

THE GOLDEN HOUR IN TRAUMA: DOGMA OR MEDICAL FOLKLORE?

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INTRODUCTION

The term “golden hour” is a well-known part of the lexicon of trauma surgeons and emergency medical service (EMS) providers who take care of injured patients on a daily basis. The underlying tenet is that an injured patient has 60 minutes from the time of injury to receive definitive care, after which morbidity and mortality increase significantly. Teleologically this seems to make great sense, as no one would argue that we should leave an injured patient bleeding on the streets for longer periods of time. Nevertheless, like many holy shrines in medicine, once exposed to the light of an evidenced-based review, it is found to lack conclusive evidence in the literature to support our biases. This article will briefly unpack the origins of the golden hour and look at evidence to refute or support it.

HISTORICAL BACKGROUND

The vernacular term “golden hour” is widely attributed to R. Adams Cowley, founder of Baltimore’s famous Shock Trauma Institute. In a 1975 article, he stated, “the first hour after injury will largely determine a critically-injured person’s chances for survival.”¹ However, no references or data were provided to support this statement. The foundation for this statement is a bit unclear, but it is widely believed that at the time he stated this, Cowley was trying to win support for a shock trauma hospital and a helicopter program that would fly any trauma victim in the state of Maryland to a trauma hospital in Baltimore within 60 minutes (the golden hour). A companion to the golden hour has arisen in pre-hospital lore called the “platinum 10 minutes.” This is based on the concept that seriously injured patients should have no more than 10 minutes of scene-time stabilization by emergency medical personnel prior to transport to definitive care at a trauma center. This dogma likely arose from the military, as many battlefield fatalities occur within the first minutes post-injury.²

The idea that definitive trauma care must be initiated within 60 minutes has spawned a billion dollar industry of trauma systems, trauma centers, aeromedical rescue, and advanced pre-hospital life support. It has subjected the general public to significant potential risk from well-intentioned ambulance crews careening rapidly through busy streets, transporting injured patients in crowded driving conditions, or air ambulances flying in less than ideal weather. However, this concept is established on a less than rigorous scientific foundation. The fact of the matter is that there is a paucity of data to support the golden hour and even some data that refute it.

EVIDENCE IN FAVOR OF THE GOLDEN HOUR

Two of the most significant studies that found a significant correlation between reduced out-of-hospital times and decreased mortality rates were from Quebec in the 1990’s.^{3,4} The 1993 study by Sampalis et al³ found that total pre-hospital time over 60 minutes was associated with a significant increase in the odds of mortality. The 1999 study by the same group⁴ found that reduced pre-hospital time was associated with reduced odds of dying, when outcomes were controlled for the severity of injury and age of the patient. Additionally, reduced pre-hospital time has been found to be beneficial in specific patient populations, including severe head injuries,^{5,6} intra-abdominal bleeds,⁷ severe thoracic injuries,⁸⁻¹⁰ and rural trauma patients with long EMS transport times.¹¹ Two EMS studies from the United States^{12,13} further supported the importance of shorter pre-hospital time periods: a 2002 study by Blackwell et al¹² found that EMS response times of less than 5 minutes were associated with improved survival in a cohort of both life-threatening and non-life-threatening EMS calls, and a 2005 study by Pons et al¹³ found that EMS response times within 4 minutes resulted in a significant survival benefit for patients with intermediate and high risk of mortality. It is important to note that these studies^{12,13} included mixed populations, including patients with non-traumatic cardiac arrest.

NEGATIVE OR INCONCLUSIVE EVIDENCE FOR THE GOLDEN HOUR

The validity of the golden hour and the link between pre-hospital time and outcome are far from conclusive. With the exception of patients with non-traumatic cardiac arrest,^{14,15} no field-based population has consistently demonstrated a significant association between response interval and survival. One of the most comprehensive investigations of time-to-definitive care in trauma was a 2010 prospective cohort study by Newgard et al¹⁶ of 146 EMS agencies that transported patients to 51 trauma centers in North America. These investigators identified no relationship between EMS intervals and in-hospital mortality among injured patients with physiologic abnormalities. This finding persisted across several subgroups, including injury type, age, and mode of transport.¹⁶ A 2012 German study by Kleber et al¹⁷ found similar results, identifying no significant survival advantage for trauma patients with shorter pre-hospital rescue times. This finding is supported by studies conducted in Canada,¹⁸ the United States,¹⁹⁻²² and Italy.²³

Despite the conflicting evidence regarding the golden hour, rapid EMS transport to medical facilities remains the standard of trauma care. Yet, in the aggregate, there is significant evidence indicating that many trauma patients do not need to be rushed to the hospital.¹⁶⁻²³ Some research even indicates that a slower, smoother transport to the hospital would be beneficial to both patients and pre-hospital providers. A 2010 study by Chung et al²⁴ found that increased ambulance speed negatively affects the quality of chest compression during transport. EMS workers have a documented fatality rate of 12.7 per 100,000 workers, more than twice the national average of 5.0 per 100,000.²⁵ By some estimates, the risk of transportation-related injury to EMS workers and their patients may be five times the national average risk of transit injury.²⁶ These deaths and injuries are largely attributed to helicopter and ambulance crashes that result from the emphasis on shorter pre-hospital time frames.^{27,28}

PERSPECTIVES

There are limitations to the evaluations of the significance of the golden hour. For example, there are multiple time periods that may be evaluated,

including time between the event and notification of 911 (discovery time), 911 notification to hospital arrival (EMS transport time), and hospital arrival to treatment. As a result, there are many different contexts in which the golden hour can be evaluated. Also, determining precise time periods can be quite difficult. For instance, the time of injury and death may be inconsistently recorded. The exact time of injury and death may be unknown if unobserved. Further, declaration of death may be delayed until after resuscitative efforts have been judged futile. This inexactness results in difficulty evaluating time to definitive care and time to death.²⁹

Certainly there are significant potential negative effects of discrediting the golden hour. Misinterpretation of literature questioning the significance of time to definitive care could have unfortunate consequences for patient care if health administrators begin to use recent research studies as proof that they no longer need to invest in timely care of trauma patients. They may cut transport services and reduce staff and funding of trauma centers. This would be a great misfortune for trauma patients, as a 2006 study by MacKenzie et al³⁰ demonstrated a 25% reduction in mortality with designation as a trauma center. The implications of the literature refuting the golden hour must be carefully examined before any hasty changes are made to current trauma and EMS care models.

CONCLUSIONS

This article is not an attempt to totally disregard the importance of the golden hour dictum. True, there is an aspect of trauma care that is very time dependent, but it is wrong to apply an arbitrary time limit such as one hour to a patient in need of definitive care. Every patient coming through the ED doors to the trauma resuscitation area is unique. For a patient who has a gunshot wound to the heart with rupture of the left ventricle, the difference between life and death may be a golden 5 minutes, not a golden hour. Conversely, for a patient who is in a car accident and has an isolated tibia fracture, it may be a golden day or two.

In the year 2014, it is important to look at the evidence-based medicine that either supports or refutes our widely held beliefs. In this way, we can begin to more intelligently design a trauma care system that begins to address the needs of each patient.

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