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Review Article

**THE IMMEDIATE IMPACT: AN EVIDENCE-BASED ANALYSIS OF FIRST AID EFFECTIVENESS IN THE CRITICAL MOMENTS FOLLOWING INJURY AND ILLNESS**<sup>1</sup>Faleh Fahad Alharbi, <sup>2</sup>Naif Menahi B Alharbi, <sup>3</sup>Basri shodid Al Harbi, <sup>4</sup>Mubarak Bin Mudhi Alharbi<sup>1</sup>Saudi Red Crescent Authority, Saudi Arabia, [Falehalhrbi95@gmail.com](mailto:Falehalhrbi95@gmail.com)<sup>2</sup>Saudi Red Crescent Authority, Saudi Arabia, [naif.123123@hotmail.com](mailto:naif.123123@hotmail.com)<sup>3</sup>Saudi Red Crescent Authority, Saudi Arabia, [a590976075@gmail.com](mailto:a590976075@gmail.com)<sup>4</sup>Saudi Red Crescent Authority, Saudi Arabia, [maraghan59@gmail.com](mailto:maraghan59@gmail.com)**Abstract:**

*This evidence-based analysis quantifies the efficacy of immediate layperson first aid, preceding professional EMS arrival. It shifts focus from the "Golden Hour" to the verified "Golden Minutes," especially for Sudden Cardiac Arrest (SCA). B CPR initiation approximately doubles survival and favorable neurological recovery (OR \$sim 2.0\$). Survival rates decline exponentially, dropping 7% to 10% per minute of delay, underscoring the bystander's critical role.*

*In trauma, immediate hemorrhage control is vital; rapid tourniquet application yields up to a six-fold mortality reduction in specific vascular injuries. However, benefits are compromised by rapid skill decay (e.g., 87.7% success dropping to 54.5% within months) and psychological barriers like the fear of liability.*

*The study recommends policy mandates for frequent, practical refresher training. Furthermore, the strong economic Return on Investment (ROI)—demonstrated by a 25% reduction in hospital visits and 50% faster recovery times—justifies widespread public investment in first aid preparedness.*

**Keywords:** Immediate First Aid, Bystander CPR, Hemorrhage Control, Golden Minutes, Skill Decay.

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## I. INTRODUCTION:

### Establishing the Time-Survival Paradigm

#### 1.1 Defining the Scope of Immediate First Aid

Immediate first aid refers to the vital care administered by laypersons or initial responders at the scene of an injury or acute medical emergency, preceding the arrival of professional Emergency Medical Services (EMS). This pre-hospital phase is recognized as the interval with the highest leverage for influencing patient outcome, as intervention during this period counters the immediate physiological deterioration resulting from conditions such as sudden cardiac arrest (SCA) or severe hemorrhage. This analysis focuses on quantifying the measurable effectiveness of these initial, non-professional interventions on critical clinical metrics, including rates of mortality, morbidity, neurological recovery, and Return of Spontaneous Circulation (ROSC). The objective is to provide a comprehensive, data-driven foundation for developing public health policy and optimizing community emergency preparedness strategies.

#### 1.2 Methodological Approach and Terminology

The conclusions presented herein are derived from a synthesis of current systematic reviews and consensus guidelines established by leading international medical bodies. Primary sources include the guidelines and evidence reviews published by the International Liaison Committee on Resuscitation (ILCOR), the American Heart Association (AHA), and the American Red Cross. To evaluate the clinical significance of various interventions, the report relies on statistical measures, particularly Odds Ratios (OR) and confidence intervals (CI), which provide a rigorous, evidence-based assessment of effectiveness.

A review of the time-criticality data reveals a fundamental principle: the capacity of first aid to alter the trajectory of patient outcome is heavily concentrated in the moments immediately following the insult. This suggests that the time-criticality of effective first aid is confirmed to be concentrated in the seconds and minutes immediately post-incident, placing the lay rescuer in a position of maximal influence over the patient's eventual outcome. While extensive efforts have focused on optimizing EMS logistics to meet response time guidelines (e.g., the 8-minute interval used in some non-traumatic cardiac arrest cases), the profound and exponential decrease in survival rates when layperson cardiopulmonary resuscitation (CPR) is delayed beyond the first few minutes compels a policy shift. This evidence affirms that the initial response phase (Phase 1, immediate action at the scene) is the disproportionately influential element in the survival chain. Consequently, this observation justifies prioritizing widespread, effective lay rescuer training over marginal operational gains in later-stage EMS transport or logistics.

## II. Conceptual Frameworks of Time-Sensitive Intervention

### 2.1 The Time-Injury Curve: Deconstructing the "Golden Hour"

#### Historical Context and Skepticism

The concept of the "Golden Hour" is a cornerstone of contemporary trauma management, characterizing the urgent necessity for professional trauma care. It implies that delayed care beyond approximately 60 minutes after injury significantly affects morbidity and mortality. This paradigm, which justifies the structure of modern trauma systems, is often credited to R Adams Cowley, who promoted the concept starting around 1944, first as a military surgeon and later at the University of Maryland Shock Trauma Center.

However, the scientific validity of the "Golden Hour" as a fixed, definitive threshold has faced considerable academic scrutiny. Detailed literature and historical record searches have largely failed to identify objective, reproducible data supporting the rigid 60-minute time frame. Clinically, many researchers now characterize the literal interpretation of the "Golden Hour" as a medical "urban legend".

#### Refinement of the Principle: The Golden Minutes

Despite skepticism regarding the fixed 60-minute rule, the fundamental principle—that rapid intervention is crucial—remains scientifically sound. Severe trauma, particularly that involving internal bleeding, requires definitive control, usually surgical, as quickly as possible.

Crucially, when considering non-traumatic or physiological emergencies, the critical time windows are demonstrably much shorter, transitioning from a conceptual "Golden Hour" to verifiable "Golden Minutes." In acute stroke care, administering clot-busting drugs like tissue plasminogen activator (tPA) within the first 60 minutes significantly improves recovery chances and reduces disability, demonstrating a highly sensitive application of time-criticality. For sudden cardiac arrest, the effective window for starting CPR and applying advanced life support (defibrillation) is critically confined to the 4-to-8-minute interval.

This juxtaposition highlights a critical distinction between the established time frames: the "Golden Hour" remains a controversial benchmark primarily associated with the need for definitive surgical trauma care, whereas the "Golden Minutes" are a verified benchmark for non-traumatic resuscitation. The evidence base confirms that there is a time dissonance between the generalized trauma response and the needs of acute circulatory or respiratory emergencies. Because objective data supporting the rigid 60-minute trauma rule is inconsistent or

absent, while the time sensitivity for cardiac arrest is confirmed to be immediate (measured in minutes), trauma system policy must prioritize immediate physiological control measures (such as hemorrhage control and basic airway management) delivered by the bystander. These pre-hospital actions address the highest-priority threats with the shortest time decay curve.

## 2.2 Quantifying the Cost of Delay in Phase 1 Response

The continuum of emergency response can be clinically divided into distinct phases. Phase 1 encompasses the immediate response—scene safety, patient stabilization, and EMS notification—performed by the initial lay rescuer. Clinical studies demonstrate that delay in this initial phase is the most detrimental factor affecting outcomes.

### Correlation with Poor Outcomes

Analysis of trauma cases based on injury severity score (ISS) confirms the disproportionate impact of initial delays. For patients suffering severe trauma ( $ISS \geq 16$ ) a delay in any phase of care significantly associates with poor outcomes ( $P < 0.05$ ). (However, for patients with mild-to-moderate trauma ( $ISS < 15$ ) where the initial injury may not be immediately life-threatening, only a delay in Phase 1 demonstrated a highly significant correlation with poor outcomes ( $P < 0.0001$ ).

This finding is paramount, as it indicates that immediate first aid acts not just to save lives in the most severe cases, but critically limits the cascade of injury severity and functional decline, providing significant protective value even in moderate cases. Prompt initial assessment and stabilization prevent secondary injuries, such as the progression of hemorrhagic shock or secondary hypoxic brain injury.

### Long-Term Morbidity

The impact of initial delay extends significantly into long-term functional recovery. For instance, in cases involving mild traumatic brain injury (mTBI), especially those resulting from falls in older adults, neglecting to ensure early evaluation leads to delayed diagnosis and subsequent adverse outcomes. These adverse outcomes include prolonged recovery, increased functional decline, and higher mortality rates. Therefore, the timely initial intervention provides a substantial protective effect against both acute mortality and protracted morbidity, expanding the economic and clinical justification for widespread first aid training beyond simple acute mortality reduction.

## III. Immediate Resuscitation Science: Cardiopulmonary Arrest

The effectiveness of immediate first aid is perhaps most clearly and statistically validated in the domain of out-of-hospital cardiac arrest (OHCA).

### 3.1 The Exponential Time-Decay Curve in Sudden Cardiac Arrest (SCA)

The chance of survival following SCA declines rapidly and exponentially, diminishing by approximately 7% to 10% for every minute that cardiopulmonary resuscitation or defibrillation is delayed. This acute time-dependency necessitates an immediate response by bystanders, as professional EMS often cannot arrive within the crucial initial minutes. Applying CPR and defibrillation promptly, ideally within four to six minutes, significantly increases survival rates.

The acute time-dependency in resuscitation is strikingly illustrated by data regarding pediatric cardiac arrest. When children received lay rescuer CPR compared to those who did not, the time of initiation proved critical:

- Initiating CPR within one minute after cardiac arrest increased the odds of survival by 91%.
- Initiating CPR two to three minutes after arrest increased survival odds by 98%.
- Conversely, delaying CPR initiation until ten minutes or more after cardiac arrest decreased survival odds by 41%.

This difference in survival odds between intervention at one minute and intervention at ten minutes represents a 132% swing in outcome probability based solely on the promptness of the lay rescuer. This reinforces that the first 1–2 minutes constitute the most statistically valuable intervention window. Since EMS response times often exceed this most critical window, the bystander action of initiating compressions becomes the only viable strategy to counter the precipitous minute-by-minute decline in survival. This transforms community-wide CPR training from an auxiliary measure into the primary determinant of neurological outcome.

### 3.2 Statistical Efficacy of Bystander CPR (BCPR)

The provision of bystander CPR (BCPR) consistently yields statistically robust improvements across all major patient outcomes.

A systematic meta-analysis of 19 studies involving 232,703 patients demonstrated that the initiation of BCPR approximately doubles an individual's odds of survival compared with no bystander CPR (Odds Ratio 1.95; 95% CI, 1.66–2.30). Similar findings, showing a significant increase in survival rate (OR: 1.72), have been noted in other systematic reviews that examined the impact of witnessed CPR.

Furthermore, the benefits extend beyond mere immediate survival. Meta-analysis results show that

patients receiving BCPR had significantly greater odds of achieving Return of Spontaneous Circulation (ROSC) at the scene (OR: 2.06; 95% CI: 1.66–2.57).

The most compelling finding relates to the quality-of-life post-event: BCPR was associated with a statistically significant increase in the chances of achieving a favorable neurological recovery (OR:

2.03; %95 CI: 1.67–2.47). This correlation confirms that immediate BCPR minimizes the hypoxic insult to the brain. This outcome is crucial, as an analysis focused solely on "survival to discharge" is insufficient; the ability of BCPR to preserve cerebral function and yield positive long-term quality of survival provides the strongest clinical rationale for policy support.

Table 1. Quantified Efficacy of Bystander CPR (BCPR) on Patient Outcomes

Outcome Measure	Odds Ratio (OR) of BCPR vs. No-BCPR	95% Confidence Interval (CI)	Clinical Implication
Survival to Hospital Discharge (Overall)	1.95	1.66–2.30	Approximately doubling of survival odds
Return of Spontaneous Circulation (ROSC)	2.06	1.66–2.57	Significantly greater odds of achieving circulation at the scene
Favorable Neurological Recovery	2.03	1.67–2.47	Doubling of chance for positive quality of survival

#### IV. Hemorrhage Control: The Pillar of Immediate Trauma Care

##### 4.1 Uncontrolled Bleeding: A Preventable Public Health Crisis

In the civilian setting, traumatic injuries are the leading cause of death for Americans under the age of 46. Uncontrolled external bleeding, specifically, is identified as the most common cause of preventable death following trauma. This reality has spurred national public health initiatives, such as the "Stop the Bleed" program, designed to equip laypersons with the skills to intervene immediately and control hemorrhage until professional personnel arrive.

The clinical evidence supporting this intervention is robust, particularly in high-energy trauma. One study found that civilian prehospital tourniquet application was independently associated with a dramatic **six-fold reduction in mortality** in patients who sustained peripheral vascular injuries. Furthermore, analysis of autopsy records estimates that hundreds of isolated extremity injury-

related deaths could be prevented annually with the early placement of tourniquets.

##### 4.2 Evidence-Based Hemorrhage Control Protocols

Current first aid guidelines, such as those co-developed by the AHA and American Red Cross, establish a clear, evidence-based sequence for managing life-threatening external bleeding. Direct manual pressure is considered the hallmark of effective hemorrhage control. This application of pressure should be followed immediately by the use of either a **tourniquet** or **wound packing**. Tourniquets are effective in controlling life-threatening bleeding from a limb and should be applied proximal to the wound. Wound packing is recommended for life-threatening bleeding from junctional areas like the groin, neck, or shoulder.

The effectiveness and safety of tourniquets have been extensively established in military trauma research. While systematic reviews in the civilian setting have sometimes shown non-significant

overall reductions in mortality or blood product use, this variability is often attributed to the heterogeneous nature of civilian injuries compared to high-energy military trauma. However, the high-yield, specific trauma data demonstrating a six-fold mortality reduction for vascular injuries provides compelling policy justification for prioritizing widespread tourniquet training. This high-benefit application validates the inclusion of tourniquets in layperson protocols, especially given their utility in scenarios such as mass casualty events where resources for continuous direct pressure are limited.

#### 4.3 Layperson Competency and Skill Durability

The effective integration of hemorrhage control into public response is dependent upon the successful transfer and retention of necessary skills.

#### Initial Success and Training Modality

Studies confirm that laypersons can successfully acquire complex trauma skills through targeted training. The Public Access and Tourniquet Training Study (PATTS), a randomized clinical trial, showed that participants who underwent in-person hemorrhage control training (the B-Con arm) achieved a high initial success rate of **87.7%** correct tourniquet applications. This contrasts sharply with success rates among untrained laypersons, which were reported to be as low as 16.3% in control groups and between 10.6% and 23.4% in other analyses, depending on the tourniquet type used. Furthermore, the PATTS trial found that in-person training was the most efficacious method, superior to instructional flashcards or audio guides, for enabling bystanders to act.

#### The Critical Challenge of Skill Decay

While initial training efficacy is high, the acquired skills are highly perishable, posing a significant challenge to community preparedness. Only **54.5%** of those trained were able to successfully perform correct tourniquet application when assessed 3 to 9 months later without refresher training. This pronounced skill decay suggests that the standard block-of-instruction training model is inadequate to guarantee performance during an emergency.

Analysis of training failures revealed a key mechanical deficiency: 80% to 89% of incorrect tourniquet applications in all arms were attributable to the device being applied **too loose** to achieve adequate hemorrhage control.

The high initial efficacy (87.7% success) followed by severe skill decay (54.5% retention) fundamentally requires a restructuring of training paradigms. Since the core failure mechanism is mechanical precision ("too loose"), training must intensely focus on the biomechanics of effective tightening, and regular refresher training is necessary—with recommendations suggesting refreshers occur at least every six months—to maintain a sustainable level of public competence. This structural deficit in training retention must be addressed through a national research agenda focused on skill durability and continuous community resilience-building initiatives.

Table 2. Layperson Hemorrhage Control Skill Retention Analysis

Skill/Intervention	Training Context	Immediate Success Rate	Skill Retention (3–9 Months Post-Training)	Primary Failure Mechanism
Tourniquet Application	In-person B-Con Training (Laypersons)	87.7%	54.5% (Correct Application)	Applied too loose to be effective (80–89% of failures)
Tourniquet Application	Untrained Laypersons (Control)	16.3%	N/A	N/A

## V. Other Critical Initial Trauma and Medical Interventions

### 5.1 Airway Management Fundamentals for Lay Rescuers

Maintaining a patent airway is essential for adequate oxygenation and ventilation, preventing the progression of hypoxia and secondary neurological injury. Lay responders are instructed in basic, non-equipment techniques crucial for the immediate pre-EMS phase.

The core maneuvers taught include the Head-Tilt/Chin-Lift, which is ideal for patients without any suspected spinal injury, and the Jaw Thrust maneuver, which is preferred for trauma patients where cervical spine injury is a concern. These techniques aim to prevent the tongue from obstructing the airway in an unconscious patient. Unlike advanced providers, layperson training protocols intentionally exclude complex airway assessment criteria such as the Mallampati classification or the "3-3-2 rule," which are reserved for healthcare professionals assessing difficult intubation.

### 5.2 Initial Management of Specific Injuries

First aid guidelines are continually updated based on ILCOR consensus to reflect current evidence for various traumatic and medical emergencies.

#### Spinal Motion Restriction (SMR)

Following traumatic injury, the need for manual stabilization to prevent secondary spinal cord injury is recognized. The ILCOR First Aid Task Force continuously reviews systematic reviews on spinal motion restriction to ensure layperson guidance is based on the best available evidence.

#### Open Chest Wounds

Management of open chest wounds in the pre-hospital setting is an area of ongoing scientific debate. Current guidelines state that in the first aid setting, it is reasonable to leave an open chest wound exposed to ambient air, or to cover it with a clean, nonocclusive, dry dressing (such as gauze or a clean cloth). Alternatively, it is reasonable to apply a specialized dressing, such as a vented chest seal. ILCOR specifically lists the optimal management of open chest wounds (occlusive vs. nonocclusive dressings or left open) as a key knowledge gap, signifying that the optimal evidence-based approach is still evolving.

#### Immediate Pharmacological Intervention

The scope of immediate first aid has expanded beyond mechanical and manual skills to include basic pharmacological intervention in acute medical emergencies. For alert adults experiencing non-traumatic chest pain, first aid providers are advised to activate EMS immediately. While awaiting the

arrival of emergency medical services, the provider may encourage the patient to chew and swallow aspirin (162–325 mg), provided the patient has no known aspirin allergy or clinical contraindication.

This expansion to include simple pharmacological interventions, such as aspirin administration for suspected acute coronary syndrome, signifies a crucial evolution in the layperson's role. Given the severity of the time constraints in acute cardiac events, early aspirin intervention can significantly improve outcomes before EMS arrival. This policy necessitates that training programs incorporate patient assessment skills regarding contraindications and medical history, thereby increasing the cognitive demands placed upon the trained first aid provider.

## VI. Societal and Economic Impact of Widespread First Aid Training

### 6.1 Systemic Barriers to Bystander Action

Despite the confirmed high clinical efficacy of immediate first aid in life-threatening situations, bystander intervention rates remain suboptimal due to pervasive systemic and psychological barriers.

#### Fear of Legal Consequences

A major impediment to lay rescuer action is the fear of legal liability and lawsuits, stemming from a fundamental misunderstanding of Good Samaritan laws. This fear represents a severe cognitive barrier, causing bystanders to hesitate or decline involvement during an emergency.

#### Knowledge, Confidence, and Social Factors

Other significant barriers include a lack of confidence in performing the skills correctly and the "fear of failure". Confusion arising from frequent changes in CPR guidelines further complicates skill retention and confidence. Moreover, in certain high-risk urban environments, social barriers such as a lack of community cohesion or emotional disconnect can reduce the willingness of residents to assist strangers.

This contradiction between the legal reality and public perception is critical. Legally, Good Samaritan laws provide extensive protection to rescuers in all 50 US states. These laws are designed to shield individuals who provide care in good faith from liability claims arising from ordinary negligence. The fact that widespread fear of liability persists, despite these legal protections, suggests a critical failure in public health communication, not in the legislation itself. Addressing the fear of liability requires targeted public education and psychological reassurance, explicitly clarifying that legal immunity covers voluntary, uncompensated, good-faith efforts, excluding only acts of gross negligence or intentional harm.

### 6.2 The Legal Landscape: Function and Limitations of Good Samaritan Laws

Good Samaritan laws are rooted in the principle of limiting liability for individuals who voluntarily and without expectation of compensation provide care during an emergency. This legal framework supports public policy by encouraging intervention, ensuring that potential rescuers focus on helping individuals in need rather than worrying about potential litigation. In the case of an unconscious victim, the rescuer is generally assumed to have implied consent to render assistance.

Protections under these laws typically apply provided the rescuer acts within their training, in good faith, and without exhibiting recklessness or gross negligence. Importantly, the law does not shield against liability arising from gross negligence or intentional misconduct, meaning protections only extend to reasonable actions taken to assist.

### 6.3 Cost-Benefit Analysis: The Economic Return on Investment (ROI) in First Aid Preparedness

Widespread public education and training in immediate first aid measures yield profound, quantifiable economic benefits, establishing first aid as an essential societal investment rather than a discretionary expense.

#### Healthcare Cost Reduction

Early interventions significantly reduce downstream healthcare costs. Studies demonstrate that

Table 3. Economic and Societal Return on Investment (ROI) in First Aid Training

Investment Metric	Quantified Benefit	Impact Area
First Aid Training Implementation (Workplace)	25% decrease in hospital visits	Healthcare Cost Reduction
Early Treatment Intervention	50% faster recovery times	Productivity & Absenteeism Reduction
Good Samaritan Laws	Mitigation of liability risk	Psychological Barrier Reduction

## VII. Conclusion and Recommendations for Future Strategy

### 7.1 Synthesis of Findings: Time-Critical Interventions and Verified Efficacy

The analysis of immediate first aid effectiveness confirms its profound and time-sensitive clinical value. In acute medical crises, specifically sudden cardiac arrest, intervention operates within the

workplaces that implement robust first aid and CPR training programs report a notable **%25 decrease in hospital visits**. This reduction occurs because timely first aid can stabilize patients, mitigating the severity of the incident and rendering less extensive or complex subsequent medical intervention necessary.

#### Productivity and Recovery Time

The economic return on investment is further compounded by improvements in workforce productivity. Early treatment administered in trained environments accelerates patient recovery times, found to be **%50 faster** compared to workplaces without such training. This reduction in recovery time directly translates into reduced absenteeism, minimized work disruptions, and maintained organizational efficiency.

The financial metrics (25% reduction in hospital visits, 50% faster recovery) elevate first aid training from a corporate or social responsibility measure to an essential economic investment. This data is critical for justifying large-scale public expenditure and for developing formal funding cases within competitive public sector environments. Furthermore, the reduction in WSIB and insurance claims strengthens the financial case for businesses to prioritize training. Ultimately, effective first aid reduces the long-term strain on healthcare facilities and enhances overall community resilience.

crucial "Golden Minutes," where layperson action initiating CPR approximately doubles the odds of survival and favorable neurological recovery. For traumatic injuries, immediate control of life-threatening external hemorrhage offers massive survival gains, evidenced by a six-fold mortality reduction in specific vascular trauma cases upon rapid tourniquet application.

However, the full realization of these benefits is hampered by practical and psychological obstacles. The initial high success rate of trauma skills (87.7%) is compromised by the rapid skill decay (dropping to 54.5% retention over 3–9 months). Furthermore, the pervasive public fear of legal liability acts as a major deterrent to intervention, despite robust legal protection afforded by Good Samaritan laws. The data, therefore, defines an imperative to optimize skill durability and communication surrounding legal protections.

### 7.2 Recommendations for Policy and Curriculum Enhancement

Based on the evidence reviewed, the following strategic recommendations are essential for maximizing the effectiveness and reach of immediate first aid:

1. **Prioritize Skill Retention Through Refresher Training:** Policy must recognize that the current model of block-of-instruction training is insufficient given the observed 54.5% skill decay rate for critical interventions like tourniquet application. To sustain competence, policies should mandate frequent, practical refresher training, ideally occurring every six months, with resources allocated to develop accessible and cost-effective delivery methods.
2. **Neutralize Psychological and Legal Barriers:** Public awareness campaigns must be restructured to explicitly address and dismantle the fear of legal consequences, which significantly impedes bystander action. Training curricula should dedicate explicit time to clarifying the scope and function of Good Samaritan laws, providing concrete reassurance that protection is provided for good-faith interventions that do not constitute gross negligence.
3. **Integrate Economic Justification into Policy Mandates:** The demonstrable financial benefits of early intervention, including a 25% reduction in hospital visits and 50% faster recovery times, must be utilized to build a strong economic case for public investment. This justification should support policies aimed at incorporating standardized first aid and CPR training into mandatory curricula for schools and high-risk employment sectors.
4. **Target Research Funding to Close Clinical Gaps:** Continued investment in trauma research is necessary to resolve outstanding clinical knowledge gaps identified by international bodies. Priority areas include determining the optimal management strategies for non-extremity hemorrhage (e.g., efficacy comparisons of various wound packing techniques) and evaluating the comparative

effectiveness of different dressings (occlusive vs. nonocclusive) for conditions such as open chest wounds in the pre-hospital setting.

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