



# Mass Casualty Response: Time, Triage and Lessons from the Trauma Registry

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20 Oct 2022

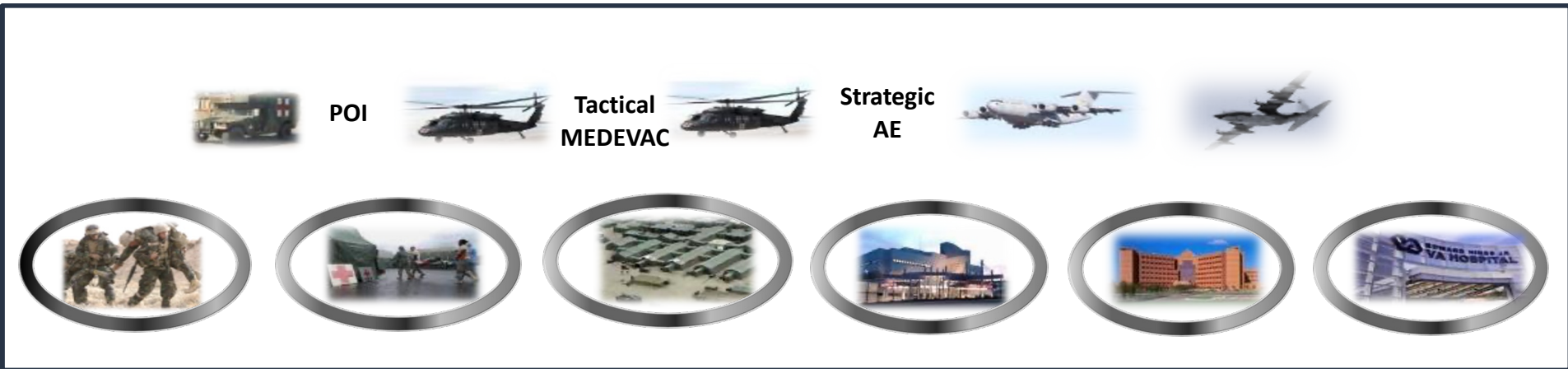
# Disclaimer

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- The opinions or assertions contained herein are the private views of the author and not to be construed as official or as reflecting the views of the Defense Health Agency or the Department of Defense.
- There are no conflicts of interest to disclose.



# CHAIN OF SURVIVAL AND RECOVERY ACROSS THE GLOBAL CONTINUUM OF CARE

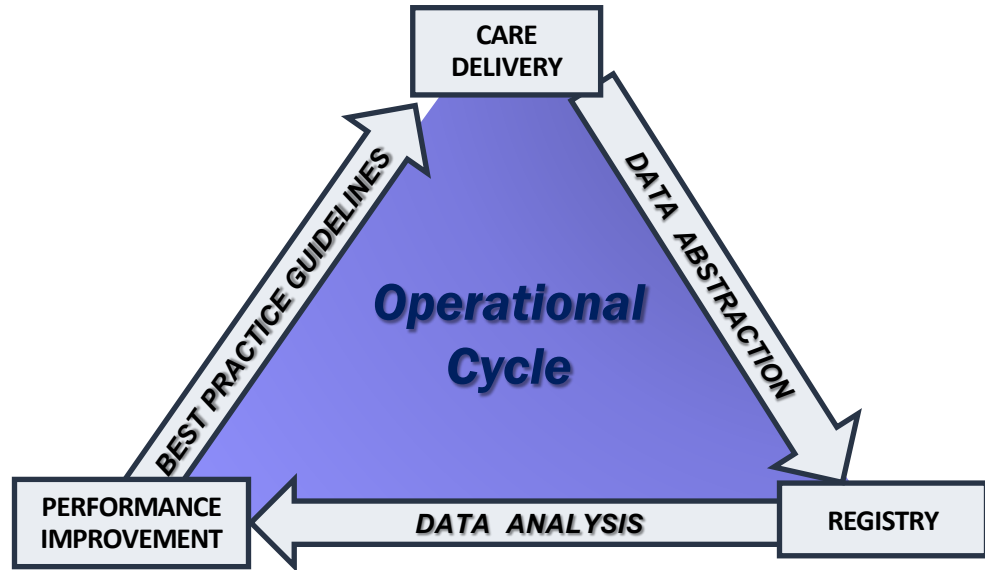


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# Joint Trauma System

**Mission:** To improve trauma readiness and outcomes through evidence-driven performance improvement



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# POINT of INJURY considerations

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Treatment objective

**Stop the BLEED!**

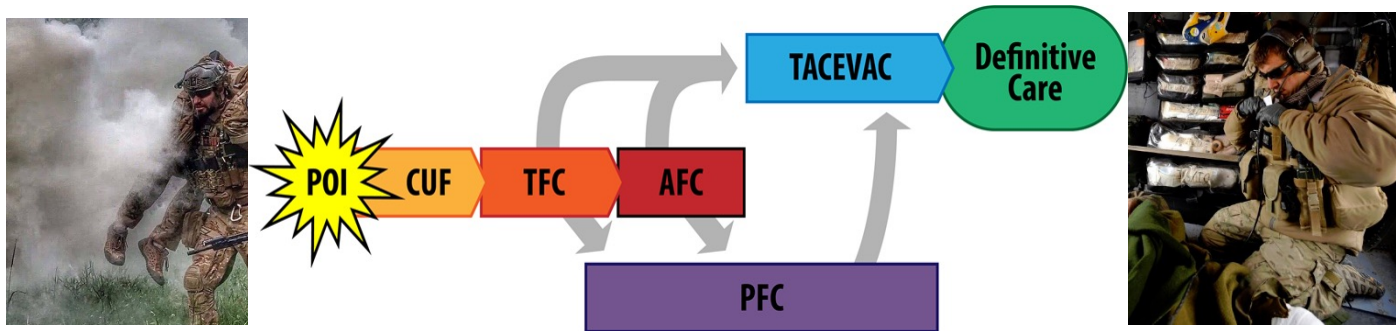


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# Tactical Combat Casualty Care (TCCC)

- NO higher care will follow if there is not adequate Point of Injury care
  - Massive hemorrhage
  - Airway
  - Respiration
  - Circulation
  - Head and Hypothermia



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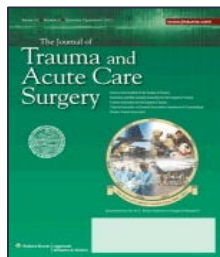


# Most Combat Trauma Deaths Occur Prehospital and are Associated with Hemorrhage

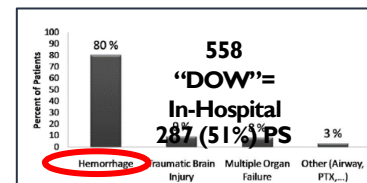
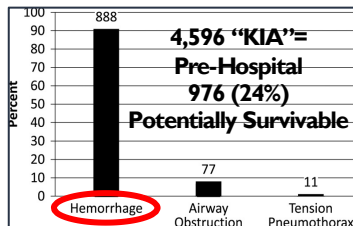
Death on the battlefield (2001–2011): Implications for the future of combat casualty care

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

J Trauma 2012



**> 1000  
Potentially  
Preventable  
Deaths from  
BLEEDING!**



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# Time and Triage

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Life-saving treatments delivered too late  
do not improve survival

What is too late?



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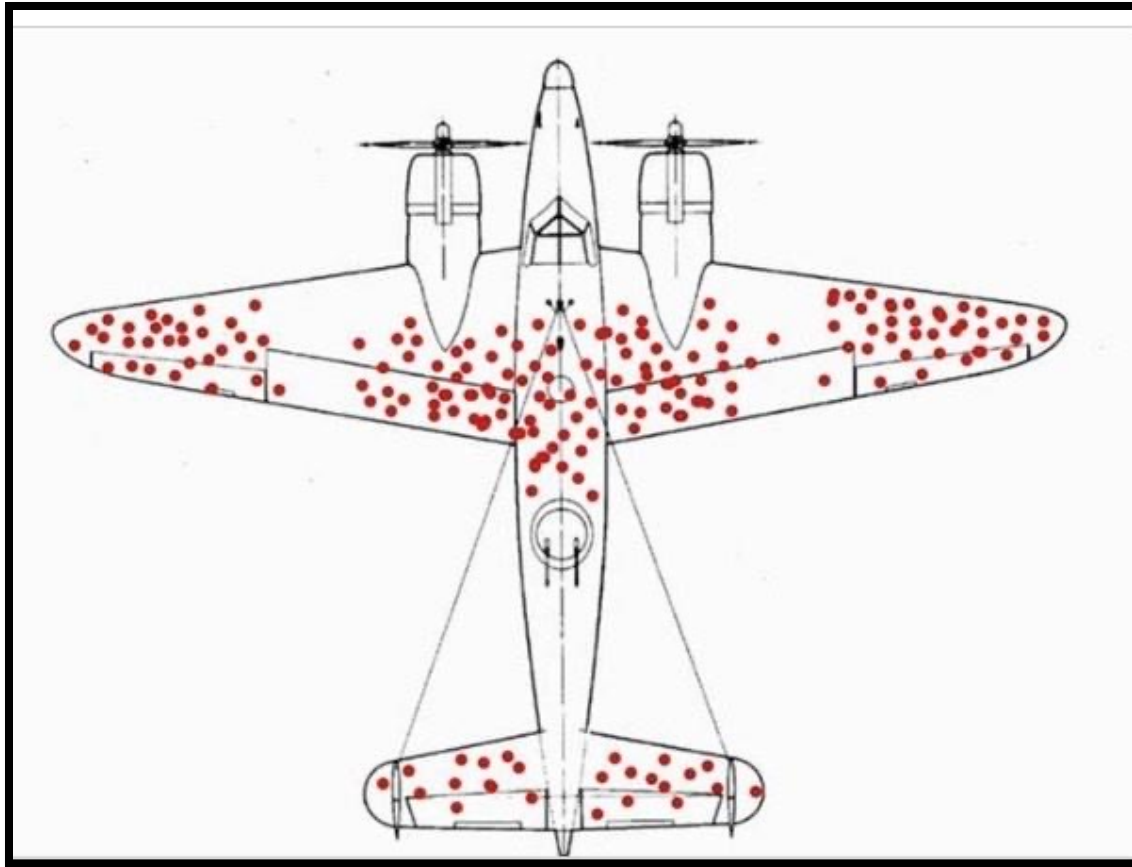






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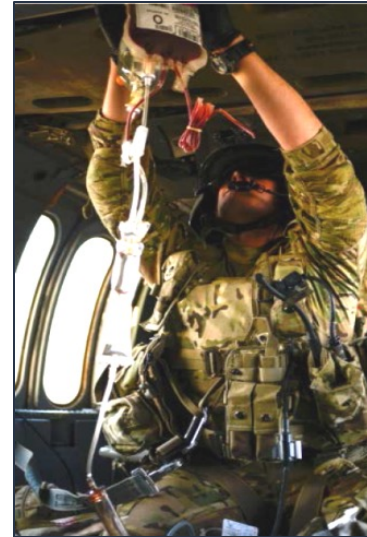


JAMA | Original Investigation

## Association of Prehospital Blood Product Transfusion During Medical Evacuation of Combat Casualties in Afghanistan With Acute and 30-Day Survival

Stacy A. Shackelford, MD; Deborah J. del Junco, PhD; Nicole Powell-Dunford, MD; Edward L. Mazuchowski, MD, PhD; Jeffrey T. Howard, PhD; Russ S. Kotwal, MD, MPH; Jennifer Gurney, MD; Frank K. Butler Jr, MD; Kirby Gross, MD; Zsolt T. Stockinger, MD

“Among medically evacuated US military combat casualties in Afghanistan, **blood product transfusion prehospital or within minutes of injury was associated with greater 24-hour and 30-day survival** than delayed transfusion or no transfusion.”

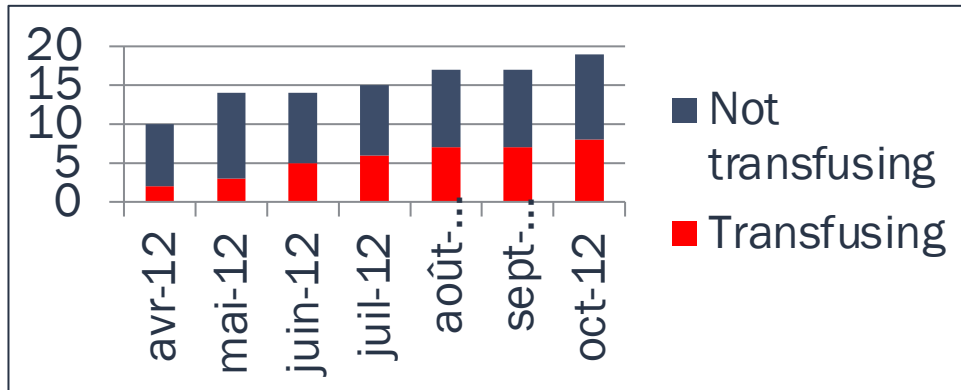


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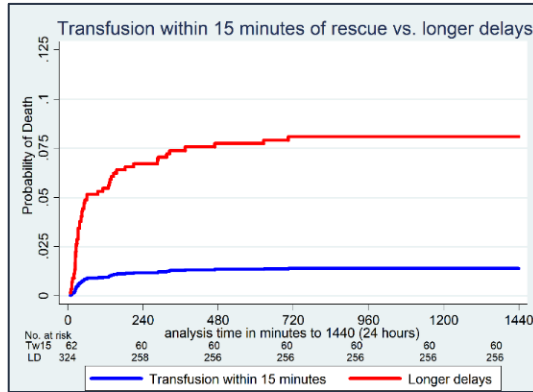


- **Study Population:** US military casualties in Afghanistan from April 1, 2012 to August 7, 2015
- **Study Design:** Retrospective comparing concurrent cohorts, 502 patients, of whom 55 received prehospital transfusion
- Gradual expansion of transfusion capability to different MEDEVAC sites

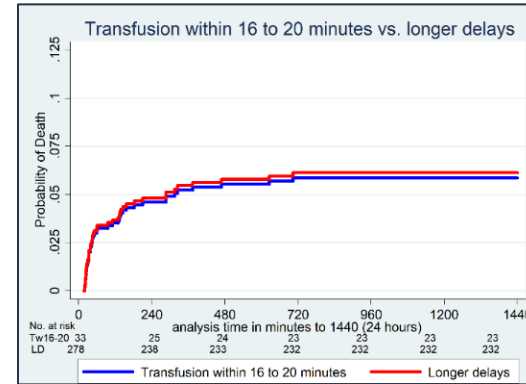
### Example: Cumulative MEDEVAC Sites over Time



# Mortality by time from MEDEVAC rescue to start of transfusion



HR = 0.17 (95% CI = 0.04 - 0.73, P=0.017)



HR = 0.94 (95% CI = 0.41 - 2.17, P=0.887)

15 min after MEDEVAC rescue = median of 36 minutes after injury



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# Time and Surgery



- What is a surgical capability?
  - Advanced resuscitation team
  - Surgical team
  - Blood products
  - Advanced decision-making
    - Diagnostic equipment
    - Clinical experience
    - Operational experience



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# Analysis of the Effect of Time to Surgical Capability\*

- Retrospective Cohort of US military and non-US military casualties
  - Iraq (37%) or Afghanistan (63%)
  - Jan 2007–Dec 2015 with MAIS  $\geq$  2
- Data Sources
  - DoDTR (primary data source for all)
  - AFMES (AIS/ISS on US military deaths)
  - Original medical records (selected)



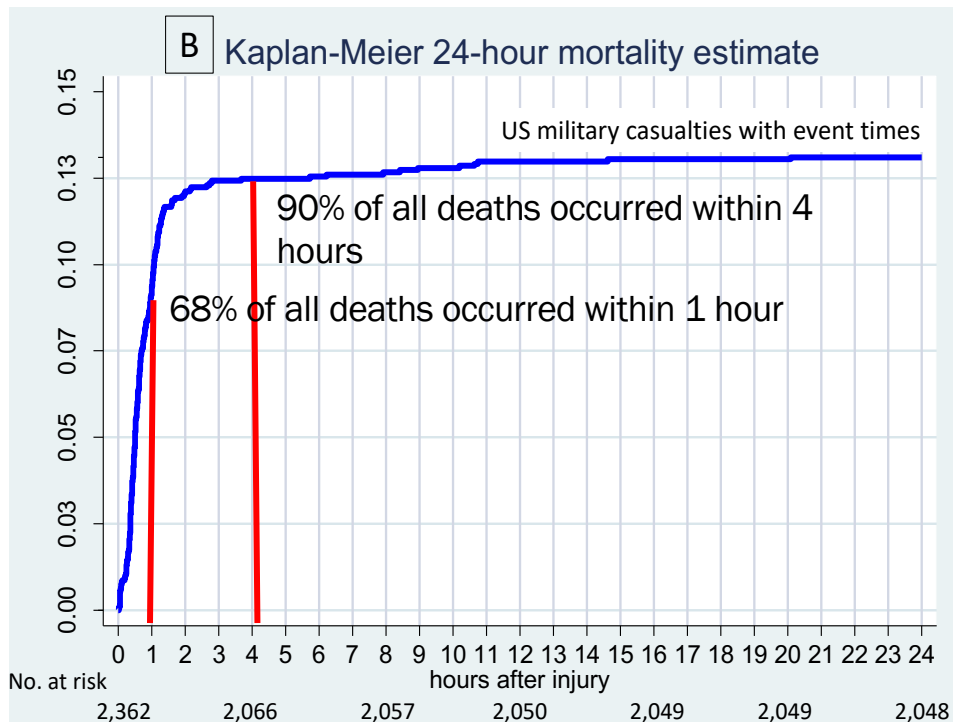
\*Presented at Military Health Service Research Symposium, pending publication



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# 24-hour survival

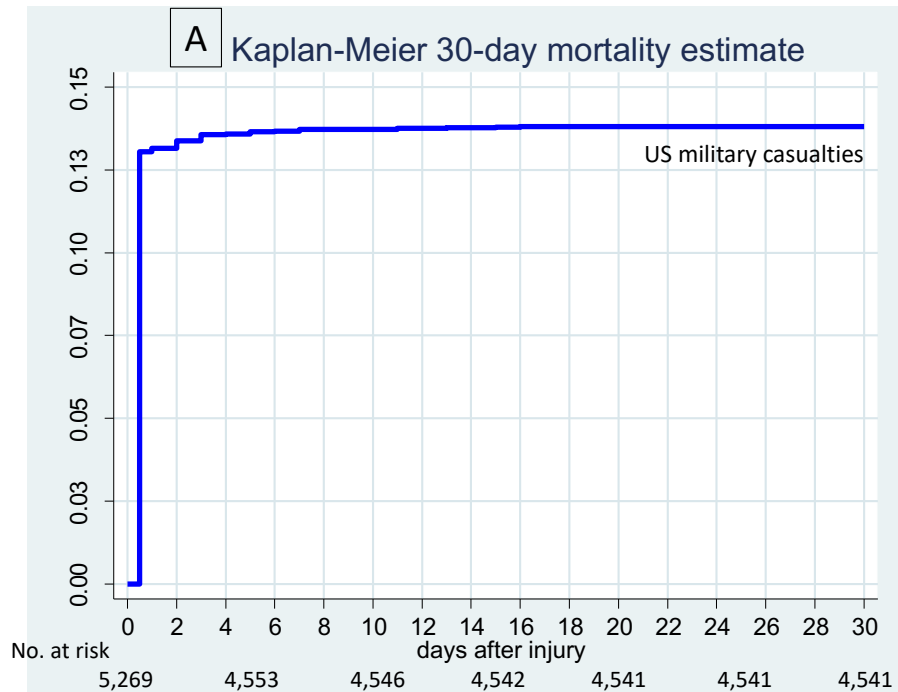


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# 30-day survival

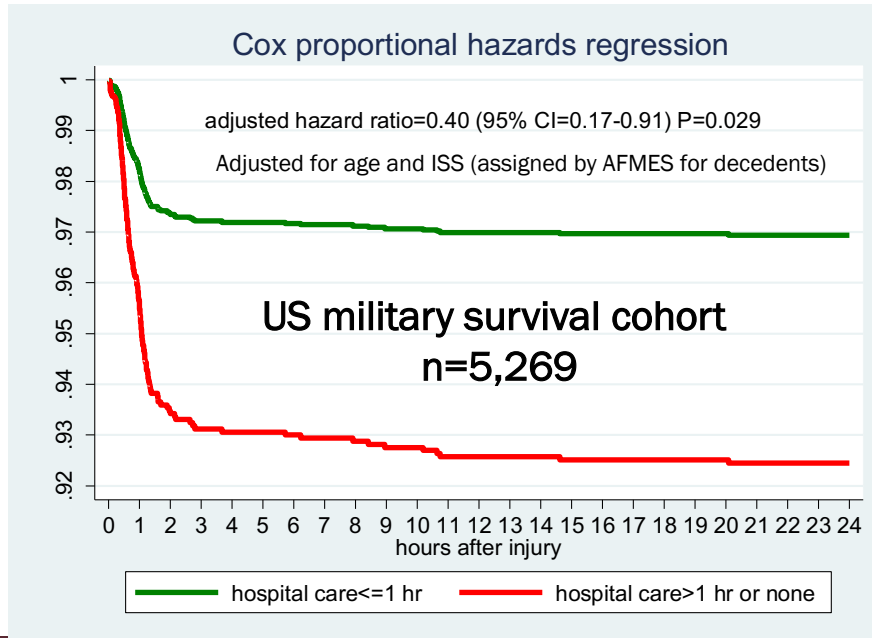


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# Time to surgical capability

≤ 1 hour delay association with 24 hour survival

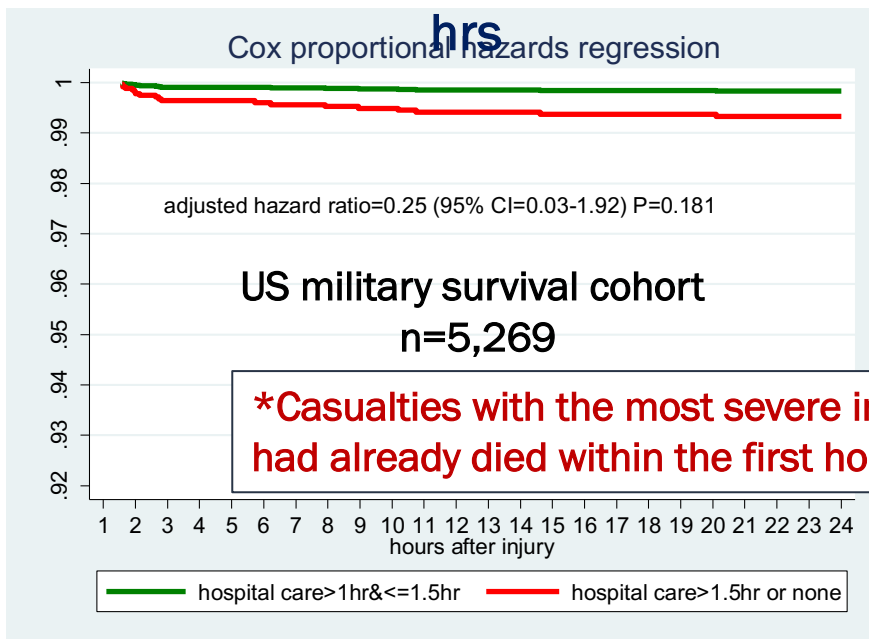


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# Time to surgical capability

1-1.5hr delay association with survival between >1 - 24

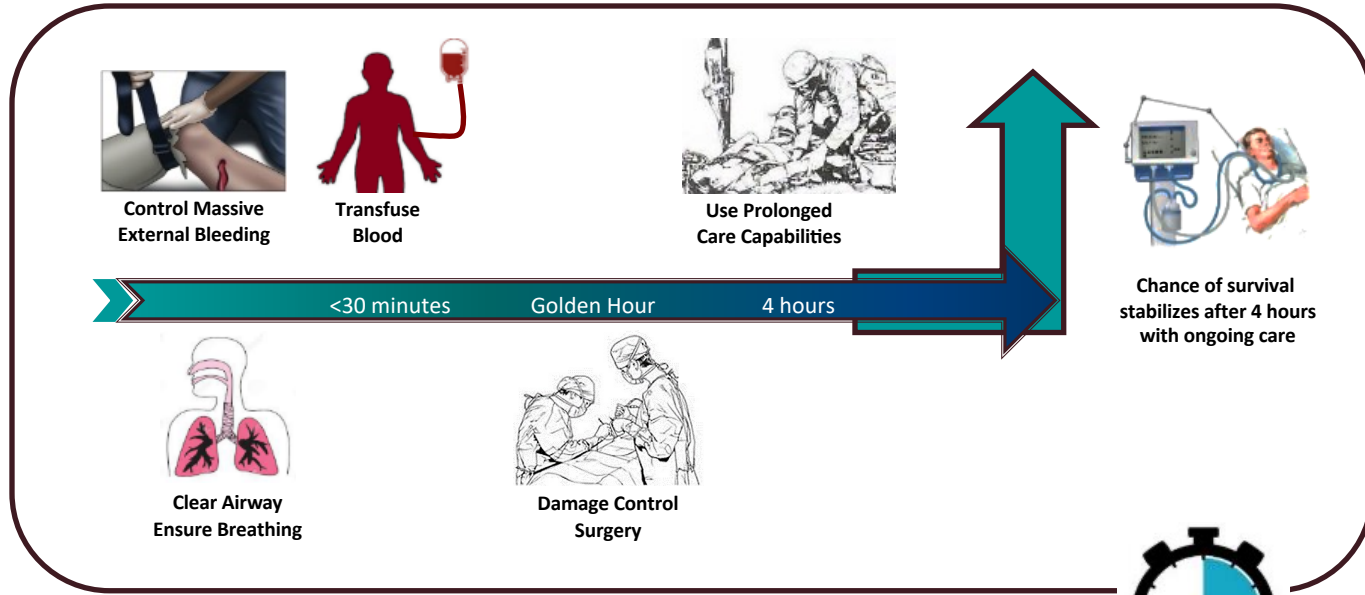


# Time and Surgery

- What is a resuscitation capability?
  - Advanced resuscitation team
  - Surgical team
  - Blood products
  - Advanced decision-making
    - Diagnostic equipment
    - Clinical experience
    - Operational experience



# Timeline of effective interventions



*Lifesaving interventions delivered too late do not improve survival*



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# **Rethinking MASCAL: Implications of Time and Triage**

# Background

- Current triage algorithms are based on individual patient assessment and categorization
- There is no triage method published which addresses extremely large casualty events
- The effect of time on the patient population must be incorporated into decision making

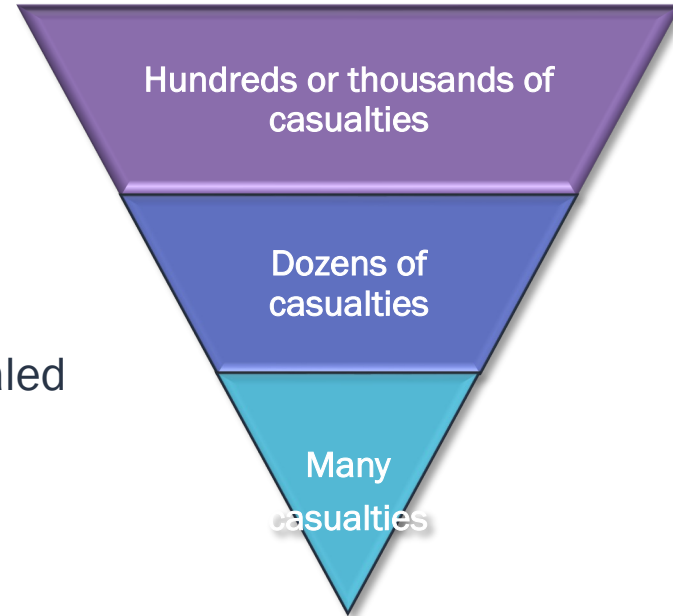
<b>START Triage</b> <i>Assess, Treat, (use bystanders)</i> When you have a color <b>STOP - TAG - MOVE ON</b>			
<b>M I N O R</b>	<b>D E M O N S T R A T E</b>	<b>I M M E D I A T E</b>	
		-- <i>Move Walking Wounded</i>	
		-- No RESPIRATIONS after <i>head tilt</i>	
		-- <b>Breathing</b> but UNCONSCIOUS	
		-- <b>Respirations</b> - over 30	
		-- <b>Perfusion</b> Capillary refill > 2 or NO RADIAL PULSE <i>Control bleeding</i>	
		-- <b>Mental Status</b> Unable to follow simple commands	
<b>D E L A Y E D</b>	-- Otherwise		
	<b>REMEMBER:</b>  Respirations - 30 Perfusion - 2 Mental Status - Can Do		



# Time and Scale of MASCAL Response



- Time is a Triage Tool
- Survivors Self Triage
- MASCAL Response is Scaled



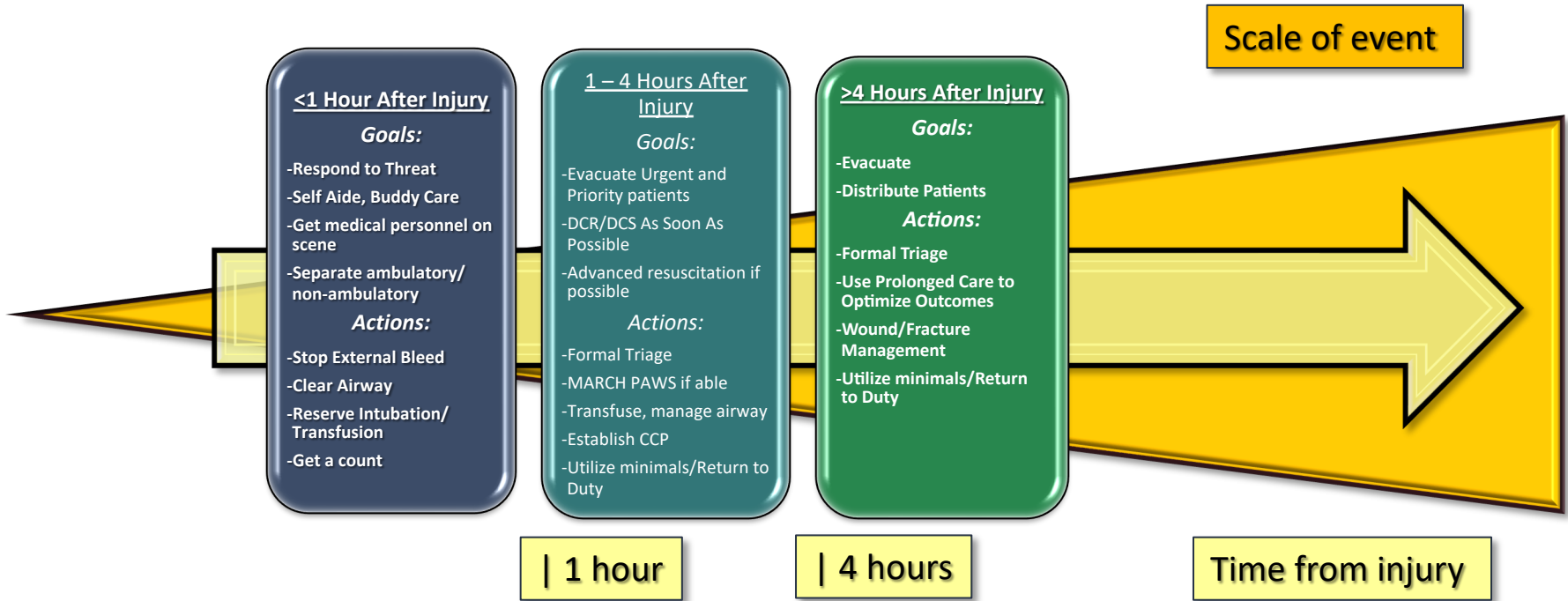
*Interventions are determined by the time from injury and the scale of the event, relative to available resources*





Situation	Multiple casualties	MASCAL	Ultra-MASCAL
<b>What is the total casualty estimate?</b>	Number of casualties stretches available resources	Number of casualties exceeds available resources	Hundreds or thousands of casualties greatly exceeds resources
<b>What is the threat?</b>	Threat is controlled	Threat is uncertain	Threat is ongoing
<b>Are there resource limitations that will affect survival?</b>	Resources are limited	Some essential resources are exceeded	The majority of resources are exhausted
<b>Can medical personnel arrive?</b>	Medical personnel are on scene rapidly	Medical personnel can arrive within 30-60 minutes	Medical personnel are unable to arrive within 1 hour, possibly much longer
<b>Is evacuation possible?</b>	Evacuation to damage control surgery can occur within 1 hour	Evacuation is possible, <50% patients may reach damage control surgery within 1 hour	Evacuation is not possible within 1 hour for vast majority of patients
<b>Description</b>	Adequate medics and first responders to manage critical and non-critical casualties	Medics are unable to manage all of the severe and critical casualties	Overwhelming number of severe and critical casualties

# Time and Scale of MASCAL Response



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# USA Triage

<b>Unstable</b>	<b>Severe bleeding, weak pulse, not alert, respiratory distress</b>
<b>Stable</b>	Non-ambulatory; alert, good pulse, breathing okay; severe eye trauma
<b>Ambulatory</b>	Can self-extricate and transfer to CCP
<b>Massive tissue destruction or pulseless</b>	Not expected to survive given the scenario



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# Implementation of Guiding Principles

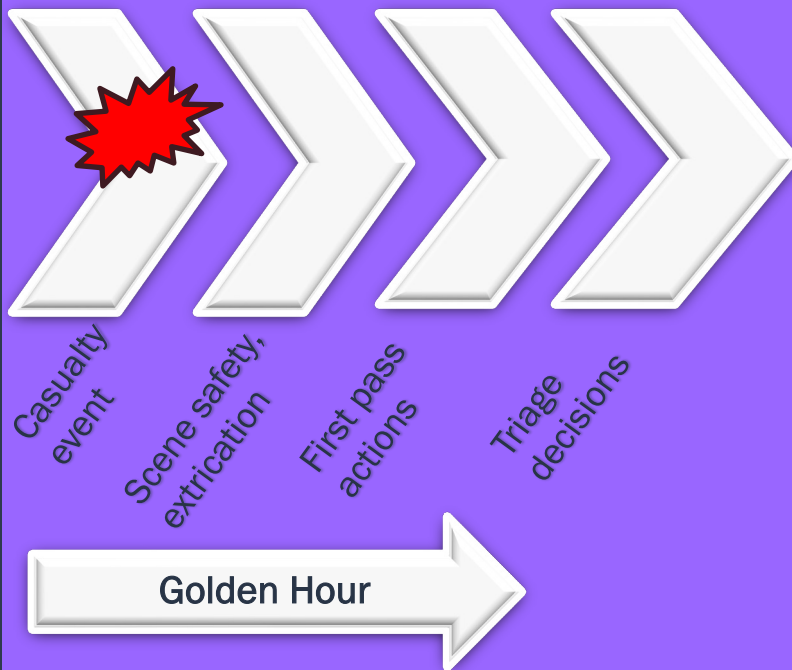
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- Priorities change based on time from injury
- Activities in first hour are **critical**
- Don't waste time with formal triage tools in the first hour
  - ❖ Just extricate/stop threat, stop external bleeding, clear airway
- Transfusion and ventilator support within the first hour identify a resource-intensive patient
- Damage control surgery has little impact after the first hour



# Evidence-based Principles of Time, Triage and Treatment; Refining the Initial Medical Response to Massive Casualty Incidents

US military evidence and experience guides a modified approach to large-scale MASCAL incidents.



Introducing: classification of MASCAL, timeline of lifesaving interventions, first pass actions prior to triage decisions, simplified triage, recognition that "ultra-MASCAL" primarily requires casualty movement and survival needs.

# The Joint Trauma System



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