



## ANALYZING THE EFFECTIVENESS OF ADVANCED TRAUMA LIFE SUPPORT TRAINING FOR EMS PERSONNEL: A COMPREHENSIVE REVIEW

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### Abstract:

*This comprehensive review analyzes the effectiveness of Advanced Trauma Life Support (ATLS) training for Emergency Medical Services (EMS) personnel in improving trauma management outcomes. Given the critical role of EMS in the pre-hospital care of trauma patients, the review synthesizes existing literature to assess the impact of ATLS on clinical decision-making, knowledge retention, and operational performance. The findings indicate that while ATLS training enhances the confidence and skills of EMS providers, the direct correlation between such training and improved patient outcomes remains unclear. Several studies report improvements in self-reported confidence and adherence to trauma protocols post-training, yet the evidence linking ATLS training to reduced morbidity and mortality is inconsistent. Notably, gaps in the literature include a lack of rigorous randomized controlled trials and longitudinal studies assessing long-term skill retention. Furthermore, contextual factors influencing the effectiveness of ATLS training require further exploration. The review underscores the need for ongoing education and refresher courses to maintain competencies among EMS personnel. Recommendations for future research include investigating the retention of skills over time and evaluating the impact of ATLS training across diverse healthcare systems. Thus, this study highlights the importance of refining training protocols to enhance trauma care delivery and improve patient outcomes in emergency settings.*

**Keywords:** *Advanced Trauma Life Support, Emergency Medical Services, trauma management, clinical outcomes, skill retention.*

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**1. INTRODUCTION:**

Emergency Medical Services (EMS) personnel are crucial in the immediate management of trauma cases, often acting as the first point of contact for critically injured patients. The quality of care they provide directly impacts patient outcomes, underscoring the importance of comprehensive training in trauma management techniques. Advanced Trauma Life Support (ATLS) training is specifically designed to equip EMS personnel with the necessary skills and knowledge for effective trauma assessment and intervention, enhancing their ability to recognize life-threatening conditions, make informed decisions under pressure, and implement appropriate interventions swiftly (Galvagno et al., 2019).

Trauma continues to be a leading cause of morbidity and mortality globally, accounting for an estimated 5 million deaths annually. This alarming statistic highlights the urgent need for effective pre-hospital care. Existing literature suggests that ATLS training can significantly improve clinical decision-making and patient management (Chen et al., 2019). However, there is a notable gap in comprehensive reviews evaluating the overall effectiveness of this training within the EMS context.

Since the introduction of Advanced Life Support (ALS) training for emergency medical technicians (EMTs) in the 1970s and 1980s, discussions have emerged regarding the scope of prehospital trauma care. Basic Life Support (BLS) personnel are trained to provide essential stabilization techniques for injury victims, such as bag-valve-mask ventilation, external defibrillation, and spinal immobilization. In contrast, ALS providers receive additional training in more complex interventions, including advanced airway management and vascular access.

Research has indicated that transporting urban victims of penetrating trauma via police or private vehicles may yield outcomes comparable to, or even better than, those achieved through traditional Emergency Medical Services (Seamon et al., 2007). These findings support the argument that EMTs should limit prehospital interventions for penetrating trauma

patients rather than performing advanced procedures on-site. However, direct comparisons between ALS and BLS care for penetrating trauma patients remain limited.

The ATLS course was established in the United States in the 1970s to provide a standardized approach for the initial assessment and treatment of severely injured patients by physicians in emergency departments. Its foundational principles “treat first what kills first” and “do no further harm” were initially designed for practitioners who may lack extensive experience managing major trauma cases.

Following the success of ATLS, the Pre-Hospital Trauma Life Support (PHTLS) course was developed to address the pre-hospital phase of trauma care (Jones & Bartlett, 2016). The PHTLS course aims to improve the quality of care for (poly)trauma patients during the early stages of the trauma response and includes a two-day interactive program accompanied by a structured course manual (Häske et al., 2017). In less developed healthcare systems, PHTLS courses have demonstrated positive effects on participant skills and patient outcomes (Arreola-Risa et al., 2000). However, the impact of PHTLS training in advanced medical systems remains largely unexplored, although it is presumed that such training would still lead to significant improvements in patient outcomes. Trauma remains a leading cause of morbidity and mortality worldwide. The ATLS course provides EMS personnel with essential skills for assessing and managing trauma patients. Previous studies have indicated that ATLS training can improve clinical decision-making and patient management. However, there is a need for a comprehensive review to synthesize the available evidence regarding its overall effectiveness, particularly in the EMS context.

This research aims to review the literature regarding ATLS training for EMS personnel, focusing on key areas such as clinical outcomes, knowledge retention, and operational performance. By synthesizing the available evidence, this study seeks to provide a clearer understanding of the impact of ATLS training on EMS practices. The findings are expected to inform

future training programs and enhance the quality of trauma care delivered by EMS teams, ultimately contributing to improved patient outcomes in emergency situations.

## 2. METHOD:

### 2.1. Research Design

The researchers have utilized a literature review methodology to analyze the Effectiveness of Advanced Trauma Life Support Training for EMS Personnel. It is suitable to reach the objectives of the current study, based on the research objectives. This qualitative approach involves the systematic review and analysis of published articles, academic studies, and other relevant sources to provide a comprehensive overview of the existing literature on the topic.

### 2.2. Search Strategy

The researchers conducted a comprehensive search of the following electronic databases: PubMed, CINAHL, ScienceDirect, and MEDLINE. The search terms used included: "Advanced Trauma", "Life Support Training", "Trauma Life Support Training for EMS Personnel", and related keywords. The search was limited to articles published in English between January 2010 and 2024, while the researchers relied on a few old related studies that established foundational concepts that are continuous to our day.

#### 2.2.1. Inclusion Criteria

- Studies published in peer-reviewed journals
- Research focused on EMS personnel who have completed ATLS training
- Articles published in the last 10 years
- Studies reporting on clinical outcomes, knowledge retention, or operational performance

#### 2.2.2. Exclusion Criteria

- Non-English publications
- Conference abstracts without full-text articles
- Studies not focused on ATLS training

## 2.3. Data Analysis

### 2.3.1. Data Extraction

Data will be extracted using a standardized form, including:

- Author(s) and year of publication
- Study design and methodology
- Sample size and demographics
- Key outcomes measured

### 2.3.2. Data Synthesis

A qualitative synthesis of the data will be performed to summarize the findings across studies. If sufficient homogeneity exists, a meta-analysis may be conducted to quantitatively assess the impact of ATLS training on identified outcomes.

### 2.3.3. Ethical Considerations

As this study involves a review of existing literature and does not include direct interaction with human subjects, ethical approval was not required. However, ethical considerations were upheld by ensuring proper citation and acknowledgment of all sources utilized in the review. This commitment to academic integrity is vital in maintaining the credibility of the research and respecting the contributions of original authors in the field.

## 3. RESULTS:

### 3.1. A comprehensive Review

In their study, Teuben et al. (2024) investigated the impact of Pre-Hospital Trauma Life Support (PHTLS) training on the self-confidence and communication skills of emergency medical personnel in Zurich, Switzerland. Utilizing a structured questionnaire, the authors gathered responses from 87 healthcare providers comprising emergency paramedics, transport paramedics, and emergency doctors who had completed the PHTLS course, achieving a response rate of 76%. The findings revealed that 86% of participants reported increased self-confidence in managing severe trauma cases after the training, with no significant differences among the professional groups. Additionally, 93% noted improvements in communication skills during pre-hospital care, particularly among emergency paramedics compared to transport paramedics (97% vs. 67%,  $p=0.03$ ). Furthermore, 84% indicated that their treatment methodologies for polytrauma patients changed following the course. Multivariable analysis identified emergency paramedics as the group benefiting most from the training, while factors such as previous experience and prior course participation did not significantly influence the outcomes. These results suggest that PHTLS training effectively enhances both self-confidence and communication among medical personnel involved in trauma care, regardless of their specific roles or levels of experience, highlighting its critical role in pre-hospital trauma management.

The study by Esmaeilzadeh et al. (2022) evaluated the impact of the Pre-hospital Trauma Life Support (PHTLS) training program on the on-scene time interval for trauma victims in Iran. The research involved a controlled field trial with 64 emergency medical technicians, divided into experimental and control groups. The main findings indicated a significant reduction in the mean on-scene time for the experimental group, which decreased from 17.6 minutes before training to 12 minutes one-month post-intervention, compared to no significant change in the control group. Data analysis employed SPSS,

revealing that the reduction in on-scene time was statistically significant ( $p < 0.001$ ). The study underscored that effective training improves adherence to trauma care protocols, enhancing decision-making and prioritization during emergency responses. It highlighted the importance of minimizing on-scene time to improve trauma outcomes, emphasizing the need for integrating PHTLS training into routine EMS practices to enhance patient care and survival rates. Overall, the results support the effectiveness of advanced trauma life support training in reducing crucial time intervals during emergency medical responses.

The study by Sivrikaya et al. (2022) examined the long-term retention of knowledge and skills among Emergency Medical Technicians (EMTs) following Advanced Cardiovascular Life Support (ACLS) training, utilizing simulation-based scenarios. A total of 42 EMTs participated, with evaluations conducted both immediately after the training and one year later. Results indicated a significant decline in retention over the year. While participants' skills improved immediately post-training, with high percentages of correct performance in key areas such as compression depth and rate, retention scores dropped notably during the follow-up assessment. Specifically, the mean rate of correct chest compressions decreased from 89.4% to 68.3%, and the ability to differentiate between shockable and non-shockable rhythms fell from 85.3% to 61.4%. Knowledge retention, assessed through multiple-choice questionnaires, also reflected a decline: correct answers dropped from 82.8% at the end of training to 69.4% a year later. Notably, EMTs with over two years of experience and those managing more than 150 cardiac arrest cases annually demonstrated better retention. The study concluded that while simulated training effectively enhances initial skills and knowledge, retention deteriorates significantly over time. The findings emphasize the importance of ongoing training and the potential role of experience in maintaining competency in emergency medical care.

Choi et al. (2021), examined the impact of Advanced Trauma Life Support (ATLS) training on Emergency Medical Services (EMS) personnel and its effectiveness in improving trauma care outcomes. Trauma remains a significant public health issue, contributing to millions of emergency visits and a high mortality rate, particularly among younger populations and the elderly. Key findings indicate that ATLS training enhances the skills and confidence of EMS personnel in managing trauma cases. The structured curriculum—including standardized lectures, practical

skills stations, and simulation exercises—has been shown to reduce mortality rates in trauma patients significantly. For instance, institutions implementing ATLS reported a 20% decrease in mortality compared to pre-ATLS periods. Additionally, the integration of ATLS into EMS protocols has standardized trauma care across varying geographical locations, ensuring that personnel are equipped to recognize and respond to life-threatening injuries. Despite some debate regarding the optimal prehospital intervention approach, evidence suggests that ATLS-trained providers deliver higher quality care, improving triage and transport decisions. The study underlines the importance of ongoing education and the need for regular updates to training programs to incorporate new techniques and evidence-based practices. Overall, the findings support the continuation and expansion of ATLS training among EMS personnel as a means to enhance trauma patient outcomes and reduce preventable deaths.

The study by Yoder et al. (2020) analyzed the triage effectiveness of Emergency Medical Services (EMS) personnel, specifically comparing Advanced Life Support (ALS) and Basic Life Support (BLS) transport over a 13-year period in Pennsylvania. The research utilized data from the Pennsylvania Trauma Outcomes Study database, encompassing 462,830 trauma patients. Of these, 115,825 had an Injury Severity Score (ISS) of 16 or greater, qualifying for trauma alert activation. Key findings indicated that ALS personnel demonstrated a significantly lower rate of undertriage (UT) compared to BLS (relative risk ratio [RRR] = 0.92,  $p = 0.003$ ). Conversely, ALS transport resulted in a higher rate of overtriage (OT) (RRR = 1.59,  $p < 0.001$ ). Both UT and OT were associated with increased mortality, highlighting the critical nature of accurate triage in trauma care. The study concluded that while ALS training reduces UT, it may lead to excessive OT, raising concerns about resource utilization in trauma systems. Recommendations included enhanced education for BLS providers on identifying major trauma cases to improve triage accuracy. Overall, the findings underscore the necessity for continuous training and adherence to triage protocols to optimize patient outcomes in prehospital settings.

The study by Donnelly et al. (2016) explored the attitudes and experiences of Emergency Medical Services (EMS) personnel regarding domestic violence following participation in a specialized training program. A total of 403 EMS respondents completed an online survey after engaging in training focused on recognizing and responding to domestic

violence. Key findings revealed that 71% of participants frequently encountered patients disclosing domestic violence, yet many held misconceptions about victim responsibility and the efficacy of their interventions. Specifically, 45% believed that if victims did not disclose abuse, there was little they could do to help, and a significant portion endorsed harmful stereotypes, such as the idea that victims are responsible for the abuse. Despite a strong awareness of community resources for domestic violence, with 80% indicating familiarity and 69% having made referrals, the study highlighted a gap in effective response strategies. Approximately one-third of respondents reported having received minimal training on domestic violence in the past five years, with 19% having no training at all. The results underscore the need for enhanced training programs that challenge existing myths and attitudes about domestic violence, ensuring EMS personnel are better equipped to support victims effectively. The study advocates for ongoing education to foster a deeper understanding of the complexities surrounding domestic violence and improve the overall EMS response to such cases.

The systematic review by Jayaraman et al. (2014) evaluates the effectiveness of Advanced Trauma Life Support (ATLS) training for hospital staff, aiming to assess its impact on injury mortality and morbidity. Despite the growing adoption of ATLS in both high-income and low- to middle-income countries, the review found no randomized controlled trials or comparable studies that met the inclusion criteria. The authors conducted a thorough literature search, ultimately identifying 3109 citations but concluding that none provided evidence for the effectiveness of ATLS in improving patient outcomes. While some studies indicated that ATLS training enhances the knowledge and skills of healthcare providers, there was insufficient evidence to link this training to reduced mortality or morbidity in trauma patients. The review highlights the urgent need for rigorous research to evaluate trauma systems incorporating ATLS, emphasizing that current evidence is inadequate to guide practice or policy. The authors advocate for future studies that employ more robust designs, such as controlled before-and-after studies, to clarify the role of ATLS in trauma care outcomes.

The study by Seamon et al. (2013) investigated the effectiveness of Advanced Life Support (ALS) compared to Basic Life Support (BLS) in the prehospital care of penetrating trauma victims in an urban setting. Conducted over a period from June 2008 to December 2009, the study analyzed 236 consecutive trauma patients transported by Emergency Medical

Services (EMS) to a Level 1 trauma center. Key findings revealed that 71% of patients were transported by ALS, which performed significantly more prehospital interventions (97% of ALS patients) than BLS (17% of BLS patients). Despite the higher rate of interventions, ALS transport was associated with a lower survival rate to hospital discharge (69.5% for ALS vs. 88.4% for BLS,  $p < 0.01$ ). Notably, while ALS on-scene time was longer, total prehospital time did not significantly differ between the two groups. Statistical analyses indicated that ALS transport was linked to decreased survival odds (odds ratio [OR] = 0.30,  $p < 0.01$ ), suggesting that advanced interventions did not confer a survival benefit for rapidly transported, urban penetrating trauma patients. The study concluded that the ALS prehospital care model may not be optimal for this patient population, emphasizing the need for reevaluation of ALS protocols in urban trauma settings.

The study by Blomberg et al. (2013) examined the impact of Prehospital Trauma Life Support (PHTLS) training on the outcomes of traffic-injury victims in Sweden from 2001 to 2004. Utilizing data from the Swedish National Patient Registry and the Cause of Death Registry, the researchers analyzed 28,041 cases of motor-vehicle traffic injuries. Key findings indicated that the introduction of PHTLS training was associated with a 54% higher odds of prehospital mortality among PHTLS-trained ambulance personnel (OR 1.54, 95% CI: 1.07-2.13). Conversely, there was no significant reduction in 30-day mortality for those admitted to the hospital (OR 0.85, 95% CI: 0.45-1.48), nor in time to death or return to work. Despite an overall reduction in prehospital mortality during the study period, the data revealed no clear association between the regional implementation of PHTLS training and improved patient outcomes. The study concluded that while PHTLS training has been widely adopted, its effectiveness in significantly reducing mortality and improving recovery times remains questionable. Overall, the findings highlight the need for further research to clarify the relationship between advanced trauma training and patient outcomes in prehospital settings.

The study by Johansson et al. (2012) investigated the impact of Prehospital Trauma Life Support (PHTLS) training on trauma patient outcomes, specifically mortality rates. Conducted in Uppsala County, Sweden, this population-based observational study analyzed data from 2,830 trauma patients who either died or were hospitalized for more than 24 hours between 1998 and 2004. The findings suggested a possible association between PHTLS training and

reduced mortality among trauma victims. The unadjusted odds ratio for mortality was 0.96, while the adjusted odds ratio indicated a 30% relative reduction in mortality (OR = 0.71; 95% CI: 0.41–1.25). The mortality rate was slightly lower for patients treated by crews with PHTLS training (4.5%) compared to those without (4.7%). However, the precision of these estimates was low due to the overall low mortality rates in the cohort, yielding an estimated absolute risk reduction of just 0.5 lives saved annually per 100,000 population with full PHTLS implementation. The study also revealed that while PHTLS training could enhance adherence to established trauma care protocols, there were no significant differences in response, on-scene, or transport times between PHTLS-trained and non-trained crews. Overall, while the results indicate a potential benefit of PHTLS training in improving trauma survival, the low absolute risk reduction and the challenges in establishing definitive causal relationships underscore the need for further research to validate these findings. The study by Johansson et al. (2012) assessed the efficacy of Prehospital Trauma Life Support (PHTLS) training on trauma patient survival rates in Uppsala County, Sweden. Analyzing data from 2,830 trauma patients who either died or were hospitalized for over 24 hours from 1998 to 2004, the research aimed to determine the association between ambulance crew PHTLS training and patient outcomes. Results indicated a slight reduction in mortality associated with PHTLS training. The mortality rate was 4.5% for patients treated by PHTLS-trained crews compared to 4.7% for those without such training. The adjusted odds ratio suggested a 30% relative risk reduction in mortality (OR = 0.71; 95% CI: 0.41–1.25), although the overall low mortality rates resulted in a predicted absolute risk reduction of only 0.5 lives saved annually per 100,000 population. The study highlighted that, despite the potential benefits of PHTLS training in improving trauma care adherence, no significant differences in response, on-scene, or transport times were observed between trained and untrained crews. While the findings support the notion that PHTLS training may positively influence trauma outcomes, the low absolute risk reduction and the challenges in establishing a definitive causal link warrant further investigation to confirm these effects in broader contexts.

The study by Johansson et al. (2012) investigated the impact of Prehospital Trauma Life Support (PHTLS) training on the survival of trauma patients in Uppsala County, Sweden, during the gradual implementation of PHTLS from 1998 to 2004. Analyzing a cohort of 2,830 patients who either died or were hospitalized for

over 24 hours, the researchers linked prehospital records with hospital discharge and cause-of-death data. The findings suggested that PHTLS training was associated with a relative reduction in mortality, with an adjusted odds ratio of 0.71 (95% CI: 0.42–1.19). The overall mortality rates were 4.7% for patients without PHTLS-trained crews and 4.5% for those with trained personnel. However, the absolute risk reduction was minimal, estimated at 0.5 lives saved annually per 100,000 population with full PHTLS implementation. Despite showing potential benefits, the study highlighted that the precision of these estimates was low due to the overall low mortality rates observed. The authors concluded that while PHTLS training may correlate with improved outcomes, the evidence remains insufficient to strongly advocate for its widespread implementation in trauma care, underscoring the need for further research to establish definitive benefits.

The study by Jayaraman, (2010) addresses the rising global burden of injury, particularly in low- and middle-income countries (LMICs), where Advanced Life Support (ALS) training for ambulance crews is increasingly adopted as a strategy to improve trauma care outcomes. However, the effectiveness of this intervention remains controversial and inadequately evaluated. The objective was to quantify the impact of ALS-trained crews versus those without such training on reducing mortality and morbidity in trauma patients. Comprehensive searches were conducted across multiple databases up to July 2009, including the Cochrane Injuries Group Specialized Register and MEDLINE, to identify relevant studies. The inclusion criteria encompassed randomized controlled trials, quasi-randomized trials, and non-randomized studies. Ultimately, one controlled before-and-after trial, one uncontrolled before-and-after study, and one randomized controlled trial were included. None of these studies provided evidence supporting the efficacy of ALS training for pre-hospital personnel. Notably, the uncontrolled study revealed an increase in mortality among patients with a Glasgow Coma Scale score of less than nine who were treated by ALS-trained crews. Logistic regression analysis further indicated that mortality rates significantly increased for patients receiving care from ALS-trained ambulance crews when accounting for pre-hospital trauma scores.

The study conducted by Baker et al. (2009) evaluated the impact of Pediatric Advanced Life Support (PALS) training on the performance of Emergency Medical Service (EMS) providers during out-of-hospital pediatric resuscitations. An analysis was

performed on 183 pediatric trauma and medical resuscitation cases over three years, with a focus on airway management, vascular access, shock recognition, and adherence to cardiac arrest protocols. Key findings revealed that PALS-trained EMS personnel successfully intubated patients at a significantly higher rate (85%) compared to their non-PALS counterparts (48%,  $p < 0.001$ ). Additionally, vascular access was successfully established in all PALS-trained cases versus 70% in non-PALS cases ( $p < 0.001$ ), and intraosseous line placement was more successful in PALS-trained providers (100% vs. 55%,  $p < 0.01$ ). Despite these improved procedural outcomes, there was no significant difference in mortality rates between the two groups (37% for PALS vs. 32% for non-PALS). The study concluded that while PALS training enhances critical skills for EMS personnel, it does not correlate with improved survival rates in pediatric resuscitations. The authors advocate for the integration of PALS training in EMS curricula to bolster provider competency in pediatric emergencies.

The study by Eckstein et al. (2000) examined the impact of prehospital Advanced Life Support (ALS) on the survival rates of major trauma patients. Conducted over 36 months, the retrospective analysis included 9,451 trauma patients, focusing on those who received either bag-valve-mask (BVM) ventilation or endotracheal intubation (ETI) by paramedics. Key findings revealed that of the 496 patients receiving airway interventions, 81% were treated with BVM and 19% with ETI. The mortality rate was significantly higher in the ETI group (93%) compared to the BVM group (67%). Logistic regression analysis indicated that patients treated with BVM were 5.3 times more likely to survive than those who underwent ETI, despite the higher Injury Severity Scores (ISS) in the ETI cohort. The study also assessed on-scene times, finding no significant difference between those receiving ETI and those receiving BVM. This suggests that ALS procedures can be performed without extending on-scene time. However, the lack of improvement in survival rates associated with ALS interventions raises questions about their effectiveness in prehospital trauma care. In conclusion, while ALS procedures, including ETI, did not demonstrate a survival advantage, they were executed efficiently by paramedics. The authors call for further research to clarify the role of prehospital ALS in trauma management.

#### 4. DISCUSSION:

The findings of this comprehensive review highlight the significant impact of Advanced Trauma Life

Support (ATLS) training on Emergency Medical Services (EMS) personnel, particularly in enhancing clinical decision-making and operational performance in trauma care. The studies reviewed indicate a consistent trend: while ATLS training improves skills and confidence among EMS providers, the direct correlation between such training and improved patient outcomes remains ambiguous.

For instance, the study by Choi et al. (2021) demonstrated that ATLS training is associated with a notable reduction in mortality rates among trauma patients. Similarly, Teuben et al. (2024) reported increased self-confidence and improved communication skills among emergency medical personnel post-Pre-Hospital Trauma Life Support (PHTLS) training. These findings suggest that structured training programs can lead to enhanced performance in trauma management scenarios.

However, other studies present a more nuanced picture. For example, the investigation by Seamon et al. (2013) indicated that despite more interventions being performed by Advanced Life Support (ALS) personnel, this did not translate into improved survival rates for penetrating trauma patients. This aligns with the findings from Johansson et al. (2012), which suggested that while PHTLS training may correlate with better adherence to trauma protocols, the actual impact on mortality rates is minimal. These discrepancies highlight a critical gap in the literature: while training appears to equip EMS personnel with essential skills, the effectiveness of these skills in real-world scenarios, particularly in improving survival outcomes, is not consistently evidenced.

Furthermore, the systematic review by Jayaraman et al. (2014) underscores the lack of robust studies linking ATLS training to improved patient outcomes, emphasizing the need for more rigorous research designs to evaluate the effectiveness of trauma training in prehospital settings. The absence of randomized controlled trials assessing the direct impact of ATLS on morbidity and mortality further illustrates this gap. Moreover, the retention of skills and knowledge over time poses another challenge. The study by Sivrikaya et al. (2022) revealed significant declines in skill retention among EMTs one-year post-training, suggesting that while initial training may be effective, ongoing education and refresher courses are crucial to maintain competencies. This concern is echoed across various studies, indicating that without continuous training, the benefits of ATLS may diminish over time. In conclusion, while current evidence supports the notion that ATLS and PHTLS training enhance EMS personnel's capabilities, the correlation between these

training programs and improved patient outcomes remains inadequately addressed. Future research must focus on longitudinal studies that not only assess immediate improvements post-training but also evaluate long-term impacts on patient care and survival rates. Additionally, exploring the integration of training with continuous professional development may provide insights into sustaining the effectiveness of trauma care within EMS. Addressing these gaps will be essential for refining training programs and ultimately improving trauma outcomes in prehospital settings.

### 5. Gaps in Literature

Despite the increasing recognition of Advanced Trauma Life Support (ATLS) training for Emergency Medical Services (EMS) personnel, several critical gaps in the literature need further exploration, particularly concerning the direct correlation between ATLS training and improved patient outcomes.

Many studies indicate enhancements in skills and confidence among EMS personnel post-ATLS training, such as the findings from Choi et al. (2021), which reported a significant reduction in mortality rates among trauma patients. However, the literature lacks rigorous studies demonstrating a direct link between ATLS training and measurable improvements in patient morbidity and mortality. For instance, the systematic review by Jayaraman et al. (2014) highlighted the absence of randomized controlled trials assessing the direct impact of ATLS on patient outcomes, emphasizing the need for more robust research designs.

The existing studies often employ heterogeneous methodologies, leading to inconsistent findings. For example, Teuben et al. (2024) focused on self-reported confidence and communication skills post-training, while Esmailzadeh et al. (2022) evaluated on-scene time intervals. This variability complicates the synthesis of results and undermines the ability to draw definitive conclusions about the effectiveness of ATLS training across different EMS contexts. While initial training appears beneficial, the literature lacks longitudinal studies examining the long-term retention of skills and knowledge acquired through ATLS training. Sivrikaya et al. (2022) revealed a significant decline in skill retention among EMTs one year post-training, suggesting that the benefits of ATLS may diminish without ongoing education. This gap highlights the need for continuous professional development to ensure EMS personnel can maintain competencies and deliver high-quality trauma care over time.

Another gap lies in the exploration of contextual factors that may influence the effectiveness of ATLS training. Studies like those by Seamon et al. (2013) and Johansson et al. (2012) indicate that variations in trauma type and regional healthcare infrastructure can significantly affect patient outcomes. However, current literature often overlooks these factors, limiting the generalizability of findings. A deeper understanding of how these contextual elements interact with ATLS training could inform more tailored and effective training programs.

Most studies focus on specific aspects of trauma care or particular training outcomes, leading to fragmented insights. For example, while Blomberg et al. (2013) assessed the outcomes of traffic-injury victims in relation to Prehospital Trauma Life Support (PHTLS) training, it did not comprehensively evaluate other dimensions of trauma care. A holistic evaluation that integrates various dimensions of ATLS training—such as clinical outcomes, knowledge retention, operational performance, and the psychosocial aspects of EMS work—would provide a more comprehensive understanding of its effectiveness.

The identified gaps have significant implications for the future of trauma care in prehospital settings. Addressing these gaps is crucial not only for refining ATLS training programs but also for enhancing patient outcomes. By focusing on robust study designs that directly assess the impact of ATLS training on patient care, researchers can contribute valuable insights that inform policy and practice in EMS. Furthermore, understanding the long-term retention of skills and the influence of contextual factors can lead to more effective training strategies that adapt to the complexities of real-world trauma management.

In conclusion, while ATLS training is widely recognized for its potential benefits, a more nuanced understanding of its effectiveness in improving patient outcomes is essential. Future research should prioritize these gaps to ensure that EMS personnel are adequately equipped to provide high-quality care during critical trauma incidents.

### 6. Areas for Future Research

Future research should prioritize longitudinal studies that evaluate the long-term impacts of Advanced Trauma Life Support (ATLS) training on both patient outcomes and skill retention among Emergency Medical Services (EMS) personnel. Specific areas of focus could include:

- Investigating how skills acquired through ATLS training are retained over months and



years, identifying factors that contribute to effective retention.

- Conducting studies that track trauma patient outcomes over extended periods following the introduction of ATLS-trained personnel into EMS protocols, comparing outcomes with historical data.
- Examining the effects of ongoing education and refresher courses on skill retention and patient care, assessing whether regular updates to training curricula enhance the effectiveness of ATLS training.
- Studying how the effectiveness of ATLS training may vary across different healthcare systems and geographical locations, particularly in urban vs. rural settings.

#### 7. Practical Recommendations

Based on the findings of this review, the following recommendations are made for enhancing EMS training programs:

- Implement regular continuing education modules that refresh ATLS knowledge and skills. This could include online courses, workshops, and hands-on simulations that reflect current best practices.
- Schedule mandatory refresher courses every 1-2 years for EMS personnel to ensure skills remain sharp and up-to-date with evolving trauma care protocols.
- Regularly update training curricula to include the latest evidence-based practices and technologies in trauma care, ensuring that personnel are familiar with the most effective interventions.
- Establish mentorship programs where experienced EMS personnel can provide guidance and practical support to newer team members, fostering a culture of continuous learning.

#### 8. Limitations of the Study

While this review provides valuable insights into the effectiveness of ATLS training, several limitations must be acknowledged:

- Many studies analyzed may have inherent biases, such as self-reporting by EMS personnel regarding confidence and skill levels, which could skew results.
- The methodologies and outcomes measured across studies varied significantly, making it challenging to draw consistent conclusions about the overall effectiveness of ATLS training.
- The findings from certain studies may not be applicable to all EMS settings, particularly in low-resource environments where healthcare

infrastructure differs significantly from high-income countries.

- The absence of robust randomized controlled trials assessing the direct impact of ATLS training on patient outcomes limits the ability to make definitive claims about its effectiveness.

#### 9. CONCLUSION:

This comprehensive review underscores the significant potential of Advanced Trauma Life Support (ATLS) training to enhance the skills and confidence of EMS personnel in trauma management. Key findings indicate that while ATLS training is associated with improvements in clinical decision-making and operational performance, the direct correlation between such training and improved patient outcomes remains ambiguous. The review also highlights critical gaps in the literature, particularly the need for longitudinal studies to assess long-term impacts on patient care and skill retention. Given the high stakes involved in trauma care, further research is essential to refine training practices and enhance the quality of care provided by EMS teams. Continued exploration in this area has the potential to inform EMS training protocols significantly, ultimately contributing to improved trauma outcomes and reduced mortality rates in emergency situations. By addressing the identified gaps and reinforcing the need for ongoing education and assessment, EMS organizations can better prepare their personnel to meet the challenges of trauma care.

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