Killed in Action

How golden are 60 minutes?

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Research & Clinical Innovation

Killed in action (KIA): an analysis of military personnel who died of their injuries before reaching a definitive medical treatment facility in Afghanistan (2004–2014)

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ABSTRACT

Introduction The majority of combat deaths occur before arrival at a medical treatment facility but no previous studies have comprehensively examined this phase of care.

Methods The UK Joint Theatre Trauma Registry was used to identify all UK military personnel who died in Afghanistan (2004–2014). These data were linked to non-medical tactical and operational records to provide an accurate timeline of events. Cause of death was determined from records taken at postmortem review. The primary objective was to report time between injury and death in those killed in action (KIA); secondary objectives included: reporting mortality at key North Atlantic Treaty Organisation timelines (0, 10, 60, 120 min), comparison of temporal lethality for different anatomical injuries and analysing trends in the case fatality rate (CFR).

Results 2413 UK personnel were injured in Afghanistan from 2004 to 2014; 448 died, with a CFR of 18.6%. 390 (87.1%) of these died prehospital (n=348 KIA, n=42 killed non-enemy action). Complete data were available for n=303 (87.1%) KIA: median Injury Severity Score 75.0 (IQR 55.5–75.0). The predominant mechanisms were improvised explosive device (n=166, 54.8%) and gunshot wound (n=96, 31.7%).

In the KIA cohort, the median time to death was 0.0 (IQR 0.0–21.8) min; 173 (57.1%) died immediately (0 min). At 10, 60 and 120 min post injury, 205 (67.7%), 277 (91.4%) and 300 (99.0%) casualties were dead, respectively. Whole body primary injury had the fastest mortality. Overall prehospital CFR improved throughout the period while in-hospital CFR remained constant.

Conclusion Over two-thirds of KIA deaths occurred within 10 min of injury. Improvement in the CFR in Afghanistan was predominantly in the prehospital phase.

Key messages

- Eighty-seven per cent of UK deaths in Afghanistan were prehospital.
- Over half of the killed-in-action deaths were immediate, and two-thirds occurred within 10 min of injury.
- A primary injury to the head had a significantly shorter time to death compared to the abdomen and to the lower extremity.
- Significant improvement in survival can be attributed to a reduction in the prehospital case fatality rate (CFR) without an increase in the in-hospital CFR.

INTRODUCTION

Most fatalities from trauma, in civilian and military settings, die before reaching a medical treatment facility (MTF).[1 2] Paradoxically, this is the least researched and understood phase of care. It is accepted that the sooner a patient reaches definitive medical care, the better the outcome from severe trauma.[3] This has been appreciated for several decades of military conflict, and underpins the concept of MTFs being located as far forward as possible to minimise the time to definitive care. In recent conflicts, life-saving interventions such as prehospital emergency anaesthesia, blood transfusion and surgical procedures (for example thoracotomy) were pushed forward into the prehospital environment. These interventions, combined with senior decision making, were used to good effect in the recent conflict in Afghanistan.[4 5] These advances in prehospital care have also been adopted in civilian practice, and are associated with improved early mortality.[6]

Historically, death due to trauma was thought to follow a tri-modal distribution.[7] However, more recently this has been questioned, with many challenging the validity of this model in a modern trauma system.[8–10] Similarly, the '*Golden Hour*' is a widely understood concept that describes the first hour following injury as the optimal period to intervene with life-saving intervention, and this has been used to drive improvement in the initial management of trauma patients and indeed the entire trauma pathway. However, the 60 min of the '*Golden Hour*' are not based on robust evidence. It is not known how quickly life-saving intervention is needed in patients with time-critical potentially fatal injuries.

Op HERRICK was the UK's contribution to the conflict in Afghanistan between 2002 and 2014. Survival from a given injury severity improved year on year throughout the course of the conflict but further analysis is necessary to define where these benefits occurred.[5] It has been suggested that in order to improve future survival rates, we should focus on the died-of-wounds cohort,[11] but most

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Introduction

- The majority of servicemen die before MTF
- Pre hospital emergency care holds the greatest potential for improving mortality on the battlefield

Aim

What were the causes of death on Operation HERRICK?

What was the precise time between point of wounding and time of death?

Background:

ORIGINAL ARTICLE

Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD, Paul Uribe, MD, Olga Mallett, Tamara Zubko, Lynne Oetjen-Gerdes, Todd E. Rasmussen, MD, Frank K. Butler, MD, Russell S. Kotwal, MD, John B. Holcomb, MD, Charles Wade, PhD, Howard Champion, MD, Mimi Lawnick, Leon Moores, MD, *and* Lorne H. Blackbourne, MD

BACKGROUND: Critical evaluation of all aspects of combat casualty care, including mortality, with a special focus on the incidence and causes of potentially preventable deaths among US combat fatalities, is central to identifying gaps in knowledge, training, equipment, and execution of battlefield trauma care. The impetus to produce this analysis was to develop a comprehensive perspective of battlefield death, concentrating on deaths that occurred in the pre–medical treatment facility (pre-MTF) environment.

METHODS: The Armed Forces Medical Examiner Service Mortality Surveillance Division was used to identify Operation Iraqi Freedom and Operation Enduring Freedom combat casualties from October 2001 to June 2011 who died from injury in the deployed environment. The autopsy records, perimortem records, photographs on file, and Mortality Trauma Registry of the Armed Forces Medical Examiner Service were used to compile mechanism of injury, cause of injury, medical intervention performed, Abbreviated Injury Scale (AIS) score, and Injury Severity Score (ISS) on all lethal injuries. All data were used by the expert panel for the conduct of the potential for injury survivability assessment of this study.

RESULTS: For the study interval between October 2001 and June 2011, 4,596 battlefield fatalities were reviewed and analyzed. The stratification of mortality demonstrated that 87.3% of all injury mortality occurred in the pre-MTF environment. Of the pre-MTF deaths, 75.7%

"No studies have comprehensively evaluated the outcomes of wounded warriors who died of their injuries before reaching an MTF."

Eastridge BJ, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care *J Trauma Acute Care Surg*. 2012

"69% died pre-hospital"

PostScript

LETTER

Violent death in London: in the news, but not in the database

Violent death in London reached a 10-year high in 2019, with 149 reported homicides, a 60% increase compared with 2014.[1] These figures have been widely reported, and the medical community has recently voiced the need for new strategies, including prevention and safe-guarding.[2] However, in the UK we do not collect total epidemiological data with which to inform our advocacy.

We used open access media reports to review London homicides in 2019 (n=148, one person shot by police was not included).[3] Of these, 104 (69.8%) were due to stab or gunshot injuries

example in the setting of decapitation, rigor mortis, decomposition and so on. The former would ideally be included in a trauma registry but would require the full cooperation of ambulance trusts and Her Majesty's Coroners to ensure data completeness. The latter (those in whom resuscitation attempt is not made) pose a more difficult argument and data-capture challenge—should these cases even fall under the remit of TARN, whose aim is to 'support hospitals by providing evidence of the standards of care [in trauma]',[4] and if so which agencies would be required to share data with TARN in order for it to report total epidemiological data?

The UK Defence Medical Services has a different approach, which results in total epidemiological injury data through 100% inclusion.[7] This process assisted rapid evolution of medical management during

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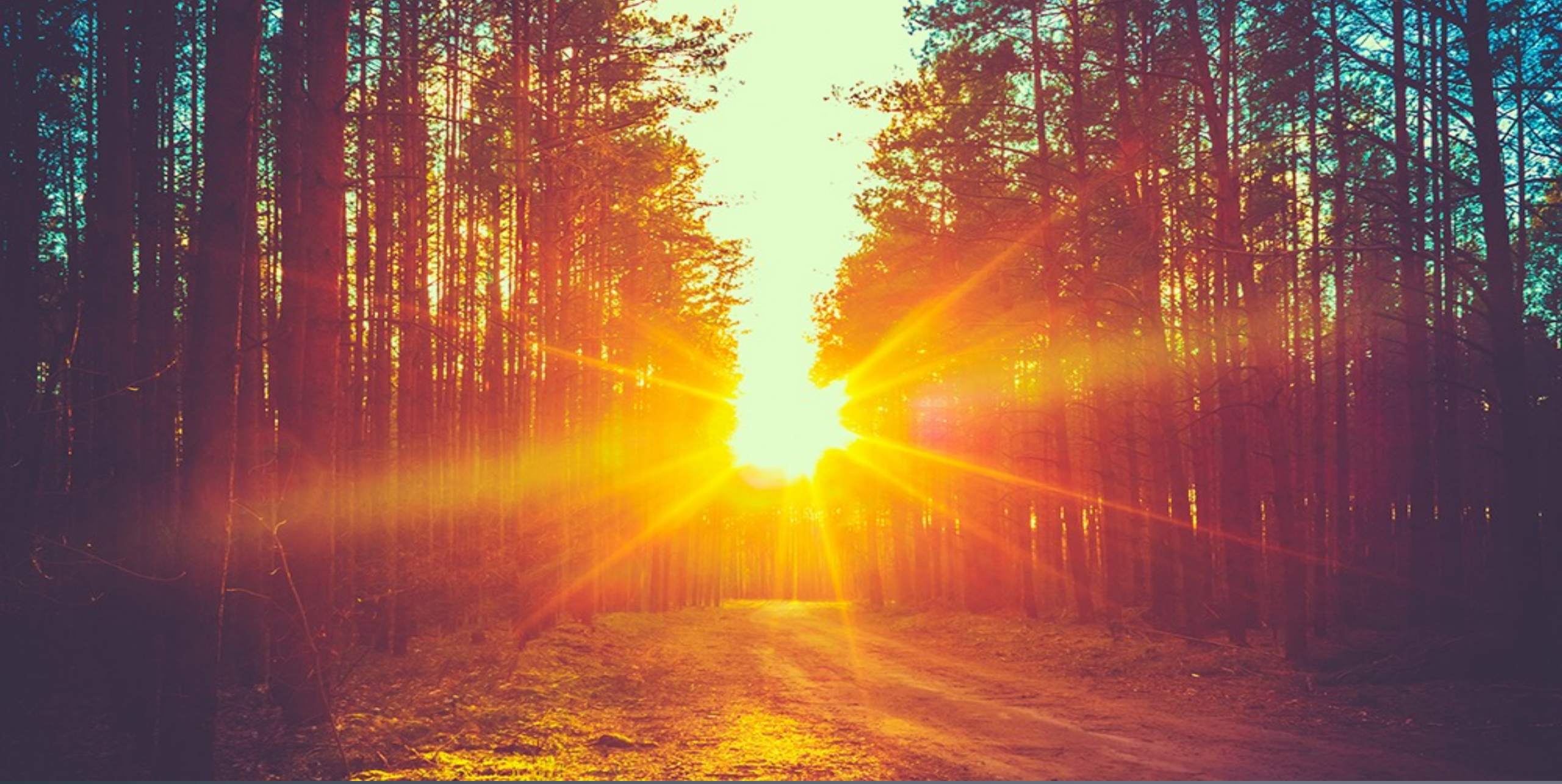
Emergency Medicine Journal 2020;37:496.



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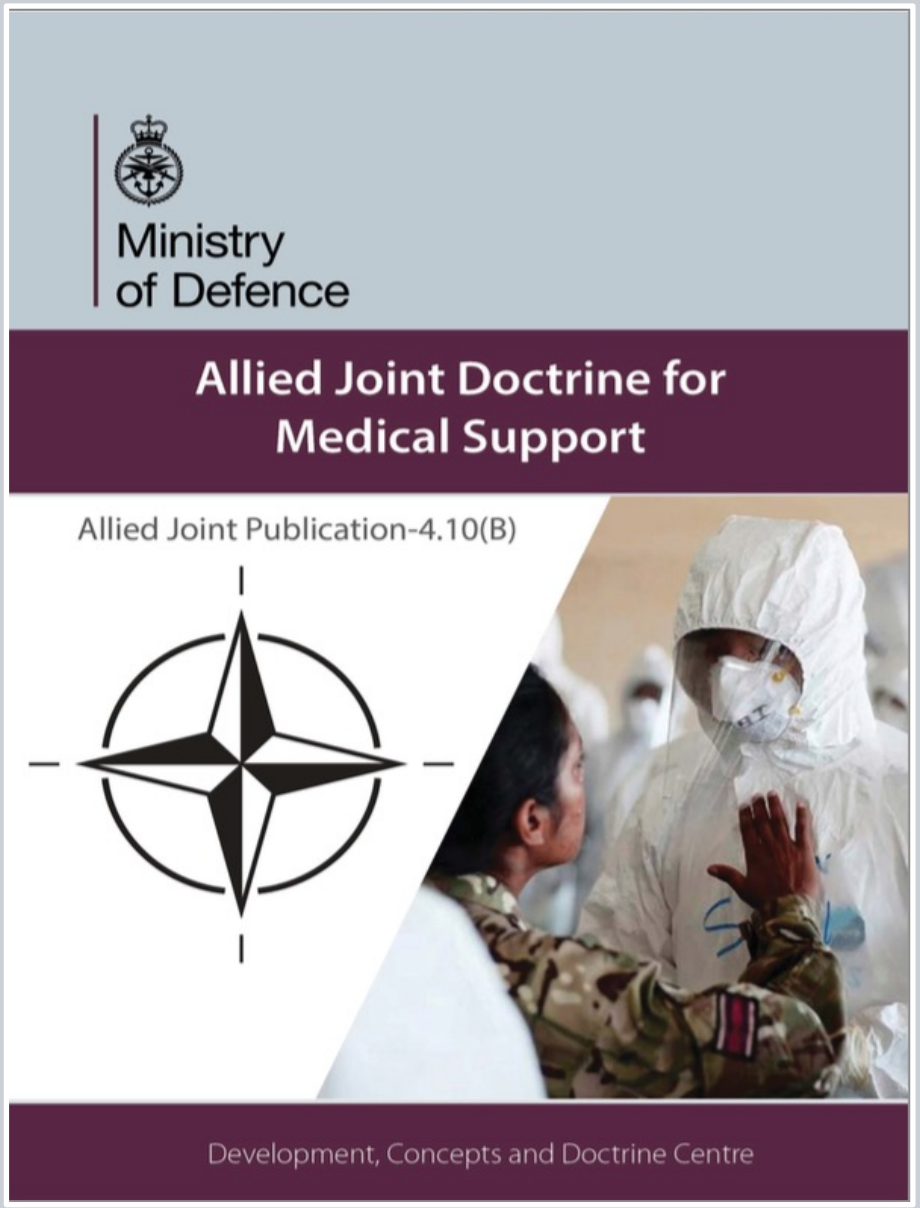
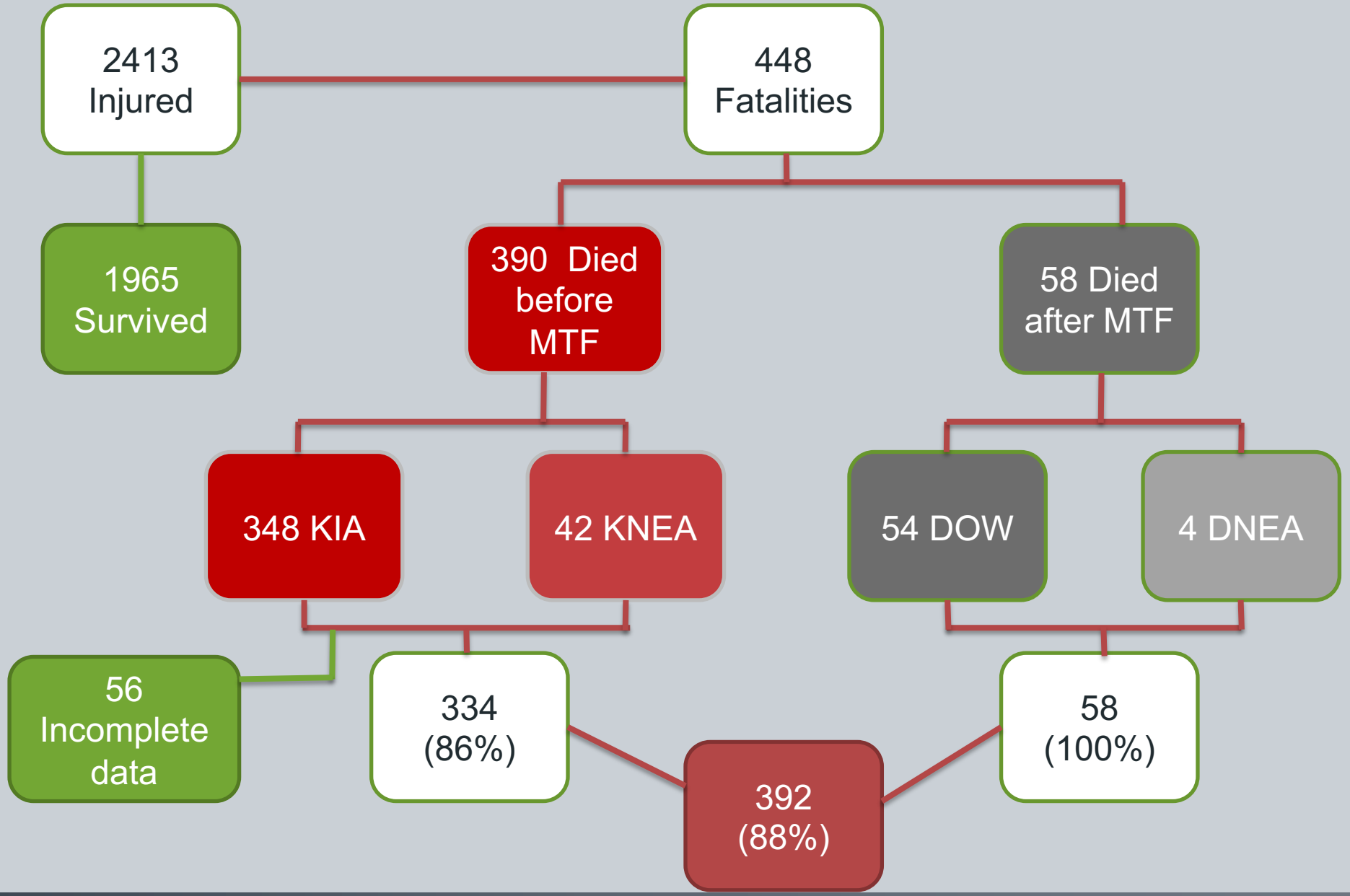

Ministry
of Defence
Allied Joint Doctrine for
Medical Support
Allied Joint Publication-4.10(B)
Development, Concepts and Doctrine Centre

Methods:

- *Joint Trauma Theatre Registry (JTTR)*
- *Post mortem review*
- *Land Operational Reporting Database (LORD)*
- *SINCREPS, WISREPS, Individual incident reports*


2413
Injured
448
Fatalities
1965
Survived
390 Died
before
MTF
58 Died
after MTF
348 KIA
42 KNEA
54 DOW
4 DNEA
56
Incomplete
data
334
(86%)
58
(100%)
392
(88%)

Demographics

Age	18 – 49 (25)
Gender %male	99%
ISS	9 – 75 (75)
Mechanism of Injury n, %	
- IED - GSW - RPG - Aircraft Incident - Mine - MVC - Mortar - Other	225, 50% 128, 29% 26, 6% 21, 5% 19, 4% 12, 3% 7, 2% 7, 2%

Where do battlefield casualties die?

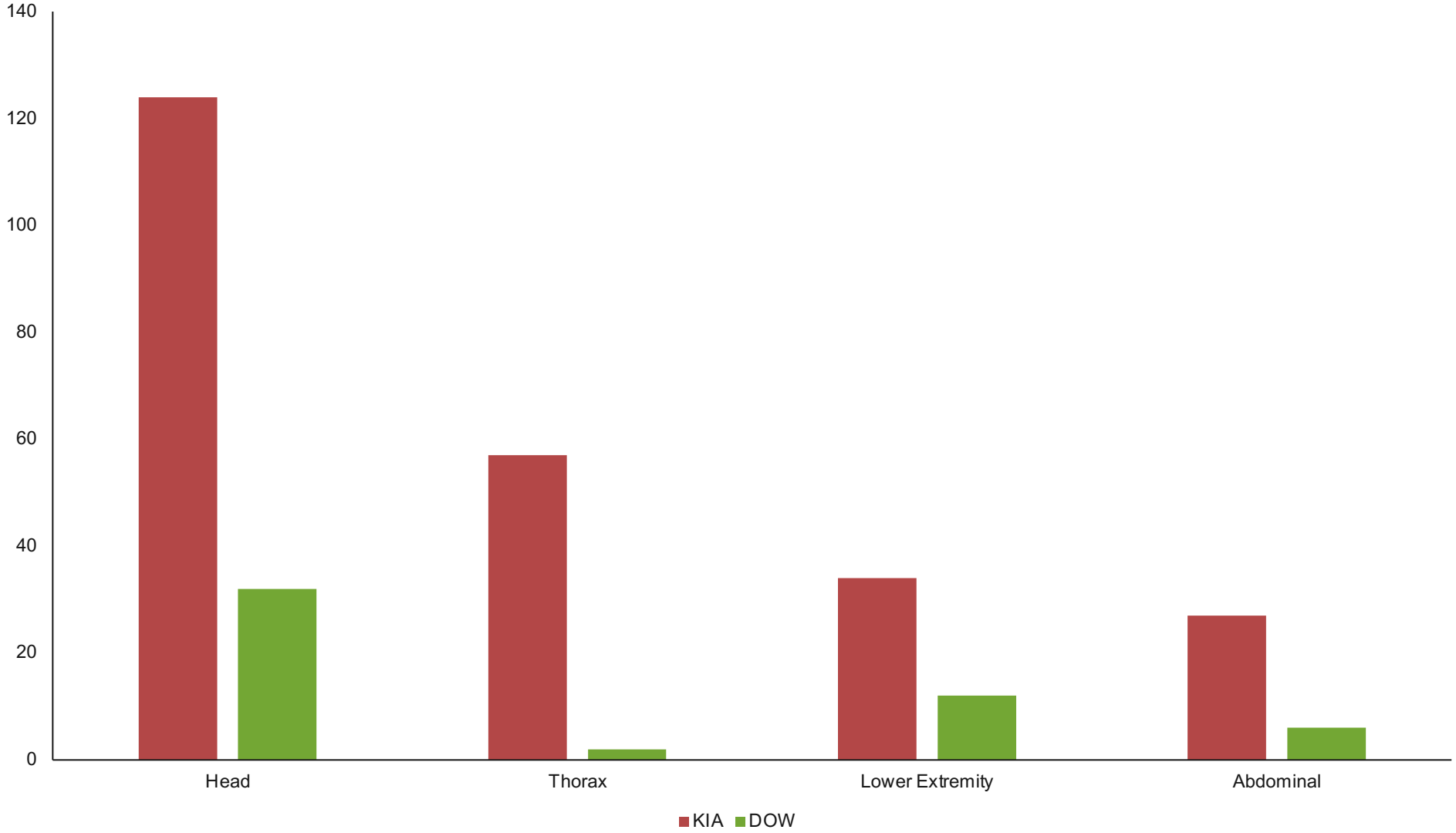
78%

12%

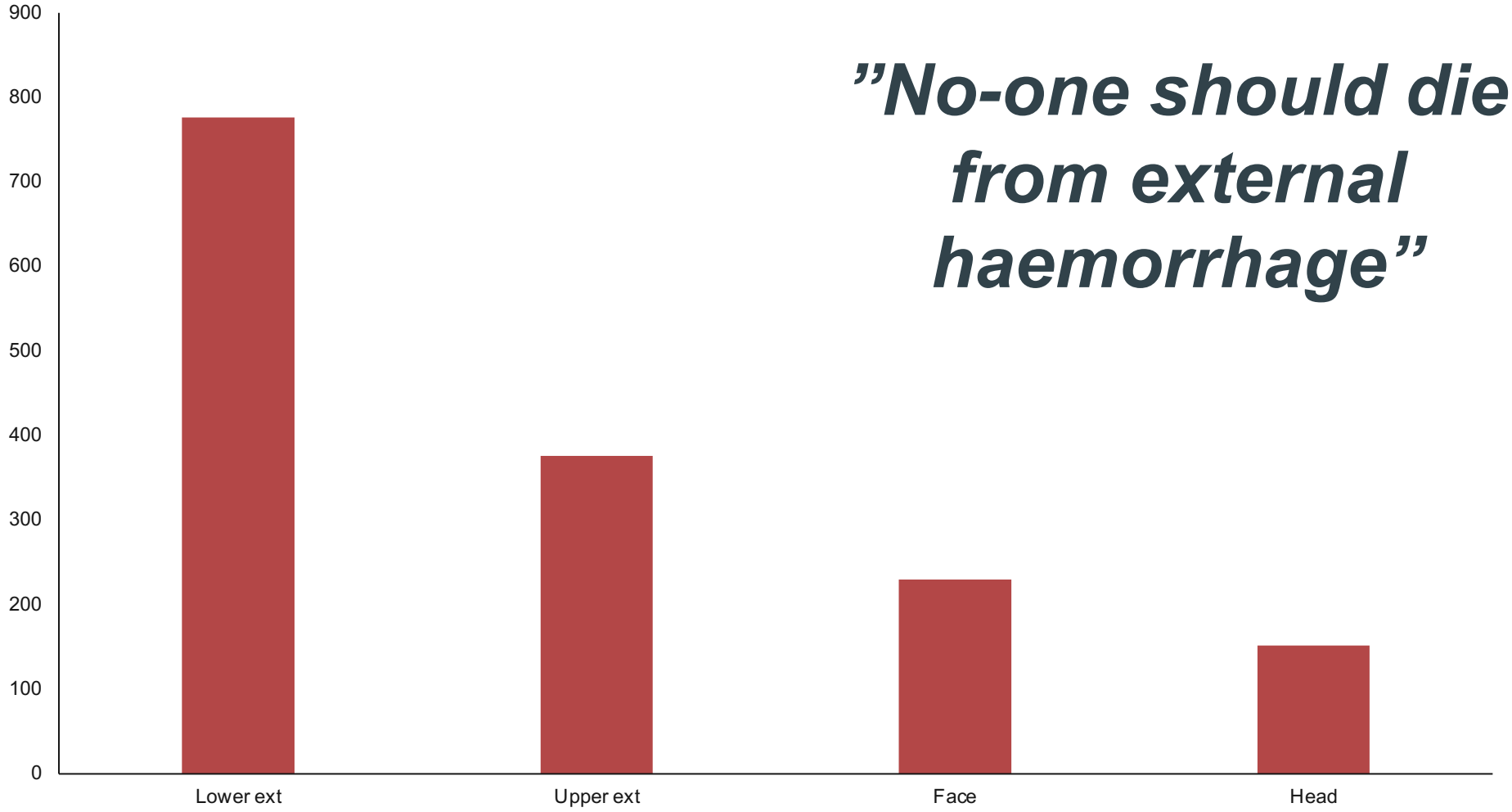
9%

1%

Comparison of death before and after arrival at R3

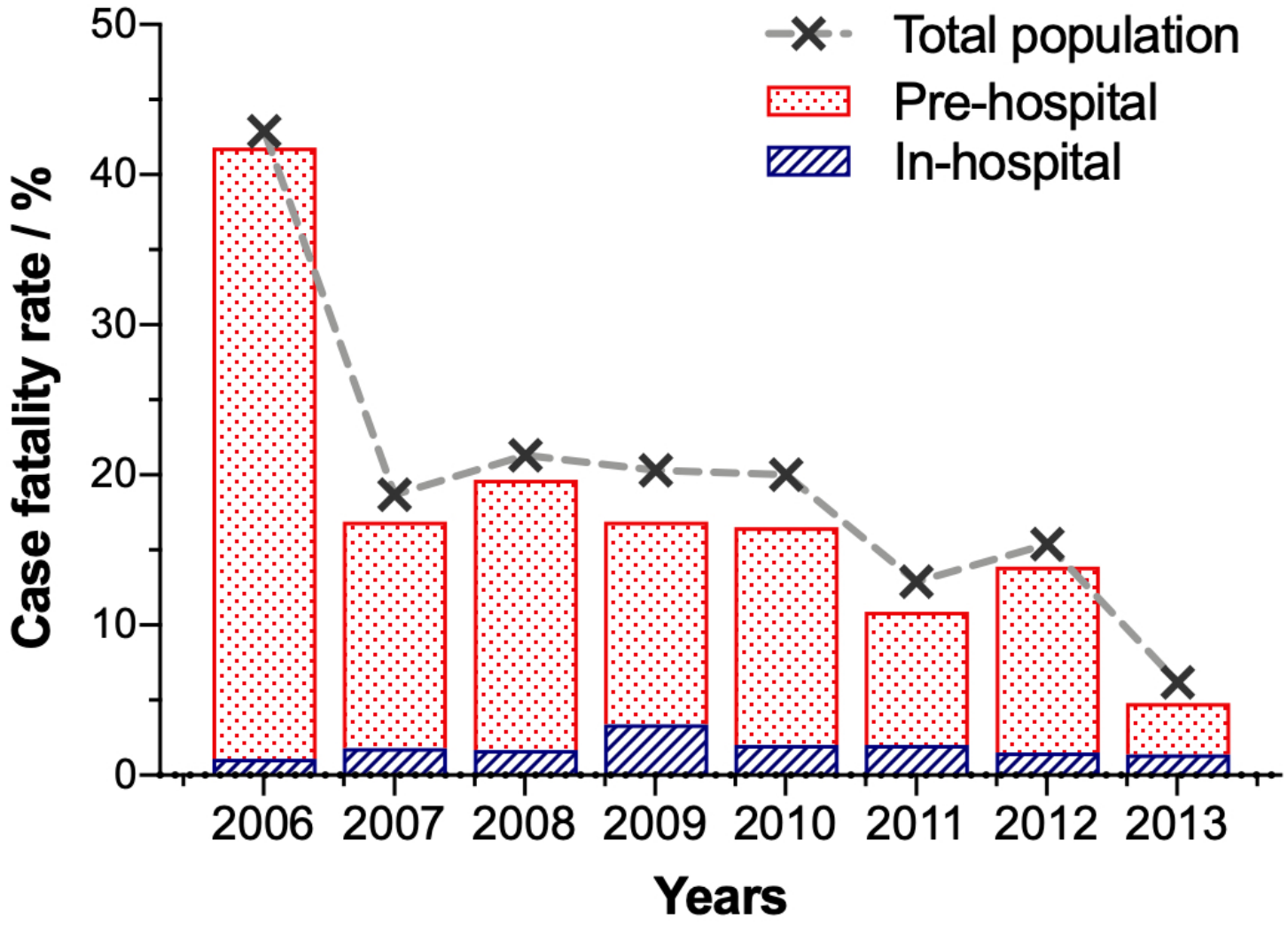


What about the survivors?

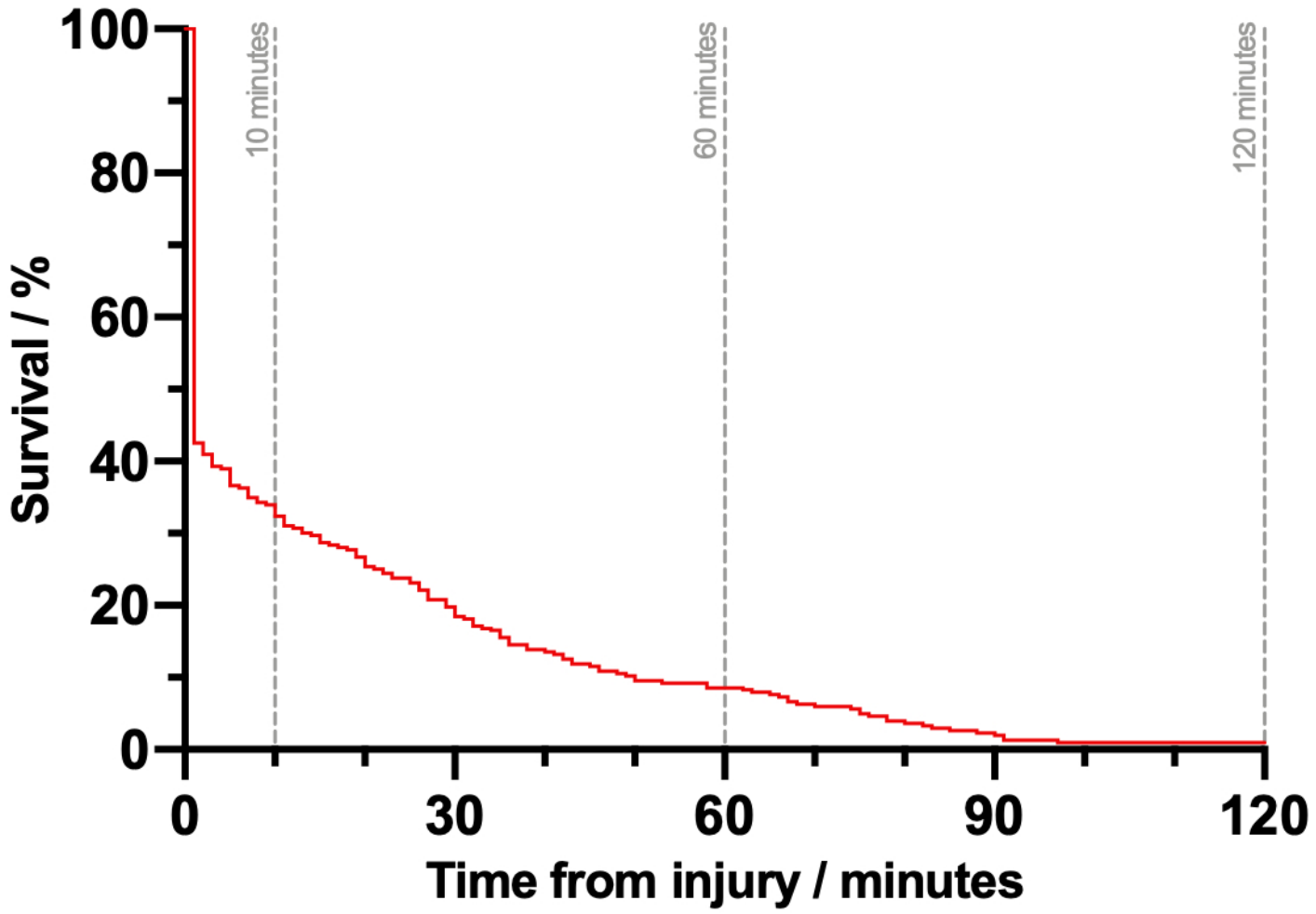


”No-one should die from external haemorrhage”

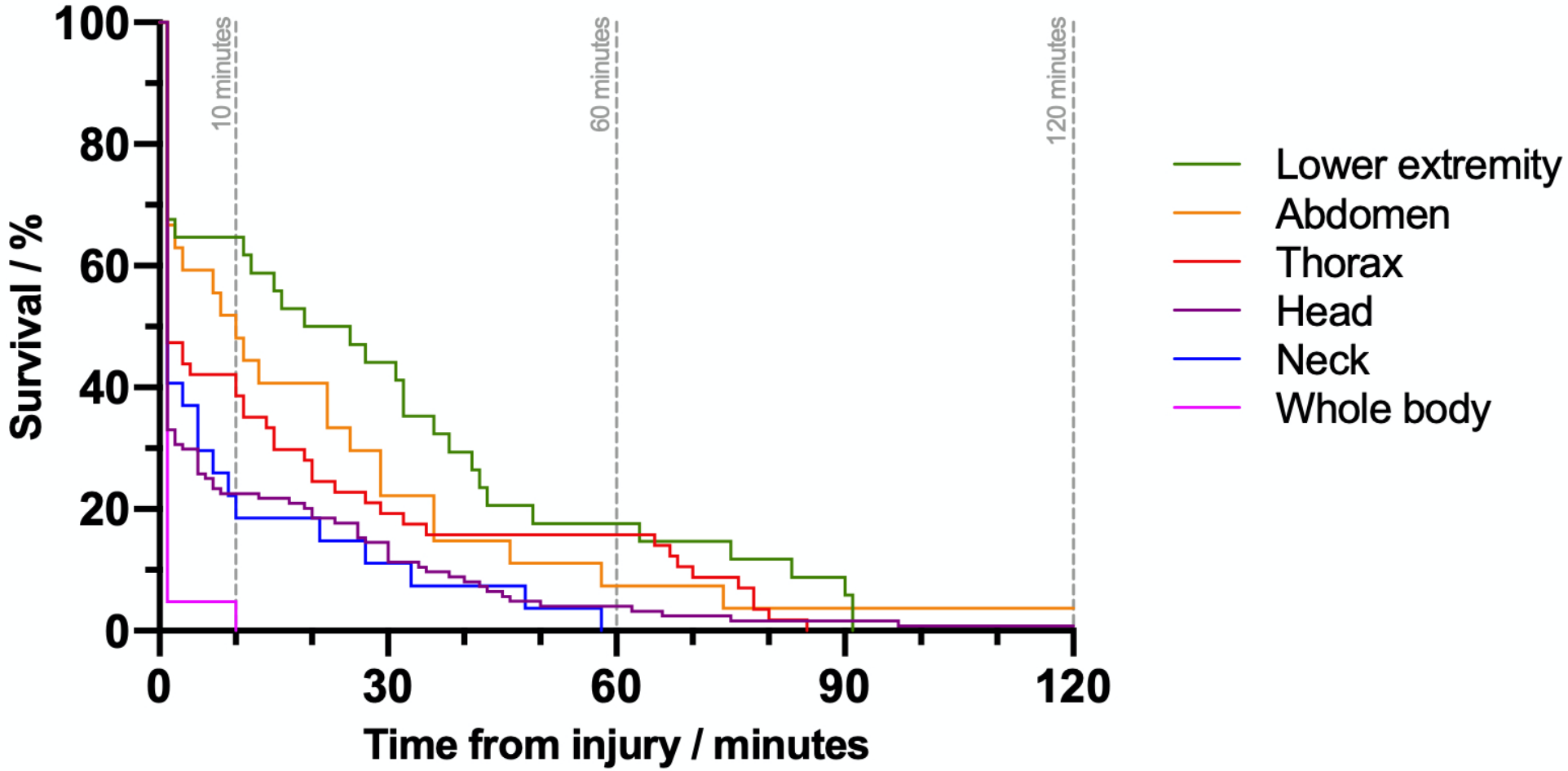
Mortality Improvement



Time to death for those Killed in Action (KIA)



Anatomical Variation



Future Work

Key Messages:

- 87% of UK deaths in Afghanistan (2004-2014) were **pre-hospital**
- **>50%** of KIA deaths were **immediate**, and 2/3 occurred <10 minutes
- The key to improving overall **survival** lies in the **pre-hospital phase** without an increase in the in-hospital CFR