting; for example, the Battle of Solferino (24 June 1859) resulted in 40,000 casualties (Vanna 2002).

2.1.4. Crimean War/American Civil War

The next major conflict to impact casualty transportation and treatment was the Crimean War (1853-1859; Fisher 2013). Florence Nightingale was famous for her improvements to the treatment of wounded soldiers in this conflict (Fee & Garofalo 2010). On the other side of the Atlantic, the American Civil war commenced in 1861

and ran to 1865. It was to have a major effect on the delivery of Emergency Medicine in both the military and the civilian community.

2.1.5. Creation of Civilian EMS Systems

In the latter half of the 19th century it was recognized that there was also a need to develop a system for dealing with civilian injuries in peacetime. A major driver of EMS in the USA was the availability of medical staff discharged from the military following the Civil War. In 1865 an ambulance service was created in Cincinnati, the first civilian ambulance service in the USA. In 1881 a fire occurred in the Ring Theatre in Vienna that killed 384 and injured hundreds. As a result the first ambulance service in Europe was created (Goniewicz & Bogucki 2013).

2.1.6. The World Wars

During World War 1 (WW1) stretcher-bearers and horse-drawn ambulances were used to transport the injured; these slowly evolved to motorized transport. The lessons learnt carried over to World War 2 (WW2). More attention was being paid to minimizing the time between injury and treatment.

Figure 4 Stretcher Bearers bringing a casualty to aid

Source: www.telegraph.co.uk

Figure 5 Ambulance on Western Front

Source: www.bbc.co.uk

Figure 6 Dodge WC54 3/4 ton Field Ambulance

Source: ww2db.com

2.1.7. Korea/Vietnam

Further wars such as the Korean and Vietnam Wars saw the use of helicopters to further reduce time from injury to treatment. It gave rise to the concept of the "Golden Hour" (Berger 2010) the hour immediately following traumatic injury in which medical treatment to prevent irreversible internal damage and optimize the chance of survival is most effective.

2.1.8. Iraq/Afghanistan

Further conflicts such as Iraq and Afghanistan have resulted in fine-tuning of the medical system for military casualties. There have been a number of technological and other advances in dealing with trauma. These advances have been transferred to the civilian communities.

2.2. TERRORISM

The rise in terrorism has resulted in a need to better prepare for mass casualty incidents in the civilian population, not uncommon occurrences for the military on the battlefield. An example of the impact of terrorism on a Western city was the recent attack on Paris. The event occurred on Friday 13 November 2015. It resulted in 130 dead and hundreds of casualties, of which at least 99 were critical. The casualties occurred at multiple locations in a coordinated attack (Elgot, Phipps & Bucks 2015). An event of this scale has the capacity to overwhelm existing EMS systems.

It is not necessary to have access to automatic weapons or explosives to cause carnage and chaos, as shown by the truck attack in Nice, France. On 14 July 2016, a man drove a large truck into crowds of revellers celebrating Bastille Day, causing 85 deaths and over 400 injured (Agence France Presse 2016), a massive test for the providers of EMS services.

In terms of the number of casualties these events pale when compared to the Sarin gas attack on Tokyo's subway system. On the 20 March 1995, an incident occurred in the Tokyo subway system involving a release of Sarin gas, a nerve agent. The event resulted in 12 deaths, a relatively low figure, but there were more than 5,000 casualties. The problems with this event were compounded as many of the first responders from the Tokyo Fire Department, both ambulance and firefighters, became casualties, and receiving hospitals were contaminated with the poisonous gas affecting medical staff in these locations (Seto 2001). An event of this scale would overwhelm any existing EMS system.

Melbourne has been a target for terrorist activity with locations such as the Melbourne Cricket Ground, Federation Square, St Paul's Cathedral and Flinders Street Railway Station all identified as terrorist targets. Fortunately for the people of Melbourne these plots were foiled by intervention by law enforcement and counter-terrorist forces. If any of these targets were hit there would be massive casualties, which would be a extreme test for the Victorian EMS system.

The number of qualified EMS staff able to respond immediately can have a significant impact on the survival rates of those seriously injured. On 20 January 2017, an event occurred in Melbourne CBD involving a car deliberately driving into pedestrians in the Bourke Street Mall. The result was 4 dead and at least 20 injured, many of them seriously. At one stage, it was reported by the media that Ambulance

Victoria was recalling off-duty staff. There would be unavoidable delays before such staff were able to respond (Silvester 2017). By comparison to world events, the Melbourne incident was relatively small with a modest number of casualties, but it still stretched the city's EMS system.

2.3. ANGLO-AMERICAN MODEL

The Anglo-American Model is also known as "scoop and run" as the aim is to quickly stabilize the patient and bring them to an Emergency Room for a higher level of medical intervention in the shortest practicable time. The model is used in countries such as UK, Australia, New Zealand, USA and Canada (Dick 2003). The model does not use doctors or nurses, but specially trained ambulance officers, and now paramedics.

2.4. FRANCO-GERMAN MODEL

In Europe the model of EMS that evolved was called the Franco-German Model and was known as "stay and play". It differed from other models in that it was the norm to include an emergency medical physician and nurse on the ambulance. As the name implies "stay and play" involved sophisticated treatment at the scene of the incident. There was no pressure to immediately transport the patient to hospital (Arnold 1999; Cameron 2014; Fleischmann & Fulde 2007).

Figure 7 Ambulance, Paris

Source: http://www.ambulance-photos.com/picture/number3978.asp

There is research that shows that there is little difference in the outcomes of the two models with regard to cardiac arrest (Olasveengen et al. 2009; Skow 2010). As a result of this finding, there will be no more comment on "stay and play" or

Franco/German and this research will focus on “scoop and run” or Anglo/American system.

2.4.1. America

2.4.1.1. *Introduction*

It is appropriate to have a section on EMS in America as most of the case studies involve American agencies. It is also important to see how the evolution of the service occurred and to identify the drivers of that change

2.4.1.2. *Evolution of EMS*

In the USA the concept of an ambulance was created out of the carnage of the American Civil War (1861-1865). Significant developments in treating the wounded occurred during this time. Initially neither side had systems in place to care for the wounded. Following the first battle of Bull Run the wounded were left to fend for themselves, as litter bearers helped themselves to the personal effects of the dead and dying and the numerous transport carts were used for the personal transport of officers (Goniewicz & Bogucki 2013; O'Brien 1998). Not surprisingly there was public outrage.

As the war progressed the Surgeon General Jonathan Letterman adopted the ideas put forward by Larrey (Napoleonic Wars), and an effective ambulance corps was established. It utilized lightweight, two-wheeled carts to remove the injured from the battlefield and take them to dressing stations or field hospitals. Large four wheeled ambulance wagons were used to transport to area hospitals or other military medical facilities. On March 11, 1864, President Lincoln signed legislation (“An Act to establish a Uniform System of Ambulances in the Armies of the United States”), which was passed by Congress (Goniewicz & Bogucki 2013).

Figure 8 American Civil War Ambulances

Source: www.replications.com

The First and Second World Wars used the evolving methods of transport from stretchers, wheeled carts, and horse-drawn vehicles through to motorized transports. The main objective was to reduce the time between injury and treatment.

During the Korean War medical resources were established as close as possible to the frontlines to reduce time from wounding to medical assistance. Transportation was often by helicopter and these facilities were known as Mobile Army Surgical Hospitals (MASH; King & Jatoi 2005).

During the Vietnam War the process of casualty treatment improved further. Casualties were no longer taken to intermediary MASH facilities but were transported by helicopter directly to full service hospitals. As a result of these innovations the mortality rate for injured soldiers fell to 1.7% (Goniewicz & Bogucki 2013; Shah 2006).

Figure 9 American Army MASH Helicopter

Source: www.mprnews.org

Prior to the 1950-early 1960s, injured people in the civilian community made their way to hospital using the available means of transport. In what must have been a frightening ride, up to 50% of injured were transported to hospital in morticians' vehicles in 1966 (Simpson 2013).

Figure 10 Cadillac style hearse / ambulance

Source: www.hearse.com

On the home front, the ambulance evolved in an ad-hoc manner with many providers, some of which were fire services. In the early 1960s fire-based EMS started to evolve into the modern systems seen today (Eisenburg et al. 1996; Eisenburg 2006).

A number of issues drove the modernization and professionalism in EMS. One was the concept of the "golden hour", in which the patient was to be in the care of a

hospital within one hour of the injury/event occurring (Merriam-Webster 2005). Another was the Vietnam War and the improvements in treating the wounded, including reduced time to hospital. The use of helicopters to evacuate the wounded was also a factor in reducing the time to receiving hospital care (Carr et al. 2006; Goniewicz & Bogucki 2013; Heart Foundation 2013; Lerner & Moscati 2008; Newgard et al. 2010).

Figure 11 Helicopter Rescues casualties Vietnam

Source: www.history.com

In 1966 the National Research Council of the National Academy of Sciences in the USA produced a report titled "Accidental Death and Disability: The Neglected Disease of Modern Society" (National Research Council 1966/2000). Some 65% of ambulance attendants had only first aid training, while 10% had no training at all. Communication systems were poor, dispatch systems ad-hoc, and emergency rooms inadequate (O'Brien 1998). Following production of this report, civilian EMS started to progress swiftly. The National Highway Safety Act was passed and spurred the Department of Transport to provide guidelines for EMS. Funds were made available for ambulances, medical equipment, and communication systems and training. In the first instance, physicians on ambulance were trialled, but this soon changed to physician surrogates to provide a higher level of emergency medical care: paramedics. The type of medicine practiced has been called "gutter medicine" by some.

A number of fire departments that were already providing ambulance services took up the challenge. These included Seattle, Los Angeles, Columbus, Portland and Nassau County. Many of the new paramedics were actually Vietnam veterans and brought their experience with battlefield casualties to the streets. The popular television show “Emergency” depicting two LA County firefighter paramedics also did a lot to spread the message and raise community expectations regarding the provision of emergency medicine (Bergman 2007).

In 1973 the US Federal Government passed the Emergency Medical Services Act, which outlined the fifteen main components of an EMS System:

- Manpower
- Training
- Communications
- Transportation
- Emergency facilities
- Critical care units
- Public safety agencies
- Consumer participation
- Access to care
- Patient transfer
- Standardized record keeping
- Public information and education
- System review and evaluation
- Disaster planning and mutual aid (O’Brien 1998)

The Act brought with it federal funding to support the program. The result of this legislation was a paradigm shift in the delivery of EMS across the United States (O’Brien 1998).

Figure 12 Squad 51

Source: http://en.wikipedia.org/wiki/Emergency!#/media/File:Squad_51.jpg

2.5. CHAPTER 2 SUMMARY

This chapter has described EMS from ancient times through to the modern day. It demonstrated how the need to treat the wounded on the battlefields drove changes in the delivery of EMS both on the battlefield but also in the civilian environment. Military EMS has had a profound effect on the development and delivery of EMS in the community, which started in ancient times and continues to today. Additionally, this chapter has explained how survival rates have improved as patients get from the battlefield to hospital in shorter times, as well as describing the Anglo/American and Franco/German EMS systems.

Chapter 3, which follows, covers a literature review of the broader concepts of Performance Management in both private and public sector. In addition to explaining the resistors to transformative change in the public sector, it discusses issues of power and influence in organisations, the power of public sector unions, the use of performance measures in organisations and specifically in emergency services. It will also explain the elements of response time, and outlines the importance of a short response time for time critical emergencies.

CHAPTER 3: LITERATURE REVIEW ACADEMIC AND SUBJECT MATTER

3.1. INTRODUCTION

An extensive literature review was unable to identify any previous research comparing the Australian ambulance model for EMS delivery to that of the fire-based EMS system used in the USA. There are a number of peer-reviewed articles comparing the USA system with other systems, including the UK, European and Canada. There have also been comparisons of the different systems in Asia and the Middle East. This earlier research will assist this project (Hsien-Ho 2007; Ingolfson 2013; Lechleuthner 1994; Roudsari 2007; Fischer 2011; Dick 2003; Moore 1999; Blackwell 2002). A significant amount of research has been done on EMS performance measures both in Australia (O'Meara 2005) and the USA (Lambert 2009).

3.2. PERFORMANCE MANAGEMENT

Improved performance in organizations has been an issue for over 100 years. Over time a number of techniques were developed in the private sector. These innovations moved into the public sector over time. Performance Management has become a key part of organizational success but also an important tool for survival in today's world. Performance Management was identified as the most pressing issue for Human Resources (HR) in 2013 in a joint document produced by Speechly Bircham and Kings College, London University (Thomas 2013): there is significant pressure to "do more with less" (Arnaboldi, Lapsley & Steccolini 2015). The reason for including this topic in the research is that it was my intended aim to compare the performance of a number of EMS delivery systems. To understand the systems used and the performance indicators in a wider range of industries is a critical part of the process.

3.2.1. History of Performance Management

One of the most used definitions of Performance Management comes from Armstrong, who states: "Performance Management can be defined as a systematic process for improving organizational performance by developing the performance of individuals and teams" (Armstrong 2006, p. 1). A reason for the popularity of this definition is that it links the organizations human resources to achieving the

organizations goals. Alignment of these factors is considered crucial to achieving the desired results.

The key principles of performance management are:

- Translates corporate goals into individual, team or department goals
- Helps clarify corporate goals
- Is a continuous and evolving process in which performance improves over time
- It relies on consensus and co-operation rather than control and coercion
- It creates a shared understanding of what is required for improvement and how it will be achieved
- Encourages self-management of individual performance
- Requires a management style that is open and honest and encourages two way communications between superiors and subordinates
- Requires continuous feedback
- Feedback loops allow the experiences and knowledge gained by individuals to modify corporate objectives
- Measures and assesses all performance against jointly agreed goals
- Should apply to ALL staff and not primarily concerned with linking performance to financial reward (Armstrong 2000).

Performance management can be said to be about improvement, rather than about performance appraisal (Armstrong 2000). It can be traced to as far as the beginning of the industrial revolution; in fact, Taylor produced his book on "Scientific Management" in 1911 (Taylor 2003). A further early example such as the Hawthorne Experiment illustrates the process (Thomas 2013), although it was not known by its current title at that time.

The predecessor of Performance Management was Managing by Objectives (MBO). This process was criticised mainly because it was seen to be top down, excessively bureaucratic and dealing only with issues that were measurable and quantifiable, and having an exaggerated emphasis on output. A further perceived failure of the system was that it did not give any weight to qualitative aspects of performance (Ashdown 2014).

Then, in the 1980s and 1990s people began taking a more holistic approach to improvement to include processes and the people involved. Whilst it began in the private sector it quickly made the transition to the public sector. Some governments, such as New Zealand, legislated to ensure their departments used such a system (1988 State Sector Act). The 1993 Government Performance and Results Act (USA) is another example.

The issue of Performance Management is very topical, with a number of recent articles addressing the issue (Arnaboldi, Lapsley & Steccolini 2015; Worrall 2010). Key factors in a successful PM system include a need to set clear objectives or targets, which are set and agreed upon by all parties (individuals and management), regular monitoring and review of performance against these targets, and meaningful reward for successful outcomes (financial, recognition, or a combination of both; Ashdown 2014).

3.2.2. Private Sector

There are differences between private and public-sector organisations. Commonly accepted differences include ownership, financial resources and type of social control, as cited by Perry and Rainey (1988, in Hvidman 2014). Ownership is in private hands; income comes from charges made for goods and services provided to consumers, and private organisations operate in an environment significantly beyond the control of politicians. The main focus for private organisations is economic performance (Hvidman 2014). Research carried out in Hong Kong showed that the private sector was more efficient than the public sector at carrying out the same work and with the same set of rules (Wu et al. 2016).

Care must be taken in reading too much into the performance of the private sector over the public. Whilst there are obvious differences recent research has shown that entrepreneurial orientation can have positive effect on performance and satisfaction in both sectors, particularly when linked to rewards based on performance (Kwon & Cho 2017).

3.2.3. Public Sector

The major differences with performance management in the public sector compared to the private sector are ownership, where organisations are collectively owned by the community, financial resources, which come in the main from taxpayers, and the fact that they are subject to political influences (Hvidman 2014).

Arnaboldi, Lapsley and Steccolini (2015, p. 1) state that "The pressure to improve performance is **the** issue for the public sector in the current environment". There are major challenges for performance management in the public sector, as techniques developed and honed in the private sector may not produce the same results because of the complexity of influences in the public sector. In part this may be because of political influences, lack of managerial discretion and complicated levels of accountability (Arnaboldi, Lapsley & Steccolini 2015).

Research has been undertaken which likens the environment in the public sector to chaos theory (Teisman 2009; Rhodes et al 2012; Geyer & Rihani 2010; Room 2011; Haynes, 2012). Other researchers believe it is inappropriate to try to use a theory that originated in the natural sciences in the social sciences (Klijn 2008 and Pollitt 2009, as cited in Arnaboldi, Lapsley & Steccolini 2015).

There has been a tendency for the public sector to mimic the trends and fads in performance management in the private sector such as Benchmarking, Balanced Score Card and Lean Management. One of the many challenges for the public sector is the lack of goal clarity, and the fact that it cannot just focus on efficiency but must also deal with issues such as multiplicity of goals and criteria (such as political and equity; Hvidman 2014).

3.2.4. Issues

Whilst PM was seen as a significant driver of improved productivity and job satisfaction, it has not always fulfilled the promise, particularly in the public sector. There has been significant dissatisfaction with the process that has led to decreases in job satisfaction, increases in absenteeism and rapid staff turnover (Guerra-López, 2013; Michie 2004; Arnaboldi, Lapsley & Steccolini 2015).

In some organizations, there has been a focus on outputs rather than outcomes. One of the reasons for this is that it is much easier to measure outputs rather than outcomes. To help manage performances there have been many tools developed to gather data related to performance measures. The lower the number of indicators, the higher the probability of it having a dysfunctional effect (Armstrong 2006). Budgets have been used as indicators but are considered a very crude and limited tool.

Key performance indicators (KPIs) and benchmarking have also been used extensively. The use of KPIs has resulted in a focus on what can be measured, rather than encapsulating all of the key dimensions of an organisation's performance (Bevan

& Hood 2006, as cited in Arnaboldi, Lapsley & Steccolini 2015). Benchmarking with similar organisations in different jurisdictions has also become popular, but it also brings its own complexities (Bowerman 2000, 2001 as cited in Arnaboldi, Lapsley & Steccolini 2015). More recent research on performance measures has focused on the benefits of established routines for the collection of quality data. It proposed that the old adage of "what gets measured gets done" should change to "what gets practiced gets learned" and "where there is a result, there's a routine" (Josephs 2016).

3.2.5. Change and the Public Sector

Why is change in the public sector so hard to achieve? In her book, Jenkins highlights that change in the public sector has proven difficult for international agencies, OECD countries and developing countries (Jenkins 2008). In a recent article on public sector innovation it was put forward that the following three issues are a major impediment to acceptance of change: resistance to change, risk aversion and hierarchical structure (Micheli et al. 2012).

3.2.5.1. *Resistance to change*

In the absence of the commercial pressures that drive the private sector (including the profit motive), the public sector can focus on maintaining current performance rather than pursuing innovation (Micheli 2012). A recent article outlined the resistance to the introduction of new technology in the public sector because the staff were fearful of losing control (Meier, Ben & Schuppan 2013). Resistance to change is not limited to the public sector. Research has shown that if the current state satisfies the persons current needs they will resist change for fear of loss regardless of sector (Evans & Evans 2017). It has been argued that inertia in the public sector exists because of formalisation, risk aversion and incentive structures which will emphasise decision avoidance (Felix 2014).

Another longitudinal study on change in a public-sector workplace showed that human factors are the major reason for success or failure. A successful pre-change process does not guarantee success in the longer term. People felt disempowered by the change process and felt their opinions counted for little. There is an identified need to continue a two-way information process throughout the implementation of change. With proper pre, during and post-change management it is possible to achieve meaningful change within the public sector (Meier, Ben & Schuppan 2013).

An example of an organization which has implemented significant change is the Tasmanian Public Service. The aim was to create "Service Tasmania" as a one-stop service delivery vehicle (https://www.service.tas.gov.au). The goal was to achieve the stated outcome with a focus on customer service. A number of problems were identified, such as lack of resource, tight time frames, existing organization cultures and petty rivalries.

Having identified the impediments to it, the first task was to create a shared vision of the proposed change. Given the challenges, a sense of urgency was created around the proposed changes, whilst recognizing that resistance to change is the norm. Communication, including to and from management and also with the "customers" of the changed service, was identified as the greatest issue. Nevertheless, management were able to achieve a tight alignment of people to the organizational goals by emphasizing their role in the change process.

It was acknowledged that training was not as effective as it could have been early in the process, but additional training was provided following the identification of problems. In addition to extra training sessions, a staff training centre was created, and a "buddy system" was implemented to mentor staff. They also tailored additional courses to deal with identified needs. Key issues were ownership and the embedding of the change in the organizational culture (Blackburn 2014).

The Tasmanian experience is an excellent example of how properly managed change is achievable in the public sector, despite its acknowledged challenges and human resistance to change.

3.2.5.2. *Risk Aversion*

What is risk aversion?

It is the behaviour of humans when exposed to uncertainty, to attempt to lower that uncertainty. This risk aversion can be directly linked to a resistance to organisational change (Waddell D.M. et. al, 2014) as society seeks better models to deliver EMS to the public. There can be strong arguments mounted to maintain the status quo and consequently to uphold the current sources of power within the current models.

Public sector organizations find it hard to manage risk, as the costs of failure are high and transparent. Research has been undertaken which demonstrates risk aversion

for people working in the public sector. It is interesting to also note the same research indicated that public servants are less likely to donate to charity than their private sector counterparts. The reason given was that as they were underpaid public servants they were already making a contribution to society. The longer the people were in the public sector the more pronounced this became the reason for not donating to charity. The research provided valuable insights for those managing within the public sector (Buurman 2012; Micheli 2012).

3.2.5.3. *Hierarchical Structure*

Public servants view their hierarchical structure as the source of new ideas. Outsiders are viewed with suspicion (Micheli 2012). Whilst the existing hierarchical structures can be an impediment for change, managed correctly they can actually be a tool to help facilitate change, as was demonstrated in research undertaken in UK hospitals. This research demonstrated that change must not only be top-down, but to engage and co-opt managers at all levels of the organization. If they buy-in and accept the benefits of change they become strong advocates for the change process (Mc Dermott 2013).

For some in the public sector, success could be political and measured by a contented Minister, avoiding embarrassment, agreeing to political proposals for new policies, and generally 'staying out of trouble' (Jenkins 2008). There are obviously some committed and extremely competent public servants but most have been in the public sector for decades and consider it a right for life. The vast majority are undertaking clerical tasks and have very weak links between the clerk and the Minister (Jenkins 2008). An added dimension is the interaction of politicians and senior bureaucrats.

Politicians' main focus is getting elected and staying in office, which means a very short time frame. Political timescales are very different from those of a well-run organization. To get elected politicians will promise to "fix things", while many might complain that they are "pulling the levers but nothing is happening" (Jenkins 2008). Change in bureaucracies is a slow process, and more and more electorates are holding politicians accountable to their promises: in fact, a 2003 survey showed that politicians are the least trusted profession (Jenkins 2008). Most politicians have little experience in managing large organizations. Prior to being elected, most come from within the party,

and they are professionals, academics or in the military. All come with a belief they will be better than their predecessors (Jenkins 2008).

Whilst these comments were made regarding UK politicians, they are equally relevant in the Australian context. In Victoria, the current Minister for Health and Ambulance Services has a background as a lawyer, board member and chair and political advisor to the Premier (Hennessy 2015), while the Minister for Emergency Services was a lawyer and senior advisor to the Premier (Garrett 2015).

To demonstrate the scale of the Ministries the Ministers have to oversee the following budget figures are provided. The Victorian health budget in 2013-14 was $14.3 billion (Treasury and Finance 2013) and the additional cost of the Ambulance Service for 2014-15 was $720.7 million (Ambulance Victoria 2015a). The Fire and SES budgets are a total of $924 million, allocated as follows: MFB – $373 million (MFB 2014), CFA – $500 million (Country Fire Authority 2014), and SES – $51 million (Victoria State Emergency Service 2014). The budget for Health for Health and Human Services 2016-2017 is $22.1 Billion.

Former Victorian Premier John Brumby recently raised the need for better training of politicians. He indicated that he felt that the training should commence when they are elected to parliament and continue on a yearly basis; the purpose of the training to prepare them for the demands of being a minister. He specifically spoke of the need for training in governance, management and occupational health and safety and compared the needed training to that required to becoming a member of the Australian Institute of Company Directors. He warned serving and future politicians against over promising, and stated: “It is one thing to have a good plan but the bigger challenge is implementing it” (Willingham 2015).

3.2.6. Public Sector Unions

In recent times there has been much discussion about the roles of unions in both the public and private sector. The number of people in the private sector in unions has fallen dramatically in the past two decades. It currently stands at 12% (Australian Bureau of Statistics 2013). There are a number of reasons for the fall in numbers, such as more individual agreements and the changes in employment opportunities. Manufacturing jobs, which were traditionally strong unionized workforces, have fallen dramatically with the increase in job opportunities in service industries such as finance, IT and property, which traditionally have not had high union penetration. The public

sector has 42% of its employees as members of unions (Australian Bureau of Statistics 2013). It is argued that private sector employees are exposed to the market but that public sector employees are insulated from free market forces.

In their article "The case against public sector unions", McGinnis and Schanzenbach (2010) outlined the nature and scale of the problems created by public sector unions in the US. In the article the researchers make the assertion that the unions have distorted public spending priorities and make it more difficult to implement innovative change that would benefit citizens (McGinnis & Schanzenbach 2010). The research was undertaken at a time of significant financial stress on state and local budgets. The proposition was put that these financial pressures create an opportunity that would be in the interest of both liberal and conservative governors.

For conservatives there is an opportunity to eliminate inefficient spending, lower taxes and create lean government. For the liberals, it is an opportunity to redirect scarce funds to provide better public outcomes, such as improved education, among others.

The researchers suggest for such a program to work it needs the support of both sides of politics to prevent one side being played off against the other. In the private sector there are inbuilt checks and balances such as cost-benefits, and the need to produce profits. No such checks and balance apply in the public sector. State and local governments have the capacity of "raising prices" in the form of higher taxes or reduction of services. There is no competition for the provision of public goods so there are no constraints on union demands (McGinnis & Schanzenbach 2010; DiSalvo 2012, 2014).

Whilst there are criticisms of some public-sector organisations it must be balanced against those in the sector who perform at the highest levels. As has been shown in earlier research; with the correct structures and appropriate incentives the public sector is capable of exceptional performance (Dubrin, Dalglish & Miller 2006; Kwon & Cho 2017). A further balance to the power of public sector unions is the option of contracting out services. Such options can have sobering effect on industrial demands ('Hospitals blamed over ambulance response times; The ambulance union says paramedics are failing to meet performance targets because of overcrowding in emergency departments' 2012).

There has been criticism of public service unions wielding significant influence to obtain benefits for themselves at the expense of the public. Wage increases are just

the tip of the iceberg as the public sector incurs significant on-costs. Some of the benefits enjoyed are not available to the wider workforce such as early retirement, high-end health benefits, job security, high wages, significant overtime and generous defined benefit superannuation schemes (DiSalvo 2012).

A feature of increasing benefits is that it is opaque, and the true costs may not be clear until long after the current politicians have gone (McGinnis & Schanzenbach 2010). The future unfunded liabilities of pension schemes are already having a significant impact on budgets.

A news item from Chicago shows that Moody's have estimated unfunded liabilities for public sector pension funds in 2015 of US$80.9 billion. To fund these pensions the city has laid off thousands of employees and reduced services such as closing 50 schools. The reduction of jobs and services starts a spiral of reduced collection of taxes as the tax base shrinks, resulting in more layoffs and further reduction in services. In addition, as taxpayers stop receiving services that they have paid for, they are likely to move, further exacerbating the problem (Hinz 2013).

3.3. LEADERSHIP, POWER AND INFLUENCE

3.3.1. Leadership

Leadership within organisations is the ability to inspire confidence, and motivate others to achieve the organisations goals: **"**A common characteristic of leadership is the ability to inspire and stimulate others to achieve worthwhile goals" (as discussed by Chan & Maubourgne 1992, in Dubrin, Dalglish & Miller 2006).

A number of other definitions of leadership include interpersonal influence, influence above and beyond compliance with instructions, an ability to act in a shared direction, influencing people by persuasion and a willingness to take blame. Leadership can be seen as a partnership with power balanced between the parties. For a partnership to exist there is a need for all to participate in the creation of the vision and values, it is the leader's role to articulate the shared vision. Within a partnership people must have the right to say no. An interesting quote stated that within a partnership "a person may lose an argument but never a voice" (Dubrin, Dalglish & Miller 2006, p. 4). A partnership has shared accountability in that all share in the success or failure of the enterprise and creates an environment of complete honesty. All of these create empowerment and teams (Sinclair 2007).

3.3.2. Leadership vs. Management

Management is about planning, organising and directing. A definition of management provided by Daft (1994, p. 8, as quoted in Veal 2005) describes management as "the attainment of organisation goals in an effective and efficient manner through planning, organising, leading and controlling organisational resources". The difference between leaders and managers has been described as leaders having followers and managers having subordinates. As with most things these days life is more complex with these roles intermingled (Clyatt 2017).

Steven Covey (as quoted in Allman 2009) in his book *The Seven Habits of Highly Effective People* said "You lead people and manage things". It is possible to be a good manager but not a good leader. An effective leader must ensure both are done. A leader does not have to do the managing and may hire a competent manager to perform those roles but a leader without management lacks structure. Professor John Kotter (Ret), Harvard Business School describes Management as coping with complexity and Leadership about coping with change.

Who wants to be managed? Most people want to be led but management is under rated. It can make a company efficient and profitable. Management is about making the current systems function well and leadership is about producing useful change. There is a need to balance these skill sets as needed, Ken Blanchard, Management guru calls this strategy situational leadership (Allman 2009; Tschohl 2014; Nelson 2005).

3.3.3. Power

There are a number of types of power including Position Power. This is legitimate power given to an individual by virtue of their position within an organisation. There may be limitations placed on that power as a result of the organisation culture. Reward Power relates to the leader having the power to give or remove rewards; this power is only effective if the rewards are meaningful. Coercive Power is when the leader has the right to punish and is based on fear. It is not a particularly effective tool. Another form of power is Information Power and comes from the ability of the leader to manage the flow of information. Finally there is Personal Power and comes from being an expert, referent power which is to do with personal traits and prestige power that comes from a person's status or reputation (Finkelstein 1992, as quoted in Dubrin, Dalglish & Miller 2006).

In a recent article, Jeffrey Pfeffer challenged the theory that a modest leader who was true to himself would be successful. He stated that most employers do not care about their employees or employee engagement; the current trends are to move away from traditional employees and to employ independent contractors in the "gig" economy. He also pointed out many narcissist and self-promoting CEO's have had success such as Welch at GE, Eisner at Disney and Jobs at Apple. Pfeffer's view is that leaders need to be true to what others need from them and not how they are feeling. Leaders need to inspire confidence in those around them and motivate even if in accomplishing that outcome by not being completely truthful (Pfeffer 1981).

Pfeffer goes on to argue that the use of power in organisations has political dimensions and politics can be used to leverage and retain power (Pfeffer 1981). He puts the proposition that organisations are like the government in that they both have political dimensions that need to be worked to achieve the desired outcomes. In his view power, politics and leadership are linked together and that leadership without power will not produce desired results. Getting things done requires power (Pfeffer 1992).

3.3.4. Influence

What is influence? It can be said that leadership is an influence process and a charismatic leader can influence many people. Some find that the term power and influence are interchangeable whilst others say that influence is the capacity of a leader to communicate ideas and to also gain support for them. Power is the potential to influence (Dubrin, Dalglish & Miller 2006, p. 240).

There are a number of tactics to use influence. These include leading by example, rational persuasion, having a reputation as a subject matter expert, exchanging favours and bargaining, getting network members to offer their support and legitimizing a request by demonstrating it is within your scope and inspirational appeal and emotional display (Dubrin, Dalglish & Miller 2006, p. 246).

Influence is not just a downward process as followers have significant capacity to influence leaders (Dubrin, Dalglish & Miller 2006; Harrell & Simpson 2016).

3.3.5. Use of Power and Influence

In organisations people see the battle lines drawn between labour (in the form of unions) and management and take a position depending on their perspective. There have been many examples of management abusing their position to the detriment of the

employees. The current issues regarding underpayment of international students in organisations such as 7/11 is but one example (Ferguson & Dankert 2016). In circumstances such as these the unions have a significant role in protecting the powerless. At the other end of the industrial spectrum there are excesses take by some unions such as the CFMEU black bans on Boral to the detriment of management and community (Loussikan 2015). Unions use their influence with political parties who support their view of the world just as employer groups use their influence and funds to try and influence government policy (Duckett 2016; Viellaris 2016).

Whilst acknowledging there are excesses by all sides the researcher will focus on the issue off power and influence of unions in the public sector as this is particularly relevant to one of the case studies (Metropolitan Fire Brigade, Melbourne).

3.3.6. Culture

In 1985 Ed Schein, Management Scholar, defined culture as "a set of basic assumptions- shared solutions to universal problems of external adaptation (how to survive) and internal integration (how to stay together- which have evolved over time and are handed down from one generation to another" (as quoted in Dubrin, Dalglish & Miller 2006). It is true for ethnic groups but equally true for organisations.

Schein went on to identify three different levels of culture within organisations. These include artefacts that relate to the visible and observable such as premises layout, technology, signs, rituals and stories. The second level relates to the individual's sense of what should be, what it does and how, which reflect the culture. The third level relates to the underlying assumptions within a work group or organisation; these become entrenched, taken for granted and immutable. They may be unconscious beliefs, values and perceptions that will have an impact on everything within an organisation. All communication, both internal and external is seen through the prism of the organisational culture (Dubrin, Dalglish & Miller 2006; Hoogervorst, Flier & Koopman 2004).

Organisational change is made much more difficult if a strong organisation culture exists (Pfeffer 1981). Organisation culture is about "How we do business around here" and if a leader is to bring about change they must first understand that culture did not evolve in a linear way, nor will change occur because of linear interventions. Culture can be understood as a system consisting of players, context, engagement, interactions, belonging and emotions (Jones 2012).

To bring about successful change the leader must be aware of the organisation culture and use the opportunities created by this awareness. It is also important that the leadership team all demonstrate the desired behaviours in a consistent manner. A case of not just talking the talk but also walking the walk. Any attempt at changing organisation culture must involve honest and open two-way communication throughout the organisation (Bower 1966; Jones 2012).

3.3.7. Public Sector Union Power

There are concerns in some quarters that public sector unions have undue influence on issues of public policy. In the political process the vote of taxpayers is diffused and is not as important as those who can bring a block of votes for a politician, such as a union. Unions can distort, direct and in some instances dictate public policy (DiSalvo 2012). The example of education in the US has been used to illustrate the point. Teachers have tenure, which makes it almost impossible to remove incompetent teachers. The systems are rigid, unproductive and come at significant financial and educational cost to the students. The teachers' union is a major contributor to federal campaigns (the highest of any unions). Their political donations at state level are even higher, but they are by no means the only union providing funds in support of political parties who will further their agendas.

Unions are focused on obtaining increases in pay and benefits for their members as well as expanding their workforce; however, their interests are not consistent with the interests of the clients that they serve (Kremalis 2012). In the long run, inefficient public services will drive business and individuals out of the state (McGinnis & Schanzenbach 2010; DiSalvo 2014).

In the private sector the negotiations take place between owners (or their agents) and the unions. The negotiations are at least two-sided. When a government is dealing with a public-sector union, it is in effect negotiating with itself. Unions provide significant political donations and other means of support to some political parties; perhaps the same elected officials with whom they are negotiating (McGinnis & Schanzenbach 2010; Kremalis 2012). These unions use the government to collect the union fees on their behalf, a privilege not available to all in the private sector. Unions also have political clout, which can be used to influence outcomes of elections (Mehay & Gonzalez 1994).

3.4. PERFORMANCE MEASURES FOR EMS

A key component of competent management in any industry is a system of appropriate performance measures or Key Performance Indicators (KPIs); this is also true for the effective delivery of EMS. Analysis of the impact of KPIs across broader industries is relevant to this research.

It is possible to describe the different delivery systems, but to be able to compare patient outcomes there is also a need to compare performance measures. For decades the only significant performance measure for ambulance services has been response times (Al-Shaqsi 2010; Ambulance Victoria 2013; National Audit Office 2011; Mayer 1979; Myers et al. 2008).

All EMS providers in Australia, UK and the USA produce annual reports containing details of response times (Ambulance Victoria 2013; Pons et al. 2005; Turner 2011; Wankhade 2011). For the past six years at least Ambulance Victoria has failed to meet its response time targets (Auditor General 2010). There has also been considerable public comment on this issue (Herald Sun, 2013). The response time target for Code One calls is 90% of calls within 15 minutes. The actual result for 2009-2010 was 86.9% (Auditor General 2010). In 2012-13 the figure fell to 78.1% (Ambulance Victoria 2013).

3.4.1. Response Time

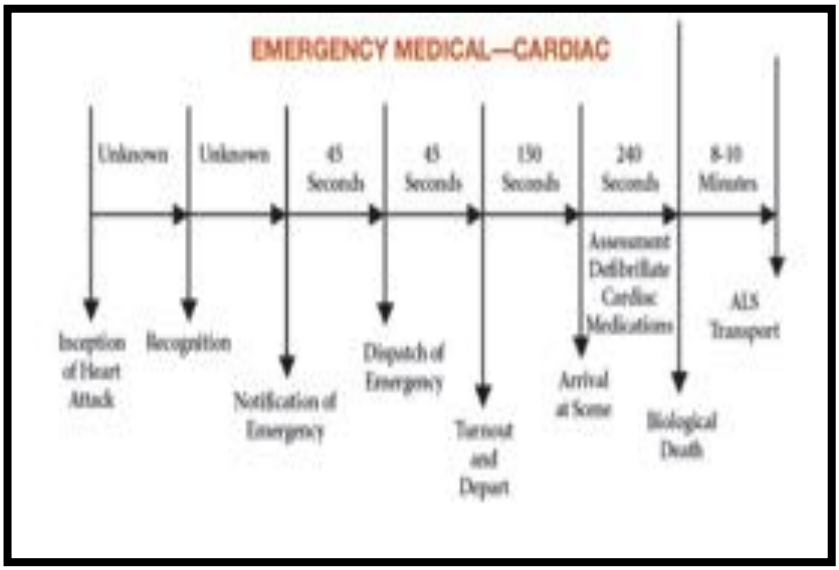
What is response time? It is a term that is widely used in the media (Herald Sun 2010, 2011, 2013) but much misunderstood by those not in the emergency services. Unfortunately this seemingly easy measure is complicated, as many services measure different things and report them as response time. Response time can consist of the sum or parts of the following:

- Time of first call
- Call taking
- Dispatch/Turnout
- Travel time
- Arrival on scene
- Arrival at patient (International Association of Firefighters 2002)

An international model which explains the component parts of response time has been published by the National Fire Protection Association, a leading international

codes and standards developer based in Boston, USA. The model provided included target response times for each component.

Figure 13 Response time for EMS as recommended by NFPA 1710 (2010) from Emergency Medical Services: A Guidebook for Fire based Systems



Source: International Association of Firefighters (2002)

Even within Australia, different ambulance services measure different things as part of their response time; some include call taking, whilst others start measuring time from dispatch of responders. There is also no common target used within Australia (Sassella 2005); comparatively, in the USA the National Fire Protection Association produces NFPA 1710, which does outline a timeline for EMS calls.

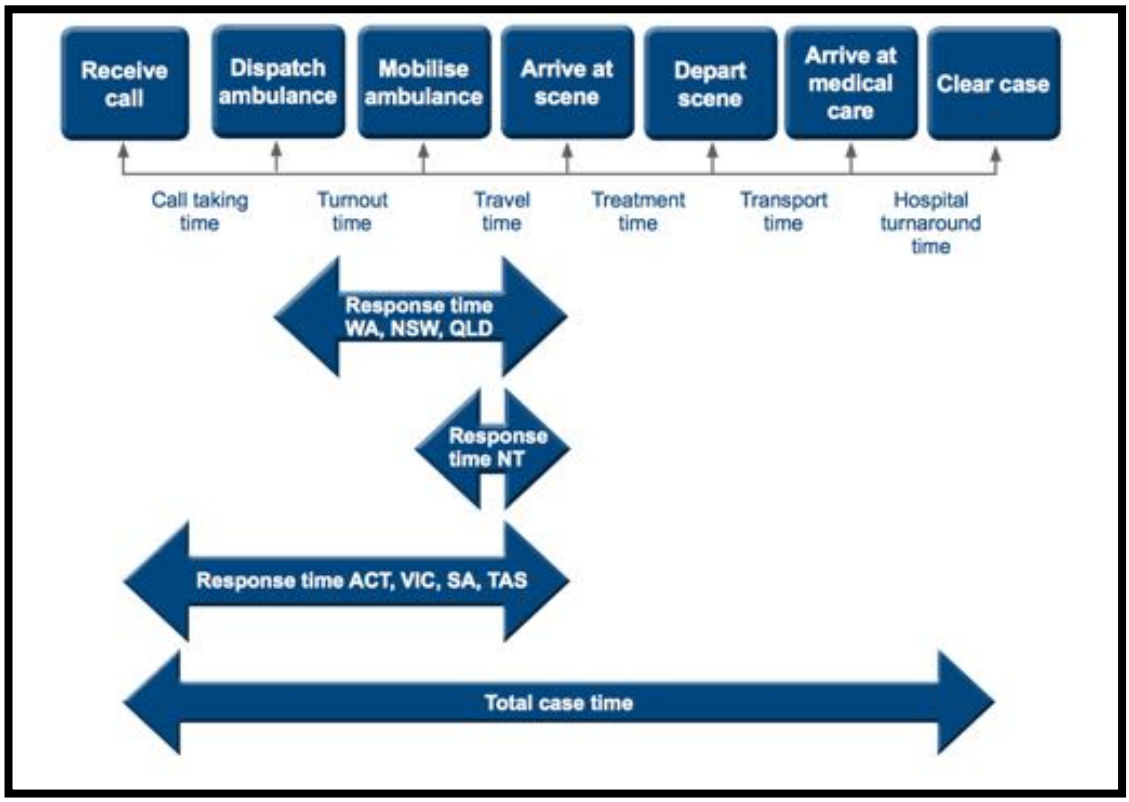
Response time targets in Australia have no basis in science and are governmental in nature. There is not a definitive EMS response time in the Australian literature although all agree that shorter response times to time critical incidents are desirable. The lack of national targets across Australia is demonstrated by the wide spread of response times. Below are some examples of response time and performance of Code One calls (Emergency, Sirens and Lights):

- Queensland Ambulance Service (2012-2013): Do not have targets but report performance at 50 percentile and 90 percentile - Metro North (Brisbane): 50 percentile, 8.4 mins. 90 percentile: 16 mins; Metro South (Brisbane): 50 percentile, 8.5 mins. 90 percentile: 15.4 mins. (Queensland Ambulance Service 2013)

- Ambulance Service of NSW (2011-2012): Do not provide any targets and only report 50 percentile for entire state. The 50 percentile was 10.93 mins. (Ambulance Service of NSW 2013)
- Ambulance Victoria 2011-2012: Do not provide 50 or 90 percentile but provide percentile against a target of 15 mins. The goal is to achieve this target on 90% of occasions. In metro areas with a population in excess of 7,500 the performance is 87.4% (Ambulance Victoria 2013)
- SA Ambulance Service (2011-2012): Performance is stated to be responding to 90.6% of life threatening cases in 16 minutes (SA Ambulance Service 2011-2012).
- Metropolitan Ambulance Service, Western Australia: achieved 92% for Priority One incidents against a target of 15 mins. (St Johns Ambulance WA 2011-2012).

The following figure highlights the problems presented when trying to benchmark ambulance response times across Australia.

Figure 14 Measure of response times for ambulance services in Australia (Response times are counted from different point s in time in different jurisdictions)



Source: Auditor General (2013)

Figure 15 Ambulance response times, capital cities, 90th percentile

Source: (Australian Productivity Commission 2017b)

In Victoria, Ambulance Victoria defines response time as the time from a triple zero (000) call being answered and registered by the Emergency Services Telecommunications Authority (ESTA) to the time the first AV resource arrives at the incident scene (Ambulance Victoria 2016b).

The problems of ambulance response times are an ongoing problem in Australia. In 2015 it was reported by the NSW Auditor General that ambulances are arriving at the slowest time in five years, with response times well above the national average: the median response time for urgent calls has risen from 10.8 minutes in 2013-14 to 11.2 minutes in 2014-15, while the national median response time is 9.4 minutes (Wood 2015).

It has been reported that NSW Ambulance Service is taking 20-30 minutes to respond to emergencies when the target is 8.2 minutes. The 2015 Report on Government Services states that Sydney has the worst record for answering 000 calls and the longest response times of any capital city (Miranda & Dunlevy 2015).

As a comparison, in the USA target response times may vary from 4 to 8 minutes (International Association of Fire Chiefs & International Association of Firefighters). The same problems exist in that they all record different things. For example, in Seattle the Fire Department has a response time target to life threatening emergencies of 4 minutes on 90% of occasions (Seattle Fire Department 2012). The

target time does not include call handling or dispatch, which is included in the Victorian figures. A major challenge will be to compare like to like.

The Western Australian Auditor General acknowledges that response times are widely used in Australia and internationally as the main performance measure for Ambulance services, and that the response time target of 90% of Priority One calls within 15 is being met (Auditor General 2013). He also makes the point that this measure does not take into account patient outcomes, a view shared by the CEO of Ambulance Victoria (Sassella 2005). He indicated a need to look at issues such as patient outcome, pain management and patient satisfaction in addition to response times (Sassella 2005). Similar changes were occurring worldwide (McLay & Mayorga 2010; Myers et al. 2008; Turner 2011; Wankhade 2011). Issues such as cardiac survival, pain management and patient satisfaction were common themes across all countries regardless of system delivery method. The Australian Productivity Commission includes patient satisfaction in its current performance measures for Ambulance Services (Australian Productivity Commission 2017b).

3.4.2. Golden Hour

The term "Golden Hour" has been part of the vocabulary of emergency medical practitioners for many years. During the First World War French Research showed that mortality reduced to 10% with treatment within one hour of injury compared to 75% at eight hours (Little 2010). More recent literature attributes the term "Golden Hour" to Dr Cowley, MD:

> There is a golden hour between life and death. If you are critically injured you have less than 60 minutes to survive. You may not die right then, it may be three days or two weeks later-but something has happened in your body that is irreparable (Cowley, as cited in Little 2010, p. 4)

Data from the military from WW1, WW2, Korea and Vietnam showed reductions in mortality with shorter times for removal of the injured from the battlefield to medical care. The helicopter played a major role in this process in the later conflicts.

These experiences were to have a major influence on the evolution of civilian EMS systems that were going through major change in the '60s and '70s. Systems were created to quickly move casualties from the scene of injury to specialized trauma centres, in many instances using helicopters. As these systems evolved there was a need for rapid on-scene triage, minimal on-scene treatment and rapid transportation to

emergency departments. The outcome was that there was considerable focus on the response times of EMS providers.

In more recent times there has been much controversy about the validity of "golden hour". Whilst there is no doubt that for some emergencies response time is critical, it can be argued that it is not the time but what is done within that time that matters most (Little 2010; Newgard et al. 2010).

Figure 16 Golden Hour

Source: Commonwealth of Australia

Figure 17 Helicopter

Source: Cpl. Hamish Paterson, 1st Joint Public Affairs Unit, Commonwealth of Australia

Emergency medicine in the military continues to evolve in places such as Afghanistan and Iraq, and will continue to provide innovation that will ultimately transfer to civilian EMS.

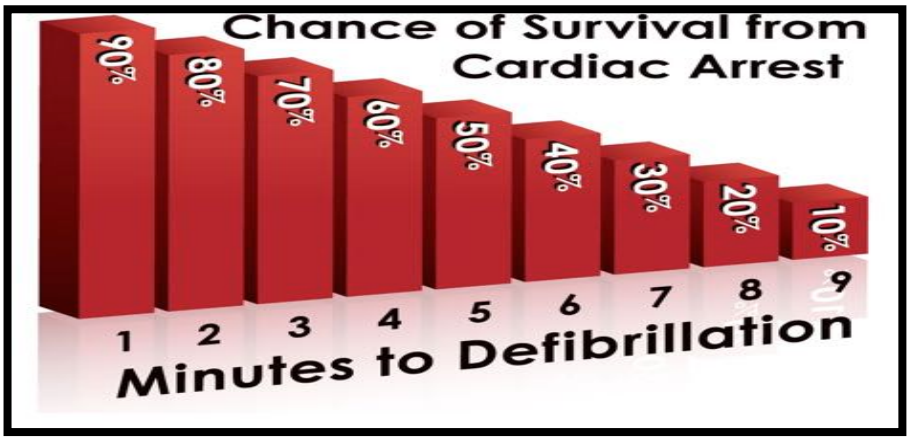
In a recent article in *Australasian Science*, the notion of the "golden hour" was replaced with that of the "Platinum 10 minutes" as the new window of opportunity and the development of new drugs to assist in treating catastrophic injury (Dobson 2015). In the past stemming blood loss could damage the brain, and treating the brain injury could result in further blood loss. The new drugs and protocol treats both blood loss and

damage to the brain. It is being developed by a collaboration between James Cook University in Australia and the US Military (Dobson 2015).

3.4.3. Why Is Response Time Important?

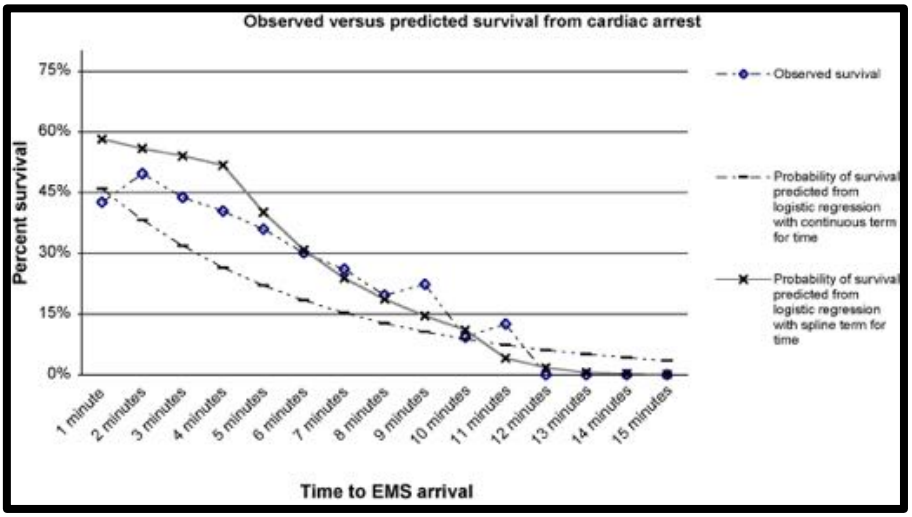
For incidents involving heart attack the chance of recovery is dependent on the speed of intervention. The following graph shows the problem.

Figure 18 Chance of Survival



Source: iPad (http://www.ipad-aed.com/wpcontent/uploads/2013/10/graph.jpg)

Figure 19 Observed versus predicted survival form cardiac arrest



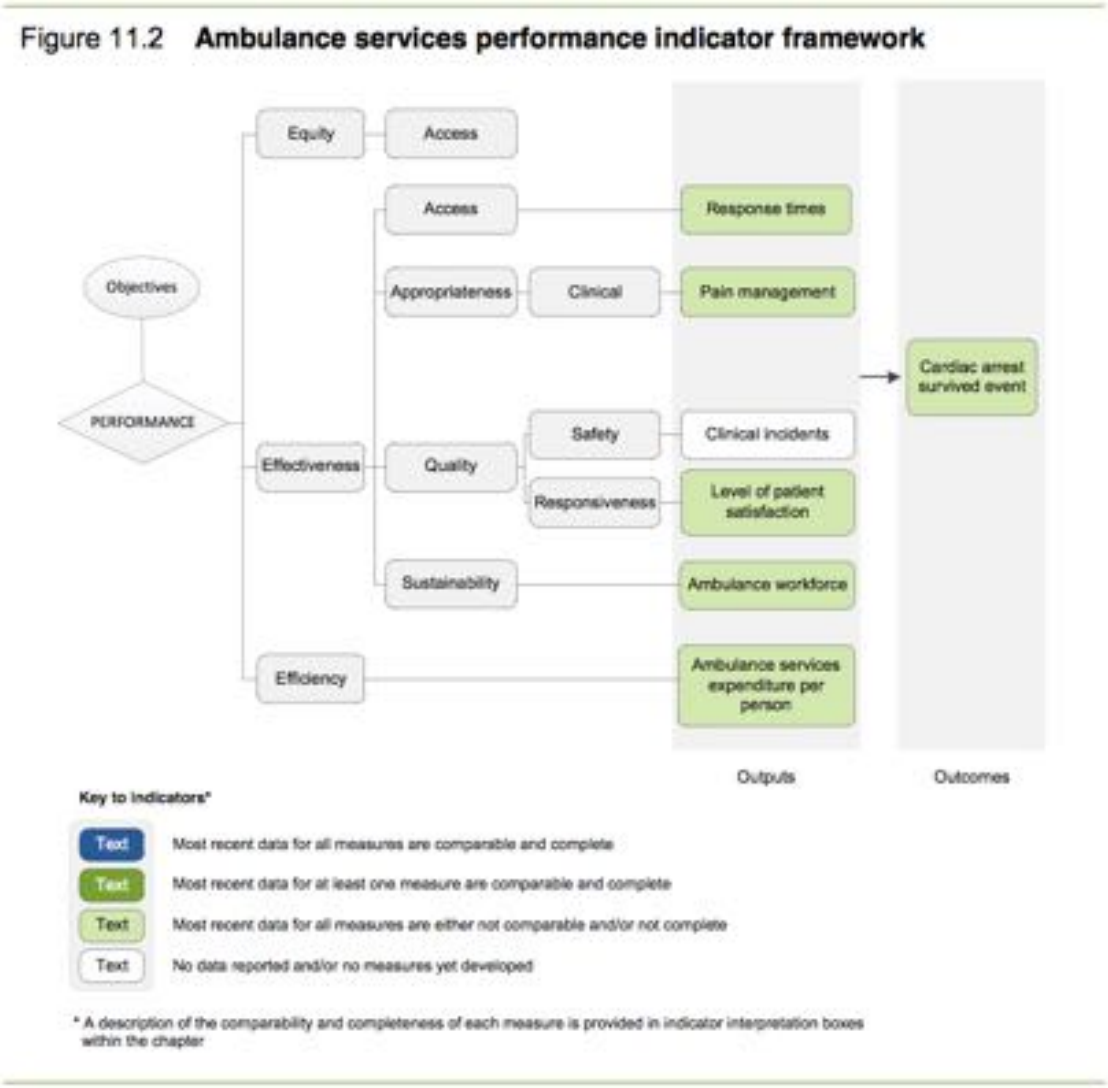
Source: Resuscitation Volume 81, Issue 5, May 2010, Pages 622-625

(Gold et al. 2010)

There are other time-critical medical emergencies such as major bleeding, severe trauma, and near drowning to name a few.

In 2012 the Australian Productivity Commission produced a performance model framework for ambulance services (Productivity Commission 2013). The final outcome was produced following a period of public comment. The outcome closely reflected the submission made by The Council of Ambulance Authorities Inc., an organization that represents ambulance organizations in Australia, New Zealand and Papua New Guinea (The Council of Ambulance Authorities 2013).

Figure 20 Ambulance events performance indicator framework



Source: (Australian Productivity Commission 2017a, p. 11.6)

The literature shows that there are difficulties with performance measures in health settings as many of the findings are subjective, such as pain management and patient satisfaction. Levels of medication would also influence patient satisfaction responses. In the area of trauma it has been deemed that there are too many variables for the outcomes of the EMS intervention to be measured. The main definitive measures are

cardiac survival and response times (Eddy 1998). It is intended that this research will explore and compare these issues (Linwood et al. 2007; Office of Emergency Medical Services 2013).

Other areas of significance to be researched are the use of technologies for both patient management and for training (Barr 2012). Levels of training and qualifications also have potential impact on patient outcomes (Fischer et al. 2011; Texas Children's Hospital 2012). A comparison of skill levels and use of technologies will form part of the research.

There is a major knowledge gap in that it appears that there is no academic literature comparing Victoria's (or Australia's) ambulance-based EMS system to the USA fire-based system. There has been some academic comparison of other EMS systems internationally, which can provide existing research models on which to build. There will be a need to benchmark outcomes such as response times and cardiac events and to ensure the comparisons are like with like. The research will help address an existing gap in the literature and possibly provide a new model for comparing EMS services by bringing together disparate existing research in this field.

3.5. CHAPTER 3 SUMMARY

This chapter has provided information from a broad-based literature review of the theory and practice of Performance Management. When considered at the individual level, performance management is a process that provides feedback, accountability, and documentation for performance outcomes. It helps employees to channel their talents toward strategic objectives and organisation goals. Performance management is also directed at department and organisational levels. In the context of this research, response times are a universal measure of organisational performance balanced against the resources available to the organisation. It has looked at performance management in both the private and public sector and explored differences, as well as identified the resistors to transformative change in the public sector and explored the wider concept of leadership, power, culture and influence of management and labour also of public sector unions. The chapter has also reviewed the current use of performance measures in EMS, described response time and the various elements affecting the final figure, and outlined the importance of short response times for time critical medical emergencies.

Chapter 4, which follows, provides a broad overview of research methodologies. In addition to exploring the wide range of research options and discussing quantitative,

qualitative and mixed methods whilst also explaining advantages and disadvantages of each method, it explains why a particular research methodology was chosen for this project and describes the case study method and its application for this research. Finally, it looks at data collection and analysis in the context of this project and the use of thematic analysis to identify emerging themes across cases.

CHAPTER 4: RESEARCH METHODOLOGY

Selection of Research Method

The process begins with the research questions. The researcher then needs to decide whether to use qualitative, quantitative or mixed methods. “A design is then based on bringing together a world view or assumptions about the project being researched, strategies of inquiry and research methods. Decisions about choice of design are further influenced by the research problem being studied, personal experiences of the researcher and the audience for whom the researcher writes”. (Veal 2005)

Roger Bennett (1991) has defined research as “a systematic, careful inquiry or examination to discover new information or relationships and to expand/verify existing knowledge for some specific purpose”. Bennett (1991, as cited in Veal 2005, p. 3) noted that the specified purpose may be theoretical or practical. The objective of the proposed research is to compare ambulance to fire service EMS delivery systems and the results produced for the patient. A significant amount of the required Australian information is available as secondary data in the public domain in the form of annual and investigative reports, such as those produced by the Victorian Auditor General (Ambulance Victoria 2013; Auditor General 2010). For local case studies requests for additional information in the form of internal documents and interviews were made directly to Ambulance Victoria and the Emergency Services Telecommunications Authority (ESTA; Emergency Services Telecommunications Authority). For international cases, the data was collected from questionnaires, fire department websites, annual reports, strategic planning documents and statistics from the National Fire Protection Association (NFPA) and the National Fire Administration (NFA) USA.

The research to be undertaken for this project is a multiple or comparative case study (Yin 2014). It has been designed to examine a number of performance outcomes in eight fire departments related to response times and patient outcomes. The data for this study was collected using a mixed-methods paradigm, with the majority of the data being qualitative (Creswell 2013; Plano Clark & Creswell 2007; Tashakkori & Teddlie 1998).

In early research Guber and Lincoln (Guber 1981; Lincoln 1986; Lincoln & Guber 1985, 1986) discussed judging the quality of the “inquiry process”. The key issues identified by this research were “trustworthiness and authenticity”. More recent

works by the same authors make the case that the "product" is as important as the "process". The product of the research is the case study.

The project was multi-phased. The first phase was to research multiple sources for primary and secondary data (Sapsford & Jupp 2006, p. 150). The second phase consisted of administering questionnaires to verify the previously collected data and open-ended questions to explore other areas pertinent to the research questions (May & Cantley 2001). The final phase was conducting interviews to both verify earlier data and to explore other key issues in depth (O'Leary 2009). The targets of the questionnaires and interviews will be the Fire Chiefs or operational heads of the organizations.

As the study involved questionnaires and interviews there was a need to ensure participant safety and ethical treatment (O'Leary 2009). Approval for the project was obtained from the Ethics Committee from the researcher's university.

The selection of organizations for the case studies was purposive (Veal 2005). The organizations chosen for this research are fire and ambulance services that provide a level of EMS delivery to the citizens that they serve. The organizations were chosen on the basis of similar size, budget, staffing and risk profile to the two key organizations under review in Australia. Advice regarding exemplars in the field was sought from key members of the Metro Chiefs Association including an acknowledged EMS expert. These sources were also used to identify organizations that may be willing to participate in such a study (pragmatism; Creswell 2009).

4.1. AN OVERVIEW OF POTENTIAL METHODS

In the field of social science research there are two central paradigms: positivist and critical/interpretive approaches (Creswell 2009; Veal 2005). The first adopts a positivist approach, or one that assumes that the world is "external and objective to the researcher" (Veal 2005, p. 25). This type of research is similar to that adopted in the natural sciences. The second is the critical or interpretive paradigm in which the researcher is seeking to undercover meaning and understandings of the broad interrelationships of the material they are researching (Veal 2005, p. 25).

The predominant research paradigm for this research will be the critical or interpretive paradigm but will also contain elements of the positivist approach.

4.2. QUANTITATIVE RESEARCH

"Not everything that can be counted counts, and not everything that

counts can be counted" Albert Einstein (as quoted in O'Leary 2005, p. 254)

Veal has stated that the quantitative approach to research involves the gathering and analysis of numerical data (Veal 2005). Such an approach uses numerical evidence to test hypotheses and conclusions. It may involve data on large numbers of people or organizations and will often use computers to analyse the data. With a large sample the aim is to use the results produced to represent an even larger population and allow generalizations. The source of the data may be from observation or can also come from primary data, e.g. personnel statistics. When dealing with quantitative data there is a need for the researcher to understand variables, which may be dependent or independent, and measurement scales to capture the difference within a variable (Creswell 2009; O'Leary 2005).

4.3. QUALITATIVE RESEARCH

Qualitative research methods incorporate a theoretical framework. It may be identified prior to the collection of data or may evolve as the research progresses. In mixed methods it may well be a combination of both.

Qualitative research "involves gathering a great deal of rich information about a relatively small number of subjects" (Veal 2005, P. 26). Conclusions are not based on analysis of statistics and are not presented in numerical form. As the studies involve small numbers of case studies it is not possible to claim that they are representative of a larger sample.

Qualitative research covers a broad range of research methodologies and examines the why and how of decision making, as opposed to quantitative research, which wants to identify the what, where, when and how. Qualitative research is used in the field of sociology to better understand government and social programs. It usually involves collecting a lot of "rich" information from a relatively small sample, although there are exceptions to this rule (Creswell 1998).

The advantages of using qualitative methods include enabling the researcher to grasp and explain in detail personal experiences of individuals, providing a basis for understanding and interpretations rather than laws of behaviour (Garner & Scott 2013). It also enables the researcher to experience an issue from the participant's perspective.

It is only by using qualitative methods that the researcher may discover the use of new time-critical drugs on the patient that may have resulted in different outcomes.

In doing so the research will address the issues raised in the aims of this project and seek to provide a model that offers an opportunity to enhance patient outcome. It is intended to take a positivist view of the information collected in that the data in "the world is external and objective to the researcher" (Veal 2005, p. 24-25).

Qualitative research results may be reported in the form of a narrative instead of statistical form. It is a useful means of exploring personal changes over time. The issues explored by this type of research are of particular interest to managers of people (Veal 2005; Yin 2014).

4.4. MIXED METHODS

Quantitative research has been described as limited data about a large number of subjects (as opposed to qualitative research, which is about a large amount of information on a few subjects). The main difference is the nature of data collection, but there is a widely held view that the two methods complement each other. Use of multiple methods in a research project can overcome weaknesses or biases created by using a single method (Denzin & Lincoln 2017; Tashakkori & Teddlie 1998). Mixed method combines both quantitative and qualitative concepts (O'Leary 2009; Veal 2005).

4.5. CASE STUDIES /MIXED METHODS

The case study and mixed methods were chosen as the most appropriate for this study because the researcher is seeking to deal with "how" or "why" questions regarding a social issue, and the research fits the criteria outlined in the literature (Yin 2009, p. 4; Veal 2005, p. 169). The study to be undertaken would be a descriptive study and could be called a self-contained "portrait" of each case (Veal 2005, p. 173).

Use of the case study method enables an opportunity to make the connection between practice and theory and allows improvement in business practice (Serio, Nanut & Borgonovi 2016). Helen Simmons (2009) as quoted in Thomas (2016) provides the following definition of a case study:

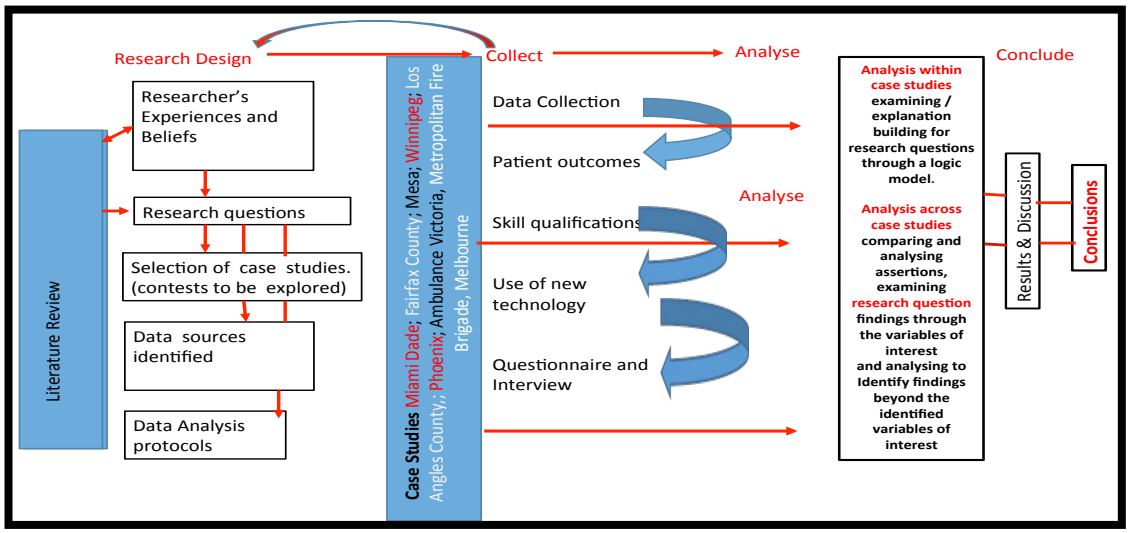
> Case study is an in-depth exploration from multiple perspectives of complexity and uniqueness of a particular subject in a real life context. It is research-based, inclusive of different methods and is evidence led. The primary purpose is to generate in-depth understanding of a specific topic (Simmons, as cited in Thomas 2016, p. 10).

Each case study is undertaken as an individual study. Within the case study methodology it is possible to apply a mixed method of research to each individual case. The reason for choosing this method is that there is quantitative data to be collected and analyzed, but also qualitative data; the challenge will be to integrate the results (Bergman 2008; Plano Clark 2007; Silverman 1999). It is claimed in the *Journal of Mixed Methods Research* that mixed methods is the best for social and health research (Mertens 2013).

An important difference between a case study and other research is the number of cases. In broader research a little is learned about a large number of cases, whilst in the case study method the researcher will learn much more about a small number of cases (Creswell 2013; Veal 2005). There are an optimum number of cases for quality case study research, depending on scale, time and budget. This research has elected to use eight case studies. They are reviewed holistically by examining them from multiple sources of data collection and focusing on the specific research questions (O'Leary 2005; Stake 2005). A case can be undertaken when the subject being studied has a distinctive identity and can be studied in isolation from its context. A "case" needs to be a self-contained entity with clear boundaries. Each agency (fire and ambulance) to be researched has clear boundaries – both legal and geographic – and is a self-contained entity (O'Leary 2009; Veal 2005).

The focus of the research is restricted to the scope of the research questions and care needs to be taken related to wider implications. Case study research focuses on an understanding of dynamics in a single setting and enables the researcher to take a holistic view (Denscombe 2014). In this research, by having a small number of cases (eight) it is possible to provide a level of detail and a depth of study not possible with a large number of cases (e.g. all 29,000 fire departments in the US). By choosing a small number of cases it is also possible to have a better understanding of the interactions between the parts of an organization (Creswell 1998). Other considerations included access to information, scale of the task and the value of the outcome. Whilst a small sample has limitations it does not prevent outcomes that have implications across a broader number of agencies (Creswell 2013; Silverman 1999; Thomas 2016; Veal 2005). As stated earlier, the proposed research (Figure 20) will use mixed methods and where possible triangulation that will combine qualitative and quantitative components.

Figure 21 Research Design



Source: adapted from Starkey (2010)

The above chart is a visual representation of the process to be undertaken in this research project. It is designed to be flexible to allow changes during the research phases. The literature review will explore the subject matter and research methodologies and assist in the development of research questions, selection of case studies, identification of data sources, collection methodologies and data analysis. Each case will be researched for the material appropriate to assist in answering the research questions, but also to allow the researcher to identify new material/directions relevant to the overall research. The data will then be analyzed to identify trends, themes and patterns. The results will be reviewed and conclusions formed and documented. Whilst a comprehensive literature review is undertaken as one of the first tasks in the research project, literature review is actually a continuous process of review and confirmation using all available literature sources during the entire research project. Finally, the results are presented and discussed, and conclusions drawn.

The purpose of the research is to explore the problem of ever increasing ambulance response times to unacceptable levels in Victoria, Australia and to answer the following research questions:

1: Which EMS delivery system provides the optimum outcomes for the patient; the ambulance-based system used here in Victoria or the USA and Canadian fire-based systems?

2: Survival rates from cardiac arrest

3: Skill levels

4: Use of advanced technologies/innovation

5: Does the metropolitan fire brigade in Melbourne have capacity to take on a supportive role in EMS?

4.6. TRIANGULATION

The term is taken from a land-surveying term that means fixing a point by coming at it from two or more different directions (O'Leary 2009). In research it involves using more than one method of data collection in a single study.

Weaknesses in one method can be compensated for by the strengths of another. True triangulation occurs when multiple methods of data collection are used to answer the same question. Any differences in outcomes should form part of the research findings (Plano Clark & Creswell 2007; Tashakkori & Teddlie 1998; Thomas 2016). The use of triangulation provides greater confidence in the validity of the data and also helps to ensure objectivity (Sapsford & Jupp 2006, p. 89).

In this research, wherever possible the researcher has used more than one source of information to verify data. An example of triangulation at work is the Miami-Dade Fire and Rescue; in this case the researcher used secondary data such as annual reports, a questionnaire and an interview. This has been repeated for each case study to maximize the quality of the data collected.

4.7. POSITIONALITY/BIAS

When a researcher is immersed in a subject both by study and previous roles there is the potential for this background to influence the nature of observations and interpretations. Given my previous history as firefighter/Fire Chief and involvement in emergency services for over 40 years it is important that this background be declared upfront. Whilst every effort is made to just report on factual information free of biases, such a declaration is important for others who may read the research and its findings. If people are unhappy with the findings of the research they may well accuse the researcher of bias to try and discredit the findings (Hammersley 2010).

Nevertheless, research undertaken by MacCoun (1998) shows that the impact of bias can be overstated. Evidence suggests that biases are most often subtle and of small magnitude. When the evidence is strong and comprehensive, any biases are minimized. There are no problems with a researcher taking an advocacy role provided they declare their background and are explicit in declaring their position (MacCoun 1998). In

addition, to minimize the impact of bias, the data collection and analysis was reviewed by independent reviewers and intersubjectively assessed (Groen 2007).

4.8. CASE STUDY SAMPLE SELECTION

Case study selection involves two distinct processes. The first is to define the case and set boundaries that will give meaning and contain the elements the researcher wants to explore. The second is to select a number of cases that are within the defined boundaries (O'Leary 2009; Veal 2005).

This research involves case studies of a number of organizations, eight in total. It also involved reviewing a number of other organizations that had implications for the research questions. The selection of the cases was purposive in that the organisations were chosen based on size, nature of risk, geographic location (to provide a spread) and provision of Advanced Life Support (ALS) EMS (Veal 2005). The final selection engaged comparison within and between nations, with two organisations in Australia, seven in North America and two in the United Kingdom.

4.8.1. Victoria, Australia: Metropolitan Fire Brigade (Melbourne) and Ambulance Victoria

These are the key target organizations for this research project and core conclusions will focus on these two cases.

4.8.2. United States

Six US fire departments were chosen to cover a geographic spread of north/south and east/west. Also the fire departments were chosen to be of similar size and cover similar risks to those in Victoria where possible. The nature of the risks included a Central business district, airports, commercial, industrial, and suburban areas. One department, which did not fit the size and geographic parameters, was recommended as an exemplar in the field undertaking creative and cutting-edge innovations by key industry experts in the US, and has been included.

These organisations are:

- Miami Dade Fire and Rescue, Florida
- Fairfax Fire and Rescue, Virginia
- LA County Fire Department, California
- Mesa Fire and Medical Department, Arizona
- Phoenix Fire Department, Arizona

- New York City Fire Department It was included on the basis of the lessons learnt from the merger of fire and EMS. What went wrong, what worked and how the problems of a merger can be addressed?

4.8.3. Winnipeg, Canada

A Canadian example was offered as an example from another North American country and would enhance the result. Winnipeg was chosen as they had recently combined separate fire and ambulance services into one organization. The results and the lessons learned from this case study were invaluable.

Each of the services chosen as subjects of this research provide ALS. Most also provide medical transport; LA County is an exception with the medical transport provided by a third party. It is acknowledged that there are many models of delivery of EMS in the US and all are not covered by this research.

4.8.4. United Kingdom: UK Ambulance Service and UK Fire Service

These two organizations are important, as they were behind the creation and evolution of the two Victorian fire and ambulance entities. They differ from the other case studies in that they deal with country wide overviews of multiple services. It is important to look at their continued development and to benchmark them against current targets and practices in Australia. It will be possible to identify significant similarities/differences in service delivery and roles between the UK and their Australian counterparts.

The following chart outlines the common material that will be collected for each case study to enable comparisons to be undertaken and was created by the researcher.

Table 1 Summary of the characteristics of the selected case studies

Case Studies 1-8	Response times including all elements	Size	Staffing and skills	Number of calls	Types of calls	EMS Response	Innovations	Use of new technologies

4.9. DATA COLLECTION

Data can be primary or secondary. Primary data is new information that the researcher has collected as part of the research project. Secondary data is data that has been collected by others for other purposes and is being used by the researcher as a secondary user. The majority of the data collected for this project was secondary data. Data such as annual reports from the agencies being studied or reports produced by

third parties such as the Auditor General, questionnaires and interviews were used. A challenge was to ensure the units of analysis such as response time were recording the same information and as such were consistent in each case.

Data for this research was collected in a number of ways, including individual interviews, group interviews or focus groups, participant observation ethnography and biographical research. A questionnaire was also developed and used. The questionnaire collected some quantitative data but also a significant amount of qualitative information: it consisted of some closed questions seeking factual information, and open questions seeking the respondents' opinions or views on certain issues such as the adequacy of the current performance indicators, use of technology and innovation (Cohen, Manion & Morrison 2013).

The data used included 'grey literature', defined as

> that which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers ... i.e., where publishing is not the primary activity of the producing body (Rucinski 2015, p. 550)

It includes most literature produced by governments and public-sector agencies. Grey literature can be of very high quality and is invaluable for the researcher. Much of the source literature used for this project came from grey literature sources (University of New England 2017).

A key issue is consistency with the units of analysis across the cases. This comment is particularly true as many agencies record different measures for response time. Were possible the data collected for each case covered the same time frame (Veal 2005). In addition, a template was developed to ensure the same data was collected from each case study to enable the researcher to create similar holistic understanding of each case. Such data can then be used to identify trends across the cases.

A large amount of numeric data was collected from each case. The information included response times, manning of vehicles, breakdown of calls into type (e.g. fire, EMS), staff numbers, vehicles and stations. The source of this information is in the main from secondary sources such as annual reports, auditor reports, strategic planning documentation, official statistics and city websites. To validate/confirm the data collected from these sources, questions requesting data, particularly related to response times (including breakup of the segments of a call) was also included in the questionnaire and interviews (triangulation; O'Leary 2009). The data used in the Case

Studies was consistent across sources within the same case study. To ensure that similar data sets was available for each case study a template was created to collect data from each case, summarized at the beginning of each.

The interviews conducted were semi-structured, in that they covered the issues raised in the questionnaires but also included open questions to potentially explore new issues regarding the future delivery of EMS (Seidman 2013; Thomas 2016).

The collection and analysis of the quantitative data addressed the following 2 research questions:

1: Which EMS delivery system provides the optimum outcomes for the patient; the ambulance-based system used here in Victoria or the USA and Canadian fire-based systems? Do response times vary significantly under different models of service delivery?

2: Survival rates from cardiac arrest: Do survival rates from cardiac arrest vary significantly under different models of EMS delivery?

It was anticipated that the quantitative component would give rise to questions that needed to be addressed in more detail, thus necessitating some follow-up qualitative research: in particular, it was expected that this would involve comparisons between levels of training, skills and use of technologies.

The researcher also intended to interview the CEOs and other key personnel of the organizations and key associations to further understand future directions in measuring performance outcomes and service improvements in EMS. In the case of the USA fire service departments, the option not be identified was given to help create an environment of openness and disclosure. All participants agreed that their agencies could be identified.

The collection of the qualitative data addressed the following 3 research questions to be answered:

3: Skill levels: How do competency levels compare across service delivery models?

4: Use of advanced technologies/innovation: Do all EMS delivery systems take advantage of advanced technologies for training, quality control and patient management? This research will be undertaken by interview, on-scene analysis and literature review.

5: Does the metropolitan fire brigade in Melbourne have capacity to take on a supportive role in EMS?

The research was undertaken by using in-house and publicly available documents (Annual Reports, Auditor General's Reports) to collect the quantitative data in the first instance, followed by the qualitative information regarding training, skills and use of technologies. Finally, interviews were conducted with key people to validate and conform the earlier data and also look at future directions for performance measures and delivery models in EMS. The research aimed to clearly describe the different delivery systems for EMS and identify and compare the performance outcomes for the patients.

At the end of the research, it should be possible for other researchers to use the material produced for further research and comparison of different EMS systems. It may well produce a new model which others may be able to use in conducting similar comparisons.

4.10. DATA ANALYSIS

There are three main methods of analysis in case studies as identified by Burns (1995, p. 324-325) and Yin (1994, p. 106-118), as quoted in Veal (2005, P. 177). These are: pattern matching, explanation building, and time series analysis. Each case is a "container" of information, circumstances and trends that can be identified and analyzed in a holistic manner to better understand the subject case individually. There is then a need to look at each case and try to identify emerging themes and categories (Cohen, Manion & Morrison 2013; Gray 2014; Thomas 2016).

The researcher examined the data for linkages identifying patterns and abstracting ideas from the collected data. It is important for the researcher to construct a narrative to helps explain the findings in the data (Thomas 2016; Veal 2005). A review of the cases identified trends in quantitative data, detecting increases and decreases and identifying if such movements are occurring across the range of cases. The research then identified resource allocations and distribution of capabilities across the range of cases.

Regarding qualitative data one of the methods of data analysis is thematic analysis, which involves the researcher identifying implicit and explicit ideas or themes as opposed to just counting words or phrases (Guest, MacQueen & Namey 2012). The researcher followed the principle that the data analysis is continuous; in other words, it

is conducted at the end of data collection but also during it. As data is collected it was continually reviewed in light of the research questions with an awareness it may also influence further research (Hammersley 2010; Seidman 2013; Silverman 1999; Stake 1995).

As part of the data analysis the researcher laid out the material collected from all cases and looked for themes. All agencies collect and include response time targets and performance against those targets. The challenge was to be able to do meaningful analysis of what information was collected to enable valid comparisons.

It became clear that all agencies were dealing with an increased demand for EMS services. There were a number of issues creating the demand; these included changing demographics, with the aging of baby boomers, population growth, and increased living densities.

A significant demand on the provision of ALS services was inappropriate calls where the actual event did not warrant the highest level of response. A number of agencies were implementing proactive programs to try and filter out these inappropriate calls and providing alternate response strategies.

Another theme identified was the number and qualifications of those attending to EMS calls. For example Miami-Dade dispatches a vehicle with a minimum of two paramedics and two EMTs whilst Ambulance Victoria may respond an ambulance with a crew of two Paramedics (Australian qualifications).

During the process of data collection a number of the questionnaires were not completed. In total three completed questionnaires were received. In one case there was a delay in responding, and a significant amount of data regarding that case was collected from public sources. When the questionnaires from that service were returned, they requested them to be anonymous. As I had already collected significant data from publicly available material I asked for their permission to publish this material with the agency identified rather than use the questionnaire. On reviewing the material the Department indicated to me they were comfortable with me using the public material and identifying their service. It was felt that the identification helped demonstrate the geographic spread and was more important than using the questionnaire and having one department not identified.

The research and questionnaire were to be followed by interviews. As part of this process the researcher attended the Metro Chiefs Conference in the US. The timing

could not have been worse. At the time of the Conference the US was experiencing significant civil unrest related to the Black Lives Matter movement. There had already been instances of rioting in a number of cities (Ferguson, Baltimore, Charlotte). In light of those circumstances a number of chiefs who had indicated they would meet with me did not attend or were very busy. The problem was exacerbated by the location of the conference. Not many Chiefs were prepared to be absent whilst their cities burned and the Fire Chief was in Las Vegas, as the local press would have a field day. In the end three interviews were done, one in person and the others by telephone. The various sources of information were collated to ensure accuracy of the data collected.

When all of the data was collected the cases were placed side by side to try and identify any trends or themes. It was a major challenge to identify the components of response time as not all agencies collected the same data. Some defined response time as time from first call to arrival on-scene, others measured the time from station notification to arrival on scene (excluding call handling and dispatch). The NFPA Code allows two minutes for response time, but in many real life calls it is considerably longer. It is understandable that agencies do not want to be responsible for services that may be provided by a third party, but to the patient the time from call to arrival is their main concern. The majority of agencies collected this data even when those services were provided by a third party. Ambulance Victoria and the Metropolitan Fire Brigade (Melbourne) are examples of a third party providing these services.

Other issues of importance included the geographic size of the department, number of staff, number of staff/vehicles that responded to ALS calls, qualifications of responders and proportion of EMS calls compared to fire calls. A common theme was the problems posed by ever-increasing demands for EMS services. Most agencies were implementing strategies to try and minimize these demands, some developing and trialling creative proactive solutions.

There was significant use of new technologies and drugs to improve performance. New technologies also allowed smarter use of the data collected. The quality of the data was dramatically improved by collecting it electronically rather than manually, usually after the event.

Wherever possible the data collected was compared with national data. Such comparisons are called ‘external benchmarking’ and are an invaluable tool to assist in analysis and to determine if the data collected is within an acceptable range. If not, it raises the question as to why (Feys & Probert 2015).

4.11. ETHICS

Ethics is an essential part of the research process. Consideration must be given to the types of participants, consent, confidentiality, and data security, and ensure the research is done under the auspices of a university to obtain ethics clearance (May & Cantley 2001; O'Leary 2009; Veal 2005; Yin 2014).

As the proposed research involves questionnaires and interviews, ethics approval has been obtained from the university. All departments approached for use of the questionnaire or for interviews were informed of the option of being anonymous if required. The use of information in the public domain does not require ethics approval.

4.12. CONCLUSIONS

Having reviewed the available methodologies it was felt that the case study method was the best in this instance. The selection of the cases was purposive (Veal 2005, p. 209). Mixed methods allowed for the broadest collection of data within each case. The data was collected from a number of sources by different means (triangulation) to enhance quality, then it was examined and evaluated within each case and compared to the other cases to identify themes and hard data (Creswell 2013). The cases were then written up in a manner that would allow a reviewer to understand the process and identified outcomes.

4.13. CHAPTER 4 SUMMARY

This chapter provided a broad overview of the research methodologies available to the researcher. Mixed methods case studies were chosen as the best options for this research because they would be most likely to produce the required results. Case study method was explained, with discussion of its advantages and shortcomings. Explanations were provided regarding the selection of the cases to provide a geographic, risk profile and international spread. Additionally, this chapter explored the methods and sources of data collection and the advantages of triangulation, as well as some of the challenges related to data collection from multiple sources. The chapter also looked at the data analysis tools, identified themes from the data collected and addressed the issues of ethics, positionality/bias and the need to compare like data.

Chapter 5, which follows, provides a comparison of skills and EMS training between North America and Australia, and also an overview of a number of case studies from Australia, USA and Canada. It provides background to the evolving system of

regulation, accreditation and skills in the USA, by outlining the training requirements and skills sets required for each level and describing the qualifications and tasks for three levels of EMS providers including First Responder, EMT and Paramedic. After explaining the difference in terminology of EMS titles between North America and Australia, the legal limitations on performing some tasks are also outlined.

CHAPTER 5: COMPARISON OF EMS QUALIFICATIONS AND SKILLS: USA AND VICTORIA, AUSTRALIA

5.1. INTRODUCTION

To undertake this research a number of case studies were identified and data collected. The aim was to identify metropolitan fire services in the US and Canada that also provided EMS to review their performance measures as they related to EMS response. The selection of the North American fire services was to ensure an East Coast/West Coast and North/South spread. It was also decided to include one Canadian fire service to add another dimension.

5.2. EMS COMPARISON: US

The American system to allow people to obtain the skills and licensing required to operate as qualified EMTs and Paramedics is complex, with requirements at both federal and state level. The system also varies state to state. By comparison the Victorian system is very simple.

5.2.1. US Qualifications and Skills

The skills, qualifications and approvals for US EMS providers are complex and involve many players. The actual approval to operate as an EMS professional is given by the states. Each state in the USA has an EMS lead agency or State Office of Emergency Medical Response. State EMS Offices issue licenses to EMS professionals and ambulance service providers. At this time 46 US States require their EMS professionals to be certified by the National Registry of EMTs (NREMT) in order to obtain a license to practice in their State. Some States require their EMS professionals to maintain certification with the NREMT as part of the continued license and others have their own license renewal schemes. All EMS Professionals are required to complete continuing education (NREMT 2015).

The current lead for EMS education standards in the USA is provided by the National Highway Traffic Safety Administration of the US Department of Transport (NHTSA). It is unusual for some that these standards are set by this agency and not a

health organization. The reason for its initial involvement was a dramatic rise in road toll and it continues to this day.

5.2.2. History of EMS Education in the USA

In the mid-1950s the American College of Surgeons developed the first training program for ambulance attendants. Prior to 1966 the EMS systems in the US were disjointed and not of a similar standard across the country. In 1966 a report was produced by the National Academy of Science outlining the problems. The report showed the scale of the problems in the following statement: "In 1965, 52 million accidental injuries killed 107,000 temporarily disabled over 10,000,000 and permanently impaired 400,000 American citizens at a cost of approximately US$18 billion" (*Accidental Death and Disability. The Neglected Disease of Modern Society* 2000, p. 5). The report went on to describe the current disjointed system, poor equipment and the lack of national qualifications for EMS providers. A number of recommendations were made to rectify the problems identified. To many this document was the turning point for the beginning of an organized system of pre-hospital care (Howard 2000). The report included 29 recommendations for improving care to injured victims. Eleven of the recommendations related to out-of-facility EMS and a number of these related to training and skills required by EMS personnel.

Also in 1966, the Highway Safety Act was passed which created the Department of Transport (DOT). The DOT was given the task of improving EMS, including implementation and development of standards for provider training. The Highway Safety Act (1966) also included funding to create an appropriate training course for emergency care providers. The first national EMT-A curriculum was published in 1969. Early programs focused mainly on cardiac care and cardiac arrest resuscitation.

Whilst there was now national curriculum, training standards and certification requirements varied significantly across the country (*EMS agenda for the future* 1996). In 1967 the *"Orange Textbook" Emergency Care and the Transportation of the Sick and Injured* and the text "*Training of Ambulance Personnel and others Responsible for Emergency Care of the Sick and Injured at the Scene and During Transport*" were the first national attempt to provide standardized EMS training (National Research Council 1966/2000).

In 1990 NHTSA convened the Consensus Workshop on Emergency Medical Services Training Programs. The event enabled diverse participants in the EMS

community to discuss needs and priorities in EMS education. Priorities established at this meeting set the national priorities in EMS education for the next decade.

The NHTSA convened an EMS conference in 1996. The conference had representatives from over 30 EMS-related organizations. The recommendations of this group resulted in the production of a report titled EMS Agenda for the Future (National Research Council 1966/2000). From this document came a further document titled *EMS Education Agenda for the Future: A Systems Approach* (Michael & French 2000). The Education Agenda was developed by a task force with representatives from a full range of professionals in the field including EMS administrators, physicians, regulators, educators and providers. The Task Force as a result of a consensus process proposed a system with 5 integrated components:

- National EMS Core Content
- National EMS Scope of Practice Model
- National EMS Educational Standards
- National EMS Education Providers Accreditation
- National EMS Certification

  (Michael & French 2000)

The purpose of the document was to provide a national framework that included minimum standards whilst still allowing state and local flexibility. The document clearly defined roles of participants and provided a mechanism for improving quality and updating material on the basis of scientific research. Physicians have the primary role of determining medical content, regulators the regulatory issues, and educators the educational issues. The EMS education system was designed to be supported by multiple instructional techniques (National Research Council 1966/2000). The report proposed a sequential process starting with National EMS Core Content, the purpose of which was to provide a universal EMS body of knowledge, skills and abilities (National Highway Safety Administration 2005).

The next to be developed was the National EMS Scope of Practice Model (National Highway Safety Administration 2007). Scope of practice can be explained as a description of what a licensed individual legally can and cannot do. The purpose of this document was to provide a national model. If used it would assist with consistency of nomenclature and competencies, facilitate reciprocity, improve mobility and enhance

public understanding and recognition of EMS (National Highway Safety Administration 2007).

Currently there is no federal agency with the sole responsibility of EMS. As recently as 12 May 2015, the Department of Transport (DOT) Secretary appointed 25 new members to the National Emergency Medical Advisory Council (NEMSAC). The role of NEMSAC is to advise the DOT and Federal Interagency Committee on EMS (FICEMS). Supported by National Highway Traffic Safety Administration (NHTSA) Office of EMS, the NEMSAC provides advice to the safety agency and its Federal partners on issues such as data collection, performance measurement and the EMS workforce (National Highway Safety Administration 2015).

As has been indicated earlier at this time (2015) 46 States require their EMS personnel to be registered with The National Registry of Emergency Medical Technicians (NREMT). The NREMT lists the skills required for national certification as follows:

- **Emergency Medical Responder (EMR), also known as First Responder**:

The primary focus of the Emergency Medical Responder is to initiate immediate lifesaving care to critical patients who access the emergency medical system. This individual possesses the basic knowledge and skills necessary to provide lifesaving interventions while awaiting additional EMS response and to assist higher level personnel at the scene and during transport. Emergency Medical Responders function as part of a comprehensive EMS response, under medical oversight. Emergency Medical Responders perform basic interventions with minimal equipment (NREMT 2015a).

- **Emergency Medical Technician (EMT):**

The primary focus of the Emergency Medical Technician is to provide basic emergency medical care and transportation for critical and emergent patients who access the emergency medical system. This individual possesses the basic knowledge and skills necessary to provide patient care and transportation. Emergency Medical Technicians function as part of a comprehensive EMS response, under medical oversight. Emergency Medical Technicians perform interventions with the basic equipment typically found on an ambulance. The Emergency Medical Technician is a link from the scene to the emergency health care system (NREMT 2015b).

- **Advanced Emergency Medical Technician (Advanced EMT):**

The primary focus of the Advanced Emergency Medical Technician is to provide basic and limited advanced emergency medical care and transportation for critical and emergent patients who access the emergency medical system. This individual possesses the basic knowledge and skills necessary to provide patient care and transportation. Advanced Emergency Medical Technicians function as part of a comprehensive EMS response, under medical oversight. Advanced Emergency Medical Technicians perform interventions with the basic and advanced equipment typically found on an ambulance. The Advanced Emergency Medical Technician is a link from the scene to the emergency health care system (NREMT 2015c).

- **Paramedic:**

The Paramedic is an allied health professional whose primary focus is to provide advanced emergency medical care for critical and emergent patients who access the emergency medical system. This individual possesses the complex knowledge and skills necessary to provide patient care and transportation. Paramedics function as part of a comprehensive EMS response, under medical oversight. Paramedics perform interventions with the basic and advanced equipment typically found on an ambulance. The Paramedic is a link from the scene into the health care system (NREMT 2015d; California Emergency Medical Services Authority 2015).

All of these qualifications require completion of a state-certified course for the required standard (National Highway Safety Administration 2005; *National Registry of Emergency Medical Technicians (NREMT)* 2015). The skills sets for each level are contained in The National Highway Traffic Safety Administration 2007 and are minimum requirements. States may impose variations and additional skills.

Different states have differing levels of skills and certification. In California there are four levels of EMT licenses. These include Emergency Medical Technician (EMT), Advanced Emergency Medical Technician (AEMT), Paramedic (MICP), and Mobile Intensive Care Nurse (MICN; California Fire Chiefs Association 2013 Annual Conference, 2013). On the other hand, in Florida there are only three levels: First Responder, Emergency Medical Technician (EMT) and Paramedic (Florida Administrative Code & Florida Administrative Register 2015).

As can be seen by the preceding material the process and skills requirements are complicated and may have many state variations. For the purposes of this research, Florida has been chosen as it is the State of the largest case study used for this research.

5.2.3. Florida First Responder

To become a First Responder or Emergency Medical Responder (EMR) a person must undertake Advance First Aid training course and pass an examination. Colleges, certifying medical associations and public service organizations, offer such courses. The typical courses are between 40-60 hours of training and include a range of first aid skills but also attendance at mass casualty incidents. The inclusion of this material is because of the changing nature of the risk. The curriculum is largely based on the requirements outlined by the US Department of Transport National Standard Curriculum (NREMT 2015).

5.2.4. Florida Emergency Medical Technician (EMT)

To undertake this course it is generally a requirement that persons have already completed the course that precedes it, i.e. First Responder. It is possible to complete an EMT qualification in one semester. The course satisfies the needs for both state and national certification. These programs are usually provided by colleges (Study.com 2017)

5.2.5. Florida Paramedic

There are two routes to paramedic qualifications. As the work is very demanding there is an entrance interview, prerequisite course material and examination, and also two criminal checks. The first route is a Paramedic Certificate. The program is available for those already holding EMT and CPR Certification. The course is available by achieving 42 credit hours. The alternative route is an Associate of Applied Science Paramedic. The program contains the same material for the certificate course but with additional educational course work. It can be completed in 5 semesters (Study.com 2017).

5.2.6. QUALIFICATIONS AND SKILLS: CANADA

Canada and Australia have similar systems. The main difference is that the Canadian Qualification takes two years to complete whilst the Victorian Qualification takes three years.

In the Canadian EMS system there are three levels of Paramedic:

- Primary Care Paramedic (PCP)
  Entry level providing basic medical care, administer limited drugs and no invasive techniques
- Advanced Care Paramedic
  Can carry up to 20 different drugs and can carry out a number of invasive techniques
- Critical Care Paramedic (CCP)
  Advanced Life Support and can carry out a number of procedures normally performed by nurses or a physician

To apply to become a Primary Care Paramedic an applicant must have completed an Advanced First Aid Course (75-80 hours) and then complete a two-year Primary Care Paramedic Program and pass the required exams.

5.3. QUALIFICATIONS AND SKILLS IN VICTORIA, AUSTRALIA

Prior to the 1990s the base level of EMS providers was called Ambulance Officers and the higher level were called Paramedics. The current terminology is Paramedic for the base level and Mobile Intensive Care Ambulance (MICA) Paramedic for the higher level. Within the Victorian Ambulance Service there are also other specialties such as Bicycle Response Paramedic and Air Ambulance Paramedic (Ambulance Victoria 2013).

The range of tasks for a paramedic include:

- Responding to medical emergencies and providing basic life support (BLS) and advanced life support (ALS) if required
- Assess, manage and treat the patient en-route to hospital
- Performing invasive techniques such as intravenous cannulation, administer pain-relieving drugs, replacement of fluids in a trauma setting and advanced airway management.
- Placing the patient on a stretcher and loading into an ambulance

- Transporting the patient to hospital
- Preparing appropriate records related to injuries and treatment provided
- Triaging patients to most appropriate facility
- Providing routine transport of patients between home and treatment facility
- Undertaking vehicle and equipment checks to ensure all equipment including the vehicle are in good working condition. Also ensuring all medical equipment including drugs are available
- Proactively attending large public events where accidents or health emergencies may occur (Ambulance Victoria 2013).

To be employed by Ambulance as a graduate paramedic, a person must undertake a three-year degree, which includes the fundamentals of their medical training including anatomy, biology and physiology. The course is provided by a number of universities in Victoria and throughout the country (Student Paramedics Australasia 2015). A graduate paramedic selected for employment by Ambulance Victoria would then spend a period under supervision of a clinical instructor to enable them to make the transition from classroom to the field (Ambulance Victoria 2017b; The Council of Ambulance Authorities 2015). Ambulance Victoria does not provide "on the job" entry-level training. The Victorian system has the effect of transferring the training of ambulance paramedics from the employer to the educational system. South Australia uses a similar system (Haymes 2013).

There are many more graduates in this field than jobs available. A demonstration of this fact is that in South Australia, in 2013, 115 graduates were competing for 33 positions with the South Australia Ambulance Service (Haymes 2013). There is also a significant oversupply of Victorian paramedic graduates. The qualified graduates are being sought for employment both interstate and internationally, with London Ambulance Service an active recruiter. There have been a number of recruitment seminars held locally looking to recruit both Australian and New Zealand paramedic graduates for employment in London (Berg 2014; Butt 2015).

5.4. SUMMARY

In the United States the system is very complex involving many state and federal agencies. The range of training varies in both complexity and length of courses depending on location: for an Emergency Medical Responder, 40 hours of training are required; for an EMT, 110 hours; 200-400 hours for an Advanced EMT; and 1,000 or

more hours for a Paramedic (Commission on Accreditation of Allied Health Education Programs [CAAHEP [2015).

On the other hand, in Victoria the system is simple. To become a paramedic with Ambulance Victoria applicants are required to have a three-year degree from a university and an acceptable level of experience (Ambulance Victoria 2015b). If selected, the graduate paramedic then operates under supervision for at least a year.

5.5. TASKS UNDERTAKEN BY VARIOUS LEVELS OF EMS PROVIDERS IN BOTH VICTORIA AND USA

There are many similarities between the courses and tasks undertaken in USA and Australia. There are also common tasks for all levels of EMS responders. They are required to respond to the scene of an incident, provide immediate medical care to the critically sick and injured and transport the patient to appropriate medical care, usually an emergency room at a hospital.

All EMS providers must be able to perform their duties in uncommon situations. The provision of EMS in the field is sometimes referred to as “gutter medicine” (Coleman & Granito 1988). A key guide is to “do no harm”. They need to be aware of the medical/legal environment in which they are working and not work beyond their licensed scope as defined by state and local regulatory agencies.

On arrival on scene the ambulance or response vehicle is parked in a location to prevent further injury and provide protection for the victims and responders. For example a response vehicle may be parked at a 45-degree angle between oncoming traffic and an accident scene to help fend off oncoming vehicles. The first arriving responders must “size up” the scene to ensure it is safe and to identify the number of patients. They will call for additional resources as required. Other agencies such as police, fire rescue and utilities are notified if required to attend.

The responder then determines the nature and extent of the illness or injury and prioritizes the emergency care based on the patient assessment. Duties may include opening and maintaining an airway and ventilating the patient, administering CPR, using external defibrillators, controlling any bleeding and bandaging wounds, treating shock, and immobilizing limbs, neck and spine. The responder also provides medical care for emergency childbirth, altered mental states, breathing difficulties, diabetic, cardiac care, allergic reactions and drug overdose. They need to search the patient for

medical identification emblems, which may provide a guide to emergency medical care. The responder provides assistance with prescribed medications such as inhalers and epinephrine auto-injectors, and with the administration of oxygen, oral glucose and activated charcoal. Finally, it is the responders' responsibility to reassure patients and bystanders by operating in a confident and competent manner.

If extrication is required, the EMS provider will work with the rescuers whilst providing medical support to the patient including pain management. When the patient is stabilized they will be placed in an ambulance, secured and transported to a receiving medical facility. The EMS provider will continue to monitor the patient en-route to the medical receiving facility. The responder may communicate with the receiving facility and communications centre regarding the condition and number of patients. On arrival the patient is transferred to the facility in accordance with the protocols of the EMS system, including verbal and written transfer of information of observations and treatments provided.

Following the call the EMS providers are required to restock any consumables or drugs as required, and clean and decontaminate the vehicle as needed, ensuring the vehicle is in a safe and working condition and that all other equipment is ready for use.

All EMS providers including paramedics are required to have on-going education and refresher training as required by their employers, medical control and licensing and certifying agencies. They may also be provided with specialized training on new equipment, protocols or drugs (Ambulance Victoria 2013; Clinton Community College 2015).

5.5.1. First Responder or Emergency Medical Responder (EMR)

The training involves an advanced level of first aid and use of automatic defibrillators and oxygen. The skills and training are similar in both the United States and Victoria, Australia. The training is similar to that provided by the Metropolitan Fire Brigade Melbourne for its First Responder Program (National Highway Safety Administration 2007; NREMT 2015d; Huggins et al. 2012; McGibbon 2015; Paramedics Australasia 2017b).

5.5.2. EMT (US System) and Paramedic (Victorian System) Basic Life Support (BLS)

The terms are different and confusing but the roles are similar. In some literature this level of skills is referred to as Basic Life Support (NREMT 2015d). EMS providers

in both countries would carry out similar tasks as outlined in the previous section (Paramedics Australasia 2017b).

Key skills would include invasive techniques such as advanced airway management, intravenous cannulation and pain-relieving drugs (Ambulance Victoria 2013; International Association of Fire Chiefs & International Association of Firefighters).

5.5.3. EMT (Advanced)

In the US some States have a qualification of EMT (Advanced). Personnel qualified at this level are able to undertake a number of advanced techniques and more invasive procedures. These may include advanced airway devices and the administration of a wider range of drugs, which may include Narcan, D50, glucagon, thiamine and atropine. They can also use techniques such as needle decompression of tension pneumothorax, endotracheal intubation, nasogastric tube placement, use of cardiac event monitors/ECGs, and administer certain cardiac drugs (National Highway Safety Administration 2007). For some communities Advanced Emergency Medical Technicians provide an option of high benefit, lower risk advanced skills for areas which cannot justify paramedic level care; this is frequently the case in rural and volunteer systems (National Highway Safety Administration 2007).

5.5.4. MICA Paramedic (Victoria) and Paramedic (USA) (Advanced Life Support (ALS)

MICA Paramedics have the highest level of clinical skills, and as well as performing all of the tasks of a paramedic in the Victorian system they can also perform more advanced medical procedures. Their level of training increases their capacity to make complex medical decisions without medical consultation. The procedures they are trained to perform include advanced airway management, including endotracheal intubation, complex management of patients with head injuries and with cardiac conditions, insertion of cannulae into bone for advanced drug and fluid administration of pediatric patients, and treatment of life-threatening chest injuries (including collapsed lung) by inserting a chest tube (Ambulance Victoria 2015a; Paramedics Australasia 2017a, 2017b).

5.5.5. Paramedic (USA)

Tasks performed by paramedics in the USA are similar to those performed by MICA Paramedics in Australia. A US paramedic is expected to be able to perform all of the tasks of EMR, EMT and AEMT. The major difference between a Paramedic and an Advanced Emergency Medical Technician is the ability to perform a broader range of advanced skills. The skills required carry a greater risk to the patient if improperly performed, and are more difficult to attain and maintain competence in. They also require significant background knowledge in basic and applied science (*EMT Courses in Miami Florida* 2015; Ambulance Victoria 2015a).

5.5.6 QUALIFICATIONS AND SKILLS: CANADA

Canada and Australia have similar systems. The main difference is that the Canadian Qualification takes two years to complete whilst the Victorian Qualification takes three years. In the Canadian EMS system there are three levels of Paramedic:

Primary Care Paramedic (PCP)

Entry level providing basic medical care, administer limited drugs and no invasive techniques

Advanced Care Paramedic

Can carry up to 20 different drugs and can carry out a number of invasive techniques

Critical Care Paramedic (CCP)

Advanced Life Support and can carry out a number of procedures normally performed by nurses or a physician

To apply to become a Primary Care Paramedic an applicant must have completed an Advanced First Aid Course (75-80 hours) and then complete a two year Primary Care Paramedic Program and pass the required exams".

5.6. CHAPTER 5 SUMMARY

This chapter provides a comparison of skills and EMS training between North America and Australia, as well as an overview of a number of case studies from Australia, USA and Canada. It has provided a background to the evolving system of

regulation, accreditation and skills in the USA, as well as outlining the training requirements and skills sets required for each level and the legal limitations on performing some tasks. Finally, it has explained the difference in terminology of EMS titles between North America and Australia.

The following Chapter 6 covers the case studies of each city/region which were undertaken. A template was developed to ensure a similar packet of information was collected for each case. This information is contained in a box at the commencement of each case. Additional information regarding the individual cases was also collected e.g. strategies to reduce the number of unnecessary ALS calls to help improve response times. The North American cases are addressed in the first instance, followed by two Australian cases (Victorian Ambulance Service and Metropolitan Fire Brigade), which are a key focus of this research.

CHAPTER 6: CASE STUDIES

6.1. CASE STUDY 1: MIAMI DADE COUNTY FIRE AND RESCUE

6.1.1. Overview of Miami Dade

Miami Dade County is in Florida, which is located in the south-eastern part of the United States.

Figure 22 Map of the USA and Location map of Florida

Source: https://commons.wikimedia.org/wiki/File%3AMap_of_USA_FL.svg

Figure 23 Location of Miami Dade Country in Florida

Source: http://www.floridacountiesmap.com/dade_county.shtml

6.1.2. Snapshot

Figure 24 Snapshot Miami Dade Fire and Rescue

Location

Southern Florida, South East USA

Agency

Miami Dade Fire and Rescue (MDFR)

Protects 4,877 square kilometres

Budget

US$361 Million recurrent, also a five year $54 Million Capital works program

Size of Department

Approximately 2000 uniform staff, 429 Support Staff

1586 Paramedics (ALS), 378 EMT (BLS)

Stations

65 Fire Stations

Calls

Fire Calls	23,412
EMS Calls	206,758
False Alarms	13,765
Other	25,473
Total Calls	246,408

Response Times

The target response times for ALS calls is 8 minutes 90% of the time.

The actual as measured between 2009 and 2014 is 10.2 minutes 90% of the time

All material used in the text box Figure No. 23 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

6.1.3. Overview of County

Miami Dade County covers a total area of 5,040 square kilometres. Within the county there are 35 incorporated municipalities, the city of Miami being the largest. The total population of the County is 2,662,874 (United States Census Bureau 2014). The population of the unincorporated areas is approximately 1,200,000 people (Miami-Dade County 2015).

Where there are incorporated and unincorporated levels within a county, the cities are the lowest tier of government and provide city services such as police, fire and code enforcement. The county is the higher tier, and provides metropolitan services such as emergency management, health care, public housing and environmental services. These services are funded by taxes paid by both residents of incorporated cities and unincorporated areas. The residents of the unincorporated areas pay an equivalent of city taxes to fund services such as fire and police in unincorporated areas. The county provides these services.

A Mayor and a Board of thirteen Commissioners run Miami Dade County. The County employs approximately 26,000 staff and has an annual budget of nearly US$7 billion dollars. The current Mayor was previously the Fire Chief of the City of Miami and has now been elected Mayor for a second term. All of the elected officials are term-limited to two four-year terms (Miami-Dade County 2015).

6.1.4. Miami-Dade Fire and Rescue (MDFR)

MDFR is the largest fire and rescue service in the southeast United States and is in the top ten largest fire department in the country, with an annual recurrent budget of US$361 million and a 5-year capital works program of US$54 million. It provides fire and rescue services to all unincorporated areas of the county and to over 30 municipalities located within the county. The total area protected is 1,883 square miles (4,877 square kilometres), ranging from dense urban areas to agricultural, rural and national parks including the Everglades National Park.

There are 2,429 staff, of whom nearly 2,000 are uniformed firefighters operating from 65 fire stations. All firefighters have EMT qualifications and over half also hold

paramedic qualifications. It is a requirement for selection as a recruit MDFR firefighter that all applicants are qualified EMTs. Promotion to higher levels in the organization (Lieutenants, Captains) also requires paramedic qualifications.

The organization provides a diverse range of operations, including emergency dispatch, fire and medical response, hazardous materials, port, marine, dive, airport crash rescue, air support, technical rescue and urban search and rescue (USAR). MDFR is one of the National USAR Teams (FL-TF1) but also one of the international teams, and it has been deployed on a number of international missions.

Major incidents the Department has responded to in Miami Dade include Cyclone Andrew and the ValuJet aircraft crash in the Everglades; there have also been numerous international deployments in response to earthquakes and cyclones/hurricanes.

In 2014 the Department attended to the following:

Fire Calls 23,412

EMS Calls 206,758

False Alarms 13,765

Other 25,473

Total Calls 246,408 (Firehouse 2015)

6.1.5. Miami- Dade Response Times

The target response time for ALS calls is 8 minutes 90% of the time. The actual as measured between 2009 and 2014 is 10.2 minutes. MDFR responded to questions asked regarding performance. A full copy of the response can be found in Appendix 2.

6.2. CASE STUDY 2: FAIRFAX COUNTY FIRE DEPARTMENT COMMONWEALTH OF VIRGINIA

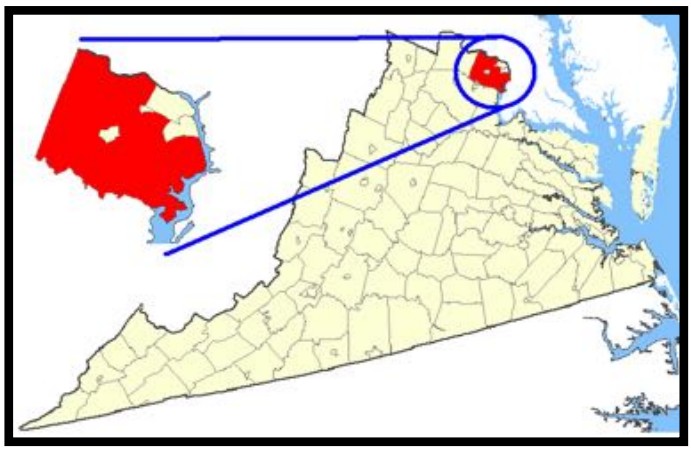
6.2.1. Overview of Fairfax County

Fairfax County is located in the Commonwealth of Virginia, which is on the East Coast of the USA.

Figure 25 Location of Virginia in US

Source: https://commons.wikimedia.org/wiki/File:Map_of_USA_VA.svg

Figure 26 Location of Fairfax County in Virginia

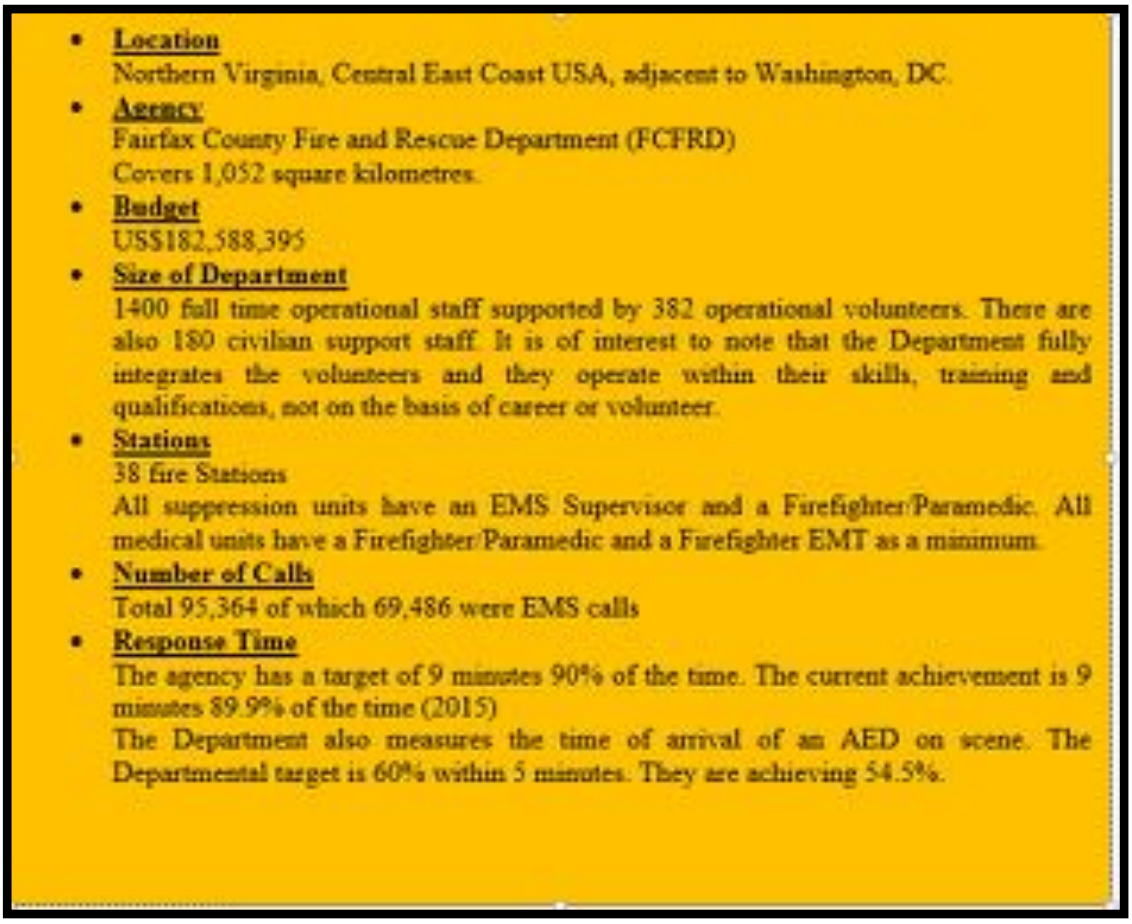


Source:

https://commons.wikimedia.org/wiki/File:Map_showing_Fairfax_County,_Virginia.png

6.2.2. Snapshot

Figure 27 Snapshot Fairfax County Fire and Rescue



Source: Fairfax County Government (2016); Fairfax County Virginia (2016)

All material used in the text box Figure No. 25 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

Fairfax County is located in the Northeast of Virginia and shares a boundary with Washington, DC (the Potomac River). The County covers 1052 square kilometres and has a population of 1,081,726 (United States Census Bureau 2010-2016). The County was the first in the US to achieve a six-figure median household income. The County is managed by a 10-person Board of Supervisors. The Fairfax County Executive undertakes the day-to-day management. The major employer in Fairfax County is the Government or contractors working for the Government. There are a number of intelligence agencies in Fairfax including the CIA and the National Counter-Terrorism Office (Fairfax County Virginia 2016).

Figure 28 Fairfax County Fire and Rescue Department (FCFRD)

Source: http://www.fairfaxcounty.gov/fr/download/2016anlrpt.pdf

Fairfax County Fire and Rescue is led by Fire Chief Richard Bowers and provides a full complement of emergency response including fire, EMS, HAZMAT, rescue and USAR. The Department provides BLS, ALS and emergency medical transport. FCFRD is both one of the National Urban Search and Rescue Teams (Virginia Task Force 1) but also one of the international teams. The most recent international deployment was to Nepal following the devastating earthquake. The Department employs 1400 uniformed staff operating out of 38 fire and rescue stations. They are supported by 180 civilian staff and 382 operational volunteers. The annual budget is $182,588,395.

A feature of the Fire Department is that it is a fully integrated career/volunteer organization. The volunteers fill roles in accordance with their training and skills, and not on the basis of career or volunteer. The volunteers actually own and or/operate 15 of the 38 fire stations (Fairfax County Volunteer Fire and Rescue Association 2016).

Activity:

EMS 69,486

Fire 18,736

Public Service 7,142

Total 95,364 (Fairfax County Government 2016)

Figure 29 Fairfax County Fire and Rescue Department Ambulance

Source: https://www.fairfaxcounty.gov/fr/images/apparat/!ambulan2.jpg

6.2.3. Response Time

The Department is achieving a response time of 9 minutes 89.9% of the time against a goal of 9 minutes 90% of the time. The department also collects the time of first AED on scene. It has an internal target of 60% within 5 minutes and is achieving 58.89%. The Department uses NFPA 1710 as the basis for response times with the clock starting at time of call.

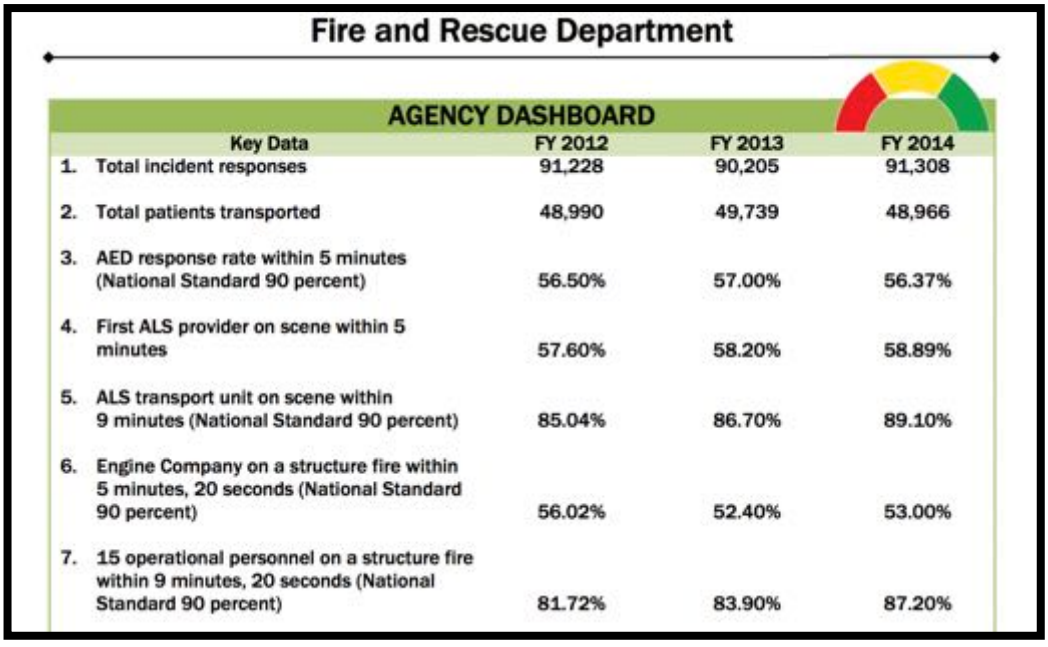
Figure 30 Virginia Performance Indicators

Indicator	Prior Year Actuals			Current Estimate	Future Estimate
	FY 2013 Actual	FY 2014 Actual	FY 2015 Estimate/Actual	FY 2016	FY 2017
Output					
Patients transported	49,739	48,966	49,000/51,425	50,000	50,000
Service Quality					
ALS transport units on scene within 9 minutes (National Standard 90%)	86.70%	89.10%	90.00%/89.95%	90.00%	90.00%
AED response rate within 5 minutes (National Standard 90%)	55.00%	56.37%	60.00%/54.57%	60.00%	60.00%
Outcome					
Cardiac arrest patients arriving at the Emergency Department with a pulse (National Average 23%)	52.3%	55.9%	30.0%/58.5%	30.0%	30.0%

Source: Fairfax County Performance Measures Database

Source: Fairfax County Government (2016)

Figure 31 Virginia Dashboard Report



Fire and Rescue Department

AGENCY DASHBOARD

Key Data	FY 2012	FY 2013	FY 2014
1. Total incident responses	91,228	90,205	91,308
2. Total patients transported	48,990	49,739	48,966
3. AED response rate within 5 minutes (National Standard 90 percent)	56.50%	57.00%	56.37%
4. First ALS provider on scene within 5 minutes	57.60%	58.20%	58.89%
5. ALS transport unit on scene within 9 minutes (National Standard 90 percent)	85.04%	86.70%	89.10%
6. Engine Company on a structure fire within 5 minutes, 20 seconds (National Standard 90 percent)	56.02%	52.40%	53.00%
7. 15 operational personnel on a structure fire within 9 minutes, 20 seconds (National Standard 90 percent)	81.72%	83.90%	87.20%

Source: Fairfax County Government (2016)

The Fairfax EMS response model is called “one and one staffing”. It means that the medical units have a Firefighter/Paramedic and a Firefighter/EMT with EMS supervisors and paramedics on all suppression units (Bowers 2015).

6.3. CASE STUDY 3: MESA FIRE AND MEDICAL DEPARTMENT MESA, ARIZONA

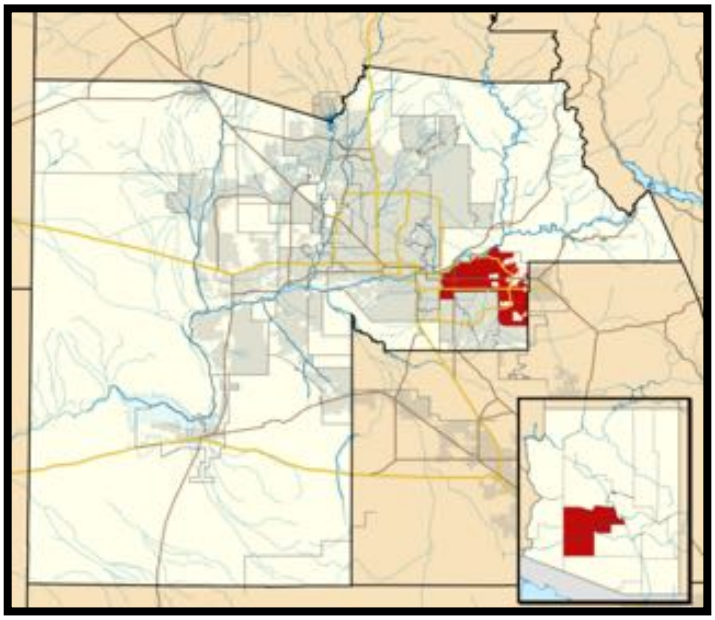
6.3.1. Overview of Mesa, Arizona

City of Mesa is part of Maricopa County in Arizona, which is located in the southwest of the United States.

Figure 32 Location of Arizona in US

Source: https://www.mapsofworld.com/usa/states/arizona/arizona-location-map.html

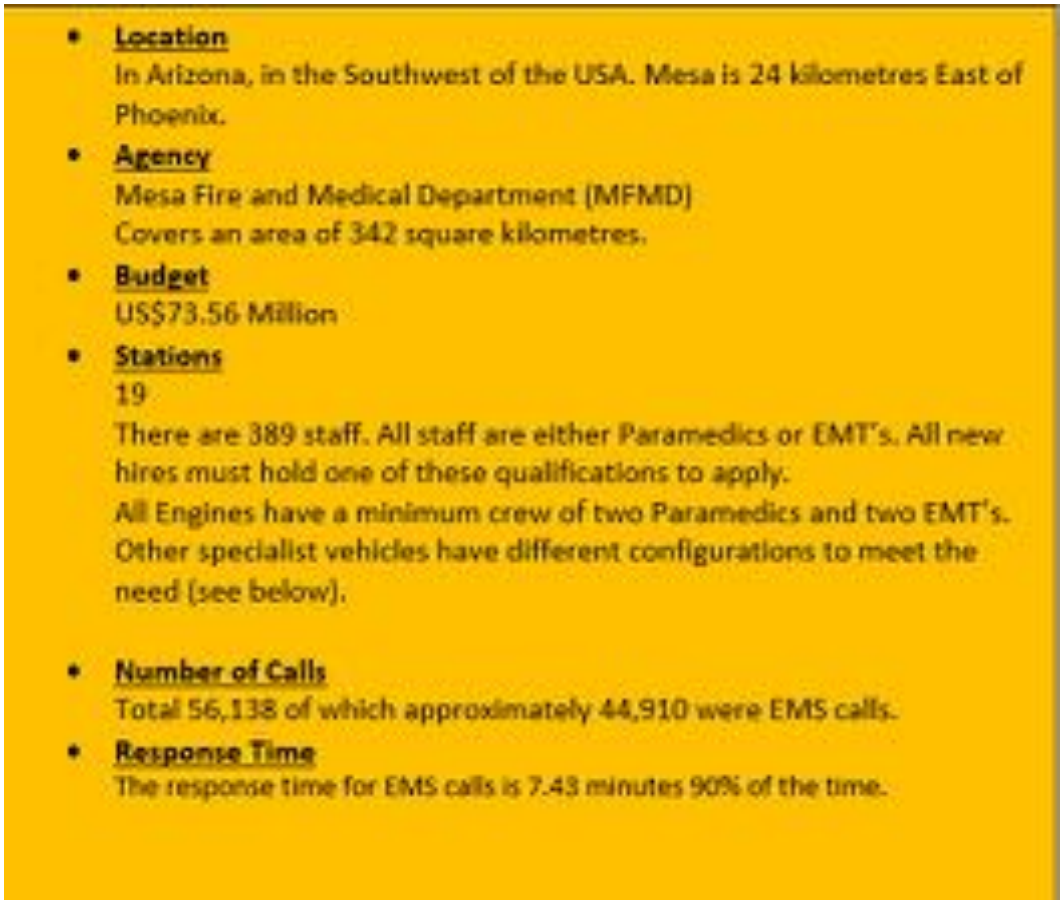
Figure 33 Location of Maricopa County in Arizona and Location of City of Mesa in Maricopa County



Source:
https://upload.wikimedia.org/wikipedia/commons/1/11/Maricopa_County_Arizona_Incorporated_and_Unincorporated_areas_Mesa_Highlighted_0446000.svg

6.3.2. Snapshot

Figure 34 Snapshot Mesa Fire and Medical Department



All material used in the text box Figure No. 32 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

Mesa is located 15 miles (24 kilometres) east of Phoenix and covers 132 square miles (342 square kilometres). It is the third largest city in Arizona and the 38th largest in the United States (City of Mesa 2016a). The population of Mesa in 2015 was 462,376 (City of Mesa 2016c) and the annual budget for 2015-2016 was $1,610,000,000 (City of Mesa 2016b).

Figure 35 Mesa Fire and Medical Department (MFMD)

Source:http://www.mesaaz.gov/Home/ShowImage?id=4743&t=635623428626330000

Figure 36 Fire Engine MESA Fire and Medical Department

Source: http://www.emergencyrigs.net/viewphoto.asp?PhotoID=3554&Size=L

The MESA FIRE and Medical Department (MFMD) has 389 staff, operates 29 vehicles from 19 fire stations. Fire Chief Mary Cameli leads the Department (appointed December 2016. The annual budget for the department is $73,556,000 (City of Mesa 2016b; Firedepartment.net 2016).

The Mesa Fire Department changed its name to Mesa Fire Medical Department in 2013 to more accurately describe the role played by the service in the community. Of 56,138 emergency calls 80% were EMS calls. The MFMD runs two EMTs and two paramedics on each of their engines. They also have a number of specialist vehicles with different configurations.

All new recruits to the service must have either EMT or Paramedic qualifications at time of joining. The Arizona Department of Health Services provides certification for Emergency Medical Responders (EMR) Emergency Medical Technicians (EMT) and Paramedics. They require compliance with the National Emergency Medical Services Education Standards for each of these designations (Arizona Department of Health Services 2016).

With regards to performance measures for MFMD, the City Government outlined the key performance measures for the Department in the Budget Papers. The only performance measure for Fire/EMS was a target response time for 2012/2013 of less than 4 minutes for 70% of the time. The benchmark was Seattle Fire Department, which have a target of 4 minutes 90% of the time. Other performance measures were actual totals for activities such as inspections or community contacts (City of Mesa 2012).

The Department identified a number of challenges including a fall in the number of fire calls, ambulances wait times at hospitals, and small numbers of people utilizing a disproportionate use of medical resources and budget pressures.

An interesting innovation has been the creation of Transitional Response Vehicles (TRV). These vehicles are manned by a Medic Captain and a Firefighter EMT. These are responded to non-emergency medical incidents as determined by appropriately trained medical dispatchers. It frees up capacity and helps to keep response times low (California Fire Chiefs Association 2013 Annual Conference 2013).

Figure 37 A Transitional Response Vehicle (TRV)

Source: http://dev6.visioninternet.com/Mesa6/home/showdocument?id=162

A further development of this concept replaced the EMT with a Nurse Practitioner (NP) on one unit, which helped lower costs and expand the range of services provided.

6.4. CASE STUDY 4: WINNIPEG FIRE PARAMEDIC SERVICE

6.4.1. Overview of Winnipeg, Canada

Winnipeg is located in Manitoba Province in the centre of Canada, which is adjacent to the US border.

Figure 38 Location of Manitoba Province in Canada

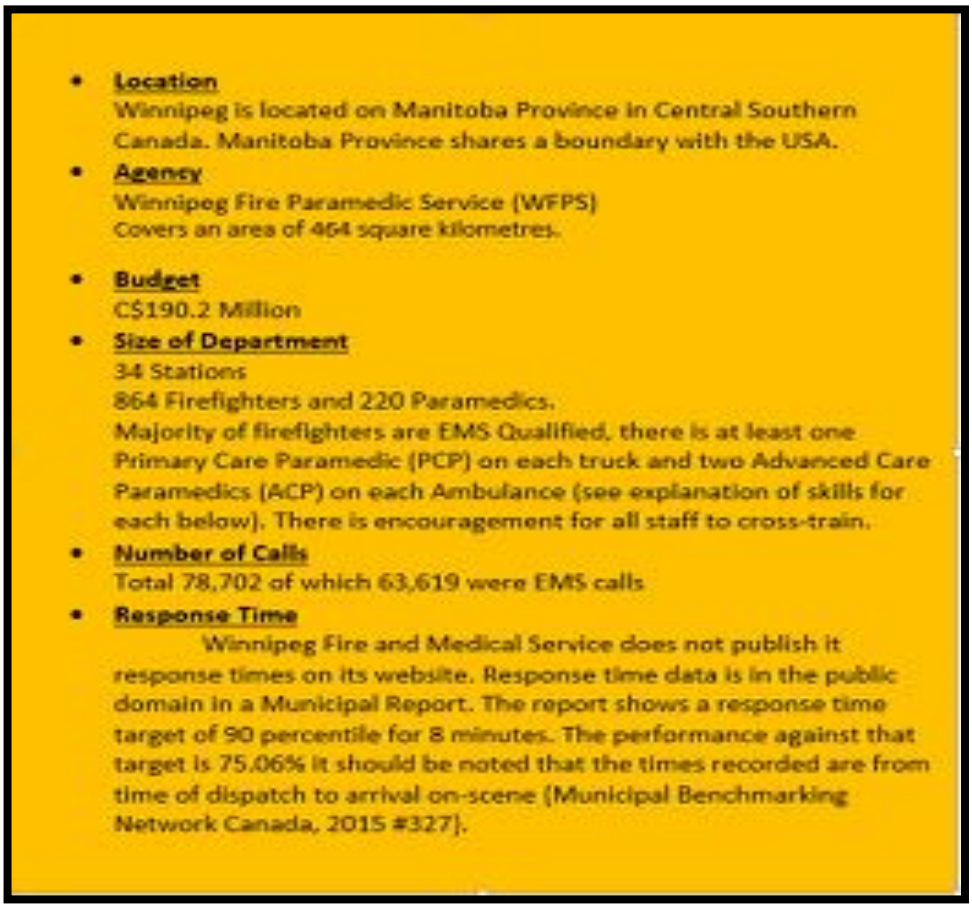
Source: https://upload.wikimedia.org/wikipedia/commons/thumb/8/87/Manitoba_in_Canada.svg/250px-Manitoba_in_Canada.svg.png b

Figure 39 Location of Winnipeg in Manitoba Province

Source: https://upload.wikimedia.org/wikipedia/commons/thumb/2/2f/Manitoba_generalmap.png/220px-Manitoba_generalmap.png

6.4.2. Snapshot

Figure 40 Winnipeg Fire Paramedic Service



All material used in the text box Figure No. 38 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

The City of Winnipeg covers an area of 464 square kilometres and has a population of 620,000 people. It is the seventh largest city in Canada. The City is managed by a Mayor and Council model (15 councillors; City of Winnipeg 2016b).

Figure 41 Winnipeg Fire Paramedic Service (WFPS)

Source: Lane (2016)

The Service, led by Fire Chief John Lane, has 1,371 employees of which 864 are firefighters and 220 are paramedics. They operate from 34 stations. The response vehicles consist of 49 fire apparatus and 32 ambulances. The annual budget for the service was C$178.4 million in 2015, with a projected cost of C$190.2 million for 2016 (City of Winnipeg 2016a).

Prior to 2000 there were separate fire and ambulance services. In 2000 these two services amalgamated to form what is now known as the Winnipeg Fire Paramedic Service. It has been stated that the final result was more an integration rather than an amalgamation. Whilst the integrated model is more common in the US, there are some Canadian services using the model (Bradley 2015; Lane 2016).

In 2013 the Service attended to the following:

Fire related calls 15,083

EMS 63,619

Total 78,702 (Bradley 2015)

The majority of Winnipeg Firefighters are trained as Emergency Medical Responders (EMR). The service model is to provide at least one Primary Care Paramedic on each fire truck and two Advanced Care Paramedics on every ambulance (City of Winnipeg 2016a).

6.4.3. EMS Qualifications

6.4.3.1. *Emergency Medical Responder (EMR)*

EMR qualifications are to prepare responders to provide emergency patient care, cardio-pulmonary resuscitation (CPR), patient immobilization, oxygen therapy and carry out basic assessments.

6.4.3.2. *Primary Care Paramedic (PCP)*

These are graduates of a CMA-accredited training program. They may be found on pumper trucks, rescues, and squads in the Winnipeg Fire Department. They may also be assigned to ambulances for Winnipeg Emergency Medical Services. The Primary Care Paramedic (PCP) scope of practice includes manual defibrillation, glucometry, pulse oximetry, IV maintenance and administration of drugs (including ASA, epinephrine, glucose gel, nitroglycerin and salbutamol).

6.4.3.3. *Advanced Care Paramedic (ACP)*

The function of an ACP includes all of the responsibilities of a PCP but further enhanced with additional training and skills. Paramedics in Winnipeg attending a WFPS undergo a two-year program. On completion of the program the students are recognized locally as Intermediate Care Paramedics. Intermediate and Advanced Care Paramedics (ICP and ACP) are exclusively assigned to EMS units of the Winnipeg Emergency Medical Services. The Intermediate Care Paramedic (ICP) scope of practice includes synchronized cardioversion, 12 ECG interpretation, intravenous therapy, intraosseous infusion, direct laryngoscopy and foreign object removal using Magill forceps, and administration of additional drugs.[1].

Upon successful completion of their second year of training, the Advanced Care Paramedic (ACP) graduate's scope of practice includes needle cricothyrotomy, needle chest decompression, oral or nasal endotracheal intubation, ETCO2 monitoring, oro- or nasogastric tubes, advanced patient assessment, external transcutaneous pacing,

[1] These include amiodarone, atropine, midazolam, dimenhydrinate, diphenhydramine, lidocaine, D50, narcan, glucagon and combivent.

synchronized cardioversion and administration of a full drug list[2] (City of Winnipeg 2016c).

All new job applicants for the role of firefighter must have EMR qualifications but preference is given to those holding Primary Care Paramedic qualifications. Efforts have been made to encourage existing ambulance paramedics to cross-train as firefighters. These efforts have had limited success with peer pressure from the other serving ambulance paramedics and the union representing ambulance personnel discouraging participation (Bradley 2015).

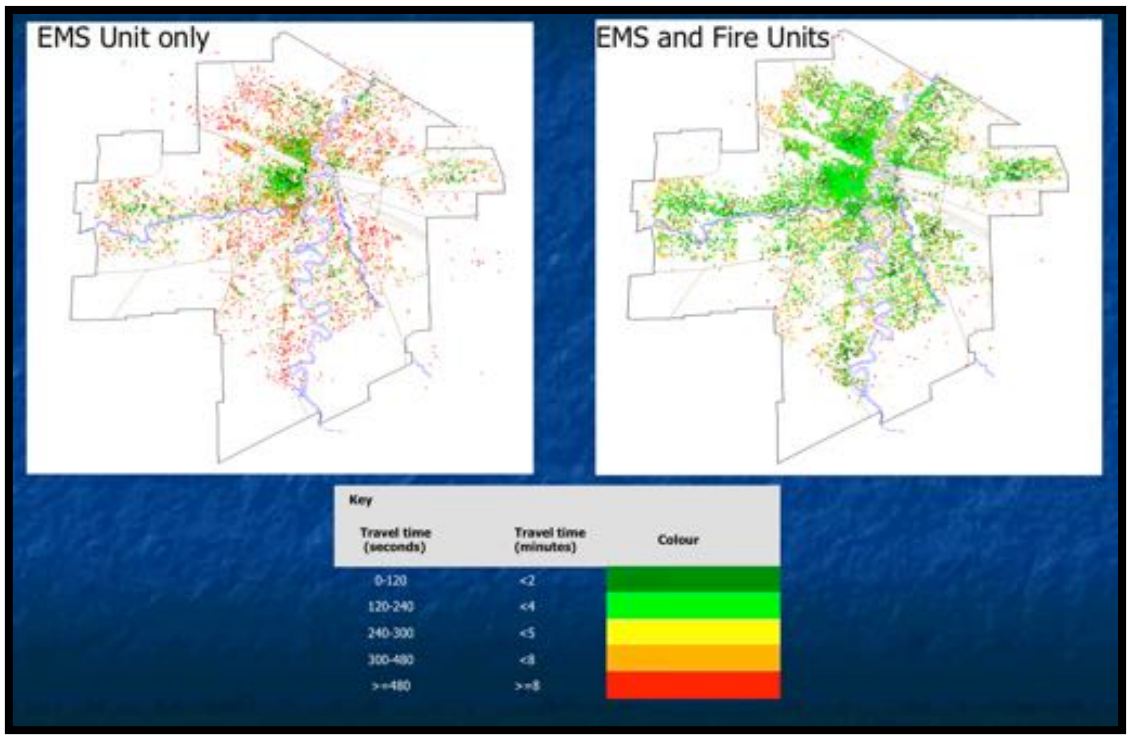
6.4.4. Response Model

Many integrated EMS systems respond ambulance only or fire and ambulance. The Winnipeg system is different in that it responds three different configurations: ambulance only, fire only and fire and ambulance combined.

In 2014 WFRS attended to 32,595 EMS calls. Of those, fire alone managed 11,688. 10,474 were responded to by fire alone and 1,214 ambulance responses were cancelled by fire prior to scene arrival. The following shows a dramatic improvement in response time when utilizing both EMS and fire resources.

[2] These include fentanyl, sodium bicarbonate, oxytocin, topical lidocaine, haloperidol, furosemide, tenecteplase, unfractionated heparin, enoxaparin and clopidrogrel.

Figure 42 Winnipeg Medical Response Capability 2015



Source: Lane (2016)

By using fire service resources to respond to medical emergencies in an integrated way response times were reduced, there was rapid paramedic response to high acuity calls, and EMS resources were able to be allocated to community paramedicine and other proactive specialty programs (Lane 2016); a copy of an open letter to Winnipeg Free Press indicated a current travel time average of 3.4 minutes to calls (Lane 2015).

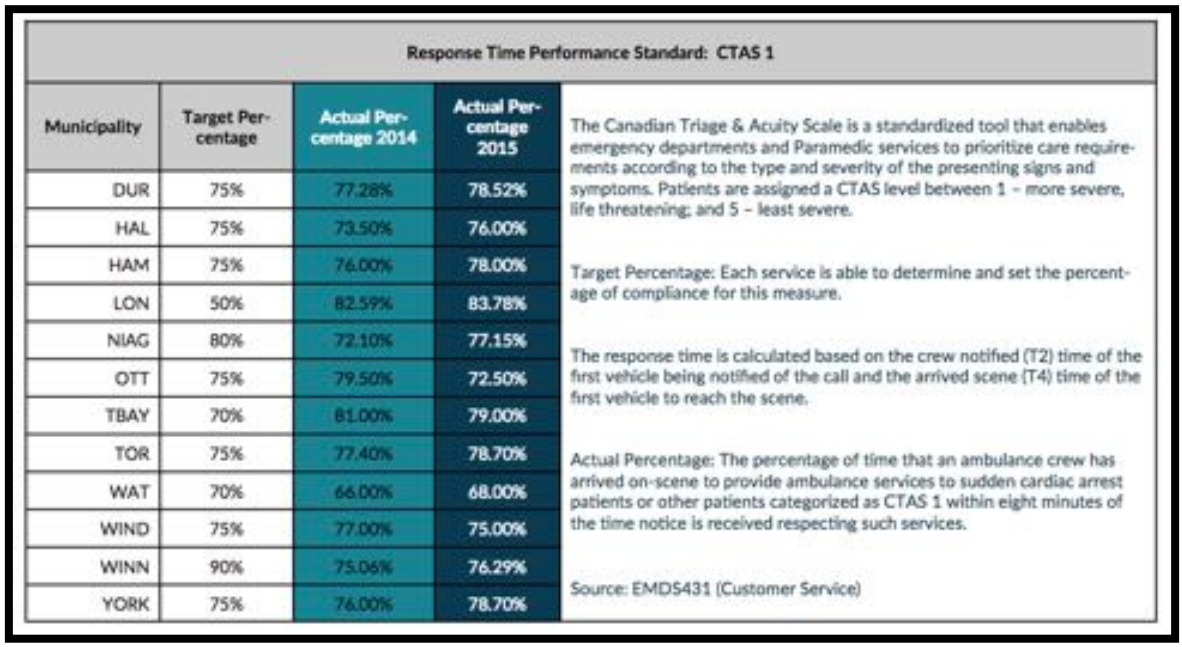
The latest available material on response times and other statistics are contained in an excellent report produced by Municipal Benchmarking Network Canada. The report is produced using data from a total of 15 cities. The data is collected in a manner that makes comparisons meaningful and is peer-reviewed to ensure the quality of the data collected. The report is produced to foster improvement by encouraging networking and sharing of ideas, to answer the questions of why such a result was obtained and how it is possible to improve (Municipal Benchmarking Network Canada 2015).

The researcher has chosen to include a number of charts as they contain information not available for the other case studies. They also contain comparative data that shows performance against targets and other cities. Such data enables senior staff

and politicians to make informed decisions about future directions for agencies. Winnipeg is shown on the charts as Winn.

6.4.5. EMS Response Times

Figure 43 Response Time Performance Standard - a Canadian Triage & Acuity Scale 1

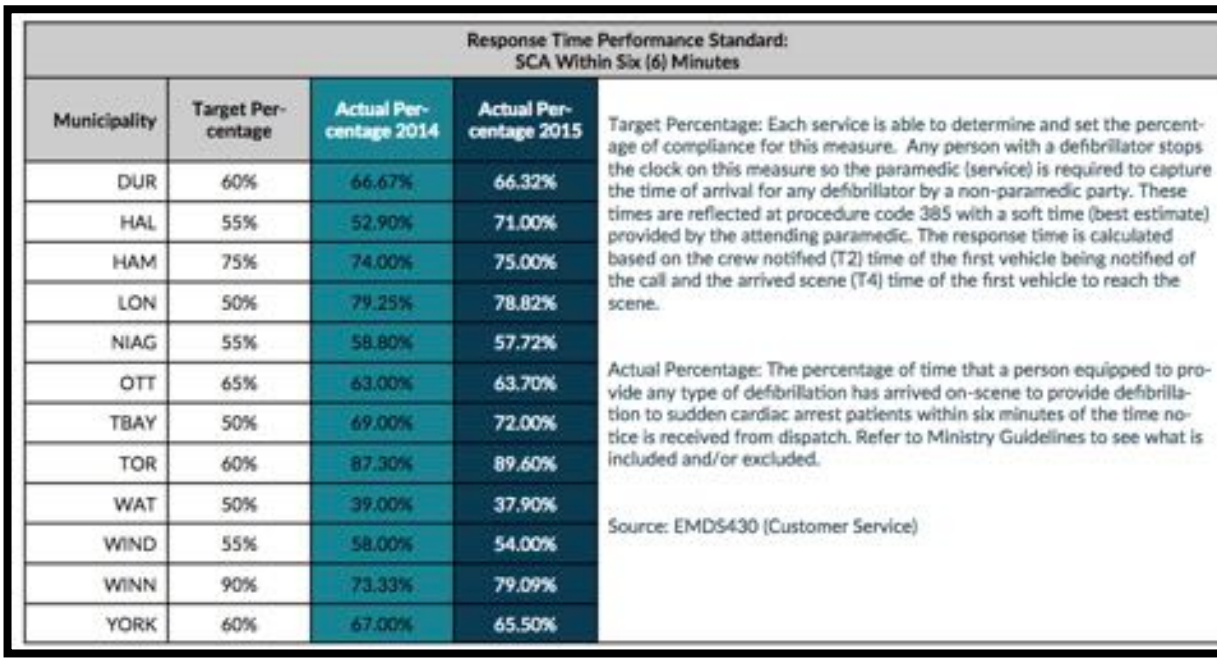


Response Time Performance Standard: CTAS 1				
Municipality	Target Percentage	Actual Percentage 2014	Actual Percentage 2015	The Canadian Triage & Acuity Scale is a standardized tool that enables emergency departments and Paramedic services to prioritize care requirements according to the type and severity of the presenting signs and symptoms. Patients are assigned a CTAS level between 1 – more severe, life threatening; and 5 – least severe. Target Percentage: Each service is able to determine and set the percentage of compliance for this measure. The response time is calculated based on the crew notified (T2) time of the first vehicle being notified of the call and the arrived scene (T4) time of the first vehicle to reach the scene. Actual Percentage: The percentage of time that an ambulance crew has arrived on-scene to provide ambulance services to sudden cardiac arrest patients or other patients categorized as CTAS 1 within eight minutes of the time notice is received respecting such services. Source: EMDS431 (Customer Service)
DUR	75%	77.28%	78.52%	
HAL	75%	73.50%	76.00%	
HAM	75%	76.00%	78.00%	
LON	50%	82.59%	83.78%	
NIAG	80%	72.10%	77.15%	
OTT	75%	79.50%	72.50%	
TBAY	70%	81.00%	79.00%	
TOR	75%	77.40%	78.70%	
WAT	70%	66.00%	68.00%	
WIND	75%	77.00%	75.00%	
WINN	90%	75.06%	76.29%	
YORK	75%	76.00%	78.70%	

Source: Municipal Benchmarking Network Canada (2015)

The chart shows that Winnipeg Fire and Medical Service has a target of 90% for a response time of 8 minutes for the most severe life-threatening calls. Against this target they are achieving 76.29%, an improvement on the previous year. In this instance response time is taken from time of dispatch to arrival on scene, not including call-taking time.

Figure 44 Response time performance Standard: Sudden Cardiac Arrest within six (6) minutes

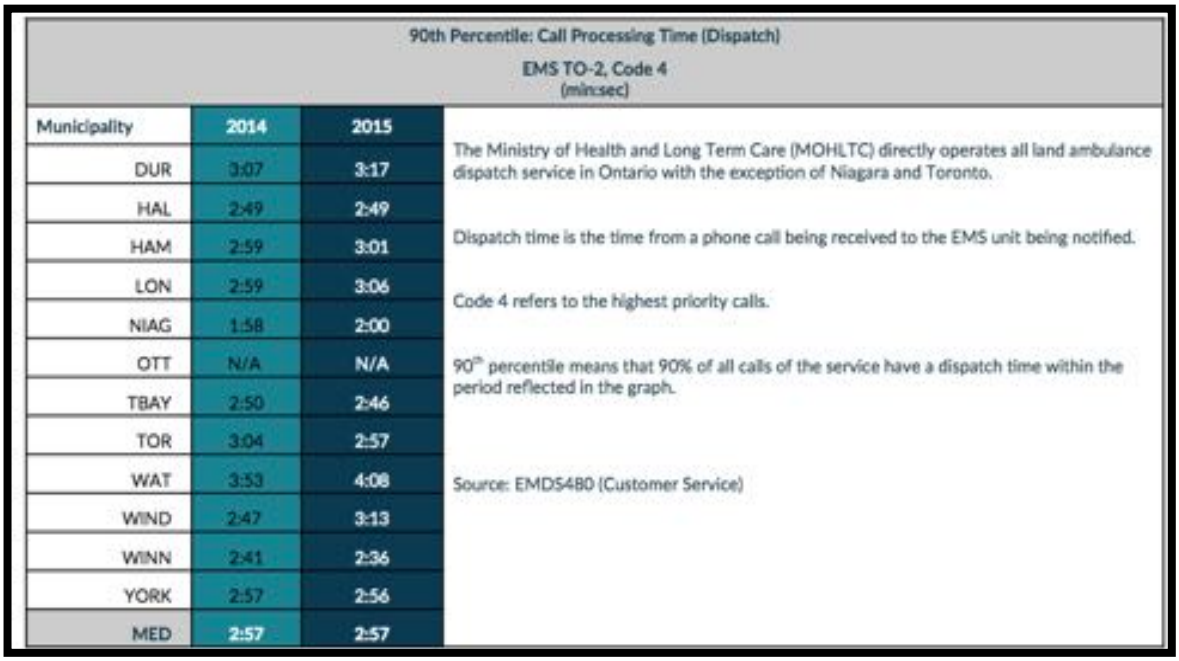


Response Time Performance Standard: SCA Within Six (6) Minutes				
Municipality	Target Percentage	Actual Percentage 2014	Actual Percentage 2015	Target Percentage: Each service is able to determine and set the percentage of compliance for this measure. Any person with a defibrillator stops the clock on this measure so the paramedic (service) is required to capture the time of arrival for any defibrillator by a non-paramedic party. These times are reflected at procedure code 385 with a soft time (best estimate) provided by the attending paramedic. The response time is calculated based on the crew notified (T2) time of the first vehicle being notified of the call and the arrived scene (T4) time of the first vehicle to reach the scene.
DUR	60%	66.67%	66.32%	
HAL	55%	52.90%	71.00%	
HAM	75%	74.00%	75.00%	
LON	50%	79.25%	78.82%	
NIAG	55%	58.80%	57.72%	Actual Percentage: The percentage of time that a person equipped to provide any type of defibrillation has arrived on-scene to provide defibrillation to sudden cardiac arrest patients within six minutes of the time notice is received from dispatch. Refer to Ministry Guidelines to see what is included and/or excluded.
OTT	65%	63.00%	63.70%	
TBAY	50%	69.00%	72.00%	
TOR	60%	87.30%	89.60%	
WAT	50%	39.00%	37.90%	Source: EMDS430 (Customer Service)
WIND	55%	58.00%	54.00%	
WINN	90%	73.33%	79.09%	
YORK	60%	67.00%	65.50%	

Source: Municipal Benchmarking Network Canada (2015)

The above chart shows a target of 90% for a response time of 6 minutes for the first AED to arrive on scene. The time is from time of dispatch to arrival on scene. The defibrillator may arrive on scene from the emergency services or public access. The time target does not include call taking.

Figure 45 EMS To-2 Code 4



90th Percentile: Call Processing Time (Dispatch) EMS TO-2, Code 4 (min:sec)			
Municipality	2014	2015	The Ministry of Health and Long Term Care (MOHLTC) directly operates all land ambulance dispatch service in Ontario with the exception of Niagara and Toronto.
DUR	3:07	3:17	
HAL	2:49	2:49	
HAM	2:59	3:01	Dispatch time is the time from a phone call being received to the EMS unit being notified.
LON	2:59	3:06	
NIAG	1:58	2:00	Code 4 refers to the highest priority calls.
OTT	N/A	N/A	
TBAY	2:50	2:46	90th percentile means that 90% of all calls of the service have a dispatch time within the period reflected in the graph.
TOR	3:04	2:57	
WAT	3:53	4:08	
WIND	2:47	3:13	Source: EMDS480 (Customer Service)
WINN	2:41	2:36	
YORK	2:57	2:56	
MED	2:57	2:57	

Source: Municipal Benchmarking Network Canada (2015)

The above chart shows the actual 90% time taken to handle dispatch to high priority EMS calls.

Figure 46 EMS Total Cost per Weighted Vehicle in service hour

Source: Municipal Benchmarking Network Canada (2015)

The above chart shows that the Winnipeg model is provided at the lowest cost and significantly lower than the other cities.

6.4.6. Fire Service Response

Figure 47 Actual 90th Percentile - Fire Station Notification Response time in Minutes (Urban and Rural)

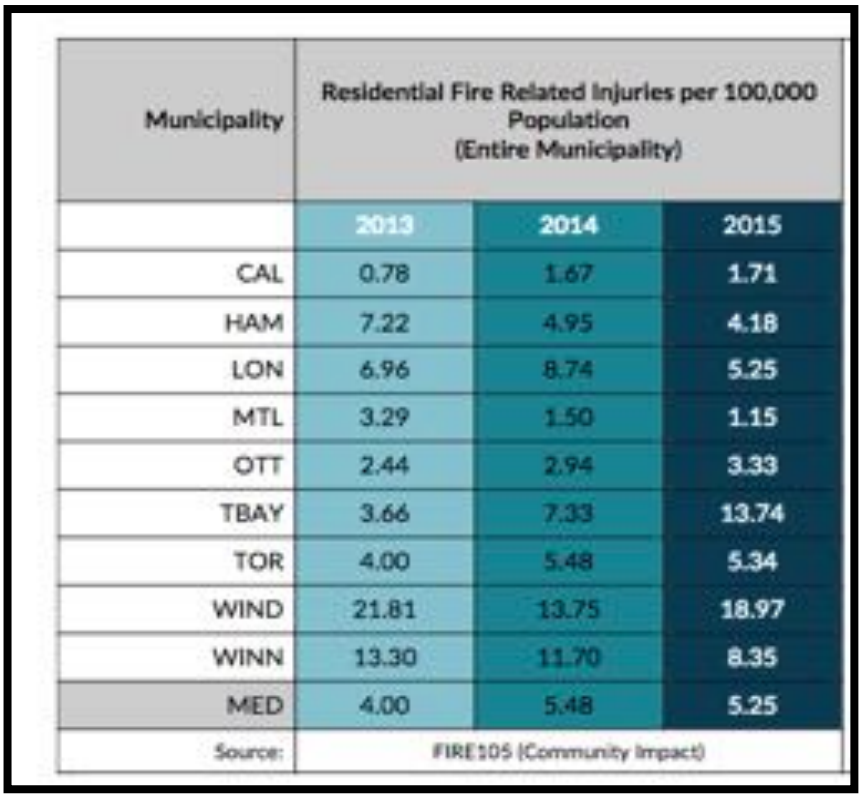
Each municipality has a different mix of vehicle types and staffing modes, reflecting its fire and community risks. Hamilton and Ottawa are the only municipalities with both urban and rural components.

Municipality	Station Notification Response Time 90th Percentile (min:sec) Urban			Station Notification Response Time 90th Percentile (min:sec) Rural		
	2013	2014	2015	2013	2014	2015
CAL	7:08	6:44	5:29			
HAM	6:45	6:55	6:52	13:20	13:06	13:43
LON	6:05	6:03	5:59			
MTL	5:39	6:20	6:02			
OTT	6:50	6:35	6:37	13:53	14:59	14:32
TBAY	6:40	6:46	6:38			
TOR	6:44	6:38	6:34			
WIND	6:58	7:15	7:21			
WINN	6:49	6:55	6:51			
MED	6:45	6:44	6:37	13:37	14:02	14:07
Source:	FIRE405 (Customer Service)			FIRE406 (Customer Service)		

Source: Municipal Benchmarking Network Canada (2015)

These figures include dispatch, turnout time and travel time. They do not include call-handling time.

Figure 48 Residential fire-related injuries per 100,000 people



Municipality	Residential Fire Related Injuries per 100,000 Population (Entire Municipality)		
	2013	2014	2015
CAL	0.78	1.67	1.71
HAM	7.22	4.95	4.18
LON	6.96	8.74	5.25
MTL	3.29	1.50	1.15
OTT	2.44	2.94	3.33
TBAY	3.66	7.33	13.74
TOR	4.00	5.48	5.34
WIND	21.81	13.75	18.97
WINN	13.30	11.70	8.35
MED	4.00	5.48	5.25
Source:	FIRE105 (Community Impact)		

Source: Municipal Benchmarking Network Canada (2015)

This chart shows that Winnipeg Fire Paramedic Service has a low rate for fire fatalities when compared to other cities. There are many factors that can influence the rate of fire fatalities such as building age and construction, demographics and ethnic groups, but it is an excellent outcome for the city.

6.4.6.1. *EPIC Program*

Winnipeg Fire and Paramedic Department recently initiated a program called Emergency Program in the Community (EPIC). The aim of the program was to decrease the number of 911 calls for EMS assistance by using community-based paramedics as primary-care providers. The program began with six community paramedics working 12-hour shifts and providing coverage 7 days a week. They have constant medical oversight by a physician medical director (Lane 2016).

Figure 49 EPIC Community Paramedic Response Vehicle Source

Source: Lane 2016)

EPIC 1

The program began by identifying the 40 most prolific users of the 911 emergency system. Typically these people do not have a family doctor, are living in poverty, have chronic and complex health problems, and are often disabled and have difficulties with housing. These people call the EPIC service directly if they are having problems. A level of trust is built between the patient and the paramedic.

EPIC 2

Community paramedics visit “at risk” persons who have been identified by personnel responding to emergency or other responses. A computer program called First Watch interacts with the computer-aided dispatch to identify trends or flags data. The EPIC paramedic then responds in a proactive manner. It could be an elderly person living alone, with difficulty walking, whose home is not clean, and who is unsure of their medications and safety concerns.

EPIC 3

The same computer program will also identify problem locations. These may be certain boarding houses, refuges or locations frequented by the homeless.

EPIC 4

Patients who have been to a hospital and had diagnostic tests done but have not waited for the results are referred to the EPIC program for appropriate follow up, including bringing the patient back to the hospital if required.

EPIC 5 (currently proposed but not yet implemented)

This program aims to provide short term support for relatively stable patients who need to be seen in hospital, but where there is a queue at the hospital Emergency Room (ER) an EPIC Paramedic could be dispatched to monitor the patient and attach telemetry as required. The patient can then stay safely at home until called, then go to the hospital with the support of the community paramedic (Bradley 2015).

Winnipeg is also using Bluetooth-interconnected iPads to ensure data on the patient is collected in a timely and efficient manner, which ensures accuracy and minimizes duplication.

6.5. CASE STUDY 5: LOS ANGELES COUNTY FIRE DEPARTMENT (LACOFD)

6.5.1. Overview Los Angeles County

Los Angeles County is in California, which is located on the West Coast of the United States.

Figure 50 Location of California in US

Source: https://www.mapsofworld.com/usa/states/california/california-location-map.html

Figure 51 Location of Los Angeles County in California

Source: http://mapsof.net/california/california-county-map-los-angeles-county-highlighted

6.5.2. Snapshot

Figure 52 LA County Fire Department

Location

- Los Angeles County is located in Southern California in the South West of the USA.
- **Agency**
  Los Angeles County Fire Department (LACoFD)
  Covers 10,575 square kilometres
- **Budget**
  US$1072 Billion
- **Stations**
  171 Fire Stations
  There is a total 4,421 staff. 710 are Paramedics, all other staff have EMT Qualifications
- **Number of Calls**
  TOTAL CALLS 389,313,
  EMS Calls 303,151, this figure represents 77% of calls to the Department.
- **Response Time**
  LACoFD documents show that the target response time for EMS calls is less than five minutes in urban areas and less than 8 minutes in suburban areas. The documentation further shows them achieving those targets. Urban is described as dense business populations, high-rise and suburban dense residential populations with some urban/wildland interface.
  Other LACoFd documents show an average EMS response time of 5.7 minutes for urban areas and 8.1 minutes for suburban.

All material used in the text box Figure No. 50 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

Source: Los Angeles County Fire Department (2015a)

Los Angeles County is the most populous in the United States. It contains 88 incorporated cities. The unincorporated area is 4,083 square miles. The County is managed by a five-member Board of Supervisors and has over 100,000 employees. The annual budget for the County is $22.5 billion.

Figure 53 Los Angeles County Fire Department (LACoFD)

Source: Los Angeles County Fire Department (2015a)

The LACFD provides emergency services to all unincorporated areas of the County plus coverage to 57 incorporated cities located within the County. They also provide emergency services to the City of La Habra in the neighbouring Orange County. The total area protected is 5,970 square kilometres with over 4,000,000 people. The annual budget for LACoFD is $1,072 billion.

The Department is led by Fire Chief Daryl Osby and has a total of 4431 staff operating from 171 fire stations and other facilities. There are 174 engine companies and a wide range of additional specialized vehicles. More unusual vehicles include 10 bulldozers and nine dedicated helicopters (Code2High 2016). An additional Erickson

Aircrane, Helitanker and Bombardier CL-415 Super Scoopers are on seasonal lease for the wildfire season.

Figure 54 LA County Fire Helicopter

Source: http://www.fire.lacounty.gov/wp-content/uploads/2016/06/LACoFD-Overview-Booklet-June2016.pdf

Broad ranges of operations are covered including dispatch, fire, wildfire, EMS, HAZMAT, technical and Urban Search and Rescue (USAR). LACoFD is one of the national and international USAR Teams (California Taskforce2/USA Taskforce2). Other duties include providing a Life Saving Division consisting of 161 fulltime staff, 641 part-time staff operating from 24 lifeguard stations. There are 159 lifeguard towers and 8 rescue boats. These resources provide protection to 72 miles of beach, including Catalina Island.

Another interesting facet of emergency response is the use of low-risk inmates of the LA County Correctional facilities to train and respond as wildfire firefighters. The program is designed to relieve pressure on correctional facilities and also supplement fire crews. In 2013 the figure was 528 inmates (Sewell 2013). The Californian Department of Corrections and Rehabilitation state that this program saves the state money and provides a number of benefits to the inmates. The inmates are paid a daily wage of $1.45 per day plus an additional $1.00 per hour whilst actually fighting fires. Other benefits include being accommodated outside of the prisons, skills acquisition, a feeling of self-worth, building a work ethic and preparing the inmates for integration back into the community on release (California Department of Correction and Rehabilitation 2016).

In 2015 the Department responded to the following:

Fire Calls 28,443

EMS Calls 303,151*

Miscellaneous 48,540

False Alarms 26,196

Mutual Aid 2,983

TOTAL CALLS 389,313

*Note: EMS represent 77% of all calls

6.5.3. EMS

All members of the LACoFD are required to have EMS-1 (or EMT-B [Basic]) qualifications as a minimum for their firefighter qualifications. Although some may hold EMT-I (Intermediate), not all states recognize EMT-I as a separate qualification level (AMR 2016; securelosangeles 2016).

The Department provides Advanced Life Support by means of 68 paramedic squads and 710 paramedics (Los Angeles County Fire Department 2011). The Squads are two-person vehicles with no ground transport capability. Transport of patients is provided by a number of contracted ambulance services (AMR 2016; Care Ambulance Service 2016). All paramedics are cross-trained as firefighters and can perform either role (Freeman 2013).

A typical response to a medical emergency such as an accident, collision or “man down” call may result in the dispatch of an engine, truck, paramedic squad and an ambulance. To some this may seem excessive but the total response provides a wide range of equipment and manpower that may be required for extrication or handling of obese patients and multiple casualties. The first arriving unit can call off oncoming units if they are not required (securelosangeles 2016).

Figure 55 Los Angeles County Fire Department Squad

Source: http://my.firefighternation.com/forum/topics/emergency-lacofd-squad-51-then?q=forum/topics/emergency-lacofd-squad-51-then

6.5.4. Strategic Planning

Figure 56 Los Angeles County Fire Department

Source:https://www.fire.lacounty.gov/wp-content/uploads/2014/02/LACFD_Strategic-Plan_2012_web.pdf

LA County Fire Department has a comprehensive strategic planning process. In 2011 LA County Government identified three key strategic drivers: operational effectiveness, fiscal sustainability, and integrated service delivery. Using these drivers as a base, LA County Fire Department undertook a Strategic Planning process in 2013 that identified 12 key goals. For each of the goals teams were tasked with identifying key performance indicators (Los Angeles County Fire Department 2013). The Plan was further enhanced in 2015 (Los Angeles County Fire Department 2015b).

6.5.5. EMS Performance Measures

LA County publishes it key performance indicators on an annual basis. The following tables outline targets and actual performance. Whilst there may be additional internal performance measures relating to EMS these are the only measures in the public domain.

Figure 57 Performance Measures

Performance Measures	Actual 2008-09	Actual 2009-10	Estimated 2010-11	Projected 2011-12
Indicators				
Percent of successful Automated External Defibrillator (AED) resuscitation attempts	8.00%	8.00%	8.00%	8.00%
Target response times for all 9-1-1 calls by area:				
Urban areas (1)	<5 minutes	<5 minutes	<5 minutes	<5 minutes
Suburban areas (2)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Rural areas (3)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Target response times for EMS (Emergency Medical Services) paramedic units by area:				
Urban areas (1)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Suburban areas (2)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Rural areas (3)	<20 minutes	<20 minutes	<20 minutes	<20 minutes

Performance Measures	Actual 2008-09	Actual 2009-10	Estimated 2010-11	Projected 2011-12
Operational Measures				
Number of times the AED was used	427	420	410	400
Number of patients on whom AED shocks were administered	178	165	155	155
Number of all 9-1-1 calls by area: (4)				
Urban areas	273,407	278,632	279,000	280,000
Suburban areas	11,008	10,989	11,000	11,000
Rural areas	7,993	6,666	6,700	6,700
Actual response time (in minutes) averages by area for emergency 9-1-1calls:				
For emergency 9-1-1 calls				
Urban areas	4.66	4.64	4.70	4.70
Suburban areas	6.09	6.11	6.10	6.10
Rural areas	9.18	9.40	9.40	9.40
Average paramedic response on EMS calls by area:				
Urban	5.72	5.71	5.70	5.70
Suburban	7.95	8.05	8.10	8.10
Rural	12.46	12.45	12.50	12.05

Explanatory Note(s):
(1) Dense business populations, high-rise structures, and no wildland interface.
(2) Dense residential population, and some wildland interface.
(3) Sparser population, few structures, and greater wildland interface.

Source: County of Los Angeles (2011-2012)

6.5.6. Training

The training program to become a paramedic at the Paramedic Training Institute (PTI) in California is 6 months full-time (the course is not offered part-time.) PTI is used by Los Angeles County Fire Department to train its operational staff as EMT-Paramedic.

The training hours are broken down as follows:

- Lecture/Lab: 450 hours
- Hospital-based clinical: 160 hours
- Field Internship: 480 hours (may be extended to 720 hours) - 1090 hours total

To undertake this training, a student must:

1. Provide certification of training, as an Emergency Medical Technician (EMT) to become an EMT requires 120 hours of training (EMT Guide 2016)
2. Prove 6 months recent experience as an EMT in the past twelve months
3. 3. Undertake a Medical Examination in accordance with the requirements of NFPA 1582
4. Provide three character references
5. Provide proof of a range of immunizations
6. Possess a driver's license
7. Completion of a Fire Academy Course approved by the California State Fire Marshal or possession of California State Firefighter 1

The Paramedic Training program consists of the following (units):

Basic Pre-hospital Care Principles: 2.0

Field Assessing and Reporting: 1.5

Prehospital Care Pharmacology: 1.5

Basic and Advanced Life Support: 6.5

Medical Emergencies: 4.0

Traumatic Emergencies: 2.0

Special Patient Emergencies: 2.0

EMS/Legal Aspects/Documentation: 2.0

Paramedic Clinical Internship: 3.0

Paramedic Field Internship: 8.5

Total units: 33 (EMT Guide 2016; Los Angeles County Department of Emergency Services 2017)

Figure 58 LA County Fire Department Paramedic working on patient

Source: (Los Angeles County Fire Department 2015a) http://www.fire.lacounty.gov/wp-content/uploads/2016/06/LACoFD-Overview-Booklet-June2016.pdf

6.6. CASE STUDY 6: PHOENIX, ARIZONA FIRE DEPARTMENT

6.6.1. Overview Phoenix

Phoenix is located in the State of Arizona, which is located in the southwest of the United States and shares a common border with Mexico.

Figure 59 Location of Arizona in USA

Source: http://www.mapsofworld.com/usa/states/arizona/arizona-location-map.htm

Figure 60 Location of Phoenix in Arizona

Source: http://www.mapsofworld.com/location-maps/usa/phoenix-az.html

6.6.2. Snapshot

Figure 61 Phoenix Fire Department

- **Location**

Phoenix is located in Arizona which is located in the south east of the USA

- **Agency**

Phoenix Fire Department
Area 1,341 square kilometres

- **Budget**

US$312,745,048

- **Size of Department**

1667 Uniform Staff, 333 Civilian Staff

- **Number of Stations**

58 Stations

All Engine companies are ALS and run 2 Paramedics and 2 EMT's as a minimum

The service also runs the Ambulance Service under contract

- **Number of Calls**

Total number of calls 186,594 EMS Calls 164,106

- **Response Time**

The Department is achieving a response time of under 10 minutes 92% of the time. The majority of calls having a response time of under 5 minutes. Other documentation shows a 6.81 minute 90% for turnout and travel time in 2015.

Source: City of Phoenix (2016a)

All material used in the text box Figure No. 59 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies**.**

Phoenix is the capital of Arizona and is the sixth largest city in the USA. The city covers an area of 518 square miles (1,341 square km), an area larger than Los Angeles. The population is in excess of 1.8 million. The city has a Council Manager form of government, in which a City Manager supervises all departments and implements adopted council policies. The City budget is $3,702,298,048; the population of the City was 1,527,509 in 2015 (City of Phoenix 2016b).

Figure 62 Phoenix Fire Department

Source: City of Phoenix (2016a)

The Fire Department, led by Fire Chief Kara Kalkbrenner, has 2000 staff – 1667 uniform and 333 civilians. The Department operates out of 58 fire stations and has an annual budget of $312,745,048 (City of Phoenix 2016a).

The mission statement of the Phoenix Fire Department is:

> We are committed to providing the highest level of public safety service for our community. We protect lives and property through fire suppression, emergency medical and transportation services, disaster management, fire prevention and public education. Our members will: Prevent Harm, Survive and be nice (City of Phoenix 2016a)

Fire Chief Kara Kalkbrenner, a veteran with over 30 years of service, was appointed Acting Fire Chief in 2014 and confirmed in her position as Fire Chief on 12 November 2014. At that time she was one of only 6 female Fire Chiefs of large

Metropolitan Fire Departments in the USA. It is of interest that 4.9% of Phoenix Fire Department sworn members are female (ABC 15 Arizona 2014; Ballotpedia: The Encyclopaedia of American Politics 2016).

The Fire Department is an integrated service providing both fire and EMS capability. The service provides one of FEMA's (Federal Emergency Management Agency) National Urban Search and Rescue Teams.

Call Activity 2015-16

Fire 14,604

EMS 164,106

Special Operations 1,683

Miscellaneous 2,219

Total 186,594 (City of Phoenix 2016a)

6.6.3. EMS

The Phoenix Fire Department has been delivering paramedic EMS since the early 1970s. In 2006 the service, in partnership with the Union representing the firefighters, began developing a long-term strategic plan. The goals were to improve service delivery by reducing response times and out-of-service times, and keeping fire appliances in their response areas.

Prior to 1985 the City of Phoenix used private ambulance providers. The average response times were unacceptable, approaching 20 minutes. In November 1985 the Phoenix Fire Department was awarded the contract to provide this service. As a result of this change response times have fallen substantially: "The service now consistently delivers response times under 10 minutes 92% of the time with the majority of calls having on-scene times of less than 5 minutes" (City of Phoenix 2016; Ballotpedia:The Encyclopedia of American Politics 2016).

By 2nd June 2010 all engine companies had been converted to ALS running a minimum of 2 paramedics and 2 EMTs. The ambulances (also called 'rescues') ran 1 paramedic and 1 EMT. The result of these changes was a 10% reduction in response times, increased availability of engine company availability, and a decrease of out-of-service times (Harms 2010).

6.7. CASE STUDY 7: NEW YORK CITY: FIRE AND AMBULANCE

New York State is located in the north-east corner of the United States.

Figure 63 location of New York State with in the USA

Source:http://www.tworvgypsies.us/!USA-trip-6-2013/2013-60-Rock_City_Park_NY.html

The City is located on the southern tip of New York State.

Figure 64 Location of New York City with New York State

Source:

http://www.worldatlas.com/webimage/countrys/namerica/usstates/ny.htm

6.7.1. Snapshot

Figure 65 Snapshot New York Fire Department

New York City is located on the Southern tip of New York State which is located in the North East of the Country. New York City consists of five Burroughs; Brooklyn, Queens, Manhattan, The Bronx and Staten Island. It has access to the Atlantic Ocean.

Agency

New York Fire Department (NYFD) Protects an area of 834 Square Kilometres (to put the area into perspective it is smaller than the Metropolitan Fire District in Melbourne, Australia)

Budget

US$1.8 Billion

Size of Department

Uniformed Fire Personnel	11,051
EMS Personnel	4,414
Civilian Personnel	1,924

Fire Stations

218 Fire Stations 37 EMS Stations

Number of Calls

Fire and non–medical calls	308,760
Medical Emergencies	1,425,719
Total	1,734,479

Response times

New York Fire Department collects End-To-End Response times (in minutes and seconds)

Average response times to structure fires	4:52

Combined average response times to life threatening medical emergencies by ambulances and fire companies	8:08
Average response times to life threatening medical Emergencies by ambulances	8:59
Average response times to life threatening medical Emergencies by fire companies	7:24
Hospital Transports	1,092,752

Source: (Fire Department & City of New York 2016)

All material used in the text box Figure No. 63 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

This case study differs from the others in that much of this case is supported by a peer reviewed report on the merger of NYFD and the Ambulance Service (Nahmod 2006).

6.7.2. Overview New York City

New York City (NYC) has a resident population of 8,537,673 (United States Census Bureau 2010-2016; United States Census Bureau 2016) but that number increases significantly as commuters come to the city from surrounding areas. The Greater Metropolitan area contains 23.7 million (United States Census Bureau 2010-2016). The City is the most densely populated city in the USA. It is estimated that over 800 languages are spoken making it the most linguistically diverse city in the world (Kleinfield 2016). In 2016 the City had a record 61,000,000 tourists and expected to grow to 62,000,000 by the end of 2017 (Bellafante 2017).

New York City has a Mayor-Council Government with a strong Mayor model. The Council consists of 51 Council members from districts defined by geographic population boundaries. The current Mayor is Bill de Blassio, a Democrat and he was elected in 2013 with over 73% of the vote.

The adopted budget for 2017 shows an expected expenditure of over US$82.2 billion (Mayor's Office of Management and Budget 2016).

6.7.3. Overview of the New York City Fire Department

New York Fire Department is the largest fire department in the United States (Tokyo Fire Department 2017) and the busiest urban fire department in the world (New York City Government 2016). The current Fire Commissioner is Daniel A. Nigro and the Chief of Department is James E. Leonard (Fire Department & City of New York 2016).

Figure 66 New York Fire Department

Source: https://au.pinterest.com/pin/270004940130538037

Figure 67 Fire Engine New York Fire Department

Source: images.search.yahoo.com

Area Protected: 834 Square kilometres (322 square miles)

Population: 8,537,673

Fire Stations: 218

EMS Stations: 34

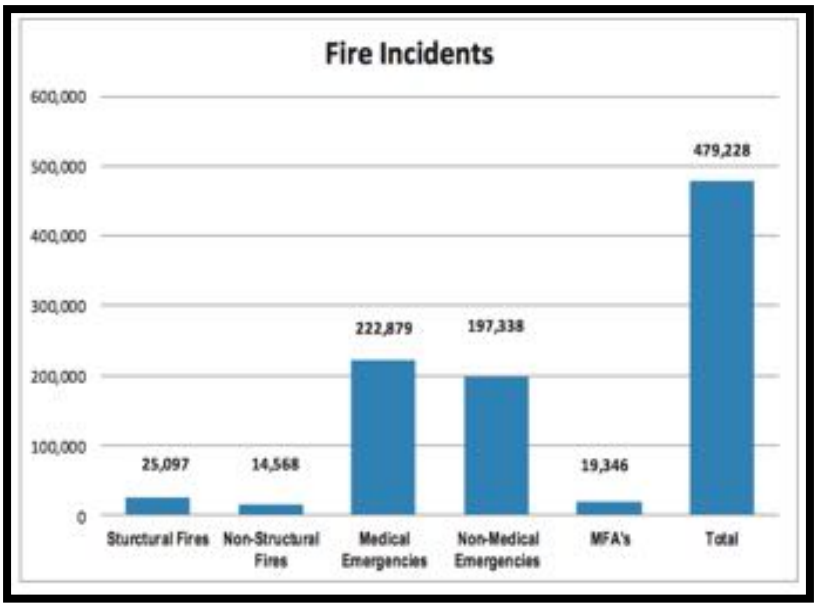
Uniformed Fire Personnel 11,051

EMS Personnel 4,414

Civilian Personnel 1,924

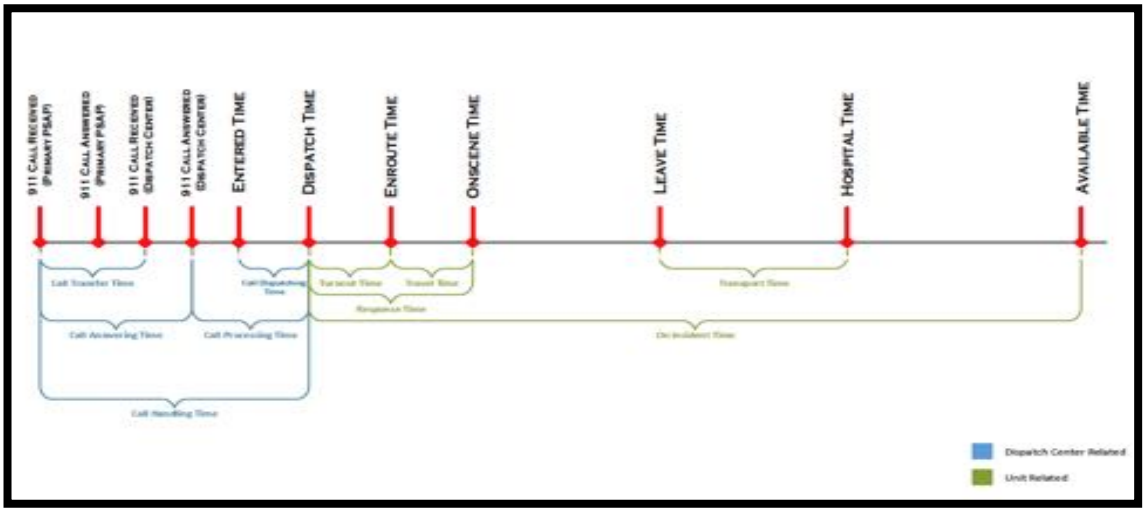
Budget: FY14: $1,771.7 million (the total estimated cost of providing the service including pensions and other benefits is US$3.4 billion; New York Independent Budget Office 2016).

Figure 68 Fire Incidents



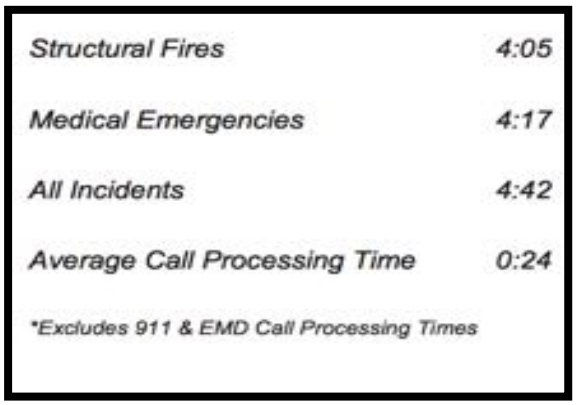
Source: New York City Government (2013)

Figure 69 Breakdown of time milestones on 911 call processing and incident response



The time scale units used by New York City is consistent with NFPA. Source: New York City Independent Budget Office (2013)

Figure 70 Average City wide Response Time (Fire)

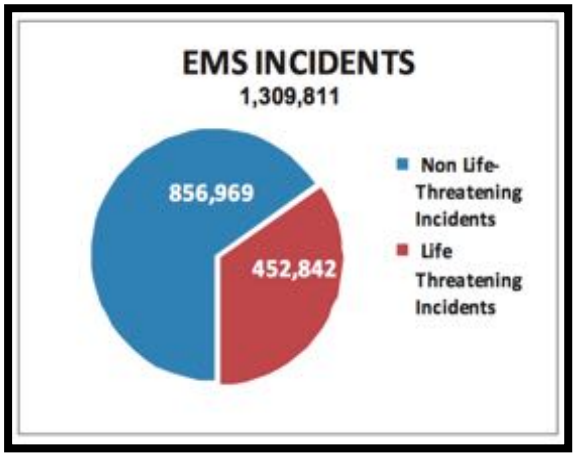


Structural Fires	4:05
Medical Emergencies	4:17
All Incidents	4:42
Average Call Processing Time	0:24

*Excludes 911 & EMD Call Processing Times

Source: New York City Government (2013)

Figure 71 EMS Incidents



Source: New York City Government (2013)

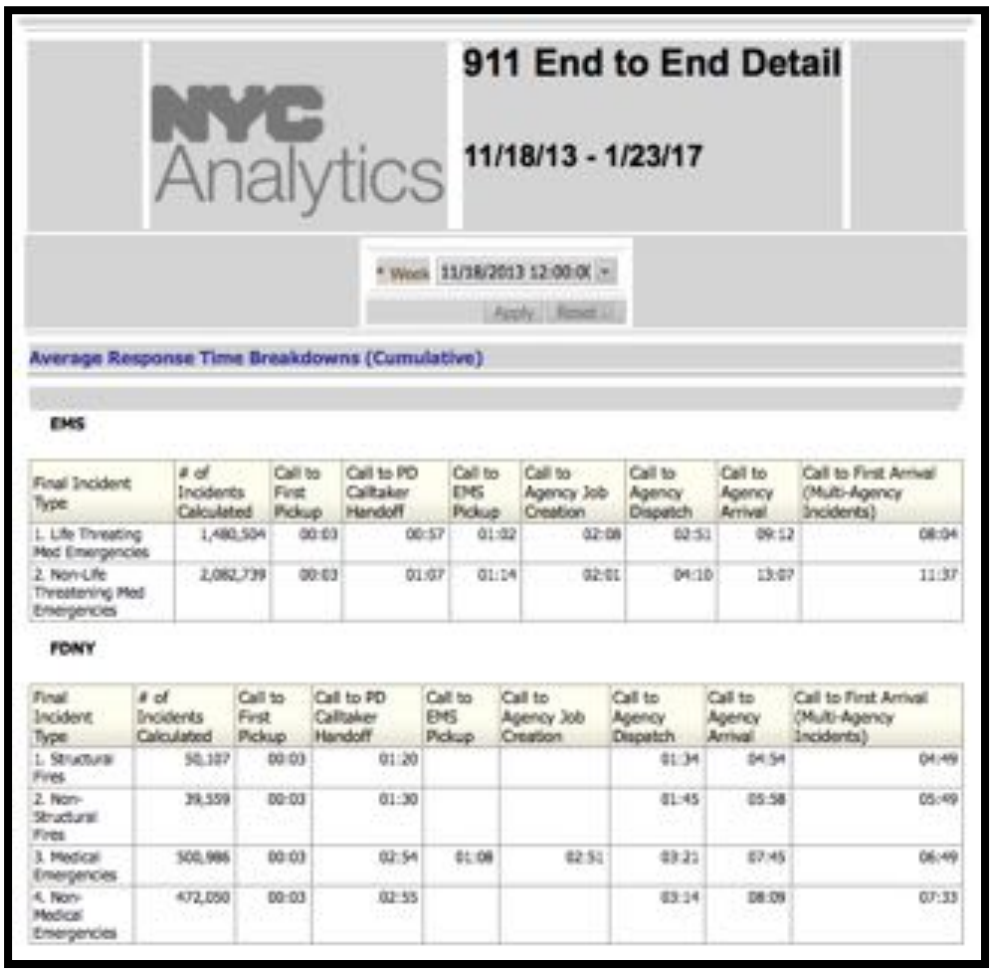
Figure 72 Average city wide response times (EMS)

Cardiac Arrest / Choke (Fire & EMS)	4:14
Life-Threatening Segment 1-3 (EMS)	6:47
Life-Threatening Segment 1-3 (EMS & Fire)	5:47
All Incidents (EMS)	9:24
Hospital Transports	986,739
Emerg. Room Turnaround Time	32:46

Source: New York City Government (2013)

The following chart shows the average cumulative response time for Fire and EMS to life threatening medical emergencies. The time is from first call to arrival on scene.

Figure 73 New York City Analytics 2013-2017



NYC Analytics

911 End to End Detail

11/18/13 - 1/23/17

* Week 11/18/2013 12:00:00

Apply Reset

Average Response Time Breakdowns (Cumulative)

EMS

Final Incident Type	# of Incidents Calculated	Call to First Pickup	Call to PD Calltaker Handoff	Call to EMS Pickup	Call to Agency Job Creation	Call to Agency Dispatch	Call to Agency Arrival	Call to First Arrival (Multi-Agency Incidents)
1. Life Threating Med Emergencies	1,480,504	00:03	00:57	01:02	02:08	02:51	09:12	08:04
2. Non-Life Threatening Med Emergencies	2,082,739	00:03	01:07	01:14	02:01	04:10	13:07	11:37

FDNY

Final Incident Type	# of Incidents Calculated	Call to First Pickup	Call to PD Calltaker Handoff	Call to EMS Pickup	Call to Agency Job Creation	Call to Agency Dispatch	Call to Agency Arrival	Call to First Arrival (Multi-Agency Incidents)
1. Structural Fires	50,107	00:03	01:20			01:34	04:54	04:49
2. Non-Structural Fires	39,559	00:03	01:30			01:45	05:58	05:49
3. Medical Emergencies	500,986	00:03	02:54	01:08	02:51	03:21	07:45	06:49
4. Non-Medical Emergencies	472,050	00:03	02:55			03:14	08:09	07:33

Source: Office of the Mayor (2017)

6.7.4. Background

In 1996 the Giuliani Administration in New York City combined the city's fire and ambulance services, bringing together the city's Emergency Medical Services from the public hospital system to the fire department. Prior to this there had been many questions raised regarding the lack of timely response to medical emergencies and the possibility of combining the services. The reasons for the changes were to better coordinate EMS response, to have a greater number of firefighters responding to EMS calls (and thus greater productivity), as well as to reduce redundant staffing in both operations and administration with the resultant financial savings. There would also be a reduction in a number of support units.

The new combined department was set a goal of responding to 90% of serious medical emergencies in 10 minutes or less with an Advanced Life Support Ambulance manned by paramedics. The share of serious medical emergencies responded to in less than 10 minutes of serious medical emergencies increased from 64% in 1999 to 81% in 2011. There was a reduction in the disparity of response times across the boroughs that make up the city, and greater availability of ambulances.

Another significant outcome was that there were far fewer instances of non-attendance by paramedics to serious medical incidents. In 1999 the number of serious EMS incidents with no paramedic attendance was 29,000, while in 2011 this number had fallen to 5,150.

Figure 74 A system of city and private ambulances

Source: www.rescue911.de

When an EMS call is made to the 911 dispatch centre, either a city or private ambulance is deployed. The city ambulances are manned by NYFD and the private ambulances are operated by private hospitals, or by commercial ambulance companies on behalf of private hospitals. The private ambulances can only attend to EMS calls if responded by the 911 dispatch. These private ambulances are not paid for by the city; they do charge fees, but these charges do not cover the cost of providing the service. The hospitals have a financial benefit in that the patients (who may otherwise have been taken to other hospitals) are brought to their emergency rooms and/or admitted. In 2011 NYFD provided 63% of available ambulance time with the remaining 37% being provided by private ambulances.

6.7.5. Categorizing Medical Emergencies

In the City of New York medical calls are categorized according to seriousness: from Advanced Life Support (ALS) to less serious Basic Life Support (BLS) responses. In 2011 there were just over 325,000 ALS calls, which account for about 25% of all

incidents. The types of medical calls requiring an ALS response include cardiac conditions, breathing difficulties, being unconscious, and major burns, in addition to other serious medical emergencies as deemed to be so by the 911 dispatcher. The remaining 75% of calls are deemed to be BLS and include a wide range of non-life threatening medical conditions, including non-critical injuries, emotional disturbances, abdominal pain or other sickness, and drug and alcohol abuse.

In NYC ALS units are staffed by 2 paramedics; BLS calls may be responded to by 2 EMTs. In some instances both ALS and BLS may be responded (cardiac arrest). If BLS is responded and a higher level of medical support is required, ALS will subsequently be responded. All ambulance staff must be New York State-certified for their role. Paramedics receive over 1500 hours of training compared to 120-150 hours for EMTs. Since the merger there has been a steep increase in the number of ALS calls, resulting in the additional response of a fire unit. These will have a minimum of 2 people qualified in cardiopulmonary resuscitation and use of an automatic defibrillator; a critical piece of equipment in reviving heart attack patients.

Figure 75 Steep increase in dispatching firefighters to medical emergencies

	1993	1999	2005	2011
Fires				
Structural	30,481	29,429	28,455	25,380
Nonstructural	63,305	32,083	22,940	15,729
Subtotal (All Fires)	**93,786**	**61,512**	**51,395**	**41,109**
Medical Emergencies	1,971	156,573	202,526	216,083
Other Emergencies and False Alarms	266,818	230,946	231,781	230,825
TOTAL Incidents	**362,575**	**449,031**	**485,702**	**488,017**

SOURCE: New York City Fire Department
NOTES: Structural fires occur in buildings and other structures. Examples of nonstructural fires include brush, rubbish, or automobile fires. Other emergencies include utility emergencies, vehicle accidents, and stuck elevator rescues.
New York City Independent Budget Office

Source: New York City Independent Budget Office (2013)

The location and number of fire stations in NYC was determined historically to provide fire coverage for the city; because of these locations the firefighters often are first on scene to medical emergencies and are to stabilize the seriously ill or critically injured prior to the ambulance arrival. In 2011 on average the firefighters arrived in 4.3 minutes to life-threatening emergencies, with the first ambulance arriving on average in 6.5 minutes. These figures are a significant reduction compared to 1999 prior to the

merger. It is also important to note the reductions in both structural and non-structural fires and the dramatic increase in EMS call over time.

Figure 76 Median Response time has declined

Median Response Time (in minutes) of First Arriving Unit	1999 (N=293,655)	2011 (N=326,116)	Percentage Change
ALS Ambulance	7.9	6.5	-17.7%
ALS or BLS Ambulance	7.1	6.1	-14.1%
ALS or BLS Ambulance or Firefighter Unit	5.6	4.8	-14.3%

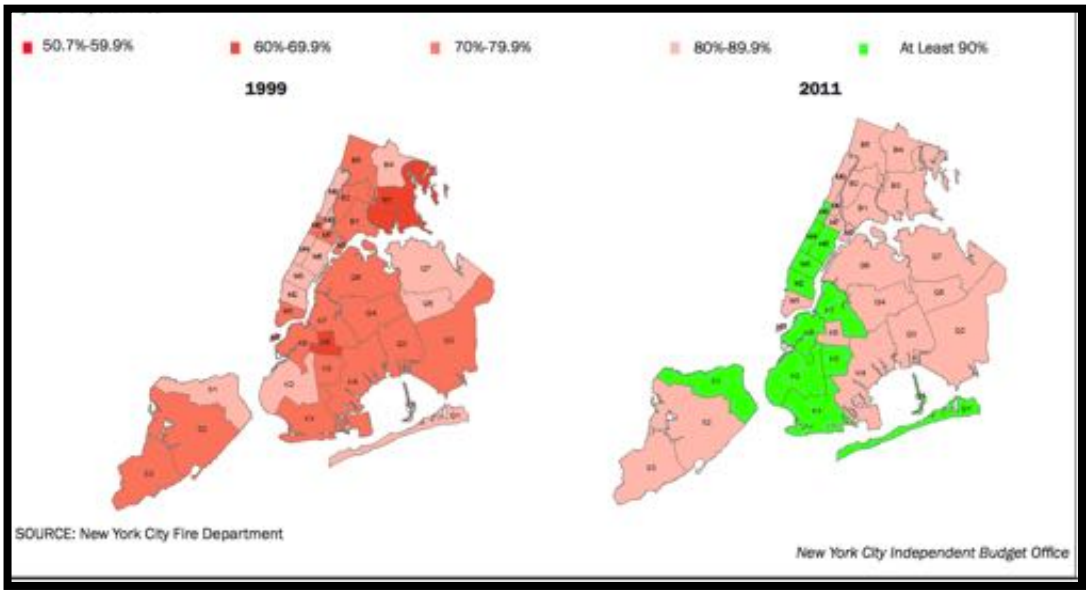
SOURCE: New York City Fire Department

New York City Independent Budget Office

Source: New York City Independent Budget Office (2013)

As indicated earlier, at the time of the merger the Mayor set a target response time for paramedics of at least 90% of ALS calls within 10 minutes. In 2012 a new performance measure of 90% of ALS calls responded to by either ALS paramedics or EMTs was implemented. In 2012 90.2% of ALS calls were attended to by either a paramedic or EMT within 10 minutes. NYFD makes the case that prior to the arrival of ALS there may be BLS on scene to assess and perform non-invasive treatment prior to the arrival of ALS (New York Independent Budget Office 2016).

Figure 77 Share of serious medical incidents responded to by advanced life support or basic life support ambulance within 10 minutes



Source: New York City Independent Budget Office (2013)

The above graphic shows the dramatic improvement in response time following the merger.

6.7.6. Merger Issues

In the private sector there has been a drive for mergers for some time. The aim of mergers is to increase market share, reduce competition and to increase profits. It is also perceived that combining back office processes will reduce costs. It is this issue that has caught the attention of public sector managers. In addition to overlapping services, each department may have payroll, administration, supply and support units. Consolidation of agencies could result in staff reductions, with resulting savings that could be used to improve performance or reduce costs. Thus, the public sector jumped onto the merger bandwagon.

After a few years of merger mania, problems started to emerge. Even when companies provided the same type of product to the same customer base, productivity and profits often declined. Researchers were of the opinion that whilst the pre-merged companies may have the same goals, they may have very different means of achieving them; such clashes of internal systems were postulated as the problem.

For example, every company or government agency has rules and procedures but they also have unwritten codes of conduct. These disparate "rules" form the organizational culture. Culture in organisations is about assumptions, beliefs, values and norms for a particular group. It is about the symbols and traditions the group hold dear. Within these boundaries the group feels secure. When these norms are threatened, a normally passive group can become violently aggressive. It is considered by some scholars that the reason many mergers fail is the fact that the culture of the acquired company is ignored. When companies merge one of the entities takes the lead role and tries to assert its culture on the other organization. The merger of the NYFD with EMS is such a case. Both agencies provided different but similar services to the same clients. The Health Department handed over complete control of the EMS Department to the Fire Service, setting up a significant clash of cultures.

6.7.6.1. *Before the Merger*

Both services had similar beginnings with the use of volunteers. The fire service ended up with a paramilitary structure and the Fire Department evolved over time. The ambulance service was very disjointed, being hospital-based. The Health Department eventually consolidated the ambulance service into a semi-autonomous unit. Over a

period of 30 years, the EMS developed its own strong and unique culture. As the issue of a proposed merger was discussed, the fire department began training firefighters in cardiopulmonary resuscitation (CPR); this later evolved into First Responders and defibrillator certification (CFR-D). Then, fire trucks started to be sent to all high priority EMS calls.

6.7.6.2. *Fire Service Culture*

The culture of the New York Fire Department was typical of fire service culture across the country. It requires a team to work together to do a dangerous job; there may be 19-25 firefighters plus their officers at the fire station. The firefighters operate as teams under the supervision of an officer. The team forms a "family" of mutual support, and for this reason the fire service is often called a 'brotherhood'. Firefighters eat, sleep and work together to perform the job and to protect each other from harm. Anything that builds team unity is encouraged. The department believes that every firefighter will do their part; officers have faith in their subordinates, and the subordinates believe the officers will protect them from harm. The outcome is faith in the chain of command.

Traits such as strength, courage and loyalty are expected. Much of the compliance with the rules, both written and unwritten, is achieved by peer pressure. Such a culture is resistant to change. Firefighters tend to look for constant approval from both the media and the public, and will respond aggressively if threatened.

The two statements commonly attributed to New York City Fire Department (albeit with no evidence that NYFD is the actual source) are, famously, "One hundred and fifty years of tradition unimpeded by progress" and "You light them we fight them". These statements imply a reactive rather than proactive stance.

6.7.6.3. *EMS Culture*

The culture of EMS is very different to that of the fire service. Officers are trained to act and think independently although they usually work in pairs. Teamwork is not important. The roles may change, with one member leading on an incident and the other on the next. Their efforts complement each other; if one misses something the other will pick it up. They have the same qualifications and see each other as equals. Personality, skills and loyalty are prized. Personality is important as officers are in each other's company for a long time. Some make the comparison of the EMS team to a marriage; fidelity or loyalty is greatly valued, and they will protect each other. The work of EMS personnel demands that they be aggressively independent. They are

trained to challenge authority in the interests of their patient. The medical-legal implications also have an impact on the EMS environment. Rules must be followed; people must work within their legal competencies and document all actions (Weiss 1998).

Within EMS there is a dual hierarchy: EMT, Paramedic, Lieutenant, Captain and Chief for administrative purposes and EMT, Paramedic, physician for medical authority. It is possible for an EMT Lieutenant to be supervising much better qualified paramedics. These dual streams of authority create their own problems.

6.7.6.4. *Combining the Cultures*

Research shows that there are basically two strategies when combining organisations: assimilation and integration (Ito, Fujimura & Tamiya 2012). Assimilation is when the acquired is indoctrinated into the culture of the acquiring agency, while integration is when there is an equal flow of culture across boundaries.

The NYFD went down the road of assimilation, despite the strong organizational culture of EMS. They repainted the ambulances in Fire Department livery, and changed the EMS uniforms to resemble the firefighters (which alienated both cultures). The firefighters were of the view the EMS staff had not earned the right to wear the fire service uniform, and the EMS personnel complained of losing their unique EMS identity.

Figure 78 FDNY Ambulance

Source: NYPost.com https://www.facebook.com/NYCambulances/

Figure 79 FDNY EMT Jacket

Source: http://www.forum-pompier.com/sujet36203.html

The Fire Department was remaking the EMS in its image, including changing the deployment model to more closely represent its own. Changing the deployment model proved to be the final straw. Response times started to blow out and morale plummeted (Weiss 1998).

Fire Department senior managers felt that the EMS staff would welcome being part of the fire service team; instead they felt like an unwanted stepchild. Response times continued to blow out and morale continued to fall. Even though they essentially wore the same uniform, a key issue was that firefighters were "uniformed members" whilst the EMS staff were known as "civilian employees". The civilian category was the same as that given to the department janitors. There were also broken promises regarding new facilities and training opportunities (Weiss 1998).

After six months of low productivity and falling morale the fire department backed off and restored the EMS Chiefs to their previous supervisory role, reverted to the pre-existing deployment model (EMS) and allowed the EMS to return to their familiar EMS culture. The results were near immediate. Response times fell

dramatically, morale improved and staff were now talking about the future of the service rather than focusing on the past.

To achieve the goal of merging the two departments into a single entity, a number of proactive steps have been identified. These include reducing the use of the term "uniformed" and having all staff wear the same dress uniform (currently firefighters wear a white cap and EMS staff a blue cap), but with "Firefighter" or "EMT"/"Paramedic" on the back, thus restoring EMS identity by putting the term Emergency Medical Services on their uniforms and vehicles (Weiss 1998). These initiatives will help create separate identities but equal partners within the fire department. It is also intended to reduce cross-cultural tensions by getting EMS and paramedics to ride on fire trucks and vice versa. It will create opportunities to "see how the other half lives" and breakdown cultural stereotypes, so that the new culture has an opportunity to grow organically.

For any agencies considering merging Fire and EMS, the New York City case study provides valuable lessons on both what to do and what not to do and should be compulsory reading (Weiss 1998).

A recent update shows that from 12-16 December 2016 the NYFD was undertaking entrance examinations for its EMS staff who wanted to work as firefighters. Of the 3,700 staff 1,591 have applied to take the examination. The figure represents approximately 45% of the EMS workforce and nearly 65% of 2,500 who meet the age eligibility of under 29 years. These tests were not open to the general public. Those who achieve a score of 70 or higher are fast-tracked ahead of outside applicants who will be able to take the examination later next year.

The system has been accessed by the families of serving firefighters and other NYC "bigwigs", and critics of the program say that it is being used as a back door entry into the fire service, which pays a considerably higher salary (firefighters earn over US$100,000 per year compared to US$45,000 for EMTs); for example, Joe Cassano, the son of former Fire Service Commissioner Salvatore Cassano was one of the serving EMTs to undertake the test to enable him to become a firefighter (Otis 2016). There is nothing illegal in accessing the program, but there are issues of lack of diversity; figures from 2013 showed the NYFD at 90% white, which does not represent the diversity of the city (Fire Engineering 2013). Nevertheless, an advantage to the service is that it provides cross-trained firefighter-medics with experience in both disciplines.

The case study shows that by combining the two services it was possible to reduce response times. It also clearly demonstrates the need to properly manage a merger of fire and ambulance by showing both what not to do and also techniques that work.

6.8. CASE STUDY 8: AMBULANCE VICTORIA

Figure 80 Map of Australia showing the State of Victoria in SE on Mainland

Source: https://ivanhoecycles.com.au/admin2/articles/media/Victoria_in_Australia.svg.png

Figure 81 Map of Victoria

Source:https://www.google.com.au/maps/place/Victoria/@37.7344652,141.9937871,6.52z/data=!4m5!3m4!1s0x6ad4314b7e18954f:0x5a4efce2be829534!8m2!3d-37.4713077!4d144.7851531

6.8.1. Overview

Victoria is located in the south-eastern corner of mainland Australia. The Victorian Ambulance Service provides EMS response across the entire state, an area of 227,010 square kilometres. The agency has a metropolitan and rural division, which provide BLS and ALS and transport patients in a wide variety of ways including road and air.

6.8.2. Snapshot

Location

Victoria is located in the south east of the Australian mainland. It is the most densely populated state in Australia.

Agency

Victorian Ambulance: this entity was created in 2013 with the amalgamation of rural and metro services (#2).

The total area of the state is 227 010 square kilometres (Geoscience Australia 2017). The population of Victoria is 5,354,042 (Department of Environment 2017).

Budget

$766.54 million

Staffing

On road clinical staff 3,438.6

Operation Support and Managerial staff 318.2

Other Managerial, Professional and Administrative Staff 366.5

Total 4,123.3

MICA Paramedics 530.7

MICA Trainees 48

These staff numbers are included in the total number of fulltime staff.

There are also 357 Community Emergency Response Team volunteers (CERT) and 723 Ambulance Community Officers (ACO) who provided emergency response in 2015-16 (Ambulance Victoria 2015-16)

Number of Calls

Total number of calls for whole State 594,403

Metropolitan Calls 416,887 (communities above 7,500 people)

Response Time

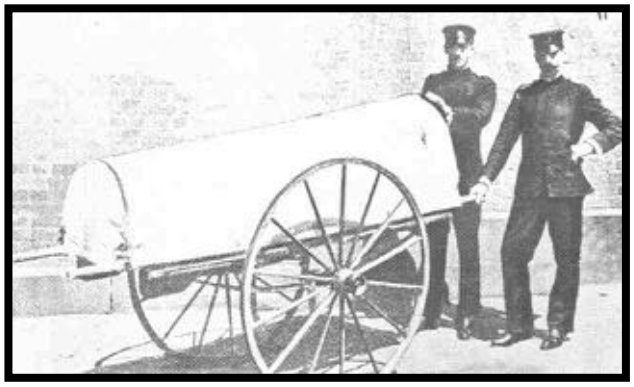
A response time of 15 minutes or less was achieved in communities of greater than 7,500 people on 80.5% of occasions against a target of 90%. The figures for the whole of the state are 72.5% against a

All material used in the text box Figure No. 80 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

6.8.3. History

The earliest provision of ambulance services in Melbourne began in 1889 with the provision of wheeled litters operating out of police stations. The first civil response for medical emergencies began with the purchase of six Ashford litters that were strategically placed in Melbourne police stations (4), Melbourne Town Hall (1), and the Eastern Hill Fire Station (1). The firefighters were trained in first aid skills and are considered to be Melbourne's first ambulance officers (May 2005).

Figure 82 A Melbourne Ashford Litter



Source: http://www.colacambulance.com/Ashford%20Litter.htm

The first horse-drawn ambulance in the State of Victoria was in Ballarat in 1894. Melbourne's first horse-drawn ambulance was stationed at Eastern Hill Fire Station in 1899. The fire service operated the ambulance until the end of 1902, when it ceased provision of the ambulance service due to increasing workload and lack of support (May 2005).

Figure 83 Melbourne's first horse drawn ambulance

Source: http://www.colacambulance.com/ambulance%201880%20-%201900.htm

Figure 84 Firefighters training for Ambulance work

Source: http://www.colacambulance.com/ambulance%201880%20-%201900.htm

From 1903 to 1913 the ambulance service was operated by private contractors (Fiske Bros.) for St John's Ambulance and the first motorized ambulance for Melbourne was introduced in 1910. Following financial difficulties for the contractor, St John's Ambulance took responsibility for the service in 1913.

Figure 85 Melbourne's first motorized ambulance

Source: http://www.colacambulance.com/ambulance%201880%20-%201900.htm

Over the next 50 years many regional ambulance services were formed. In 1962 an ambulance officer's training school was opened in Geelong, but later moved to Melbourne. In 1988 16 ambulance services were merged, creating one metropolitan and six rural services. In 1999, 5 of the 6 rural services merged to create Rural Ambulance Victoria. Then, in 2008 the Metropolitan Ambulance Service, Rural Ambulance Victoria and the Alexandra Ambulance Service combined to form Ambulance Victoria, the current model (Rood 2008; Ambulance Victoria 2013).

During this period of evolution there were a number of significant milestones including air ambulance (1962), introduction of ambulance helicopter (1971), MICA paramedics in 1971, and computer-aided dispatch in 1992.

Figure 86 Ambulances outside Ambulance HQ (1937)

Source: http://www.colacambulance.com/Dodge%20D11.htm

In 2015-16 Ambulance Victoria responded to over 840,000 emergency and non-emergency cases, and transported over 660,000 patients by air or road. The core business of Ambulance Victoria is to service the community with pre-hospital emergency care. A number of other services are also provided, including non-emergency patient transport. The service is involved in the Emergency Management arrangements for the state.

Figure 87 Current model Ambulance

Source: http://www.colacambulance.com/ambulance%202001%20-%202003.htm

Figure 88 Helicopter Ambulance

Source: http://www.colacambulance.com/ambulance%202001%20-%202003.htm

6.8.4. Budget

In 2015-16 the cost of Ambulance Victoria was $766.54 million (Ambulance Victoria 2016a). It is helpful to look at the costs of the service over a number of years:

- 2013-14: $657.21 million
- 2014-15: $720.70 million
- 2015-16: $766.54 million

An Auditor General's Report on Access to Ambulance Services indicated that increased funding of $185.7 million over 4 years from 2008-9 has not led to any demonstrable improvement in response times (Victorian Auditor General 2010).

When the Andrews Labor Government in Victoria came to power in 2014, they provided Ambulance Victoria with $99 million to "improve ambulance services across the state, upgrade ambulance stations, equipment and vehicles" (Andrews 2015). Of that sum $77 million was spent on pay rises, with additional funds required for superannuation and long service leave. The cost of providing an ambulance has risen by 23% since 2012-2013 (Gordon 2016b).

In the State Budget announced in April 2016, the Government allocated $144 million to Ambulance Victoria, which includes funds to upgrade and construct new ambulance stations, and a $60-million Response Rescue Fund (Hennessy 2016; Pallas 2016; Willingham 2016a).

On 26 November 2016 the Andrews Government announced it was spending an additional $518 million on the ambulance service to build new stations and to hire an additional 450 paramedics. The program will be implemented over a period of three years. The announcement came a week after Victoria's Health System was overwhelmed by the asthma emergency caused by a thunderstorm. The government indicated the timing of the announcement and the storm-created medical emergency was coincidental (Preiss 2016).

6.8.5. Performance

An Auditor General's report in 2010 found Ambulance Victoria measures its performance using response time (which it reports on quarterly) and the clinical outcomes for the patients. The response time for 2015-16 for areas with more than 7,500 people is 80.5% for a target of 15 minutes. The percentile target for this response time is 90% (Ambulance Victoria 2016a).

A comparison of the 2015 March quarter with the same quarter in 2016 shows that for the first full year of the Labor government, 29 of 79 local government areas the response time was worse than for the previous quarter. The article did not separate rural from metropolitan, but it did indicate that the Whitehorse Council was the only local government area in the state meeting the 90% in 15 minutes target for Code 1 calls. On average response times have fallen by 5 seconds across the state (Willingham 2016a; Hennessy 2016).

In addition to measuring response time, Ambulance Victoria have a number of other performance targets. Some of these relate to patient outcomes but measure more than the paramedic input. For example the number of patients leaving hospital after a heart attack is a measure of the system that takes into account all of its parts, including the input of firefighters (if they arrived first), the paramedics, emergency room, ICU and other parts of the hospital.

6.8.6. "Where the hell does 15 minutes come from?"

The rather challenging title above was taken from a document prepared in support of the Ambulance Union to attack the then Napthine-led Coalition Government in Victoria (*"Where the hell does 15 mins come from?"* 2013). The issue of the 15-minute response time target for Ambulance Victoria is one of the key findings from this research, as hundreds of millions of dollars are being spent to achieve this target time. As has been shown from the budget figures above, spending over $200 million managed to reduce response times by 6 seconds. The target response time taken from Ambulance Victoria Annual Reports shows the following:

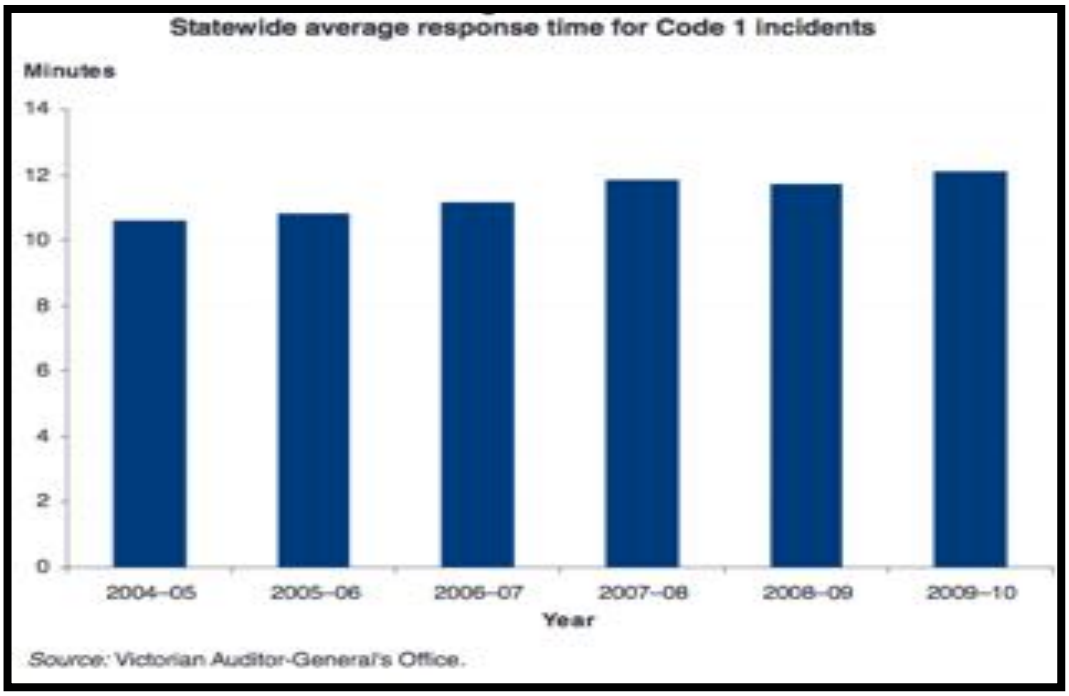
1979-2000: Code 1 (highest priority) response time target was 8 minutes

2000-2007: Code 1 response time target was 13 minutes

2007 to date: Code 1 response time target was and now is 15 minutes

(Disposable Asset 2013)

Figure 89 State-wide average response time for Code 1 Incidents



Note: the graph shows averages, not 90 percentile (Victorian Auditor General 2010).

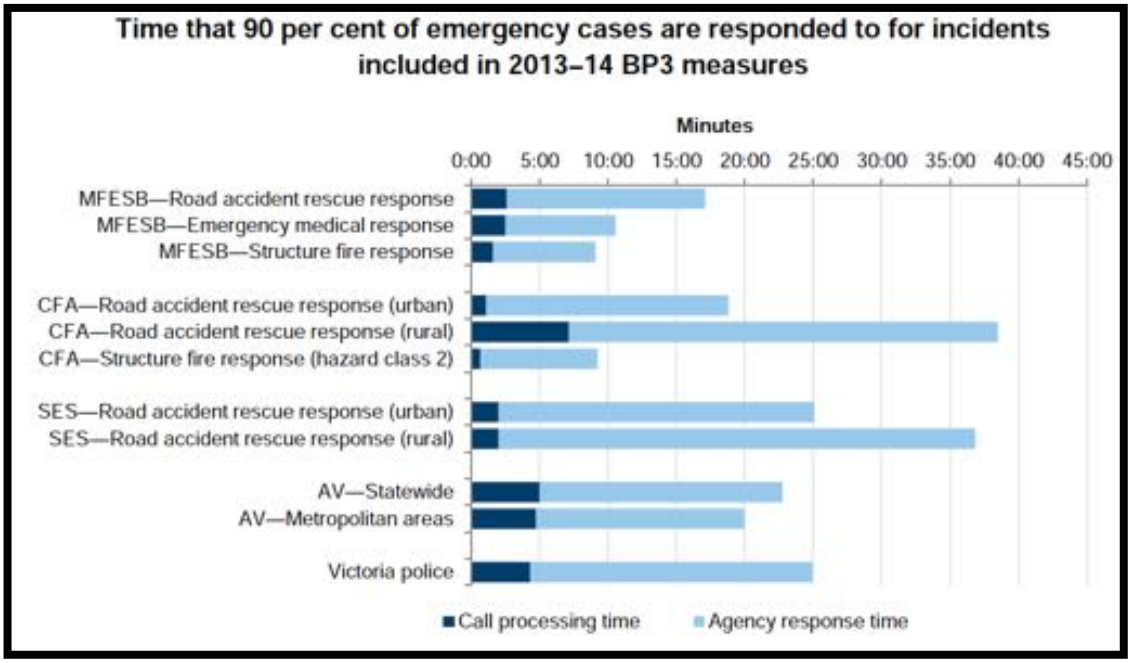
The chart above shows response times getting progressively longer over time. These changes raise the question of why that occurred and what are the clinical reasons for them. The paper prepared by paramedics (*"Where the hell does 15 mins come*

from?" 2013) draws the conclusion that if the set targets cannot be met, they should be changed; the study found no other clinical justification for the 15-minute response time target.

In a 2015 review of emergency service response times by the Victorian Auditor General, he raised the same issue. He found that the emergency response times for all agencies are either outdated or not based on evidence. Whilst acknowledging response time is an important component of an emergency services performance, there is also a need to look at outcomes, service quality efficiency and cost effectiveness (Victorian Auditor General 2015). The Auditor General also pointed out that there is a significant part of response time that is not under the control of the individual agencies. Call-taking and dispatch are provided by a separate agency (ESTA). These arrangements are in conflict with Department of Treasury and Finance's guidelines, which require performance measures to be "directly attributable to the actions of the organization" (Victorian Auditor General 2015).

ESTA is failing to meet its call-taking and dispatch time targets for AV. These times are part of the total call time for AV response times and result in longer response times (Victorian Auditor General 2014, 2015).

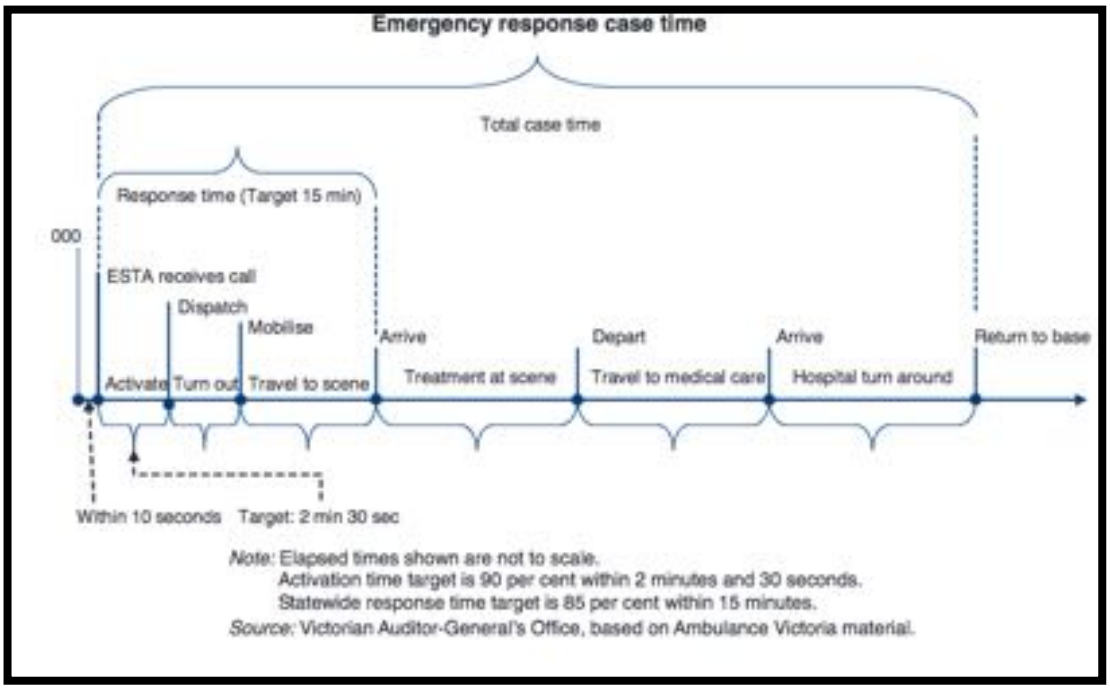
Figure 90 time the 90th percent emergency cases are responded to for incidents included in 2013-14 BP3 measures



Source: http://www.audit.vic.gov.au/publications/2010-11/20100610-Ambulance-report.pdf

The above chart shows that the ESTA call handling time for AV is significant and impacts on total response time. The issue of call handling time is not manageable by AV.

Figure 91 Emergency response case time



Source: (Victorian Auditor General 2010)

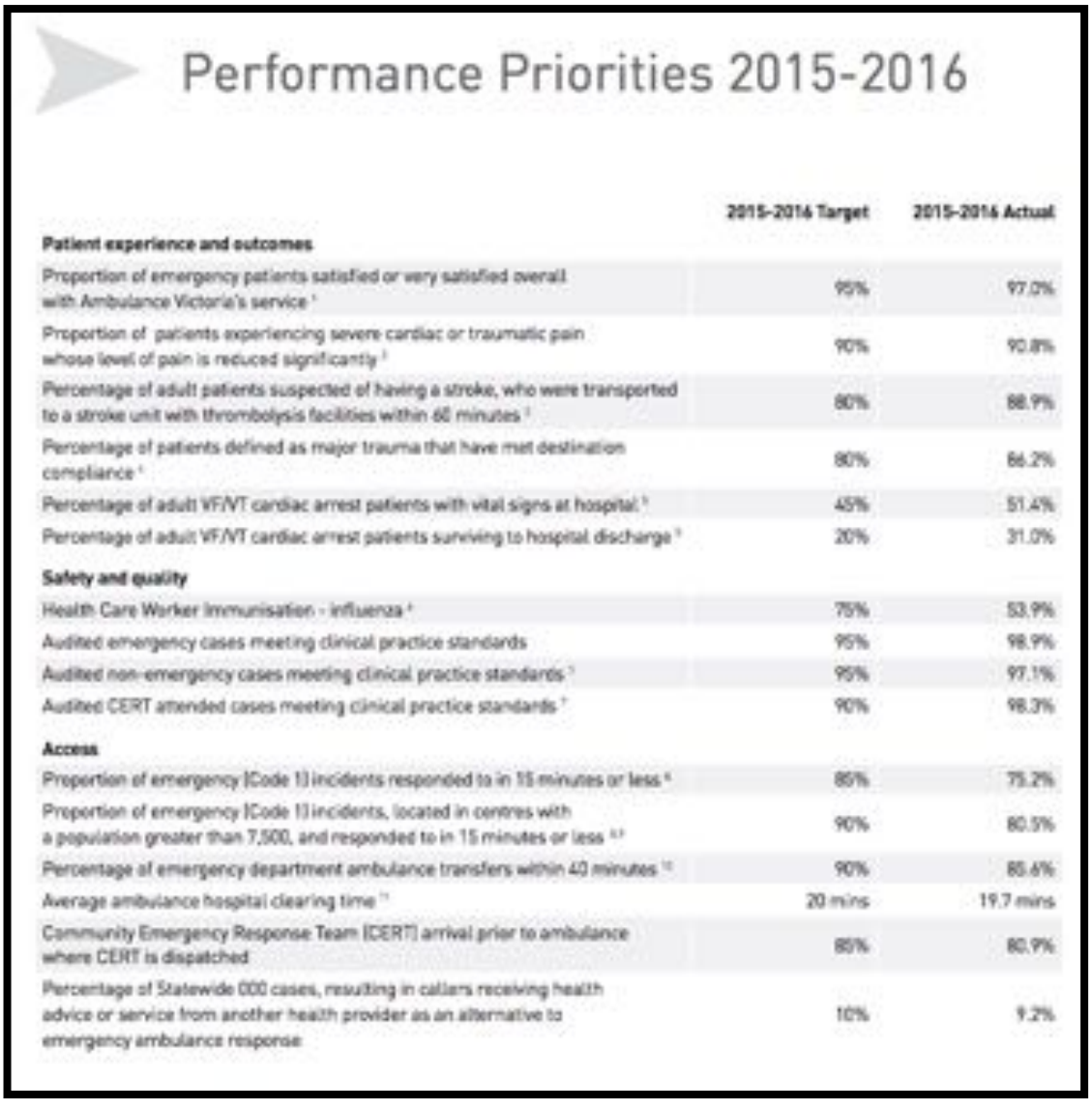
The chart above shows the actual sequence of an emergency call for Ambulance Victoria with target call handling time (Victorian Auditor General 2010). Whilst response time is a key performance measure, there is a need to measure the effect of other key activities such as prevention, mitigation, investigation and education. In fact, the Auditor General states "the 15 minute response time is not supported by clinical or operational evidence or a clear rationale" (Victorian Auditor General 2015, p.vii). A recommendation was made for all emergency service organisations to review their response time targets (Victorian Auditor General 2015). In the latest available annual reports for AV and MFB response time targets remain unchanged.

It was surprising to see that there was no comment regarding benchmarking with national and international peers performing the same tasks. An earlier Auditor General's report showed that AV was performing better than Ambulance Service of NSW, a comparable service (Victorian Auditor General 2010). Comparatively, as has been shown in this dissertation, the UK Ambulance Services (on which Ambulance Victoria is based) have a 75% goal for an 8-minute target. They are currently achieving a result of 75.8% against a target of 8 minutes for the whole country (The Association of Ambulance Chief Executives, 2015). London Ambulance is achieving 75.36% against a target of 8 minutes (London Ambulance Service 2015), while Ambulance Victoria is achieving a result of 80.5% against a target of 90% in 15 minutes (Ambulance Victoria

2016a). On the other hand, in the USA NFPA 1710 requires a response time target of 90% of the time for 8 minutes and Winnipeg in Canada has the same target.

The following chart outlines the performance priorities for Ambulance Victoria for 2015-2016. It shows that the KPI's for the service have expanded far beyond just response times and demonstrates the complexity of developing and collecting meaningful performance measures in the EMS environment.

Figure 92 Performance Priorities 2015-2016



Performance Priorities 2015-2016

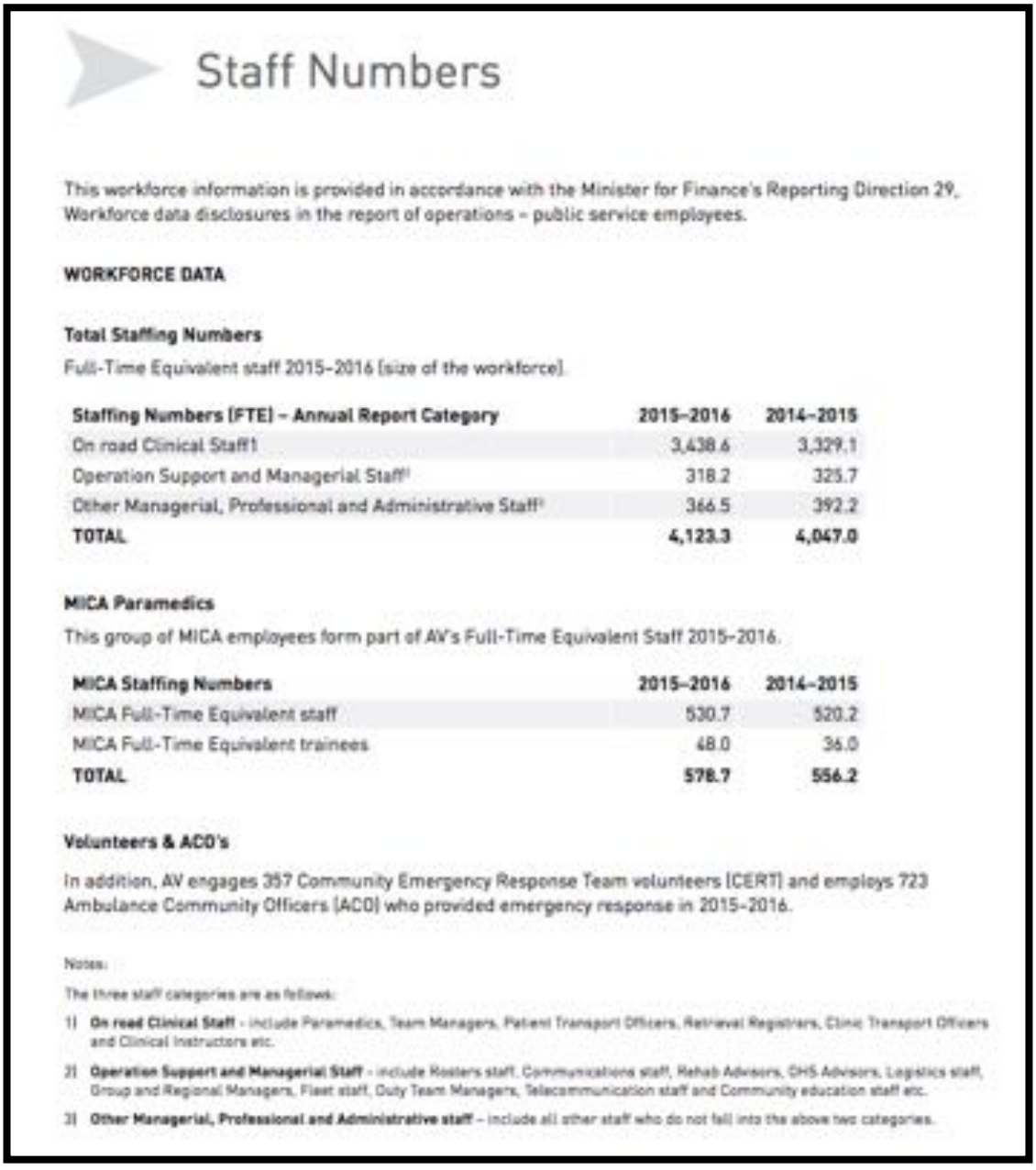
	2015-2016 Target	2015-2016 Actual
Patient experience and outcomes		
Proportion of emergency patients satisfied or very satisfied overall with Ambulance Victoria's service [1]	95%	97.0%
Proportion of patients experiencing severe cardiac or traumatic pain whose level of pain is reduced significantly [2]	90%	90.8%
Percentage of adult patients suspected of having a stroke, who were transported to a stroke unit with thrombolysis facilities within 60 minutes [3]	80%	88.9%
Percentage of patients defined as major trauma that have met destination compliance [4]	80%	86.2%
Percentage of adult VF/VT cardiac arrest patients with vital signs at hospital [5]	45%	51.4%
Percentage of adult VF/VT cardiac arrest patients surviving to hospital discharge [5]	20%	31.0%
Safety and quality		
Health Care Worker Immunisation - influenza [6]	75%	53.9%
Audited emergency cases meeting clinical practice standards	95%	98.9%
Audited non-emergency cases meeting clinical practice standards [7]	95%	97.1%
Audited CERT attended cases meeting clinical practice standards [7]	90%	98.3%
Access		
Proportion of emergency (Code 1) incidents responded to in 15 minutes or less [8]	85%	75.2%
Proportion of emergency (Code 1) incidents, located in centres with a population greater than 7,500, and responded to in 15 minutes or less [8,9]	90%	80.5%
Percentage of emergency department ambulance transfers within 40 minutes [10]	90%	85.6%
Average ambulance hospital clearing time [11]	20 mins	19.7 mins
Community Emergency Response Team (CERT) arrival prior to ambulance where CERT is dispatched	85%	80.9%
Percentage of Statewide 000 cases, resulting in callers receiving health advice or service from another health provider as an alternative to emergency ambulance response	10%	9.2%

Figure Source: Ambulance Victoria Annual Report 2015-2016 (Ambulance Victoria 2016a)

6.8.7. Staffing

At a recent graduation ceremony, Ambulance Victoria graduated 253 new Advanced Life Support Paramedics (these are making the transition from university graduates to the workforce), 21 Mobile Intensive Care Ambulance (MICA) Paramedics, 2 Flight Paramedics and 1 Paramedic from a rural sponsored degree.

Figure 93 Victoria Ambulance Staff Numbers



Staff Numbers

This workforce information is provided in accordance with the Minister for Finance's Reporting Direction 29, Workforce data disclosures in the report of operations – public service employees.

WORKFORCE DATA

Total Staffing Numbers

Full-Time Equivalent staff 2015–2016 (size of the workforce).

Staffing Numbers (FTE) – Annual Report Category	2015–2016	2014–2015
On road Clinical Staff1	3,438.6	3,329.1
Operation Support and Managerial Staff2	318.2	325.7
Other Managerial, Professional and Administrative Staff3	366.5	392.2
TOTAL	**4,123.3**	**4,047.0**

MICA Paramedics

This group of MICA employees form part of AV's Full-Time Equivalent Staff 2015–2016.

MICA Staffing Numbers	2015–2016	2014–2015
MICA Full-Time Equivalent staff	530.7	520.2
MICA Full-Time Equivalent trainees	48.0	36.0
TOTAL	**578.7**	**556.2**

Volunteers & ACO's

In addition, AV engages 357 Community Emergency Response Team volunteers (CERT) and employs 723 Ambulance Community Officers (ACO) who provided emergency response in 2015–2016.

Notes:

The three staff categories are as follows:

1) **On road Clinical Staff** – include Paramedics, Team Managers, Patient Transport Officers, Retrieval Registrars, Clinic Transport Officers and Clinical Instructors etc.

2) **Operation Support and Managerial Staff** – include Rosters staff, Communications staff, Rehab Advisors, OHS Advisors, Logistics staff, Group and Regional Managers, Fleet staff, Duty Team Managers, Telecommunication staff and Community education staff etc.

3) **Other Managerial, Professional and Administrative staff** – include all other staff who do not fall into the above two categories.

Source: Ambulance Victoria Annual Report 2015-2016 (Ambulance Victoria 2016a)

6.8.7.1. *Females in the Workforce.*

Currently 47% of the Victoria Ambulance Service Paramedics are females compared to a national average of 32 %(in 2011; Choahan 2017). The following chart shows the age group and sex of Paramedics Australia wide. The same information for Ambulance Victoria was not available from public sources. The most interesting figure in the national statistics is that 53% of Paramedics in the 20-29 demographic are female (Paramedics Australasia 2012). On the basis that the number of female Paramedics in Victoria is 15% higher than the national average it would be anticipated that the figure of females on this demographic would be even higher. It clearly demonstrates the differences in the number of females employed in the fire service (3-4%) compared to the Ambulance Service.

Figure 94 Paramedics by age and sex in 2006 and 2011

Age	2006 male	2006 female	2006 per cent female	2011 male	2011 female	2011 per cent female
10-19	10	5	33	15	8	35
20-29	723	692	49	1123	1275	53
30-39	2102	1060	34	2090	1341	39
40-49	2224	524	19	2570	944	27
50-59	1341	89	6	1852	227	11
60-69	301	10	3	450	27	6
70-79	15	3	17	18	0	0
Total	6716	2383	26	8118	3822	32

Sources: 2006 and 2011 census data: customised tables Note: Unadjusted data (Paramedics Australasia 2012)

6.8.8. Staff Development

Ambulance Victoria runs a number of programs for staff development. All new members of the service have a 3-year degree and then do a transition program on the job. The operational workforce is provided with 40 hours of annual training with emphasis on safety, mental health, and clinical development.

There are a number of developmental programs designed for all leadership levels – frontline, middle manager and senior leader. The programs are designed to assist leaders to better work with their teams and to improve the work environment (Ambulance Victoria 2016a).

6.8.9. Research

Ambulance Victoria is currently involved in 66 significant medical research programs in its field in collaboration with other institutes, and is recognized both nationally and internationally for this work. A recent example was the Air Versus Oxygen in Myocardial Infarction (AVOID) study, which showed that giving more oxygen to a patient having a heart attack was more harmful than the patient breathing normal air. In 2016 the study was named by *The Medical Republic* "one of the most influential health research studies in the last 100 years" (Ambulance Victoria 2016a).

6.8.10. Innovation

Ambulance Victoria have run a pilot program in conjunction with Victoria Police which serviced low-needs patients, with the aim of reducing demand on high-level response service whilst at the same time servicing the medical and other needs of the patient. The program is similar to that run by Winnipeg Fire and Paramedic Service, which however uses a paramedic and a firefighter (see Winnipeg Case Study; section 4.8).

6.8.11. First Responder

In 2000 the Victorian Ambulance Service joined the Metropolitan Fire Brigade (MFB) to co-respond to life-threatening emergencies within the Metropolitan Fire District, which encompasses much of Greater Melbourne. Early research showed that the Emergency Responder Program resulted in a two-minute decrease in cardiac incident response time (Huggins et al. 2012). The literature clearly shows that the shorter the time to defibrillation, the better the chances of survival. Research undertaken in Seattle showed that survival for immediate defibrillation is nearly 100%; this rapidly falls to 5% if defibrillation occurs after 10 minutes (Adgey, Spence & Walsh 2005; Weaver & Peberdy 2002).

In 2012 a similar system began trials with the Country Fire Authority (CFA).

Figure 95 MFB Pumper

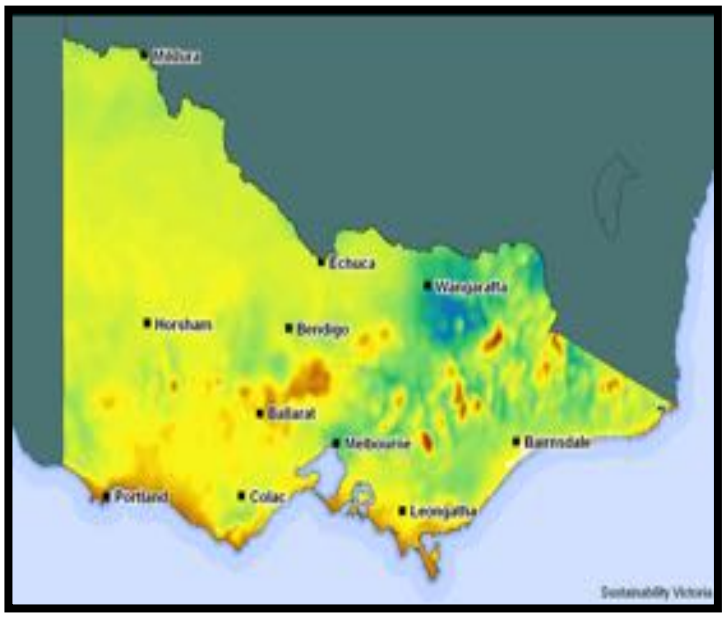
Note green medical symbol on side of vehicle. Source: www.fire-engine-photos.com%252Fpicture%252Fnumber33505.asp%3B735%3B551

6.9. CASE STUDY 9: METROPOLITAN FIRE BRIGADE, MELBOURNE (MFB)

Figure 96 Map of Australia showing the State of Victoria in SE of Mainland

Source: https://ivanhoecycles.com.au/articles-bicycles-melbourne/article.php?article_id=79&name=Victoria%27s-Tourism-Action-Plan

Figure 97 Map of Victoria showing location of Melbourne



Source: Sustainability Victoria

6.9.1. Snapshot

Figure 98 Metropolitan Fire Brigade

Location

Is located in the Metropolitan area of Melbourne, the capital of the State of Victoria, in south east mainland Australia.

Agency

Location

Is located in the Metropolitan area of Melbourne, the capital of the State of Victoria, in south east mainland Australia.

Metropolitan Fire Brigade (MFB)

The Metropolitan Fire district covers approximately 1,000 square kilometres. The Greater City of Melbourne has grown considerably beyond the boundaries of the fire district.

Budget

$386.2 Million

Size of Department

1,938 Uniformed Staff

320 Civilian Support Staff

Stations

47 Stations

Majority of staff are qualified as First Responders. When this role was introduced staff had the option of not undertaking the training but most did as it resulted in a higher rate of pay. All new hires are required to have this qualification.

Number of Calls

Total Calls 37.945

First Responder Calls 3,950

Structure Fires 2,142

Source: (MFB, 2016)

Response Times

The target response time for structure fires is 7.7 minutes 90% of time

The actual is achieving the target 89% of time

The target response time for EMR calls is 9.2 minutes 90% of the time

The actual is achieving the target 94.6% of the time

Note: The US Fire Services shown in the Case Studies all provide Advanced Life Support (ALS) by using cross trained Firefighter/Paramedics. First Responder training is advanced first aid with defibrillator and oxygen (approximately 80 hours training)

All material used in the text box Figure No. 97 is included in the text of the case study. The text box has been provided to provide a snapshot of key information to enable comparison between case studies.

6.9.2. Overview

The Metropolitan Fire Brigade area of responsibility is located in the State of Victoria, located in the south-eastern corner of the Australian mainland. The Metropolitan Fire District is centred on Melbourne and covers 26 local government

areas (approximately 1,000 square kilometres). It faces a wide range of risks ranging from CBD, port, airports, commercial and industrial areas and housing, including high-rise, medium-rise and single-family dwellings. The boundary is historical and has not changed as the city has grown and does not cover the entire Melbourne metropolitan area. The outer suburbs and regional cities adjacent to the Metropolitan Fire District are protected by a mix of CFA career firefighting staff and volunteer firefighters.

Figure 99 Map of Melbourne showing Metropolitan Fire District

Source: Summary of Decision, Metropolitan Fire and Emergency Services Board v United Firefighters' Union of Australia (2014)

The area protected is serviced by 47 fire stations. These range from headquarters to stations with multiple vehicles, down to two- and one-appliance stations. The MFB has approximately 1850 uniformed staff and 350 non-uniformed staff (Metropolitan Fire and Emergency Services Board 2014). The annual budget is $375.5 million (MFB 2013-2014).

The Metropolitan Fire Brigade is unique in that it is the only fully career fire service in the country (not counting airport firefighters). All other fire services in Australia are a combination of career, part-paid staff and/or volunteers. In light of this fact it is very difficult to make financial comparisons for the services provided in each State.

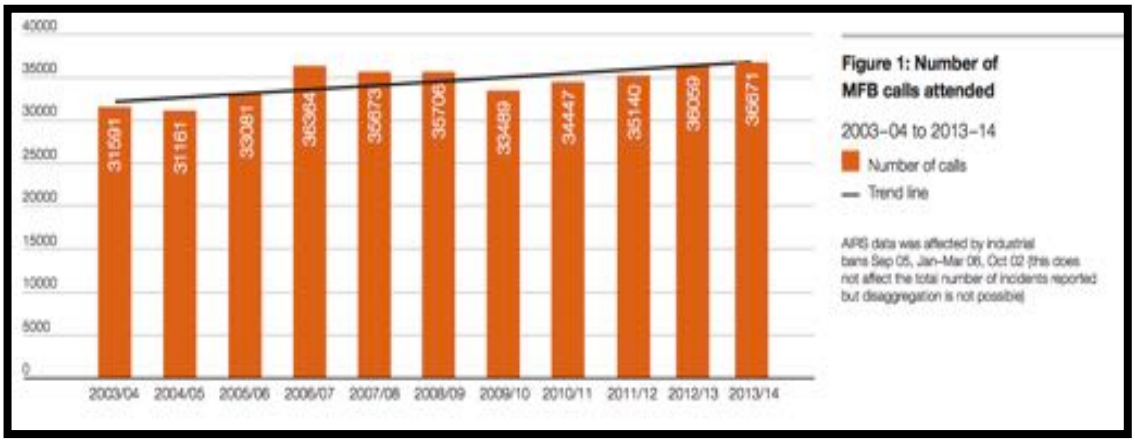
The range of services provided includes:

- fires

- hazardous incidents
- automatic alarm response
- road accident rescue
- emergency medical response
- urban search and rescue
- marine response (Metropolitan Fire and Emergency Services Board 2014)

The brigade attends to approximately 35,000 calls per year; in 2013-2014 the figure was 36,671.

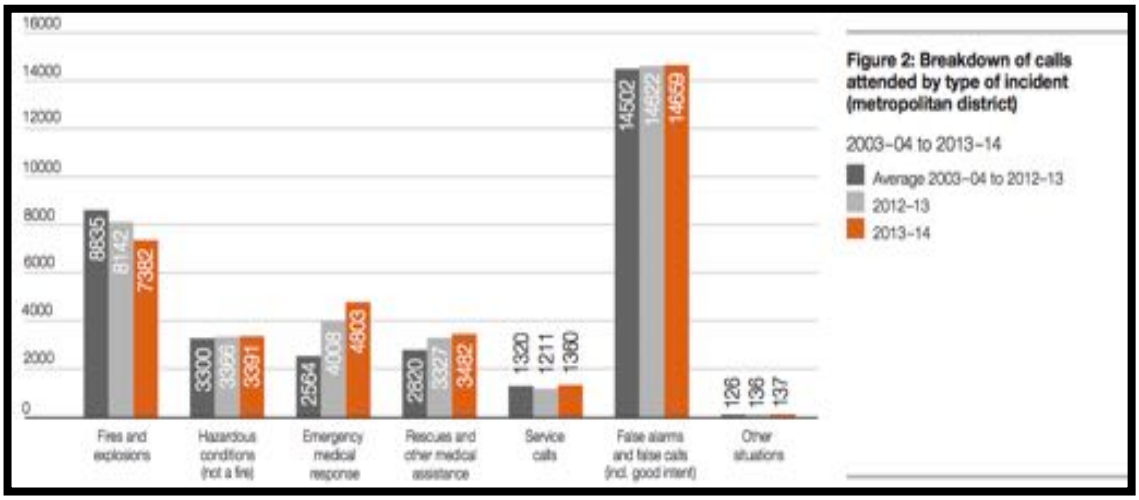
Figure 100 Number of MFB Calls Attended to



Source: (MFB 2013-2014)

The breakdown of call types is as follows:

Figure 101 Call Beakdown by type of incident



Source: (MFB 2013-2014)

The statistics show that there are approximately 8,000 fires a year. In 2013-2014 the total was 7,382, with a fall in the number of incidents over the past three years. These figures include all fires including structures, car, grass and rubbish. The actual number of structure fires is approximately 3000 per year, ranging from a pot on the stove to a high-rise fire.

6.9.3. Where have all the fires gone?

The MFB now attends to more EMR calls than structure fires. It is interesting to compare some of the statistics from an earlier time. In 1996-1997 the total number of fires was 10,241. In 1996-1997 the number of 3rd Alarm or above fire was 50. In 2013-2014 the comparable numbers are 7,382 fires and the number of third alarm fires or above was 37. The number of fire deaths in 1996-7 was 15; the number of preventable deaths in 2013-2014 was 5 (although these figures are not comparable as preventable deaths are not defined). Analysis of this data indicates the total number of fires has fallen, as well as the number of very large fires. The reasons for the reduction in very large fires include earlier calls (because of 24/7 lifestyle and the proliferation of mobile phones), installed fire protection such as sprinklers and smoke alarms, and better firefighting equipment such as more sophisticated and capable fire trucks, thermal imaging and better personal protection.

There have been similar reductions in the number and severity of fires worldwide (see England below). In the USA fire departments responded to 62% fewer fires between 1977 and 2013. Over the same time frame there was a 56% drop in fire deaths (Thomas et al. 2013). The Boston Globe has also reported that the number of major fires in Boston has fallen dramatically. In 1975 the number was 417, while in 2013 this figure had fallen to 40. The decline in major fires in Boston is over 90 %(Boston Globe 2013).

The trends in the USA are not limited to Boston but are repeated throughout the country. Of the 30 million calls to fire departments for assistance received in 2011 only 1.4 million related to fires, a 50% reduction since 1981. Whilst the actual number of calls for assistance is rising, only 5% of them are fire-related. When fires do occur, they are being contained and extinguished before they become large; it must also be understood that this figure is for all fires, ranging from a rubbish bin on fire to a large warehouse or high-rise. The vast majority of calls now are for medical emergencies (Neyfakh 2013). The number of firefighters in the US is essentially unchanged since

1986 despite the falling number of fires. Critics say the numbers should be decreased and the funds better spent elsewhere.

Professor Fred McChessney of Northwestern University wrote a widely referenced article entitled “Smoke and Errors”, in which he argues that firefighters used their sterling reputation to force politicians to protect their jobs. Their efforts are supported by a large, effective and financially strong Union. He argues that in the world of business when demand drops so does supply (McChessney 2002). Supporters of the fire service see them as the people who go in when others are running away. They acknowledge the dramatic reduction in the number of fires but describe firefighters as all-purpose emergency response squads with a significant participation in emergency medical response and other emergencies (Neyfakh 2013). Although firefighters have a special place in the American community, historical and further enhanced by their selfless acts of bravery in the events of 9/11, McChessney argues this is no reason not to question the status quo (McChessney 2002).

A review of the information provided in the MFB Annual Report shows a reducing number of fires offset to some degree by EMR calls. EMR calls do not involve as much operational time as a fire and also only involves one vehicle. A newspaper article in the Herald Sun highlighted the reduction. During the decade 2004-14 there was an average of 23 fires per day. In 2015 financial year there were 19 per day (a reduction of 17%). Despite the reductions in fires, the cost of firefighting in Victoria is $214.31, $100 more per person than in New South Wales $131 (Drill 2016).

The MFB has a number of key performance indicators (KPIs). The indicators below relate to response times and containment of fire to room origin.

Figure 102 MFB KPIs

Major outputs/deliverables Performance measures		Unit of measure	2013–14 target	2013–14 outcome	2012–13 outcome
KPI 1	Structure fires contained to room of origin (BP3 definition)	per cent	Both building and structure fires 90	86.5 (building) 90.5 (structure)	86.9 (building)
KPI 2	Emergency response times – structure fires (90th percentile)	minutes	7.7	7.8	7.6
KPI 3	Emergency response times – road accident rescue response (90th percentile) *	minutes	13	14.4	13.4
KPI 4	Emergency response times – emergency medical response (90th percentile)	minutes	9.2	8.3	8.2

Source: (MFB 2013-2014)

The MFB is maintaining its response time targets, despite increasing traffic congestion and the need to don more complex protective clothing prior to leaving the station. It should be noted that the response time targets for fire emergencies are nearly half that of the Ambulance; yet, the MFB are achieving them, while the Victorian Ambulance is not (Ambulance Victoria 2015a; MFB 2013-2014).

In 1997 KPMG published a report commissioned by the MFB. As part of its findings the report concluded that MFB firefighters are only actively involved in emergencies for less than 5% of the time (KPMG 1997). Whilst acknowledging this data is very dated, it has not been possible to find any contemporary data that addresses the issue of actual time spent on emergency response. With a fall in the number and severity of fires, and with EMR calls being of short duration and only involving one vehicle, the figure today is likely to be in the same region. It would be very simple to redo the research to find the actual figure of time spent on emergencies today.

6.9.4. Emergency Medical Response

Further to the KPMG Report the MFB became engaged in providing First Responders, or as it is now known, as Emergency Medical Response (EMR). EMR is a system whereby the firefighters are given training in emergency medical response and provided with automatic defibrillators, oxygen and other appropriate medical supplies. Given the response time of the firefighters is nearly half that of the Ambulance Service,

it was clear that they would arrive on scene at medical emergencies prior to the ambulance on many occasions.

The possibility of the program was first raised in a 1994 document produced by the Public Bodies Review Committee. There was significant resistance by the Union and it was not until 1998 that the first trial took place. Researchers at Monash University independently assessed the trial data and the proposition regarding First Responder response was proven. The trail was then expanded across the entire MFB Fire district and officially implemented in 2001. Monash University undertook further research in 2010 (Boyle et al. 2010), which showed the value of the program.

In 2013-2014 the MFB attended to 4803 EMR calls, and this number has been growing year on year. In 2015 the Chief Fire Officer of the MFB stated that the EMR Program had saved over 200 lives (Boyle et al. 2012). In 2015 Emergency Management Victoria announced that a successful trial of EMR within the CFA had been completed and that EMR would be rolled out to all manned CFA stations, 15 years after its successful introduction in the MFB (Emergency Management Victoria 2015). However, there has been little innovation or increasing of medical skills amongst MFB responders since its inception.

6.9.5. Absenteeism

The MFB faces other areas of productivity issues. A recent report by the Victoria Auditor General shows that the MFB has the worst performance for unplanned absences compared to Victoria Police and Ambulance Victoria, and nearly double the rate of the Victorian public sector (Victorian Auditor General 2013).

Figure 103 Lost time due to unplanned leave in fire services and he public sector 2011-12

Agency	Leave types	Hours	Standardworking days (7.6 hours)
MFESB firefighters	Sick and carer's	139.5	18.4
Fire service organisations[(a)]			
• MFESB	Sick and carer's	125.6	16.5
• South Australian Metropolitan Fire Service	Sick and carer's, including unpaid	101.8	13.4
• Tasmania Fire Service	Sick and carer's, including unpaid	41.8	5.5
Victorian public sector[(a)(b)]			
• Police and emergency services agencies	Sick and carer's	76.0	10.0
• Victorian public sector	Sick and carer's	73.0	9.6

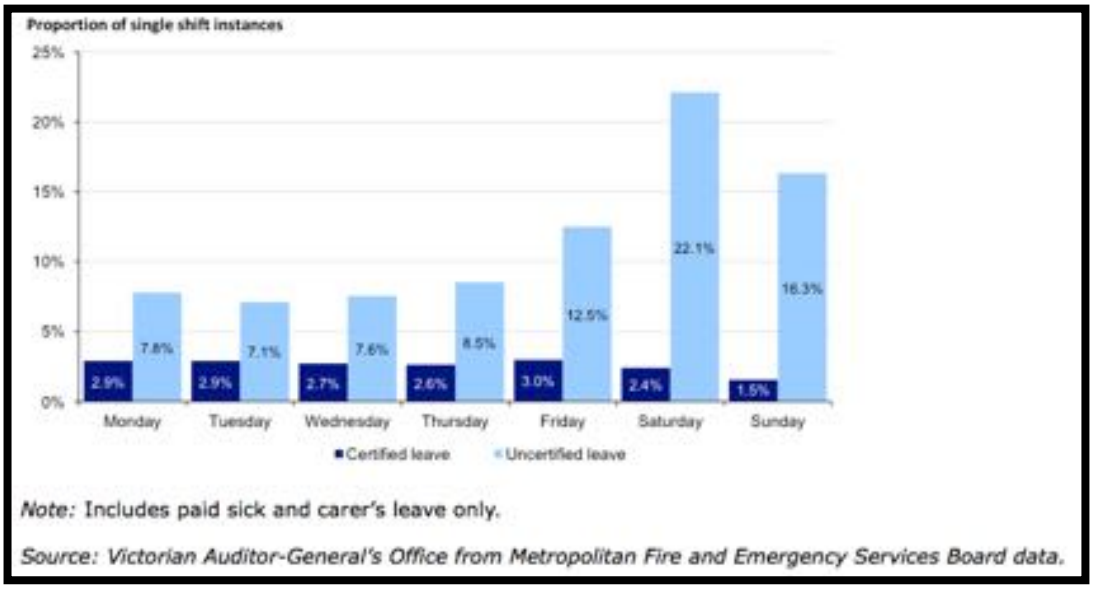
(a) Includes operational and non-operational staff.

(b) Excludes staff not employed for the whole year.

Source: Victorian Auditor-General's Office from Victorian State Services Authority data, the South Australian Public Sector Workforce Information, June 2012 and the Tasmanian State Fire Commission Annual Report 201112

The unplanned leave problem is compounded by the days of the week in which this leave is taken. A snapshot of unplanned leave taken in July 2012 showed that "an average of 13% of firefighters are unavailable for their rostered shifts on weekdays and 17% on weekends" (Victorian Auditor General 2013).

Figure 104 Single shift personal unplanned leave by day of the week 2011-12



Source: (Victorian Auditor General 2013)

Of personal unplanned leave 72% are single shifts and of these 82% is without medical evidence. The unplanned leave results in significant overtime costs, which continue to rise. The AG's Report shows that overtime rose 30% between 2006-7 and 2011-12 from $13.2 million to $17.2 million (Victorian Auditor General 2013). In 2013-2014 the total overtime was $17.7 million (MFB 2013-2014). Approximately 50% of the overtime was paid to cover unplanned absences (Victorian Auditor General 2013). All overtime at the MFB for operational staff is double time. Where a person is retained in excess of 60 minutes they are paid 4 hours overtime, or eight hours pay. If a person is recalled to do a 10-hour day shift, they are paid 20 hours; for a 14-hour night shift. 28 hours (Metropolitan Fire and Emergency Services Board & United Firefighters Union 2010). The Auditor General noted "there are negligible penalties for taking unplanned personal leave" and "no positive incentives", also "recalling firefighters to work overtime at double pay, creating a financial benefit" (Victorian Auditor General 2013).

The Auditor General identified the main constraint in managing this issue was the Enterprise Bargaining Agreement between the MFB and Union. The agreement requires consultation on all issues and the committee consists of an even number of members from each organization. If there is no consensus there is no progress. The agreement actually expired on 30 September 2013. In the absence of a new agreement, the existing one continues to operate. Although the MFB went to Fair Work Australia to

have the agreement terminated, it was not successful in its application (Fair Work Commission 2014).

A newspaper reported that on 7 February 2009 (Black Saturday) a total of 103 MFB firefighters were absent on sick or other leave; it goes on to say that this figure is double the figure reported to the Royal Commission. The next day and night a total of 87 were away (Metropolitan Fire and Emergency Services Board & United Firefighters Union Operational Staff Agreement 2010; Bolt 2010). The article also pointed out that a week later 62 firefighters were absent on the Valentine's Day night shift, one in five. Peter Marshall, United Firefighters Union (UFU) Secretary, reportedly said: "any suggestion that MFB Firefighters shirked their responsibilities on Black Saturday were abhorrent and wrong", and that "The large number of Valentine Days absentees might be related to a high level of family breakdowns among emergency workers" (Bolt 2010).

In a related point, in January 2015 Forbes reported that the most stressful job in the US was identified as firefighting (Adams 2015). The research has been used by the United Fire Fighters Union in Australia to support it claims for presumptive legislation for PSTD (United Firefighters Union of Australia 2015). Whilst not commenting on the Union's claim, it is inappropriate to use research done on firefighters in the USA to support the claim in Australia. The conditions of service are totally different in hours worked, nature of shifts (some US firefighters work a 56-hour week with 24-hour shifts), and leave entitlements; furthermore, most metropolitan firefighters in the US provide full service EMS as well as their firefighting duties. There is also a significant difference in the number of calls attended to each year: for example, MFB attended to a total of 36,671 calls (MFB 2013-2014), while Miami-Dade Fire Rescue attended to 246,408 calls in 2014 (Firehouse 2015).

6.9.6. Fire Service Review

After coming to power in Victoria, the Labor Andrew's Government commissioned a review of the two major fire services in the State (MFB and CFA). The review was carried out by David O'Byrne, a former union official holding a number of senior roles in the union movement (albeit without any direct firefighting experience). He was also ALP State President prior to his election to the Tasmanian Parliament in 2010. During his time in Parliament he held a number of portfolios, including Police and Emergency Services, from 2011 to 2014 when he lost his seat (David O'Byrne

2018). He likened the current relations between management and the union as “trench warfare” (O'Byrne 2015, p. 2).

Although the review did not have independent fire service professionals as part of the review team, did not benchmark with other fire services within Australia, or reference the significant changes occurring in the fire service internationally, it did result in a number of excellent recommendations. To be implemented within the MFB the recommendations would have to progress through the committee process, with the UFU having the right of veto. The State government rejected a number of the key recommendations relating to merging the two services and having the Chief Officer and current civilian CEO positions merge into one role (Edwards 2016a; O’Byrne 2015). Another key issue identified was a major demographic problem with 48% of the current workforce over 50 years old. He also highlighted the lack of diversity in the workforce, both in terms of gender and ethnicity.

David O’Byrne made the following comment in his conclusion: “Victoria’s fire services were once regarded as the best in the world. Due to some of the difficulties outlined above (within the body of the report), they cannot confidently make the same claim today” (O’Byrne 2015, p. 58; see Appendix for full report).

6.10. CHAPTER 6 SUMMARY

This chapter presented the case studies undertaken. The North American cases are addressed in the first instance, followed by two Australian cases (Victorian Ambulance Service and Metropolitan Fire Brigade) that are a key focus of this research. Additional information regarding the individual cases was also collected, e.g. strategies to reduce the number of unnecessary ALS calls to help improve response times, staffing issues and innovations.

Chapter 7, which follows, provides an overview of the UK ambulance and UK fire services. These issues are important as they are the models on which the Australian systems are based. The UK Ambulance case shows response times and addresses the employment of Australian paramedics by UK Ambulance Trusts, resulting in significant savings for the UK at the expense of Australian taxpayers. The UK Fire and Rescue Service provides an overview of the service and includes two major reviews. The chapter includes a case study of Greater Manchester Fire Service as an example of an organization embracing change and moving away from the traditional reactive model.

CHAPTER 7: UK AMBULANCE AND UK FIRE SERVICE REVIEW

These case studies differ from the others in that they cover entire countries. As Ambulance Victoria is based on the UK model, it is appropriate to spend some time looking at its history and current state, including their performance.

History: UK AMBULANCE

Figure 105 UK Ambulance

Source: www.alamy.com

The history of ambulance services in the UK not surprisingly mirrors that of Australia, albeit longer. The Romans had medical systems integrated into their armies and would have brought those systems to Britain in the first century A.D. There is evidence of the Anglo Saxons having an ambulance based on a hammock and a cart in 700 A.D. In the late 1890s, police and fire service provided wheeled litters for the injured and sick. Horse-drawn taxis were also used.

As with other societies, wars and civil defence had their influence on the creation of civil ambulance services from Napoleonic times through the First and Second World Wars. After the Second World War, in 1948, the National Health Service (NHS) was formed and gave the responsibility for ambulance services to local government (Independent Ambulance Association 2015).

Over time the number of areas of responsibility was reduced. Currently there are 11 Clinical Commissioning Groups in England and a further one in Wales, Scotland and Northern Ireland (Health and Social Care Act 2012). The reduction in the number of entities with responsibility for running ambulance services has also occurred in Australia.

A key difference between Australia and the UK is that in the UK there are many private providers that provide emergency EMS response on a contractual basis, making up for shortfalls in the capacity of statutory authorities. The private providers are represented by the Independent Ambulance Association and the statutory authorities are represented by The Association of Ambulance Chief Executives. The use of private contractors for such services is controversial among the public, and opposed by the unions. Since 2011 all service providers must use the following performance indicators:

- Outcome from acute ST-elevation myocardial infarction (STEMI)
- Outcome from cardiac arrest – return of spontaneous circulation
- Outcome from cardiac arrest – survival to discharge
- Outcome following stroke for ambulance patients
- Proportion of calls closed with telephone advice or managed without transport to A and E (where clinically appropriate)
- Re-contact rate following discharge of care (i.e. closure with telephone advice or following treatment at the scene)
- Call abandonment rate
- Time to answer calls
- Service Experience
- Category 'A' 8-minute response time
- Time to treatment by an ambulance-dispatched health professional (The Association of Ambulance Chief Executives 2015)

These measures would enable comparisons of health systems, including ambulance but not limited to EMS intervention.

The performance across all trusts in the UK for Category A calls in 2015-2016 was 72.5% for 8 minutes (Comptroller and Auditor General 2017). The London Ambulance achieved 71.1% for the period February to July 2017, as stated on their website (London Ambulance Service NHS 2017). As a result of differing population densities there will be differing distances travelled for a given time. None of the current case studies provide information on distance travelled. For the patient with a time critical medical emergency the key issue is response time.

A definition of response time for Ambulance Services in England is as follows: “For Category A Red 1 calls the “clock starts” when the call is presented to the Control room telephone switch. The clock stops when the first ambulance service-dispatched responder arrives at the scene of the incident” (NHS England 2016). These figures compare to Ambulance Victoria in Australia where for the same period for urban areas they achieved 78.5 per cent within 15 minutes, nearly twice the response time.

A disturbing document was discovered on the Ambulance Authorities of Australia website which has implications for the UK Ambulance Service. The current number of students currently training to become paramedics in Australia actually exceeds the total number of paramedic positions in the country. Each of these students has taken up study in this field with the view to obtaining employment as a Paramedic. They have undertaken three years of university education. They have also incurred a significant HECS fee – a fee that is paid for in advance by Australian taxpayers.

What is the return on this investment? For a lucky few it will result in full-time employment as paramedics in one of the Ambulance services in Australia; but for many others, the prospects of working in their chosen profession in Australia are grim.

Countries outside of Australia see a pool of well-trained paramedic graduates seeking employment as a wonderful opportunity to save money. These Australian graduates have qualifications above those required in these other countries, and they can easily be trained in the local variations. The process is demonstrated by the London Ambulance Service coming to Australia and running recruitment seminars and employing Australian paramedics to work in the UK.

It has been indicated that there are over 2,000 vacancies for paramedics in the UK, with at least 400 in the London Ambulance Service (Davey 2015; London Ambulance Service 2016). For example, a recent press article stated that there are currently over 450 Australian paramedics currently working for the London Ambulance Service; it also mentioned the involvement of two of these Australian paramedics in responding to the recent terrorist attack in Paris (Australian Associated Press 2016a; National Health Service Trust 2014).

When Australian paramedics go to London to work they undergo 4 months conversion training that will include UK emergency driver training, learning the London Underground and use of drugs not currently used by paramedics in Australia. There are some costs associated with these conversions but these are more than offset

by savings in not having to train candidates from scratch. According to Jason Killens, Director of Operations of the L Service, “It costs £50,000 [$98,000] to train one paramedic back home, so when we recruited 175 Australians last year we saved about £9m in training fees” (Davey 2015). Australian taxpayers in fact fund these savings for the London Ambulance Service.

An earlier media report showed that the London Ambulance Service is not only looking to employ new paramedic graduates who may have difficulty obtaining employment with existing Australian ambulance services, but also senior, experienced paramedics. A lure for Australian paramedics is the opportunity to practice a wider range of skills than just emergency response, in that London paramedics will soon have the opportunity of filling in for GPs for out-of-hours patients. The reason for these changes is there is a shortage of London-based GPs. It is ironic that the UK shortage of GPs is in part due to the fact that a number of them have moved to Australia.

Another major draw is London’s proximity to Europe and generous payments (up to A$17,000) to cover travel and relocation costs, including family. The salaries are comparable (A$78,000 for Australia and A$63,000-84,000 in the UK, where the cost of living is higher; those working in central London are also eligible for further allowances (Davey 2015).

The issue of Australian graduate paramedics being employed in the UK continues. A newspaper article in 2016 reported that the London Ambulance Service were back in Australia recruiting paramedic graduates again. It was reported that in 2014 there were over 2200 paramedic students enrolled in Victoria alone (Allouez 2016). Ambulance Victoria employed a total of 241 graduate paramedics in 2015-2016 so the scale of the problem is easy to see and it is increasing every year (Ambulance Victoria 2016a). The net loss to Australia is the people leave the country and their skills are lost. Some argue that they might come back with additional skills and experience, and would be picked up by our local agencies. If so, they would displace others in the ever-growing pool of unemployed graduates. The current system is unsustainable. This problem has been identified by the Australasian Ambulance Authorities, but to date no solution has been proposed. At least it is now in the public domain and being discussed in some quarters.\

7.1. REVIEW ENGLISH FIRE AND RESCUE SERVICES

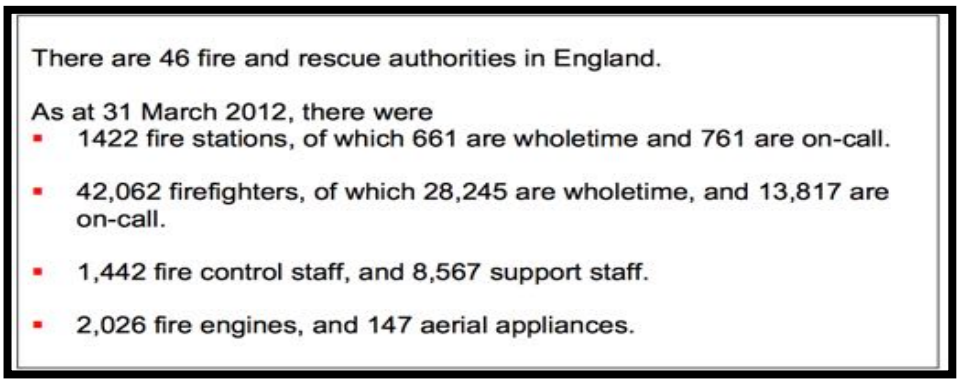
Figure 106 UK Fire Truck

Source: The Fire Brigade Society (http://www.thefirebrigadesociety.co.uk/photogallery04.html)

Why is the UK Fire Service being reviewed in such detail? The creation of the MFB was based on the UK Fire Service model. The first Chief Fire officer of the MFB, DJ Stein (appointed to the role in 1891), had earlier served in the London Fire Brigade and as Superintendent of the Margate Fire Brigade before coming to Australia. He served in the role of Chief Fire Officer for 17 years and had a significant impact on the creation of the organisation (Wilde 1991).

Whilst the UK model has changed dramatically in recent times, the MFB model remains largely unchanged over the past twenty years. What are the differences? What are the drivers of change? How do they show capacity to take on additional roles? Since one of the key questions posed by this research is whether the MFB has existing excess capacity that could be possibly used in a future expanded EMS role it is necessary to explore the history and roles currently being performed by the current UK Fire Services and compare them to the current roles performed by the MFB.

Figure 107 Overview of UK Fire Service



Source: Knight (2013)

In 2000-2001 the total number of calls was 855,500; in 2011-2012 the total number of incidents fell to 595,700. The total cost of providing this service in 2011-2012 was £2.2 billion. The average spend per person was £38 per year, but with a wide range (from £26 per resident through to more than £50) for broadly the same services. Attempts were made to try and benchmark internationally but no firm conclusions could be made.

In December 2012 the Fire Minister commissioned a major review of efficiencies and operations of the fire and rescue authorities in in England. The review was to be undertaken by Sir Ken Knight (previously London Fire Commissioner; Knight 2013). The start point of the review was to revisit previous fire service reviews undertaken in 2002 and 2010 and review expenditure and statistics for the 2011-2012 year to enable comparisons between services.

The review found that the number of fire deaths had been reduced by 40% in the last decade, but found no change to expenditure, suggesting a need to re-configure resources to meet the current risk. All major indicators showed reductions in the past decade. Attendance time at fires was down 48%, minor outdoors fires down 44% and road collisions down 24%.

The following statistics show the level of resources used to fight fires, they highlight the issues related to the size of fires and the means of extinguishment. Fire Statistics from the UK showed that in 1991 firefighting by the Brigade was not required in 21% of fires. In the remaining 79% of fires, no hose reels or jets were required in 17% of the fires, hose reels only in 68%; one or two jets in 12%, three or four jets in 2%

and five jets or more in 1% of fires. The vast majority of fires are extinguished by use of the hose reel on the first arriving vehicle (Ramachandran & Charters 2011).

Comparisons showed that some services cost twice as much to provide similar services with little or no relationship between expenditure and outcomes. If the more expensive services reduced their costs to the average there would be savings of £196 million (Thomas 2015).

The report identifies a need for change to relate to the current demand for resources in a different risk environment. The major driver of change has been significant reductions in central government funding and freezes of local council tax revenue. Some services are pursuing different crewing models but this approach is not widespread. Mergers are a possible part of the solutions with significant reductions in duplication of administrations and senior operational staff. Embleton and Kingwell in their article on space exploration raise the importance of avoiding duplication and maximizing scarce resources when undertaking significant tasks (Embleton & Kingwell 1997). The same principles apply to the fire and emergency services. For example, Scotland dealt with this issue by creating a single National Fire Service. In the UK, however, there is significant resistance to such moves and no incentives. It was identified that collaboration, co-responding and co-location with other emergency services could produce efficiencies but is hampered by local resistance.

A major finding of the review was to look at the rostering arrangements with its inbuilt excess of staff to cover a range of contingencies including unplanned leave. A number of services in England are currently using new creative models to reduce overtime; these include allowing staff who work extra shifts to take time off when there is surplus staffing, and the creation of a "strategic reserve" to cover shortages at normal time. One such system resulted in savings of around £1.2 million on staffing costs and a further reduction of overtime by £70,000 in six months.

Nevertheless, an issue for fire services is the capacity to manage major incidents with appropriate levels of senior staff. As the scale and number of major incidents fall, are there more creative ways of solving this issue? Across the current services there is a wide range of models demonstrating the ratio of senior officers to firefighters. In a metropolitan service there are 73 firefighters to one senior manager, but in another there are 29. Industry has many examples of seeking to rationalize resources to find continual savings. An example of this process is explained in an article on rationalizing human

resources in the health sector by outsourcing a number of non-operational functions with resultant savings of staff (Ostojić, Bilas & Franc 2012).

A further example of rationalizing resources is when existing organizations such as fire and EMS merge there are also potential savings in senior operational staff to manage large scale incidents (Weiss 1998).

In his report, Knight (2013) states: "The most effective way of saving lives is to prevent fires and other emergencies from occurring" (Knight 2013, p. 38). The English fire service is proactive in this area. In 2004-8 it carried out nearly 2 million Home Fire Risk Checks and installed nearly 2.5 million 10-year smoke alarms. The effort was funded by a central government grant of £25 million. An evaluation of the program showed a 57% fall in accidental dwelling fire deaths, 13,670 fewer fires and 888 fewer fire casualties. The estimated economic value associated with the value of the reduced number of fires, deaths and injuries was between £926m (US$1,225Billion) and £1,943m (US$2.571 Billion).

Of all of the calls to fire and rescue authorities 42% are false alarms (see Figure 78). The Fire Protection Association estimates that in excess of 95% of calls generated by Automatic Fire Alarms are false. The number of calls attended to was dramatically reduced by a system known as "Call Challenge", which involves the control room making a call to the premises before responding. Some of the agencies have been using this system (with safeguards) since 2003, and reductions of 40% in the level of false alarms have been achieved. Reducing the number of false alarms would result in some savings, although the real savings come from the freeing up of capacity.

Figure 108 Type of incidents attended to by a firefighter 2001/2 versus 2011/2012

	Fires	False alarms	Non-fire incidents	Total
2011-12	**43**	**46**	**21**	**110**
2001-02	80	70	28	178

Source: Knight (2013)

In England it can be seen that the numbers and severity of fires and incidents is falling dramatically and releasing capacity within fire and rescue services. A number of

recommendations have been made such as amalgamations, procurements and alternative staffing models. These are all “internal proposals”.

In line with the current research the review also looks at possible collaboration with other emergency services. There are currently 10 Ambulance Trusts and 46 Fire and Rescue Services in England. The review raised the issue of combining fire and ambulance into a single fire, rescue and emergency medical service as has been done in many other developed countries. Whilst there have been some successful examples of co-responding and first responder, this issue is left to local determination with varying degrees of success. The issue of a need for co-location of emergency services was raised; this included Police, Fire and Ambulance (Knight 2013). In fact, although Knight’s review identifies many areas of potential savings and improvements in productivity, it has been followed by a consultation paper looking at closer co-operation between what are referred to as “Blue Light Services” (police, fire and ambulance). The consultation paper asks a number of questions regarding the advantages and disadvantage of closer co-operation. The proposals look at all three services; controversial elements include the possibility of Police running fire services or alternatively Fire Chiefs heading up Police forces (Home Office, Communities and Local Government & Department of Health 2015).

In light of recent developments in Victoria regarding firefighting volunteers, the Country Fire Authority and the UFU, it is interesting to note that in the UK the fire service is mainly career staff supplemented by part-paid firefighters; there is only one volunteer fire service in the UK.

7.2. INDEPENDENT REVIEW OF CONDITIONS OF SERVICE FOR FIRE AND RESCUE STAFF IN ENGLAND

One of the recommendations of the Knight review was an independent review of conditions for Fire and Rescue Staff. The review (Thomas 2015) was commissioned in 2014, completed in February 2015 and released to the public on 3 November 2016. The reviewer was independent of government, fire services and representative bodies. In the report the reviewer acknowledged the key role played by the fire service and its members in the community. He also raised a number of challenging issues that may be barriers to change, reform and possible solutions to improve efficiency. Many of the issues have relevance to the future of the fire service in Australia.

7.2.1. Culture and Trust

There is a need to cultivate an inclusive culture of change. Such activities should include employee representatives at the earliest stages of planning. The need to improve training in change management, leadership and employee engagement is also identified. Methods of communicating directly to staff have to be enhanced. Regular audits should be conducted to ensure the flow of information is getting to the frontline firefighter.

Research carried out in seven countries showed that when performance management was introduced it challenged and changed the culture in organisations with positive outcomes. The most likely driver of the introduction of performance management is financial and political crises occurring at the same time. The researchers also identified that trust in government was not a significant factor (Rhodes et al. 2012).

In research conducted on US federal employees shows that trust between managers and staff is a key determinant of improved performance (Hugo 2016).

7.2.2. Who is the customer?

The fire service can be seen as a response agency that does some prevention work in their "spare time", or an organization that has a broad-based role focused on increasing safety in the community and providing emergency response if required. The model that is chosen has major implications for the future of the organization. The models are not mutually exclusive but are the extreme ends of the spectrum. Some services now see themselves as an emergency service rather than a fire and rescue service (e.g. Greater Manchester). If a service is purely focused on response, the current model of an equivalent response capacity 24/7 is appropriate. If community safety is the focus, more resources are needed during the day Monday to Friday. There are significant implications for whichever model is chosen.

7.2.3. Resistance to Change

The review found that there was significant resistance to change both from the Union and firefighters. Some of the resistance was ideological, related to politics and class. Time and time again the reviewer was told that "trust has been lost" and that they would "not take other workers' jobs", the latter being a reference to co-responding with the ambulance service (Thomas 2015).

In their eponymous book, Harvey and Broyles (2010) state that resistance to change is the norm and it is a sane response. They indicate that there are three main

strategies: power or coercive change (which does not work), rational change (found to be the least effective strategy), and normative or re-educative change. The latter links change to people's drives and needs. What are the benefits of change for the 'changee'? This strategy is seen to have the best long-range impact, but it is also the most time- and resource-intensive, as resistance factors need to be identified first, then the drives and needs that will negate them.

Pfeffer and Lammerding (1981, as quoted in Harvey & Broyles 2010, p. 11) identified three conditions that allow rationality to work:

1. Clear, unambiguous goals
2. No conflict over priorities
3. Plentiful resources (Harvey & Broyles 2010)

In classic force field analysis, Lewin (1951, as quoted in Harvey & Broyles 2010, p. 11) identified that there are drivers and resistors to change. To bring about change, either drivers can be increased, or alternatively resistance reduced. The second is the most effective means of achieving long-term change (Harvey & Broyles 2010).

Despite the resistance to change in the Greater Manchester Fire Service, people tended to recognise that there had been a significant amount of change in the past and accept that change would continue. On more than one occasion, the reviewer was told that there was an expectation that firefighters would gain paramedical skills in the future.

A lot of the resistance was around how change was being introduced; people feared that each demand for efficiency would be followed by another, and so on with no end in sight. People wanted to know what the ultimate goal was, and make sure that once reached that would be the end point.

However, on the issue of communication it was clear to Thomas (2015) that the union had excellent communication strategies, which in some cases exceeded the reach of management teams. In the UK there are 46 Fire and Rescue Authorities and the reviewer found that some are progressive, with excellent relations with their staff and unions. Thomas questioned why change was occurring in one fire service and not another. The current predominant culture is resistance to change. Many employee representatives and local authorities question the "need" for change rather than questioning "how" change will be delivered.

Thomas (2015) also questioned why the lessons learnt from successful change management in services were not rolled out across those organizations that were struggling with change, and outlined a four-part process for effectively managing organizational change:

1. Recognize the changes in the broader environment that bring about the need for change (fewer and less severe fires);

2. Developing a response for the changed environment (e.g. a strategy for taking on a wider range of activities such as enhanced fire safety, co-responding to medical emergencies);

3. Win the support of employees and other stakeholders; and

4. Implement appropriate training to support the change process.

Change should only require validation once prior to roll out. Having to justify change on multiple occasions is likely to result in inefficiencies. The report refers to the UK Military as having established effective decision-making tools to assist in the change management process, as they have had their own challenges in transforming the British Army (Army 2013); a further example was the Land Warfare Centre, Warminster who challenged suppliers to demonstrate how effective any equipment change is compared to current issue.

7.2.4. Bullying and Harassment

Much has been made of bullying and harassment in the Fire and Rescue Service. Thomas (2015) was unable to align the level of complaint to the actual number of complaints submitted or reported to Police.

Surveys conducted by the reviewer and by the union showed about 40% of staff complained to have been bullied or harassed. The complaints raised included claims of union intimidation, harassment of union officials by management and management to staff. If the survey results are extrapolated across the whole of the service, it would equate to about 16,000 firefighters; however, the actual complaints were dramatically lower, being in single figures for each authority.

A check of the documented policy documents from the services on bullying and harassment showed them to be current and in line with current practices; it is not a failure of adequate policies that is causing the problems:

> The conclusions drawn as a result of extensive interviews across many agencies is that a significant number (probably the majority) of complaints is not related to bullying and harassment but rather to unhappiness with relationships, with probably the largest proportion being firefighters viewing management instructions as being bullying behavior (Thomas 2015).

Currently the fire service tends to be a mono culture of white males. Outsiders are not readily accepted and this can lead to bullying and harassment. There have been aims at having the fire service more closely represent the community they serve. Currently there is 4.3% representation of females. The issue of ethnic minorities also needs to be addressed.

7.2.5. Second Jobs

During field visits, the impact of second jobs on the fire service was raised. A second job is defined as paid activity undertaken by full-time firefighters during their off-duty time. In the UK it is a requirement to obtain permission from the fire service employer. Permission may be denied if the second job conflicts or impacts the organization, but it is rarely declined. Thomas (2015) reports that the declaration rate was consistent across authorities, with 30-40% indicating that they had second jobs. However, some authorities had rates as high as 85%, and it was generally accepted that the official declaration rate understated the reality of those who had second jobs.

Thomas' view was that whilst there should not be any stronger restrictions on second jobs, workplace change should not be restricted because of the practice of second jobs. A feature of the second job is that a significant number of full-time firefighters work in their own or other fire services as part-paid firefighters. Such arrangements allow flexibility in the deployment of staff to other duties and implementing Integrated Risk Management Plans. Thomas (2015) strongly argued that full-time firefighters be encouraged to seek second jobs as retained firefighters. Such a system increases numbers without incurring recruitment, training and retention costs.

7.2.6. Role of the firefighter: Response vs. Prevention

Figure 109 Response vs Prevention

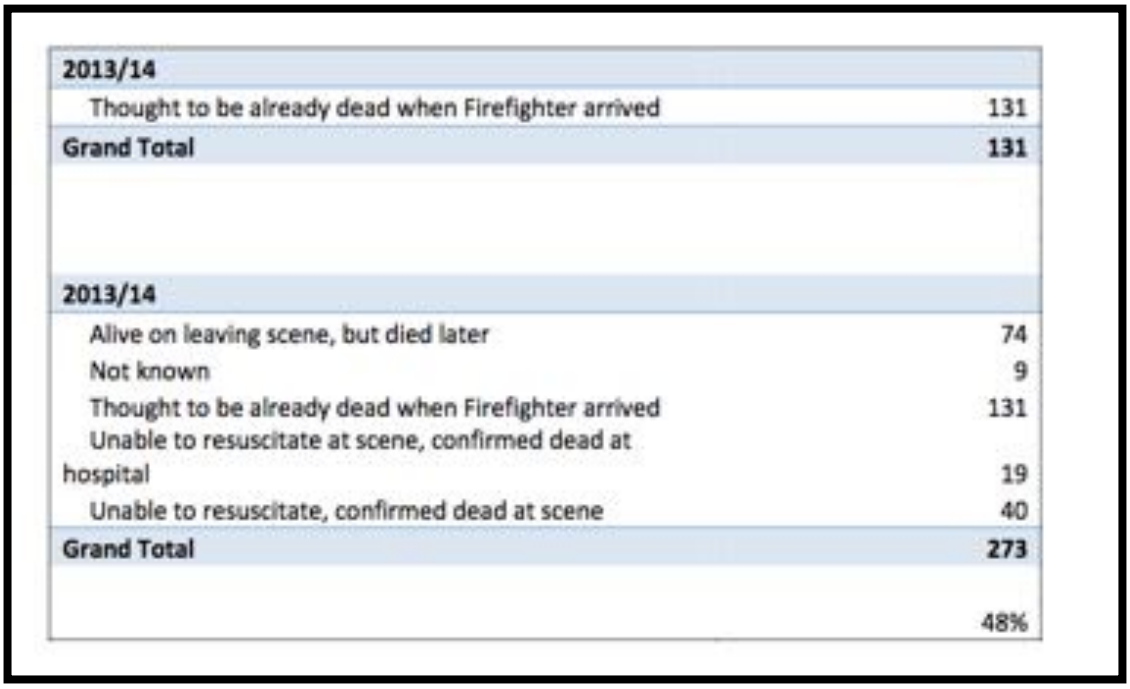
Source: Fire Service College, UK

In the words of Thomas (2015),

> The perception of the firefighter as the hero emerging from a burning, smoked filled house rescuing the occupier from certain death is the image that most people have of the fire and rescue service. It is a dramatic picture and has been played out many times in the past and is one on which many people believe the structure of the fire and rescue service should be based (Thomas 2015, p. 33).

A review of fatalities paints a somewhat different picture, with some 48% of fatalities occurring prior to the arrival of the fire service. In all probability they may have been dead before the fire service was even called. The only way to save these people is by prevention or minimization; both activities that must take place prior to the event of the fire. The station location, crew levels and turnout time are secondary to preventing the fire in the first instance (Thomas 2015).

Figure 110 Percentage of fatalities thought to be already dead when fighters arrived



2013/14	
Thought to be already dead when Firefighter arrived	131
Grand Total	**131**

2013/14	
Alive on leaving scene, but died later	74
Not known	9
Thought to be already dead when Firefighter arrived	131
Unable to resuscitate at scene, confirmed dead at hospital	19
Unable to resuscitate, confirmed dead at scene	40
Grand Total	**273**

48%

Source: https://www.gov.uk/government/statistics/fire-statistics-monitor-april-2013-to-march-2014

The current and future role of the firefighter has to be geared not only to response but also fire prevention and broader community safety. The changing roles may inspire a wider demographic to apply for the changed role.

The report stated that "firefighters are 'only' operational 5-10% of the time" (Thomas 2015). Firefighters in the UK are involved in a wide range of other activities including training, physically visiting vulnerable people in the community, fitting smoke detectors and providing fire safety training in schools and other institutions. The role and position descriptions for the role of firefighters needs to change to better represent the expanded role. There is recognition that one size does not fit all, and of a need for flexibility.

With regards the shift or duty system, the older firefighters valued the fixed shift system where the younger members showed enthusiasm for flexible shifts and the potential for self-rostering. These attitudes need to be addressed as flexibility will be required to change the role from firefighter to include the public education and fire prevention role.

The current role maps used in the UK restrict flexibility such as utilizing the fire service as co responders with the ambulance service. The Fire Brigades Union actually

took court action, which appeared to prevent firefighters corresponding in support of the ambulance service. An earlier court case found that co-responding was not part of the role of a firefighter. The employer in that case appealed, lost, and did not take the case any further.

These outcomes date back to 2007 and much has changed since. Firefighters in a number of UK Brigades are co-responding with Ambulance and undertaking a broad range of tasks beyond firefighting. The ability of having a flexible workforce provides many cost benefits. These flexible arrangements are on a local basis and have not been rolled out countrywide.

The reviewer reported that in an age of reducing demand for fire response it seemed strange that employee representatives were not looking to increase capability as a means of protecting roles/numbers, since in private sector organisations up-skilling and additional activity is seen as a means of protecting jobs.

7.2.7. Duty Systems

There are five different duty systems laid out in the guidelines for work (Grey Book):

- Shift duty system – 42 average hours, nights no less than 12 hours, 4 shifts worked in a seven-day period.
- Day crewing duty system – 35 hours per week based at a station, plus 7 hours on standby at home.
- Day duty system – 42 hours average, with 9 nine days per fortnight worked Monday to Friday.
- Flexible duty system – combined worked and rostered stand-by hours not exceeding 48 in an eight-week period. Only for station manager or above. No return to normal hours except by volunteering.
- Retained Duty System – hours by agreement by each authority. Assumed that full cover is 120 hours per week. Pay is restricted to either 10% (for 120 hours) or 7.5% (for any hours below 120) of the annual basic pay.

The reviewer was of the opinion that the current restrictive arrangements do not provide the flexibility to meet current demands nor provide room to move on efficiencies. Across the UK there are significant variations to the constrained system

outlined above, negotiated at a local level, that have little in common with the national system.

7.2.8. Issues

The reviewer reported that there were three key issues that came from his investigations: a public expectation that if called a firefighter will respond to their emergency; the very low percentage of time actually involved in emergency response; and the dedication of firefighters and the desire to respond to incidents. Emergency response is now only a part of the role of a firefighter in the UK; the majority of the role is training and community fire safety.

7.2.9. Recruitment

As fire services contract in the UK it is creating a future problem due to a recruitment gap as a result of shrinking workforces and no new recruitment. The gap, which could be up to 15 to 20 years and linked to low academic entry requirements, presents a potential problem of identifying and training suitable middle and senior managers. It will also be problem when significant numbers of staff are eligible to retire at the same time.

Thomas (2015) states that future changes in technologies, work practices and crewing levels may require services to enlist future applicants with different skills and behaviours. The current senior managers are selected from a small pool of long-serving, technically qualified officers. As the number of firefighters reduces, the size of the selection pool will also reduce. There is an identified disconnect between the skills required at recruitment and those needed for senior management. Progression to senior management roles is through advancement by promotion within internal systems or transfer to another service. Transfers between services were seen beneficial, and as a mechanism to expose senior managers to innovation and change. If possible such exchanges could be extended to junior officers. However, in the UK the proposal to exchange junior officers between services is actively resisted.

Thomas (2015) is advocating for lateral entry of graduates and increased entry-level requirements to increase the quality of the potential senior management pool. He does warn the slow progression may result in increased turnover of staff, but does not see that as a bad outcome as the organisation would constantly receive new talent. Thomas (2015) further argues that such changes would potentially increase diversity

and make the service more closely represent the community it serves; in other words, there is a need for organisations to develop strategic workforce plans.

7.2.10. Training and Leadership

There is a need to ensure that firefighters retain their skills and fitness through career. Mechanisms need to be in place to ensure and record that this is taking place. Furthermore, management and leadership training is considered vital at all levels to help deal with the issue of a rapidly changing environment.

A submission to the review interestingly found the fire service was "over managed but under led" (Thomas 2015). This was interpreted as saying that current fire service leaders do not have the leadership skills to drive through change in the face of strong resistance.

The review used a quote from John Cotter, Harvard University to demonstrate what was needed to bring about significant change in organizations:

> I am often asked about the difference between "change management" and "change leadership," and whether it's just a matter of semantics. These terms are not interchangeable. The distinction between the two is actually quite significant. Change management, which is the term most everyone uses, refers to a set of basic tools or structures intended to keep any change effort under control. The goal is often to minimize the distractions and impacts of the change. Change leadership, on the other hand, concerns the driving forces, visions and processes that fuel large-scale transformation (Cotter 2011, p. 1).

To bring about lasting change in the fire service there will be a need to create change leaders. To achieve this result there is a need to train the current crop of senior officers but to also raise the quality of recruits. Thomas also raises the desirability of two-tier entry to encourage more graduates to apply for senior positions; this is already occurring in some police forces in the UK (Thomas 2015).

Finally, as an example of significant change, the report identified the Greater Manchester Fire Brigade (see Section 7.4 below). It is appropriate to view the key issues as approached by that service. The Integrated Risk Management Plan (IRMP) 2016- 2020 outlined some of the challenges confronting the service and possible ways forward (Greater Manchester Fire and Rescue Service 2015).

7.2.11. Background to Change in GMFB

In 2010 the UK Government, as part of its actions to reduce an expanding public service deficit, conducted a spending review as part of its deficit reduction plan. The public deficit was at its largest peacetime level, with one pound in four borrowed and spending £45 billion on debt interest. The government made significant cuts to budgets. The fire service was faced with a 25% budget cut over four years (HM Treasury 2010; Neill 2010).

The government was of the view that the impact of the reductions would be reduced by reforms. Whilst acknowledging that the local fire service had responsibility to decide where cuts should be made, they suggested efficiencies in the following areas:

- Flexible staffing arrangements
- Improved sick leave management
- Pay restraint and recruitment freezes
- Shared services/Back office functions
- Improved procurement
- Sharing Chief Officers and staff (Neill 2010).

7.3. GREATER MANCHESTER FIRE BRIGADE

Figure 111 Greater Manchester Fire Brigade

Source: Greater Manchester Fire and Rescue Service (2015)

The Great Manchester Fire Brigade protects an ethnically diverse community of 2.7 million (increases during working hours), covers an area of approximately 500 square miles (1294 square kilometres). It does this with 1,375 uniformed and 491 non-uniformed staff operating out of 41 fire stations, a training centre, a technical centre and headquarters. The annual budget for 2015-2016 was £102.316 million (A$172 million).

The service is achieving an average response time of 5 minutes 34 seconds (90 percentile response times are not provided; Greater Manchester Fire and Rescue Service 2015). This response time achieved is about 1 minute lower than the national average.

Figure 112 Integrated Risk Management and Corporate plan 2015-2018

Source: (Greater Manchester Fire and Rescue Service 2015)

7.3.1. Impact

Since the 2009-2010 budget there has been a reduction of £28 million or 25%. These savings have been achieved by a number of measures that included revisions of shifts, more cost-effective procurement, reduction in ill health retirements and energy conservation. By far the most significant savings came from reducing support staff, senior management and firefighters. The numbers of uniformed staff have gone from 1,915 in 2009-2010 to 1503 in 2015, a reduction of 412 frontline positions. The budget is going to be further reduced by £14.79 million by 2020. There will be a further reduction of 285 firefighters by that date. Furthermore, since 2010 and 2015 there has been a reduction of 10 fire engines. More will be removed in the future. Such dramatic changes have placed significant pressure on the service to change the way they do business whilst still meeting their objectives.

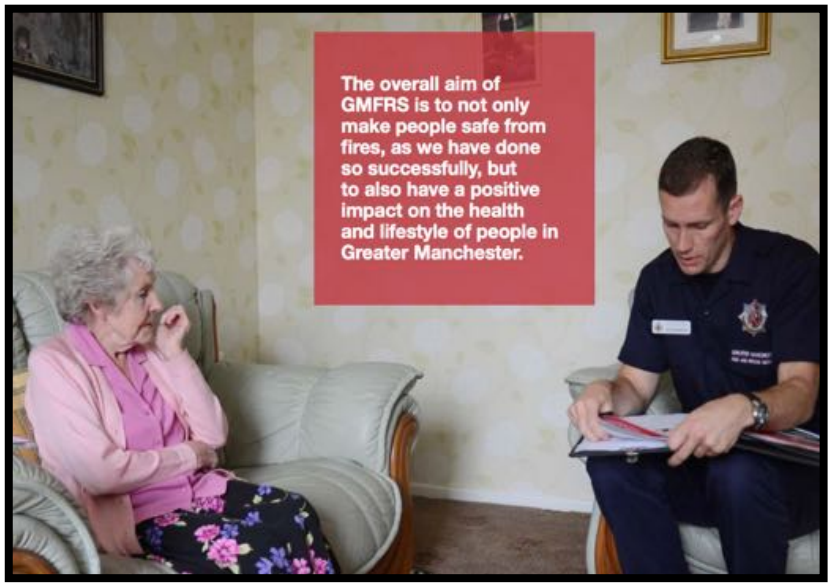
7.3.2. Proactive vs. Reactive

Which produces the best results? By working hard and proactively, the GMFRS have been able to reduce the number of structure fires by 42% over six years, and the result is being achieved at a time of dramatic reductions of staff. Similarly, in 2015-2016 the service carried out over 60,000 home safety checks; whilst undertaking the inspections many other problems could be identified and referred to other agencies. An example is a falls assessment program aimed at reducing the number of falls: the current

cost of falls to the National Health Service is £2 billion, so any reduction has significant cost benefits.

A number of creative programs are in place and they are costed to ensure there is a community return on the funds spent. With the cardiac response program, it is estimated that for every £1 spent there is a saving of £6 for their partners.

Figure 113 Manchester Creative Programs



Source: Greater Manchester Fire and Rescue Service (2016)

Another example is a current pilot program called Community Risk Intervention, which was initiated to reduce demand on public services. These teams have responded to thousands of incidents on behalf of the ambulance, police and fire services. Whilst involved with individuals, they conduct holistic home safety checks; they look for risks, but also identify issues such as social isolation. Independent analysis shows that for each £1 spent on the scheme £1.60 was directly saved from the Manchester budget and there was also a social return of £7.67 ((Greater Manchester Fire and Rescue Service 2016).

The Fire service is also working proactively with business to reduce the number and extent of fires in the commercial arena. In 2010 over 1,700 enforcement notices were issued, over 180 prohibitions more than 50 offenders were prosecuted. As well as punishing offenders, the strategy also had a preventative effect as the incidents were well reported in trade journals. These actions and other work by the service resulted in a 28% reduction in non-domestic property fires (Greater Manchester Fire and Rescue Service 2015).

7.3.3. Firefighting Technology

The service is exploring and using new technologies to fight fires in a smarter way. A new high-pressure abrasive lance that uses ultra-high-pressure water with an abrasive additive will quickly pierce a hole in most modern building materials. High-pressure water spray is then introduced to the enclosure through the small opening created. The small water particles rapidly absorb the heat, quickly extinguishing the fire whilst also minimizing water damage. It is estimated that 48% of the damage at a fire scene extinguished by conventional methods is caused by water.

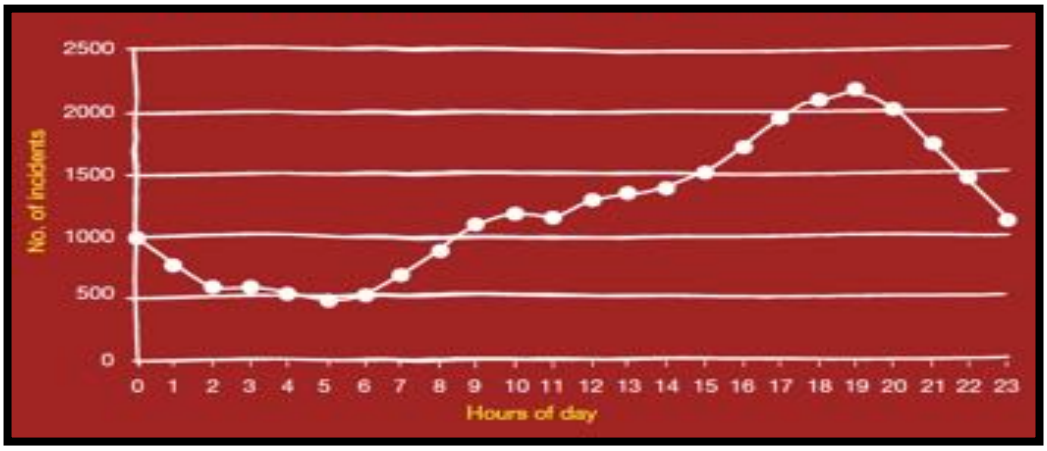
The new extinguishing system is used in conjunction with positive pressure ventilation and thermal imaging. With all of these systems in place, the result is quicker extinguishment, less damage and reduced risk for the firefighters. Other technologies such as aerial cameras and geographic information systems (GIS) assist in helping the incident commander to make informed decisions.

Increased training for these new extinguishing systems, including specialist training for high demand incidents (Urban Search and Rescue - USAR, trench rescue, water rescues, rescue from heights, etc.) has been provided.

7.3.4. Risk and Demand Modelling

It is now possible to use technology and data to plot risk and also examine demand. In the case of Greater Manchester Fire and Rescue Service (GMFRS) the greatest demand occurred between 10.30 AM and 10.30 PM. It is proposed to have 56 front line pumpers available between 10.30 AM and 10.30 PM and 52 from 10.30 PM and 10.30 AM.

Figure 114 GMFRA Incidents by Hour of Day (2014 /15)



Source: Greater Manchester Fire and Rescue Service 2015)

To achieve these outcomes, cross-manning of some vehicles will be required, as well as the introduction of smaller community response vehicles (CRV) manned by a two-person crews. Different shift manning practices will also be required.

7.3.5. Multi Skilling and Multi-Tasking

The GMFRS is a co-responder with the local ambulance service for cardiac arrests. The staff have been trained in CPR and use of AEDs. It is the only fire service in the UK to undertake this task with all firefighters and fire engines. Fire and Community Safety staff work with police to help combat organized crime, including sexual exploitation and modern slavery. They are involved in health, crime prevention and fire safety collocated with other agencies to provide synergies for the agencies and the public.

The Community Response Vehicles have been used to respond to medical emergencies such as cardiac arrest, health checks on behalf of the ambulance service, and welfare checks, which would usually have been done by police. Such activities by the fire service help free up other agency resources for their primary roles.

7.3.6. Fire Station of the Future

Community fire stations used as a resource by a number of agencies and the community will become the norm. Some fire stations include sports clubs and facilities to enhance community engagement; this includes their co-location with agencies such as police, fire and ambulance. Many firefighters are qualified trainers of CPR and currently provide CPR training to the community and schools. As part of the European

“Restart a Heart Day”, the fire fighters and community volunteers trained 3,500 students in CPR (Greater Manchester Fire and Rescue Service 2016).

7.3.7. Manning/Manpower

The service runs a number of volunteer programs. It does not use the volunteers for firefighting, although volunteering may lead to a pathway to join the service. There are 410 volunteers who have provided over 140,000 hours of work since 2011. In the main the volunteers are involved in community-based programs aimed at including youth, to encourage skills acquisition that may reduce anti-social behaviour, prevent radicalization and potentially lead to employment. In 2015 the program engaged over 1000 youths and helped them gain over 1,700 recognized qualifications. Furthermore, wellness programs are run for staff to improve fitness and reduce injury and absences. These programs are also showing positive results.

To be able to achieve manning that is adequate to the demand there will need to be changes made to the current shift manning. The service is currently in negotiation with the Union regarding a proposal to change to 12-hour shifts mainly based on two days, two nights and four days off. These firefighters would be supplemented by two shifts of four 12-hour days followed by four days off.

The additional available manpower during the day would enable the service to undertake a broader range of activities such as training and prevention work in the community. It is believed that more flexible hours would also help improve diversity in the workforce. It is intended that these changes be in place by 2017/2018 (Greater Manchester Fire and Rescue Service 2015).

7.3.8. Public Service Reform

The pressure of reducing budgets applies to fire, police and ambulance. All agencies are looking for ways of cooperating and sharing resources. There has been no let up on the pressure to change and it will continue into the foreseeable future.

7.3.9. How do you achieve such change?

When such dramatic change is undertaken there is a need to take the community and workforce along for the ride. The service has used a number of mechanisms to inform the public and staff of the need for change, invited consultation from all parties using face to face contact, citizens forums and extensive use of social media. Staff have

an opportunity to interact live with senior staff and authority members live in Q&A sessions watched by other staff on local devices.

Figure 115 Every Firefighter in Manchester faces the sack

Source: Getty Images

On 20 September 2016 it was reported that 1,200 firefighters in Greater Manchester face the prospect of being dismissed or applying for their jobs on the basis of new 12-hour shifts, after notices to that effect were published. The basis for the proposal was that the Greater Manchester Fire and Rescue Service intended to use Section 188 of the Trade Union Labour Relations (Consolidation) Act to dismiss all staff and then to rehire under changed working conditions. GMFRS have indicated that they have no intention of making anybody redundant, but have to introduce the new staffing model to make government required savings of £14.4 million whilst also providing the best possible emergency response services for the community. Not surprisingly, the Union responded angrily to the proposal, which they said had not been negotiated.

Councillor David Acton, who is Chairman of the Greater Manchester Fire and Rescue Authority (GMFRA), indicated that with the scale of the cuts, no change was not an option. He also said a third of the cuts had come from senior management and back office, but the balance would have to come from changes to the shift system in order to enable the greatest number of people to be on shift during times of high demand (Palmer 2016).

The Union ran an online petition against the changes and claimed to have received over 20,000 signatures in support against the authorities' plan to dismiss the

firefighters. On 27 September 2016 the GMFRS agreed to withdraw its Section 188 notices to allow negotiations with the Union to continue. Matt Brack, General Secretary of the Fire Brigades Union (FBU), welcomed the move and indicated it would allow negotiations to continue to discuss the challenges of the budget cuts without the threat of action by either party. The first meeting to start the process was held on 29 September 2016 (Fire Brigades Union 2016).

7.4. CHAPTER 7 SUMMARY

This chapter has provided an overview of the UK ambulance and UK fire service. It included an overview of the UK Ambulance Service, including reporting on its performance measures and response times, and a major review of the current UK fire service indicating the need for major changes and improvements in productivity. The chapter also presented a case study of the Greater Manchester Fire Brigade indicating the dramatic results of proactive management of the fire service.

Chapter 8, which follows, presents and discusses the themes identified within the case studies. The main themes identified are staffing, industrial influence and innovation. There are subsets such as the role of women in the emergency services, Public Sector Unions and their influence on public policy, and changes such as the use of "big data" as an aid to planning, new equipment procedures and drugs, new manpower arrangements with a focus on proactivity rather than the traditional model of reactivity, and dramatically improved communications to allow procedures unimagined in the recent past. The chapter also discusses suicide and its impact on the emergency services. Finally, it reviews EMS Compass, the latest and most comprehensive approach to EMS performance indicators currently evolving in the US.

CHAPTER 8: DISCUSSION, FINDINGS AND THEMES

8.1. INTRODUCTION

The research undertaken for this paper was undertaken using mixed methods and multiple case studies. The case studies provide a diverse international and geographic spread. There was a significant amount of data collected relating to response times, skills and service delivery. The issues raised by the research questions and identified as themes were generated from the data collected from the case studies, the questionnaires and broader research on the subject matter. The themes identified were based on the data collected and the initial data analysis was undertaken to do pattern matching, explanation building and time series analysis to identify trends and commonalities across the cases. The themes emerged with a number of possibilities reduced to a controllable number.

The research set out to show which of two different models of service delivery for EMS provided the best outcomes for the patient, and to address further issues as outlined in the research questions. The literature review showed that there had not been previous attempts to directly compare the delivery of EMS in Melbourne Australia to the delivery of EMS in North America.

It is clear that direct comparison of the performance of different systems is difficult. From the published data it is not even possible to compare the performance of Ambulance Services within Australia; NSW and Victoria are a case in point, as they use different measures for response times. Until recent times there has not been widespread collection of data relating to patient outcomes produced by the interaction of the medics and the patient from time of arrival on scene to handover at hospital in the systems reviewed.

For a long time the only performance measure for most non-law and order emergency services was response time. It is now acknowledged that whilst response time is a very important input to the issue of performance and patient outcome, it is not the only one. Ambulance Victoria is still failing to meet its response time target of 90% of attendances in 15 minutes; this target, however, is not consistent with targets in both UK and USA of 90% of calls within 8 minutes.

Whilst there has been considerable data generated regarding the outcomes for cardiac patients this data does not isolate the contribution of the EMS provider, but measures the performance of the whole health system, which can be compared to other health systems.

The research also identified dramatic changes occurring in EMS delivery systems; some of these related to new drugs, technologies and procedures. Almost all improvements of drugs and procedures evolved out of the military.

Another significant issue is the change to proactive delivery of EMS to try and reduce the ever-increasing demands on the system, a strategy already used by proactive fire services to reduce the number and impact of fire for a long time.

In the Fire Service there have also been significant changes. Perhaps the most significant is the dramatic fall in number of fire deaths, scale and number of fires, and changes in the proactive roles performed by firefighters, particularly in the UK. Productivity in North American firefighters is dealt with by them performing dual roles as firefighter/paramedics. The MFB has productivity issues that need to be addressed.

Whilst the tasks performed by paramedics in Australia and EMT (A) in the US are similar, there is a significant difference in the time taken to train people for these roles. The same is true for MICA Paramedics in the Victorian system compared to Firefighter/Paramedics in the US and Canadian systems.

Finally, with regards to workload for the fire service in Melbourne, they currently have significant capacity to take on additional roles without adversely affecting their primary role. It is clear Union interference with management is preventing progress.

The study set out to answer the following research question: *Which EMS delivery system provides the optimum outcomes for the patient; the ambulance-based system used here in Victoria or the USA and Canadian fire-based systems?*

To answer it, the following aspects were compared:

- Response times
- Survival rates from cardiac arrest
- Skill levels (training regimes)
- Use of advanced technologies

- Whether the Metropolitan Fire Brigade in Melbourne have the capacity to take on a supportive role in EMS.

8.2. RESEARCH QUESTION 1: Which EMS delivery system provides the optimum outcomes for the patient; the ambulance-based system used here in Victoria, or the USA and Canadian fire-based systems?

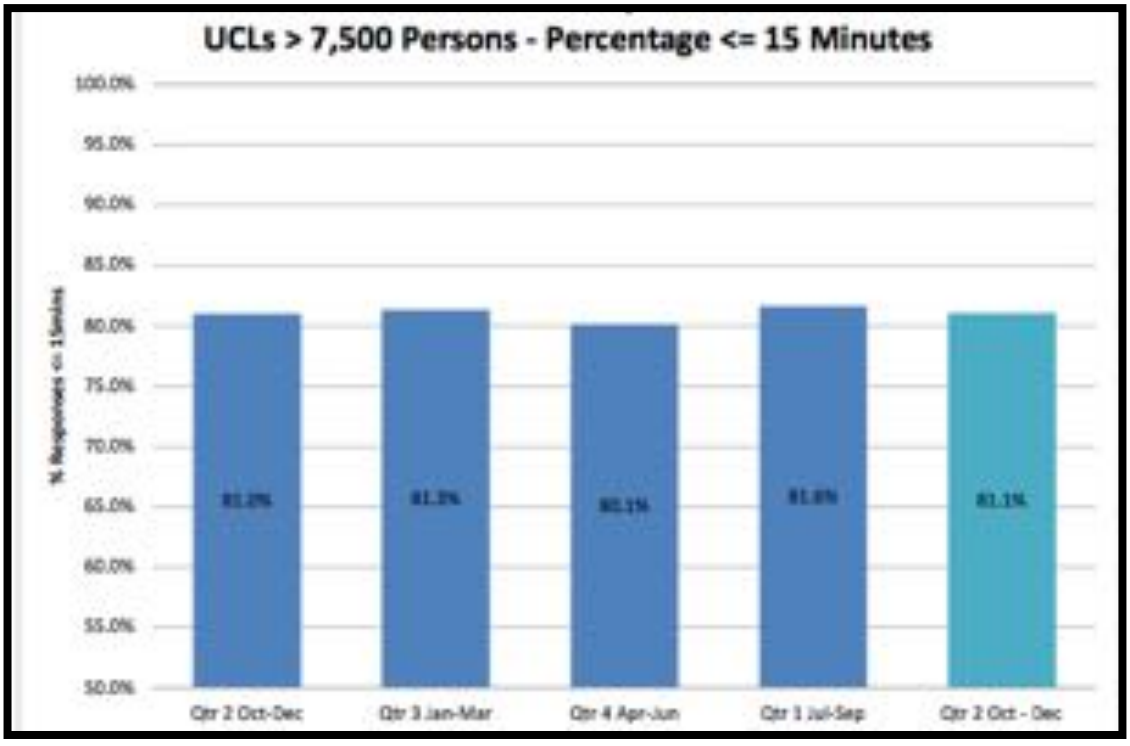
This question must be answered in two parts, response times and survival rates from cardiac arrest.

8.2.1. Response Times

8.2.1.1. *Ambulance Victoria*

The current response times for Ambulance Victoria in Metropolitan areas is 81.1% against a target of 90% for a target time of 15 minutes. These times show performance from 1 October 2016 to 31 December 2016 (Ambulance Victoria 2016b).

Figure 116 AV State - Wide First Response



Source: Ambulance Victoria (2016b)

8.2.1.2. *Metropolitan Fire Brigade, Melbourne*

The current response time target for medical calls is 9.3 minutes 90% of the time. The actual is 8.3 minutes 90% of the time (MFB 2013-2014).

8.2.1.3. *US Fire Departments*

In the US there is no national mandated response time for EMS calls. However there is a standard produced by the National Fire Protection Association (NFPA), which outlines response times for fire and EMS incidents at 8 minutes 90% of the time. Some Department choose to adopt this standard, while others do not. Unless a standard is called up in legislation, it is not a legal requirement. Some cities that contract EMS services nominate required response times as part of the contract. Below are the response times from the case studies examined:

8.2.1.4. *Miami Dade Fire and Rescue*

Has a target response of 8 minutes 90% of the time. They are currently achieving a response time of 10.2 minutes 90% of the time.

8.2.1.5. *Fairfax County Fire and Rescue Department*

Has a target of 90% for a target time of 9 minutes. They are achieving an 89.9% against the target of 9 minutes.

8.2.1.6. *Mesa Fire and Medical Department*

Has a benchmark response time of 6 minutes for EMS calls, but is achieving 7.43 minutes 90% of the time.

8.2.1.7. *Los Angeles County Fire Department*

Figure 117 Performance Measures

Performance Measures	Actual 2008-09	Actual 2009-10	Estimated 2010-11	Projected 2011-12
Indicators				
Percent of successful Automated External Defibrillator (AED) resuscitation attempts	8.00%	8.00%	8.00%	8.00%
Target response times for all 9-1-1 calls by area:				
Urban areas (1)	<5 minutes	<5 minutes	<5 minutes	<5 minutes
Suburban areas (2)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Rural areas (3)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Target response times for EMS (Emergency Medical Services) paramedic units by area:				
Urban areas (1)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Suburban areas (2)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Rural areas (3)	<20 minutes	<20 minutes	<20 minutes	<20 minutes

Performance Measures	Actual 2008-09	Actual 2009-10	Estimated 2010-11	Projected 2011-12
Operational Measures				
Number of times the AED was used	427	420	410	400
Number of patients on whom AED shocks were administered	178	165	155	155
Number of all 9-1-1 calls by area: (4)				
Urban areas	273,407	278,632	279,000	280,000
Suburban areas	11,008	10,989	11,000	11,000
Rural areas	7,993	6,666	6,700	6,700
Actual response time (in minutes) averages by area for emergency 9-1-1calls:				
For emergency 9-1-1 calls				
Urban areas	4.66	4.64	4.70	4.70
Suburban areas	6.09	6.11	6.10	6.10
Rural areas	9.18	9.40	9.40	9.40
Average paramedic response on EMS calls by area:				
Urban	5.72	5.71	5.70	5.70
Suburban	7.95	8.05	8.10	8.10
Rural	12.46	12.45	12.50	12.05

Explanatory Note(s):
(1) Dense business populations, high-rise structures, and no wildland interface.
(2) Dense residential population, and some wildland interface.
(3) Sparser population, few structures, and greater wildland interface.

Source: County of Los Angeles (2011-12)

Performance Measures	Actual 2013-14	Actual 2014-15	Actual 2015-16	Projected 2016-17
Indicators				
Percent of successful Automated External Defibrillator (AED) resuscitation attempts	24%	29%	24%	24%
Target response times for all 9-1-1 calls by area:				
Urban areas (1)	<5 minutes	<5 minutes	<5 minutes	<5 minutes
Suburban areas (2)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Rural areas (3)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Target response times for EMS Paramedic units by area:				
Urban areas (1)	<8 minutes	<8 minutes	<8 minutes	<8 minutes
Suburban areas (2)	<12 minutes	<12 minutes	<12 minutes	<12 minutes
Rural areas (3)	<20 minutes	<20 minutes	<20 minutes	<20 minutes

Source:(County of Los Angeles 2016-17)

The information in the table is not complete and the researcher was unable to access additional information. The tables do not define the "when to when": Are the times for total call time from initial call to arrival on scene or timed from dispatch to arrival on scene? What percentage is being achieved? It is unlikely to be 100%.

8.2.1.8. *Phoenix Fire Department*

The Department is responding to EMS calls in less than 10 minutes on 92% of occasions.

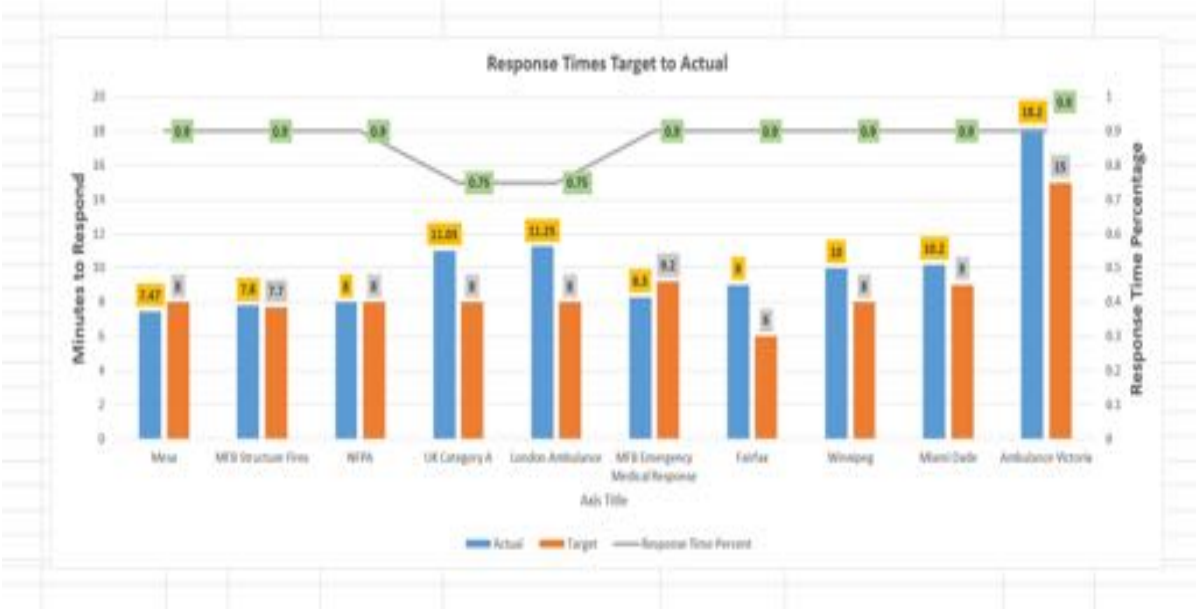
8.2.1.9. *Canadian Fire Service: Winnipeg Fire and Paramedic Service*

The Department has a current response time target of 8 minutes on 90% of calls. They are achieving a result of 76.29% against this target. It must be noted that these figures do not have elements of call handing but only deal with dispatch and travel time. Using the NFPA 1710 guidelines it would be necessary to add two minutes to the eight to better represent total call time. It cannot be considered definitive, as the actual call handling may exceed the two minutes allocated, but it is indicative.

8.2.1.10. *UK Ambulance*

The performance across all trusts in the UK for Category A calls in 2015-2016 was 72.5% for 8 minutes (Comptroller and Auditor General 2017). The London Ambulance achieved 71.1% for the period February to July 2017, as stated on their website (London Ambulance Service NHS 2017).

Figure 118 Response Time Table for Case Studies



Source: Times provided by this research

The above chart displays the response times for the case studies. The targets for all with the exception of Ambulance Victoria are between 6 to 9 minutes 90% of the time. The actuals range from 7.47 to 10.2 with the exception of Ambulance Victoria who have an actual of 18.2 minutes 90% of the time. There are potentially a number of reasons for different response times. These range from density of population (such as London which has a population density of 5518 people/km² compared to Melbourne which has a population density of 1560 people/km²; Versus 2017) to resourcing, workloads, geographic spacing and multiple vehicles at fire stations. Whilst there are different population densities that may result in different travel distances the key issue for the patient is not distance travelled but response time. Population densities for other case study cites include Phoenix 2790 people/km², New York City 10,194 people/km² and Mesa with 1365 people/km² (Versus 2017). As a result of differing population densities there will be differing distances travelled for a given time. None of the current case studies provide information on distance travelled. For the patient with a time critical medical emergency the key issue is response time.

Ambulance Victoria has the challenge of providing a timely response with finite resources over a wide geographic area in an environment of increasing demands on their services.

8.2.1.11. *Possible Solutions*

Ambulance Victoria is not meeting its goal of 90% for a 15-minute target for EMS response to high priority calls. If they were to place a Paramedic on all frontline MFB response vehicles, change the dispatch criteria and dispatch a fire truck to all time critical emergencies they would be able to achieve a 8.3 minute response time. Given the Ambulance Service spent $200 million to reduce times by 6 seconds the proposed approach would be far more economical. It would also provide significant additional benefits which are outlined in the following responses.

8.3. RESEARCH QUESTION 2: Survival Rates from Cardiac Arrest

The statistics regarding survival rates for cardiac arrest incidents are collected by virtually all EMS providers; Australian Ambulance Services are required to collect this data as per the Australian Productivity Commission Report (Australian Productivity Commission 2017b), and these events are comparable wherever they occur around the world.

The data related to survival rates, including discharge from hospital, indicated what is being measured are medical systems made up of many different parts. The ambulance response is only a part of a much larger system. A call to a heart attack victim may involve public providing CPR and public access AEDs, fire service providing first responder skills and defibrillation, advanced life support provided by paramedics, transportation to hospital, emergency room staff, Intensive Care Unit, ward staff through to eventual discharge.

Whilst the measures are extremely important to enable benchmarking, self-improvement and research, it is not possible to separate out the EMS component as a single part responsible for the outcome; the outcome is provided by the entire system. As a result the researcher is unable to provide further comment on Question 2. The Australian Productivity Commission may also need to revisit its current ambulance performance measures (Australian Productivity Commission 2017a, p. 11.6).

The performance measures created by EMS Compass would be a good starting point for the Productivity Commission to explore appropriate performance measures and KPI's for EMS delivery in the Australian context (EMS COMPASS).

8.4. RESEARCH QUESTION 3: Skill Levels

The researcher was able to identify the various levels of EMS in both Australia and the US and the various skills required to perform the roles. It is appropriate to reinforce that the researcher has no medical qualifications and cannot make definitive statements regarding the comparability of the two programs; this would be a suitable task for future research by somebody qualified to make such an assessment.

It is however possible to make some broad statements regarding the various roles. Unfortunately the different titles used in Australia and North America makes for confusion.

8.4.1. Level 1

First Responder (US) and Emergency Medical Response (EMR) for MFB (Australia). The programs are similar in length of course and course content; the US program is 40-50 hours, while the Victorian program is about 70-80 hours. The course is Advanced First Aid and includes the use of AEDs and oxygen. The use of drugs and any invasive techniques are not included.

8.4.2. Level 2

Here is where the use of terminology creates confusion. In the US the next level is called Emergency Medical Technician (EMT). There are a number of skill levels for EMTs in the US depending on state.

An EMT can perform a range of non-invasive tasks and use a limited range of drugs. These skill sets and drugs have been outlined earlier in the paper. The top level for an EMT in the US is an EMT-A, described as the backbone of the EMT workforce. An EMT-A fits between an EMT and a paramedic and can undertake a limited range of invasive techniques and deliver a broader range of drugs.

On the other hand, in Australia a person operating at this level is called a Paramedic; hence the confusion. A paramedic in Australia would perform similar roles to those of an Advanced EMT (EMT-A) in the US.

The most significant difference is time taken to qualify for this role. It is possible to become an EMT in the US with 120-150 hours of training, with a further 400 hours to become an Advanced EMT (Study.com 2017). In Australia the course to become an EMT-A equivalent (Paramedic) is a 3-year degree course.

8.4.3. Level 3

This is generally considered the top of the EMS levels. In the US this level is called Paramedic and in Australia it is called Mobile Intensive Care or MICA Paramedic. Achieving this level in the US can require 1-2 years or 1200-1800 hours of training. In California there is a requirement to have EMT qualifications and having performed in that role for at least 6 months before being eligible to undertake paramedic training. In Australia there is a need to have the 3-year degree and undertake further advanced training to achieve MICA Paramedic status (ALS) (Paramedics Australasia, 2017; Paramedics Australasia 2017a). There are other specialized paramedics for work in rescue helicopters, SWAT, water and other unique environments.

When confronted with the significant difference in the training requirements, two questions emerge: Are US EMT and paramedics undertrained? Are Australian paramedics (EMT-A equivalence) over-qualified for the tasks they are being asked to perform? Both countries seem satisfied with the outcomes produced by their own systems. There is no pressure to change either.

When the training for the Emergency Medical Response Program in Melbourne was developed it was to provide a base level of skills. After nearly twenty years there has been little change in the level of medical training for MFB Firefighters. It is now an appropriate time to assess the program and see if there are community benefits in training at least some staff to a higher level.

There is an existing program that has been developed and published by Paramedic Australasia which could be used. The Program is Basic Life Support Medic (BLSM) it is a Certificate Course and sits between First Responder and Paramedic (Paramedics Australasia 2017b).

8.5. RESEARCH QUESTION 4: Use of Advanced Technologies/Innovation

In the past ten years there has been a revolution occurring within EMS. It is a revolution that involved a number of areas. These include new equipment being developed in much shorter time frames than the past. Technology that once existed in rarefied atmospheres in imaging departments and ICUs has been reduced in size and cost, and is now appearing in ambulances, helicopters and planes (Mayo Clinic; National Highway Traffic Safety Administration 2015). New drugs and equipment such

as clotting bandages, and new techniques and procedures such as intraosseous (direct into bone) infusions are being created and are finding their way into the mobile drug boxes and current skill sets. Many of these new drugs, equipment and procedures have come from lessons learnt from or developed for the US military; some other examples of these have been listed in earlier chapters.

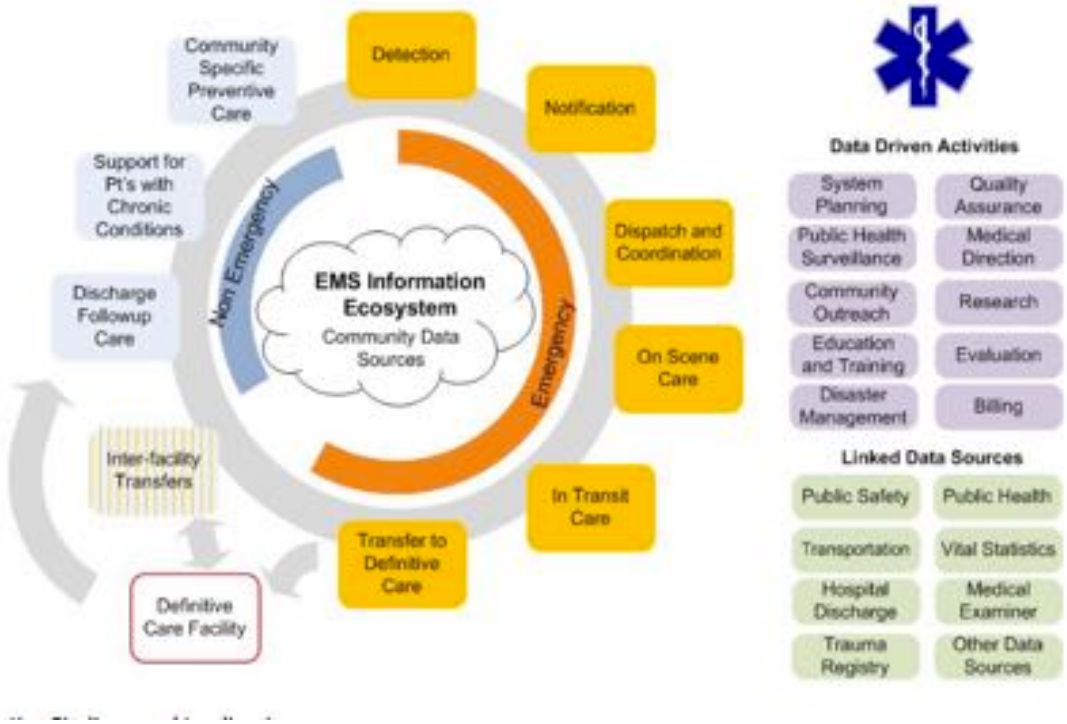
Another part of the revolution has been the massive collection and use of accurate data. Prior to the widespread use of computers there was very little data recorded and the quality of some of the data collected was doubtful. Many reports were filled in after the event on the basis of memory. The proliferation of computers, standardization of data collection and quality of data (much of it captured electronically) has led to massive changes in the industry (Miami Dade Fire and Rescue are now using Electronic Patient Care Reports (ePER) to ensure accuracy of data collected (Appendix 2). Changes to manning arrangements to better deal with peak loads and predictive modelling to identify the likelihood of next call location are just a few examples.

Quality research is being undertaken worldwide but the following extract from the 2015-16 Ambulance Victoria Annual Report is worthy of inclusion:

> We undertook a comprehensive program of research, with 66 active research projects during the year. Our paramedics participated in three major clinical trials, with collaborating institutions. A research highlight for 2015–2016 was the recognition of the Air Versus Oxygen In myocardial infarction (AVOID) study as one of five finalists at the 2016 Australian Clinical Trials Alliance 'Trial of the Year' Awards. The AVOID study established that giving additional oxygen to a patient having a heart attack caused harm, compared with the patient breathing normal air. During the year this study was named as one of the most influential health research studies in the last 100 years by The Medical Republic (Ambulance Victoria 2016a).

The following chart was taken from a document titled "Emerging Digital Technologies in Emergency Medical Services: Considerations and Strategies to Strengthen the Continuum of Care" produced in August 2015 (National Highway Traffic Safety Administration 2015).

Figure 119 Continuum of Care



Source: (National Highway Traffic Safety Administration 2015, p. 4)

The document discussed the significant changes in EMS as a result of the digital revolution. The current state of play exceeded predictions made in previous reports. It explores how the new technologies and software may improve patient outcomes, the operation of systems (including enhanced 911) and performance management. It also makes comment about using the data for proactive programs to maximize positive patient outcomes. It also raises some of the legal and regulatory challenges in the brave new world (National Highway Traffic Safety Administration 2015).

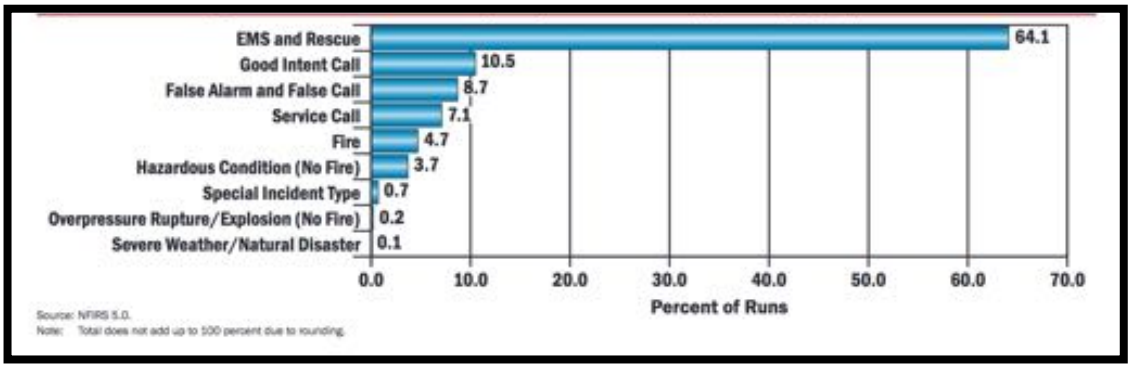
8.5.1. US Fire Service Run Profile and Use of Big Data

Using the currently available technology and standardized data collection across agencies it is now possible to do analysis of "big data" to identify trending issues. The revolution of the use of big data is not coming, it is already here (Henke 2016; Manyika et al. 2011).

A recent report produced by the Federal Emergency Management Agency (FEMA) is an example. In 2014 fire departments responded to 23,315,600 incidents. The figure was for the entire country and includes data from Metropolitan and rural departments. Key findings included that nearly two-thirds of calls (64%) were EMS, while only 5% of all fire department calls were fire-related; half of all calls (53%) were to residential properties, and only 3% of those calls were fire-related; about 8% of calls

were to provide back up to adjacent agencies; and false alarms and false calls accounted to 9% of the total (US Fire Administration 2017).

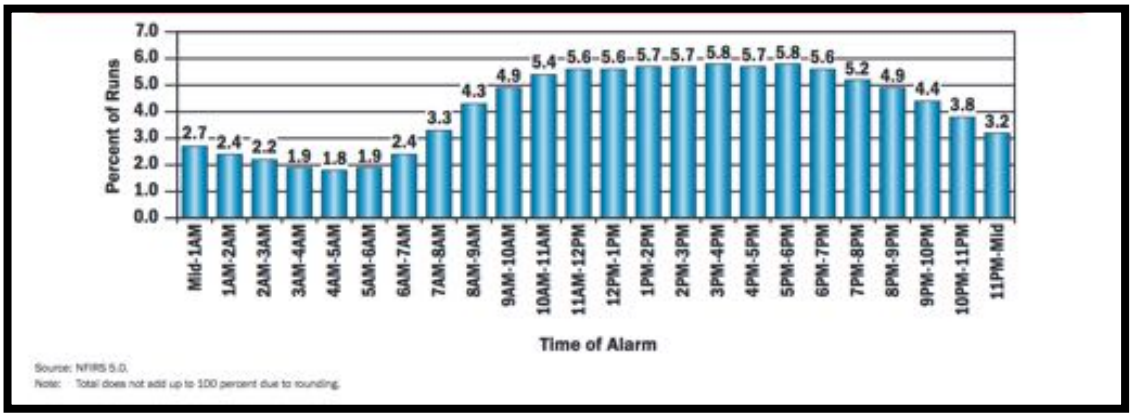
Figure 120 Fire Department Overall Runs by Major Incident Type Category (Percent of Runs 2014)



Source: https://www.usfa.fema.gov/downloads/pdf/statistics/v17i8.pdf

Data contained in the above chart is important for identifying trends, areas requiring proactive attention and resource allocations.

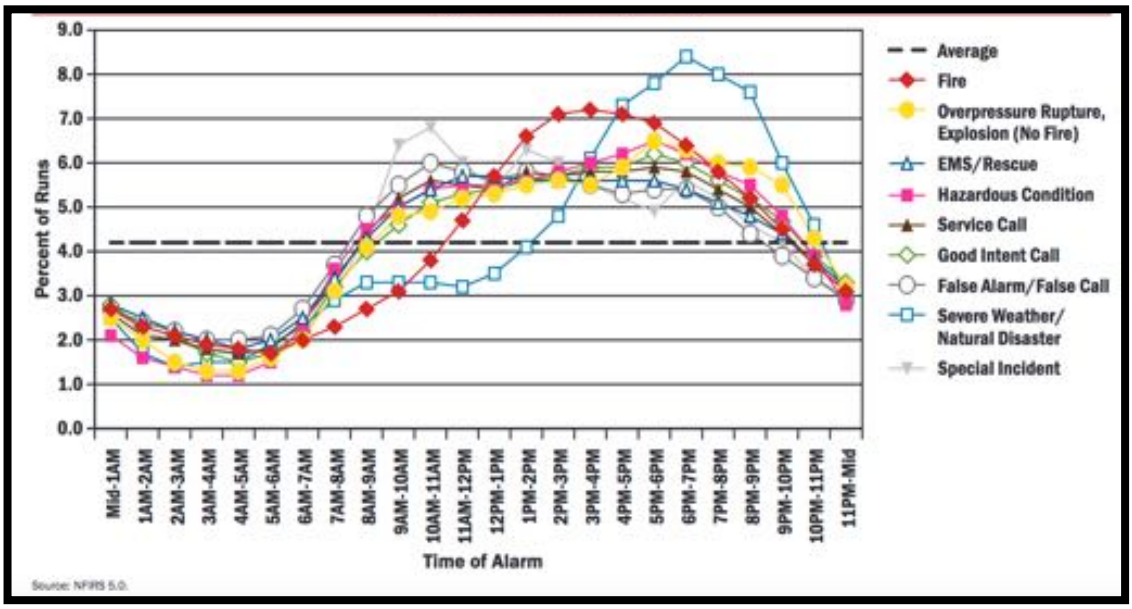
Figure 121 Fire department overall runs by time of day (Percent of Runs,2014



Source: https://www.usfa.fema.gov/downloads/pdf/statistics/v17i8.pdf

The above information also has implications for possible alternative manning strategies which may see different manning levels to match the risk depending on time of day.

Figure 122 Fire department overall runs by time of day and major incident type category (Percent of Runs, 2014)



Source: https://www.usfa.fema.gov/downloads/pdf/statistics/v17i8.pdf

The types of call and time of day assist those making decisions regarding manning and possible changes. It is interesting to note the similarity of the demand times across emergency types and to the time lines in the GMFRS (UK) data for fire.

The use of information as outlined above can be to create reports or to create tools. A recent journal article ('Big Data and Transformational Government' 2013) outlined how the effective use of big data can create tools for transformational change

(Joseph & Johnson 2013). The private sector has the profit motive to leverage data to their advantage. The same drivers are not in place in the public sector, even though there are significant benefits to improve efficiency and effectiveness by collection and analysis of key data.

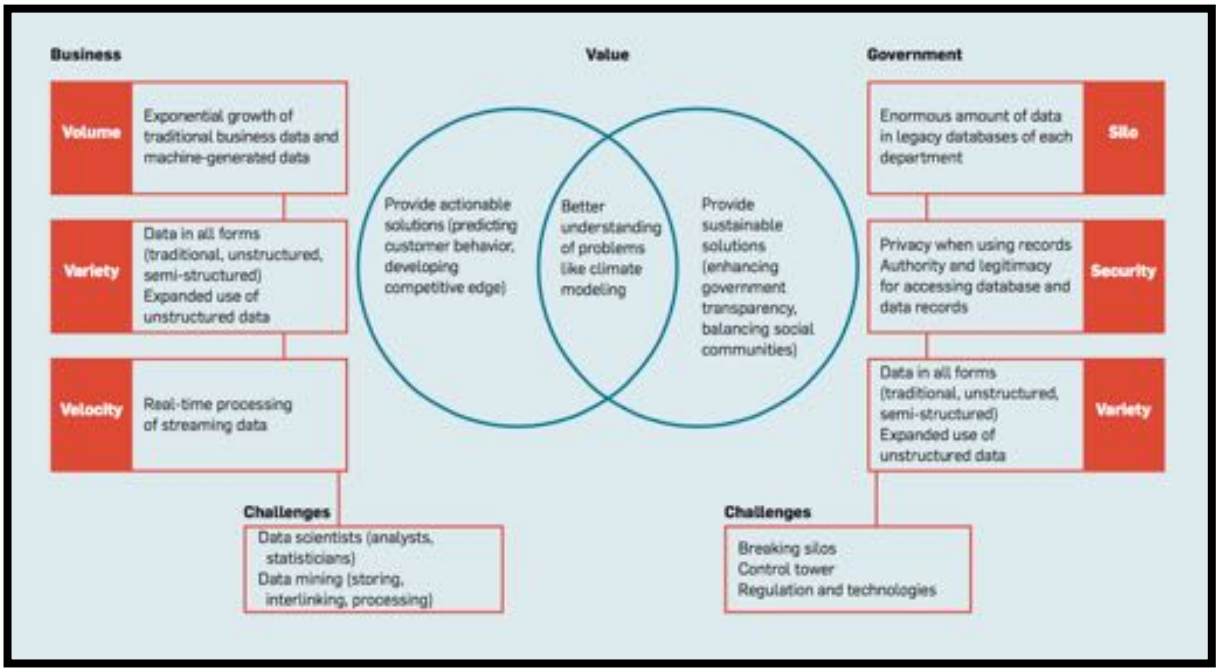
The fire service and other emergency services now operate in a sensor-rich environment in that there is a massive amount of information being collected by smart systems ranging from traffic data to smart fire detection and suppression systems through to building construction details and weather and biometric data. Smart firefighting agencies of tomorrow must fully exploit the opportunities presented by this deluge of data to enable them to operate efficiently and effectively. Effective use of this information known as "cyber-physical systems" is set to revolutionize firefighting and other emergencies (NIST - National Institute of Standards and Technology 2014).

Comments by Joseph indicate that for some government agencies there is "a simultaneous over production and under consumption of data" (Joseph & Johnson 2013). Big data now goes far beyond the types of information outlined in the FEMA collection of information and includes images, blogs, smartphones mobile devices, GPS and social networks. The challenge is the integration of the information. Legacy systems currently in place will not have the capability of managing and sharing this data and will need to be upgraded. Although large bureaucracies and governments are notoriously resistant to change, as the advantages of using big data become obvious it will pick up more champions.

A current problem is that election cycles impact on the possibility and pace of change (Dean 2015; Joseph & Johnson 2013). The use of new technologies and analytics will enable change to occur over shorter timelines than are currently possible:

> The emergency services have great potential to use this information to transform themselves by providing improved customer service, innovation, better management of resources and lower costs (Joseph & Johnson 2013, p. 49).

Figure 123 Business and government dataset attributes compared



Source:

http://0eds.a.ebscohost.com.library.vu.edu.au/eds/pdfviewer/pdfviewer?sid=2591cbe9-c3a9-4e80-9b95-d57d70fcf8df%40sessionmgr4008&vid=2&hid=4108

Figure 114 clearly shows the differences in the challenges between the public and private sector. Some of the key issues identified for government are legacy systems, legality, privacy and security of data. These issues are also vital to key organisations in the private sector such as banks and large corporations. With a few notable exceptions, most companies have struggled to get anything beyond modest gains for their considerable investments in big data (Henke 2016) but the potential rewards far outweigh the challenges (Manyika et al. 2011).

Of particular interest to the emergency services is the use of big data for the prevention and response to terrorism and as a tool to assist in managing man-made and natural disasters. For such systems to work the current ‘silo mentality’ must be left behind (Gang-Hoon, Trimi & Ji-Hyong 2014). The “silo mentality” refers to the collection of data within an agency but an unwillingness or lack of capability to share the data across agencies.

8.5.2. The Revolution in EMS

As a result of new technologies, new life saving techniques and new roles EMS providers are changing the way in which they deliver services and are barely recognizable to their predecessors of only a few decades ago.

8.5.2.1. *Equipment*

In the past defibrillation was something that only took place in the hospital. We are all familiar with movie scenes showing hospital staff yelling Stand Clear, Stand Clear and then shocking the patient with electronic paddles. The same technology is now so intelligent and user friendly it is now available in public places such as airports, shopping centres and sports grounds and people with NO training are encouraged to use the device (Ambulance Victoria 2017c).

These days an ambulance may contain X-ray and ultrasound devices, machines that perform CPR, communications that can forward electrocardiograms to the Emergency Room, video links and equipment for lab tests. An example of the use of new technologies from the case studies is Miami Dade and their use new technology to collect electronic patient information.

Another example of the use of high-tech equipment is the Mayo Clinic in Rochester, Minnesota. It is considered a leader in the field with its helicopter capable of operating as a mobile emergency room or mobile intensive care unit. The Mayo Clinic works closely with the US military to see how lessons learnt on the battlefield may be transferred to the civilian community.

External defibrillators and pacemakers are standard equipment (on all case studies front line vehicles), as are portable equipment for lab tests and non-invasive devices to determine if a blood transfusion or antibiotics are required. State-of-the-art equipment includes capnography, a monitoring device that helps in the placement of breathing tubes and also monitors the carbon dioxide content of the exhaled air. The Mayo Clinic can also transport patients connected to a machine that performs the task of heart and lungs.

As the Mayo Clinic has its own blood bank the helicopter also carries a range of blood products, which others may not carry. Mayo One crews also carry tranexamic acid (TXA), shown to be beneficial to trauma patients if given within three hours of injury. It is also approved for use with a medical head bleed (Mayo Clinic 2017).

Figure 124 Interior of Mayo One Helicopter

Source: https://codoureyrocks.wordpress.com/2015/11/18/turning-blades-241-km-radius-airborne-emergency/

The work the Clinic has been involved with the US military has led to the use of quick clotting bandages and tourniquets for blunt trauma and penetrating wounds. Mayo Clinic EMS crews plan to adopt this practice as an alternative to intravenous lines, particularly if a limb has been lost. The process involves sternal intraosseous infusion, where fluids and medications are delivered into the bone marrow directly through the sternum.

A recent development that demonstrates how fast innovations in the medical field are occurring is a smart bandage developed by University of Nebraska-Lincoln, Harvard and MIT. The bandage is made up of electrically conductive fibres coated in gel loaded with antibiotics, tissue regenerative material and painkillers. It has a microcontroller the size of a postage stamp that can be triggered by a smart phone or other wireless device. It combines precise doses customised to meet the patient's needs and will accelerate the healing. Tests showed a regeneration of tissue at three times faster than a plain bandage. The military will benefit from using this technology as it will stimulate faster healing and prevent infection for bullet and shrapnel wounds. It obviously has applications for EMS providers (Schrage 2017).

In the near future the technological, drug and procedural advancements may further enhance the abilities of first responders such as firefighters to provide higher levels of care.

8.5.2.2. *Changed Delivery Models*

Another revolution is the change from reactive delivery to proactive prevention and minimization of EMS issues. Interestingly these have been the proactive actions of progressive fire departments for many years in the area of fire prevention and mitigation. Examples revealed in the case studies include the proactive programs in Mesa and Winnipeg.

Currently there are at least 230 EMS systems in the USA with proactive "community paramedicine". By way of example, Texas has a 911-nurse triage and preventative care system operating in 15 cities in and around the Fort Worth area. It is estimated that this local system has saved US$11.5 million in transport, emergency department visits and hospital admissions in the past four years (Bui & Williams 2017).

Another example is the Colorado Springs Fire Department, which plans to turn a number of fire stations into preventative care clinics. Members of the public could go to the fire station at set times for blood pressure and blood sugar checks. It is hoped to extend the program to include non-emergency check-ups and EKGs (Handy 2012).

The community paramedic teams provide preventative care and even make house calls. The aim is to provide better care but to also reduce demand on the emergency response resources. They treat patients in their homes, work with old and frail and those with chronic problems such as diabetes. They will also check on recently discharged patients to ensure they are following all of their care instructions.

One of the issues identified is that the majority of 911 (emergency) calls require a non-emergency response. These may include shortness of breath, weakness and fatigue, dehydration, cuts and abrasions, abdominal pain, low-grade fevers, cold-like symptoms, urinary problems and minor falls (Landro 2016). If alternatives are found to respond to these calls, the highly skilled (and expensive EMS resources) are freed up to be able to respond to time critical emergencies.

There are now several pilot programs in the US and Canada in which EMS providers are providing services so that they **do not** take the patients to the hospital. For example, Mount Sinai Hospital in conjunction with a local ambulance service are

running a community paramedic program in which specially trained paramedics will respond to calls to patients enrolled in the program. The paramedics will visit and examine the patients in their home, and they also consult with the hospital doctors by telemedicine or two-way video links for advice on how to proceed. Of 36 patients who used the service over six months only five were transported to hospital, which resulted in significant financial savings (and possibly better patient outcomes).

Mesa Arizona Fire Department run a similar program in which the dispatchers talk to the caller to ascertain their needs in much greater detail. For those deemed non-urgent, nurses offer medical advice, or send a community–medicine unit. The unit staffing may be firefighter paramedics, nurse practitioners, physician's assistants or behavioural-health counsellors depending on need. A test of 983 patient interactions between August 2012 and February 2013 showed a cost saving of over US$1 million (Landro 2016).

When it is possible to treat patients in their homes there are advantages for everybody involved. In Mesa they receive approximately 55,000 911 calls, of which about 40% are low-acuity. It is very expensive to respond to these calls and to take the patient to the emergency room. Furthermore, community care units can follow up on high-risk patients following hospital discharge to ensure they are following discharge instructions. Paramedics may also recommend follow-up by appropriate social services or a physician.

In another example of proactivity, the Mesa Fire Department offered free flu vaccinations. The program was run in conjunction with a Fire Prevention Fair, which also provided information on CPR, drowning prevention, and senior safety. In one week over 800 flu vaccinations were administered (Dyer 2014). Immunization programs such as described are common across the US.

If the broad-based proactive programs by fire departments to reduce 911 calls are to become widespread, there will be a need to revisit the funding models.

8.5.2.3. *Next generation communications*

In 2012 the US Department of Commerce has set up an Independent Authority called FirstNet with a mission to develop, build and operate the nationwide, broadband network that service first responders to save lives and protect U.S. communities (First Net: First Responder Network Authority 2017). Regulators are setting aside sufficient bandwidth to deal with the next generation of emergency service communications. One

of their projects is called Next Generation 911, which will enable callers to send pictures and videos to the dispatchers. Many states have also added the ability to call 911 via text.

Benjamin Schooley, Assistant Professor, based in the University of South Carolina and linked to Integrated Information Systems (http://www.iisysinc.com) has developed technology to enable video, pictures and other information to be transmitted from car accident scenes. It is his belief the EMS has only started to scratch the surface of what will soon be possible with real-time patient data (Landro 2016; National Highway Traffic Safety Administration 2015).

8.5.3. Less is More

Some patients may benefit from less intervention from EMS staff; this is particularly so for penetrating injuries such as a shooting or stabbing to the chest or torso. Temple University is currently undertaking a five-year study on this subject. Zoe Maher, Trauma Surgeon and researcher, indicated that intervention may assist in remote rural areas that are far from a hospital, but in a city with quick hospital access they may not assist and may cause additional problems. An example is the administration of IV fluids, which may dilute blood's clotting ability and make intubation more difficult (i.e., placing a tube down a patient's throat may increase pressure in the chest cavity, resulting in a decrease in the amount of blood coming back to the heart; Landro 2016). In certain circumstances, "less is more".

8.6. PERFORMANCE MEASURES

EMS performance measures have been around for at least a century. In the mid-1800s, Pennsylvania Hospital began collecting data on patients, sorting them by diagnosis and outcome. In the 1850s Florence Nightingale used data to track death rates in British military hospitals. Using this data it was possible to identify trends and differences between hospitals. In 1910 surgeon Ernest Codman recommended that all hospitals should follow each patient to track the effectiveness of their treatments. His recommendations were incorporated into the American College of Surgeons' Inspection Program. The Joint Commission on Accreditation of Hospitals, which was founded in 1951, continued the program.

The nature of the challenges of creating meaningful performance measures for the deliverers of EMS was highlighted in a recent thesis entitled "Quality Performance

Measures for Fire Based EMS Services". The research identified 15 indicators and 27 measures which would go a long way towards measuring performance in these organisations. If multiple agencies used the same measures it would be possible to bench mark performance and use this information to assist in improving performance across agencies. I had the opportunity to meet with Dr Moore at a Conference and to discuss aspects of her paper. I asked the question as to how many agencies were using all of her 27 identified measures at that time and she indicated none though many agencies were using some of the indicators. There were a number of reasons for this outcome including data quality and difficulty in getting accurate times for a number of the elements (Moore 2002).

The recent revolution in the collection of electronic data has created new opportunities to better track health care performance. With the explosion of data has come a strong need for key performance measures.

There have been many efforts at producing EMS performance measures at national, state and local levels in the USA. One of these efforts is EMS Compass, a two-year project by National Highway Traffic Safety Administration (NHTSA) "to support a culture of performance improvement in EMS, one in which EMS providers and systems strive to provide evidence-based, patient centred care using standardized measures of performance" (EMS COMPASS).

Figure 125 EMS Compass

Source: (EMS COMPASS)

The difference with EMS Compass is that it is the largest nationwide project and the first in a decade to develop EMS measures. The process is also designed to be continuous and ongoing beyond the term of the current project.

The EMS Compass project commenced in 2015. The project is funded by NHTSA and managed by the National Association of State EMS Officials (NASEMSO). It brings together a wide range of EMS stakeholders including agencies, regulators and patients. A key factor in enabling the project was the National Emergency Information Systems (NEMSIS), which collected a vast amount of national standardized EMS-related data.

8.6.1. Initiative Objectives

The objectives of EMS Compass include the development of a core list of measures for specific definitions for EMS to improve quality, the use of evidence-based recommendations and best practice data as the foundation of the development process, and of data elements from the National Emergency Services Information Systems (NEMSIS) whenever possible; the engagement of local, state and national stakeholders throughout the development and testing process, and the design of a system to support continuous updating and expansion of the performance measures dictionary (EMS COMPASS n.d.).

8.6.2. About Performance Measures

The main objective of EMS is to provide high quality care for the patient. Without valid performance measures EMS providers and regulators have no way of knowing if they are achieving their goals.

Performance measures are a critical tool for individuals, organizations and the community; without them it is not possible to assess whether performance is improving or deteriorating, if an implemented change has had the intended effect, and whether the cost of a program or piece of equipment is worth the expense (EMS COMPASS n.d.).

The use of performance measures in healthcare is not new, but their use has expanded dramatically in the past few decades. The use of the standardized collection of EMS data by the National EMS Information System (NEMSIS), the use of electronic patient care reports and linking to computer aided dispatch systems make a project such as EMS Compass viable.

The EMS Compass program is a very exciting development in the creation of accepted performance measures that have been developed by a broad spectrum of agencies. It may well lead to usable data to help all involved improve performance. Its creation and results are also a useful tool for the international community (EMS COMPASS).

8.7. RESEARCH QUESTION 5: Does the Metropolitan Fire Brigade in Melbourne Have Capacity to Take On a Supportive Role in EMS?

There are two parts to the response to this question. The first relates to an ability to perform additional EMS during a workday without adversely impacting on the current primary role of the organization. The second part relates to the capacity for the organisation to change.

KPMG showed that in 1997 the total time spent responding to and dealing with emergency response for the MFB was less than 5 % (KPMG 1997). Since that time a number of things have occurred. The numbers of structure fires have fallen slightly over the past 10 years (2328 in 2005/2006 to 2149 in 2015/2016; MFB 2016), whilst the number of large fires has decreased.

The fall in the number and severity of fires is a worldwide trend. Where the fire departments have aggressive proactive programs of community involvement utilizing all of the departments resources (on duty firefighters) the results are even more pronounced.

The figures from the UK clearly illustrate the trends. Fire deaths reduced by 40% over the last decade. During the same period the actual amount of time spent at fires is down 48%, and the number of minor outdoor fires is down 44%. UK fire departments carried out over 2 million home safety inspections and installed over 2.5 million smoke alarms over a period of 4 years from 2004-2008 (Knight 2013, p. 38). The home inspections covered a broad range of issues, not just fires. The program resulted in a 57% fall in dwelling fire deaths over the same period (2004-2008). The estimated benefits of this program are in excess of £1 billion (Knight 2013, p. 38).

Another issue is that in 2015-16 the MFB attended to 16,175 false alarms, which represents nearly 43% of all calls (MFB 2016, p. 15). Time spent by fire departments attending to false alarms is time spent for no purpose. Some fire brigades in the UK

have aggressively tackled the problem and since 2003 have achieved reductions of 40%. Such reductions help protect the community and firefighters from potential traffic accidents and also free up significant resources for other tasks.

The MFB role as First Responders to EMS calls has resulted in additional calls. In the 2015-16 Annual Report the MFB attended to 3950 Emergency Medical Response (EMR) calls (MFB 2016). There are significant differences to the response for an EMR call compared to a fire call. An exchange call or sprinkler activation for a fire in a city building would result in a minimum of 6 vehicles and a fire call to a house fire in the suburbs would be a minimum of 2, while an EMR call to the same addresses would involve one vehicle.

EMR calls involve a fraction of the time compared to the amount of time involved in fires. MFB response time to EMS Calls is 8.3 minutes at the 90% level. Ambulance Victoria is achieving a response time of 18.2 minutes at this level. These figures indicate a gap at the incident of 9.9 minutes or less 90% of the time. At the same time the fire truck is responded, an ambulance is also responded. Given the differences in response times the fire truck may arrive prior to the ambulance. If the fire truck arrives first the firefighters perform their EMR duty until the arrival of the ambulance crew, when they then hand the incident over to the ambulance service. Unless there is a need for their assistance the fire crew are now available to respond to other calls that may occur in their area. They may choose to stay on scene and assist until the ambulance clears but EMR calls take up very little operational time.

The research identified the common EMR question that is often raised: What will happen if a fire occurs at the same time as an EMR call is being attended to? The answer is the same as if a fire truck was attending to a fire and another fire occurred: the system will respond the next closest vehicles. One of those may be from the same station as the EMR response (some stations have multiple vehicles). If the EMR response were from a single vehicle station the next closest vehicle would be sent. Given nearly twenty years of experience delivering EMR in Melbourne, it would be interesting to know how many times this problem has occurred. This data is not available from public sources.

Currently the only figure we have regarding use of operational resources for emergencies is less than 5%. In the time since that figure was produced we have seen reductions in the size of fires and the addition of EMR. The researcher suspects the figure for today would not be much different from that produced in 1997. If the 5%

figure is correct, it means the resources of the brigade could be used to perform other tasks including additional EMS calls without impacting its capacity to perform its primary task. Obtaining this information is a simple and non-time-consuming task.

Another key issue is the fire brigade response time. Having set a 90% target for a goal of 9.2 minutes for EMR calls, the MFB is achieving a 90% goal in 8.3 minutes, nearly half the ambulance goal of 90% in 15 minutes (which Ambulance Victoria is not achieving). The point needs to be made that all MFB calls are emergency response with sirens and lights. Ambulance Victoria has priority emergency calls with sirens and lights but also non-priority calls with a non-emergency response. Ambulance Victoria does not publish the response times for non-emergency calls although the information would be collected by the CAD system and could be published. It would also be possible to plot the calls spatially, but this information is not contained in publicly available sources.

8.7.1. Who Says the Organization Is Sick?

The second part of the answer relates to the actual capacity for the organization to change. The MFB has had a number of managerial failures over recent years. The problems compounded in 2010 when an EBA allowed for Consultative Committees which effectively gave the UFU the right of veto over management decisions.

The following quotes are from a wide range of respected people who have had involvement with the MFB from a broad spectrum of backgrounds. The words are their own and I make no comment.

The author of the recent fire service review, David O'Byrne, is a former union official holding a number of senior roles in the union movement (albeit without any direct firefighting experience). He was also ALP State President prior to his election to the Tasmanian Parliament in 2010. During his time in Parliament he held a number of portfolios, including Police and Emergency Services, from 2011 to 2014 when he lost his seat (Beacon Foundation 2017; O'Byrne 2017).

He stated:

> At times, the relationship between the leadership and firefighters seems like trench warfare ... With the current state of morale and strategic and operational leadership, the fire services appear to be in an extremely unhealthy state: a situation that must not be allowed to continue [comment also relates to CFA] ...but the high level of response is held

> together by the goodwill and effectiveness of those on the frontline. This is not sustainable and if left to continue, would potentially pose a risk to the Victorian Community (Byrne 2015, pp. 2-3)

Further on, he continues by saying that "Change is not only desired but desperately needed" (Byrne 2015, p. 6), and concludes as follows:

> ... There is a serious and fundamental disconnect between the senior management and operational firefighters. In the MFB this has become an almost uncrossable chasm. ... There is no clear ownership or accountability for decisions. ... In the past the UFU has stridently discouraged its members from engaging in management activities (Byrne 2015, pp. 32-34).

The following comments come from "A Review of the MFB Employee Support Program" written by Dr Peter Cotton (2016). Although the UFU applied to the Fairwork Commission to block publication of the report, it was published in full the next day by the Herald Sun (Minear 2016c): "…the MFB has grappled with the death by suicide of three firefighters in a two-month period". In relation to Workplace Health and Safety (WHS) performance: "…currently the MFB is performing at a level that is 93% worse than all relevant industry benchmarks, and further deteriorating according to available indicators" (Cotton 2016, p. 33). In relation to Workers Compensation performance he states that:

> …Out of all Australian Fire and emergency services agencies, MFB rates as the second worst performer. Of these 14 fire and rescue agencies MFB has 9% of all employees in this group yet accounts for 16% of all claims ... The extreme lack of MFB workforce diversity, lack of mobility and access to flexible working hours contributes to psychological health and safety risk. ... All of the women interviewed by the review team except one, reported experiencing significant gender-based harassment, sexism and misogyny ... Typical workforce health and risk management initiatives - such as fitness for duty assessments and drug and alcohol testing regime are absent (Cotton 2016, p. 33).

A troubling figure shows the MFB was spending $14.2 million on Work Cover claims at $6,455 per person, double the amount for Victoria Police (Minear 2016b).

Former Labor minister Andre Hearmeyer served as Shadow Minister for Emergency Services for six years, then as Minister in the Emergency Services for a further 6 years in the Brack's Government. Peter Marshall was UFU Secretary for the whole time the he was Minister (Mitchell 2016). He made the following comments on radio: "at some stage you just need to accept that the problem is with the UFU is not with the Board of the CFA, or the MFB or a Minister or senior operational command";

and “The UFU was ‘like no other union’ and that boss Peter Marshall wore him down at times. There was a sort of overbearing intimidation, the 2.00AM phone calls, the constant wearing you down” (3AW News 2016).

Similarly, in his resignation letter from the MFB Board, Lieutenant-General Des Mueller made the following comments: “The culture of conflict which regrettably pervades the MFB is unlikely to diminish in the foreseeable future” and “In spite of the difficulties which the MFB experiences, and they are the worst I have ever seen in an organization…” (Toscano 2015).

Adrian Nye, former President of the MFB Board, also provided the following damning comments after he quit the role: “It’s intractable, significantly sick. The core struggle is about control of the organization”, and “I have never known such a bullying culture as the one within the MFB” (ABC News 2010).

In July 2016 the Andrew’s Government announced it had engaged the Victorian Equal Opportunity and Human Rights Commission (VEOHRC) to investigate the CFA and MFB. The request follows the Fire Service Review which had found evidence of bullying, harassment and lack of gender diversity. The UFU has told its members to shun the investigation (Willingham 2016). In June 2017 the UFU launched an attempt to permanently block the release of the Report. They first tried in the Fairwork Commission but the matter is now before the Supreme Court (Willingham & Preiss 2017). The VEOHRC has agreed not to release the report until the UFU runs its case in the Supreme Court to try and supress the report (Deery & Galloway 2017).

On 17 October, 2017 an internal CFA Report was leaked to the media (http://www.theage.com.au/interactive/2017/CFA/PTA.pdf). The report alleges a culture of fear, bullying and impunity. There are claims of sexual harassment and sexual assault driving women to illness and the brink of suicide. The report takes aim at the UFU which it claims perpetuates a culture of “no transparency or accountability”. Some staff claimed that the UFU contributed to a culture in which “management and in particular operational staff bully and harass with impunity as a consequence…of an organisational culture that has no transparency or accountability” (McKenzie & Baker 2017b). A number of the matters raised in the report have now been referred to Victoria Police and the Independent Broad-Based Anti-Corruption Commission (IBAC; Alison & Johnston 2017a).

On 19 October 2017 the Victorian Human Rights Commissioner, Ms Hilton warned people coming to her office to tell her confidential stories about bullying or harassment in the MFB and CFA that they may be covertly photographed when entering her building. A file note states "people were taking photographs of persons who were presenting at the [VEOHRC's offices]. The purpose was "intimidation" says Ms Hilton. Whilst she suspects she knows who is taking the photographs; the publisher of the newspaper reporting the event declined to name the perpetrators because of the lack of concrete proof (McKenzie & Baker 2017a).

Following these revelations the leader of the State Opposition, Mathew Guy is calling for a judicial review of the CFA (McKenzie & Baker 2017a). His call for judicial review are supported in an Age editorial (The Age Editorial 2017). It is likely that any such judicial review would be extended to include the MFB. As of the 21 October 2017 the UFU continues its action in the Supreme Court to try to prevent publication of the VEOHRC report into the CFA and MFB (The Age Editorial 2017).

In August 2017 Craig Lapsley, Emergency Management Commissioner, Victoria stated the following whist giving evidence at a Parlimentary Committee looking into the Victorian Fire Services (MFB and CFA) "…the Victorian fire services are looked at across the nation as the worst fire services in Australia" (Hunt 2017).

In the current environment and in light of the UFU's capacity to veto management decisions it is not possible to envisage creative change being achieved. Public safety is too important to be left in the hands of a militant public-sector union. The Government of the day has an obligation to provide broad policy to be implemented by the independent Boards it appoints to manage the organizations in the interests of the community, and not based on vested interests.

It is not possible for Management to address these issues if the UFU exercises its right of veto.

8.8. THEMES

Data analysis involved pattern matching, explanation building and time series analysis to identify trends and commonalities across the cases.

During the data analysis phase of the case studies a number of themes began to immerge from the case studies and are in the following key areas: Staffing and

Industrial Influence. The findings come from information collected from the case studies and additional research into related topics. Where appropriate the emerging themes from the research will be linked to wider issues in the non-emergency service workplaces identified in the literature review. It is intended in this Chapter to explore the identified themes and directly address the findings related to the research questions.

There were a number of themes that were common to all case studies, these include:

- Challenges meeting response time targets
- Providing the highest level of EMS (ALS) in the shortest time
- Significant disparity between number of fire calls to EMS calls
- Inappropriate demands for high level EMS resources
- Proactive measures being taken to reduce the number of Priority One calls (sirens and lights)
- Stress levels of EMS providers including suicide
- Industrial issues
- Women in the workforce

These issues are addressed in the following sections

8.8.1. Staffing

Staff covers a wide range of issues. Some organisations are in the growth phase, others are contracting and some are merging. As manpower costs in a fire service can be as high as 85-90% of the budget any attempts to improve efficiency and effectiveness will have impacts on the workforce and staffing arrangements. As has been stated in Chapter Three regarding Performance Management there is enormous pressure on the public sector to improve performance. The literature (Arnaboldi, Lapsley & Steccolini 2015) also stated that progress in the broader public sector has been slow or no existent (Micheli et al. 2012).

In 2013 a major review of the UK Fire Service (Knight 2013) was undertaken. A number of issues relating to staffing and workload were raised, these included a reduction in fire deaths of 40% over a period of ten years, total attendance time at fires down 48%, minor outdoor fires down 44%, road collisions down 24% over a period of 10 years and in some services false alarms reduced 40% with no reduction in staffing. Figures produced in 1991 showed that in that year 29% of fires required no action by the brigade and 90% of fires extinguished by the brigades were put out with one hose reel.

In 2001-2 an average firefighter attended 80 fires a year, by 2011-12 it was down to 43 fires. All of these statistics demonstrate there has been a dramatic reduction in the demands on firefighters and that proactive work produces better outcomes for the community. The current rigid staffing models make it very difficult to produce such outcomes. The rigid staffing model and resistance to change has brought the management and union into conflict. Who has the power and influence (as discussed by (Dubrin, Dalglish & Miller 2006; Pfeffer 1981) to prevail in this clash of wills? The community needs to decide if a fire service is going to be reactive or proactive. With the UK review showing that 48% of deaths by fire occur before the fire service is even notified and most fire service legislation requiring fire services to protect life from fire the answer is that there is a need to do both.

The UK review identified that a large percentage of firefighters have second jobs and came to the conclusion fire services could use that time to supplement manning without incurring the costs of further recruitment, training and retention. He made the point that workplace change should not be restricted because of the practice of second jobs.

The UK Fire service is undergoing a period of contraction brought about by government mandated budget cuts. The staffing figures from Greater Manchester Fire and Rescue Service (GMFRS) demonstrate the challenges; from 1,915 in 2009-2010 to 1503 in 2015. There has also been a reduction of 10 fire appliances over this time frame. Future budget projections show the loss of a further 285 firefighters by 2020.

Fire services can choose to be proactive or reactive. GMFRS opted for the former and have reduced the number of fires by 42% over 6 years. They are carrying out home inspections which provide a much wider range of community benefits than just fire prevention such as fall prevention in the elderly which results in significant financial and other benefits to the community.

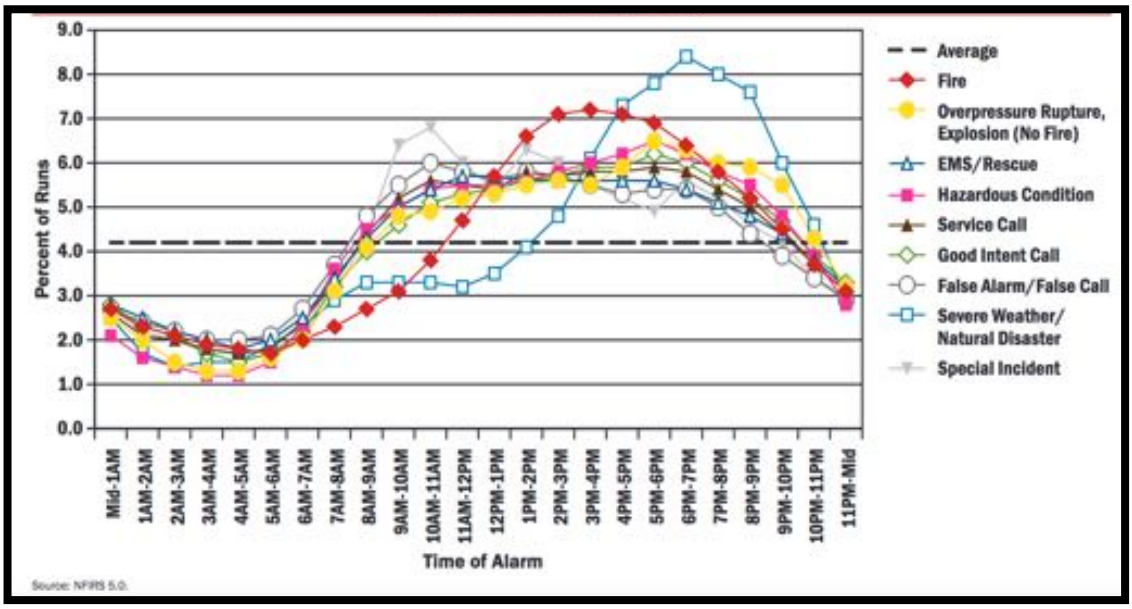
On-duty firefighters are carrying out a proactive program of inspection and enforcement in non-residential properties that has resulted in a 28% reduction in fires (2010-2015) with substantial financial savings.

There has been significant multi skilling and multi-tasking of the workforce including co responding to medical emergencies. Other areas include community safety and crime prevention in cooperation with other agencies. A key issue is being able to

increase manning levels when required (Monday to Friday during the day) and to reduce manning levels during periods of low demand (late night and early morning)

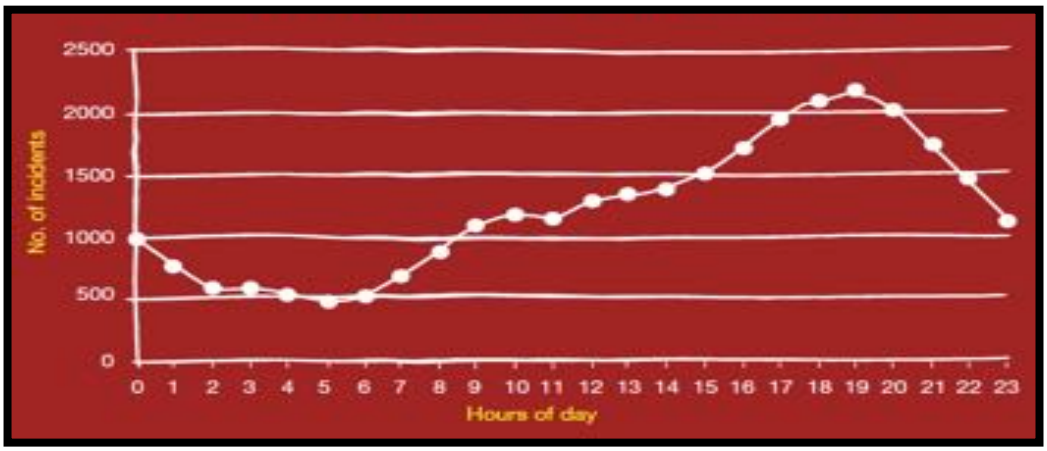
It is interesting to compare the two demand models from the UK and USA and note the similarities. The run data shows that there are peak times for incidents and it is possible to alter the manning accordingly. The risk profile also changes depending on the time of day and season (Winter, Summer). There is a significant risk difference in a fully sprinklered high-rise office block during the day when it is fully occupied compared to the early hours of the morning.

Figure 126 Fire department overall runs by time of day and major incident type category (Percent or runs, 2014)



Source: https://www.usfa.fema.gov/downloads/pdf/statistics/v17i8.pdf

Figure 127 GMFRS Incidents by hour of day (2014/15)



Source: Greater Manchester Fire and Rescue Service 2015)

By comparison to their Australian counterparts the US Fire Service demonstrates a significant difference in productivity, in the main because of multi skilling as Fire-fighter/Paramedics or EMT's and responding to a broader range of EMS calls in the US Model (MFB 1850 Fire-fighters, 41,474 calls: Miami Dade 2,000 fire-fighters 246,408 calls; MFB, 2013-2014; Miami-Dade County, 2015).

The MFB in Melbourne is also facing a reduction in the number and size of fires and the KPMG Report (1997) showing they are attending emergencies less than 5% of

the time. Since that report was produced the MFB is now responding to EMR calls (4,803 in 2013-14). There is no current data showing time spent at emergencies but this information can be produced quickly if requested by appropriate authorities. The incoming Labor Government in Victoria has promised 100 additional MFB firefighters from 2015-2019. There has been no business case for the additional staff (Victorian Labor, 2014).

8.8.1.1. *One of the most popular jobs in Australia*

In some industries there are difficulties in getting suitable applicants for employment at a given time; this is certainly not the case for the fire service. Firefighting is one of the most popular jobs in Australia. In NSW the NSW Fire Brigade receives between 7,000 to 10,000 applications for 120 positions each year. The strength of response to job advertisements is replicated in other fire services around Australia. Some people have tried for as long as 17 years to get a position as a firefighter. On average, a firefighter's annual salary is $80,912 not including overtime or other allowances (Burgess 2015). Should there be a need to employ a significant number of new firefighters there would appear to be many willing applicants.

8.8.1.2. *Use of volunteers*

It is interesting to see the use of volunteers by a number of organisations investigated. Fairfax County Fire Department uses volunteers to work within the firefighting force. The volunteers perform any task for which they are qualified such as firefighter or officer and that may include a volunteer officer taking charge of paid firefighting staff (They recognize the qualification not the pay status).

LA County Fire Department are involved with training the Federal Emergency Management Agency (FEMA)-approved Community Emergency Response Teams (CERT) which involves the creation of neighbourhood self-help teams to respond to disasters as neighbours assisting neighbours until the emergency services arrive. Emergency personnel including firefighters and EMS personnel teach the program. The training involves basic disaster response skills, fire safety, light search and rescue, team organisation and disaster medical operations. The types of disasters may include but not limited to fire, flood, or earthquake. The CERT Teams do not work for LACoFD but under the control of the Emergency Operations Centre that will include a Fire Department Liaison officer. LACoFD also has an Explorer program for engaging youth.

In the UK there is only two fully volunteer fire Brigades: Peterborough in England and Borth in Wales (Cambridgeshire Fire and Rescue Service 2017; Mid and West Wales Fire and Rescue Service 2017). All other brigades are either fully manned or manned and supplemented by part paid staff (some of whom may work full time for other fire authorities) Volunteers in the UK are used by Fire Brigades for a broad range of support but not fire-fighting tasks. In GMFRS volunteers have provided 140,000 hours of service, the programs in the main involve community-based programs aimed at youth with a goal of encouraging skills acquisition and reducing anti-social behaviour, prevent radicalization and potentially lead to employment.

Ambulance Victoria use volunteers in areas of low caseload and no ambulance station to provide advanced first aid in their communities until the ambulance arrives. These are called Community Emergency Response Teams (CERT's), the same terminology as FEMA in the USA (Ambulance Victoria 2017d). The Metropolitan Fire Brigade does not utilize volunteers.

The use of volunteers provides a multiplier effect to the workforce and its impact on the community and should be considered by agencies that do not currently use volunteers.

8.8.1.3. *Suicide*

Suicide is an issue for all emergency services where ever they exist around the world. A number of the Case Studies had widely published major suicide events which resulted in changes and strengthening support programs (Cotton 2016, p. 4; Garcia 2016; Jouvenal 2016).

As has been shown in the MFB Case Study suicide can have a devastating effect on an organisation and its workforce. Three suicides within a three-month period shook the organisation to its core (Metropolitan Fire And Emergency Services Board, 2016).

A potential indicator of stress in the workforce is suicide (Erich 2014). A recent Victorian Coroners Prevention Unit report provided details of suicide by occupations. The rate across all Victorians was 10.9 per 100,000. For Police and Fire and other emergency services the figures were 10 and 10.5 respectively.[3] Whilst suicide from any emergency service is a tragedy, the figures show Police and Fire (and other emergency

[3]

services) are at less risk than the state average help to place it in perspective. However, the figure for Victorian paramedics is 35.6 per 100,000, more than 3.5 times higher than Police and Fire. Whilst the report does not directly indicate a linkage between occupation and suicide it raises the possibility of occupation being a factor (Coroners Court of Victoria 2015).

Figure 128 Suicide Rates

Target occupation	Victorians employed in occupation, 2011 Census	Frequency of suicides in occupation, 2008-2014	Average annual rate / 100,000
Accountant	37,685	14	5.3
Chef	58,467	28	6.8
Engineer	19,060	28	21.0
Fire or emergency worker	2730	2	10.5
Hairdresser	12,727	10	11.2
Lawyer	14,264	9	9.0
Medical practitioner	17,320	13	10.7
Nurse	67,909	46	9.7
Paramedic	3208	8	35.6
Police officer	11,385	8	10.0
Real estate agent	13,903	13	13.4
Security guard	9490	23	34.6
Truck driver	32,548	53	23.3
Veterinarian	1869	5	38.2

Source: Coroners Court of Victoria 2015)

All emergency services in Victoria have extensive support networks and programs to assist staff with mental/stress challenges. Since the publication of the Coroner's Report there was a cluster of three MFB firefighters committing suicide in a three-month period (2015-16). These figures would alter the findings. The father of one of the suicide victims is suing the Metropolitan Fire Brigade saying his death could have been prevented (Deery 2017).

In the US it is difficult to obtain accurate statistics regarding firefighter suicide. A recent article in Fire Chief Magazine stated that the National average for suicide in the broader community was 13 per 100,000 whilst the suicide rate for Police and Firefighters was 34.1 per 100,000 (these figures came from the CDC (Centre for Disease Control) and combine fire and police under the heading of protective services). It is difficult to draw strong conclusions from the statistics as it does not separate fire from police and the statistics are not clear as to whether it includes volunteers and career. Separate research has shown that volunteer firefighters are twice as likely to

have members come up with a suicide plan or attempted suicide when compared to career firefighters (Fire Chief Magazine 2016). Most Firefighters in the US are cross trained and also providers of EMS; it is interesting to compare the figure of 34.1 (for US Police and Fire) to 35.6 for Victorian Paramedics.

Many of the Case Study Fire Departments who have had experience with suicide of members of their staff have Welfare Departments to look after the mental wellbeing of staff. The level of support may explain the difference in the rates of suicide between career and volunteer firefighters. Following a number of publicised suicide events the fire service agencies are now aggressively tackling the suicide problem with additional resources and targeted programs. One study showed that the number of deaths by suicide is three times the number of Line of Duty Deaths (LODD) in the US (Antonellis 2012).

The issue of supporting staff and preventing suicide is a major issue; particularly for those personnel providing EMS in both fire and ambulance. Allowing free movement between fire and ambulance Melbourne has the potential to reduce stress and possibly suicide within both agencies.

8.8.1.4. *Size/skills of crews*

A number of trends relating to the size of EMS crews came from the case studies. Miami Dade Fire and Rescue respond a minimum of a Paramedic Officer, Paramedic Firefighter and two EMTs on 48 suppression units. They also have 54 ALS Transport Units staffed with a Paramedic Officer and two Firefighter Paramedics. All new recruits must have EMT qualifications or higher. All promotions to higher rank require a paramedic qualification.

Fairfax County Fire and Rescue Department have a minimum of a EMT Supervisor and Firefighter/Paramedic on all suppression units and all medical units have a Firefighter/Paramedic and Firefighter/EMT as a minimum.

In Mesa Fire and Medical Department all staff are either Paramedics or EMT's. New recruits must have either of these qualifications prior to joining. All Engines have a minimum crew of two Paramedics and two EMT's.

8.8.2. Optimum manning levels for EMS calls

Figure 129 A Firefighter / EMS crew of four attending to a patient

Source: Moore-Merrell et al. (2010)

A major research project was undertaken in 2010 to identify optimum numbers and skills required for major trauma and cardiac incidents. Participants included National Institute of Standards and Technology (NIST), the International Association of Fire Chiefs (IAFC), the International Association of Firefighters (IAFF), the Worcester Polytechnic Institute (WPI), the University of North Carolina, School of Medicine (UNC) and others.

The research focused on a number of tasks that needed to be performed using a number of different manning configurations. The results showed that the best outcomes were achieved with a four-person crew that included an ALS Paramedic on the responding fire truck. They performed better than two person ALS crews. Not only did the larger crews perform the required tasks in a shorter period of time; they were also considered safer as they were able to carry the patient with reduced risk of injury to the patient and responders (Moore-Merrell et al. 2010).

The USA and Canadian systems which have cross trained firefighter/EMT/paramedics have the capability of responding a much larger number of qualified paramedics and EMT's in a short time when compared to Ambulance Victoria. The surge capacity is very important in the event of terrorist events or other large-scale multi casualty incidents. Nearly all EMS calls attended by US and Canadian fire have elements of ALS.

8.8.2.1. *Women in the fire/ambulance service*

Why is the issue of women in the emergency services an issue? Why should there be diversity in the workforce? A comment on the website of the Department of Prime Minister and Cabinet states that women's participation in the workforce is a economic and social imperative and essential for economic growth and Australia's future (Department of the Prime Minister and Cabinet 2017).

An article published in 2014 makes the case that diversity produces better outcomes in both the workplace and society. It makes the point that research has shown that socially diverse groups are more innovative than homogeneous groups (such as male dominated fire services) Also that diverse groups are better at solving complex, non-routine problems. These outcomes are not just because of different backgrounds bringing new information but because interactions with people who are different results in better preparation, anticipation of alternate viewpoints and an understanding that consensus takes effort (Phillips 2014). Diversity is not easy to achieve and comes with its own challenges. The benefits in terms of social cohesion, innovation, creativity, better decision making and problem solving and are worth the effort. These statements are not just wishful thinking but come from decades of research from psychologists, scientists, sociologists, economists, and demographers (Phillips 2014).

A recent journal article from The Center For Firefighter Injury Research and Safety Trends (FIRST) at Drexel University shows that women firefighters can make a unique contribution to safety. Men are socialised around risk taking whilst women are socialised to be risk adverse. Women are more likely to ask for help in performance of a task rather than risk injury. Women are more likely to try diverse ergonomic techniques to perform a physical task. Unfortunately there is strong resistance to acceptance and change from their male counterparts (Drexel University 2017).

The issue of females in the fire and emergency services has been around for a long time. The first female joined the New York Fire Department in 1982 yet today there are only 54 female firefighters out of a workforce of 11,051 uniformed fire-fighters. Why so few female firefighters?

The culture of an organisation is a very powerful force and can encourage or stifle change as indicated in Chapter Three by (Hoogervorst, Flier & Koopman 2004; Pfeffer 1981; Dubrin, Dalglish & Miller 2006). The culture within a fire service or even

a single station can have significant impact on the acceptance or otherwise relating to diversity.

8.8.2.2. *Women in the Metropolitan Fire Brigade, Melbourne*

Figure 130 MFB Women Fighters

Source: MFB Annual Report 2015-16 (p. 25)

The Metropolitan Fire Brigade currently has a female workforce of 3-4% uniformed firefighters. It is looking proactively to recruit more women to deal with this lack of representation. Interestingly the United Firefighters Union (UFU) created a dispute in the Fair Work Commission, as they were not consulted on the proposed recruitment policy. The Union is trying to get the recruitment process included in an industrial agreement, although one can question why this is a role for the Union. There was considerable push back on this union response by the employer and the Minister, Jane Garrett, who later resigned from her position.

8.8.2.2.1. Women in the Ambulance Services

The current rate of female employees in ambulance services Australia-wide is 21.5% full- and 6.1% part-time (compared to male employees' part-time rate, which is 2.9%). These figures seem to support the hypothesis that part-time work makes emergency service work more accessible to females (Open Universities Australia 2016).

Information identified in the Ambulance Victoria Case Study shows that 47% of the workforce is female, dramatically higher than the figures for Australia wide (Choahan 2017). Attempts were made to identify the female employees by age group

but were not available for Ambulance Victoria. National statistics were discovered which show interesting demographics in the Ambulance Service. There are a significant number of female paramedics in the younger age groups, going as high as 53% in the age group 20-29 (Paramedics Australasia 2012). Given the numbers of females in Ambulance Victoria it would be anticipated the figures for this age group in their workforce would be much higher. It shows a huge disparity between the numbers of females in the ambulance service compared to the fire service (3-4%).

8.8.2.2.2. Women in New York City Fire Department

Figure 131 Women in New York City Fire Department

Source: Greene (2016, http://www.nydailynews.com/new-york/female-firefighters-set-join-ranks-fdny-article-1.2854389)

New York Fire Department has a long history of the organisational culture resisting females in the fire-fighting ranks. Akabas (2010) speaks of the court interventions, the shunning of the females recruits and incidents such as the silent treatment, pulling back the privacy curtains on the shower and toilet and even defecating in a female firefighter's boots (Akabas 2010). A more recent article from 2013 produced by the American Civil Liberties Union (ACLU) discussed the barriers to selection, harassment, threats and appalling treatment of women in the NYFD workforce. Women were discouraged from applying and if they got in encouraged to resign. They were given no support from their supervisors (Lewis 2013).

A further article by the New York Post indicates that 70% 0f the women employed by NYFD have retired on disability pensions; this compares to 63% of males. Questions have been raised regarding the higher percentage of women and whether they are more susceptible to injury, but the very small number of females involved means that a small increase in female recipients can easily distort the percentages. The numbers for both men and women leaving on disability are disturbing and warrant closer scrutiny. Payments under the pension plan have reached US$1.1 Billion, just under the active duty budget of US$1.2 Billion (Edelman 2015).

An article published in December 2016 indicated that 5 women would graduate as firefighters in a class of nearly 300 fire-fighter recruits for Fire Department New York (FDNY). The five females were the largest group of females to graduate at FDNY since 1982. Their graduation brings the total number of female firefighters in FDNY to 58, which represents less than 0.05 % of the workforce (Greene 2016).

8.8.2.2.3. Women in the Phoenix fire department

Figure 132 Fire Chief Kara Kalkbrenner, Chief of Department, Phoenix Fire Department

Source: City of Phoenix (2016a)

An interesting comparison is the Phoenix Fire Department. The figure of 5% females may not seem high but what is impressive is the number of females occupying senior ranks, up to and including Chief of Department. The department reports on both gender and ethnicity of its workforce on an annual basis (Phoenix Fire Department 2016).

Around the world emergency service organisations are trying to increase the numbers of women in the workforce; some willingly others as a result of court orders. Some such as Ambulance Victoria are doing an excellent job and others such as New

York Fire Department and Metropolitan Fire Brigade struggle. The recent report on mental health issues in the MFB encourages diversity as a means of improving the mental health across the organisation (Metropolitan Fire and Emergency Services Board, 2016).

Fire Chiefs such as Kara Kalkbrenner, Phoenix Fire Department provide positive role models for other women who aspire to join and make the fire service a career. There are also supportive organisations which connect female firefighters in Australia and around the world (International Association of Women in Fire and Emergency Services 2017; Women and Firefighting Australasia (WAFA) 2017).

Existing senior managers must also play their role in encouraging females (and other minorities) to join and make the fire service a career. They must provide and if necessary enforce a safe and supportive environment as organisations move closer to resembling the communities they protect.

8.8.2.3. *Summary of Staffing issues*

With manpower making up by far the largest proportion of the budget of fire services there is a need to ensure the community is getting value for money. In the UK the proactive programs were aimed at reducing both the number and severity of fires. In doing so they have significantly reduced the death and injuries and property loss caused by fire. Their proactive work with other agencies are also producing significant broader benefits for the community (falls reduction, engagement of youth).

Such programs dramatically improve productivity and return on the community resources provided to the fire service.

In the USA and Canada the fire services that also provide EMS with cross trained firefighter/paramedics are dealing with a much higher workloads than those services that do not. It is interesting to see the fire services use the same proactive techniques used successfully in fire prevention and fire reduction to minimise the impact of the growing number of EMS calls.

The dramatic reduction of fires both in number and intensity is creating opportunities to enable use of manpower in different ways as shown by the UK experience. In the Metropolitan Fire Brigade these issues have not been addressed.

There is also a demonstrated lack of diversity in many fire services that needs to be addressed. If the MFB were to look at employing qualified paramedics out of the

pool of graduates who are not currently employed by Ambulance Victoria they would be able to achieve more diversity as there are many female graduates, the new recruits bring a higher level of EMS to the organisation and it may provide a possible pathway to Ambulance Victoria in the future.

8.8.3. Industrial Influence

In the earlier chapters of this dissertation the theory of Power and Influence has been discussed by Pfeffer (1992), Dubrin (2006), Harrell (2016) and others and the concepts can be seen in action within the fire service. There are both cooperative and combative models. An example of the cooperative model is the joint development of the Phoenix Fire Department Strategic Plan by the Department and the Firefighters Union. The first was developed in 2007 and resulted in a number of changes and resulted in reduced response times. The most recent is the 2016-17 to 2017-8 Strategic Plan, again produced in partnership with the firefighters' union developed in a cooperative manner between management and labour. Both parties acknowledge that change is difficult but necessary (Antonellis 2012; Phoenix Fire Department). The Phoenix experience has been included in a textbook on labour relations in the fire service as a positive example.

An example of conflict is the tension between Greater Manchester Fire and Rescue and the Fire Brigades Union (FBU) that resulted in the sacking of all staff and allowing them to reapply for their jobs.

8.8.3.1. *Union Influence on Public Policy: The UFU/CFA dispute*

In Chapter 3 the researcher dealt with the broad concepts of union power and influence in the public sector. The following is an example that uses one of the case studies to demonstrates the activities and results of public sector union power in one industry in the state of Victoria. The example is the United Firefighters Union (UFU) engagement in the recent Victorian election, which was won by Daniel Andrews' Labor government. The purpose of outlining the UFU/CFA dispute in this research is to highlight the power of public sector unions to influence public policy. It is not intended to provide a detailed analysis of the dispute, although it would make a fascinating topic for future in depth research. Whilst the dispute involves the CFA the outcome will have direct impact on the MFB (one of the case studies). The following narrative outlines some of the key issues in the dispute; a more substantive chronology of events can be viewed in Appendix.

Prior to the election the UFU claimed to have had firefighters door-knocking in strategic seats for 23 days, with 40,000 one-on-one conversations with the public, and to have provided 700 firefighters to stand outside 107 polling booths in nine marginal electorates asking the voters to put the incumbent government (the conservative Liberals) last. The UFU Secretary Peter Marshall claimed: "Internal polling conservatively estimated a 4.5% swing in seats where there was a firefighter presence- and up to 7% in some marginal seats". He further claimed that "firefighters and ambulance officers had been credited by commentators across the political spectrum with the success and unexpected extent of the swing to Labor" (United Firefighters Union of Australia 2015; Ainsworth 2015).

In February 2015 UFU made a log of claims to the Country Fire Authority (CFA), with a similar claim expected to be made to the Metropolitan Fire Brigade (MFB); there are accusations by the Opposition that the claim is payback for the electoral support provided to the Government (Campbell 2015). The 390-page log of claims included a 9.7% pay rise a year for the next three years, a full day's pay for any firefighter working 20 minutes overtime, and the creation of Consultative Committees. These committees would effectively give the Union the right of veto over CFA management decisions; any changes to the operations, policies and procedures of the CFA would require Union approval.

The proposed "Consultative Committees" and the right of veto would prevent the CFA from managing their organization. Currently the UFU has a system of "Consultative Committees" already in place with the MFB, which effectively gives the Union the right to veto management decisions (Campbell 2015; Victorian Auditor General 2013).

The Premier and the Emergency Services Minister Jane Garrett have labelled the UFU pay and conditions demands as outrageous and expensive. The Andrews Government was resisting the UFU's claims and it asked the Fairwork Commission to intervene on what they say are unrealistic demands by the union, as the 30% pay rise over three years and 45 new allowances would cost tens of millions of dollars.

For these reasons, the Union is accusing them of betrayal. Peter Marshall, UFU Secretary, was quoted as saying "I guarantee you that Daniel [Andrews, Victorian State Premier] and Jane [Garrett, Minister for Emergency Services] will regret the day that they betrayed firefighters" (Edwards 2015, p. 1). The relationship between the UFU and

the government has soured since the November 2014 state election, with the UFU accusing the government of failing to meet election promises (Edwards 2015).

It has been reported that in 2015 Peter Marshall made axe threats to Ms Garrett, Minister for Emergency Services at a Board Room meeting in front of people who included a senior member of the Premier's staff.

One witness claimed: "He blew up and said words to the effect of: 'Tell the Premier there's 3000 firefighters all with axes coming to bury them in his head, and same goes for Garrett'" (Campbell & Johnston 2016). Minister Garrett was not present at the meeting and Peter Marshall denies he made the comments (Campbell & Johnston 2016).

In mid-April Marshall had a private meeting with the Premier, bypassing the Emergency Services Minister, the Premiers Office insists no deal has been done with the UFU (Willingham 2016b). In June 2016 the Government and Premier changed their position and supported the UFU claims and sacked the CFA Board (Livingston 2016). The then Emergency Services Minister, Jane Garrett resigned from Cabinet saying she was unable to support the Governments support for the Union (Livingston 2016). Her resignation was soon followed by the resignation of the CEO of the CFA (Willingham & Grey 2016).

On 17 June the Government appointed a new CFA Board and CEO on 30 June the Chief Fire officer of the CFA also resigned. Also on the 30 June the Chief Fire officer of the Metropolitan Fire Brigade sent a letter to the Minister indicating the continued right of veto provided to the UFU was putting the community at risk (ABC News 2016; Full copy of the letter is available(Rau P Chief Fire Officer 2016). Minister Merlino, Minister for Emergency Services responded by calling Rau alarmist, irresponsible and reckless over his expressed concerns for public safety.

On 23 September Chief Fire Officer Rau resigned from the MFB due to ill health. The Minister stated that the resignation had nothing to do with the current dispute (ABC News 2016). Three days later CFO Rau's wife went public indicating his ill health had been exacerbated by stress caused by bullying from UFU (Minear & White 2016). On the 10th October 2016 Deputy Chief Fire Officer (DCFO) David Yousef resigned. There are claims UFU members would bark like a dog to DCFO Yousef whilst on duty as the Union considered him a 'dog' (a traitor) for putting the case against the Union in the Fairwork Commission. Neither the Chief's nor Deputy

position in MFB have been filled (Wallace 2016). On the 13th October 2016 two senior members of MFB reported as being on indefinite sick leave. Two senior MFB corporate directors have also resigned (Minear 2016a).

Even more disturbing are recent allegations raised by a group of now non-serving MFB senior officers of threats and bullying including receipt of a bullet mailed to a home address and a refusal to obey orders from a senior officer on the fire ground. The group are currently suing the MFB for not protecting them from systematic bullying and threats from Union members (Herald Sun 2017a).

16 December 2016: The release of a report on the Mental Health Review of MFB firefighters was to take place (Metropolitan Fire and Emergency Services Board, 2016). The UFU tries to prevent publication of the report in the Fairwork Commission. The author of the report, Dr Cotton, said it was "disgraceful" and "gobsmacking" that the UFU was trying to block the release of the report. The Herald Sun published the report in full in the newspaper despite the Union actions to try and prevent publication.

The report raised significant issues such as: suicide, alcohol and drug abuse and the need for testing, bullying, sleep deprivation as a result of second jobs, lack of diversity, a "monoculture", lack of flexibility in rosters, and that whilst the current support systems are best practice they are under-resourced (it was reported that the MFB has hired a new psychologist and peer support co-ordinator; Minear 2016c).

Comments from the report attributed to Operational Staff include: "You basically learn in induction that you can never be sacked, no matter what happens" and "No matter what you do, you always know the Union will back you up" (Cotton 2016, p. 40).

Victoria Police and Ambulance Victoria have undertaken similar reviews into mental health within organisations with general agreement by management and unions to implement all recommendations. The MFB will consult with the UFU on the recommendations using the consultative committee process that gives the UFU the right of veto.

On the 24th January 2017 Peter Marshall, Secretary of the UFU writes to government MPs telling them he wants to meet with them individually to ensure they support union firefighters. The meetings are to "gain support and to ensure that all commitments and agreements are honoured." in relation to the Enterprise Bargaining Agreements (EBA's) between the UFU, MFB and CFA.

Following publication of Annual Reports for 2016-2017 from the MFB and CFA, it has been revealed the extra $102 million in wages has been paid to Victoria's Fire Services. The pay rises were awarded by the Andrews Government because the bitter pay/industrial disputes regarding EBA's remain unresolved. There appears to be no trade-offs or improvements in productivity involved (Alison & Johnston 2017b).

All of the above demonstrate the power and influence of a public-sector union and its capacity to influence government policy in its own interest to the possible detriment of the community interest. The dispute with the MFB has been going for over three years. During this time the Union has been taking protected industrial action. The MFB did apply to the Fairwork Commission to bring the bargaining period to an end, but the Commission ruled in favour of the UFU and allowed the dispute to continue as it does to date.

It has been reported that Labor politicians, including members within Andrew's own Cabinet are openly questioning what Peter Marshal, Secretary of the UFU may have over the Premier and why he is burning so much political capital on this issue (Herald Sun 2017b). All parties involved deny any deals were done.

All we can do is look at the outcomes and form our own opinions as will the electorate at the next State Election to be held in 2018.

CHAPTER 9: CONCLUSIONS

9.1. INTRODUCTION

Responding to medical emergencies in a timely manner is an issue for all developed countries. A number of different service delivery models have evolved and are facing similar problems of growing demand and a need to provide services in a cost-effective manner. The research addressed the knowledge gap by comparing systems, response times and other associated issues between services and countries.

The final chapter will now shift the focus back to Chapter 1 and summarize how the research questions were addressed and how the objectives of the research were achieved. It will be followed by a review of the practical and theoretical contribution and discussion of the future research implications.

9.2. REVISITING THE RESEARCH AIMS

This thesis was motivated by a problem of ambulances in Victoria failing to meet their response times and growing community angst regarding the issue. The research was to make comparisons of different delivery models, response times and associated issues (as posed by the research questions)

To address the knowledge gap this thesis used a multi method, multiple case studies approach with an aim of identifying the model that provided the best outcome for the patient. The response times for EMS delivered by the Fire Service in both the US and Canada are less than those provided by Ambulance Victoria. In most cases it is by a significant margin. The shortest response time of the Departments studied was Mesa Fire and Medical Department, who were achieving 90% of calls within 7.43 minutes (compared to Ambulance Victoria achieving 80.6% against a target of 90% by 15 minutes).

However, **i**t is important to note that during the research it was noted that many US Fire Departments do not report on their performance for the total time response. In New York City Government they referred to the total time response as “end to end”. The term means the clock starts at the time of first call and finishes at time of arrival on scene. The main reason for not including the call handling in the measure by some departments is that an independent third party may provide the call handling service and

the fire department has no control over the process. The Victorian Auditor General raised this very issue in his latest report on emergency service response times. Whilst it is understandable that the fire service does not want to be accountable for matters beyond its control, it is vitally important in terms of patient outcomes that this information is included in response time statistics. Without this information accurate benchmarking of systems is not possible.

Given the current research proves that the fastest response time is provided by the fire service, and that the fire service in Melbourne has significant unused capacity, it is appropriate to explore further opportunities to use this underutilized resource for the timely delivery of EMS in the interests of the community.

The performance measure that relates to survival rates for cardiac arrest has been demonstrated to not be an appropriate measure for EMS staff performance. The issue needs to be revisited by the Australian Productivity Commission and replaced with more meaningful KPI's for the actual EMS intervention.

The issue of measuring the patient outcomes as a result of the intervention of EMS staff has not been broadly addressed by the industry. Some agencies are collecting data at time of arrival and additional data at time of handover of the patient at a hospital emergency room to try and measure the results of the inputs of EMS personnel. Unfortunately such actions are not wide spread and are not consistent across agencies. Also, there is a need to collect such information automatically to ensure it is timely and correct. The Compass project currently underway to produce a consensus on key performance indicators may be the best way forward.

The skill requirements for the three main levels identified in Australia and the US are similar but the training requirements are very different. The US system produces similar qualifications in a shorter timeframe. There is no pressure to change either system.

There is indeed a revolution going on in the delivery of EMS services. The technology is advancing with new technology being deployed into the field. There are also new drugs and procedures being used. A very interesting aspect is the proactive approach being taken by some progressive agencies to reduce the demand for high-level EMS services. It is an area that will continue to grow.

The dramatic reduction of demand for firefighting and the impressive results for community safety of proactive work done by firefighters indicate that the status quo for

most fire services is not an option. The current rigid models no longer satisfy community needs and will change. The researcher was taken by the comments of the Phoenix Fire Department and the firefighters union that both parties acknowledge that change is difficult but necessary (Antonellis 2012; Phoenix Fire Department).

The low productivity in the Metropolitan Fire Brigade must be addressed to ensure the community gets a cost effective and efficient service. A way of improving the value to the community is to become proactive regarding fire prevention utilizing on shift resources and increasing the EMS role. In the current industrial/political environment it will not be easy.

9.3. THEORETICAL AND PRACTICAL CONTRIBUTIONS OF THE RESEARCH

The Victorian community has a problem with the delivery of EMS services. History has shown that the response times of Victoria Ambulance are not meeting response targets and that the targets used do not align with the international EMS community. The problem has been documented by the Auditor General and discussed at length in the Parliament and in the media. All recognize that there is a problem.

The Auditor General (Victoria) in his report on Emergency Service Response Times (Victorian Auditor General 2015) requested both MFB and Ambulance Victoria justify their current response times. A request was made by the researcher to the Auditor General for a copy of Ambulance Victoria's response. That request was denied so the researcher reapplied under the Freedom of Information Act. The Auditor General's Office used its powers to again deny access to the information requested.

The issue concerns the community as a whole, and not only should a significant portion of existing community resources be directed to solving the problem, but also the government should look further than the single ministry and take a holistic approach. So far, the government's solution has been to see the problem as existing in a silo that can only be fixed by the ambulance service. When the current Labor Government was elected, they gave Ambulance Victoria and additional $100 million in funding. It is not clear on what basis the funding was made available, but $77 million was spent on pay rises. More recently the government provided a further $60 million to help reduce response times. To date the response times have dropped by 5 seconds.

An update: In its latest Annual Report (2016-2017) released on 19 October 2017 Ambulance Victoria reports that for communities greater than 7,500 people it is achieving 83.7% against a target of 90% in 15 minutes. Whilst this is an improvement over earlier figures they are still failing to meet their targets (Ambulance Victoria 2017a).

The cost of running Ambulance Victoria has soared since the Andrews Labor Government did what was seen by some as a controversial pay deal for the paramedics. The cost of an ambulance call-out has risen 23% between 2012-13 and 2015-16, and the wage bill jumped $77 million in 2015-16 (Gordon 2016a). Since coming to power the Andrews Government has provided or promised nearly $750 million in additional funding for Ambulance Victoria.

What existing resources can be used to help solve the problem? The fire service currently has major productivity problems: the amount of time spent at emergencies represents less than 5% of the available time. A possible cost-effective solution to the problems of trying to achieve response time targets for EMS would be to have a paramedic on each fire truck, and these to be responded to a wider range of time critical medical emergencies. Over time, staff could be cross-trained to end up with a multi-skilled workforce of Firefighter/Paramedics. At the same time it would dramatically increase the numbers of females employed by the Fire Brigade.

There are also potential contributions to the mental health of both firefighters and paramedics. The wider range of calls would see firefighters responding to calls that show the positive side of EMS on more occasions. Also having a paramedic as part of the crew would instil confidence and improve skills. The paramedic on the fire truck would benefit from not operating in such a high-pressure environment as serving on an ambulance. It would help prevent burnout and reduce attrition rates for Ambulance Victoria staff.

The benefits in terms of financial savings, mental health for providers and improved patient outcomes cannot be ignored.

9.4. LIMITATIONS OF THE STUDY

There are a number of limitations to the study. These include the sample size, although the inclusion of the findings of other broader research demonstrates the nature of response times in Australia, UK, USA and Canada. In Australia each agency

provides details of response times in their annual reports (as shown by the list of Ambulance response times in Chapter One and the Chart sourced from the Australian Productivity Commission (Australian Productivity Commission 2017b). The US has excellent fire related statistics including EMS produced by NFPA (NFPA 2017) and the US Fire Administration. Interestingly neither reports response times. There are over 27,000 fire departments in the US and most provide details of their response times on their websites. There does not appear to be a central location for recording this data. It represents the fragmented nature of the US system. The UK provides response time for each Fire Service (Home Office 2017) and Ambulance Trust (The Comptroller and Auditor General 2017) service and also provides national statistics. Canada produces an excellent Performance Measures Report which collects 156 measures, representing 36 municipal services including Fire and EMS across 15 Municipalities (Municipal Benchmarking Network Canada 2015).

A further limitation to the study is that the researcher does not come from a medical background. He makes no claims to be an expert in any medical field. A challenge was to be able to compare the requirements and skills of EMS providers in different countries. In speaking to colleagues in the US, there seems to be much variation in the study and the time taken to achieve competence. One method was to compare tasks that could be undertaken, and those that are excluded. Ultimately, the time taken to graduate in Victoria (three years full-time) is significantly more than the timeframes for comparable qualifications in the US.

A problem with the data collection was the secrecy around much of the information, with some notable exceptions. In the main it was difficult to obtain information not in the public domain. Given the scale, timeframe and limited KPIs identified, the information is sufficient to confidently conclude that the fire service response to medical emergencies in Australia, USA and Canada is much faster than the Victorian ambulance model and that the UK figures for both fire and ambulance are nearly half those of Ambulance Victoria.

9.5. FUTURE RESEARCH IMPLICATIONS

Given the current research proves that the fastest response time is provided by the fire service, and that the fire service in Melbourne has significant unused capacity, it is appropriate to explore further opportunities to use this underutilized resource for the timely delivery of EMS in the interests of the community.

Another point to consider is whether we are overtraining our paramedics. If the US can achieve similar outcomes with considerably less training, there is a need to revisit Australian requirements in this field to determine who is right. The question also emerges of why far more graduates than required are being trained.

Finally, the issue of the UFU/Andrews Government regarding public sector union influence on government policy would be a fascinating case study for future research.

9.6. CONCLUDING STATEMENT

This study has addressed a major public policy issue. It raises a number of issues and possible solutions for consideration by governments and the community. To what extent should governments be looking for efficient and cost-effective delivery of services? To what extent should governments take a whole of government approach to issues rather than seeing them through the silo of a single Ministry? Is there a need to benchmark services with their international peers to arrive at meaningful benchmarks?

Some more fundamental issues also need to be resolved. Is the Ambulance a Health Service or an Emergency Service? Is it best located with other emergency services or operate separately in the Health portfolio? Should the agencies be combined as occurs in most developed countries? Which will produce the best outcome for the community, both financially and for patient outcomes? To what extent does political and industrial power and influence impact on the outcome of the questions above?

My final recommendation is that there should be an independent review of the viability of combining Fire and Ambulance into a single, state-wide, non-law and order agency. The review must be totally independent of the existing emergency services and emergency management Victoria to ensure any recommendation will be objective and not influenced by self-interest of the existing players. We currently have a single state-wide Police force and a single state wide Ambulance service. A single, state-wide non-law-and-order agency with cross trained staff is consistent with what is already in place.

The review must not be derailed by comments such as “we will achieve the desired outcomes by cooperation across Ministries and Agencies”. The folly of assuming voluntary cooperation is illustrated by a small case study. In the late 1990’s the MFB trialled and provided proof of concept for First Responder in that firefighters were responded to time critical medical emergencies at the same time as the ambulance

service. It was then introduced across the agency. Independent research by Monash University demonstrated that the additional response of firefighters had saved hundreds of lives (Metropolitan Fire Brigade 2015). In 2011 the CFA announced it was trialling EMR for a period of 12 months across four fire stations (Country Fire Authority 2011).

It raises a number of questions. If in the late 1990s the trial of this concept has been proven why did it take over 11 years for the program to be initiated in the CFA area? Why did the program need to be trialled yet again because it is on the other side of an imaginary line in Metropolitan Melbourne (MFB/CFA boundary)? If the program works it just needed a decision to implement it.

If as the research shows that the fire service is arriving two minutes prior to the arrival of the ambulance service for time critical medical emergencies why did the ambulance service not encourage involvement in the program by the CFA earlier? In all of this who was viewing the program in the best interests of the patient/community? How many people may have been saved it was rolled out across the entire State after the successful trial and proof of concept in the MFB and other countries around the world?

The review needs to look at the financial implications of a cross trained multi skilled workforce, and also at the financial implications of reducing duplication of support services. Equipment and procedures would become common to all staff making interoperability and multi skilling easier.

At the moment if a Paramedic is experiencing intolerable stress they may leave the service or tragically commit suicide. Either way they are lost to the service. If there are less stressful roles with lesser demands emotionally they may well have time to recover and continue to be valued employees. The review needs to look at the human benefits of lower levels of stress across a workforce, which can be moved to various roles. A reduction in stress may help to address the terrible levels of suicide in the ambulance service. Such changes have the potential to dramatically increase the number of females undertaking firefighter/paramedic roles, a stated aim of our political leaders.

Ambulance Paramedics have a heavy workload and firefighters have low level and reducing of demand on their time whilst on duty. Could these be brought together to proactively manage call reduction for the EMS calls and to address other social issues? It has been done successfully elsewhere, why not here? Do all of the agencies that use the combined model of delivery of fire/EMS know something we don't? Can we learn from them?

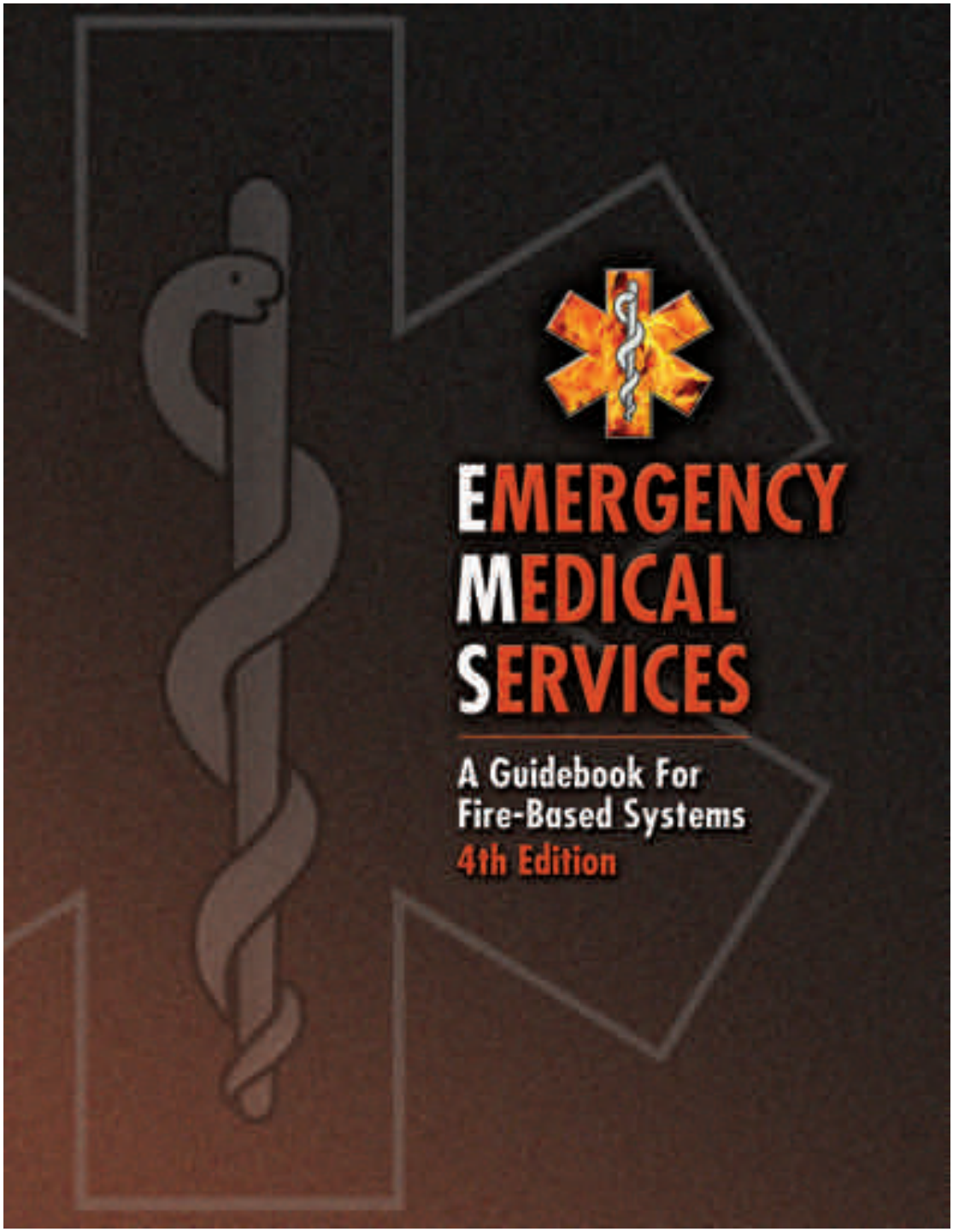
The volunteers are a vital component of our emergency services and they must be respected for their contribution and be an integral part of the process. The significant savings made would enable more resources to be spent supporting volunteers with additional facilities, equipment and training.

Any amalgamation process must be carefully managed to ensure the desired outcome. There are international examples such as the combination of New York Fire and Ambulance with many lessons for the leaders who may undertake such a process. There are many outstanding examples of fire/ems departments who have been using this model for a very long time.

Historically Victoria has had a reputation for being a leader and innovator in the Emergency Services. There is no reason for it not to reassume that position and to lead the country in developing a world-class model of proactive, timely, professional emergency services.

Last but not least what is in the best interests of the community? Reduced costs and better outcomes, less pain and suffering? The arguments for such change are so compelling they cannot be ignored.

APPENDIX 1


EMERGENCY
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Fire-Based Systems
4th Edition

APPENDIX 2: MIAMI DADE FIRE AND RESCUE (MDFR)

1. What are your current performance measures for EMS?

- **Advanced Life Support (ALS) Incidents:**
  - Travel Time: 90 percent of the time the first MDFR apparatus capable of initiating effective incident intervention responding to a Life-Threatening (ALS) incident/alarm in:
  - Metropolitan, Urban and Suburban areas of the District will arrive within 6 minutes
  - Rural areas of the District will arrive within 10 minutes
  - Total Time: 90 percent of the time the first MDFR apparatus capable of initiating effective incident intervention responding to a Life-Threatening (ALS) incident/alarm in:
  - Metropolitan, Urban and Suburban areas of the District will arrive within 8 minutes
  - Rural areas of the District will arrive within 12 minutes
- **STEMI Incidents**

STEMI Network hospitals sign a performance commitment contract to restore blood flow to a patient's blocked artery within 90 minutes of emergency medical care being initiated by paramedics. This reperfusion must be performed in the catheterization laboratory of a hospital.

- **Percentage of Patient Transports**
- **Patient Transfer Times at Hospital**

2. What is your performance against those measures?

Advanced Life Support (ALS) Incidents:

Life-Threatening Medical Incidents - 90%		Metropolitan						Rural						
Alarm Handling	Benchmark 90%	All Years	FY13-14	FY12-13	FY11-12	FY10-11	FY09-10	Benchmark 90%	All Years	FY13-14	FY12-13	FY11-12	FY10-11	FY09-10
PSAP	**1:00**	2:18	2:21	2:20	2:15	2:16	2:19	**1:00**	2:18	2:21	2:20	2:15	2:16	2:19
MDFR Communications	**1:00**	0:54	0:54	0:54	0:52	0:53	0:56	**1:00**	1:00	1:00	1:01	0:57	1:01	1:01
Turnout Time	**1:00**	2:43	2:43	2:42	2:43	2:42	2:44	**1:00**	2:39	2:38	2:41	2:40	2:40	2:38
Travel Time - First Unit Arrival	**4:00**	7:12	7:30	7:26	7:21	6:49	6:38	**8:00**	8:57	9:19	9:08	9:00	8:34	8:46
Total Time - First Unit Arrival	**8:00**	10:20	10:28	10:25	10:21	10:11	10:12	**12:00**	13:06	13:20	13:03	13:10	12:53	12:55
Total Call Analyzed														
PSAP														
MDFR Communications		339,040	67,005	68,905	69,120	68,679	65,328		22,776	4,519	4,678	4,754	4,542	4,283
Turnout		338,434	67,641	69,317	69,293	68,473	63,708		23,106	4,682	4,767	4,813	4,606	4,238
Travel - First Unit		341,867	68,341	69,983	69,941	69,142	64,457		23,432	4,746	4,826	4,880	4,671	4,309

- **STEMI Incidents:**

Prior to the implementation of the STEMI protocol, MDFR's patients were averaging a 164 minute benchmark, and a 12% mortality rate was standard for this type of call. In the past five Fiscal Years from 2009-2010 to 2013-2014, MDFR has maintained a 53 minute reperfusion time with a mortality rate of 1%.

- **Percentage of Patient Transports:**

In Fiscal Year 2013-2014, MDFR transported 40 percent of all medical incidents/alarms.

- **Patient Transfer Times at Hospital (in minutes and seconds):**

During Fiscal Year 2013-2014, it took MDFR units an average 14:14 to transfer custody of the patient after arriving at the hospital.

3. How do you define response time as collected by your organization?

PSAP Alarm Handling (Processing) Time - The time interval from the point the call is received by the Emergency Response System, Public Safety Answering Point (PSAP) and the time the PSAP Call Taker electronically relays the known incident information to Miami-Dade Fire Rescue (MDFR). The national benchmark for this element of response time is 60 seconds.

MDFR Communication Alarm Handling (Processing) Time – The time interval from the point an incident/alarm is electronically relayed by the PSAP Call Taker to MDFR Communications and the time a MDFR Communication Dispatcher/Computer Aided Dispatch (CAD) Operator activates the Station Alerting Device to dispatch an MDFR unit (s).

Turnout Time - The time interval between the activation of the unit/station alerting device and the time when the responding crew activates the "enroute" button on the Mobile Data Unit (MCU) or notifies MDFR Communications by voice that the unit is enroute/ traveling to the incident.

Enroute Time - The point in time at which the responding crew activates the "enroute" button on the MCU or notifies MDFR Communications Dispatchers by voice that the unit is enroute/ traveling to the incident.

Travel Time – The difference between the **Enroute Time** and the time when the responding crew depresses the "arrival" button on the MCU or notifies MDFR Communications by voice that the unit has arrived at the incident location.

On-Scene (Arrival) Time – The point in time at which the responding crew depresses the "arrival" button on the MCU or notifies MDFR Communications by voice that the unit has arrived at the incident location.

Initiating Action – At fire incidents, MDFR defines this time as the time of arrival when "size up" commences or resources are deployed to mitigate the incident. For EMS incidents MDFR captures the "**At Patient" Time** via the ePCR tablet.

Total Response Time – The time interval from the receipt of the alarm at the primary PSAP to when the first emergency response unit arrives at the incident/alarm location.

Transport Time - The time interval from the departure of the incident/alarm location with the patient to when the emergency transport unit arrives at the appropriate hospital facility.

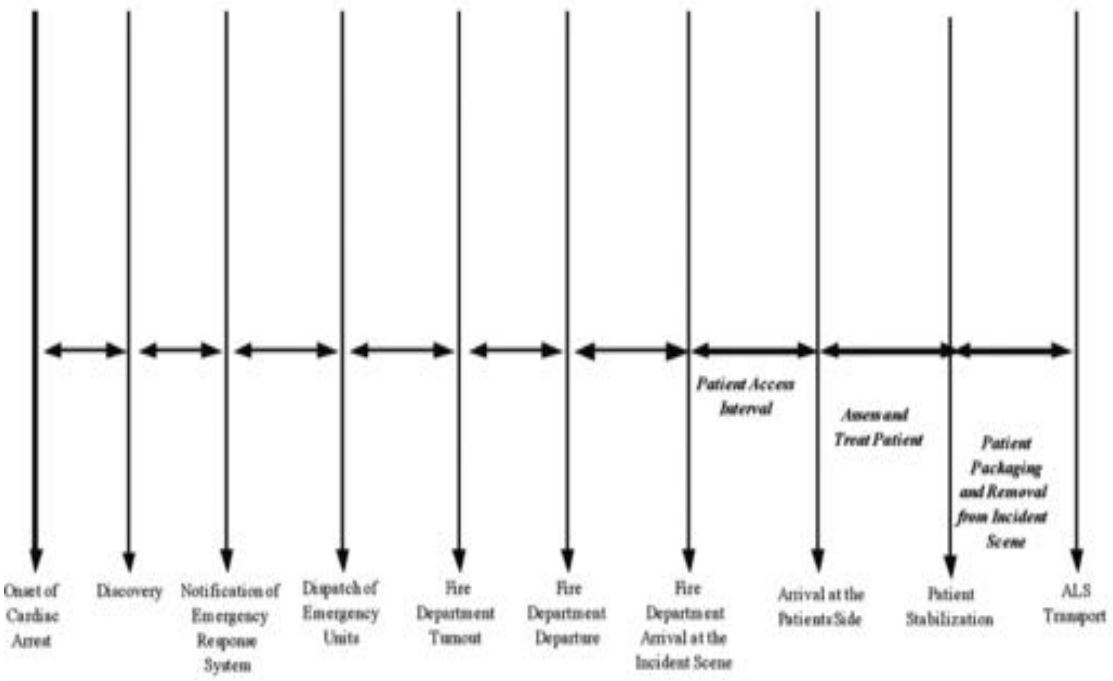
Hospital Wait Time - The time interval from arrival of the emergency transport unit at the appropriate hospital facility to when patient custody transfers to the hospital facility.

4. Which if any of the components listed below are collected by your department

- Notification of Emergency Response System
- Dispatch
- Turn Out Time
- Arrival at Incident Scene
- Transport Time

5. What is your organizations response to those segments collected?

See the chart in #2



6. Do you think the current performance measures used by your organization are adequate? If not what would you add or change?

I believe "Arrival at the Patient's Side" is essential and currently difficult to capture. While there is not much that can change, i.e. building size/access is difficult to change, the actual time between arrival and Patient Contact is valuable.

7. What are the qualification levels in your organization and what are the requirements to qualify for those levels (e.g. First Responder, EMT, ALS (Paramedic)

All personnel (378 of 1964 uniform personnel) are at a minimum, Florida certified Emergency Medical Technician (EMT). This comprises 180 hours of Lecture and hands-on lab practicum, and 40 hrs of clinical field experience.

Additionally, 1586 of 1964 uniform personnel are Florida certified paramedics. This comprises 550 hours of Lecture and hands-on lab practicum, and 650 hours of clinical field experience. Personnel hired after 2004 must become a State certified Paramedic to be eligible for promotional opportunities i.e. Lieutenant, Captain, etc.

48 of 56 suppression units (engines and aerials) are permitted by the State of Florida as Advanced Life Support (ALS) Non-Transport units. These are staffed with a Paramedic Officer, Paramedic Firefighter and two EMT Firefighters as a minimum.

We also have 54 ALS Transported units staffed by a Paramedic Officer and two Paramedic Firefighters.

8. What new technologies or innovations are used in your department in the delivery of EMS?

- **Automation**
  - Electronic patient care (ePCR) records
  - Electronic Medical Protocols
  - Electronic Controlled Substance Log
  - On line-based continuing education
- **Patient Care**
  - Use of safety IV catheters
  - Transition to a complete needless system
  - Power lift and Load stretchers
  - Temporal scan thermometers
  - Lucas II device (CPR device)
  - I Gel secondary airway device.
  - Active EMS R&D program to evaluate current medical devices and associated equipment.
- **Programs**
  - Comprehensive Infection Control Program overseen by an FF/RN
  - In House ACLS and BCLS training
  - Partnership with private BLS transport provider to transport BLS patients for suppression units
  - Partner in countywide STEMI Network
  - Partner in countywide Stroke Coalition
  - Tactical Medic Program supporting police SRT
  - Committee-based programs to support Protocol development and QA initiatives
  - Exploring the initiation of a community-based paramedic program injunction with a local University.

Source: Fire Chief Dave Downey & Miami-Dade Fire and Rescue (2015)

APPENDIX 3: FAIRFAX COUNTY FIRE AND RESCUE DEPARTMENT

Response to Questions

Fairfax County Fire and Rescue Department

Provided by Beth Adams, Quality Manager on 12/11/2015

Reviewed by Maura Power, Operations Data Program Manager on 12/14/2015

Quality Management, EMS Division

Fairfax County Fire and Rescue Department

Performance Measures for EMS

Request Date: December 9, 2015

Requestor: Deputy Chief Jason Jenkins on behalf of Jeff Godfredson, Doctoral candidate, Victoria University, Australia

Request Details: Research being conducted as part of doctoral research project.

Methodology: Answers to the requestor provided research questions are drawn from previously released reports.

1. What are your current performance measures for EMS?

Operations Division

Objective: For Emergency Medical Services (EMS) to provide on-scene Advanced Life Support (ALS) capability within 9 minutes and a first responder with an Automatic External Defibrillator (AED) within 5 minutes, so that at least 30 percent of the patients with witnessed non-traumatic cardiac arrest presenting with a shockable rhythm arrive at a hospital with a pulse.

Performance Indicators

Indicator	Prior Year Actuals			Current Estimate	Future Estimate
	FY 2013 Actual	FY 2014 Actual	FY 2015 Estimate/Actual	FY 2016	FY 2017
Output					
Patients transported	49,739	48,966	49,000/51,425	50,000	50,000
Service Quality					
ALS transport units on scene within 9 minutes (National Standard 90%)	86.70%	89.10%	90.00%/89.95%	90.00%	90.00%
AED response rate within 5 minutes (National Standard 90%)	55.00%	56.37%	60.00%/54.57%	60.00%	60.00%
Outcome					
Cardiac arrest patients arriving at the Emergency Department with a pulse (National Average 23%)	52.3%	55.9%	30.0%/58.5%	30.0%	30.0%

Source: Fairfax County Performance Measures Database

2. What is your performance against those measures?

See table above

3. How do you define response time as collected by your organization?

Fairfax County Fire and Rescue Department adheres to the definition found in the NFPA 1710 standard: the time interval from receipt of the alarm at the primary public safety answering point (PSAP) to when the first emergency response unit is on scene

Performance Measures for EMS Page 2

4. Which if any of the components listed below are collected by your department

Our CAD system captures the incident interval components from call receipt up to and including when unit is cleared/back in service: call receipt, dispatch, enroute, arrival on scene, arrival at patient, enroute to facility, and arrival at facility, clear.

5. What is your organization's response to those segments collected?

The Operations Data Program Manager provides monthly response data reports of system wide and station responses. The system information is also included in the agency performance measures report.

6. Do you think the current performance measures used by your organization are adequate? If not what would you add or change

These performance measures are adequate.

7. What are the qualification levels in your organization and what are the requirements to qualify for those levels (e.g., First Responder, EMT, ALS (Paramedic)?

Personnel hold certifications from the Commonwealth of Virginia Department of Health Office of EMS (EMT, Intermediate, and Paramedic) and are authorized to provide care by our Operational Medical Director.

8. What new technologies or innovations are used in your department in the delivery of EMS?

In collaboration with the Community Services Board, the County agency providing mental health services, we are developing an alternate destination policy for selected patients as part of our mobile integrated healthcare initiative. TXA and IT clamps were added to our available treatment modalities in 2015.

Fire and Rescue Department

AGENCY DASHBOARD

Key Data	FY 2012	FY 2013	FY 2014
1. Total incident responses	91,228	90,205	91,308
2. Total patients transported	48,990	49,739	48,966
3. AED response rate within 5 minutes (National Standard 90 percent)	56.50%	57.00%	56.37%
4. First ALS provider on scene within 5 minutes	57.60%	58.20%	58.89%
5. ALS transport unit on scene within 9 minutes (National Standard 90 percent)	85.04%	86.70%	89.10%
6. Engine Company on a structure fire within 5 minutes, 20 seconds (National Standard 90 percent)	56.02%	52.40%	53.00%
7. 15 operational personnel on a structure fire within 9 minutes, 20 seconds (National Standard 90 percent)	81.72%	83.90%	87.20%

Source: https://www.google.com.au/search?client=safari&rls=en&q=FY+2016+Fairfax+County+Advertised+Budget+Plan+ (Vol. +1) +-+254&ie=UTF-8&oe=UTF-8&gfe_rd=cr&ei=c-WGV_nDB6zu8wfi5r0Y

The National Fire Protection Association (NFPA), a standard-setting organization for fire departments, adopts standards regarding response time objectives and staffing levels. The Service Quality indicators reported by the Fire and Rescue Department track the percent of time the department meets NFPA standards. NFPA response time standards for structure fires require the first engine company to arrive on the scene of a structure fire within five minutes and 20 seconds, and 15 firefighters to

arrive on scene within nine minutes and 20 seconds, 90 percent of the time. In FY 2014, the department met these standards, 53.0 percent and 87.2 percent of the time respectively. NFPA response time standards for medical emergencies require an advanced life support (ALS) transport unit on scene within nine minutes and an AED on scene within five minutes, 90 percent of the time. In FY 2014, these response goals were met 89.1 percent and 56.4 percent of the time respectively. As a result of increased staffing, the department's goal is to improve response times to both fire and medical incidents (Fairfax County Government 2016).

The Fairfax EMS response model is called "one and one staffing". It means that the medical units have a Firefighter/Paramedic and a Firefighter/EMT with EMS supervisors and paramedics on all suppression units (Fire Chief Richard Bowers 2015).

APPENDIX 4: MESA FIRE AND MEDICAL DEPARTMENT

In response to the questions submitted the following response was provided.

1. What are your current performance measures for EMS?

The current performance measures for EMS related to response times are the Benchmark times as published by the NFPA in 1710; Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special operations to the Public by Career Fire Departments, 2010 Edition.

2. What is your performance against those measures?

The performance measures against those standards are calculated and posted each year for our annual accreditation report. The chart posted below is our current response time matrix showing the EMS times from 2006 through 2014. The Benchmark is the NFPA 1710 Standard:

Medical		Benchmark	Baseline	2006	2007	2008	2009	2010	2011	2012	2013	2014
Alarm Handling	Pick-up to Disp.	:60	:60	1:09	1:02	:58	:57	:54	:60	1:02	1:05	1:19
Turnout	1st Unit	:60	1:53	1:48	1:43	1:46	1:47	1:51	1:53	2:18	2:34	2:26
Travel Time	1st Unit Dist.	4:00	5:59	6:01	5:57	5:57	5:54	5:52	5:59	5:42	5:02	5:08
TTL Resp. Time	1st Unit Dist.	6:00	8:52	8:58	8:42	8:41	8:38	8:37	8:52	9:02	8:41	7:43

3. How do you define response time as collected by your organization?

Response times are defined as the time sequence from receiving the call at the 911 centre, through the arrival of the apparatus at the scene.

4. Which if any of the components listed below are collected by your department

We collect four components within our own CAD and firehouse software, including the alarm handling time, the turnout time, the travel time and the total response time.

5. What is your organizations response to those segments collected?

We collect within the CAD and EPCR but not generally report within department reports, the time arrived at the patient and the transport time. These are not

mandatory entries in our electronic records system (which was Sansio and now Zoi) and therefore have a varying reporting rate which impacts reliability of the data.

6. Do you think the current performance measures used by your organization are adequate? If not what would you add or change?

Some measures are adequate and others could be improved on. The response time data is adequate and allows the organization to see each piece of the response time, which allows us to identify the areas of improvement. Other data that is manually put into the system on patient records can have variables due to several members doing the report and their interpretation. The training component is critical to assure the information is as consistent as possible. Having more mandatory fields in the electronic records would help to make the data input more consistent.

7. What are the qualification levels in your organization and what are the requirements to qualify for those levels (e.g. First Responder, EMT, ALS (Paramedic)

Every sworn member is an EMT or Paramedic. Every engine and ladder is staffed with 2 EMTs and 2 paramedics.

All members are required to have their EMT in order to be considered for hire. To become a paramedic, there is a testing process. The test consists of a written exam and an oral interview. Members with the highest scores are sent to paramedic school. Mesa Fire and Medical Department (MFMD) is currently working with the local accredited colleges for the paramedic program.

8. What new technologies or innovations are used in your department in the delivery of EMS?

For the past 3 years we have been utilizing a two-person unit, staffed with a Paramedic Captain and a Nurse Practitioner (NP) or Physician's Assistant (PA). This unit responds on low level emergencies where the patient can be treated and released on scene. MFMD also has another two-person unit staffed with a Paramedic Captain and a Crisis Counsellor to respond on behavioral type calls. These patients are evaluated on the scene and if needed transported directly to a behavioral facility. In the past behavioral patients were always sent to an Emergency Room, regardless if there was a medical component or not.

August 2014 we were awarded a $12.5 million dollar grant to expand both programs. Snow the Department is currently operating two 24/7 PA units called CCU's…and three 40 hour behavioral units called CCS's. We have several partnerships to help with the programs. The Partnerships are with Mountain Vista Medical Center for the PA/NP's, Crisis Preparation Recovery for the Crisis Counsellors, a neighbouring Fire Department (Superstition Fire and Medical) as well an educational facility (AT Still University). Each of these partnerships are important for the success of the program.

In addition to the units in the field, within the grant there are two nurses in the alarm room and within the next month there will be 24/7 medical control in operation.

A billing company was selected through an RFP Process and will do faux billing which will allow MFMD to collect data on incoming revenue with this program. The overall goal for the organization would be to continue the program after the three-year grant period. This would be possible through billing for services as well as working with insurance companies regarding the costs savings that would be apparent on their side. Through data analysis, it is determined that the organization can save $40+ million dollars in healthcare costs over the 3-year period.

The cost savings will be obvious but even more important the patient will get the most appropriate treatment depending on the call type and will prevent an unnecessary transport to an Emergency Room.

APPENDIX 5: EMS COMPASS

Hypoglycemia

EHS Compass ID	Version	Topic/ Clinical Area	EHS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator
Hypoglycemia01	1	Hypoglycemia	Hypoglycemia	Treatment Administered for Hypoglycemia	Measure of patients who received treatment to correct their hypoglycemia	Process	Displays the number of patients who received EMS intervention that is intended to administration of oral glucose, dextrose, or glucagon)	Patients receiving treatment intended to correct hypoglycemia (food,

x

Medication Error

EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	
PEDS-03	1	Clinical	Pediatric Medication Error	Documentation of estimated weight in kilograms - pediatric	Frequency that weight or length based estimate are documented in kilograms	Process	Medication errors are common in pediatric patients and are often based on wrong weight	Weight value in kilograms or length based weight entered	[illegible]

Pediatric Respiratory

EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	Denominator
PED9-01	1	Clinical	Pediatric Respiratory	Respiratory Assessment - Pediatric	Documented evidence that a respiratory assessment was performed on pediatric patients	Process	Detection of respiratory distress has been shown to be challenging in pediatric patients. Reassessment of the pediatric respiratory patient is critically important. Pediatric respiratory distress is a frequent cause for emergency care.	Pediatric patients with SpO2 AND RR measurement	Patients <18 years AND PPI/SEC Impression with (Dyspnea, unspecified Orthopnea, Shortness of breath, or Other forms of dyspnea) originating from a 911 request
PED8-02	1	Clinical	Pediatric Respiratory	Administration of beta agonist for pediatric asthma	Administration of beta agonist for pediatric asthma	Process	Evidence shows administration of beta agonist improves outcomes for pediatric asthma	Pediatric patients administered (Albuterol, Accuneb, Combivent, DuoNeb, ProAir, Proventil, Ventolin or Xopenex) by any means	Patients 2-15 years AND PPI/SEC Impression "Asthma with exacerbation or "Acute bronchospasm" originating from a 911 request

Seizure

EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	Denominator
Seizure-01	1	Seizure	Seizure	Blood Glucose Evaluation	Measure of seizure patients who received an evaluation of their blood glucose	Process	Blood glucose is an important diagnostic vital sign for determination of the cause of a seizure	Patients receiving a blood sugar evaluation	Patients with ongoing status activity (also known as stat epilepticus, defined as seiz minutes or more or two or m seizures in a 5-minute peri regaining consciousness) r from a 911 request
Seizure-02	1	Seizure	Seizure	Patient Receives Intervention	Measure of patients with ongoing seizure activity for 5 minutes or more or two or more seizures in a 5 minute period without	Process	Patients experiencing status epilepticus are at risk for hypoxia but with benzodiazepines the seizure may be controlled	Patients receiving EMS intervention (e.g. benzodiazepine) aimed at terminating their status seizure	Patients with ongoing status activity (also known as stat epilepticus, defined as seiz minutes or more or two or m seizures in a 5-minute peri regaining consciousness) r

Stroke									
EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	Denom
Stroke-01	1	Stroke	Stroke	Suspected Stroke Receiving Prehospital Stroke Assessment	To measure the percentage of suspected stroke patients who had a stroke assessment performed by EMS	Process	Stroke assessments using prehospital stroke assessment tools can screen for stroke and affect patient destinations.	Number of suspected stroke patients who had a stroke assessment performed (CPSS, LAMS, etc.)	Patients with a provi stroke originating fro
Stroke-08	1	Stroke	Stroke	Emergency Department Diagnosed Stroke Identified by Prehospital	Measures the percentage of emergency department diagnosed stroke	Process	Stroke assessments using prehospital stroke assessment tools can screen for stroke and affect patient destinations. Using hospital data, this	Patients with a positive stroke assessment	Patients with emerge diagnosed stroke tha originating from a 91

Trauma

EMS Concept ID	Version	Topic/ Clinical Area	EMS Compass Node	Measure Title	Description	Measure Type	Rationale	Numerator
Template	1	COVID	Trauma	Trauma patients transported to trauma center	Trauma patients transported to trauma center	Process	Evidence to support this measure	Patients transported to a trauma center

Trauma Pain

EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	Denominator	Complete
Trauma-01	1	Clinical	Trauma Pain	Pain assessment of injured patients	Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain	Process	Recognizing that pain is undertreated in injured patients	Patients with pain scale value present	Patients with injury originating from a 911 request	(eVitals.27) IS NOT NULL 9922005 WHERE eRespo Requested = 2205001 - 9
Trauma-02	1	Clinical	Trauma Pain	Pain re-assessment of injured patients	Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain	Process	Pain control is an important component of prehospital care	Patients with two or more pain scale values present	Patients with injury and pain scale value >0 originating from a 911 request	eRecord.01 IN (SELECT * FROM eVitals WHERE eVitals.27 IS NOT NU GROUP BY eRecord.0 HAVING count(*) > 1) WHERE (eSituatio AND (eVitals.27) > 0 WHERE eResponse.05 - Ty 2205001 - 911 Response
Trauma-03	1	Clinical	Trauma Pain	Effectiveness of pain management for injured patients	Of injured patients reassessed, how many had less pain	Outcome	Improving pain management is an important aspect of quality prehospital care	Patients with a final pain value less than the maximum	Patients with injury and pain scale value >0 originating from a 911 request	MAX(eVitals.27) - LAST(e (eSituation.02) = 992200 AND (eVitals.27) > 0 and eRecord.01 IN (SELECT * FROM eVitals WHERE eVitals.27 IS NOT NU GROUP BY eRecord.0 HAVING count(*) > 1) WHERE eResponse. Requested = 2205001 - 9

Vehicle Operations Safety

EMS Compass® ID	Version	Topic/ Clinical Area	EMS Compass Bundle	Measure Title	Description	Measure Type	Rationale	Numerator	Denomin
Safety-01	1	Safety	Vehicle Operations Safety	Lights and Sirens Response to Scene Rate	A rate of emergency lights and sirens responses. This includes each vehicle responding to an incident.	Process	Lights and siren responses are demonstrated to have a greater risk for patients, providers, and public. Assessing risk is an important EMS system issue. The intent of this measure is to allow an agency to assess the use of lights and sirens response within the agency.	Number of lights and sirens responses	Number of responses 911 request
Safety-02	1	Safety	Vehicle Operations Safety	Lights and Sirens Transport Rate	A rate of emergency lights and sirens transports. This includes each vehicle transporting from an incident with one or more patients.	Process	Lights and siren responses are demonstrated to have a greater risk for patients, providers, and public. Assessing risk is an important EMS system issue. The intent of this measure is to allow an agency to assess the use of lights and sirens transports within the agency.	Number of lights and sirens used during transport	Number of patient tra originating from a 911

APPENDIX 6: BIBLIOGRAPHY

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