Prehospital Response to Terrorism

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Grad Dip Emergency Health
Bachelor of Health Science (Paramedic)
Bachelor of Arts

A thesis submitted in partial fulfilment of the requirements for the degree of
Master of Philosophy
at
Monash University
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Monash University Accident Research Centre
Disaster Resilience Initiative
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DECLARATION

This thesis includes 3 original papers submitted to peer reviewed journals. The core theme of the thesis is the exploration of prehospital response to terrorism. The ideas, development and writing of all the papers in the thesis were the principal responsibility of myself, the student, working within the Monash University Accident Research Centre under the supervision of Emeritus Professor Frank Archer and Associate Professor John Moloney.

In the case of Chapters 2, 3 & 5 my contribution to the work involved the following:

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<th>Thesis Chapter</th>
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<th>Nature and % of student contribution</th>
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<td>2</td>
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<td>Published: JHTAM</td>
<td>75%. Concept, collecting data and writing first draft</td>
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<td>Triage in Complex, Coordinated Terrorist Attacks</td>
<td>Accepted for publication: PDM</td>
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<td>Clinical Governance and Interagency Collaboration in Tactical Medical Operations</td>
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*If no co-authors, leave fields blank

I have renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis. All references for embedded papers are located in a single reference list at the end of this thesis, numbered sequentially as they are located in the text.
The undersigned hereby certifies that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Frank Archer
Main Supervisor signature: Date: 16 February 2019

Matt Pepper
Student signature Date: 16 February 2019
ABSTRACT

**Background:** Terror attacks have been an increasing burden on mass casualty response for developed prehospital medical providers. The prehospital response is complicated by the presence of dynamic threats and other unique characteristics that differ from other mass casualty incidents. Understanding these characteristics will facilitate effective response capacity building.

**Methods:** A systematic literature review has been used to identify the quality and quantity of reporting and research into the prehospital response to terrorism. The application of triage in complex coordinated terrorist attacks was identified as a prevalent theme from the available literature, which will be explored in a comparative analysis and described through a meta-aggregational framework. This research is then combined with a pragmatic, practical application through ‘on the ground’ information gathering with international prehospital terrorism response agencies, and formed into ‘lines of action’ to guide policy and practice.

**Results:** A paucity of high-quality literature was revealed, with the themes of triage, systematic activation, communication and tactical casualty care identified as common issues and highlights. Traditional triage systems were poorly applied, not available or inappropriate to the high physiological stress and evolving threat profile of complex coordinated terrorist attacks. Innovative approaches to tactical ‘warm zone’ systems, further research on simplified algorithms and use of new approaches to patient movement are potential future solutions. Fourteen recommendations have been formulated to translate this research into ‘lines of action’ on a local and national level.

**Conclusion:** The paucity of high level evidence and systematic reporting of lessons learned in the prehospital terrorism response field requires a renewed push for access to data and the establishment of reporting systems that are inclusive of all responders. Current triage tools are inadequate for use in insecure environments, such as the terrorism response. Further research and validation is required for novel approaches that simplify tactical triage and support its effective application. The implementation of the fourteen recommendations will bridge current capability gaps and ensure that patients in high threat incidents will receive care in accordance with international best practice, as well as mitigating risk for first responders.
I would like to acknowledge the supervision and mentoring of Professor Frank Archer and Professor John Moloney over the course of my thesis.

Frank has been a guiding influence not only over the period of my thesis completion, but through the past 10 years that he has helped shape my path professionally and academically as I have studied under him at Monash. This period has been a significant one for me as I have transitioned from my previous career in Defence and into the Paramedic workforce, developing into the niche area of prehospital high threat incident response. Frank has been instrumental in guiding me in overt and subtle ways throughout this process.

I would also like to wholeheartedly thank everyone who has assisted along the way, especially in the execution of the two overseas study trips I have undertaken during this research project. To NSW Ambulance and NSW health for their support, and all the agencies and individuals who gave me so much of their time and resources, thank you.
DEDICATION

As always, the support of my beautiful wife Jo has been the driving force behind me being able to complete this thesis and all the concurrent work and time away that’s been involved. Without you, your understanding, help and love I would never have been able to accomplish what I have. To Arch, Louie, Sunny and Kirra thanks for letting me spend countless hours away and researching that I could have been spending with you!
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<td>LESS</td>
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<td>LNR</td>
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<td>MIMMS</td>
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<td>MTFA</td>
<td>Marauding Terrorist Firearms Attack</td>
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<td>NHS</td>
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<td>NTDB</td>
<td>National Trauma DataBase</td>
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<td>PAC</td>
<td>Police Area Command</td>
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<tr>
<td>PAIC</td>
<td>Paramedics Australasia International Conference</td>
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<td>POCUS</td>
<td>Point of Care Ultra Sound</td>
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<td>PRISMA</td>
<td>Preferred Reporting Items for Systematic Reviews and Systematic Analyses</td>
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<td>RAID</td>
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<td>SBP</td>
<td>Systolic Blood Pressure</td>
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<td>SALT</td>
<td>Sort, Assess, Lifesaving interventions, Treatment/Transport</td>
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<td>Vehicle of Opportunity</td>
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<td>Yorkshire Ambulance Service</td>
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Autoethnography is a form of autobiographical description that can utilise ‘epiphanies’ or highlights to describe an author’s own journey and how it relates to cultural concepts or ideas.\(^3\) In describing qualitative research it allows the author’s story to be expressed, explaining the interaction between personal views and interpretations, compensating for the chaos and complexity that exist in ‘real’ life.\(^2\) The field of prehospital terrorism response is one that deals with a great deal of complexity and chaos, making the use of autoethnography a relevant and pertinent choice to contextualise the research of this thesis.

I am very aware that my personal experience and my career as a Special Operations Paramedic have had a significant effect on how and why I have gone about this research. This Prolegomenon aims to identify and ‘bring out in the open’ some of those formative experiences and how they may have influenced my thesis. The evolution of the conceptual basis of this research has been intertwined with my professional journey, and both have heavily influenced the other.

**My professional journey**

As a special operations paramedic I am involved professionally in the preparedness for, and execution of prehospital response to acts of terrorism. As a previous Army officer and being involved in patient care and extrication from the warm zone at the Lindt café Siege in 2014, I have generated a vested interest in developing civilian high threat medicine in the same way that military prehospital battlefield evidence has changed practice and saved many lives.\(^3\)

I began the journey of this MPhil in 2014, and initially completed the following coursework subjects:

- Research and evaluation in disaster preparedness and management
- Responsible research practice and project management in emergency and disaster settings

These subjects complemented my previous studies in disaster preparedness and response with completion of a Graduate Diploma in Emergency Health in 2012. Towards the end of completion of these subjects in my first year of enrolment I was involved in the response to the Lindt Café siege, a significant event on the Australian terrorism landscape that had far reaching consequences across political, military and emergency services domains.

As a responder I recognised significant gaps in our capability and knowledge and embarked on a journey to explore international approaches that would bridge these gaps. On a local level I sought to refine our tactics, techniques and procedures (TTP’s) and training approaches to tactical medicine and terrorism response. On a national level I sought a
strategic, unified approach to increasing the baseline of preparedness for high threat incidents across all emergency services.

I embarked on this journey with a strong foundation in military tactics, strategy and leadership from 7 years in the Australian Army, graduating the Royal Military College, Duntroon (RMC-D) in 2000. My career in the Army consisted mainly of troop leading dismounted reconnaissance teams as a Cavalry officer, with some other postings also in combat roles.

After transitioning across to ambulance, I accumulated a number of years of experience as a prehospital responder, working across three Australian ambulance services in lead clinician roles as an Intensive Care Paramedic (ICP) and Special Operations Team (SOT) Paramedic.

Having a unique blend of tactical and medical experience and knowledge I recognised that I had the potential to be able to identify not only our current vulnerabilities to terrorist attacks, but also a road map for strategic capability, with the capacity to lead the capability forward on a local and national level.

Through this path I undertook a Churchill Fellowship in 2015 to investigate international models and innovation in the prehospital response to terrorism and tactical incidents. During the research and analysis undertaken on this trip I identified the gap in the knowledge base around the characteristics of the prehospital response to terrorism in established Emergency Medical Services (EMS). The research aims of this thesis are to expand knowledge in this area to enhance future resilience to acts of terror.

After the 2-month overseas research trip of the Churchill Fellowship, I co-authored a business case in 2016 with 2 other SOT paramedics to introduce innovative trauma interventions for use in high threat response, using the knowledge of international best practice developed during the Fellowship.

Introducing these interventions, coupled with a 2-day course designed to bring paramedics up to a level of competence in their use; whilst under significant sensory overload and physiological stress, we were able to significantly bolster NSW Ambulance high threat response capacity.

The training that we have introduced over the past 2 years as a result of the Fellowship, for SOT and Rescue Paramedics in NSW, has created a prehospital terrorism capability that is unmatched in Australia, and is considered the benchmark for high threat response.

In 2017 I founded the Australian Tactical Medical Association (ATMA) to bring together those with a vested interest in building response capabilities and preparedness on a national level. This has been a highly successful endeavor, enabling information sharing, networking and collaborative work across the country. Through ATMA we have founded a peer reviewed journal, the Journal of High Threat and Austere Medicine (JHTAM) to ensure that
research in the field is being encouraged and undertaken with as much academic rigor as possible.

We have held two conference’s, the Australian Tactical Medicine Conference 2017 and 2018, which have both sold out and have been huge milestones in the development of strong networks and information sharing across traditional boundaries and silos.

As I have been building these national structures, I sought to understand international best practice through a national approach to tactical medicine. I secured the 2018 NSW Health Clinical Excellence Commission Scholarship in Patient Safety to visit prehospital tactical response units in the UK and identify best practice models of governance and national standardisation in tactical medicine and prehospital terrorism response. The aim of this scholarship was to use the research from the earlier stages of this thesis as a framework for pragmatic information gathering, combining academic research with practical outcomes and making recommendations for national and local progress.

As the founding President of ATMA and a member of the editorial board for JHTAM I have been able to influence the development of tactical medicine in Australia in conjunction with the development of this thesis. The intent of this thesis is to complement my professional journey, through building the knowledge base and identifying appropriate ‘lines of action’ on local and national levels.

Over the period of completion of this thesis I undertook several concurrent activities in order to develop further enhancement of terrorism response capacity in Australia, and as development opportunities to enhance my own understanding and knowledge of peripheral concepts to the core themes of the research I was completing. Following is an outline of these concurrent activities.

**Other training attended related to Masters**

To guide the topic of my thesis I undertook training opportunities that were chosen to build on my knowledge of aspects of terrorism. Whilst not directly related to prehospital terrorism response, these courses enabled a more complete and broader knowledge base.

- Monash University Disaster Resilience Initiative (MUDRI) Colloquia and Forums, attended in person and via skype throughout candidature.

- *Understanding Terrorism and the Terrorist Threat*: 6 week course through the University of Maryland National Consortium for the Study of Terrorism and Response to Terrorism (START). This course significantly enhanced my knowledge of terrorist group dynamics, terrorist operations and patterns in modes of attack (2017).

Papers

Peer reviewed:


Pepper, M, Archer, F and Moloney, J. Triage In Complex, Coordinated Terror Attacks. Submitted to Prehospital Disaster Medicine, December 2018.

Pepper, M, Archer, F and Moloney, J. Systematic Literature Review Of The Prehospital Response To Terrorism. Accepted for publication by the Journal of High Threat and Austere Medicine January 2019.


Non- peer reviewed:


Conference Presentations

2016:

  - Case for change, development of Australian and New Zealand prehospital response capacity for terrorist events.

- Sydney: Australian and New Zealand College of Paramedicine (ANZCP).  
  - Tactical medicine and prehospital response to terrorism

- Sydney: Student Paramedic's Australasia International Conference (SPAIC).  
  - Tactical medicine and prehospital response to terrorism

- Auckland, New Zealand: Paramedic's Australasia International Conference (PAIC).  
  - International models in prehospital response to terrorism

2017:

- Sydney: Australian Tactical Medicine Conference 17 (ATMC).
o  Rescue Task Force models for prehospital warm zone response  
  o  Paris terror attacks – Case study  

-  Los Angeles, California: Committee for Tactical Emergency Casualty Care (C-TECC) Annual Meeting  
  o  Australian approach to tactical medicine  

2018:  

-  Charlotte, North Carolina: Special Operations Medicine Association Scientific Assembly (SOMSA), C-TECC meeting  
  o  Update on the Australian Tactical Medical Association  

-  Brisbane, Sydney, Canberra: Australian Tactical Medical Association  
  o  Management of trauma in high threat and tactical environments  

-  Brisbane: Australian Tactical Medicine Conference 18  
  o  Conference opening, Collaboration in tactical medicine  

-  Perth: Australasian Fire and Emergency Services Authority Council (AFAC) Conference 2018  
  o  A national approach to high threat incident response: Building resilience to the Black Swan  

-  Sydney: NSW Health Institute of Trauma & Injury Management (ITIM)  
  o  Prehospital changing trauma interventions in Special Operations  

2019:  

-  Charlotte, North Carolina: SOMSA  
  o  Review of the prehospital response to terrorism  

**Awards**  

2015 – Churchill Fellowship  
2015 – Commissioner’s Citation for Courage – Lindt Café Siege  
2018 – Ian O’Rourke Scholarship for Patient Safety, NSW Health Clinical Excellence Commission
CHAPTER 1: INTRODUCTION AND RESEARCH PROTOCOL

Initial research question:

What are the characteristics of the prehospital response to terror attacks in the post 2011 era?

Focus is on the following factors outlined in Utstein-style template for uniform data reporting of acute medical response in disasters:

- On-scene initial actions including the assessment of the preliminary health effects
- On-scene medical control and coordination including the development of a medical action plan
- System-level medical coordination
- Medical communication and information management
- Medical resource management

Secondary research questions:

- What are common themes in the description and analysis of prehospital response to terrorism?
- What are innovative approaches that can be identified to refine the future response to terror attacks?
- What are ‘lines of action’ to address identified themes in the response to complex, coordinated terrorist attacks?

Relevance of research:

The post 2011 era has seen both an increase in prevalence and lethality of terror attacks as well as an evolution in tactics. Through this era the rise of suicide, incendiary, low tech and improvised explosive device (IED) tactics has been a distinguishing feature of terror attacks. The increase in complex attacks, lone wolf actors and internet influenced tactics and motivation have also created a new challenge to prehospital providers.

The Global Terrorism Database highlights the sharp increase in terrorist incidents worldwide from 2011 onwards. This period of significant increase in terror attacks, deaths and injuries will be the focus of this research as it suggests an unprecedented modern era of terrorism that is unmatched by a significant increase in our understanding of best practice in prehospital response to these incidents.

In setting priorities for capacity building emergency medical services (EMS) need a more complete picture of the threat posed by terrorism and the medical response required to
modern terror attacks. Terror medicine within the broader umbrella of disaster medicine has been cited as a new discipline and the evidence base requires consolidation to focus efforts.\textsuperscript{12}

Whilst significant funds have been allocated to the development of counter terrorism (CT) capability in Western countries for policing and prevention, the same has not occurred for prehospital systems.

To maximise the use of available funds more data is required to focus efforts. Currently the evidence base in this field consists of response reports and statistical accounts of the impact of individual terror events. A systematic review of the literature will collate individual event descriptions and analyses to give direction to prehospital capacity building; therefore increasing resilience to future terror attacks.

Most of the current data in the field of tactical medicine is drawn from military experience, with some recent studies beginning to provide a civilian perspective.\textsuperscript{13-15} This research draws together data unique to the civilian setting to allow the evidence base to be developed with consideration of the unique features of this setting.

The increase in coordinated attacks, such as the 2008 Mumbai event and recent attacks in Paris highlight the need to review prehospital preparedness. Strikes by coordinated teams with mixed modes of attack and preplanned tactics create a scale of disaster beyond the current capacity of most EMS, even in highly developed systems. Research on the characteristics of this form of attack will build the knowledge base to allow EMS to adjust, build and enhance response capabilities.

The Mumbai terror attack was a sentinel event in the complexity and coordination involved, grinding one of the largest cities in the world to a halt for over 60 hours and causing huge difficulties in the prehospital response to massive numbers of critically injured patients.\textsuperscript{16} The second phase of this project analyses themes in this form of event to better understand the complexities of prehospital response and identify ‘lines of action’ to improve resilience.

**Conceptual Framework:**

The conceptual framework for this thesis is the prehospital response to terrorism incidents through a lens of pragmatic philosophy and a meta-aggregational approach.\textsuperscript{17} This framework uses a narrative exploration of qualitative themes to identify ‘lines of action’ as outcomes of the research and areas of future work.

The availability of high level, robust evidence to inform decision making at a practitioner and system level is sparse in the prehospital fields, and even more so in disaster medicine. As a subset of disaster medicine, terrorism and high threat response is even more limited in the availability of evidence to guide practice.
To overcome these limitations alternative approaches are required that aggregate qualitative evidence, identify themes and establish priorities for system wide implementation. The meta-aggregational approach is well aligned to this approach, allowing the researcher to establish ‘lines of action’ that consist of recommendations, and are based on themes identified and explored through the qualitative research process.

This thesis incorporates a systematic literature review to assess the evidence available and identify themes. An identified theme will be explored in depth through a comparative analysis, and then ‘lines of action’ will be identified. The ‘lines of action’ are based on research conducted into international best practice on the ground with units that respond to high threat incidents and merged with the academic findings of the initial stages of the thesis. They are presented as a report and disseminated on a state and national level to influence policy and practice in high threat medical response.

The pragmatic philosophy emphasises the practical application of academic research, translating findings to the ‘real world’ and bridging the gap between researchers and practitioners. This thesis utilises a pragmatic philosophy that will ensure a practical application of the findings to guide future high threat and terrorism response, embodied in the recommendations of the Clinical Excellence Commission report.

The Disaster Health Conceptual Framework outlined by Birnbaum et al\(^1\) also underpins this research project (Appendix 1). This conceptual framework sets and defines the language in a meaningful way to allow for the study of interventions that increase local response capacity, to decrease the risk of an event becoming a disaster. The Framework presents a deconstructed and redrafted Disaster Management Cycle which will allow for the identification of capacity building interventions that can build resilience. In line with the Framework this project will identify current knowledge and undertake a comparative analysis to then recommend ways in which EMS can most effectively capacity build to the specific threat of terrorism.

**Definitions:**

The universal medical definition of terrorism proposed by Birnbaum et al in 2003\(^1\) is used throughout this project:

*The intentional use of violence — real or threatened — against one or more non-combatants and/or those services essential for or protective of their health, resulting in adverse health effects in those immediately affected and their community, ranging from a loss of well-being or security to injury, illness, or death.*

For the literature review inclusion criteria, a more specific definition of terrorism is required to identify papers that genuinely fit the aim of the research. It can be difficult to define an act as terrorism when certain perspectives might see the same act as freedom fighters, organised criminals or state sponsored asymmetric warfare. For the literature review
inclusion criteria the following definition used by the Global Database on Terrorism is utilised:

- **The incident must be intentional**—the result of a conscious calculation on the part of a perpetrator.
- **The incident must entail some level of violence (including violence against property) or the threat of violence.**
- **There must be sub-national perpetrators.**

Two of the following three criteria must also be present for inclusion as a terrorism incident:

- **The act must be aimed at attaining a political, economic, religious, or social goal. In terms of economic goals, the exclusive pursuit of profit does not satisfy this criterion. It must involve the pursuit of more profound, systemic economic change.**
- **There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) than the immediate victims. It is the act taken as a totality that is considered, irrespective if every individual involved in carrying out the act was aware of this intention. As long as any of the planners or decision-makers behind the attack intended to coerce, intimidate or publicize, the intentionality criterion is met.**
- **The action must be outside the context of legitimate warfare activities. That is, the act must be outside the parameters permitted by international humanitarian law (particularly the prohibition against deliberately targeting civilians or non-combatants).**

Part B investigates incidents that have involved complex mixtures of tactics and weaponry. The following definition is therefore used through this research to describe complex attacks with multiple terrorists, multiple sites of attack and/or multiple weapon systems:

**Complex, coordinated terrorist attack (CCTA):** *An intentional use of force to cause physical injury or death to an identified population through a coordinated and multifaceted approach using a multitude of conventional weapons and tactics.*

**Research methods:**

**Part A:** A systematic review of the literature has been conducted on theprehospital response to terror attacks to better understand characteristics of response and the quality of reporting. Key themes are identified to analyse opportunities to improve EMS capability and refine response to intentional mass violence in an era of evolved terror threat. Using the conceptual framework of meta-aggregation this information is explored through a narrative exploration to set 'lines of action' for EMS policy.

Focus of the research is on:

- Injury patterns and attack modalities.
• Prehospital response, triage, distribution of casualties and clinical interventions.
• Opportunities for clinical and organisational improvement (Response capacity building).

**Part B:** Comparative analysis: From this review, identified terror attacks that involve complex, coordinated tactics with mixed modes of attack or multiple attack sites (CCTA’s) is compared and contrasted in detail to determine their unique characteristics. Using the conceptual framework of Birnbaum et al, these incidents are discussed to set priorities for EMS capacity building. The theme of triage, identified in Part A, is the focus of the comparative analysis, maintaining an emphasis on this and other themes to identify ‘lines of action’.

On the spectrum of terrorism events, Australia has faced only lone wolf or internet inspired actors that have performed low tech, single attacks with firearms or bladed weapons in the recent era. This reality of the threat level could breed complacency and it is important that in building response capacity the worst case scenario is considered. The complex, multi-site attacks of Mumbai (2008), Norway (2013), Paris (2015) and Brussels (2016) tested prehospital systems to their limit, and need to be considered in the Australian context. The 2009 plot by three Islamist radicals to attack Holsworthy Army Barracks with automatic weapons, and the thwarted multi modal terror attack in Melbourne planned for Christmas Day 2016 are prime examples of the potential in Australia for a complex terrorist attacks with overwhelming medical consequences.

CCTA’s are a low probability, high consequence event that present huge complexity in the prehospital response required. Events identified of this type through the literature review were analysed in order to better understand the complexities of forming a capability with improved resilience. Using the methodology set out in *Research and Evaluations in the Health Aspects of Disasters*, the Relief/Recovery Framework is used to provide a comparative impact evaluation of the prehospital response to these complex incidents.

**Part C:** Application/Translation: The outcomes from this review, plus the findings from a Churchill Fellowship and Ian O’Rourke Clinical Excellence Commission Scholarship are used as a framework to recommend improvements to New South Wales Ambulance (NSWA) and the Australian Tactical Medical Association (ATMA) national guidelines for high threat prehospital response.

The outcomes from this review, plus the findings from the Churchill Fellowship and Ian O’Rourke Scholarship will be used as a framework to review the NSWA and national guidelines for EMS high threat response.

These findings will be implemented on a local and national level through the authors employment in NSWA Special Operations and ATMA.
Ethics and Governance

As a staff member of NSW Ambulance and the Principal Investigator I am bound to comply with the NSW Ambulance Research Policy. All research conducted by staff members are required to gain approval from a NSW Lead Human Research Ethics Committee (HREC) regardless of other ethics approval gained. The only exception to this is ‘Low and Negligible Risk’ (LNR) research. This thesis is a ‘desktop’ review based primarily on the analysis of available literature from peer reviewed and grey sources, such as after action reports (AAR’s), standard operating procedures (SOP’s), and published academic papers.

This project therefore fulfils the requirements for LNR, and only required internal review led by the Research Governance Officer. On review in October 2016, by the NSW Ambulance Research Governance Officer, LNR status was granted.

Data storage and management

Data for this project consists of non-sensitive material that only needs to be shared with internal Monash staff until completion. Referencing the Monash Digital Data Options Matrix accessed at https://monash.edu/library/researchdata/guidelines/storage/, a number of paths are available. Three of these were used to create redundancy as the most detrimental outcome for this project would be the loss of work completed. As a result, a combination of desktop computer, labeled USB drives and uploads of completed work to Monash Google Drive was utilised.

All data in this project is publicly available and no identifying patient information is involved. Therefore, paper-based data is stored in a designated location at the Principal Investigators home.

According to the Australian Code for Responsible Research (the Code) data should be kept for a minimum of 5 years. To comply with this data needs to be kept in the onsite hardcopy and offsite cloud drive to ensure redundancy is maintained for any adverse events which may occur over the following 5 years.

During the search phase of the literature review records were kept in an endnote library, which is backed up offline. This means that if there is any failure in the hardware of the Principal Investigator’s desktop computer, the records can still be accessed elsewhere. The collection of records in this way also will aid in ensuring transparency of the search process and ability to replicate.
CHAPTER 2: Literature Review

Introduction

In order to identify themes in prehospital terrorism response and recommend on future ‘lines of action’ to refine response capacity a baseline needs to be established of the available literature. The conceptual framework of this thesis suggests that the interpretation of themes in qualitative reporting can be shaped to influence policy through the use of high quality, methodologically sound syntheses.\(^{17}\) For this reason the guidelines of the statement on Preferred Reporting Items for Systematic Reviews and Systematic Analyses (PRISMA)\(^ {25}\) have been used, and a rigorous approach to evidence appraisal adopted.

The use of a systematic review allowed for a greater understanding of the availability and quality of documents on prehospital response to terrorism, which is essential prior to further investigation of themes.

All references for embedded papers are located in a single reference list at the end of this thesis, numbered sequentially as they are located in the text.

Chapter 2 consists of a systematic literature review which establishes the baseline of literature and reporting on prehospital terrorism response.

This paper was accepted for publication in the peer reviewed Journal of High Threat and Austere Medicine on 4\(^{th}\) January 2019.

A Systematic Literature Review of the Characteristics of Prehospital Response to Terrorism

Abstract

**Background:** Terrorism is increasingly the aetiology of mass casualty incidents. Improved prehospital response capability targeted to the unique characteristics of high threat incidents is an area of urgent focus. Gaps in current knowledge coupled with inconsistent reporting and difficulties in accessing data create difficult conditions for capability enhancement.

**Methods:** A systematic literature review was conducted to describe the characteristics of prehospital response to terrorism from 2011 -2017. Papers were included if they described a prehospital response to a terrorist incident, were in English or translatable to English and full text was available.

**Results:** 6115 records were located in the initial search of grey and published literature, with 71 retrieved for full text after screening of title and abstract. 23 papers were included in the final analysis, describing 6 separate terrorist attacks. The majority of literature was published by physicians, all were from Western countries with advanced Emergency Medical Services (EMS) and a standard reporting template was not identified. The level of evidence
was low to very low. Themes of tactical triage, coordinated activation and response, communication and tactical casualty care were common throughout the papers.

**Conclusions:** The paucity of high level evidence and systematic reporting of lessons learned in the prehospital terrorism response field requires a renewed push for access to data and the establishment of reporting systems that are inclusive of all responders.

**Keywords:** Terrorism, Pre-hospital, Response, Tactical Emergency Casualty Care, Tactical Combat Casualty Care

**Background**

**Unique characteristics of responding to terror attacks**

The Global Database on Terrorism has reported a significant worldwide increase in terrorist attacks and related deaths and injuries since 2011 (Figure 1).\(^{11}\) Whilst the overwhelming majority of attacks have occurred in countries without any established or coordinated EMS, the lessons learned from response to such events could be of great benefit to medical and prehospital professionals to build high threat response capacity.

![Terrorist incidents worldwide](image)

**Figure 1: Terrorism incidents, deaths and injuries 1970-2015\(^{11}\)**

The benefits of self-analysis and reporting of the prehospital response to terrorist attacks include the ability to provide directed guidance to improve capacity and capability for future threats. Without the information that comes through after action reports (AAR), case reports and published literature on terrorism response, the ability for EMS to appropriately improve and evolve is limited. This systematic review establishes the current baseline of recent open source literature available to EMS.

This review purposefully focuses on the prehospital response to acts of terror. There are a large number of dynamic and hostile mass casualty events that fall outside of this definition, such as the 2017 Las Vegas shooting and the 2017 Bourke Street hostile vehicle attack in Melbourne. There are thorough AAR’s, such as the report from the Aurora ‘Batman’ Theatre attack\(^{26}\) and a 2017 systematic literature review on civilian public mass shootings\(^{27}\) that describe in detail the prehospital response to non-terrorist active violence incidents.
(AVI). It is the unique characteristics of terrorism and its medical response that narrows the focus of this review.

Terrorist attacks are events that necessitate a complex prehospital response, regardless of scale. Data on 160 AVI’s in the United States describes short timeframe’s to resolution (5 minutes or less in 69.8% of incidents where timeframes could be ascertained) and high rates of suicide (40%) by the offender. Terror attacks differ from this in the mindset of the attackers, as their intent is to carry out maximum carnage and gain as much exposure to media as possible, thereby creating longer timeframes to resolution.

Australian Federal and State Governments are acutely aware of the unique characteristics of terrorist attacks and have made legislative change in order to ensure a swift and decisive law enforcement response to decrease casualties. Previous ‘Contain and Negotiate’ paradigms have shifted to ‘Shoot to Kill’ once the incident has been defined as a terrorist attack.

A knife attack by an individual such as the murder of drummer Lee Rigby in London in 2015 is no more medically complex for prehospital clinician’s than a stabbing at a weekend party. The complexity that arises in cases of terrorism involves the inherent mentality of using violence to promote a cause or message. By virtue of this, the response to an act of terrorism should always be predicated on the possibility of a dynamic, unsafe scene and secondary attacks on first responders, bystanders and victims.

The unique terror related characteristics of dynamic, dangerous scenes and potential for longer and more complicated responses require effective analysis of previous attacks to enable and inform the improvement of emergency medical response.

Knowledge and Data Gaps

Callaway recently identified a number of capability gaps in the provision of high threat care, the first of these being a data gap. Unless coordinated effort is instigated to ensure availability of quality data for research the ability to learn from experience is limited.

The Joint Theatre Trauma Registry (JTTR) has been extremely effective in collating medical data from battlefield casualties and translating the data into academic output. The large number of seminal studies that have come out of the JTTR have influenced and directed policy, training and equipping of Western militaries in particular through the guidelines of the Committee of Tactical Casualty Care (CoTCCC). This influence has spilled into the civilian sector, with initial take-up by tactical police teams and tactical paramedics. There is, however, no similar system to analyse the trends and data from civilian terrorism incidents and other dynamic active violence events. A proposal to correct this in the United States with a National Trauma Registry has not seen significant progress.

Reviews of the literature, particularly when they are able to utilise a robust collection of data, are able to significantly change policy and practice. An example of the bridging of a data gap with reviews is the use of tourniquets, previously a taboo in civilian prehospital trauma response. The development of Tactical Combat Casualty Care (TCCC) saw them come back into widespread use in Iraq and Afghanistan, and retrospective reviews tapped
into the wealth of data in the JTTR to ratify their lifesaving efficacy and low rate of complications.\textsuperscript{32} Despite no evidence in the civilian specific environment, the push for widespread use of tourniquets has been strong and backed by organisations such as the American College of Surgeons.\textsuperscript{33} A 2018 systematic review of civilian tourniquet use found that there is still huge inconsistency in reporting, poor standardisation of outcomes and low quality of research evidence.\textsuperscript{34} The translation of battlefield data to civilian settings requires renewed enthusiasm for research in high threat response and a collaborative approach to data collection.

A knowledge gap exists in the unique setting of civilian intentional mass violence incidents. There is growing evidence that wounding profiles may differ substantially in this setting from those documented in battlefield environments, with lower rates of preventable extremity haemorrhage and higher rates of torso and head injuries.\textsuperscript{35-37} This follows the logic that civilian victims of terrorist incidents are not wearing ballistic protection, taking cover and firing positions or returning fire. Civilian populations also differ from the military in their population characteristics of paediatrics, geriatrics, anti-coagulant therapy and significant co-morbidities, all of which contribute to the need for an altered approach in the medical prehospital response to AVI’s.

The burden of repeated AVI’s in the United States has pushed forward the establishment of civilian organisations such as the Hartford Consensus, Stop the Bleed Campaign and the Committee for Tactical Emergency Casualty Care (C-TECC), all of which are attempting to bridge data and knowledge gaps and advocate for greater capability to treat the victims of AVI’s expediently. The United Kingdom (UK) has utilised some of the principles outlined by C-TECC and fused them with local considerations to implement a range of national and local strategies under the umbrella of Tactical Medical Operations (TMO) and Marauding Terrorist Firearms Attack (MTFA) response.\textsuperscript{38-40}

**Objectives**

In light of the knowledge and data gaps in civilian prehospital response to terrorist attacks, what is the availability of reporting and analysis of injury profiles, response paradigms and lessons identified?

This systematic literature review also sets out to establish a baseline of the published literature in peer reviewed journals and government reports. The baseline allows for analysis of current gaps and trends in the publication of open access materials for EMS programs to use.

**METHODS**

**Search Strategy**

The systematic literature review was conducted in line with the principles of the statement on Preferred Reporting Items for Systematic Reviews and Systematic Analyses (PRISMA).\textsuperscript{25}
PRISMA principles ensure consistency in reporting, and while designed for the systematic review of randomised trials, they are equally applicable for qualitative research and its assimilation through the use of systematic reviews.

The search strategy interrogated the MEDLINE, MEDLINE In-process, Cochrane, EMBASE, CINAHL and Google Scholar databases for Medical Subject Headings (MeSH) and keywords:

(terror* OR attack OR bombing OR mass casualty incident OR explosion OR shooting OR aggressive deadly behavior OR hybrid targeted violence OR complex attack OR multimodal attack) AND (emergency medical services OR ambulance OR prehospital OR health response)

The same search string was used in the Google search engine, and the first 1000 results scanned for relevance.

For the terror attacks that were identified as appearing regularly through the initial database search, the following search string was used:

(event and terror*) and (emergency medical services or prehospital or medical or health or response)

Eligibility Criteria

Papers that were published since between 2011 - 2017 and described or discussed the prehospital response to a terrorist attack, as defined by the National Consortium for the Study of Terrorism and the Response to Terrorism’s (START) Global Terrorism Database, were included. Figure 3 displays the inclusion and exclusion criteria utilised. Papers in languages other than English were translated through the online Google Translate multilingual machine translation service. If they were not able to be translated through this service papers were excluded.
All titles and abstracts of papers found in the search process were screened for inclusion and the final full text was obtained for manuscripts. Full text papers were read in full and reference lists were screened for further relevant papers.

The last search was conducted on 30 May 2017.
<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Published between 2011 – 2017</td>
<td>- Identified methodological or analytical flaws.</td>
</tr>
<tr>
<td>- Subject of study is the prehospital medical response to an act of terrorism in the same time period.</td>
<td>- Full text not available.</td>
</tr>
<tr>
<td></td>
<td>- Not in English or not easily translatable to English language.</td>
</tr>
<tr>
<td></td>
<td>- Subject of study on the hospital medical response only.</td>
</tr>
</tbody>
</table>

**Figure 3. Inclusion/Exclusion Criteria**

**Data Extraction**

A data extraction tool was created using DeBacker et al’s *Utstein Style Template for Uniform Reporting of Acute Medical Response in Disasters*. Each of the 23 papers were read and qualitative and quantitative data assigned from them into the following *Utstein Style Template* prehospital headings:

<table>
<thead>
<tr>
<th>1. Event Notification</th>
<th>5. Onsite Medical Care</th>
<th>9. Deactivation of DMMP</th>
</tr>
</thead>
</table>

**Figure 4. Data Extraction Elements**

The use of the Template allowed for the identification of themes as well as the recognition of completeness or otherwise of the data presented in each paper. A previous systematic review found that no universal template is being used for the reporting on prehospital medical management during major incidents.`41` None of the reporting templates assessed had undergone external validation.`41` In the vacuum of a standard approach the ‘*Utstein Style Template*’ was chosen as it is specific to disaster medical response and identified in its dataset common themes relevant to terrorist incidents such as triage, disaster plan, onsite medical care and injury profiles.

Quality appraisal was conducted on each paper and assigned a relevant level of evidence (Figure 5). Each paper was also assessed against a pre-conceived checklist for biases, imprecision and methodological flaws. The checklist consisted of the following data elements:

- Type of study
- Risk of bias
- Publication bias
- Imprecision
- Inconsistency
- Indirectness
- Methodological flaws
2 papers were excluded for methodological flaws. Imprecision, inconsistency and indirectness was very rare; however, some level of bias was almost universal with the most common being the publication of papers in a short timeframe after the event occurred, giving the appearance of ‘rushing’ the reporting through while focus was still on the terror attack in the public consciousness.

**Summary of Evidence**

The Joana Briggs Institute ‘New JBI Levels of Evidence and Grades of Recommendation’ were used to assign each of the papers to a category to indicate its strength of the evidence. The ‘JBI Levels’ were chosen as a guide for evidence levels as they align with the pragmatic philosophies of meta-aggregation: the analysis of qualitative themes to recommend ‘lines of action’ as an outcome of research.

![New JBI Levels of Evidence](image)

**Figure 5. Levels of Evidence**

![Number of Papers](image)

**Figure 6. Incidents described in sourced literature**
RESULTS

The literature review obtained 23 papers which described the prehospital response to 6 separate terrorist attacks from 2011-2016. Figure 6 displays the attacks described in the literature sourced, with the November 2015 Paris terror attacks represented the most reporting with 11/23 (48%) papers.

3 of the incidents were coordinated strikes using a variety of attack modalities, defined as complex, coordinated terrorist attacks (CCTA). In total 17/23 (74%) of the papers sourced described the response to CCTAs.

5/23 (22%) were reports or papers from the United States, with 18/23 (78%) from Europe. Of the European papers only 5/23 are left if the 2015 Paris series are removed.

A significant proportion of the papers located through the search are from countries with physician led EMS. Only 2/24 (9%) papers were written by non-physician prehospital responders.

Oslo/Utoya Island 2011

The medical response to the coordinated attacks by Anders Brevik in Norway was analysed with 5 papers found during the literature search. 3 of these involved the same author and described incident command, decision making and prehospital response, 1 was a comprehensive government review of all medical aspects and the last was a report by the Swedish disaster medicine study organisation Kamedo. Major themes were:

- The need for a ‘warm zone’ EMS capability
- The majority of critical decision making is made early, with incomplete information and by EMS commanders on scene
- Information technology systems were overwhelmed, and traditional means of communication were required within minutes of incident onset
- National major incident activation and coordination of EMS and medical resources is critical
- The need for a standard triage system

Boston 2013

Four papers were located from the 2013 Boston Marathon bombings, 2 government reports and 2 peer reviewed published papers. 1 paper described the use of improvised tourniquets by responders and had a thorough description of injuries and prehospital treatment considerations. The remaining 3 looked at the overall response, 1 focusing on the hospital system with brief mentions of the prehospital response, 1 on the overall response and the last outlined the preparedness measures that contributed to the success of the response.
Figure 7. Data Element Mapping

Charlie Hebdo 2015

One paper in the systematic review was focused on the prehospital response to the
Hypercacher supermarket siege resolution at Port De Vincennes in January 2015. Written
by the responding tactical police unit Research, Assistance, Interference, Deterence (RAID),
a unit which has embedded physicians to provide hot and warm zone medical care. The paper is a case series of the 6 patients injured during the emergency action, and highlighted the importance of:
- Maintaining a single point of contact for police-EMS liaison
- Maintaining zoning of care to the level of threat
- Rapid triage and transport of patients with the implementation of prehospital damage control resuscitation (DCR).

Paris 2015

11 papers were sourced that reported on the November 2015 coordinated terror attack in Paris. 6/11 were published in a January 2016 Special edition of Annales Françaises de Médecine d'urgence.57-59, 61, 62, 67 The other 5 were editorials and viewpoint articles published during 2016.53-55, 60, 68 Common themes throughout the papers were:

- Activation of ‘Plan Blanc’ and ‘Plan Camembert’ for overall control of resources, preventing overcommitment to any one site, maintenance of a substantial reserve for further attacks and effective distribution of victims to appropriate hospitals
- The use of prehospital DCR and principles of tactical casualty care, particularly around zoning of care to the level of threat
- The use of simplified ‘tactical’ triage

San Bernardino 2015

The single paper sourced from the San Bernardino terror attacks perpetrated by Syed Farook and Tashfeen Malik in December 2015 was a government report undertaken by the Department of Justice that summarised internal AAR’s and 3 site visits with interviews of responders and commanders.65 The 142-page report has less than 3 pages dedicated to the medical response. With 14 killed and 24 wounded in the attack the medical response is a considerable element of the overall response paradigm. Recommendations included increased medical training for law enforcement responders and high fidelity, reality-based training to prepare medical providers in high threat incidents.

Nice 2016

A number of hospital-based papers were published in the aftermath of the 2016 Bastille Day hostile vehicle terror attack, however only 1 described elements of the prehospital response.52 This paper was predominantly focused on the hospital response; however, it outlines casualty clearance from the scene and the distribution to emergency departments. This paper was a ‘correspondence’ published in The Lancet and did not disclose sources of the statistics on prehospital transport. It was highlighted that many of the initial patients were taken to hospital in private cars, the next wave was taken to the nearest hospitals by the first ambulances on scene and then a triage system was established with an effective (only 3% secondary transfers) patient distribution.

DISCUSSION

In this same period of 2011-2017 that the attacks documented here occurred, there were 70,706 terror attacks carried out worldwide.69 Of all these attacks only 23 reports on the prehospital response were able to be found in this study. The lost opportunity that this represents is profound, with the potential for many more of these incidents to have
response analysis and feedback for the international EMS community. Only 1 paper was excluded as it couldn’t be translated, and 1 other due to full text not being available, highlighting that there is not a wealth of literature in other areas that couldn’t be accessed due to language or locality. With an overwhelming majority of these attacks occurring in developing countries\textsuperscript{11}, there is likely to be a lack of established, coordinated EMS response to report upon in the first place.

The confidential nature of counter terrorism and terrorism response has potentially limited the access to internal AAR’s and other government or organisational reports, as many are held as internal documents or given security levels that prevent their public dissemination. With an unknown amount of data in this space it is impossible to know just how much more reporting is happening internally without information sharing spreading the lessons learned. Whilst the sensitive nature of response paradigms is clear, more effort is required to deliver retrospective analyses by responding agencies into the public domain.

The vast majority of published literature was physician led. This has a distorting effect on the results of the literature review as the majority of EMS in Australia, the UK and North America are paramedic led. It is logical that during their training physicians develop a good working knowledge of research and knowledge transfer, and therefore take the lead on conducting both research and reporting.

A large number of papers excluded by abstract and full text screening were solely hospital-based reports on terror incident response. The familiarity with publishing that physicians hold is likely an explanation for this factor also, highlighting the need for research education to be integrated into the training of all EMS.

The most comprehensive reviews of prehospital response were government based AAR’s. Typically, these reports covered the entire spectrum of response and were particularly detailed, with the extensive use of primary sources to gather data.

A majority of the papers (74%) described the response to CCTAs, suggesting that the higher end of response complexity stimulates more self-analysis and impetus to share lessons with the international community.

The objectives of this review were to establish a baseline for literature on prehospital terrorism response and assess the availability of reporting on terror attacks. Whilst literature is scarce and evidence levels were low the baseline is shown through the 23 identified papers. The most persistent themes throughout this baseline of reporting around response paradigms, lessons identified and injury profiles were:

- Communication
- Systematic activation
- Triage
- Tactical casualty care

The overall low level of evidence of the papers collected by this review aligns with previous description of disaster reporting, particularly in the acute phase\textsuperscript{10-12}.
The unpredictable nature of disaster events and the inability to provide control measures or randomisation in interventions used in the medical response means that high quality evidence is very difficult to obtain. Consistent with this Figure 5 displays each paper’s assigned evidence level, with no higher than 4.C. All papers were either case series, case studies, expert opinion consensus or single expert opinion, falling into the categories of low and very low levels of evidence.

Gerdin et al\textsuperscript{73} made the case that we shouldn’t accept the paucity of high level research in acute health disaster settings, and instead advocate for the use of systematic review’s to achieve two aims:

1. Collation and analysis of existing evidence to improve access and aid decision making.
2. Identify knowledge gaps and areas of focus for future research.

This systematic review identifies a very low level of evidence in the published and grey literature, however the collation and analysis of these papers allows for improved access to information and highlights the need for future research.

The disaster health and prehospital fields are well known for difficulties in sourcing rigorous evidence on which to base practice. The dynamic, unpredictable and non-linear nature of terrorism response means that innovative approaches to research are required, with acceptance of potentially lower evidence levels. As Vu et al stated in making recommendations for Tranexamic Acid use in combat and tactical settings; that in the absence of definitive, robust studies there is a need for “…the art of balancing what evidence there is with a mixture of basic science and opinion, contextualized by gradients of biological plausibility, and tempered by consensus of experts in the field.”\textsuperscript{74}

Limitations

This review is by design limited to terror related incidents. This focus excludes non-terrorism related active shooter incidents, civilian public mass shootings and bombings from the same time period. The exclusion of this data may limit some conclusions. The level of evidence obtained through the systematic review was consistently low, hampering the viability of results.

Conclusions

Analysis and implementation of lessons learned from terror attacks is limited by the lack of quality data and widespread reporting by prehospital responders. Triage, communication, systematic activation and the use of tactical casualty care principles were highlighted as common themes in the available literature. Physician led, advanced EMS are well represented in reporting, although no standardised templates are currently being used. There is urgent need for access to quality data, standards in reporting and further research in the field of prehospital terrorism response.

Conflict of Interest

No conflicts of interest pertain to any of the authors.
Funding

No funding was obtained for this study.

Conclusion

The application of a rigorous methodology to the appraisal of available literature on prehospital terrorism response has determined that a paucity of reporting exists in comparison to the huge numbers of attacks that occur. The identification of this problem justifies the continuation of this research project, and focuses it in onto the common themes.

The following themes have been identified in the meta-aggregational approach through the analysis of all available literature published between 2011-2017 and sourced through this literature review:

- Triage
- Communication
- Systematic activation
- Tactical casualty care

The next chapter will focus on triage and its application in CCTA’s, however the overall theme of this thesis will seek to identify pragmatic solutions to all the themes unearthed through this systematic literature review as being common issues in the prehospital response to terrorist attacks.
CHAPTER 3: Triage and Terrorism

Introduction

The exploration of themes identified through the meta-aggregational approach is essential to develop ‘lines of action’ and ensure pragmatic carry over of research findings into ‘real world’ applications.

The limited scope and word limit of this thesis enable two possible strategies in theme investigation:

- Superficial exploration of all themes identified in the systematic literature review of the characteristics of prehospital response to terrorism
- In-depth exploration of one theme to fully understand the potential adjustments and enhancements to current response paradigms.

To allow a comprehensive review the second strategy has been adopted, with a theme explored to its full extent and many elements of its application in prehospital terrorism response considered.

Triage was identified throughout the attacks described in the literature sourced by the systematic review as being an area that requires consideration and refinement to enable more effective response. In attacks of greater complexity, such as the Paris 2015 incident, traditional triage systems were poorly applied or inappropriate and new, innovative approaches clearly required.

The comparative analysis that makes up chapter 3 of this thesis will therefore explore triage and its application in recent complex coordinated terrorist attacks. This paper was submitted to the journal Prehospital Disaster Medicine on 8th December 2018, and is currently undergoing peer review prior to publication.

Triage in Complex Coordinated Terrorist Attacks

ABSTRACT

Background: Terror attacks have increased in frequency, and tactics utilised have evolved. This creates significant challenges for first responders providing lifesaving medical care in their immediate aftermath. The use of coordinated and multi-site attack modalities exacerbates these challenges. The use of triage is not well validated in mass casualty settings, and in the setting of intentional mass violence new and innovative approaches are needed.

Methods: Literature sourced from grey and peer reviewed sources was used to perform a comparative analysis on the application of triage during the Oslo/Utoya Island, Paris and San Bernardino terrorist attacks. A thematic narrative identifies strengths and weaknesses of current triage systems in the setting of complex, coordinated terrorist attacks (CCTA’s).
Results: Triage systems were either not utilised, not available or adapted and improvised to the tactical setting. The complexity of working with large numbers of patients, sensory deprived environments, high physiological stress and dynamic threat profiles created significant barriers to the implementation of triage systems designed around flow charts, physiological variables and the use of tags. Issues were also identified around patient movement and ‘tactical triage’.

Conclusion:

Current triage tools are inadequate for use in insecure environments such as the response to CCTA’s. Further research and validation is required for novel approaches that simplify tactical triage and support its effective application. Simple solutions exist in tactical triage, patient movement and tag use, and should be considered as part of an overall triage system.

BACKGROUND

Complex coordinated terrorist attacks (CCTA’s) present a unique challenge to prehospital medical responders. Overwhelming numbers of patients presenting almost simultaneously, multiple sites and modes of attack, varying mechanisms of injury and secondary threats all combine to create a confusing and complex operating environment for responders.

CCTA’s are intentional mass violence incidents that involve coordinated tactics, various weapon types and potentially, multiple sites of attack. Incidents such as the 2017 London Bridge/Borough Market terror attack involved the attackers conducting a hostile vehicle attack, then dismounting to attack civilians with knives, whilst wearing fake suicide vests. Responding to an incident such as this creates an uncertain environment with a high index of suspicion for secondary attacks.

In the confusing and dangerous response to CCTA’s, triage of victims is more difficult than in other disaster or mass casualty incidents. This paper will compare and analyse three recent CCTA’s to determine the applicability of triage systems in high threat tactical settings, and identify successful elements that could guide development of an appropriate ‘tactical triage’ system.

Triage

Triage is the process of categorising patients according to their urgency for clinical interventions, including treatment, transport and destination. The history of triage is well described, and extends back for many hundreds of years to its first documented use by Napoleonic armies. Despite a rich history, triage is still poorly applied and not well validated.

In the setting of prehospital response to intentional mass violence triage is used firstly to distinguish patients that most urgently require lifesaving interventions (LSI’s) and therefore rapid extrication to further echelons of care. Tactical triage, the triage process conducted in the ‘warm zone’, when threat may still be active and responder stress will be high, requires rapid application and simplicity of use.
Currently few tactical triage tools exist, and improvisation of primary triage systems are commonly used.

Once the security situation has become more controlled, primary triage is applied using traditional ‘sieve’ systems. These systems are most often used by emergency medical systems (EMS) as the initial step in prehospital response to mass casualty incidents. The majority of these systems rely on the use of algorithms, tags and physiological variables, such as Simple Triage and Rapid Treatment (START) and Sort, Assess, Lifesaving interventions, Treatment/Transport (SALT).

After patients have been moved from the warm zone into a casualty collection point (CCP) or casualty clearing station (CCS), more sensitive and specific tools can be implemented in the process of secondary triage. These tools identify patients with the greatest need for treatment and allocate them to the most efficient transport modality and highest level of definitive care (Field triage).

**Triage and Complexity**

Triage is a linear system that aims to provide an objective rating of a patient’s likelihood of requiring emergent medical intervention, the comparative urgency for transport to hospital or the requirement for transport to a specific level of definitive care. The intent behind this is to remove the ambiguity and subjectivity that a human responder will bring to the process. It can be considered prescriptive. A consequence of this process is that an ordered, inflexible, process driven algorithm is overlaid onto dynamic, complex, uncontrolled situations. The resulting juxtaposition of complexity and simplicity can result in the inability to recall or effectively utilise algorithms as well as the incorporation of emotion and subjectivity into what should be an objective process.

Law enforcement and EMS responders to the San Bernardino attack reported extremely high levels of physiological stress, exacerbated by the noise and water from fire alarms and sprinklers, the smell of cordite and blood and the screams of injured victims. The 2008 Mumbai CCTA shocked the world in its destructiveness and the difficulty in response from a law enforcement and medical perspective. Persistent threat to life, combined with sensory overload; complicated individual response and erected barriers to effective systematic implementation of emergency medical treatment. No triage was implemented in the prehospital setting, with triage systems only being applied once patients had been transported to hospital Emergency Departments (ED’s).

Low levels of stress are associated with increased performance in medical professionals, however high stress is correlated with a significant deterioration in ability to make effective decisions and to perform clinical and technical skills, especially when an individual has a low perception of ability to cope with a given situation. Whilst fine motor skills can increase with moderate physiological and psychosocial stress, a systematic review of surgeons ability to conduct procedures shows degradation of performance of technical and non-technical skills with increasing stress, particularly in stress ‘crises’. Likewise, under settings of high anxiety and pressure police officer’s performance in work related tasks is shown to decrease significantly. Terrorist attacks and incidents with tactical violence are self-
The overwhelming nature of CCTA’s for prehospital responders emphasises the need for triage systems that are able to be recalled and implemented effectively under situations of high stress with reduced fine motor skills.

**METHODS**

Literature identified as being descriptive of prehospital response to terrorism in a previous systematic literature review was utilised to conduct a comparative analysis of the CCTA’s in Norway (2011), Paris (2015) and San Bernardino (2015). Recently published grey and peer reviewed literature was also sourced for the same CCTA’s to build a picture of the application, usefulness and potential for improvement of the triage process during CCTA’s. A meta-aggregational narrative framework was utilised to identify themes in the application of triage in complex settings.

**RESULTS**

A number of themes were highlighted in the comparative analysis of the three CCTA’s, with a significant amount of commonality suggesting these findings could be extrapolated to many CCTA’s and other intentional mass violence incidents.

**Overview of Incidents:**

**Oslo/Utoya 22nd July 2011**

The bombing in the Government District of Oslo saw a rapid reaction from emergency medical services (EMS), with adequate availability of resources. Triage was conducted on a business as usual model, with good reported success of field triage, aside from some over triage which had little to no impact due to the ready availability of in-hospital resources.

The second attack occurred shortly afterwards when Anders Breivik began shooting members of a political youth camp on Utoya Island, eventually killing 69 and injuring 65 that required hospitalisation. Two CCS’s were established on the mainland, and a forward, warm zone CCP established after 2 hours on the island itself. Triage was conducted through these established positions, with the first mainland CCS requiring to be shifted due to security concerns.

**Paris November 13th 2015**

Paris emergency services faced a grim task when gunmen fired upon cafes; suicide bombers attempted to enter the Stade de France during an international football match and scores of hostages were taken inside the Bataclan Theatre. In total 495 wounded were treated and 130 were killed as well as the 7 terrorists.

Due to the number of Service d'Aide Médicale d’Urgence (SAMU) staff recalled to work, the control centre was able to mobilise an appropriate number of Mobile Intensive Care Unit Physician teams, who were sent to the various sites to assist with the triage and patient distribution process.
Tactical physicians attached to the special forces police joined the assault into the Bataclan and triaged and treated over 50 invalid patients and 89 fatalities in a highly dynamic warm zone.\textsuperscript{92}

**San Bernardino December 2\textsuperscript{nd} 2015**

A husband and wife who had self-radicalised and sympathised with Islamic State (IS) entered the San Bernardino Inland Regional Centre and shot 36 people attending a meeting, killing 14 of them. They left a secondary improvised explosive device (IED), presumed to be intended to kill and injure first responders.\textsuperscript{93, 94} An hour later the terrorists were killed in a gun fight on a suburban street that left 2 police officers injured.\textsuperscript{65}

Patients were initially triaged inside the conference room of the building by a Tactical Paramedic attached to the Special Weapons and Tactics (SWAT) Team. Police extricated all casualties to a CCP in the carpark outside the IRC where vehicles of opportunity (VOO) were commandeered to transport all patients to ‘Triage A’, where 15 patients were triaged and transported. Another 5 patients were triaged by Fire Department medics and transported from ‘Triage B’, located on the golf course across the road from the IRC.\textsuperscript{93}

**Themes in Triage:**

**Use of Established Triage Systems**

Prior to the 2011 Oslo and Utoya Island CCTA there was no national standard in Norway for prehospital triage.\textsuperscript{43} Some local trusts had begun to implement triage tools, however during the attacks none were utilised.\textsuperscript{46} The disaster/major incident system in Norway designates a Medical Commander who oversees triage, treatment and transport.\textsuperscript{44} The presence of experienced clinicians was credited with the success of triage and transport decisions during the attacks, from the oversight of medical commanders as well as Helicopter Emergency Medical Service (HEMS) Anaesthesiologists who conducted primary and field triage on scene.

In contrast to the lack of a universal triage system in Norway, responders at San Bernardino had trained many times on the use of Simple Triage and Rapid Treatment (START) adult and JumpSTART paediatric algorithms. No responder utilised this system during the incident. Post incident analysis reveals that responders universally relied on clinical judgement and did not use physiological parameters or number ranges for triage decisions.\textsuperscript{93} The metrics of activity, pallor, gasping or rapid breathing, presence of large amounts of blood and the anatomic location of gunshot wounds were utilised instead to aid decision making.

France utilises a national standard for triage.\textsuperscript{62} Whilst this was applied at CCS’s across Paris, improvised and simplified tactical triage systems were also reported to be used at various sites including the Bataclan.\textsuperscript{57}

**Use of Triage Tags**

The use of triage tags is not recorded in any of the available literature from Oslo/Utoya Island. In the absence of a national or local standard system the Norwegian Directorate of Health stated that no colour coded tags were available or used.
Triage tags were used at various times throughout the San Bernardino incident, in the form of tape and paper tags. The Tactical Paramedic that first encountered patients inside the IRC had minimal gear due to his role, and used coloured tape to designate triage categories. Fire Department Medics that arrived in response to reports of up to 20 more patients entered the IRC and conducted a secondary search for survivors and completed further verification of death, using paper triage tags to mark victims. The amount of water coming from the fire sprinklers and a ruptured pipe made this process problematic. Once patients had been extricated to Triage point A, they were initially assessed by Fire Department EMS and had a triage tag placed. Halfway through the total number of patients a decision was made to discontinue this process as it was ‘interfering’ with assessment and treatment of patients.

The Système d’Information Numérique Standardisé (SINUS) is a national system used by Paris emergency services to track patients from initial triage, utilising a bracelet and barcode. Paris Fire Brigades use SINUS regularly in day to day operations, however other services such as SAMU are not particularly familiar with its use. During the Paris CCTA there was decreased compliance in use of the system which was exacerbated by a lack of available SINUS kits, and the system was not used across the board.

Casualty Collection Points & Casualty Clearing Stations

The Oslo bombing saw a rapid and immense response from EMS, with 41 Ambulance units available within 26 minutes of the explosion and the first on scene in 3 minutes. To organise this response incident command was quickly established and two CCS’s sited due to the lack of a single evacuation corridor, however only one CCS was used for the majority of the patients transported.

With the close proximity of a primary care clinic, fire and police vehicles were used to move patients, as well as a commandeered bus and a number of patients moving by foot. The familiarity of the responding crews with the capabilities of the primary care clinic for low acuity patients is credited with the successful field triage of patients, with only two requiring secondary transport to a trauma centre. A Kameda report described that “…staff did not therefore need to use any special triage algorithm…” as they worked on their usual prehospital model in deciding transport disposition for trauma patients.

The appropriate triage and transport of 64 patients to the primary care clinic was achieved in less than 2 hours through the established CCS. A degree of over triage was reported with 3 of the 10 patients transported to a designated trauma hospital later deemed to be appropriate for a lesser level of care.

With many patients initially arriving by civilian boats from Utoya island a CCS was established at Utvika Quay, near the shortest distance from the island to the mainland of approximately 630m. Shortly after the marshalling area was established at the Quay, police elected to move it further back to the main road as bullets from the terrorist on the island were striking the water nearby.
At this first CCS EMS nurses, paramedics and physicians conducted minimal interventions, with assignment of triage priority as a method of deciding on order of casualty evacuation. Many of these initial patients were swimmers with minor or no injuries, as well as patients with gunshot wounds brought to the mainland by boat.43

Due to geographical restrictions at the Utvika Quay CCS, as well as the discovery of the shooters car in close proximity, a second CCS was established further away from the island at the bridgehead to Storoya Island.43 During the time period that the primary CCS was being closed and the secondary established, 7 severe trauma patients were transferred to a non-trauma hospital that required secondary transfers, and a few uninjured patients were also transported.46 This apparent failure in field triage, with an overall under triage rate of 43% could be explained by the uncertainties surrounding the shift from one CCS to the other.

The secondary CCS had a number of paired physician’s with a nurse or paramedic assistant to conduct minimal treatment and designate field triage categories as patients arrived by boat, as well as by ambulance from the primary CCS.43, 45 Field triage was conducted utilising the following improvised tool:47

- Unstable patient: Transport by Helicopter
- Stable patient: Transport by land ambulance
- Walking wounded: Transport by bus

**Triage in the ‘Warm Zone’**

An advanced CCP was established on Utoya Island prior to it being declared secure by Police. Four victims were treated for gunshot wounds prior to evacuation off the island, and all others that came through this CCP were uninjured.43 Police special forces provided security for the CCP, however none of the medical personnel who moved to the island had any training or equipment for working in the ‘warm zone’. No information is available on the application of triage for patients moving through this CCP.

All CCP’s and triage/treatment had a security element during the San Bernardino incident, with the exception of Triage A for a period of time when the shoot out began with the terrorists nearby. The security element responded to the incident, leaving the EMS exposed for that time.93 Tactical Paramedics and Rescue Task Force personnel had previous training as well as specific equipment to operate in unsecured ‘warm zone’ environments.

As the tactical situation evolved in Paris the presence of non permissive and semi permissive environments and the overwhelming numbers of ‘absolute emergencies’ (Immediate) with penetrating trauma required the implementation of tactical triage. A simplified triage system was reportedly used by some doctors with an immediate designation for patients wounded centrally, in the abdomen or torso, as well as those in haemorrhagic shock. ‘Relative emergencies’ (Delayed) were patients wounded in extremities, even if a tourniquet had been placed to control haemorrhage.62

Inside the Bataclan Theatre physicians attached to the police special forces were situated at the rear of the assault as the intervention columns pushed in. In the main area of the
theatre they were confronted with approximately 100 patients and 400 other hostages. Due to overwhelming numbers and the unstable security situation the physicians elected to perform tactical triage by having all those who were not ‘invalid’ to move themselves immediately from the theatre. They then began the process of moving through the tangle of dead and invalid patients performing remote damage control resuscitation (RDCR) interventions.

**Patient Movement**

Over 50 Light Emergency Stretcher Systems (LESS) stretchers, specifically designed for use in mass casualty incidents, were delivered to and used for patient movement at the Oslo bombing site and the Utoya second CCS.

No similar lightweight stretchers were available in San Bernardino, and the extrication of casualties out of the IRC involved improvisation. The presence of blood and water made patients slippery and difficult to carry, and blankets, chairs and manual techniques were utilised. To move patients to Triage A police commandeered multiple VOO’s.

The large number of patients discovered inside the Bataclan once the police assault had pushed through needed to be moved to the initial CCP at the theatre entrance and then a longer distance to the ‘cold zone’ CCS. Due to a lack of stretchers many were carried on Police officers backs and on crowd barriers sourced from the street outside.

**Determination of Death/Black Tags**

According to San Bernardino Fire Department (SBFD) protocol none of the 14 victims that were designated as black tags inside the IRC met ‘obvious death criteria’. According to the START triage algorithm an apnoeic patient should have their airway opened, and if they still do not breathe spontaneously then they are a black, or ‘expectant’ category. A recent After Action Report (AAR) details that medics did not use either of these, but instead assessed presence of carotid pulse, absence of vital signs and then assessed the futility of care in consideration to the potential danger and resources onscene.

On Utoya Island, at approximately 1830hrs on July 22nd, 2011, police had arrested the perpetrator. They could not declare the Island secure at this stage as they were not positive that they were no accomplices involved. At around midnight 5 medical teams, escorted by armed police teams, combed the Island to locate remaining victims and provide declaration of death. This was done in the dark due to the need for light discipline, and initially provided an inaccurate count of 72 dead. This was corrected to 69 the next day.

**DISCUSSION**

The challenges of responders managing their own physiological stress as well as an austere environment and a dynamic threat profile create a barrier to application of accurate triage in CCTA’s.

Operations on Utoya Island after the perpetrator was arrested demonstrate the complexities of working in areas that may be clear but are not yet deemed secure. The
search for victims and declaration of deaths had to be conducted in the dark, with armed escort, creating difficult conditions for the medical teams.

The decision making in the Utoya Island attack on triage priority, especially in terms of transport triage, was associated with success in the literature due to the presence of experienced, senior physicians. This technique has been shown by an Israeli study to correlate to an accurate rate of identification of patients requiring an ‘immediate’ classification of only 50%. A study of United Kingdom (UK) Firearms Officers found that with a short training course and the use of triage decision making support tools there was a significant increase in the effective and accurate triage of patients. This finding has been replicated in a number of studies with various triage systems.

In analysis of the 22 July 2011 attacks in Norway the lack of a standard triage system was identified and later rectified, with a standard created and implemented across Norwegian EMS. A tactical triage category was included in this standard, which suggests the use of verbal commands to distinguish patients who can respond and move to those who can’t, splitting potentially large numbers of victims into those who require immediate assistance and those who can care for themselves for the short term whilst the non-permissive environment persists.

Although it is clear that there is a need for a standard in prehospital triage, and that accuracy is improved with the use of training and decision-making tools, the complexities of response to incidents such as terror attacks can interfere with their practical application. In analysis of the triage conducted by medical responders to the 2005 7/7 London bombings it was recommended that prehospital providers investigate more simplified triage systems, with only 2 prehospital triage categories rather than the traditional 4.

The majority of triage algorithms require the use of number ranges from assessed physiological parameters such as respiratory rate, pulse rate and capillary refill. As the use of anatomic cues such as injury location and mechanism of injury tend to create higher rates of over triage and assess for the potential to deteriorate rather than the current patient status; physiological ranges are used to provide a current snapshot in the triage process.

A report created from debriefs of the Westminster, Manchester and London Bridge/Borough Market terror attacks stated that the distinction between P1 and P2 triage categories was less relevant than the ability to walk. Another paper written by an attending Paramedic to the London Bridge/Borough terror attack, where 8 were killed and 48 injured, describes the difficulty of using physiological ranges in the setting of mass penetrating trauma. Many patients at this incident were mobile, however had serious wounds, and were physiologically compensating at the time of initial triage. By the time these patients show a significant change in their physiological parameters they can be irreversibly decompensated.

A tool that has been designed to avoid the need for gathering these parameters is the Careflight triage tool, which has no qualitative parameters. This tool performed identically to START and Manchester Sieve when applied retrospectively to patient data from the 2005 London bombings. The use of qualitative parameters only is well suited to use in tactical
settings, and with further simplification from Careflight’s 3 steps and 4 categories would be easily recalled and applied.

A technique formulated through experience with multiple mass casualty events in Baghdad to differentiate patients between immediate and expectant was the assessment of the presence of a radial pulse and conscious state.\textsuperscript{108}

This method has been validated in the prehospital combat environment through a retrospective analysis of the Joint Theatre Trauma Registry (JTTR).\textsuperscript{109} This study used the surrogate marker of 100mmHg Systolic Blood Pressure (SBP) to replicate a weak or absent radial pulse, as well as a Glasgow Coma Score Motor (GCS-M) component of 6 or less than 6.

Named the ‘Field Triage Score’ (FTS), these two parameters were applied to 4988 combat casualties from Iraq and Afghanistan between 2002-2008. Having both parameters present in a given patient an FTS of 2 was assigned; only one or the other an FTS of 1 and neither an FTS of 0. An FTS of 2 was associated with a mortality rate of 0.1%, whilst FTS = 1 increased to 6.1%. Having neither a SBP above 100mmHg or GCS-M of 6 (FTS = 0) had a mortality rate of 41.4%.

A random convenience sample of 216 patients transported by EMS helicopter in Texas identified that the absence of similar markers (GCS-M <6 and SBP <90mmHg) was independently associated after multivariate analysis with the need for lifesaving interventions (95% of these patients had at least one LSI applied).\textsuperscript{110}

Another retrospective registry analysis from Iraq used a slightly modified FTS (Cutoff at GCS\textsubscript{total} <8) applied to 536 battlefield casualties, finding a similar predictive accuracy for massive transfusion and mortality to the more complicated Revised Trauma Score (RTS).\textsuperscript{111}

Similarly, in a retrospective review of 1144 adult patients a number of triage algorithms were applied and compared. With reasonably similar results for sensitivity and specificity, the most significant predictors for severe injury of the triage components were GCS-M and blood pressure.\textsuperscript{105} The radial pulse character, in the prehospital setting, has been associated with a 29% mortality in those with a weak or absent pulse, and 3% with a strong pulse.\textsuperscript{112}

The use of GCS alone may have a strong predictive value for mortality and relevant triage category, with a similar performance to START, Fire Department New York (FDNY) and Careflight triage systems in a head to head comparison based on 530,695 patients recorded in the US National Trauma Data Bank (NTDB).\textsuperscript{113} A retrospective trauma registry analysis in North Carolina of 29,573 patients also found GCS-M as an effective predictor of mortality.\textsuperscript{114}

Based on these assumptions a tool that incorporates the parameters of GCS-M and radial pulse will have a reasonable association with mortality and may predict triage category almost effectively as current primary triage tools.

The Rapid Assessment of Mentation and Pulse (RAMP) triage system uses essentially the same parameters as FTS (GCS-M and radial pulse) to allocate to 3 triage categories: immediate, delayed and expectant.\textsuperscript{115} The removal of a fourth category simplifies the algorithm and makes it more amenable to apply in situations of evolving threat and high
physiologic stress. Specifically designed for tactical incidents, responders allocate a patient’s triage category by assessment of the ability to obey simple commands (GCS-M of 6) and the presence of a radial pulse. The absence of numbers, parameters or complicated algorithms makes this ‘tactical triage’ system easy to recall and apply in high stress and distracting environments such as CCTA’s.

A triage tool needs to identify more than just an association with mortality rates, it must also identify those who have the most to gain from appropriate and timely management. To make RAMP more applicable to this criterion the Sort, Assess, LSI, Treatment/Transport (SALT) ‘global sorting’ initial approach can be utilised to determine which patients to begin the individual triage process on first. Verbal commands are used to have anyone who can mobilise to walk to a given direction or area, and then ask patients to wave. Victims still lying still or with obvious life threats can then be assessed, followed by those who can wave but not mobilise. Once an individual patient is assessed, RAMP also incorporates the rapid application of necessary LSI’s into the triage process. This is identical to the Norwegian tactical triage system.

Lifesaving Interventions

To improve the way triage was performed by Paramedics after the 7/7 London bombings the need for clinical intervention during the initial triage process was evaluated. At that stage London Ambulance Service (LAS) used the Major Incident Medical Management and Support (MIMMS) principles that kept the first medical personnel on scene in a strictly triage allocation role, with no clinical interventions being undertaken. MIMMS was adapted following this review to include the rapid application of LSI’s in conjunction with the allocation of triage categories.91

With testimony from bystanders providing care at the Underground during 7/7 stating that there were multiple exsanguinating victims, the need for incorporation of LSI’s into the initial approach of a triage system is clear, with a number of other incidents also ratifying this concept.48, 55

The application of LSI’s requires definition of exactly what a lifesaving intervention in the hyperacute phase of a mass casualty incident is. One expert consensus paper sought to define LSI’s in order to better understand the parameters of assigning an ‘immediate’ triage category.118 Whilst some of the 32 LSI’s defined are relevant for inclusion in a rapid triage process, the majority are not, including interventions such as Rapid Sequence Intubation (RSI) and interventional radiology for haemorrhage control. LSI’s in the setting of prehospital triage should be rapid, use minimal equipment and be targeted to preventable causes of death, which therefore make the LSI’s specified by the SALT triage system an appropriate balance between saving lives and providing care to the maximum number of victims, especially in high threat incidents:116

- Severe haemorrhage control (Tourniquets, wound packing and/or direct pressure)
- Basic airway management (Nasopharyngeal Adjuncts and prone/recovery position)
- Application of vented chest seals and needle decompression of tension pneumothorax
- Administration of Chemical, Biological, Radiological or Nuclear (CBRN) Antidotes

The application of swift and effective haemorrhage control has been shown to have a significant effect on decreasing mortality if applied prior to the onset of shock. The earlier these interventions can be applied will be not only be lifesaving but also reduce the patients further resource requirements. Emerging evidence on civilian public mass shootings has identified that the majority of preventable deaths are occurring due to thoracic injury and tension pneumothorax, highlighting the need for rapid intervention with chest seals and decompression.

A tactical triage system should allow for LSI’s to be applied during the process of rapid patient assessment, due to risk of sudden exsanguination or deterioration.

**Marking of Triage Category**

Triage tags were only placed on 12% of patients at the 2009 Turkish Airlines plane crash in Amsterdam, echoing the experience in Norway, Paris and San Bernadino. The lack of use of triage tags appears to be a common feature of both disasters and terror attacks, with attribution to a skill outside of normal practice, need for fine motor skills, lack of space for details, removal or destruction of the tag and delays in patient care and evacuation due to completing and applying the tags. Alternatives to standard tags that could be utilised in CCTA’s and other tactical incidents are geographic triage, unnatural positioning and triage tape.

Geographic triage is similar to the system used in San Bernardino where tarps were laid out and designated to different triage categories. This may not be applicable to highly mobile and dynamic situations; however, it is a technique that can be incorporated easily into a warm zone CCP with patients of certain triage categories being placed in allocated areas, marked by tape, tarps or glow sticks.

The marking of dead patients can be problematic, especially if triage tags are not carried or utilised. Placing patients that are clearly deceased into a position with legs crossed and arms placed behind the head can prevent re-assessment and unnecessary movement after the initial application of triage category. A criticism of this technique is that it potentially disrupts evidence that may form part of a future police investigation. Whilst this is a view founded in fact, on the balance of potential disruption, the initial patient assessment will not have to be replicated to determine death and the body will be left in its original location. The determination of death at San Bernardino showed that this process may be undertaken a number of times to ensure all patients have been discovered and assessed. From the authors personal experience, responders to the 2014 Sydney Lindt Café siege faced a similar issue with one deceased patient being assessed and resuscitated three separate times by three different teams, as well as being moved location twice, a disruption of evidence that would have been avoided with the use of unnatural positioning.

An alternative to the use of tags is triage tape, utilised by many prehospital agencies that have grab bags to be used at AVI’s. To minimise weight and space triage tape is a lightweight solution and one roll of each colour can cater for the marking of many victims.
Tying a length of tape around a patient’s limb uses gross motor skills, therefore making the procedure of triage designation more reproducible under high stress conditions.

**Patient Movement/Extrication**

Movement of patients is inextricably linked to the process of triage and can be presumed to occur more often in CCTA’s due to the dynamic nature of the threat profile. Incidents such as the 2017 Westminster and 2016 Bastille Day terrorist attacks, with an extreme geographical spread of patients, create difficulties in triage and treatment of patients. The judicious use of CCP’s will assist in the colocation of patients and resources and make command and control more effective, however this will also require patient movement. Experience from the Lindt Café Siege highlighted the need for a lightweight extrication capability with five patients initially dragged manually out of the café, and then rapidly moved on wheeled stretchers over uneven ground and by hand as it was realised that the terrorist had a potential IED in his backpack nearby the CCP. This example highlights the need for security as an integral consideration in the designation of CCP locations, and that rapid patient movement may be required as a result of changing threat levels.

Patient movement was facilitated in Oslo and Utoya by the delivery of large numbers of LESS stretchers to the scenes. In both Paris and San Bernardino, the lack of patient extrication devices meant improvised techniques needed to be relied on. Availability of a specifically designed stretcher to be deployed at a CCTA will enable more effective extrication and movement of patients, which in a dynamic event may be required multiple times. Another alternative to the LESS system is the use of soft litters, a lightweight and compact option that are easily conveyed to a scene due to their small bulk. A number of soft litters can be carried by a responder or crew to deploy into a scene with multiple patients and could form an element of the response paradigm for any CCTA or intentional mass violence incident.

Novel systems are under development which may simplify the approach to some high threat incidents in the future, such as a point of care ultra sound (POCUS) triage tool proposal for categorisation of victims from hostile vehicle attacks. Continued research into innovative models and validation of existing ones will refine the triage process to make it more applicable and relevant for high threat environments such as CCTA’s.

**LIMITATIONS**

This paper focuses on triage in CCTA’s, however the application of triage in other intentional mass violence incidents, such as non-terror related attacks, may hold unknown differences.

Available literature from peer reviewed and grey sources was used to form insights into the experience of responders conducting triage in CCTA’s. The lack of regular and high quality reporting on the prehospital response to terrorism may limit the applicability of findings.
Further investigation of the conclusions of this paper was not conducted through interviews and mixed methods research. Whilst potentially limiting the scope and accuracy of findings, it also highlights the direction of future research priorities.

**CONCLUSION**

CCTA’s pose a challenge to responders in their unsafe, overwhelming and dynamic environments. Recent events have shown significant barriers exist in the application of triage systems, including algorithms and tools, tags, patient movement and warm zone triage.

Triage tool’s currently in use are not well suited to the highly stressful and dynamic setting of tactical events such as CCTA’s, particularly in the initial, or tactical triage stage. Some tools are designed for or could be adapted to the tactical triage setting, with retrospective validation of parameters.

Further prospective research is required to validate effective triage tools for dynamic tactical situations, and innovative models incorporated into current triage systems.

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**Conclusion**

Of the themes identified through the systematic search of the literature, triage was one that responders consistently highlighted as a capability gap and an area of future improvement.

The secondary research question outlined in Chapter 1, around innovative approaches to terrorism response, was explored in this chapter. Through the use of a comparative analysis it was possible to identify innovative approaches from the experience of responders in previous CCTA’s. These approaches, combined with the other findings of this chapter, will enable the formation of ‘lines of action’ in Chapter 5.

This comparative analysis of triage application in CCTA’s specifically highlighted ‘lines of action’ around the use of tactical and law enforcement triage.

CCTA’s present the highest strain on emergency services and other themes should be explored to the extent triage has been in this paper to facilitate a broad set of ‘lines of action’ to inform policy for high threat response.

This chapter enabled the theme of triage, and its application in the highest level of response complexity, to be analysed in detail. The use of a comparative analysis highlighted the strengths and weaknesses of current approaches in recent CCTA’s. Future research is required in exploration of the other identified themes to the same depth as triage was explored in this chapter.
Chapter 4: Australian Prehospital Terrorism Response

Introduction

Terrorism response in Australia is in varying degrees of readiness, ranging from states with no response capacity through to specifically trained and equipped specialist teams in others. In order to establish a roadmap for the development of these capabilities across the country I undertook a Churchill Fellowship in 2015, investigating international best practice in terrorism response and tactical medical operations. The report from the Fellowship is included in Appendix 2.

The release of the report in 2015 outlined a three-tiered strategy from general responder awareness training through to full time tactical response teams. This strategy has been implemented to various stages, with NSW Ambulance special operations having developed the most advanced current prehospital terrorism response capability.

This chapter outlines the current baseline in Australia, in order to understand two factors that are essential to the setting of ‘lines of action’ in chapter 5.

The first is the progress made on the recommendations of the Churchill Fellowship report in 2015. Several local projects have been instigated on the back of the report, and collation of information on these projects will provide some oversight on national efforts to improve tactical medical response capacity.

The second factor is the current status of training, equipment and capability. In order to recommend on future progress a well-informed picture is required of where we are moving from.

Current Australian High Threat Response Architecture – Current at May 2019

Australia currently has a range of disparate models with no significant standardisation or governing body. Police Tactical Groups (PTG’s) and other specialised police units have a wide range of medical capability, from dedicated Tactical Emergency Medical Support (TEMS) to advanced scope police tactical medics. Ambulance response is similarly disparate.

The following summarises current known capability, drawn from publicly available documents, standard operating procedures (SOP’s) and guidelines. The author’s own experience in working and training with national response organisations, as well as through some correspondence with the network established by the work of the Australian Tactical Medical Association, has been used to clarify the publicly available documents, which allowed further understanding of response capability across the states and territories.

Queensland:

General Response

- Ambulance: A Clinical Practice Guideline (CPG) was written in 2018 and published in the Clinical Practice Manual (CPM) with guidance on Tactical Emergency Casualty Care (TECC) principles for all Queensland Ambulance Service (QAS) Paramedics.
Tactical interventions including vented chest seals and junctional wound packing were rolled out with the CPG.

- **Police**: Tactical first aid has been rolled out in conjunction with the Queensland Police Active Armed Offender (AAO) program for a number of years. All officers that undertake the training are familiar with the use of TECC principles and interventions, and Individual First Aid Kits (IFAK’s) are widespread throughout the service.

**Specialised Response**

- **Ambulance**: The High Acuity Response Unit (HARU) has a mandate to provide both TEMS support to the Specialised Emergency Response Team (SERT) and Public Safety Response Team (PSRT) as well as provision of warm zone care in intentional mass violence incidents. They have Ballistic Protective Equipment (BPE), and staff have conducted a 1 day tactical familiarisation course. HARU have also sent paramedics to undertake the NSW Ambulance tactical medical operations course.

- **Police**: Queensland Police SERT have an advanced Tactical Medic capability with 10 currently trained medics. All medics have scope of practice under the QAS medical director and skills maintenance is undertaken with HARU by theory and on road response, as well as through tactical medical courses up to the level of Certificate IV with private providers.

**New South Wales**

**General Response**

- **Ambulance**: No current general responder training, equipment or guidance have been rolled out to NSWA Paramedics.

- **NSWA SOT** have created a package and business case however this has not yet been approved or implemented.

- **Police**: IFAK’s have been purchased by various police area commands (PAC’s) historically, and recently large numbers have been purchased centrally and provided to officers across the state. The 2018 iteration of the NSW Police AAO package has a TECC medical element based on the US Advanced Law Enforcement Rapid Response Training (ALERRT).

**Specialised Response**

- **Ambulance**: NSWA SOT and Rescue have approximately 135 Paramedics trained in TEMS and intentional mass violence response through a 2 day tactical medical operations and 1 day tactical triage course. Coverage exists throughout Sydney and 6 major regional centres. They have an advanced scope of practice with TECC interventions in tactical settings and provide medical support to high risk operations conducted by state and national PTG’s.

- Further advanced training modules are being rolled out currently, with a proposed full time TEMS capability.

- **Police**: Specialised units have been undertaking a 4 hour tactical first aid package provided by NSWA TMO instructors, now rolled out to over 300 officers from various
specialised police units, with further training to be rolled out. The state PTG have embedded tactical medicine as an annual competency for re-certification of all operators.
- PTG medical support is provided by NSWA SOT on a part time, call out basis.

**Victoria**

General Response
- None identified.

Specialised Response
- **Ambulance**: No TEMS or warm zone Ambulance resources currently.
- **Police**: The VicPol Special Operations Group (SOG) has a Tactical Medic program with an advanced scope and training through private and government providers.

**South Australia**

General Response
- **Ambulance**: No high threat awareness training but all ambulance kits have gold standard tourniquets and Paramedics are trained in their use.
- **Police**: No current capability.

Specialised Response
- **Ambulance**: South Australian Ambulance Service (SAAS) Special Operations provide TEMS to the PTG, Special Tasks and Rescue (STAR). In house, informal training on tactical combat casualty care (TCCC) including reality based, sensory deprived and care under fire training
- **Police**: TCCC and care under fire training provided by SAAS SOT, advanced interventions including bag valve mask ventilation, oropharyngeal airways, Israeli bandages and tourniquets.

**Australian Capital Territory**

General Response
- **Ambulance**: All Australian Capital Territory Ambulance Service (ACTAS) Ambulances now carry a TECC ‘grab bag’ and familiarisation training has been conducted by all Paramedics.

Specialised Response
- **Ambulance**: ACT Ambulance currently have no specialised tactical medical response capability.
- **Police**: Australian Federal Police (AFP) Specialist Response Group (SRG) has dedicated tactical medics who undertake skills maintenance through the Canberra Hospital. Officers are undertaking training up to the Certificate IV and Diploma of Paramedical Science level.
- AFP Dignitary Protection complete a tactical medical component during their initial close protection course, conducted over 2 days and run by a private TECC training provider.

**Northern Territory**

General response

- None identified.

Specialised Response

- **Police**: Some specialised police units have undertaken tactical medical training with private TECC providers. Undertake and participate in training exercises with search and rescue and border patrol.

**Tasmania**

General Response

- **Ambulance**: Tasmanian Ambulance have begun investigation of models for high threat tactical response (including a medical warm zone response) and have exercised capabilities to identify future direction and vulnerabilities.
- **Police**: Tasmanian Police have engaged a private company for tactical medical training, consisting of a 2-day course, that all police officers are undertaking.

Specialised Response

- None identified.

**Western Australia**

General Response

- None identified.

Specialised Response

- **Ambulance**: St Johns Ambulance have a Special Operations Team with a skill set that encompasses Urban Search and Rescue (USAR), CBRN/Hazmat, vertical and confined space rescue. They do not currently have a trained tactical medical response.
- **Police**: The Dignitary Protection Unit (DPU) has undertaken 2 day tactical medical training with private TECC providers.

**Conclusion**

This baseline of capability, which has progressed significantly from where it was 3 years ago before this project began to stimulate much of the work now done, will allow for reflective growth as the national approach is strengthened and further information sharing and research is completed.
This chapter has shown that many local projects have begun across the country, but there is a lack of interagency training or collaborative work. Having identified this national issue, the next stage of this thesis will be focused on observing international models of collaborative tactical medical operations, and recommending elements of these approaches that can be implemented in Australia to enhance clinical governance and stimulate interagency training and operations.

Further research priorities were identified from the Churchill Fellowship in the areas of high threat response education and training, standardisation of care models and law enforcement trauma care. The next chapter outlines further international research undertaken to cover these priorities and provide recommendations for a collaborative approach that will enhance Australia’s resilience to future terror attacks.
CHAPTER 5: Clinical Governance and Interagency Collaboration in Tactical Medical Operations

A roadmap for the incorporation of the pragmatic/meta-aggregational conceptual framework has been laid out throughout this thesis. The final stage is the establishment of ‘lines of action’ from the research findings.

To enable this a study trip was undertaken to the UK and Ireland to identify current best practice in terrorism response and to identify lessons learned from first responders who have been involved in the extraordinary number of attacks in their region in recent years.

A roadmap for Australian prehospital response had been established with the Churchill Fellowship trip in the initial stages of this master’s project, and significant work has been underway in the proceeding years to realise this plan. The Ian O’Rourke Scholarship was conducted to build on the findings of the Churchill Fellowship, systematic literature review of the prehospital response to terrorism and comparative analysis of triage in complex coordinated terrorist attacks. This report aims to find ways forward on the identified themes of the research thus far, through recommendations that will enable further research, policy development and response capacity enhancement.

The following summarises current known capability, drawn from publicly available documents, standard operating procedures (SOP’s) and guidelines. The methodology was largely a desktop review, with observation of local response architecture during the study trip.

The findings of this report are based around fourteen recommendations, the ‘lines of action’ that are intended to translate research into policy.

A restricted version of this paper has been disseminated through NSWA Special Operations and NSWA executive management, and several of the recommendations have been implemented. The reason for the dissemination of a restricted version is to ensure certain information around terrorism response, planning considerations and current capability gaps is not available beyond a vetted group, to ensure it doesn’t become available on the public domain.

This version of the paper is unrestricted and therefore some sensitive elements have been removed.

This paper has been published in the peer reviewed Journal of High Threat and Austere Medicine on 12th February 2019.
Clinical Governance and Interagency Collaboration in Tactical Medical Operations

2018 Ian O’Rourke Scholarship in Patient Safety - New South Wales Health Clinical Excellence Commission

Executive Summary

- Prehospital terrorism response has been bolstered significantly in the past couple of years, however there are still large capability gaps. International best practice and identified lessons from previous attacks can provide guidance on moving forward, with a systems approach to robust high threat medicine provision.

- Creation of a national Special Operations Medicine Institute would enable a strategic, collaborative approach to prehospital terrorism response. The Institute would provide for a repository of subject matter expertise across all high threat patient access and rescue domains, including police medics.

- A greater focus on the training and equipping of law enforcement officers across Australia will significantly add to the ability to save lives in intentional mass violence incidents, and will save lives from the traumatic incidents that police officers encounter in their day to day role.

- High threat response training for all first responders is crucial, and should be considered in all Australian emergency services. A number of strategies are easily implemented for refining and standardising Australian prehospital high threat response.

- NSW Special Operations Unit has a unique opportunity to build Tactical Medical Operations structure and training to include integrating with police more fully, and to ensure that capacity exists for high threat response across the state, bridging a currently identified capability gap.

THIS IS THE UNRESTRICTED VERSION OF THIS SCHOLARSHIP REPORT. SOME ELEMENTS HAVE BEEN REMOVED DUE TO THE SENSITIVE NATURE OF THEIR CONTENT AND ARE AVAILABLE ONLY TO DESIGNATED PARTIES.
Scholarship Recommendations

**Recommendation 1** – Establish a Special Operations Medicine Institute

**Recommendation 2** – Current NSWA SOT Tactical First Aid program for police be expanded for specialised police units

**Recommendation 3** – Police tactical medical capability be strengthened with a focus on training, scope of practice and governance

**Recommendation 4** – NSWA Special Operations Tactical Medical Operations capability be expanded and become more integrated with NSW Police Tactical Operations Unit, supporting the development of further police medical capability

**Recommendation 5** – NSWA Special Operations Tactical Medical Operations capability be expanded to include full time staff, a rotating roster and an advanced tactical paramedic specialisation

**Recommendation 6** – A national guideline to be developed for Law Enforcement Tactical Triage

**Recommendation 7** – Joint Response Unit police/paramedic models be considered for implementation in metropolitan centres in Australia

**Recommendation 8** – A course and security cleared role be investigated for use as an interagency liaison officer within Australian emergency services, potentially run centrally through a Special Operations Medicine Institute

**Recommendation 9** – Soft Litters to be located in Major Incident Support Unit (MISU) vehicles and in NSWA forward commander vehicles to provide an extrication capability at mass casualty incidents.

**Recommendation 10** – Soft Litters to be utilised by emergency services to provide a lightweight, easily deployable extrication capability at intentional mass violence and other disaster/mass casualty incidents

**Recommendation 11** – A Tactical uniform be introduced for NSWA Special Operations Tactical Medical Operations

**Recommendation 12** – Ballistic Protective Equipment be personally issued to Special Operations Tactical Medical Operations Paramedics and kept in responder vehicles to ensure an expedient and safe response to high threat incidents

**Recommendation 13** – High threat response training should be considered across all Australian emergency services

**Recommendation 14** – NSW AMPLAN be updated for specific discussion of response to intentional mass violence
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1.1 DEFINITIONS

Terrorist Act:

An act or threat, intended to advance a political, ideological or religious cause by coercing or intimidating an Australian or foreign government, or the public, by causing serious harm to people or property, creating a serious risk to the health and safety of the public, or seriously disrupting trade, critical infrastructure or electronic systems.

Tactical Emergency Medical Support (TEMS):

The provision of medical care to a specified group involved in tactical operations by trained medical providers.

Active Armed Offender (AAO)/Active Violence Incident (AVI):

A person armed with a firearm who is actively engaged in killing or attempting to cause serious harm to multiple people in a populated area.
Intentional Mass Violence:
The use of violence against a group or groups of persons through any means, with the purpose of causing a mass casualty incident.

High Threat Incident:
Any incident where a danger exists to responders. This may be from intentional, natural or any other hazards. Tactical and terrorism response are a subset of high threat incidents.

Complex, Coordinated Terrorist Attack (CCTA):
An intentional use of force to cause physical injury or death to an identified population through a coordinated and multifaceted approach using a multitude of conventional weapons and tactics

Marauding Terrorist Firearms Attack (MTFA):
Terminology used in the UK emergency services to denote a CCTA incident, where terrorists are actively causing harm with the use of weapons, including vehicles and/or edged weapons, and have the intent and opportunity to continue doing so.

Tactical Emergency Casualty Care (TECC):
A tiered system of threat dependent patient care utilised by civilians in tactical or high threat environments, based on best practice trauma guidelines.

Tactical Combat Casualty Care (TCCC):
A tiered system of threat dependent patient care utilised by military combatants in armed conflict.

2.1 CONTEXT AND THREAT

Australia faces an increasing landscape of threat from terrorism. The threat has evolved significantly with the call in Al Queda’s Inspire magazine in 2010 for strikes against pedestrians with vehicles being realised on the streets of Western countries. In combination with the use of edged weapons, firearms and improvised explosive devices (IED’s) the devastating results are specific injury profiles and dynamic threat situations which in turn need a specific clinical and operational response. The attacks of the past year including Westminster, London Bridge and Manchester have tested the United Kingdom’s (UK) response capabilities, and the operators from all emergency services have developed expertise and experience in working in dynamic, unsafe scenes.

The increase in low tech attacks, encrypted communications and online remote radicalisation has created a situation where disruption through intelligence is more and more difficult for police and government agencies. Since the Australian Terrorism Public Alert System was raised to ‘Probable’ in 2014 there have been 5 terror attacks and 15 disrupted, planned attacks. The current assessment from the Australian Security
Intelligence Organisation (ASIO) is: “Australia’s National Terrorism Threat Level remains PROBABLE. Credible intelligence, assessed by our security agencies, indicates that individuals or groups continue to possess the intent and capability to conduct a terrorist attack in Australia.”

The Criminal and Terrorism Incident Annex to AUSTTRAUMAPLAN states that state ambulance services are required in the response phase of a terrorism or intentional mass violence incident to “…provide initial triage and treatment of patients in a heightened security environment and to those affected by CBR agents.” To fulfil this mandate all Australian ambulance services should be implementing a warm zone response capability and preparing all responders with high threat incident awareness training.

The occurrence of complex, coordinated terror attacks (CCTA’s) such as Mumbai (2008), Norway (2011), Paris (2015) and London (2017) highlight the difficult response paradigm for ambulance when large numbers of patients present with critical penetrating injuries and a dynamic threat.

An identified capability gap exists in the provision of lifesaving interventions during an attack between the application of violence and the instigation of treatment by professional healthcare providers. In the 2017 London Bridge/Borough Market terror attack specialist firearms police had killed all the offenders within 8 minutes. Due to the unknown element of secondary attacks or other perpetrators, many patients were not accessed by advanced medical providers for a significant amount of time, with the first patient conveyed by ambulance arriving at hospital 52 minutes after the onset of the incident. A number of critically injured patients were still barricaded in restaurants for up to 2 hours after the incident was resolved. During this time police and military teams were clearing the area of Borough Market and Southwark Cathedral door to door. Larger numbers of police were in close proximity to patients in the warm zone than ambulance personnel, and with 48 injured (including 4 police officers) there was a need for first aid intervention for penetrating injuries, as well as rapid extrication, by as many emergency services personnel as possible.

This clearly outlines the ‘therapeutic vacuum’ that exists whereby critically injured patients may not be accessed by advanced life support (ALS) providers for a significant time after onset of the incident; even when the threat has been neutralised. The same issue has been identified in multiple intentional mass violence incidents in recent years.

There are a number of models to bridge this capability gap:

- **Bystander first aid**
  - **Pros**
    - Often in immediate vicinity of victims at point of injury
    - Can be a substantial number available to assist
    - If improvised techniques are familiar can provide effective haemorrhage control in crucial early stages
  - **Cons**
    - Variable training, knowledge and skill level for lifesaving interventions
    - Usually will have no medical equipment available
Barriers to implementation of bystander care training exist in Australia due to a lack of perceived threat. This is possibly as a result of effective gun control and police intelligence disruption of terrorist acts.

- **Police tactical first aid**
  - Pros:
    - Often on scene quickly
    - Variable training and experience, with some excellent programs giving critical skills and equipment to officers
    - Variable medical equipment available: Individual first aid kits (IFAK’s), go bags, standard first aid medical kits
    - Training in tactical first aid offers cross over benefit to other medical and trauma incidents that police respond to
  - Cons:
    - Primary role is to focus on elimination and containment of the threat, and to provide ongoing security, therefore medical care may be impossible or difficult in early stages of an incident

- **Escorted warm zone care (Rescue Task Force)**
  - Pros:
    - Provides lifesaving interventions to advanced life support (ALS) level
    - If performed rapidly will decrease the time of ‘therapeutic vacuum’.
  - Cons:
    - May be delayed due to response model, availability of resources and threat level
    - The need for law enforcement escorts can divert resources from the primary role of threat suppression and elimination
    - Currently in Australia very limited warm zone ALS resources are available

A hybrid, integrated and layered approach to these models will be the most successful strategy.

The UK has faced a significant challenge with terrorist incidents over recent years, including the 2005 7/7 London Bombings, 2017 Westminster attack, 2018 London Bridge/Borough Market attack, Manchester Arena bombing as well as many others. This stimulus, as well as international experience through CCTAs in Mumbai (2008) and Paris (2015) has created a permissive environment for funding and change, and therefore enhanced training and capability across the UK.

The past 2 years have seen a huge impact from terror attacks in the UK, with long term effects on systems, staff and the public. This scholarship intends to explore UK responses to these events and implementation of change to identify elements relevant for incorporation in Australia.
Research on international best practice through interaction with pioneering initiatives in the UK was sought to enable the flow of information to the NSW Ambulance (NSWA) Counter Terrorism and Emergency Management (CT & EM) Special Operations Unit, and through national dissemination to other Australian emergency services. With the goal of enhancing the quality and appropriateness of high threat clinical response, this research is intended to have a significant impact on patient safety during high threat operations in Australia.

Recommendations are indicated with colour codes to identify:

**National Recommendations**

**NSW Ambulance & NSWA Special Operations Recommendations**

Some of the recommendations are easily implemented, whilst others are long term and ambitious projects that will take time, will and energy to bring to fruition and see their effects on high threat capability.

### 3.1 SCHOLARSHIP OVERVIEW

The 2018 Ian O’Rourke Scholarship was designed around visiting ambulance and police tactical teams in the UK and Ireland to investigate the main issues that are vital to the enhancement of patient safety from high threat incidents such as terrorist attacks and intentional mass violence incidents.

Many thanks to the following units for facilitating my visits and meeting with me to discuss tactical medicine systems and innovations. The collective efforts of many individuals across these teams are creating world class care to their patients and building first rate response systems. The opportunity to learn from all of you has been an amazing experience and I’m extremely appreciative of your time.

**Dublin, Ireland:**

- Emergency Response Unit (ERU), An Garda Siochana
- An Garda Siochana College
- Special Operations, National Ambulance Service

**London, England:**

- CO19 Counter Terrorism Specialist Firearms Operations (CTSFO)
- London Ambulance Service (LAS) Hazardous Area Response Teams (HART)
- LAS Joint Response Unit (JRU)
- LAS Tactical Response Unit (TRU)
- LAS Special Operations Response Teams (SORT)
- London Air Ambulance
- Georges University
- British Transport Police (BTP) Medic Program
- Metropolitan Police Specialist Training Centre, Graves End

**Leeds, England:**
- Yorkshire Ambulance Service (YAS) HART
- West Yorkshire Police

**Edinburgh, Scotland**

- Scottish Ambulance Service (SAS) Special Operations Response Team (SORT)

**Winterbourne Gunner, Salisbury, England:**

- National Ambulance Resilience Unit (NARU)
4.1 RESEARCH THEMES

Clinical Governance and Models of National Standardisation

The first priority for this research project was governance systems across tactical medical operations units and personnel. The UK established national standardised systems after the 2005 London bombings, centred around Ambulance Trust HART’s. Over the proceeding years, as a result of the significant elevation and evolution of the threat level, this system has been bolstered and innovative projects added to it, including police-ambulance integration through the LAS TRU and JRU.

The research undertaken in this project investigated whether UK and Irish models of governance and standardisation would have benefits for further exploration and implementation in Australia.

Can a systems based approach enhance patient safety in dynamic intentional mass violent events through the creation of doctrine and a clinical governance system?

If so, on a state level doctrine and tactics, techniques and procedures (TTP’s) will be created by and used within the NSWA Special Operations Unit for Tactical Medical Operation’s (TMO). This research will also translate to high threat response training that is currently proposed for all Paramedics in NSW.

On a national level the viability of an Australian body that can oversee high threat response training, doctrine and capability will be assessed, in line with UK models.

Interagency Collaboration and Interoperability

The second theme of this research project centres on the interagency integration that overseas units have established, and investigation for their relevance in Australia.

The units visited have a number of models of interagency interaction, and have potential to bring great benefit to the public of NSW and Australia through safer, more effective high threat response and clinical care.

5.1 RECOMMENDATIONS

5.11 National Standardisation and Interoperability

There is currently no system for national standardisation of high threat medicine in Australia. This creates an environment rich in siloing and duplication of effort. Disaster preparedness is represented by Emergency Management Australia (EMA), and Counter Terrorism by the Australian and New Zealand Counter Terrorism Committee (ANZCTC). ANZCTC has no medical representation, and undertakes no national projects that focus on the medical response to terrorism.

The Australian and New Zealand Policing Advisory Agency (ANZPAA) reports to the police commissioners of Australia and New Zealand, and does not currently have any tactical medical representation.
In NSW the State Rescue Board (SRB) fulfils a similar role to the UK’s National Ambulance Resilience Unit (NARU), however this only extends to rescue units and therefore does not provide the same functions for terrorism response and tactical medical operations.

The Australian Tactical Medical Association (ATMA) was formed in 2017 to provide a platform for standardisation and representation of the sector to advocate for greater capability in high threat medical response. As a not for profit the mandate of ATMA is to create national networks and working groups to facilitate capability progression and shared learning. ATMA runs clinical professional development and an annual conference, but are not a training provider.

The UK utilises a national, standardised structure to deliver education and provide governance for all specialist high risk prehospital providers. Each National Health Service (NHS) Trust has HART units that respond to any high threat incident, including firearms and terrorist incidents.

The National Ambulance Resilience Unit is a national centre for all the NHS Trusts that oversees training, standards and models of response for UK special operations or hazardous area medical response. HART, Ambulance Intervention Teams (AIT) and TRU paramedics from all NHS trusts attend initial and ongoing training at NARU’s training facility in Salisbury. NARU also oversees auditing and regulation of all HART across the trusts, including daily consolidation of available resources and any deviation from minimum staffing. NARU is also the central point for mutual aid coordination between trusts if a major incident occurs that requires assistance from other HART locations.

The NARU model works very well in the UK, however in Australia an alternative means of creating a national body that will form a knowledge bank, standards manager, governance system and education provider is required that sits outside of the current emergency services system. The disparate nature of Australian emergency services across state and territory jurisdictions creates significant barrier’s that in turn require a less structured and centralised model than the UK NHS system.

**Recommendation 1 – Establish a Special Operations Medicine Institute**

The establishment of a national ‘centre of excellence’ to standardise and develop education and training in high threat response is recommended, based on the UK NARU model. A significant difference from NARU would be an advisory, educational and training role, but not a regulatory role. With significant differences in state-based legislation as well as TTP’s and structures, it would be a huge and unnecessary task to attempt complete standardisation and regulation across the country. Local threat context and environmental factors mean that this type of regulatory standardisation would be inappropriate.

A ‘Special Operations Medicine Institute’ would become a central repository of knowledge and best practice for all forms of high threat response, with the following fundamentals:

- A Police faculty to provide a central point of reference for AAO medical training, PTG medics and tactical first aid programs across the nation.
- The police faculty can provide clinical governance guidance to state based law enforcement medical programs.
- A prehospital special operations medicine faculty with a focus on:
  o Medical directorship of special operations and tactical medical teams.
  o Training and governance of ambulance special operations teams.
  o Advising on best practice in prehospital special operations and capability development
- Due to the significant involvement of the Australia prehospital sector with university level education, it would be a logical step for the body to be associated with a tertiary institution. This would provide access to a platform for research as well as the development of graduate and postgraduate courses in special operations and law enforcement medicine.
  o An undergraduate degree is currently the baseline for most Paramedic education nationally.
  o Postgraduate qualifications are quickly becoming the baseline for Critical Care or Intensive Care Paramedics nationally.
  o A number of courses are provided in the medical aspects of disaster response and emergency management by universities including Edith Cowan University (ECU) and Monash.
  o Central Queensland University (CQU) will begin a Graduate Certificate in Tactical Medicine in early 2019. This includes pathways for police medics to enrol with appropriate experience and qualifications.
- Partnerships with the Department of Home Affairs, ATMA and ANZCTC will ensure that this organisation does not duplicate effort and provides a significant capability across the nation.
- A national training facility, as per the NARU model, is recommended to provide for the high fidelity, immersive training that is fundamental to the provision of effective high threat medicine.
- The John Hopkins Centre in the USA is an exemplar in this field, and may be a potential source of guidance.

5.12 Law Enforcement Medical Capability

**Recommendation 2 – Current NSWA SOT Tactical First Aid program for police be expanded for specialised police units**

**Recommendation 3 – Police tactical medical capability to be strengthened with a focus on training, scope of practice and governance**

CO19, as the tier 1 firearms police response for terrorist incidents in London, have medics integrated into teams that can provide advanced medical treatment for their own team, and also have the potential to treat civilian casualties once the threat level has been mitigated or reduced. This is mirrored in the Counter Terrorism Specialist Firearms Officer systems around the country.
The Irish ERU, with the same law enforcement role, also train a number of operators as medics with a specific focus on tactical medical interventions. Outside of the police tactical group there is minimal medical training for An Garda officers, and this is an area of future focus and expansion.

Other specialised police units throughout the UK undertake the same training. Authorised Firearms Officers (AFO’s) that staff the Armed Response Vehicles (ARV’s) in England attend a high number of cases and are well versed in the application of lifesaving interventions in high threat environments, as well medical care for a range of patient presentations. Due to their availability as mobile resources, ARV officers attend a large number of cases and are anecdotally very skilled at the application of life saving interventions in high threat environments.

Doctors and Paramedics from London HEMS attend a large number of high acuity penetrating trauma cases, with 2017 statistics showing a 31% case load of all responses (The highest of all categories). A number of HEMS staff stated that they often attend these cases with excellent initial TECC care already undertaken by firearms police.

Armed police throughout the UK, including British Transport Police and the Civil Nuclear Constabulary (CNC) undertake medical training up to the level of D13 (enhanced). This consists of a 5 day course with an extensive overview of prehospital medical knowledge including tactical interventions such as wound packing and tourniquets, as well as the use of airway adjuncts and oxygen. The medical training level of D13 for all armed police officers in the UK from AFO, ARV to CTSFO all follow the D13 module which is contained within the NPFTC – National Police Firearms Training Curriculum.

This includes all county and metropolitan police forces as well as BTP and CNC and ensures a parity of training level. Clearly individual forces offer greater or lesser exposure to incidents, however all armed police officers are trained to the same base line level of D13.

There are two levels to D13 – D13.1 (Standard one day ELS training) and D13.2 (Enhanced 5 day course).

Each module is basically the same content with D13.2 being the ‘enhanced’ level because the 5 day course goes into a little more detail and contains more scenario based training.

Analysis of Patient Report Forms (PRF’s) completed from patient encounters by D13 trained UK AFO’s reveal a significant benefit to patients that they encounter with medical care provided prior to the arrival of ambulance resources. Australian police medic programs are in various stages of progress on tactical medical capability, and should be expanded drawing on the experience and lessons of the UK. The expansion of capability, particularly if further interventions and medications are added to the police medic’s scope of practice, requires a strong governance system.

In NSW, SOT TMO should expand the current tactical first aid package for specialised police units. Across the nation tactical first aid and further immersive training and capability should be an area of priority for police services.
Recommendation 4 – NSWA Special Operations Tactical Medical Operations capability be expanded and become more integrated with NSW Police Tactical Operations Unit, supporting the development of further police medical capability

5.12 NSWA Tactical Medical Operations cell

Recommendation 5 – NSWA Special Operations Tactical Medical Operations capability be expanded to include full time staff, a rotating roster and an advanced tactical paramedic specialisation

5.13 Planning

5.14 Operational Response

The TRU model provides a good example of how an effective full time team can provide coverage and short response times for terrorism, and should be considered as an avenue for SOT tactical paramedics to ensure that NSWA maintains a capability for this eventuality.

The structure of tactical response is not ideal for the NSWA context however. When TRU, AIT or HART paramedics enter the warm zone they move through an entry control point at the forward command post (FCP). They move in a team, usually of 3 (1 team leader and 2 paramedics) and are directed to either

- Treat and leave, or
- Treat and extricate.

If available, fire and rescue personnel will also move with the teams and assist with lifesaving interventions and extrication.

Prior to entering the warm zone, zones will have been designated according to known information by a joint decision in the FCP, and a limit of exploitation set which the teams are specifically prevented from going past. If the situation changes on the ground they must relay back through their team leader to the FCP where a joint decision must again be made by interagency commanders. I believe that this system seriously decreases agility and may interfere with the ability of the teams to make dynamic risk assessments and save the maximum lives in a CCTA. These restrictions were put in place as a result of the 7/7 London tube bombing coroners recommendations.

The restrictions of this system validate the current NSWA Special Operations approach that relies on a dynamic risk assessment and individual operator’s initiative to determine
appropriate working areas in the warm zone, predicated on threat, cover and concealment and protective elements.

A consideration that has excellent value in Australia just as it does in the UK is that of expediting cold zone declaration. Due to the fact that once this occurs a much larger number of resources can be sent in this decision is sought as soon as possible. If the following criteria are known commanders can redesignate a warm zone to a cold zone:

- No ballistic threat
- No IED threat (Known)
- No imminent return of attackers

In light of recent attacks having this consideration in the front of commander’s minds during a future attack will enable the flow of resources into previously non-permissive environments rapidly.

5.15 Tactical Triage

**Recommendation 6 – A national guideline to be developed for Law Enforcement Tactical Triage**

In a terror attack, particularly if it involves marauding terrorists, it is likely that police will be on scene with multiple injured patients and no ambulance resources available. While some prehospital warm zone response exists in limited numbers in a couple of jurisdictions, they are unlikely to be available in the initial stages of an incident and in significantly limited amounts.

LAS utilises a warm zone triage system of ‘Alive or Dead’ due to the difficulty in applying standard triage algorithms that are based on physiological parameters in an area of high stress, distraction and a dynamic threat. Once a victim has been located and treatment applied, a triage tag is applied and the operator radios in to the forward commander to get a triage number, writing this on the tag.

As a result of previous inquest directives, particularly 7/7, triage principles have been adjusted to ‘The best for everyone’ instead of the previous ‘The most for the most’. The same directives require LAS warm zone triage to call in over the radio each time a patient is
found to obtain a patient number for the triage card, as a result of previous criticism that ambulance commanders in 7/7 did not know exact numbers of patients triaged and treated.

NARU is implementing a similar system of ‘Red or Dead’ to also simplify the triage process during warm zone operations. To determine the category the NasMed triage algorithm is still utilised for the first few steps, including catastrophic haemorrhage and airway assessment.

During the ‘Therapeutic vacuum’ expedient application of lifesaving interventions by police officers will save many lives, however recognition of those patients that need urgent extrication to definitive care will save even more. Data from intentional mass violence incidents in the United States suggests that wounding profiles may be significantly more likely to involve torso injuries and less extremity wounds.35, 36 The ability to recognise these wounding profiles could allow police to identify priority patients for rapid extrication.

The following are characteristics of an ideal law enforcement triage tool:

- Simple, easy to recall and apply
- No numbers or physiological parameters
- Understandable by non-medical providers
- Identifies non-compressible torso haemorrhage
- Identifies patients with shock

The Rapid Assessment of Mental Status and Pulse (RAMP) tactical triage system115 being implemented by SOT Paramedics in NSWA ticks most of these boxes, however the requirement for a radial pulse to be taken could be unreliable amongst police officers with little experience in the skill.

Ethical and moral considerations also surround the application of triage to those know to have perpetrated violence who have now become patients, and some guidance on this should be considered in the tactical triage process.130

Based on these considerations work will be conducted to develop a tactical triage tool for use by police officers in intentional mass violence incidents.

5.16 Police/Paramedic Interoperability – Joint Response Unit

**Recommendation 7 – Joint Response Unit models be considered for implementation in metropolitan centres in Australia**

The Joint Response Unit (JRU) in London is a program that provides a paramedic responder in each Borough of the city dedicated to responding to Met Police incidents. The program has been very successful in stimulating interagency collaboration and freeing up Police to conduct their primary role, especially during peak periods. This program has seen improvements in patient care and safety since the pilot began in 2011.131 The program is now being introduced in other NHS Trusts across the country.
The model provides rapid access to a paramedic for police in that area, as well as developing and enhancing the relationship between the services and building familiarity with staff across traditional interagency barriers.

The London JRU is manned by Tactical Response Unit personnel during nightshifts on Thursday – Saturday nights. Each paramedic responder is assigned a police area at the start of their shift and then make their way to an initial briefing at the central police location. They hold a police radio and are available for dispatch by both police and ambulance control centres.

The TRU is a small team of specially trained paramedics for MTFA incidents, and they work closely with police agencies across London to ensure a fast response ‘warm zone’ capability to terrorism incidents. The JRU role ensures TRU paramedics and police are working regularly together and familiar with each other’s capability and procedures.

To realise the benefits that the JRU brings to both police and ambulance the model should be emulated in Australia. This will take various forms depending on local response models, however at its core it will involve the use of paramedic single responders utilising a police radio and working in close liaison with police during busy periods such as weekend nights, public holidays and major events.

5.17 Interagency Liaison Officers

Recommendation 8 – A course and security cleared role be investigated for use as an interagency liaison officer within Australian emergency services, potentially run centrally through a Special Operations Medicine Institute

The nature of CT operations requires a level of security clearance to discuss sensitive matters openly. Terrorism and high threat incidents are complex events that require a specific knowledge base for effective response from emergency services. At the confluence of these two factors is the requirement for operational commanders and leaders to hold a level of security clearance that enables the free flow of information from police and intelligence agencies, as well as a specific knowledge of terrorism fundamentals and the response to terrorism.

In the UK the NILO program provides an interagency training opportunity through a 9 day course at the UK National Fire Service Academy.

NILO Course Aim:

The course is explicitly constructed to expose students to 25 of the UK’s leading experts in terrorism and their organisational roles and responsibilities and capacities and capabilities to respond. Students will develop a common understanding of the relationships, planning and collective response to various terrorist and other malicious attacks, natural hazards, major accidents and other non-malicious attacks.
The National Inter-Agency Liaison Officer (NILO) course provides a multi-agency cadre of trained and qualified (vetted) Officers who can advise and support Gold/Service Commanders from FRS, Police, Medical, Military and other Government agencies on their Service’s operational capacity to reduce risk and safely resolve incidents.


AUSTRAUMAPLAN Annex C states that an additional activity required by State and Territory agencies in regard to criminal and terrorism incidents is:

Connecting the health sector to the security intelligence framework by ensuring that appropriate health personnel have relevant security clearances, and that there is appropriate health representation on relevant committees.

Creating a vetted interagency liaison role would enable local jurisdictions to comply with this national disaster plan.

5.18 Extrication

**Recommendation 9** – Soft Litters located in Major Incident Support Unit (MISU) vehicles and in NSWA forward commander vehicles will provide an extrication capability at mass casualty incidents.

**Recommendation 10** – Soft Litters to be utilised by emergency services to provide a lightweight, easily deployable extrication capability at intentional mass violence and other disaster/mass casualty incidents

International experience has shown again and again that the ability to extricate patients rapidly and appropriately for their injuries is a recurring issue during intentional mass violence incidents. The UK experience has mirrored this, and responders to Manchester Arena bombing stated this occurred once again, with many patients being moved by improvised means such as crowd barriers. The Kerslake report completed in response to the bombings, highlighted this issue as the following quotes from bystanders show:

“Metal railings were used to carry out all the injured people from the Arena. Me and six police officers carried X to the station. I assisted with five or six people being carried out.”

“I was carried out of the Arena on an advertising board. There was a lack of first aid equipment for people to access. They had small first aid boxes on their belts and were not allowed to collect more from stores as the zones were closed off.”

“Without a shadow of a doubt, we need trauma kits and stretchers in all arenas and public places. This should be done as soon as possible.”

**Kerslake Report recommendations regarding extrication:**

*Recommendation:* All major transport hubs and public venues should possess and provide immediate access to basic frameless canvas stretchers to enable rapid movement and
evacuation of casualties during terrorist attacks or other high-threat or dynamic-hazard incidents.

Recommendation: All emergency services should consider developing a capability to give their staff rapid access to basic frameless canvas stretchers to enable rapid movement and evacuation of casualties during terrorist attacks or other high-threat or dynamic-hazard incidents.

A simple solution is available to this in the form of soft litters. They are cheap, light, compact and strong, and require very little knowledge or training to use. Within ambulance services having a store of these on forward commanders’ vehicles would provide a ready supply in the event of a terrorist attack.

A recent study by French Special Forces police, with 160 iterations of casualty extrication mimicking a terrorist attack with various devices, showed that the most effective hot/warm zone devices are a form of soft litter.

NSWA SOT currently use the NAR Quiklitter Lite and the Phantom soft litter for tactical medical operations due to these considerations and further implementation of this extrication platform, of any brand, is highly recommended.

5.19 Tactical Uniform

Recommendation 11 – A Tactical uniform be introduced for NSWA Tactical Medical Operations

5.20 Ballistic Protective Equipment (BPE)

Recommendation 12 – BPE be personally issued to SOT Paramedics and kept in responder vehicles to ensure an expedient and safe response to high threat incidents

5.21 High Threat Response Training
Recommendation 13 – High threat response training should be considered across all Australian emergency services

Throughout the UK and Ireland consideration and planning was underway for the introduction of high threat response training for all first responders. Many examples in recent attacks showed that general duties first responders will inadvertently arrive at scenes and potentially enter warm/hot zones.

Another issue highlighted in many previous intentional mass violence incidents is the recognition of high threat indicators and the ensuing dispatch of resources. The recent UK experience has again shown this to be an area for future improvement. The London Bridge, Manchester and Westminster attacks in 2017 suffered from a late recognition of severity and complexity of the incidents, with average major incident declaration at the 15 minute mark. At Westminster a multitude of 999 calls were received at the onset, creating confusion around the type of incident occurring. Auto dispatch was turned off shortly after to prevent ambulance resources being sent into dangerous locations.

Training for all first responders in recognition of pre-incident indicators as well as the principles of tactical emergency casualty care is essential in the current climate of heightened threat.

A package has been created by SOT TMO and is ready for rollout to all NSWA paramedics online, and similar training should be implemented across Australian emergency services to ensure safety of responders.

5.22 NSW AMPLAN Update

Recommendation 14 – NSW AMPLAN be updated for specific discussion of response to intentional mass violence

The NSW Ambulance mass casualty response plan, AMPLAN, is currently based upon an all hazards approach. As a result it is well suited to large scale natural or transport related disasters over geographically spread areas, with minimal active threat and where an delay in patient contact is acceptable. The unique wounding patterns of intentional mass violence, specific lifesaving interventions and the potential presence of a dynamic threat require a specific response. This would replicate international best practice, with the UK disaster resilience focus on an all hazards approach, with specific subsets of response SOP’s based around tactical and high threat incidents. The Australasian Fire and Emergency Service Authority Council (AFAC) has a high threat response doctrine (Emergency Services Support Role to Deliberate High Threat Incidents) to be released in the near future, which will provide a basis for standardised approach across national boundaries.

Conclusion

Prehospital tactical medical providers throughout the UK and Ireland have well developed systems and are integrated with other agencies to ensure a layered and effective response is available to patients in the event of a terrorist incident. The establishment of these
systems has also had the flow on effect of bolstering the availability of well trained and equipped first aid for day to day operations.

The information from this scholarship has both validated the current setup of tactical medical operations in Australia and provided guidance for its future development.

The implementation of these recommendations will bridge current capability gaps and ensure that patients in high threat incidents will receive care in accordance with international best practice, as well as mitigating risk for first responders.

Conclusion

This chapter is the unrestricted version of the Scholarship report, some elements have been removed due to sensitivity around the discussion of response tactics and planning considerations of various prehospital agencies. The restricted version of this report has been disseminated to stakeholders within NSW Ambulance, and several of the recommendations have already been implemented within Special Operations.

Building on the research conducted through the previous chapters of this thesis, this chapter was an essential part of the meta-aggregational, pragmatic philosophy that has been the conceptual framework. The fourteen recommendations are formulated as ‘lines of action’ based on the themes and capability gaps identified in chapters 1-4. With two overseas trips during the course of the thesis to identify best practice, these recommendations have a solid practical and academic background.

To ensure the translation of the research elements of this thesis through to practical application the unrestricted version of the report has been published in JHTAM and will also be disseminated widely through the platform of the Australian Tactical Medical Association.

The next chapter will tie in these recommendations with the previous chapters, to summarise the findings of this thesis, limitations and future actions.
CHAPTER 6: Discussion

Prehospital response to terrorism is a very specific subset of disaster medicine. This thesis has set out to determine what the characteristics of response are, how well reporting on response is currently being undertaken, where identified vulnerabilities exist and establish recommendations for policy change.

Chapter 5 has outlined the recommendations to develop policy progress and many of these are broad ‘lines of action’ that will enable the creation of systems that can conduct further research in these areas. The most important of these recommendations is the creation of a Special Operations Medicine Institute. The Institute will enable the identified vulnerabilities to be bridged through a collaborative approach to research and implementation of evidence-based change. Each identified response characteristic is an area that requires extensive further research.

The characteristics of prehospital terrorism response identified from current available literature are summarised as follows.

Communication and Interoperability

Communication is identified in many major incidents as a perennial issue. This is the case for EMS response in normal operations and is exacerbated as the complexity of a mass casualty incident is layered onto the response, and even more so when the incident is intentional. The prehospital response to the 7/7 London bombings had serious communication issues identified, and interoperability was considered a large part of this; combining with disruption of physical communication equipment. The infrastructure and software associated with communications can be upgraded and in many jurisdictions are of high quality and have inbuilt redundancy, however the elements of interoperability are essential, as the human element of improving communication.

Terror attacks identified in this research consistently described communication and interoperability as an issue, and the recommendations of chapter 5 aim to increase interoperability nationally and create higher levels of standardisation across responding agencies.

Triage

Chapter 3 covered the use and misuse of triage in complex attacks in depth, identifying future areas for improvement around the use of tactical and law enforcement triage. These were investigated through the experience of tactical paramedics in the UK, and recommendations set to establish improved triage systems for tactical response in Australia.

Traditional primary triage systems have been shown to be suboptimal in tactical and other high stress environments, and adapted triage models are required. A tactical triage system has already been adopted in NSW Ambulance as a result of the research outlined in Chapter 3, and this is being promulgated to other prehospital teams around Australia. While ideal for experienced paramedics, the use of radial pulse as a determinant of triage category
could be problematic for law enforcement officers with limited experience of taking pulses. For this reason further research is required to create a law enforcement tactical triage tool.

**Systematic Activation**

Recent attacks in the UK had an average of 15 minutes until declaration of a major incident, leaving less than 20 minutes for receiving hospitals to prepare before the inundation of patients began.\(^{106}\) This has flow on effects on definitive care, with decreased warning times for emergency departments and surgical facilities to be prepared and activated. The success of the hospital response to the November 2015 attacks in Paris has been well documented and credited to the effective systematic activation by the unified French medical system. Alpha Plan Red and the ‘Camembert’ system of prehospital response by French EMS allowed a reserve to be held through the entire night of November 15\(^{th}\) 2015, even in the face of a CCTA that caused 495 wounded and 137 dead.\(^{53,\,90}\) Rehearsing the systematic activation of EMS and hospitals for a large scale terrorist attack appears to have a positive effect on response and on perceptions of preparedness by responders. In both San Bernardino and Paris rehearsals had been incidentally run in the days before the 2015 attacks.

Systematic activation requires further development in Australia, and should include the development of a set of common pre incident indicators that can be utilised to inform dispatch. The establishment of a Special Operations Medicine Institute and the review of state based mass casualty response are some of the recommendations from Chapter 5 that will ensure lessons from overseas will inform the development of appropriate policy in this area.

**Tactical Casualty Care**

The birth of Tactical Combat Casualty Care (TCCC) from the United States military special operations medical community saw a revolution in the application of life saving interventions by military personnel that has saved many lives, and was a sharp departure from contemporary EMS protocols.\(^{134,\,135}\) The evolution of these concepts and widespread adoption by military forces has created the lowest case fatality rate in documented history and a rapid decrease in deaths from preventable causes.\(^{3,\,136}\) These concepts were drawn across to the civilian sector in 2011 with the development of the Tactical Emergency Casualty Care (TECC) trauma guidelines, taking into account differing wounding profiles and patient population characteristics.\(^{137}\) In essence the concepts of tactical casualty care involve the zoning of care, dependant on the level of active threat and the incorporation of rapid intervention with life saving interventions to address the known preventable causes of death that are common in battlefield casualties. Remote damage control resuscitation (RDCR) is the application of these lifesaving interventions, however it is the acknowledgement of threat and its effect on the level of medical treatment possible that differentiates tactical casualty care.

The Paris terror attacks saw the successful implementation of tactical casualty care across a number of the response levels.\(^{54,\,90}\) San Bernardino was similar in the application of these concepts, as were the Boston and Charlie Hebdo attacks. As the origins of tactical casualty
care are well rooted within the military, continuing collaboration between civilian and military sectors will see further synergetic development. Civilian high threat medicine must continue to take advantage of the momentum that has been created by the advances in prehospital care that the Iraq and Afghanistan theatre experience has stimulated. The journey of this research project has brought about significant changes in tactical casualty care in Australia through the new collaborative efforts of military, ambulance and police to share information and work together, led by the Australian Tactical Medical Association. Further development of this collaboration will lead to enhanced prehospital terrorism response across Australia.

Through interaction in both overseas research trips as part of this thesis many units were implementing or well versed in tactical casualty care, and it was an underpinning tenant of both trip reports. Further research is required in some aspects of tactical casualty care, and the Journal of High Threat and Austere Medicine has been established in Australia to assist in building the evidence base.

**General Discussion**

The above themes were drawn from the available literature in the recent period on prehospital terrorism response. The conclusion of the review of this literature was that it was of a relatively low level of evidence and was scarce in comparison to the number of terrorist attacks occurring. Vigour and energy should be applied to further research on these and other identified themes from terror attacks.

The identified themes in this research also do not comprehensively describe the successes and capability gaps of the prehospital response to terrorism. The complexity of these events, the individual experience and the dynamic nature of responding to a mass casualty incident where your own life may be under threat create conditions that are very difficult to define, tabulate and neatly explain. A recent study of responders to the 2011 terror attacks in Norway found that the following factors were most attributable to the success of the prehospital response:

- Major incident emergency preparedness and competence based on continuous planning
- Crisis management based on knowledge, trust and data collection
- Empowerment through multi-professional networks
- The ability to improvise based on acquired structure and competence

Interestingly the Norwegian study didn’t highlight any rigid structural processes as a factor in the success of response, but rather the more abstract elements of improvisation, preparedness, crisis management and the use of networking. This was also identified in a robust AAR that was conducted on the San Bernardino terror attacks, highlighting that training and processes are important fundamentals, however the most important factor is the ability and freedom to improvise in the face of complexity. In the establishment of further procedures and policy to enhance prehospital terrorism response the ability to improvise and network should be encouraged and incorporated.
This thesis has set out to identify capability gaps and research priorities around the prehospital response to terrorism. The use of a systematic literature review established that reporting on these events needs significant stimulus and should be undertaken by all levels of responder rather than being heavily physician led. The lack of high quality reporting and small amount of post event literature should be noted by all agencies involved in the preparedness for and research of terror attacks, with future work identifying ways to overcome barriers to publishing reports and case studies. The initial research question on the characteristics of the prehospital response to terrorism was explored in detail and answered by the systematic literature review. The secondary research question established in Chapter one on the identified themes around terrorism response was also answered in detail.

The intertwined nature of the author’s professional role and this thesis was established in the prolegomenon, and has been an integral feature of all chapters. As the research project has progressed through each chapter there has been considerable work in translating the findings into practice. As an example, the findings of chapter 3 have been implemented as a training module for NSW Ambulance special operations and rescue paramedics. The one day, immersive training package has been rolled out across the state as a ‘warm zone’ triage skillset, ensuring greater safety and clinical accuracy of paramedics working in high threat tactical situations. Chapter 3 identified innovative approaches to triage in CCTA’s, and in part answered the secondary research question on this theme. Further research is required to identify innovative approaches in the other identified themes of the systematic literature review.

Similarly, the findings of the Churchill Fellowship were implemented to create the current NSW Ambulance terrorism response capability. Chapter 4 summarises the current baseline of prehospital response capabilities in Australia, with many of these programs beginning as a result of the initial impetus of the Churchill Fellowship report, which was disseminated widely. The Churchill Fellowship report has had national impact, initiated through a presentation to the Australian Council of Ambulance Authorities (CAA) Emergency Management Forum where a decision was made by all Ambulance services representatives to implement strategies to progress terrorism response capabilities in line with the report’s recommendations.

This national influence has been a feature of many aspects of this thesis, and a number of the initiatives described in Chapter 4 are a direct result of this project. As well as the stimulus for specific training and response programs, the work of this thesis has enhanced national collaboration between emergency services and the military, with many working relationships now in place and collegiate approaches underway.

Chapter 5 has a number of long term goals in the fourteen recommendations, however some of them have already been implemented into NSW Ambulance practice. The completion of this thesis marks the early part of a long journey to implement these ‘lines of action’ and continue the progression of tactical medicine, with a sustainable growth trajectory and robust clinical governance as essential guiding principles. The final secondary research question around future ‘lines of action’ was answered by this chapter.
Translating research into practice has been the overarching goal of the lens used to focus this thesis, the meta-aggregational approach and pragmatic philosophy. The conceptual framework of Birnbaum et al. helped structure the phases of the thesis, and in particular formed the foundation of the approach to the comparative analysis in Chapter 3.

Over the course of the thesis the philosophy has seen many local and national initiatives get underway, and as this research has evolved it has influenced the direction of these initiatives, including the creation of the tactical medical operations capability in NSW Ambulance and the Australian Tactical Medical Association nationally.

This project has contributed to the knowledge base in Australia on domestic and international response models for terrorism response, and as the first study of its kind in this country has added clarity to both the current status of response capacity and future research directions and priorities.

**Limitations**

Professional experience has been woven into the progression of this thesis, however this could limit the generalisability of the findings due to potential biases and the personal perspective of the author.

The restrictions of the Monash University Master of Philosophy, including word count and timeframes, prevented the in-depth exploration of identified themes beyond that of triage in CCTA’s. Further exploration of these themes is a priority for future research.

As a ‘desktop’ venture there are limitations around the depth to which research was conducted beyond the overview of available TTP’s, SOP’s and published literature. This may have limited the accuracy and extent of the described baseline of Australian response architecture and the applicability of the results of international study trips.

**Future Actions**

This project has created a starting point for further research by identifying current baselines in literature, reporting and response capacity; as well themes in the prehospital response to terrorism.

Future action should include research and exploration of identified themes, along with interventional studies and interviews with key stakeholders. As well as confirming current research, this will assess ‘what matters most’ in tactical response and therefore identify the centre of gravity for research priorities.

Investigation is required of barriers and enablers in research on prehospital terrorism response, and impact evaluations of selected interventions will provide further guidance on ‘what works well’, building on the foundation of this thesis which has described ‘what is currently done.’
CHAPTER 7: Conclusion

The paucity of high level evidence and systematic reporting of lessons learned in the prehospital terrorism response field requires a renewed push for access to data and the establishment of reporting systems that are inclusive of all responders. Active participation in research by first responders, inclusive of paramedics, police and other emergency services workers ensures that it is not only physician led. This will not only increase the quantity of research output, AAR’s and case studies, but also maximise its utility for all levels of responders regardless of their level of medical education.

Current triage tools are inadequate for use in insecure environments such as the response to terrorism. Further research and validation is required for novel approaches that simplify tactical triage and support its effective application. Other identified and recurrent characteristics of prehospital terrorism response include: communication and interoperability; triage; systematic activation; and, tactical casualty care. Further research is needed to establish the policy direction for these themes and provide further evidence to guide capability development.

The implementation of the fourteen scholarship recommendations will bridge current capability gaps and ensure that patients in high threat incidents will receive care in accordance with international best practice, as well as mitigating risk for first responders. These recommendations aim to establish systems that will progress the national approach to terrorism response and build on the research established in this thesis, allowing for further exploration of pragmatic approaches to response capacity enhancement.

The prehospital response to terrorism is defined by its complexity, insecurity, low level of reporting, paucity of evidence and difficulty in establishing best practice. These challenges can be overcome with a system wide approach to building responder education, increasing reporting and data collection, and developing response capacity in accordance with what data can be gleaned on best practice.
References


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93. Van Stralen D, Mckay SD, Williams GT, Mercer TA. Tactical Improvisation: After-Action/Comprehensive Analysis of the Active Shooter Incident Response by the San Bernardino City Fire.


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INTRODUCTION

This report sets out the findings of a Churchill Fellowship research trip that I conducted over 2 months in 2015, travelling through the USA, Canada and the UK to identify best practice in the field of Tactical Medicine, focusing on the prehospital response to high threat scenes such as terrorism, sieges and active shooter incidents, as well as the integration of Paramedics with law enforcement teams.

An overview of the trip will be detailed and the findings expressed in a thematic rather than chronological order. The themes are organised to express similar elements that have been clustered so that they can be seen in relevance to the Australian context. The overriding goal of this Fellowship is to distil the most appropriate and innovative models in tactical prehospital care so that a robust capability can be developed/enhanced in Australian Ambulance Services. Through my experiences overseas I have seen the lessons other agencies and individuals have learnt (often the hard way) and I hope that this report can bring these lessons to fruition locally.

ACKNOWLEDGEMENTS

The opportunity to conduct this valuable research would not be possible without the Winston Churchill Memorial Trust, and on the occasion of the 50th anniversary of the foundation of the trust it is a pertinent time to reflect on the huge contribution the Trust has provided to Australian society. The sheer number and quality of the individuals engaged in Churchill Fellowships to conduct research in their fields over the past 50 years is humbling, and I am extremely grateful that this project was selected for its merit and potential. A huge thanks to the Trust and to the NSW Churchill Fellows Association for their support and the opportunity to conduct this project through such a wide range of settings outside of our borders.

I would like to acknowledge the support of New South Wales Ambulance in facilitating my availability for an extended period away in order to complete this research project. In particular the support of the Special Operations Unit and Superintendent Keith Williams has been instrumental in developing the concept of the project.

The generosity I experienced during my time conducting the Churchill Fellowship was both unexpected and overwhelming. Every agency, organization and individual I met went to great lengths to make me feel at home, and it was an absolute credit to the brotherhood of Emergency Services. I was picked up and dropped off at airports and hotels, taken to ice hockey games, shouted beers, and had more accommodation, meals and coffees paid for than I can count. The collection of t-shirts, patches and challenge coins was almost heavier than my checked luggage by the end of the trip and I would like to express my massive thanks to all who hosted and met with me for making this Fellowship such an amazing experience. The camaraderie, expertise and resilience I saw amongst my Paramedic brothers and sisters is an absolute credit to the profession.

The most important acknowledgement is to my beautiful wife, Jo, who has unalteringly supported me through all my endeavours and provides the stability that enables me to push
forward. 2 months alone looking after our 3 boys is a massive achievement and no one can do it without complaint and as effortlessly as you Joey.

EXECUTIVE SUMMARY

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Intensive Care Paramedic
Special Operations Team
New South Wales Ambulance

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To research international models and innovation in
Tactical Emergency Medical Support

In response to an evolving threat of terrorism and the subsequent potential for high threat scenes such as knife and firearms attacks, improvised explosive devices (IED’s) and complex ‘Mumbai Style’ incidents, Australia has a current ‘capability gap’ in trained, expert, prehospital tactical response that founds itself on a scientific basis and established doctrine. Multiple examples of Ambulance Paramedics being staged outside of high threat scenes internationally has seen the preventable deaths of far too many victims of intentional violence. The USA, UK and Canada have reacted to this with varying models of Paramedic response that enables risk mitigation strategies to inject trained interagency teams into this type of incident to provide lifesaving interventions at or near to the ‘point of wounding’. This Fellowship project has investigated a number of response models and the training, policy, equipment and personnel that underpin them, to find the following main themes that are relevant to the Australian context.

Consideration should be given in all Australian Ambulance services to establishment of three tiers of response capability to build preparedness for Hybrid Targeted Violence:

- **Level 1**: A core team of full time Tactical Paramedics who integrate with Police Tactical Groups (PTG’s) and other first responders at high threat scenes, to respond in the warm zone and provide lifesaving interventions to casualties. The team should be able to respond in short timeframes, have appropriate individual Personal Protective Equipment (PPE), carry clinical equipment specifically for intentional mass casualty incidents and provide advice and leadership to other ambulance command and response elements.

- **Level 2**: A part time ‘Uplift’ capability of Paramedics trained in the response to Hybrid Targeted Violence who can work in the warm zone with law enforcement protection teams as a Rescue Task Force. Level 2 Paramedics may have some individual equipment, however PPE and further task specific kit will be issued prior to entering the scene. Level 2 can be called in from staff on duty shifts onroad as well as an on call register. These teams have the potential to provide cover for regional areas.

- **Level 3**: Awareness training for on road Paramedics in high threat incident response, covering the tactical, psychological and clinical fundamentals particular to this type of incident.
These capabilities must be supported by underpinning doctrine and evidence based training and curriculum, with ongoing maintenance of skills, knowledge and equipment.

“Out of intense complexities intense simplicities emerge”  
- Winston Churchill

BACKGROUND AND CONTEXT

There are three major factors that drove the idea behind this Fellowship project: the evolving terrorism threat level, the events of the Lindt Café siege in Sydney 2014 and the current level of preparedness within New South Wales Ambulance and the rest of Australia to future terror attacks.

Terrorism threat level

In an environment of heightened security and a dramatic recent history of violence against civilian populations in Western countries, the likelihood of terror attacks on our soil have increased substantially. Planning for the immediate medical response to these horrific events must evolve with the change in threat profile.

The attacks of 9/11 saw the use of devastating terror in the form of enormous numbers of dead and injured and the destruction of national symbols. Similar attacks in London, Madrid and Bali have created an environment of heightened security, as well as a collaborative and proactive intelligence/law enforcement stance to prevent the proliferation and use in Western countries of IED’s.

With the death of Osama bin Laden and a ‘changing of the guard’ in the conflicts in Syria and Iraq, new tactics have been used with horrific consequences such as lone wolf and paramilitary style small group attacks. The incidence of the lone wolf attack is increasing in prevalence, and the Federal Bureau of Investigation(FBI) has cited them as an area of grave concern in the operation of al Qa’ida.

There has been commentary citing the evolution of fifth generation warfare, where “super-empowered” individuals use open access internet materials to launch terror attacks or cyber operations. McCauley and Moskalenko dissected the characteristics of lone wolf participants, and found that whilst radical opinion is common in Western society, it is only rarely converted into any violent form of radical action. They found the two factors moving the participant toward committing a lone wolf attack is the means and the opportunity. With an array of instructions and direction now available on the internet the means and the
opportunity are increasingly accessible. Combined with the targeted radicalisation of individuals via the internet, a tactic used increasingly by Islamic State of Iraq and the Levant (ISIL), there is a

The 2 brothers who conducted the Boston Marathon Bombings in April, 2013 were not radicalised externally, but used online instructions from al Qa’ida Inspire magazine article “How to build a bomb in your mothers kitchen” to create the pressure cooker IED’s that would kill 3 and injure 250 more. This is a prime example of the influence the internet can have on providing the means and opportunity to turn from radical opinion to radical action. Recent attacks in London, Norway, Paris, Tunisia, Canada and the United States have followed this evolution with lone wolf actors utilising knives, firearms, explosives or a combination of methods to cause maximum effect and media attention.

Australia has had an increasing number of executed and thwarted terrorism incidents in recent times. Since the Australian Terrorism Public Alert was increased to High in September 2014 there has been six foiled terror attacks as well as 3 that have been carried out, including the Lindt Café siege, the stabbing attacks on Melbourne Police and the shooting of a NSW Police accountant in Parrammatta. The Australian Security Intelligence Organisation (ASIO) 2014-15 Report to Parliament states that terrorism is the number one threat to Australia’s security, and warns that whilst recent attacks have been by lone actors with unsophisticated means, the possibility of a coordinated complex attack is very high. The attacks in Mumbai (2008) and the recent attack in Paris (2015) show the devastation that can occur when multiple sites are targeted by multiple terrorists using an array of weaponry and coordinate their strikes through mobile phone and internet connectivity.

A distinguishing feature of the Australian threat landscape is that a traditional active shooter incident (ASI) involving a school shooting or disgruntled employee is less likely due to restricted access by the general population to firearms. Whilst at times opportunity may be there, the means may not, and the complete absence of ASI’s since the introduction of the National Firearms Agreement would support this theory.

**Martin Place – Lindt Café siege**

In December 2014 a lone gunman took a large number of hostages in the Lindt Café in Sydney’s Central Business District (CBD). The events that unfolded over the next day and night were extraordinary in the experience of all involved. After the Tactical Operations Unit police breached the café at approximately 2am, shooting and killing the gunman, a small team of Special Operations Paramedics entered the ‘warm zone’ wearing ballistic vests and helmets.
They instigated rapid treatment of the patients and then began to extricate them to the footpath outside as a Casualty Collection Point (CCP), where more SOT Paramedics assisted with treatment, as well as three Paramedic crews with stretchers from ambulances, which were staged approximately 200m away. The Paramedics were faced with 7 gunshot wound (GSW) patients of whom two died at the scene and one on arrival at hospital.

The gunman was also wearing a backpack with wires hanging from it, which could not be cleared as to the presence of an improvised explosive device (IED) after all patients had been moved from the vicinity of the café.

There are a few issues that the incident highlighted for future improvement:

- SOT Paramedics conduct initial training however do not have the opportunity for regular, ongoing training in operating in high threat environments and responding to Hybrid Targeted Violence.

- SOT Paramedics have informal tactics, techniques and procedures (TTP’s) around the way they operate in high threat environments, however there is little in the way of formal, written doctrine.

- Some of the equipment used was not in line with international best practice for the specific response to Hybrid Targeted Violence.

- Road crews who worked in the CCP and transported patients to hospital from the scene had little or no training in working in high threat environments or treating multiple patients in mass violence incidents.

The safety of all Paramedics, even though operating in high threat areas, must be paramount. To ensure this, rigorous and ongoing training must be implemented and equipment reviewed to ensure it is the best fit for task.

**Current preparedness within Australian ambulance**

Terror attacks through the modern era have evolved in delivery, motivation, impact and tactics, just as the tactics used to counter them by state agencies have evolved in response. Whilst Police groups are looking to international best practice and implementing programs to evolve to the threat, the prehospital medical sector has a ‘capability gap’ that needs to be addressed. NSW Police has just begun training to bring the response to active shooter incidents in line with international best practice, with the Active Armed Offender policy to dictate officers team up and head towards the sound of shooting to eliminate the threat. There is no medical element to this training.
Whilst this has been the paradigm in North America for a number of years, there has also been a shift in the deployment of Paramedics to provide lifesaving care earlier rather than staging until the scene is declared safe by police. This shift has not occurred in Australia and leaves both the Police and the public in grave danger.

Military data has displayed a direct correlation between fatal combat injuries and time from point of wounding, with the majority dying within 30 minutes. This preeminent study from Vietnam showed the following trend of combat deaths:

- Immediate: 42%
- Within 5 minutes: 26%
- Within 30 minutes: 16%
- Within 2 hours: 8-10%

This clearly demonstrates the ability of ‘point of wounding’ trauma care to save lives. The tenets of TECC are based on the fact that waiting for scenes to be cleared and patients to be evacuated will cost lives that could otherwise be saved through the rapid application of prehospital medical interventions. The application of tourniquets to the point of wounding in Iraq and Afghanistan by US soldiers reduced mortality from extremity haemorrhage by 66% in 5 years. The implementation of these lessons to the civilian sector will save lives if they are brought forward to the point of wounding where the most victims die in the early minutes. Staging ambulance resources outside of a Hybrid Targeted Violence incident will leave patients at high risk of death from preventable causes.

The purpose of this Fellowship is to identify best practice in prehospital medical response to high threat violent incidents in the context of an increasing threat level and change in the threat profile.

DEFINITIONS

The type of incident faced by first responders where mass violence, aggressive actors and elevated danger come together has struggled to be defined in the prehospital and response literature. During the course of the Fellowship I met with a number of different opinions on how the definition should be framed. All of these opinions were backed by well written, peer reviewed, published literature by the people that I met. The following table presents an overview of current definitions in the field:
Definitions of High Threat incidents:

- **Active Shooter Incident (ASI):** An individual actively engaged in killing or attempting to kill people in a confined and populated area.

- **Hybrid Targeted Violence (HTV):** An intentional use of force to cause physical injury or death to an identified population through a coordinated and multifaceted approach using a multitude of conventional weapons and tactics.

- **‘Mumbai Style’ Complex Attack:** A swift-moving, coordinated terrorist attack using either barricade- or siege-like assault methods by several operatives, enabled by wireless communications, converging on a series of targets (proximate or remote) in a high-density, urban area, combining an dynamic array of weapons, such as firearms and explosives, including the deliberate use of fire and smoke, in an attempt to maximize civilian casualties and media exposure, while confusing and overwhelming local responders over a possible multiday operational period if not neutralized.

The high end of complexity of these definitions present an operational range of hazards, confronting first responders with a wide range of weapons and coordinated small unit tactics, requiring a more complex response strategy that blurs the lines between traditional law enforcement, fire, and EMS duties and responsibilities. The lower end could be one offender with a knife. In the Australian context, for reasons I will outline later in this report, I believe it is important to exclude the ‘active shooter’ term, as this has implications in the collective Australian psyche as an ‘American’ problem. Including these words in a definition invoke the image of a school shooter or disgruntled employee. Likewise the high end of definitions such as a Complex Attack can be too specific to large and overwhelming terrorism incidents.

To overcome these definitional issues this report will use the term **Hybrid Targeted Violence** as a standard; encompassing scenes from a single offender with a bladed weapon or a vehicle with intent to cause harm, right through to ‘Mumbai style’ Complex Attacks with multiple trained offenders at multiple sites using a variety of weapons systems in an organised manner. The implication in these scenes is that there is a high threat level, to responders as well as the public.

The term **High Threat Incidents** will also be used, and refers to the scenes where Hybrid Targeted Violence is taking place.

**TEMS:** Tactical Emergency Medical Support refers to the embedded medical support for PTG’s. The goal of effective TEMS is to enable law enforcement to operate more efficiently,
more effectively, and with reduced risk. TEMS ranges from embedded, SWAT trained medics carrying weapons and participating directly in the operation, to specialist Paramedics on standby nearby to the operation without weapons and not participating in law enforcement activities.

**TCCC:** Tactical Combat Casualty Care is a set of evidence based trauma protocols devised to provide life saving interventions during the appropriate tactical phase to address the burden of preventable deaths on the battlefield. Developed in 1996 for the US Special Forces community, TCCC was based on a study of preventable battlefield deaths in Vietnam that showed:

- 9% of preventable deaths were from extremity haemorrhage
- 5% of preventable deaths were from tension pneumothorax
- 1% of preventable deaths were from airway obstruction

Data from previous wars showed that 90% of battlefield patients died prior to accessing medical care. As a result of the implementation of TCCC across the US Military there has been a significant decrease in case fatality rate in the setting of increasing injury severity. An example of the success of TCCC implementation is the widespread use of tourniquets. In the Iraq and Afghanistan theatres in 2003-2006, prior to widespread implementation of tourniquets, 7.8% of all US combat deaths were as a result of extremity haemorrhage. Due to the introduction of TCCC and ubiquitous tourniquet use across US forces in war zones, an 85% reduction in mortality was observed.

**TECC:** Tactical Emergency Casualty Care is the interpretation of TCCC to the civilian prehospital sector. Taking into consideration differences in injury patterns, evacuation times, pre existing comorbidities and varied patient populations TECC brings the lessons from the battlefield to bear in civilian high threat environment’s through a series of evidence based trauma guidelines.

In conventional emergency medical services protocols, scene safety is the first priority. However, this algorithmic tenet does not account for unsecure scenes. Civilian first responders are increasingly required to operate in high-threat environments. Traditional care guidelines are inherently limited in that they are solely patient-focused, without acknowledgement of the surrounding operational or tactical constraints. The TECC principles are a sound compilation of trauma guidelines, integrating operational and medical requirements into a consolidated set of best practices specific to high-threat prehospital care. As with the battle-tested concepts of Tactical Combat Casualty Care
(TCCC), the TECC principles are just that: principles, not inflexible or rigid protocols. - Committee for Tactical Emergency Casualty Care.

EMS: Emergency Medical Services is an umbrella term in North America which covers the range of prehospital ambulance services. Although the term is not used traditionally in Australia this report will interchangeably use EMS, Paramedic and Ambulance service to describe the spectrum of prehospital medical services.

RESEARCH METHODS

In order to identify international best practice, the program was designed to utilize mixed methods in information collection. Meetings with individuals from various agencies gave overview of local models and capability however were constrained by a lack of experiential or observational learning. To overcome this I also conducted ridealongs with Paramedic teams, undertook courses and attended lectures and presentations. Agencies and departments were chosen primarily for the type of high threat response or tactical capability they utilised, so that the full spectrum of available models could be assessed to understand what elements will work best in the Australian context.

The experience of the Fellowship developed and influenced my thinking on many aspects of high threat care, and I have distilled this into the findings through this report. Whilst many of the ideas I have directly linked to the part of the Fellowship in which it was developed or discovered, much of the experience has more subtly effected my thinking, and contributed to the recommendations contained herein. Many conversations with experts in the field of tactical medicine have enriched my knowledge and built a good understanding of how a high threat program might focus training and capability to be well prepared for future attacks.
<table>
<thead>
<tr>
<th>Date and Location</th>
<th>Overview of visit</th>
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<tbody>
<tr>
<td><strong>10-16/09/15</strong></td>
<td><strong>Urbanshield</strong>, 48hr scenario based SWAT exercise.</td>
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<tr>
<td>Alameda County,</td>
<td>- Observed, participated and instructed with the EMS Branch over the exercise period in high fidelity, immersive scenarios. Scenarios were mass casualty situations post violent terrorist attacks with the need for integration of EMT’s and Paramedics with SWAT teams to effectively treat patients in the ‘warm zone’. All EMS participants initially trained for 1 hour in TECC concepts and skills such as tourniquets, chest seals, wound packing and rapid trauma assessment and triage. Training was then directly applied in high stress scenarios with explosions, smoke and large numbers of moulaged(Special effects make up and fake blood haemorrhage devices) patients.</td>
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<tr>
<td>California. USA</td>
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<tr>
<td><strong>16-22/09/15</strong></td>
<td><em>Earnings based guidelines for use of tourniquets and wound packing now published showing strong scientific basis for these interventions.</em></td>
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<td>Las Vegas, Nevada.</td>
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**EMS World Expo**

Attended a number of lectures on active shooter response, high threat care, haemorrhage control, integration of law enforcement and paramedics and tactical medicine.

Main learning points:

- Evidence based guidelines for use of tourniquets and wound packing now published showing strong scientific basis for these interventions.
Recommendation for wound packing training to be rolled out to all onroad prehospital first responders.

- Bleeding fistulas another situation where tourniquets can be used.

- Overview of alternate models of tactical medics, Alcohol Tobacco and Firearms (ATF) Special Response Team train their operators in medical care. Difficulties in maintaining skills, however helps bridge the gap between point of wounding and EMS rendezvous. More low acuity medical support to operators undertaken than high acuity trauma care.

- Direct threat care pneumonic for immediate action: Fight/Flee, Uncontrolled haemorrhage, Communicate, Keep moving.

- Increasing threat level and number of active shooter incidents seemingly having snowballing effect on moving previous non players into action.

- Presentation and videos on Israeli bus attacks showing paradigm of ‘getting off the X’. Minimal interventions in warm zone, then rapid extrication due to previous experience with secondary IED’s.

- Assisted with engineering workshop for Zoll on the Autopulse eCPR device, and met with duty Paramedic supervisor from Las Vegas Fire Department (LVFD) EMS.

- Visit with Arlington County Fire Department (ACFD) High Threat Director John Delaney: Overview of Rescue Task Force model, equipment used, and Unified Command model.


- Visit to Boston EMS Special Operations unit.

- Ridealong with Watch Supervisor.

- Tour of Marathon bombing site.
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<tr>
<th>Date</th>
<th>Location</th>
<th>Activities</th>
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| 1-5/10/15  | New York City, New York, USA      | - Visit to **Fire Department New York (FDNY) Counter Terrorism Division**. Meeting with Sean Newman and Tim Carroll.  
- Tour of FDNY academy and EMS education facility |
| 5-9/10/15  | Oriskany, New York, USA           | **Division of Homeland Security and Emergency Services (DHSES) State Preparedness Training Centre**, Advanced Active Shooter 3 day course.  
- Training in high threat concepts and interventions, then applied over multiple high fidelity, immersive scenarios with consequence based response from moulaged actors (ie incorrect treatment and they deteriorate and die). Scenarios develop over multiple day/night to simulate a protracted ‘Mumbai style’ complex attack by multiple terrorists at multiple locations utilising a variety of attack methods. |
| 9-14/10/15 | Ottawa, Ontario, Canada           | **Ottawa Paramedic Service**, Paramedic Tactical Unit (PTU).  
- Ridealong shift with PTU members.  
- Training day with PTU and Ottawa Tactical Police.  
- Tour of Special operations and regular operations facilities. |
| 14-19/10/15| Toronto, Ontario, Canada          | **Toronto Paramedic Services**, Special Operations.  
- Meeting with Leo Tsang, Director Special Operations and Mike O’Donnell  
- Ridealong shift with Tactical Paramedic crews.  
- High risk warrant raid with Toronto Tactical Police and Tactical Paramedics, then response to a gunman in an apartment complex with same teams. |
| 19-22/10/15|                                   | **Division of Homeland Security and Emergency Services (DHSES) State Preparedness Training Centre**, EMS Special Situations 2 day course.  
- Training on prehospital response to remote, high threat, austere environment scenes. Application of training in high fidelity scenarios |
<table>
<thead>
<tr>
<th>Oriskany, New York. USA</th>
<th>in various outside and difficult settings such as woodlands, active shooters, rubble piles, unstable structures, smoke filled areas etc.</th>
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<tr>
<td>22/10-7/11/15 Sacramento, California. USA</td>
<td>- Meeting with Dan Smiley, <strong>California Emergency Medical Services Authority (EMSA) Chief Deputy Director</strong>: Overview of California statewide Tactical Paramedic program and active shooter response.</td>
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<td></td>
<td>- <strong>International School of Tactical Medicine</strong>, 2 week course.</td>
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<td>Subjects covered in theory, practical and scenario based education:</td>
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<td>- Principles and concepts of tactical medicine</td>
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<td>- Tactical medical equipment</td>
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<td>- Tactical gear and equipment</td>
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<td>- Tactical team concepts and planning</td>
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<td>- Slow and deliberate team movement</td>
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<td>- Introduction to the tactical pistol</td>
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<td>- Medical aspects of distraction devices</td>
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<td>- Dynamic building clearing techniques</td>
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<td>- Tactical casualty care</td>
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<td>- Medical aspects of wound ballistics</td>
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<td>- Haemostatics and tourniquets</td>
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<td>- Team health management</td>
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<td>- Medical aspects of clandestine drug labs</td>
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<td>- Forensics and evidence preservation</td>
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<td>- Introduction to the M4 Carbine</td>
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<td>- Chemical munitions in the tactical environment</td>
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<td>- Medical threat assessment and barricade medicine</td>
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<tr>
<td></td>
<td>- Paediatric trauma management in the tactical environment</td>
</tr>
<tr>
<td></td>
<td>- Anaesthesia in the tactical environment</td>
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</tbody>
</table>
- Medical management of blast injuries
- Advanced tactical pistol and M4 carbine
- Advanced airway management
- Environmental injuries
- WMD in the tactical environment
- Medical issues of less lethal weapons
- Low light tactics and team movement
- Advanced tactical pistol and M4 carbine field course
- Special operations aeromedical evacuation
- Medical management of canine emergencies
- Disguised weapons and street survival
- Legal and psychological aspects of officer involved shootings

National Ambulance Resilience Unit (NARU), Education Centre.
- Presentation on HART response to Marauding Terrorism Firearms Attack with Dave Bull, head of NARU Education.
- Observing on Incident Response Unit assurance course.

West Midlands Ambulance Service Hazardous Area Response Team (HART)
- Tour of facilities, overview of equipment and approach to MTFA.

9-10/11/15
Winterbourne Gunner, United Kingdom

11/11/15
West Midlands, Birmingham, United Kingdom
THEMES AND RECOMMENDATIONS

Across the agencies I worked or met with, a number of differing models of response to Hybrid Targeted Violence were apparent, summarized as follows:

<table>
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<tr>
<th>Agency</th>
<th>High threat response model</th>
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| California EMS (Various local EMS, county and private) | - Tactical medics undertake 80 medical and tactical course(International School of Tactical Medicine) to qualify to work with SWAT teams.  
- Paramedics are armed and integrated into SWAT operations.  
- Tactical medics work onroad undertaking normal prehospital duties until SWAT callouts.  
- Active shooter response does not fall under the responsibility of Tactical teams, they are focused on the mission and SWAT members only.  
- Active shooter response being addressed with rollout of 8 hour training program on escorted warm zone care for all EMS. Decision on ballistic protection up to individual agencies. |
| Arlington County FD                          | - Rescue Task Force model for active shooter incidents  
- All medics trained in warm zone operations, with individually issued ballistic vest and helmet, as well as active shooter kits. |
| Boston EMS                                   | - All medics trained for warm zone operations, with ballistic protection held by supervisors to be issued at an active shooter incident prior to escorted Rescue Task Force operation. |
| Toronto and Ottawa Paramedic Service’s       | - Tactical Paramedics undertake 4-6 week initial course and continuous ongoing training, support tactical police teams “in the stack”, but are not armed.  
- Tactical Paramedics undertake normal onroad ambulance duties until tactical tasking arises.  
- Response to active shooter incidents undertaken by tactical medics only, regular operations Paramedics receive no warm zone training. |
- Varying models across county’s, however generally tactical Paramedics are solely employed in TEMS roles, and DHSES provides courses to increase preparedness to all EMS. Coverage by these courses is certainly not complete and many EMS providers have little to no training for active shooter incidents or hybrid targeted violence.

- HART works in 6 man units responding to all difficult access or hazardous jobs. They carry ballistic protection and treatment gear specifically tailored for MTFA incidents, and will enter the warm zone without police escort.

- ‘Uplift’ capability of MTFA trained staff, with a vehicle responding with ballistic PPE and specific treatment gear for them to enter warm zones in high threat scenes.

Taking the best elements of the models that I observed, the following is a recommended plan for the Australian context:

**LEVEL 1: CORE CAPABILITY FOR PREHOSPITAL RESPONSE TO HIGH THREAT SCENES**

The most effective overseas models that I worked with or observed during the Churchill Fellowship were those that maintained a fulltime capability for high threat response and trained often with their interagency partners. These agencies were able to be present in high threat incidents at or very near the point of wounding to provide lifesaving interventions.

A core team of responders should be raised from within each Australian Ambulance service to provide a capability to respond effectively and safely with police teams and work in the warm zone of high threat incidents from single armed offender’s right through to the high end of Hybrid Targeted Violence.

The logical start would be Special Operations Paramedics from units such as NSW Ambulance Special Operations unit or South Australian Ambulance Service Special Operations Response Team. These Paramedics have the following characteristics that make them well suited to transitioning to working in high threat scenes, integrating with Law Enforcement teams and providing care in ‘warm zones’:
- Special Operations Paramedics have already ‘volunteered’ for high risk work, by virtue of the other roles they undertake such as vertical rescue, CBRNE ‘warm zone’ patient access and fire ground operations.
- Many team members already have an extensive history of working with Police Tactical Groups (PTG’s), bringing a familiarity with cover, concealment, tactical movement and Tactical Emergency Casualty Care (TECC) concepts and interventions.
- Special Operations Paramedics typically undergo job specific and fitness testing, as well as further training in austere and difficult environment patient care, both of which can aid in the progression to a full time tactical team.

In Australian services without a current Special Operations capability consideration should be given to the instigation of a tactical response capability out of their Paramedic pool. The current threat level is such that it could be considered negligent to not have a capability to insert well trained and equipped Paramedics to provide early intervention to the victims of high threat violence. Use of staff with military and law enforcement experience will value add substantially to the capability.

Consideration should be made for this team to:
- Provide an immediate response to Hybrid Targeted Violence both in support of PTG’s and as part of the Ambulance plan for terrorism related events. An on call response should also be implemented to cover protracted and large scale high threat events.
- Support Police agencies in higher risk tasking’s such as warrants, raids, large scale events or riots; undertaking a TEMS role.
- Respond to ambulance tasking’s that involve any weapons related violence. This model is used in both Canada and the UK.
- Follow the Ottawa model of undertaking ambulance transfers of any military personnel. This builds trust and improves the interagency working relationship.
- Seek out any opportunities to train and operate across agencies with military or law enforcement roles to expand the teams experience and relationships.
- Have access to clinical equipment that may not be used through the rest of the Ambulance Service. This may include equipment such as chest seals for the rapid treatment of any penetrating trauma in a warm zone, or use of extrication litters designed specifically for TECC environments. The nature of the work this team may be called upon to perform means that they should be given the freedom to custom build equipment inventories to some extent.
- Potentially operate under a wider scope of practice when in a tactical environment. Examples of this are found in some agencies through the USA, Canada and the UK.
The high rate of penetrating trauma may dictate that the implementation of interventions such as surgical airways may be mandated, or other interventions that could be lifesaving in the context of high threat scenes. One agency that used this system was the Ottawa Paramedic Tactical Unit, which operated under a standard scope of practice in support of city and state tactical police groups, however when supporting special forces military units was able to operate with a much wider scope.

**Training**

- Initial training would be required of at least 1-2 weeks to gain equipment familiarity and mastery of TECC principles and skills. Ongoing training should be prioritised and preferably coordinated with PTG’s training to maximise interoperability and teamwork. An excellent working model is that of the Ottawa Tactical Paramedic Unit, who have 2 members of their team attend training for the Tactical Police every Monday and every Friday run Tactical Medicine training with the Police often attending to assist.

- Initial selection and recruitment should consider having a member of the state PTG present with veto rights to build both buy in and oversight.

- TEMS training based on curriculum from the Emergency Medical Services Association of California Tactical Paramedic program (EMSA Competencies), the Canadian Chiefs of Canada Tactical Paramedic Training Competency Profile (CCC2008) and Schwartz’s 2014 Competency Based guidelines for Tactical Medicine. This element of the training will be to standardise and improve the integration of full time Tactical Paramedics into law enforcement operations.

- High threat incident training in line with current TECC guidelines, adapted as best as practical for the circumstances and setting of the team. This should involve high fidelity, stress inoculation, immersive scenario based training. I undertook this form of training through numerous exercises and courses in the USA and it is by far the best way to prepare for the extremes of responding to hybrid targeted violence.

- Psychomotor skills such as tourniquet application, rapid haemorrhage assessment and wound packing should be trained and drilled to the stage where these skills can be undertaken in difficult, sensory deprived environments in short timeframes.

- Due to the skills attrition of TECC interventions and the various skills to operate effectively in high threat environments, continuing training should be undertaken on a regular basis. Interagency and scenario based training opportunities should be implemented wherever possible to maximise the benefit of the ongoing training.

- The use of TECC as an underpinning philosophy takes on the advantages inherent in an international, evidence based, regularly reviewed and updated set of guidelines.

**Equipment**
- Without exception every tactical Paramedic unit or individual I met during the Fellowship had their own issued equipment which they kept with them at all times on duty or on call, including ballistic PPE and clinical equipment. For a team that has a fulltime TEMS and high threat response capability it is highly recommended that they have individually issued equipment so that it is available at short notice to respond to hybrid targeted violence incidents, as well as being trained in by the Paramedic, so it can be fitted and setup for best use in a high threat scene.

- Ballistic PPE should be rated to Level IV in accordance with the US Department of Justice Ballistic Resistance of Body Armor NIJ Standard-0101.06. This allows for protection up to that of armour piercing rounds of .30 calibre, and is the standard most often worn by tactical Police groups. Any less than this standard is exposing Paramedics to a greater deal of risk than is necessary. PPE should also include a ballistically rated helmet and protective glasses.

- Consideration should be given to the use of Nomex gloves and balaclavas as well as use of fire extinguishers, due to the possibility of explosive environments. Tactical Paramedics in Ottawa were supporting Police during an Explosive Forced Entry(EFE) training day and a shaped charge accidentally formed a large fireball in a confined space, causing a number of casualties, including 2 Paramedics who spent many days hospitalized in ICU. Since then Nomex balaclava’s are standard issue and required as PPE on all tactical operations. Tactical Paramedic teams also carry “Cold Fire Gen 3 Tactical Quick Response extinguishers”.

- Standard issue Ambulance uniforms will not be appropriate for the work environment of tactical Paramedics. The requirement for noise and light discipline, use of concealment and environmental hazards such as explosions, obstacles and broken glass require a protective and specialised uniform. The standard across most agencies I visited is a similar uniform to regular operations, with subdued insignia and no reflective stripes or tape. The reflective stripes on some uniforms can be removed from Velcro patches when transitioning from regular operations to tactical environments. Some agencies also utilize a “BDU” or “under armour” style uniform shirt, which is designed for comfort when used in conjunction with a plate carrier for ballistic PPE.

- Clinical equipment would ideally follow the recommendations of the Committee for TECC. This would indicate the use of kits on the providers person for indirect threat care, with the following as a minimum:
  
  - An effective, non bulky tourniquet such as the CAT, SOFFT-Wide or SWAT-T.
  - Pressure bandages and wound packing gauze, with haemostatic agent if allowed under local guidelines/protocols.
  - Decompression needles
  - Nasopharyngeal airways
  - Chest seals

- For further, evacuation or extended TEMS care kit should be available with a full complement of Paramedic’s clinical equipment.
LEVEL 2: PART TIME CAPABILITY FOR PREHOSPITAL RESPONSE TO HIGH THREAT INCIDENTS

The Hazardous Area Response Teams (HART) of the UK Ambulance Trusts maintain the capability to respond to a MTFA incident, however would usually only have approximately 6 staff on duty at any one time in any one trust. To enable the capability to respond effectively to a terror attack of a large or protracted nature there is also an ‘Uplift’ capability. This consists of regular on road Paramedics who have undergone further training specifically for MTFA response, with yearly ongoing training to maintain skills. The teams are known as Ambulance Intervention Teams (AIT) and provide a valuable resource to provide enough skilled prehospital providers in a large scale terror attack. The recent attacks of November in Paris show that there is a potential for huge numbers of patients in unsecured locations requiring treatment, and the ability to call on the resources of a team like AIT provides substantial boost to Ambulance capability.

The team could be raised through EOI to onroad Paramedics to receive additional training and be oncall for high threat, large scale incidents where they could move to a predesignated point, be issued PPE and additional clinical equipment and be briefed. From there Uplift Paramedics would form into teams with law enforcement and perform a rescue task force. This would entail moving under the direction of a unified command into areas which had been cleared but not secured, and begin treating patients with rapid lifesaving interventions only. Once supplies were exhausted or all patients treated, extrication would be initiated to move patients to CCP’s.

Additionally the Uplift team members once called in could site and staff CCP’s outside the warm zone, as well as provide relief and standby for teams already working in the warm zone.

In rural areas having an Uplift capability could provide a response to potential terror attacks or other intentional mass casualty incidents. Often in more remote areas there would be a significant delay in getting any specialist prehospital resources onscene, and the part time tactical Paramedics could close this gap. In NSW Ambulance regional areas have Rescue teams, who could undergo the Uplift training as another part of their skill set. Similar teams in other states should be sought out as well.

Training

- Initial training can be shorter than for Level 1, as there is no requirement for TEMS and the focus is specifically on response to hybrid targeted violence. The training should, however, be standardised to the Level 1 competencies in provision of TECC and working in high threat environments. Similarly high repetition skill training should progress into high stress, immersive scenario based training.
- Continuing training will be required, however not to the same frequency as Level 1. 1-2 days every 6-12 months should be sufficient to maintain skills and knowledge.

**Equipment**

- The requirement for individually issued equipment is not high for a part time high threat capability. HART stores ballistic PPE and clinical stores specific for TECC interventions in a truck which can be mobilized to a scene as the AIT is being called in.
- TECC ‘Grab bags’ should be personally issued with chest seals, tourniquets, wound packing gauze or haemostatic agents and some basic airway adjuncts. These bags give the Paramedics the ability to respond if they are in the first response to Hybrid Targeted Violence.
- Standardising equipment used with Level 1 would provide a logistic and interoperable advantage.

**LEVEL 3: HIGH THREAT FAMILIARITY TRAINING**

The traditional designation of a scene into zones of danger is used across many types of scenes encountered by Prehospital providers. Most commonly Hazardous Materials (Hazmat) or Chemical, Biological, Radiological, Nuclear or Explosive (CBRNE) emergencies utilize the terminology of hot, warm and cold zone, as does the rescue approach to a motor vehicle accident (MVA). Table 1 shows a template for this approach.

The use of the zone approach in a diverse range of hazardous area environments has become normal parlance, with a hot zone or direct threat area being one where active shooters or explosive devices create an immediate threat to life. The warm zone or indirect threat area is unsecured but cleared for threats, and the cold zone or evacuation area is clear of all threats and secured. In the traditional approach Paramedic teams would stage in the cold zone at a high threat scene until it was cleared by other agencies and declared a cold zone.

The model established to respond to active shooter incidents and enter the warm zone in Arlington County is that of a Rescue Task Force. I was able to observe the way this model is established in the county, with every Fire fighter/EMT equipped with Ballistic vests as well as active shooter grab bags stowed in the cabin of the fire trucks. As ACFD is a small service the ability to train and equip all members is an easier undertaking than in a large service such as NSW Ambulance with upwards of 3500 Paramedics. Smaller services may be able to train all Paramedics in Level 1 or 2 of these recommendations, and fully equip their staff with PPE, however the larger services will most likely find the costs involved prohibitive.
Whilst not every Paramedic in every service in Australia needs to be trained to Level 1, there is a clear need for awareness training on high threat incidents for regular operations. There is a strong case based on the following rationale:

- Preparedness for high threat incidents, particularly terrorism generated mass violence
- Psychosocial protection of first responders
- Generalisability of training to a range of case presentations

**Preparedness:** There are, unfortunately, numerous examples of where a lack of training in the prehospital response to high threat scenes exposed staff to great risk or caused preventable death. Each of the following examples were described to me by Paramedics and Police who were present at the incidents:

**2011 IHOP shooting, Carson City:**

After a gunman entered an IHOP Restaurant and shot a number of customers, one of the responding law enforcement officers identified a patient requiring immediate intervention for a bleeding extremity GSW. The Officer handed the patient over to an Ambulance crew and continued clearing the building. At a later time the patient was noted to be deceased due to exsanguination with no tourniquet placed, in the care of EMS.

- Although no Paramedic would ever want allow a preventable cause of death due to lack of appropriate intervention, without training they may not be armed with the knowledge and ability to do so in the environment of high threat trauma care.

**2013 Boston Marathon bombings:**

Boston EMS had staged staff for the Marathon event, and when the first IED exploded many of these staff began treating blast victims and responding into the area of damage. The second IED was intended to be set off 5 minutes after the first to maximise the effect on first responders, however it was detonated approximately 45 seconds after the first. The route for EMS resources into the area would have taken them straight past the second IED.

- This highlights the fact that zone designation cannot often be well controlled and the first staff onscene will usually not be specialist Paramedics.

**2014 Ottawa Parliament Hill shootings:**

Shortly after a gunman killed the Canadian Soldier at Parliament Hill, an onroad, non-specialist Ambulance attended to him at the point where he had been shot. This area had
not been searched or secured, and with a gunman at large would certainly be designated a warm zone.

- Regardless of the intention to stage Ambulance resources they often will enter indirect or even direct threat areas. This may happen inadvertently due to lack of situational awareness or deliberately due to a Paramedic’s desire to help.

**Psychosocial:** A survey of Canadian Paramedics found that the most emotionally distressing scene that they might encounter is that of terror attacks and malicious violence, more than doubling the emotional impact of the event. Considering the burden of Post Traumatic Stress Disorder and suicide amongst Paramedics, there is a level of responsibility to ensure that steps are taken to protect the responding emergency services psychologically as well as physically. A paramedic involved in the school shootings at Columbine in 2001 who inadvertently entered the warm zone and was exposed to a high level of potential threat was noted to be off work indefinitely due to psychological issues.

Awareness training to equip first responders with the skills and knowledge to competently and safely respond in high threat incidents can have a significant effect on inoculation against the psychological burden that violent settings bring.

A pilot 4 hour Active Shooter Incident (ASI) training program for Paramedics in Boston saw significant improvements in attitudes, perceptions and comfort levels to integrate with law enforcement teams and enter the warm zone to provide lifesaving interventions at the point of wounding. 93% of Paramedics that undertook the training stated that they felt comfortable and prepared to work in the warm zone of an active shooter incident.

Meeting with a number of Paramedics in Boston EMS and discussing the training I had the strong impression that they felt well prepared psychologically and practically for future high threat incidents. This was replicated across a number of Paramedics I interacted with who had undergone some form of high threat training including New York, Alamaeda County, Arlington County, Sacramento and Las Vegas.

All Australian Paramedics should receive a form of similar training to this program as a preparedness primer for events that will undoubtedly be beyond the normal experience of usual prehospital care.

**Generalisability:** The concepts of Tactical Emergency Casualty Care are generalisable to many scenarios that first responders face on a daily basis. Undertaking further training in this field enables Paramedics with a solid approach to penetrating trauma (shootings, stabbings, industrial accidents), as well as scenes with safety issues such as MVA’s, and excited delirium patients. Undergoing training to develop responders skills with rapid
trauma assessment and haemorrhage control can have great benefit in areas that may not be immediately obvious.

An example was demonstrated at a lecture I attended at the EMS World Expo by Dr Peter Taillac. A case study was described where a provider used a tourniquet to stop life threatening haemorrhage from a patient’s fistula. The tourniquet had been provided during active shooter training the EMT had undertaken and he cited this training as valuable in recognising the need and the ability to undertake the intervention.

In the current environment of increasing violence against Paramedics, the usefulness of a high threat training package would be very pertinent. Recognition of danger, ability to move tactically, tools to maintain situational awareness and the skills to undertake lifesaving interventions both on the patient and oneself are of great relevance to this issue.

The following table outlines suggested core competencies that should be covered in high threat familiarity training:

<table>
<thead>
<tr>
<th>High Threat Familiarity training core competencies:</th>
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<tbody>
<tr>
<td>- Current threat profile and terrorism characteristics</td>
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<tr>
<td>- Communication with Police and unified command principles</td>
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<tr>
<td>- Use of Casualty Collection Points, siting considerations</td>
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<tr>
<td>- Cover, concealment, tactical movement, maintaining situational awareness</td>
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<tr>
<td>- TECC concepts and interventions (e.g., Tourniquets, pressure dressings, chest seals, wound packing, rapid triage, rapid extrication and carrying techniques)</td>
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<tr>
<td>- Awareness of IED’s, Secondary IED’s, Vehicle based IED’s</td>
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<tr>
<td>- Scenario based training to consolidate learning points, preferably with high fidelity simulation and stress inoculation</td>
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**UNIFIED COMMAND**

The response to high threat incidents requires an integrated, unified approach. The Inter Agency Board recommends that Unified Command is a ‘bottom up’ concept with the first responders beginning the process and handing off up to further scene managers as the incident progresses.

Consideration should be made for a separate module either during the Level 3 training or in a separate training package that addresses the specific requirements of a unified command approach to Hybrid Targeted Violence. Targeted training for scene commanders should be incorporated to provide a level of understanding and familiarity to those Ambulance staff that will be assuming command roles as scenes progress.
DISSEMINATION AND IMPLEMENTATION

The aim of this fellowship was to identify best practice in the area of high threat prehospital medicine. To disseminate these findings the following strategies will be utilised:

- Submission for publication of a research paper on Australian preparedness for the prehospital response to Hybrid Targeted Violence.
- Presentation of the findings to appropriate interested parties, beginning with executive level management in my own service.
- Identification of members in other Australian Ambulance services who can champion the cause locally and push for the implementation of the findings.
- Application to present the findings at relevant Paramedic conferences.

If implementation of the plan for capability and training becomes a reality then there is a multitude of training materials, guidance documents and anecdotal findings that can be incorporated into the establishment of doctrine and curriculum.
Bibliography


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