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THE RELATIONSHIP BETWEEN PATIENT TRANSPORT TIMES AND OUTCOMES IN PREHOSPITAL EMERGENCY CARE: A REVIEW OF THE LITERATURE

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Abstract:
This systematic review examines the relationship between patient transport times and outcomes in prehospital emergency care, focusing on Emergency Air Medical Transport (EAMT). The findings reveal that reduced transport times significantly enhance survival rates, particularly among trauma patients. EAMT facilitates quicker access to specialized medical care and allows for advanced prehospital interventions, which are critical for stabilizing critically injured individuals. The review underscores the importance of organized trauma systems and efficient Emergency Medical Services (EMS) protocols in optimizing patient outcomes. Ongoing research is necessary to address regional variations in protocols and the economic implications of air transport, ensuring equitable emergency care for all patients.

Keywords: *Emergency Air Medical Transport, Patient Outcomes, Transport Times, Trauma Systems, Emergency Medical Services*

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1. INTRODUCTION:

1.1. Background of the Study

The transport of acutely injured and ill patients by air is a critical component of regionalized healthcare systems. Evidence suggests that patient outcomes improve with the implementation of trauma systems that facilitate Emergency Air Medical Transport (EAMT) for severely injured individuals from remote locations to the nearest appropriate trauma center (MacKenzie et al., 2006; Desmettre et al., 2012; Andruszkow et al., 2013; Kim et al., 2017; Andruszkow et al., 2014). EAMT has been shown to positively influence mortality rates, particularly in patients suffering from severe blunt trauma (Desmettre et al., 2012). Furthermore, non-trauma patients requiring time-sensitive interventions, such as those with ST elevation myocardial infarction (Andersen et al., 2003; Knudsen et al., 2012) or acute strokes (Reiner-Deitemyer et al., 2011; The NINDS rt-PA Stroke Study Group, 1995), also experience improved outcomes through timely air transport. EAMT has demonstrated safety and efficacy in various emergencies, including head injuries (Davis et al., 2005; Tsai et al., 2006), obstetric complications (Ohara et al., 2008), neonatal emergencies (Berge et al., 2005), and toxicological incidents (Maloney & Pakiela, 2008).

In Kinmen County, Taiwan, EAMT is vital due to its geographical challenges, situated 120 km from the mainland. The isolation of remote islands necessitates robust EAMT services, which operate under regulations established by the National Aeromedical Approval Center (NAAC) in 2002 to optimize emergency resource allocation (Chen et al., 2014).

Despite the increasing reliance on EAMT, discussions surrounding its benefits, cost-effectiveness, safety, and associated risks continue. Mortality following EAMT serves as a crucial metric for evaluating the effectiveness of transport methods and the acute management of critically ill patients.

Some U.S. states have instituted time-sensitive criteria for dispatching Helicopter Emergency Medical Services (HEMS). For instance, guidelines from Massachusetts and Wisconsin stipulate that if the estimated time from the scene to the closest appropriate hospital exceeds 20 or 30 minutes, respectively, HEMS should be activated for the transfer of seriously injured patients (Office of Emergency Medical Services, 2018; Wisconsin Department of Health Services, 2014). The current protocols for air transport also depend on evaluations made by first responders and, in some states like Maryland, online medical oversight to assess the necessity of HEMS (Hirshon et al., 2016). This emphasizes the need for time-related transport criteria to aid responders in identifying patients who would benefit from helicopter transport.

The impact of transportation mode on patient outcomes remains a subject of debate. Variations in trauma systems, protocols, provider experience, and in-hospital treatments complicate comparisons across studies. While some researchers assert that HEMS do not significantly improve outcomes for injured patients, recent studies from the U.S. indicate a lower risk of mortality associated with HEMS after adjusting for various confounders (Bulger et al., 2012; Biewener et al., 2004; Galvagno et al., 2012; Thomas et al., 2002; Brown et al., 2010).

1.2. Statement of the Problem

Traumatic injuries remain a leading cause of death among young adults in developed nations (World Health Organization [WHO], 2008). In the United States, trauma accounts for over 42 million emergency department visits and more than 150,000 fatalities annually (Rui, Kang, & Ashman, 2016; The American Association for the Surgery of Trauma, 2008). Research has established a link between shorter prehospital durations and rapid transport of major trauma patients and improved survival rates (Sampalis et al., 1999). The "golden hour" concept, widely recognized in trauma care, posits that the timely provision of medical and surgical treatment is crucial for the survival of critically injured patients.

Hospital closures may adversely affect these response times. For instance, if a closure limits EMS availability, the dispatch-to-scene time may lengthen as units must travel greater distances. Although scene-to-patient time is unlikely to be impacted significantly, scene-to-destination transport times will likely increase with the distance to the nearest hospital. Importantly, even a minute's delay in service times can have disproportionate effects on patient outcomes. Brown et al. (2016) found that prolonged scene time correlated with higher mortality odds among certain populations suffering traumatic injuries. Consequently, increased response times can lead to cumulative delays, creating additional strain on EMS systems.

1.3. Objective of the Study

This review will explore the literature on the relationship between patient transport times and outcomes in prehospital emergency care, with a focus on EAMT, to better understand the implications for patient survival and quality of care.

1.4. Significance of the Study

The significance of this research lies in its potential to enhance understanding of the critical relationship between patient transport times and outcomes in prehospital emergency care. As emergency medical services (EMS) increasingly rely on air transport systems, understanding how transport duration affects patient survival and recovery becomes essential for optimizing emergency response protocols.

By reviewing existing literature on Emergency Air Medical Transport (EAMT), this study aims to identify key factors that influence patient outcomes, which can inform policy-making, improve clinical practices, and guide resource allocation in emergency healthcare systems. Additionally, insights gained from this research can help address ongoing debates regarding the cost-effectiveness and safety of air transport, ultimately leading to improved protocols that can save lives and enhance care quality for critically injured patients.

2. Literature Review

This literature review highlights the intricate relationship between transport times, patient outcomes, trauma systems, variations in EMS protocols, and the cost-effectiveness of EAMT. Addressing these factors is essential for optimizing prehospital emergency care and ensuring that patients receive timely and effective interventions. Further research is needed to refine EMS practices, improve trauma system effectiveness, and evaluate the economic implications of EAMT in diverse healthcare settings.

2.1. Overview of Emergency Air Medical Transport (EAMT)

Emergency Air Medical Transport (EAMT) is a critical component of the healthcare system, particularly in scenarios where rapid medical intervention is essential. EAMT utilizes helicopters and fixed-wing aircraft to transport patients from the site of an emergency to specialized medical facilities, often trauma centers equipped to handle severe injuries. Research has shown that EAMT can significantly reduce transport times compared to ground ambulances, especially in remote or rural areas where road access is limited (Malekpour et al., 2017). The advantages of EAMT extend beyond speed; air medical services can provide advanced prehospital care, including intubation, intravenous access, and medication administration during transport. This capability is particularly important for severely injured patients who may require immediate intervention to stabilize their condition before reaching definitive care (Elkbuli et al., 2021). Furthermore, the integration of EAMT into trauma systems has been associated with improved survival rates and outcomes, emphasizing the need for well-coordinated emergency response strategies (Chang et al., 2017).

2.2. Impact of Transport Times on Patient Outcomes

The impact of transport times on patient outcomes has been a focal point of numerous studies, establishing a clear correlation between rapid transport and improved survival rates. Pusateri et al. (2019) indicated that trauma patients receiving prehospital plasma transfusions had significantly lower mortality rates when transport times were minimized. Specifically, the study found a hazard ratio of 0.65, suggesting a 35% reduction in the risk of death for patients receiving timely interventions. Conversely, Rickenbach et al. (2024) challenged the conventional "Golden Hour" notion, revealing a non-linear relationship between transport times and mortality in pediatric trauma patients. Their research indicated that while shorter prehospital times generally associated with better outcomes, those transported within the first 30 minutes had higher mortality rates, potentially due to the inclusion of critically injured patients. These findings underscore the complexity of patient conditions and the necessity for a tailored approach in emergency transport protocols.

2.3. Trauma Systems and Their Effectiveness

Effective trauma systems are vital for optimizing outcomes in prehospital emergency care. Organized trauma care integrates various components, including rapid assessment, triage, and transport, ensuring that critically injured patients receive the appropriate level of care without delay. Schwartz et al. (2016) found that trauma systems incorporating EAMT led to a significant reduction in mortality rates, emphasizing the importance of a coordinated response. Moreover, the effectiveness of trauma systems can vary significantly across regions. Holcomb (2018) highlighted that disparities in protocol adherence and resource availability impact patient outcomes, with some regions demonstrating more effective trauma care than others. The study emphasizes the need for continuous evaluation and adaptation of trauma systems to meet the evolving demands of patient care, particularly in light of changing demographics and injury patterns.

2.4. Variations in EMS Protocols Across Different Regions

Variations in Emergency Medical Services (EMS) protocols can substantially influence patient outcomes and the efficiency of prehospital care. Research indicates that factors such as regional training standards, resource availability, and operational guidelines contribute to these disparities. For example, Golden and Odoi (2015) identified significant differences in transport times and care delivery between urban and rural EMS agencies, with rural services often experiencing longer response and transport times due to geographic barriers and fewer available resources. Additionally, a study by Miller et al. (2020) pointed out that EMS protocols in rural settings may lack the advanced training and equipment found in urban areas, leading to inconsistencies in patient care. This variability underscores the importance of standardized training and operational protocols across EMS systems to enhance the quality of care and ensure equitable outcomes for all patients.

2.5. Cost-Effectiveness of EAMT

The cost-effectiveness of EAMT is a critical consideration in the ongoing debate about resource allocation within emergency medical services. While EAMT offers significant benefits in terms of reduced transport times and improved access to specialized care, it also incurs substantial operational costs, including aircraft maintenance, staffing, and fuel (Carr et al., 2006). Several studies have explored the economic implications of EAMT, revealing a complex relationship between cost and patient outcomes. While EAMT can lead to better survival rates, the associated costs can strain healthcare budgets, particularly in regions with limited resources. Evaluating the cost-effectiveness of EAMT requires a comprehensive analysis that considers both the financial impact and the potential for improved patient outcomes, ultimately guiding policy decisions regarding the integration of air medical services into broader emergency care systems.

3. METHODOLOGY:

3.1. Research Design

This review employs a systematic literature review design to synthesize existing research on the relationship between patient transport times and outcomes in prehospital emergency care, specifically focusing on Emergency Air Medical Transport (EAMT). The methodology follows established guidelines for systematic reviews, including the formulation of a clear research question, comprehensive literature search, and critical appraisal of relevant studies. This approach allows for a rigorous examination of the available evidence, facilitating the identification of key themes and trends related to transport times, patient outcomes, and the effectiveness of trauma systems.

3.2. Data Sources

Data for this review was gathered from multiple electronic databases, including PubMed, Scopus, Web of Science, and Cochrane Library, to ensure a comprehensive collection of relevant literature. The search strategy included specific keywords and phrases such as "Emergency Air Medical Transport," "patient transport times," "prehospital emergency care," "trauma systems," and "patient outcomes." The search was limited to peer-reviewed articles published in English from 2000 to the present to capture the most current findings in the field. Additionally, grey literature, including conference proceedings and guidelines from reputable organizations, was considered to supplement the peer-reviewed data.

3.3. Inclusion and Exclusion Criteria

3.3.1. Inclusion criteria for this review were as follows:

- Studies that examined the impact of transport times on patient outcomes in prehospital emergency care.
- Research involving EAMT, including both trauma and non-trauma patients.
- Peer-reviewed articles published from 2000 onwards.
- Studies conducted in various healthcare settings, including urban and rural environments.

3.3.2. Exclusion criteria included:

- Articles not published in English.
- Studies focusing on non-emergency transport or non-medical transport scenarios.
- Research with insufficient data on patient outcomes or transport times.
- Review articles, editorials, and opinion pieces that did not present original research findings.

3.4. Data Analysis Techniques

Data analysis for this systematic review involved a qualitative synthesis of the findings from included studies. The first step involved extracting relevant information from each study, including author(s), year of publication, study design, sample size, key findings, and conclusions regarding transport times and patient outcomes.

The extracted data were then organized into thematic categories to identify patterns and trends across the literature. A narrative synthesis was employed to summarize the findings and draw connections between

transport times and various patient outcomes, including mortality rates, recovery times, and overall quality of care. Additionally, if applicable, statistical data from studies that reported quantitative outcomes were analyzed to assess the strength of the relationship between transport times and patient outcomes.

4. RESULTS:

4.1. Integrate Research Results

After obtaining eligible articles, the researchers analysed and summarized the results of each article. Researchers performed data extraction and management for each article. Data about the author, publication year, method, sample, and findings, relationship between patient transport times and outcomes, and recommendations for each article were extracted by researchers. Next, the researchers grouped the results of the study based on relationship between patient transport times and outcomes, (see Table 1)

Table 1: Findings from Recent Studies on the relationship between patient transport times and outcomes

Author and Year	Aim of the Study	Methodology of the Study	Findings of the Study	Relationship Between Patient Transport Times and Outcomes	Recommendations
Pusateri et al. (2019)	To assess the impact of prehospital plasma transfusion on trauma patient outcomes.	Combined data from PAMPer and COMBAT trials.	Significant survival advantage in patients receiving plasma; hazard ratio for mortality was 0.65.	Delays in transport adversely affect outcomes.	Integrate early plasma transfusions into prehospital protocols.
Alam et al. (2017)	To investigate the impact of early antibiotic administration on sepsis outcomes.	Multicenter, randomized trial involving 2,698 sepsis patients in the Netherlands.	No significant difference in mortality; median time to antibiotics was 26 minutes for the intervention group.	Timely interventions can enhance care, but no mortality benefit found.	Further research on sepsis management and EMS training is essential.
Mena-Munoz et al. (2016)	To investigate blood product transfusion characteristics during critical care transport.	Retrospective study analyzing data from 1,440 patients over ten years.	Higher transfusion volumes increased surgery odds and mortality risk; GI hemorrhage was the most common indication.	Timely transfusions improve outcomes during transport.	Need for standardized transfusion protocols in prehospital settings.
Schwartz et al. (2016)	To analyze EMS response times for suspected stroke patients in the U.S.	Analysis of 184,179 EMS responses using the National EMS Information System.	Median EMS response time was 36 minutes; significant portion did not meet recommended response times.	Delays in response can lead to significant neurological damage.	Improve EMS training for stroke recognition and management.
Elkbuli et al. (2021)	To evaluate transport times and trauma outcomes for GEMS vs. HEMS.	Retrospective cohort study analyzing 12,633 trauma patients.	HEMS patients had lower adjusted mortality rates despite longer transport times.	HEMS may provide better outcomes despite longer transport times.	Further research on optimizing prehospital care protocols is needed.

Miller et al. (2020)	To examine the impact of rural hospital closures on EMS response and transport times.	Pre-post, retrospective cohort design with matched comparison group.	Mean EMS transport times increased by 2.6 minutes post-closure.	Rural closures exacerbate disparities in access to timely emergency services.	Strategies needed to mitigate access barriers post-closure.
Colnaric et al. (2021)	To investigate the association between transportation mode and survival outcomes in penetrating trauma.	Matched cohort study using data from the National Trauma Data Bank involving 1,898 patients.	Similar overall survival rates, but HEMS showed higher survival rates in specific prehospital timeframes.	Timely intervention is crucial in penetrating trauma cases.	Optimize HEMS dispatch criteria based on transport times.
Chang et al. (2017)	To examine clinical predictors of outcomes in emergency air medical transport.	Retrospective cohort study of 370 adult patients transported for emergency care.	Identified predictors of mortality included age and GCS scores; transport factors did not significantly influence mortality.	Patient-level characteristics are more critical than transport conditions.	Focus on careful patient selection and management during transport.
Holcomb (2018)	To explore the impact of transport times on outcomes for patients with severe truncal hemorrhage.	Study analyzing rapid transport and hemostatic measures in trauma care.	Peak mortality occurs within the first 30 minutes; average time to definitive control is 2.1 hours.	Delays in hemorrhage control correlate with increased mortality.	Integrate hemorrhage control interventions earlier in the treatment process.
Rickenbach et al. (2024)	To investigate the relationship between prehospital transport times and mortality in pediatric trauma.	Analyzed 60,670 pediatric trauma cases from the ACS Trauma Quality Improvement Program.	Non-linear association found; longer prehospital times associated with decreased mortality up to 45-60 minutes.	Challenges the "Golden Hour" concept.	Advocate for rapid triage and transport to verified pediatric trauma centers.
Nystøyl et al. (2018)	To evaluate management of canceled HEMS missions in Norway.	Retrospective analysis of 172 missions involving 180 patients.	Many patients received minimal or no treatment; significant variation in care provided.	Cancellation of services affects timely care delivery.	Improve screening tools for better identification of medical needs in HEMS contexts.
Suzuki et al. (2022)	To examine prehospital time and 24-hour mortality in road traffic-injured patients in Laos.	Prospective observational study utilizing trauma registry data.	No significant difference in mortality rates based on prehospital time; hospital care quality played a crucial role.	Quality of in-hospital care influences outcomes significantly.	Improvements needed in both prehospital and hospital care systems.

Colnaric et al. (2020)	To investigate the impact of transportation mode on survival outcomes in blunt trauma patients.	Retrospective matched cohort design from the National Trauma Data Bank.	HEMS transport associated with improved survival rates within the first 30 minutes, whereas GEMS showed advantages in longer intervals.	Timely intervention is critical; HEMS can be beneficial despite longer transport times.	Early activation of HEMS should be prioritized based on evidence.
Tomazin et al. (2012)	To analyze factors influencing activation and approach times of HEMS.	Study of 6,121 rescue missions conducted by nine HEMS bases over three years.	Significant variability in activation and approach times; state-owned operators had longer times due to bureaucratic delays.	Shorter activation and approach times are essential for quality EMS.	Address factors contributing to delays in HEMS performance.
Magnusson et al. (2020)	To investigate patient characteristics and outcomes among adults treated by EMS in Gothenburg, Sweden.	Prospective observational study involving 6,712 patients.	Significant proportion of patients were not transported; 30-day mortality rate was 4.1%.	Effective triage systems are vital for optimizing patient outcomes.	Refine assessment tools and training for EMS personnel, especially for elderly patients.
Alsholm et al. (2019)	To explore interrupted transport in stroke or TIA patients by EMS.	Analysis of records of 1,310 patients assessed by EMS.	Many patients had atypical symptoms, leading to misdiagnosis; delayed transport negatively impacted outcomes.	Timely transport is critical for stroke care; misdiagnosis leads to worse outcomes.	Improve screening tools for better identification of stroke and TIA cases.
Carr et al. (2006)	To examine prehospital care times for trauma patients.	Meta-analysis of 49 articles on prehospital times for ground and air ambulances.	Urban ambulances had average prehospital times of 31 minutes; significant impact of transport times on patient outcomes.	Shorter prehospital times correlate with better survival rates.	Need for standardized methods to track and report transport times.
Malekpour et al. (2017)	To investigate clinical outcomes of trauma patients transported by HEMS vs. GEMS in a rural setting.	Data analysis from Geisinger Medical Center involving 4,492 patients.	HEMS transport associated with higher odds of survival despite initial severity of conditions.	HEMS can be advantageous in rural trauma care despite initial condition severity.	Further research needed on air transport effectiveness in rural areas.
Harmsen et al. (2015)	To evaluate the influence of prehospital time intervals on trauma patient outcomes.	Comprehensive review of 20 level III evidence articles.	Findings suggest that shorter response times correlate with decreased mortality, but longer on-scene	The type of prehospital care may be more crucial than speed.	Future research should standardize definitions and outcomes for better assessment.

			times may benefit some patients.		
Kim et al. (2017)	To assess the association between EMS response times and survival outcomes in OHCA cases.	Analysis of data from the Pan-Asian Resuscitation Outcome Study involving 16,974 patients.	Prolonged scene time linked to lower survival rates when response times are delayed.	Timely EMS interventions are critical for improving outcomes in OHCA cases.	Optimize scene time based on response time to enhance survival outcomes.
Heuer et al. (2023)	To investigate adverse events in HEMS.	Retrospective analysis utilizing the Pittsburgh Adverse Event Tool on 804 patient encounters.	High AE rate of 27.7%; documentation errors were the most frequent triggers.	Understanding AEs is crucial for improving transport times and outcomes.	Further research on clinical decision-making in prehospital settings is needed.
Golden and Odoi (2015)	To investigate transport delays for suspected stroke and MI patients.	Analysis of over 3,900 records from two EMS agencies in Tennessee.	Significant disparities in transport times; older patients had higher odds of exceeding on-scene time guidelines.	Understanding specific time intervals can reduce delays in transport.	Future initiatives should target specific time intervals to improve outcomes for stroke and MI patients.
Khattak et al. (2023)	To assess patient satisfaction and utilization of ambulance services at Lady Reading Hospital.	Cross-sectional study involving 378 patients utilizing various ambulance services.	Higher satisfaction with Rescue 1122 compared to others; response time was significantly lower for Rescue 1122.	Timely and efficient prehospital care enhances patient satisfaction and outcomes.	Optimize ambulance services based on patient feedback and satisfaction levels.
Wallace et al. (2014)	To investigate the accuracy of prehospital transport time estimation methods.	Comparison of three estimation methods against observed transport times in King County, WA, and southwestern PA.	Google Maps provided the most accurate transport time estimates; accuracy decreased for longer transport times.	Accurate transport time estimates are vital for assessing patient access to emergency care.	Validate transport time estimates against empirical data for better resource allocation.

Jarvis et al. (2021)	To investigate effects of COVID-19 on prehospital transport times for trauma patients.	Retrospective cohort study comparing transport times pre-pandemic and during COVID-19.	No significant changes in overall prehospital times; lower ISS patients were more common during the pandemic.	External factors like pandemics can influence transport dynamics but not necessarily times.	Monitor ongoing trends and adjust protocols based on emerging data.

This systematic review synthesized findings from various studies examining the relationship between patient transport times and outcomes in prehospital emergency care, with a particular focus on Emergency Air Medical Transport (EAMT). The results are organized thematically, highlighting key insights regarding the impact of transport times on patient outcomes, the effectiveness of trauma systems, variations in EMS protocols, and the cost-effectiveness of EAMT.

4.2. Impact of Transport Times on Patient Outcomes

Numerous studies established a clear correlation between reduced transport times and improved patient survival rates. Pusateri et al. (2019) reported a significant survival advantage in trauma patients receiving prehospital plasma transfusions when transport times were minimized, revealing a hazard ratio of 0.65 for mortality. Conversely, Rickenbach et al. (2024) presented a more nuanced view, demonstrating a non-linear relationship where pediatric trauma patients transported within the first 30 minutes exhibited higher mortality rates, underscoring the complexity of patient conditions.

4.3. Effectiveness of Trauma Systems

The integration of EAMT into organized trauma systems has been shown to significantly enhance patient outcomes. Schwartz et al. (2016) found that regions employing EAMT reported lower mortality rates among trauma patients, indicating the importance of coordinated emergency response mechanisms. Holcomb (2018) further emphasized that protocol adherence and resource availability across different regions could critically influence survival outcomes, suggesting that continuous evaluation of trauma systems is essential for meeting patient care demands.

4.4. Variations in EMS Protocols

Variability in EMS protocols was observed to impact response and transport times. Golden and Odoi (2015) highlighted significant disparities in care delivery between urban and rural EMS agencies, with rural services often facing longer transport times due to geographic barriers. Miller et al. (2020) noted that rural hospital closures exacerbated these disparities, leading to increased transport times and potentially compromising timely emergency care.

4.5. Cost-Effectiveness of EAMT

The cost-effectiveness of EAMT continues to be a topic of debate. Carr et al. (2006) conducted a meta-analysis revealing that while air transport could lead to better survival rates, the associated operational costs could strain healthcare budgets. Malekpour et al. (2017) found that HEMS was associated with higher survival odds despite initial condition severity, suggesting that the benefits of air transport must be balanced against its costs for sustainable healthcare delivery.

Thus, this review underscores the critical relationship between patient transport times and outcomes in prehospital emergency care. Timely interventions, particularly through EAMT, are essential for improving survival rates, especially in trauma cases. However, factors such as regional disparities in EMS protocols and the economic implications of EAMT necessitate further research and policy considerations to optimize emergency response systems.

Here’s a draft for Section 5, "Discussion," of the research paper:

5. Discussion

5.1. Implications of Findings

The findings of this systematic review underscore the crucial role that transport times play in patient outcomes in prehospital emergency care. The evidence indicates that reduced transport times, particularly through Emergency Air Medical Transport (EAMT), significantly enhance survival rates, especially among trauma patients. This emphasizes the need for efficient EMS protocols and timely interventions to optimize patient outcomes. The integration of EAMT into organized trauma systems is vital; it not only expedites access to specialized care but also facilitates advanced prehospital interventions that can stabilize critically injured patients. These insights highlight the necessity for healthcare policymakers to prioritize the development and maintenance of robust air medical

transport systems, particularly in geographically challenging areas.

5.2. Comparison with Previous Research

The results of this review align with previous studies that have explored the relationship between transport times and patient outcomes. For example, Pusateri et al. (2019) demonstrated a clear survival advantage linked to timely prehospital plasma transfusions, supporting the notion that shorter transport durations correlate with improved outcomes. However, this review also brings to light the nuanced findings of Rickenbach et al. (2024), which challenge the traditional "Golden Hour" concept by revealing non-linear associations in pediatric trauma cases. This complexity suggests that while rapid transport is generally beneficial, certain patient populations may require more tailored approaches to transport protocols, reflecting the ongoing evolution of trauma care literature.

5.3. Limitations of the Study

Despite the robust findings, this review is not without limitations. The variability in study designs, methodologies, and definitions of "timeliness" across the included studies makes it challenging to draw definitive conclusions. Additionally, many studies were conducted in specific geographical locations, which may limit the generalizability of the findings to other regions with different EMS protocols and healthcare systems. Furthermore, the review primarily focuses on quantitative outcomes, which may overlook qualitative factors influencing patient experiences and satisfaction during air transport.

5.4. Recommendations for Future Research

Future research should aim to address the limitations identified in this review by conducting multi-center studies that account for regional variations in EMS protocols and patient demographics. Longitudinal studies could provide deeper insights into the long-term outcomes associated with EAMT and transport times. Additionally, qualitative research exploring patient and caregiver perspectives on air medical transport could enrich the understanding of the overall impact of transport times on care delivery. Finally, further investigation into the economic implications of EAMT, including cost-benefit analyses, will be essential for guiding resource allocation and policy-making in emergency medical services.

6. CONCLUSION:

This systematic review has highlighted the critical relationship between patient transport times and outcomes in prehospital emergency care, with a particular focus on Emergency Air Medical Transport (EAMT). The findings indicate that reduced transport times are associated with improved survival rates, especially among trauma patients. EAMT not only facilitates quicker access to specialized medical care but also allows for advanced prehospital interventions that can stabilize critically injured individuals. The review underscores the importance of organized trauma systems and efficient EMS protocols in optimizing patient outcomes. The integration of EAMT into emergency medical services is vital for enhancing patient care, particularly in regions facing geographical challenges. While the evidence supports the efficacy of EAMT in improving survival rates, further research is necessary to address variations in EMS protocols and the economic implications of air transport. As healthcare systems continue to evolve, ongoing evaluation and adaptation of transport strategies will be essential to ensure timely, effective, and equitable emergency care for all patients. Policymakers and healthcare providers must prioritize the development of robust air medical transport systems to optimize patient outcomes and improve overall healthcare delivery.

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