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Authors
Hornor, Melissa
Khan, Uzer
Cripps, Michael
et al.

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Futility in acute care surgery: first do no harm

Melissa Hornor ,[1,2] Uzer Khan,[3] Michael W Cripps ,[4] Allyson Cook Chapman,[5] Jennifer Knight-Davis,[2,6] Thaddeus J Puzio ,[7] Bellal Joseph,[2,8] AAST Geriatrics Committee

[1]Surgery, Loyola University Chicago, Maywood, Illinois, USA
[2]American Association for the Surgery of Trauma, AAST Geriatric Trauma Committee, Chicago, IL, USA
[3]Surgery, Texas Christian University, Fort Worth, Texas, USA
[4]Surgery, University of Colorado Anschutz Medical Campus, Aurora, Colorado, USA
[5]Medicine and Surgery, University of California San Francisco, San Francisco, California, USA
[6]Surgery, The Ohio State University College of Medicine and Public Health, Columbus, Ohio, USA
[7]General Surgery, University of Texas McGovern Medical School, Houston, Texas, USA
[8]Surgery, University of Arizona Medical Center—University Campus, Tucson, Arizona, USA

Correspondence to
Dr Melissa Hornor; melissa.hornor@lumc.edu

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SUMMARY

The consequences of the delivery of futile or potentially ineffective medical care and interventions are devastating on the healthcare system, our patients and their families, and healthcare providers. In emergency situations in particular, determining if escalating invasive interventions will benefit a frail and/or severely critically ill patient can be exceedingly difficult. In this review, our objective is to define the problem of potentially ineffective care within the specialty of acute care surgery and describe strategies for improving the care of our patients in these difficult situations.

INTRODUCTION

Acute care surgeons provide emergency treatment to patients in three settings—trauma, emergency general surgery, and surgical critical care. The burden of disease within these three entities on the healthcare system and the patients and families that experience them is immense.[1] Within this large group of patients, there exists a subset that due to underlying frailty combined with a severe emergency disease state are unable to meaningfully benefit from invasive medical or surgical intervention. This subset of patients may be subject to ineffective care that may be detrimental to the patient, their family members, medical providers, and the overall healthcare system.

The word futile is derived from the Latin word futilis, which originally meant 'leaky', referring to a leaky boat or vessel.[2] Providing medical care to critically ill patients at the end of life can be seen as futile and ineffective, similar to pouring water into a leaky bucket. Whether medical care meets the definition of futility is determined by the healthcare goals and values of the patient combined with their underlying comorbid illnesses and the risk, severity, and advanced stage of the current emergency condition. It is often difficult to measure risk quickly and accurately in the emergency setting where time-pressured decisions need to be made with reduced family presence. Since potentially ineffective care in acute care surgery represents a complicated topic with a significant impact on the healthcare system, we aim to provide general and practical recommendations on how to mitigate futile care in the three acute care surgery domains: surgical critical care, trauma, and emergency general surgery. We also included a section on navigating potentially futile interfacility transfers in acute care surgery.

FUTILITY IN SURGICAL CRITICAL CARE

One in five Americans die during or shortly after an intensive care unit (ICU) stay,[3] despite a strong desire to avoid aggressive care at the end of life, particularly if cognitive or functional disability is likely to result.[4] Death in the ICU frequently follows a transition from disease or injury-directed therapy to end-of-life care, and the process is often prolonged, inefficient, and painful. The USA easily outpaces every other nation in terms of healthcare spending but yields inferior health outcomes,[5] and a disproportionate share of US healthcare spending is dedicated to care provided at the end of life.[6] Although admission to the ICU should be considered a therapeutic trial that is reconsidered in a timely manner if patient-centered results are not being achieved,[7] intensive care interventions often prolong life in a manner that prolongs suffering. These interventions often lead to moral distress and overuse of scarce hospital resources.[8 9] As such, the importance of optimizing goals of care discussions for critically ill patients and, in turn, reducing potentially ineffective care was deemed the number one research priority within the field of surgical critical care by the American Association for the Surgery of Trauma Surgical Critical Care Committee in 2020.[10]

The COVID-19 pandemic has had devastating consequences globally, and the brunt of its impact on the medical system fell on the ICU. The sheer volume of patients affected by the COVID-19 pandemic has drawn national attention to the (mis) usage of critical care resources. For the first time, many physicians have been confronted with the reality of resource limitation and the possibility of 'rationing care'.[11] The need to limit the allocation of intensive care resources such as ventilators and dialysis machines may contribute to a shift in the care offered by critical care providers to one focusing on the usage of limited resources on patients most likely to have a meaningful recovery. One small positive outcome from the pandemic is that it has brought heightened awareness to the need to improve discussion and documentation of healthcare goals, increase goal concordant care, reduce potentially ineffective care, and improve the quality of care at the end of life for all patients and their loved ones.

Advance care planning (ACP) is a key component of shared medical decision-making, an iterative process which allows patients to explore their medical care goals, identify a surrogate decision maker, complete advance directives (ADs), and translate their values into medical care plans. Thorough, early, and frequent ACP is the best way to avoid an undesirable outcome and preserve patient autonomy by allowing patients to express their goals and preferences for medical interventions. As

such, ACP and ADs have been shown to increase quality of life for those at the end of life, and reduce potentially ineffective care and healthcare costs.[12 13]

Involvement of our palliative care colleagues and/or integration of palliative care concepts into our practice may help improve provider-patient communication, patient outcomes, and reduce costs. The American College of Surgeons Trauma Quality Improvement Program Palliative Care Best Practice Guidelines recommend that clinicians identify pre-existing ADs or ACP early and hold a structured family meeting addressing goals of care within 72 hours of admission.[14] Integration of early palliative care interventions parallel to trauma care has been shown to improve patient satisfaction and increase the frequency of ACP from 4% to 36% patient days and decrease median ICU length of stay for patients that died from 3 days to 1 day, without a change in mortality rate.[15 16] In addition, high-quality palliative care has been shown to increase the usage of hospice and reduce the utilization of inpatient units for patients at the end of life.[17]

Despite its many benefits, barriers to ACP remain, and unfortunately, documented ACP information is rarely in place prior to an ICU admission.[18] Sometimes ADs are structured and suited more to a terminal disease like cancer instead of an acute process, making them less helpful for caregivers and families and not directly applicable to an acute trauma or emergency general surgery patient's situation.[19] Surgeon training in ACP is inadequate and many avoid discussing death and dying due to a perceived inability to adequately address the concerns of a frightened patient.[20] Patients, on the other hand, demonstrate willingness to engage with providers about goals of care issues to maintain control over their healthcare. It is important to note that ACP is a complex combination of health values, care preferences, and prognostic awareness that evolves based on the patient's current healthcare status—ACP is not a box one can check and be done with and must be rediscussed at frequent intervals.

In the context of medical decision-making in the ICU, prognostication is both essential and difficult, as the consequences are life-altering for both the patient and the family. Healthcare decision-making processes require providers to prognosticate about the likelihood of a patient's meaningful survival so that surrogate decision makers can make an educated decision that is aligned with the patient's goals and values. Resuscitative efforts may not always lead to death or survival, but to an in-between zone where the patient may be alive but in a state that is not aligned with their goals and preferences. An individual's prognosis is a multifactorial estimation that depends on chronic comorbidities and type and severity of illness, among other things. ICU-specific prognostic tools such as the Acute Physiology and Chronic Health Evaluation, Simplified Acute Physiology Score and Mortality Probability Model scores exist that can help providers prognosticate in-hospital mortality and length of stay, but there is almost always some degree of uncertainty and the scores can be resource intensive to calculate.[21] Evidence has shown that both scoring systems and provider 'expert' prognostication can be overly optimistic. When asked to decide whether a critical care patient was likely to survive 2 years, critical care physicians who answered 'yes' were only right 57.4% of the time.[22] Better objective scoring systems and provider training are needed to improve on the ability to accurately prognosticate function and survival for critically ill patients.

Surgical critical care providers could reduce potentially ineffective care in the ICU in many ways. We have identified several potential barriers to quality end-of-life care including low rates of ACP and the paucity of research on prognostication tools that could help quantify futile care in the ICU. We must respond with research and clinical program development that helps combat these barriers. The focus should be on three main goals: assessing patients' goals and preferences for their care early and often, improving communication about illness trajectory, and maximizing goal-concordant care.

FUTILITY IN TRAUMA

Trauma surgeons are seeing a significant shift in the epidemiology of trauma care with a greater proportion of patients in the geriatric age group and with a concomitant shift in the mechanisms of trauma. Hence, it benefits the trauma surgeon caring for these patients to recognize when further delivery of care is in the patient's best interest and when it is likely to be futile and could prolong suffering. The concept of futility in trauma is rapidly evolving, especially as it pertains to the realization that resuscitation for a minority of patients with a poor prognosis may be ineffective.

The Geriatric Trauma Outcome Score is an externally validated prognostic tool that can be easily calculated within 24 hours of injury composed of the variables Injury Severity Score, age and transfusion within 24 hours of admission. The score accurately predicts the likelihood for mortality as a percentage and can be used as a data point for prognostication when having goals of care conversations with family members.[23]

Increased attention has also been paid to the physiological distress patients can handle based on underlying frailty characteristics, distinct from and premorbid to their traumatic injury. Research investigating a frailty index specific to trauma called the Trauma-Specific Frailty Index has demonstrated that frailty scores are feasible to calculate on admission for geriatric trauma patients, and scores consistent with frailty and prefrailty are associated with increased complication rates, in-hospital mortality, and likelihood of discharge to a skilled nursing facility.[24 25] These prognostic indicators can help inform discussions that trauma practitioners will have with surrogate decision-makers in the care of the geriatric trauma patient and improve one's ability to implement care that more closely aligns with the patient's goals.

Furthermore, the data presented and published underscores an important principle for the trauma surgeon—we should not be afraid to aggressively resuscitate and treat traumatic injury in the geriatric trauma patient, but we should be comfortable with a time-limited trial of resuscitation and capable of halting treatment when deemed medically ineffective or no longer in line with patients' goals and preferences. This logic can be extended to the extremes of trauma resuscitations such as in severe traumatic brain injury, massive transfusion, and resuscitative thoracotomies.

Guidance on when it is appropriate to perform a resuscitative thoracotomy (RT) in the patient with traumatic cardiac arrest is particularly difficult to interpret for the geriatric population. Outcomes from RTs in all-comers is poor and it is in this context that decision-making for the geriatric trauma patient in arrest will need to be made. Without the details needed to generate an appropriate frailty score, the trauma practitioner will need to make a decision using the information that is available—what was the context and mechanism of the trauma (fall from bed in a nursing home vs stabbed while training for a marathon)? Is there evidence of malnutrition and debility (bitemporal wasting, loss of muscle mass, chronic ulcers)? A retrospective single-center study by Levin *et al* found no relationship between age and survival after RT.[26] In contrast, a 5-year analysis of Trauma Quality Improvement Program (TQIP) patients that underwent

RT found that no patients aged >60 years with blunt mechanism survived, and no patients aged >70 years survived at all after RT.[27] Hence, using age as a specific cut-off has had variable success and reproducibility in the assessment of outcomes after geriatric resuscitative thoracotomies.

Similarly, assessing the futility of using massive transfusion in this heterogenous group of patients is difficult. Results from a TQIP analysis from 2019 showed that in patients undergoing massive transfusion for trauma, mortality increases with age, with patients over age 80 years having an OR of 10.1 in reference to patients aged 18–29 years for inpatient mortality. However, a significant proportion of older adults who receive massive transfusion were successfully resuscitated.[28] This suggests that advanced age alone should not be used as an exclusion criteria for massive transfusion in trauma patients. When considering trauma patients of all ages, there may be a futility threshold in terms of the number of blood products transfused in massive transfusion protocol (MTP). Recent work by Loudon *et al* found that during the first 4 hours of a 1:1:1 resuscitation, 16 units of packed red blood cells (pRBCs) was the threshold for mortality exceeding survival, and after the transfusion of >36 units of pRBC survival approached zero.[29]

Among elderly trauma patients, advanced age should be considered along with pre-existing comorbidities, injury severity, and physiology when providing acute trauma care. Early and frequent goals of care discussions are paramount to a patient-centered positive outcome. Going forward, it is essential that these findings be included in the protocols and guidelines for the care of severely injured trauma patients and further define ineffective care in trauma.

FUTILITY IN EMERGENCY GENERAL SURGERY

Emergency general surgery conditions are frequently encountered in the geriatric patient population,[1] and geriatric patients undergoing major emergency laparotomy have a significant risk of mortality ranging from 22% to 44%.[1] The proportion of patients presenting with an emergency general surgery condition increases with age.[1] Geriatric patients represent a particular challenge owing to medical comorbidities and frailty that lead to a decreased physiological reserve. The condition of frailty is difficult if not impossible to modify in the emergency setting.

There exists a significant subset of emergency general surgery patients that receive no physiological benefit from the surgery, and instead, the surgery may result in increased pain and suffering with decreased quality of life. Although there is a paucity of research on potentially futile emergency general surgeries, there are two recently published retrospective database analyses that help define the epidemiology of the problem. Chiu *et al* used the National Surgical Quality Improvement Program database to find that nearly three-fourths of 'extreme risk' emergency general surgery patients undergoing an operation died in the hospital, and nearly one-third died within 48 hours.[30] Similarly, a large multicenter database review from the UK of 13 953 patients from 28 hospitals undergoing emergency laparotomy found that 40% of inpatient deaths occurred within 3 days of the operation and 70% of those early deaths occurred on the same day as the operation, raising concern for a futile intervention.[31]

Patients with multiple comorbidities that increase their odds of a poor operative outcome often present with emergency surgical conditions. The physiological state that the patient presents in has an obvious connection to poor outcomes as well. Making the decision to forego an operation in favor of alternative treatment options in the face of an obvious surgical indication is one of the most difficult in surgery. Making the decision to treat the patient non-operatively is uncommon given the 'fix-it' mental model commonly employed by surgeons when making high-risk surgical decisions.[32] The 'fix-it' model characterizes the surgical disease as an isolated abnormality that can be 'fixed' through a surgery while failing to fully consider chronic debilitating conditions that cannot be cured through surgery. This dominant concept of fixing an acute abnormality with surgery may lead to invasive interventions without sufficient consideration of alternative treatment options.

Surgery is very common at the end of life. Nearly 20% of Medicare beneficiaries undergo surgery in the last month of their life, and 10% have a surgical procedure in their last week of life.[33] Although one might assume that more care equals better care, regions of high end-of-life treatment intensity are associated with lower perceptions of quality of dying among bereaved families.[34] Patients who undergo emergency surgery in the last few days of their life are a subset of patients in whom the physiological stress and the condition requiring surgery combined with their underlying frailty and medical comorbidities are too great to survive. For these patients, most surgeons, patients, and families would define that surgery as futile.

How can futile surgery best be avoided? The risk of early postoperative death is difficult to determine. Whether surgery is futile depends on the physiological and the patient-centered outcomes of the surgery within the framework of the patient's personal healthcare goals and preferences. There are currently no objective scoring systems that predict whether an emergency surgery may be futile. Since the evidence base informing perioperative emergency general surgery care in these patients is lacking, high-quality shared decision-making that incorporates the patient's ADs, surrogate decision maker, and overall healthcare goals is currently our best prevention method. The best case/worst case framework has helped improve surgeon communication by shifting the focus of surgical decision-making away from an isolated surgical problem ('fix-it' model) to a discussion about likely outcomes and alternative paths other than surgery.[35]

FUTILITY IN INTERFACILITY TRANSFER PATIENTS

The 'hub-and-spoke' model of healthcare delivery is a widely used and efficient system of healthcare administration in a variety of regions across the USA. Simplistically, this system allows for the delivery of healthcare at outlying facilities close to where the patient lives unless the burden of disease requires a higher level of care for an optimal outcome. For these patients with specialized care needs, transfer to a 'hub' institution may be beneficial for the delivery of specialized, and often more intensive care.

This system, however, is prone to inefficiencies and is often ill equipped for the resources required for timely and efficient transfers. A recent nationwide analysis demonstrated that increased interfacility transfer time is significantly associated with an increased number of dead-on-arrival patients on admission to the receiving hospital.[36] This trend also exists in severely injured pediatric trauma patients, where a 2023 nationwide analysis found that every minute increase in interfacility transfer time is associated with a 2% increase in risk-adjusted odds of mortality.[37] Inappropriate transfers may be seen with overtriage when a patient is transferred to a tertiary care center but does not end up needing any specialized care. Another concern with interfacility transfers is the utilization of expensive transport modalities and critical care resources for patients whose injuries are not survivable, regardless of the expertise available at the

center which cares for them. A single-center analysis of 1241 trauma transfer patients to a level 1 facility found that 1.5% met their criteria for futility, defined as death or hospice discharge within 48 hours of transfer. The transport and care costs for those patients added up to a significant total cost of US$1.7 million, and an unmeasurable amount of pain and distress to the patient, family, and care providers involved.[38] These types of futile transfers also occur in the emergency general surgery population, where a retrospective cohort study from a single tertiary care center found that 4% of surgical transfer patients from 2009 to 2013 died or were discharged to hospice within 72 hours of hospital admission.[39]

Nevertheless, providers at transferring facilities are appropriately hesitant to declare their patients as unsalvageable without an attempt at treating them at a place where there is a number of available subspecialists as well as intensive care resources. In addition, there is insufficient data in the literature to definitively identify non-salvageable patients with a high degree of sensitivity and specificity.

Hence, at least for now, every institution should prioritize work on the development of guidelines and protocols to identify patients whose transfer is likely to be futile. These futile transfers are an expensive burden on a system that is often stretched to the limit with finite resources, and causes patients to be separated from their loved ones without meaningful gain. Their family members will then have to arrange for travel to facilities that may be several hours away. Furthermore, the patients are often medically complex and often arrive without an immediately available history, which makes providing quality care difficult. These scenarios provide a heavy load on providers who may have to make quick decisions based on insufficient data and whose first experience with the patient's loved ones is likely to be the breaking of bad news.

Preliminary studies have been done to help create prediction tools for futile transfer situations. One single-center analysis found that the Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure score allowed them to accurately predict futile trauma transfers from an area under the receiver operating characteristic (0.864, 95% CI 0.803 to 0.925) for futility.[40] These studies can help guide institutional protocols and help inform conversations between healthcare providers at the different institutions to help deliver the best possible care that is in line with the patient's and family's goals, rather than simply the prolongation of life.

CONCLUSION

Non-beneficial care in the trauma bay, operating room, and the ICU occurs frequently and is detrimental to patients, families, healthcare providers, and the overall healthcare system. As acute care surgeons that care for patients with emergency surgical conditions, it is our duty to be armed with the skillset and knowledge needed to avoid futile care as much as possible. The key preventive factors that we have identified include accurate prognostication tools, holding goals of care discussions early, and often to align medical interventions with patient goals and preferences, allowing a time-limited trial of critical care and avoidance of futile interfacility transfers.

Collaborators AAST Geriatric Trauma Committee: Sasha D Adams. Rosemary A Kozar. Tasce Bongiovanni, Jennifer Knight-Davis, Elizabeth Gorman, Alicia Mangram, Bryan C Morse, Ida Molavi, Bellal Joseph, Nasim Ahmed, Tyler A. Putnam, Alexandra Briggs, Kristin Pokorney Colling, Vanessa Phillis Ho, Jody C. DiGiacomo, John O Hwabejire, Adam Campman Nelson, Milad Behbahaninia, Tanya Egodage, Molly Price Jarman, Uzer Khan, Melissa A Hornor, D'Andrea Krista Joseph, Ryan Michael Landis.

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ORCID iDs
Melissa Hornor http://orcid.org/0000-0002-7669-3208
Michael W Cripps http://orcid.org/0000-0002-1263-1876
Thaddeus J Puzio http://orcid.org/0000-0003-4150-5956

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