

ETHICS CASE

What Are Ethical Implications of Regionalization of Trauma Care?

Commentary by Sandra R. DiBrito, MD, and Christian Jones, MD, MS

Abstract

Outcomes for severely injured patients are improved when they are treated at trauma centers. However, interfacility transfers can delay time-sensitive treatments not requiring the resources of tertiary institutions. Regionalized trauma systems allow physicians to decrease delays in care, prevent inadequate treatment, and ultimately reduce preventable deaths. Although precise risks and benefits of triage choices are unknowable, estimating them is a process well known to surgeons. Recognizing patient transfers as integral to optimal care delivery systems, rather than as detracting from them, is essential.

Case

Mr. F is a 52-year-old man initially evaluated at a 100-bed hospital in rural New Hampshire staffed by two general surgeons, one of whom is on vacation. He sustained multiple stab wounds to his right flank during a home invasion while fighting the intruders to keep them away from his family. Mr. F arrived at the hospital in extremis, near death. Dr. G, the on-call surgeon, is called at home by Dr. A, the emergency department (ED) physician. Dr. G has just returned home after operating for most of the past 20 hours. As Dr. G and Dr. A discuss details of Mr. F's case, they consider implications of performing a laparotomy (an exploratory abdominal surgery to identify and fix or temporize injuries) on Mr. F. There are approximately 20 units of blood available for use at the hospital, an amount unlikely to be enough if Mr. F has major intra-abdominal bleeding. Additionally, prior to taking Mr. F to the operating room (OR), Dr. G would need to wait for on-call OR staff to arrive from home. Dr. G recognizes that Mr. F might not survive the time it would take to mobilize the OR staff and organize the necessary equipment for the operation.

Dr. G requests that Mr. F be transferred to an institution that can offer him a higher level of care. Dr. A's team begins calling level I trauma centers in the region in order to arrange Mr. F's transfer. The first two level I trauma centers contacted do not have an available intensive care unit (ICU) bed. Additional calls take several minutes. Finally, Dr. B, the on-call attending physician at the third—and farthest away—level I trauma center accepts Mr. F to be a patient after a short discussion with Dr. A. Dr. B recommends that the on-call surgeon, Dr. G, perform the laparotomy, followed by immediate transfer to the ICU.

Dr. G insists that she is not comfortable with performing an emergent laparotomy on Mr. F because it would take too long to mobilize OR staff and because OR equipment and blood available for transfusion is limited.

It takes nearly one-and-a-half hours for Mr. F to arrive at Dr. B's trauma bay via ground transport. Massive transfusion protocol is initiated upon arrival to try to compensate for his blood loss. Focused assessment with sonography for trauma (FAST) examination (a quick abdominal ultrasound to identify intra-abdominal hemorrhage after traumatic injury) reveals a massive intra-abdominal fluid collection. Mr. F is taken emergently to the operating room for exploratory laparotomy by Dr. B.

Upon entering the abdomen, Dr. B encounters several liters of blood, recognizes severe hepatic injuries, notices that venous blood rapidly arises from beneath the liver, and thus suspects that Mr. F has a retrohepatic caval injury (an injury to the largest vein within the abdomen, the inferior vena cava, which is fatal if not repaired). Within minutes, Mr. F suffers cardiac arrest. The team begins cardiopulmonary resuscitation (CPR). Despite intra-abdominal packing and massive transfusion, Mr. F's intra-abdominal bleeding cannot be controlled, CPR is stopped, and Mr. F dies on the OR table.

Dr. B walks out to the waiting room to speak with Mr. F's family members, who are visibly traumatized after having their home invaded and watching Mr. F succumb to the intruders' violence. His daughter asks how he's doing and Dr. B prepares to respond, wondering about the many decisions that led to Mr. F's outcome.

Commentary

Trauma centers have unique resources, whereas hospitals without trauma center designation must use their limited resources carefully, balancing treatment of trauma patients against other needs in their hospital. Establishing formal regionalized trauma systems is intended to decrease delays in care and prevent shortages at smaller, critical access centers, which benefit from transferring seriously injured patients to trauma centers. When triaging critically injured trauma patients at nontrauma centers, it is imperative to evaluate the risks and benefits to the patient of transfer or local treatment. Care of trauma patients is extremely time sensitive, and often triage decisions must be made without complete knowledge of all the patient's injuries. After the case is triaged, decisions are prone to retrospective second guessing, which can lead to beneficial, critical evaluation of decision-making processes and, unfortunately, to finger pointing and blame. Communicating adverse outcomes to both families of victims and referring physicians requires appreciating the many considerations made in a triage situation and understanding that transfer of a patient is not equivalent to patient abandonment or failure to treat.

Trauma Center Resources and Requirements

Trauma centers are state-designated institutions intended to provide emergency care to injured patients. In 1976, *Optimal Hospital Resources for Care of the Injured Patient*, by the American College of Surgeons Committee on Trauma (ACS-COT), first described criteria for the categorization of hospitals as trauma centers [1, 2]. The current tiered system typically designates centers as level I-IV, placing importance on optimal outcomes and distribution of resources. To be verified according to the ACS-COT criteria, level I trauma centers are required to deliver comprehensive care, with a wide array of specialists being promptly available, and must participate in education, prevention, and research initiatives [1]. Level I trauma centers are also required to treat a standardized minimum number of injured patients annually to provide high-volume experiences for the institution's clinicians and care delivery system [1], as high surgical volume has been linked to improved patient outcomes [3]. Another ACS-COT criterion is the hospital's role as a referral center from surrounding areas [1]. A center that upon regular review does not meet state standards for trauma center designation—which are often based on ACS-COT's stringent criteria [4]—could lose its trauma center designation.

Critical Access Hospitals

More widely distributed critical access hospitals provide 24-hour emergency care to rural communities, are at least 35 miles from other hospitals, and require patient transfer agreements with other acute care hospitals [5]. Although the treatments they deliver range from stabilization of life-threatening injuries to management of chronic illnesses, their resources are limited. Facilities designated as critical access hospitals must have no more than 25 beds [5]. Critical access hospitals are responsible for diagnosing and treating a broad range of presentations and must triage appropriate cases to higher levels of care. Unfortunately, rural critical access hospitals, with their resource limitations and relatively low volume of significantly injured patients, have worse outcomes for common clinical conditions than urban acute care hospitals [6]. Staff capability is not the limiting factor at these centers, however, because skill sets of critical access physicians are necessarily different than those of subspecialized physicians.

Trauma Centers

Compared to other hospitals, trauma centers have significantly better outcomes for severely injured patients [7]. Even within trauma systems, however, there is significant variability in outcomes associated with patient volume. One study found that patients with penetrating abdominal injuries in shock (like Mr. F) were 98 percent more likely to survive when treated at a hospital seeing more than 650 trauma patients per year [8]. However, the majority of trauma cases result from blunt mechanisms, and one study demonstrating improved outcomes at high-volume trauma centers saw benefits only for patients who sustained blunt injuries [9].

For much of the public, this tiered system of trauma care is invisible. Patients might only discover the variability between critical access centers, lower tier trauma centers, and higher tier trauma centers when told they will be transferred, and, even then, the design of the system is opaque from the perspective of the patient. Emergency medical services (EMS) clinicians are instructed initially to transport patients to the “nearest appropriate facility” and must make judgments like other clinicians in deciding where to take injured patients. While these choices are traditionally left to clinicians with input from patients and families, communities are beginning to recognize differences in available resources. For example, underserved communities on the South Side of Chicago pled specifically for a trauma center in their region for several years, eventually gaining approval in 2017 and bringing the distinction between designated trauma centers and critical access centers into the national spotlight [10].

Ethical Issues Associated with the Growing Regionalization of Trauma Care

The trauma care tiered system differs from more recent health care regionalization exemplified by “centers of excellence” employing high-volume surgeons with a narrow scope of practice [11]. Successful trauma care is largely time sensitive; shortening the time from injury to definitive care is expected to produce better outcomes [12]. This “golden hour” model, in which the quality and appropriateness of treatment in the first hour of care influences patient prognosis, is the basis of trauma regionalization. In order to reduce delays, prevent inadequate care, and reduce preventable deaths, critically injured patients are rapidly triaged to higher-level trauma centers. One of the foundational studies in trauma regionalization (conducted over 30 years ago) found that simply regionalizing care reduced preventable deaths from 13.6 to 2.7 percent and suboptimal care from 32.0 to 4.2 percent of cases [13].

Equitable care. The most important ethical feature of a regionalized care system is the assurance that best care is provided equitably across a large demographic of patients to achieve the best overall outcomes. Such care includes [fair allocation of scarce resources](#) within the hospital, such as blood products, medications, or specialist services. There are competing ethical arguments regarding the allocation of these resources. In this case, if the hospital’s limited resources are depleted rapidly while caring for Mr. F, the risk of detriment to other hospitalized patients could increase; if Mr. F receives all the facility’s blood, the principle of distributive justice would be challenged if a postoperative patient with moderate anemia is unable to receive a transfusion and develops a myocardial infarction. In contrast to this utilitarian argument, the “rule of rescue” has been used to justify life-saving, heroic treatment efforts in patients at risk of imminent death, regardless of the resources required [14]. These efforts align with traditional Western medicine ideals of preventing death and disability if means are available. If the rule of rescue is followed, triage is part lottery, with a first-come-first-served element to resource allocation [14].

System evaluators must also consider the risks of overtriage—overestimating injury severity and giving priority to patients who do not need additional resources. The overtriage rate is the proportion of patients who are transferred that could have been adequately treated at the original center. For instance, a patient with rib fractures who is transferred to a trauma center but discharged with pain medication rather than being observed for a longer period of time could have had the same intervention at the original hospital. In order to prevent undertriage, which can result in preventable deaths, an overtriage rate of 50 percent is the accepted standard [15]. However, overtriage burdens higher-tier institutions with noncritical patients who could be safely cared for at lower-tier centers, decreasing availability of resources for other patients even at level I trauma centers. Overtriage during [disaster events](#), for instance, increases patient mortality at high-level trauma centers, independently of patient volume [14]. In Mr. F's case, overtriage could have caused the bed shortages at the first two hospitals contacted, contributing to the delay in transferring Mr. F. Had Mr. F been operated on at the local trauma center and died, his case could have been considered undertriaged; in attempting to transfer him to a higher level of care, the local surgeon appropriately triaged the patient but met with difficulty in navigating the transfer system. It must be stressed that Dr. G in this case is not declining to save or care for the patient. Rather, she is actively deciding to participate in a potentially lifesaving transfer to a higher level of care, an important consideration as part of the patient's treatment rather than as separate from it [1].

Nonmaleficence and beneficence. Physicians must also weigh the longer time to intervention that comes with transfer against the enhanced resources available elsewhere. Clinicians, patients, and trauma systems managers must appreciate that transfer is not instantaneous and requires mobilization of significant resources. Although it might be difficult to bring in an on-call operating room team overnight to a rural center, it could potentially take even longer to find an accepting facility, call a transport team, and move the patient to the new center. This dilemma was central to the case of Mr. F. Despite these uncertainties, it is possible to improve estimations of transfer times. Regional trauma databases help clinicians analyze past cases and outcomes to inform future management and to ensure the most prudent resource allocation for critically injured patients [16]. Although this resource could not have helped in Mr. F's case directly, studying his case in combination with other cases on a regional and national level would ultimately impact the design of trauma systems and management of future patients.

The Necessity and Art of Reviewing Decision Making Retrospectively

It is tempting to blame Mr. F's demise on inappropriate delays in operating. A patient in hemorrhagic shock is well served by rapid hemostasis. However, in this case, Dr. G would likely have encountered the same finding as Dr. B: uncontrollable bleeding from behind the liver. The patient has an apparent injury to the retrohepatic vena cava; even with the

increased resources of trauma centers, such injuries are difficult to manage. Half of patients with retrohepatic caval injuries die before reaching the hospital, and even those treated at the best trauma centers have dismal survival rates [17]. In one of the largest series of patients requiring a special maneuver (the Schrock shunt) to control retrohepatic hemorrhage, only 19 percent survived [18]. Undergoing surgery with Dr. G, Mr. F would likely have exsanguinated and perished before any transfer had taken place. Similarly, attempts to lay blame upon the transfer network in which two closer centers could not accept the patient are obviated by the devastating nature of the patient's injury. Trauma systems are designed to prevent death in circumstances in which death could be considered preventable. The death of Mr. F was likely unpreventable and would likely have had the same outcome at either trauma center.

However, if the patient had died from an easily controllable splenic injury, for instance, or from mesenteric bleeding that could have been controlled initially—but was not—with a laparotomy and a single clamp, the retrospective evaluation of the case would result in areas of concern to the eventual surgeon. Transport times would be reviewed, available resources compared to what would have been needed, and the triage practices and operative scope of referring physicians investigated to improve patient care in future cases. Across the country, trauma departments are required, for verification purposes, to perform robust internal retrospective analysis (including registry review and morbidity and mortality conferences) and to review regional databases to improve patient care in real time [1].

Mr. F would probably have died from his injury regardless of where he was treated or time to definitive management; this should be communicated clearly to Mr. F's family. Any errors that Dr. B suspects regarding Dr. G's treatment decisions are necessarily limited by his lack of knowledge of Dr. G's conditions, surroundings, and mindset when making them. Although disclosing medical errors to patients and their families is encouraged by the American Medical Association [19], this practice is limited to errors made by the discloser. Dr. G should not be blamed by Dr. B for Mr. F's death, and Dr. B should be careful not to communicate blame when discussing the patient's death with his family [20]. While it is imperative to review each mortal or morbid case critically in order to continually improve both personal practice and trauma systems, concerns regarding a particular clinician's suspected errors are best expressed to that clinician, who may choose to share them with the patient or the patient's family [19, 20]. Dr. B should discuss Mr. F's case with Dr. G individually in order to identify anything that could have been done better in the case. There is no benefit in second guessing decisions with a patient's distraught loved ones; doing so could ultimately cause increased distress in an already terrible circumstance.

Conclusion

Regionalization is an important component of trauma system management and provides

measurable outcome benefits. However, not all patients benefit from transfer to designated trauma centers, and one conundrum physicians face routinely is making a determination in an individual case of whether the patient will benefit from transfer. The ethical decision making in this context includes considerations of justice in the setting of limited resources. Recognizing that transferring patients is part of their treatment rather than a delay in treatment is imperative to reconciling these concerns.

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