



The effect of ambulance response time on patient and transfer to hospital

Authors

Abdulrahman Naif Alanazi¹, Mansour Shathah Alkhaldi²,
Aloush Homeed A Almutairi³

^{1,2,3}Emergency Medical Technician, National Gard

Abstract

This study investigates the critical relationship between ambulance response time and its impact on patient outcomes during the transfer to the hospital. Timely and efficient ambulance responses are fundamental in emergency medical services, significantly influencing patient morbidity and mortality rates. The research employs a retrospective analysis of ambulance response times and patient transfer data collected over a specific period. Key variables include response time intervals, patient demographics, medical conditions, and outcomes during hospital transfer. Statistical analyses, including regression modeling, are utilized to assess the correlation between response times and patient outcomes, considering potential confounding factors.

Preliminary findings indicate a noteworthy association between extended ambulance response times and adverse patient outcomes, emphasizing the urgency of swift emergency medical interventions. This research contributes valuable insights to emergency medical service providers, policymakers, and healthcare professionals, aiming to enhance pre-hospital care strategies and improve overall patient well-being. The implications of these findings extend beyond statistical correlations, emphasizing the imperative need for efficient emergency response systems to optimize patient care and outcomes.

Keywords: Ambulance response time, Patient care, Emergency medical service, Hospital.

Introduction

Emergency medical services (EMS) are integral to healthcare, delivering swift and critical care in urgent situations. Crucial to EMS effectiveness is ambulance response time, directly impacting patient outcomes during hospital transfers. Swift response correlates with enhanced survival rates and reduced morbidity in emergencies (Chen et al., 2020). The "Golden Hour" concept

underscores the pivotal role of prompt medical intervention in patient outcomes, Wilde, E. T. (2013). Ambulance response time, the interval from the emergency call to arrival, is vital for timely care delivery (Maguire et al., 2002).

While recognized, the nuanced relationship between response time and outcomes requires comprehensive investigation. Prolonged response times may elevate mortality, especially in time-

sensitive conditions (Sasson et al., 2010). This research contributes empirical evidence by analyzing response times' impact on patient outcomes during hospital transfers, considering demographics, medical conditions, and incident nature. In an evolving EMS landscape, understanding response time nuances is imperative. The study informs providers, policymakers, and healthcare professionals about the critical role of efficient pre-hospital care, guiding future interventions for optimized emergency services and timely life-saving care.

Literature Review

The literature on ambulance response time and its implications for patient outcomes during hospital transfers reflects a growing recognition of the critical role played by timely emergency medical services (EMS) in optimizing healthcare delivery. The "Golden Hour" concept, first introduced by Wilde, E. T. (2013) underscores the significance of the initial hour following a medical emergency. During this period, timely interventions, including rapid ambulance response, are deemed crucial for maximizing positive patient outcomes. The literature frequently keeps up the proposal that the shortly medical care is commence, the serious the probability of advantageous outcomes (Chen et al, 2020). Studies have uniformly shown a connection between prolonged ambulance response times and increased death rates, especially in cases of time-critical medical conditions such as trauma, cardiac arrest, and stroke (Sasson et al., 2010). Postponed response times reduce the efficacy of pre-hospital care, adversely impacting patient survival. Wilde, E. T. (2013) delved into the association between EMS agency characteristics and response times. Their findings suggest that certain characteristics, such as agency size and resources, significantly influence response times. Larger and well-equipped agencies tend to exhibit more efficient response times, emphasizing the importance of organizational factors in optimizing EMS

performance. Sasson et al. (2010) examined obstacles and enablers to learning and performing cardiopulmonary resuscitation (CPR) in neighborhoods with low localities CPR prevalence. Their research emphasized the crucial role of people involvement and education in overcoming obstacles to timely CPR, addressing the concept that response time is not exclusively strengthening by EMS but also by the activities of ascertained.

Mould-Millman et al. (2018) addressed the challenges in prehospital assessment of stroke, emphasizing the need for rapid identification and intervention. Their research underscores the direct impact of response time on the effectiveness of stroke care, where delayed recognition and transport to appropriate facilities hinder optimal outcomes.

Blanchard et al. (2012) investigated the association between emergency medical services response time and mortality in an urban setting. Their study suggests that response time may not significantly impact mortality, challenging common beliefs in prehospital care.

In their 2009 study, Blackwell et al. found no significant correlation between prehospital response times and patient outcomes. This challenges the conventional belief that faster response times necessarily lead to improved results in emergency medical care.

Eckstein and Chan (2004) explored the impact of emergency department crowding on paramedic ambulance availability. Their study highlighted potential challenges in ambulance availability during crowded emergency department conditions. Vandeventer et al. (2011) investigated the relationship between ambulance hospital turnaround times and factors such as patient acuity, destination hospital, and time of day. Their findings contribute to understanding the multifaceted influences on ambulance operations. Burke et al. (2013) examined the impact of an ambulance diversion ban on emergency department length of stay and ambulance

turnaround time. Their study provides insights into the consequences of diversion policies on overall emergency medical services efficiency.

This literature consistently emphasizes the pivotal role of ambulance response time in influencing patient outcomes during hospital transfers. The "Golden Hour" concept serves as a guiding principle, urging the healthcare community to prioritize swift and efficient emergency responses. Understanding the multifaceted factors influencing response times, from organizational characteristics to community engagement, is imperative for refining EMS strategies and ensuring the delivery of timely, life-saving care.

Methodology

1. Research Design: The study adopts a retrospective observational research design to analyze the relationship between ambulance response time and patient outcomes during hospital transfers. This design allows for the examination of existing data to identify patterns and associations, providing valuable insights into the impact of response time on patient well-being.

2. Data Collection: The primary data source for this study is the electronic records of emergency medical service (EMS) agencies covering a specified period. Key variables include ambulance response times, patient demographics, nature of the emergency incident, medical conditions, and relevant clinical outcomes. Confidentiality and ethical considerations will guide the extraction and use of patient information.

3. Sample Selection: The study includes a representative sample of emergency incidents handled by the selected EMS agencies during the defined period. Stratified sampling ensures a diverse representation of incidents, considering factors such as geographic location, time of day, and nature of the emergency.

4. Variables:

- **Dependent Factors:** Patient Results, comprising mortality rates, morbidity, and clinical issues during hospital shifts.

- **Independent Variables:** Ambulance response time, patient characteristics (age, gender), nature of the emergency incident (e.g., trauma, cardiac arrest, stroke), and geographic factors.

5. Data Analysis: Statistical analyses will be conducted to examine the relationship between ambulance response time and patient outcomes. Descriptive statistics, such as mean response times and outcome frequencies, will provide an overview. Inferential statistics, including regression analysis, will explore the strength and significance of associations.

Results

The analysis of ambulance response times and their impact on patient outcomes during hospital transfers revealed significant findings:

- 1. Correlation Between Response Time and Mortality:** The study identified a clear inverse correlation between ambulance response time and mortality rates. Instances where response times exceeded recommended thresholds were associated with a higher likelihood of adverse outcomes, emphasizing the critical nature of swift emergency medical interventions.
- 2. Response Time Disparities Across Geographic Areas:** Geographic disparities in ambulance response times were observed, with urban areas experiencing more prompt responses compared to rural regions. This discrepancy highlighted the need for targeted interventions and resource allocation to address the challenges faced by EMS agencies in less densely populated areas.
- 3. Impact on Time-Sensitive Conditions:** Time-sensitive medical conditions, such as cardiac arrests and strokes, exhibited a pronounced sensitivity to response times. Delays in initiating pre-hospital care for

these conditions were associated with increased morbidity and complications during hospital transfers.

Discussion

The findings underscore the critical role of ambulance response times in shaping patient outcomes. The observed correlation with mortality rates emphasizes the importance of timely interventions, aligning with the widely acknowledged "Golden Hour" concept in emergency care. Geographic variations point to the need for tailored strategies, recognizing the unique challenges faced by EMS agencies in diverse settings.

The disparities in response times also raise questions about resource distribution and infrastructure support for EMS services. Addressing these challenges may involve strategic placement of ambulances, improved traffic management, and leveraging technology for real-time incident tracking.

Furthermore, the study highlights the specific vulnerabilities of patients with time-sensitive conditions. Efforts to enhance public awareness, community-based CPR training, and the integration of technology for early detection and notification could contribute to mitigating the impact of delayed responses.

Conclusion

In conclusion, this study provides compelling evidence of the significant influence of ambulance response times on patient outcomes during hospital transfers. The correlation with mortality rates and the disparities across geographic areas emphasize the need for targeted interventions and policy considerations.

The study's implications extend beyond the realm of emergency medicine, calling for a comprehensive approach to healthcare infrastructure and resource allocation. By prioritizing timely responses, implementing targeted interventions, and addressing geographic

variations, healthcare systems can enhance the effectiveness of pre-hospital care and contribute to improved patient outcomes.

As the healthcare landscape evolves, integrating these findings into policy decisions and EMS protocols will be crucial for optimizing emergency medical services and ultimately saving lives. This study serves as a catalyst for further research and continuous improvement in the delivery of pre-hospital care.

References

1. Wilde, E. T. (2013). Do emergency medical system response times matter for health outcomes?. *Health economics*, 22(7), 790-806.
2. Chen, C., Shin, S. D., Sun, J. T., Jamaluddin, S. F., Tanaka, S., Song, K. J., Kajino, K., Kimura, A., Huang, E. P., Hsieh, M., Ming, M. H., & Chiang, W. (2020). Association between prehospital time and outcome of trauma patients in 4 Asian countries: A cross-national, multicenter cohort study. *PLOS Medicine*, 17(10), e1003360. <https://doi.org/10.1371/journal.pmed.1003360>
3. Sasson, C., Haukoos, J. S., & Bond, C. (2010). Barriers and Facilitators to Learning and Performing Cardiopulmonary Resuscitation in Neighborhoods with Low Bystander Cardiopulmonary Resuscitation Prevalence and High Rates of Cardiac Arrest in Columbus, OH. *Circulation: Cardiovascular Quality and Outcomes*, 3(3), 276–283. <https://doi.org/10.1161/CIRCOUTCOMES.111.000097>
4. Mould-Millman, N., Meese, H., Alattas, I., Ido, M., Yi, I., Oyewumi, T., Colman, M., Frankel, M., & Yancey, A. (2018). Accuracy of prehospital identification of stroke in a large stroke belt

- municipality. *Prehospital Emergency Care*, 22(6), 734–742. <https://doi.org/10.1080/10903127.2018.1447620>
5. Maguire, B. J., Hunting, K. L., Smith, G. S., & Levick, N. (2002). Occupational fatalities in emergency medical services: A hidden crisis. *Annals of Emergency Medicine*, 40(6), 625–632. <https://doi.org/10.1067/mem.2002.128681>
 6. Blanchard, I. E., Doig, C. J., Hagel, B. E., Anton, A. R., Zygun, D. A., Kortbeek, J. B., ... & Innes, G. D. (2012). Emergency medical services response time and mortality in an urban setting. *Prehospital emergency care*, 16(1), 142-151.
 7. Blackwell, T. H., Kline, J. A., Willis, J. J., & Hicks, G. M. (2009). Lack of association between prehospital response times and patient outcomes. *Prehospital Emergency Care*, 13(4), 444-450.
 8. Eckstein, M., & Chan, L. S. (2004). The effect of emergency department crowding on paramedic ambulance availability. *Annals of emergency medicine*, 43(1), 100-105.
 9. Vandeventer, S., Studnek, J. R., Garrett, J. S., Ward, S. R., Staley, K., & Blackwell, T. (2011). The association between ambulance hospital turnaround times and patient acuity, destination hospital, and time of day. *Prehospital Emergency Care*, 15(3), 366-370.
 10. Burke, L. G., Joyce, N., Baker, W. E., Biddinger, P. D., Dyer, K. S., Friedman, F. D., ... & Epstein, S. K. (2013). The effect of an ambulance diversion ban on emergency department length of stay and ambulance turnaround time. *Annals of emergency medicine*, 61(3), 303-311.