The Golden Hour: Scientific Fact or Medical "Urban Legend"?

E. BROOKE LERNER, MS, EMT-P, RONALD M. MOSCATI, MD

Abstract. The term "golden hour" is commonly used to characterize the urgent need for the care of trauma patients. This term implies that morbidity and mortality are affected if care is not instituted within the first hour after injury. This concept justifies much of our current trauma system. However, definitive references are generally not provided when this concept is discussed. It remains unclear whether objective data exist. This article discusses a detailed literature and historical record search for support of the "golden hour" concept. None is identified. Key words: emergency medical services; time; transportation; trauma; golden hour. ACADEMIC EMERGENCY MEDICINE 2001; 8:758–760

The term "golden hour" is ubiquitous in the trauma care literature. The idea is that trauma patients have better outcomes if they are provided definitive care within 60 minutes of the occurrence of their injuries. The golden hour justifies much of the current trauma system. Out-of-hospital care concepts such as scoop and run, aeromedical transport, and trauma center designations with trauma teams in place are, in part, predicated on the idea that time is a critical factor in the management of injured patients. Numerous research projects have been conducted with the intention of finding better ways to deliver patients to trauma centers within the "golden hour." However, references are rarely traced back more than a level or two to determine whether actual objective data exist to support the concept.

We made an attempt to identify the origin of the "golden hour" and the scientific evidence upon which it is based. While it seems intuitive that less time is better for trauma patients, there are risks and costs involved in attempting to deliver patients to trauma centers within the "golden hour." However, references are rarely traced back more than a level or two to determine whether actual objective data exist to support the concept.

The search for the golden hour began by identifying articles that give a reference when using the term "golden hour." Two articles reference Trunkey for the term.1,2 However, within Trunkey's article, there is no mention of the "golden hour" and, in fact, although there are no references given, the article describes different time constraints for different types of injury.3 For example, Trunkey states that head-injured patients must receive surgery within four hours of injury, while those with severe hemorrhage require surgical intervention within 20 minutes.

Other articles that mention the golden hour attribute the origin of the term to Cowley.4–6 One of these referenced articles by Cowley refers to an article by Foster that says the mortality rate triples for every 30-minute increase from time of injury to definitive care.7 This 1969 article by Foster reviews the state of helicopter transport at the time and discusses disagreement among physicians as to whether time is an important factor in trauma care.8 In this article, Foster quotes Robert J. Baker from an interview he gave to the Medical World News in which he stated that for every 30 minutes after injury, a threefold increase in mortality can be expected. The Medical World News article with this quotation discusses the creation of the American Trauma Society and the current state of trauma care.9 No references are given for Baker's statement, and a search of MEDLINE and Index Medicus revealed no papers that appear to contain research data to support his statements.

The textbook for the American College of Emergency Physicians' Basic Trauma Life Support course attributes the term golden hour to Cowley, but gives no reference.4 According to the text's editor, the information came from a biography of Cowley entitled Shock–Trauma (Campbell C, personal communication, April 7, 2000). This book credits Cowley as the originator of the term and states that the term is based on the findings of his research on cardiogenic shock conducted using a
canine model, but no references for this research are given. A search of research articles by Cowley on trauma provided several leads. One was a trauma case series of 760 patients that he co-authored in 1979. This case series gives no details of the patients’ times to definitive care and their relation to outcome. It does reference articles by Frey et al. and Hoffman as demonstrating that availability and rapid access to medical care are the most important early determinants of motor vehicle crash survival. The Frey article, a case series of 150 trauma patients, and the Hoffman article, a case series of 2,392 motor vehicle crash patients, both recommend giving ambulance personnel a more advanced level of training, but no data on a relationship between time and patient outcome are provided.

A text on trauma edited by Cowley contains a chapter authored by Shankar, which discusses “Cowley’s golden hour,” referencing a 1976 Cowley article. In this 1976 article, Cowley states: “all [trauma] patients [treated by the Maryland trauma system] are assumed to be dying and much of the golden hour for total stabilization has passed.” This article describes the Maryland trauma system and states that the first 60 minutes after an injury determines a patient’s resulting mortality. It references a paper of his own, written in 1975. Within this 1975 article, another review of the Maryland emergency medical services system, he states that: “the first hour after injury will largely determine a critically-injured person’s chances for survival,” but no data or reference is provided.

A 1977 article by Cowley also mentions the “golden hour,” referencing his 1976 and 1973 articles (which referenced Foster). In 1979, the foreword and an article in The American Surgeon written by Cowley state that trauma patients should, and in Maryland do, reach the trauma center in less than the “golden hour” he found to be crucial for trauma patient outcome, but no reference is given.

Cowley passed away in 1991 and the University of Utah maintains his personal papers. A request to the University of Utah library for any additional information on the origins of the golden hour yielded two outlines of Cowley speeches. The first speech was given to the American Helicopter Association on January 15, 1974, and includes the quote from Baker given in the Medical World News report. It also contains a statement that care of military casualties and Cowley’s personal experience had demonstrated an inverse relationship between favorable injury outcome and time to definitive therapy. However, no data or reference to such data is given. The other speech, presented to the American Academy of Orthopedic Surgeons on November 25, 1974, describes time and the number of body systems and organs injured as the two most important factors influencing shock outcomes. Cowley states that 90% of Maryland trauma patients transported from the scene of injury arrive at the trauma center in less than one hour from the time of injury, while 90% of patients transported from an outlying hospital arrive at the trauma center in over six hours. The mortality of patients transported from outlying hospitals is twice that of patients transported from the scene directly to the trauma center. No mention of matching for severity and/or the possibility of selection bias is given with these data. However, Cowley does go on to say that the care given in the first hour determines the extent of organ damage that the patient might sustain. Interestingly, Cowley’s next statement is that “it may even be that we should be talking about the first golden fifteen minutes as a vital period.”

Others have studied the relationship between time and trauma patient outcome, but the published studies do not appear to resolve the issue. Early published studies that support the golden hour concept came from the Vietnam War, where the survival rate in medical facilities was increased 2% over previous wars and the average time to definitive care was reduced from an average of five hours in the Korean War to only one hour. It is difficult to apply these findings in the civilian U.S. population since these data probably describe only young healthy males suffering penetrating injuries. Further, there is no evidence that these conclusions do not suffer from the ecologic fallacy (i.e., no data to show that soldiers who had shorter out-of-hospital times had better outcomes). Several civilian studies have supported the “shorter total out-of-hospital time is better” philosophy. However, these studies have had very small sample sizes and did not control for key variables such as injury severity, treatment, or demographics. Other published studies have disputed the “shorter is better” philosophy. Several of these studies had findings that were the result of a secondary analysis, while others had obvious selection bias, or looked only at patients with extremely long total out-of-hospital times.

There are no large, well-controlled studies in the civilian population that either strongly support or refute the idea that faster is universally better in trauma care. The numerous smaller studies are not sufficiently similar to use meta-analysis to resolve the question. While it appears the term most likely did originate with Cowley, it does not appear to have originated from explicit research findings. It was based primarily on the experience and opinion of one of the fathers of trauma surgery and...
trauma system design. Other trauma experts at the time also promulgated the idea behind the term. The intuitive nature of the concept and the prestige of those who originally expressed it resulted in its widespread application and acceptance. Despite the lack of definitive scientific evidence, numerous research studies and requests for research funding are based on achieving the golden hour for all trauma patients and take for granted that time always matters.

Our search into the background of this term yielded little scientific evidence to support it. It is crucial for medical researchers to critically examine concepts such as the golden hour that are widely accepted but are in fact not scientifically supported. We frequently strive to push ever higher the ceiling of medical knowledge, but we must also ensure that the knowledge base upon which we stand is solid.

References