

should communicate regularly, and goals of care of surgical patients should be discussed frequently.⁸ A multidisciplinary team approach to critical care has been shown to improve patient outcome, physicians' sense of inclusion in patient care, and patient satisfaction.⁸

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COMMUNICATION STRATEGIES TO OPTIMIZE THE CARE OF SURGICAL PATIENTS IN THE ICU

The implementation of a closed ICU managed by intensivists affects the surgeon-patient relationship when a surgical patient is admitted to the ICU. Instead of being the primary caregiver, the surgeon becomes a consultant and can often feel excluded or ignored by the new primary team regarding a patient for which the surgeon feels strongly responsible.¹³ To provide quality critical care to this patient, the surgeon and intensivist should be in close communication throughout the patient's stay in the ICU.^{5,8,13} The surgeon should inform the ICU team preoperatively regarding a patient who may need postoperative admission to the ICU so that the intensivist may review the patient's chart and ensure bed availability.¹³ Operative observation or participation by the ICU staff should be encouraged to promote further understanding of surgical procedures and intraoperative patient care.

Postoperatively, the surgeon and intensivist will need to work side by side. Goals of care should be discussed frequently, and plans should be communicated daily.⁵ It has been found that team members prefer communicating informally via text messages or in person versus formal communication processes such as documentation in the medical record and paging.⁸ This informal communication promotes improved interpersonal relationships between teams. Cooperation is crucial, since personal animosity, mistrust, and communication gaps have been found to be the most common factors that cause conflict among ICU clinicians.⁹ In a survey of ICU and surgery teams, conducted at the University of Toronto, participants said that communication was "good" when both teams worked toward a common goal and that their expertise was valued by the other team.⁹ Alternatively, when "bad" communication was perceived, both intensivists and surgeons felt that the patient had received inappropriate care.

Surgeons are more satisfied with communication when they perceive a less rigid approach to the intensivist model of care, as feelings of

exclusion have been associated with surgeon frustration and mistrust in the ICU team.⁹ Consequently, even in closed ICUs, surgeons should be consulted frequently to promote an open dialogue regarding patient care. If both teams feel valued, each will be more willing to seek the expertise of the other, which will only benefit patient care. In addition, preventing animosity between teams improves patient satisfaction, as patients and their surrogates often suffer when communication between physicians is poor.⁵

SUMMARY

The majority of critically ill surgical patients in the United States are managed by medically trained intensivists in mixed ICUs. A closed-model ICU has a clear survival advantage in the care of critically ill patients, both medical and surgical.¹² It is estimated that 54,000 lives could be saved every year if adequate intensivist staffing could be implemented immediately and effectively.¹ Given the increasing elderly population and shortage of surgical intensivists, the need for medical intensivists to provide superior care for surgical patients will increase. It is crucial that pulmonary critical care fellowships stress education in preoperative and intraoperative aspects of surgical diseases to allow the graduating intensivist to provide critical care that is equivalent to that of a surgically trained intensivist.⁴ Because resources for critical care and intensive care beds are finite and the number of surgical patients requiring care in a mixed ICU increases, it becomes more crucial for medically trained intensivists to have a wide scope of practice and be able to care for critically ill surgical patients. Perhaps eliminating the divide between medical and surgical ICUs will promote the ability for cross coverage and improve patient outcomes.

It has been shown that complex, critically ill surgical patients can be successfully managed in a mixed ICU with no difference in mortality when care is delivered by a medical or surgical intensivist.¹¹ To provide a superior level of care to these patients, medical and surgical teams

the hospital.¹¹ In addition to managing individual patients, the intensivist must be able to appropriately allocate critical care resources to patients throughout the hospital and decide which patients warrant ICU care.¹² Given the operational challenge of bed availability and patient throughput, a surgical patient waiting for an ICU bed may not receive priority, which may put the surgeon and intensivist at odds. Keys to managing this conflict successfully include respectful communication, compromise, and acknowledgment of the pressures faced by both clinicians.

Disagreements regarding futility and intensity of care may arise and have been noted to be key topics of conflict between surgeon and intensivist.¹³ Such conflict is most acute in cases where the patient experiences a complication after an elective surgery. The surgeon often feels obligated to pursue all treatments due to a sense of personal responsibility for the complication.⁵ The surgeon may be less likely to consider transitioning goals of care from cure to comfort measures. A less biased opinion from a medical intensivist may lessen the personal burden felt by the surgeon for a postoperative complication and hasten an appropriate transition of care. Given that surgeons managing their patients who have postoperative complications have reported increased rates of burnout and suicidal ideation,¹⁴ the active involvement of an intensivist may improve these significant psychological stressors. Certain clinical conditions traditionally are managed differently by surgical-based specialties versus medical-based specialties. Differences in opinions about the management of common problems can be a source of frustration between the specialties, which may ultimately lead to lack of cooperation. Some common clinical situations are discussed below.

Weaning patients from mechanical ventilation is a key component of critical care in both medical and surgical ICUs. In a comparison of medical and surgical patients referred to a specialized weaning unit, it was found that medical patients tended to have more underlying pulmonary conditions and surgical patients were more

likely to be hypernatremic.¹⁵ Despite these differences in patient populations, the time spent weaning medical and surgical patients was not significantly different. Ventilator management of surgical patients requires a critical care-trained intensivist, not necessarily a surgical intensivist.^{2,3}

Fluid management and hemodynamic resuscitation are cornerstones of intensive care treatment, particularly for surgical patients, who are more likely to experience hypovolemia from surgical third space losses or from hemorrhagic shock. A survey of intensivists in both medical and surgical ICUs across the United States revealed practice variability depending on patient characteristics, clinical specialties, and practice settings of the treating physicians.¹⁶ Although practitioners who were surveyed indicated that crystalloid was the most common fluid used in resuscitation in response to blood pressure, urine output, and central venous pressure, there was a lack of consensus among intensivists regarding the level of hypovolemia that requires fluid resuscitation. Recent advances in intraoperative fluid management include standardizing practice in patients destined for ICU care. A good example includes a study of the implementation of a goal-directed protocol for fluid resuscitation in liver transplant. Patients who received goal-directed fluid management in the operating room demonstrated lower rates of postoperative ileus and shorter duration of mechanical ventilation.¹⁷ In this study, a FloTrac (Edwards Lifesciences, Irvine, CA) monitor that measures cardiac index, stroke volume, and stroke volume variation was used to assess hemodynamic status as well as create a protocol for monitoring and hemodynamic optimization. Creating standardized protocols improves patient care and eliminates topics of conflict between team members in the ICU.¹¹

Regardless of the topic of conflict, communication among practitioners is the key to the successful management of surgical patients in the ICU. Relationships between surgeons and intensivists should be respectful, and plans must be communicated frequently.

ICU. However, the poorer outcomes in these patients may have been related to barriers of care. The decreased presence of a managing intensivist in the boarding unit, as well as care from nurses in a specialized ICU who may not have been well versed in the needs of general surgery patients, may have contributed to poorer patient outcomes.^{4,8} Therefore, it is unclear whether general surgery patients undergoing abdominal surgery truly benefit from care in a surgical ICU. Although some trauma centers have surgical ICUs to care for such patients, the majority of surgical patients in the United States are cared for in medical or mixed ICUs.¹¹ Lee et al,⁹ from McGill University, found no significant difference in the survival of trauma patients cared for in a mixed ICU when managed by intensivists with core training in surgery compared with medicine. This success was attributed to the intensivists' close communication with the operating surgeon and surgical team and familiarity in managing surgical patients. Open communication between the intensivist and surgeon also decreases medical errors, improves the quality of patient care, and increases patient satisfaction.⁸ However, this success has been limited to intensivist-driven ICUs in level I and level II trauma centers; in tertiary centers, medical intensivists managing the care of severely injured trauma patients may be less effective due to their lack of expertise in managing this complex patient population.¹¹ It is therefore imperative that the medically trained intensivist have training and experience in managing trauma and general surgery patients in order to optimize patient care and outcomes.

Postoperative patients who have undergone physiologically demanding surgery often require admission to the ICU for close monitoring and aggressive resuscitation. Although it may be intuitive to think that a surgeon familiar with performing major procedures would be more successful in managing such patients, it has been shown that mortality in postoperative surgical patients in a mixed medical and surgical ICU is not affected by the type of intensivist managing the patient.^{2,9} This has been attributed to the fact that all critically ill patients require

similar care, including ventilator management and vasopressor support, which is not unique to the care of surgical patients.² Similarly, postoperative patients who experience complications after surgery may require admission to the ICU. The postoperative complications that most frequently result in ICU admission include respiratory failure, lung injury, and sepsis, conditions frequently encountered in both medical and surgical patients with similar management strategies.⁶ Not surprisingly, the base specialty of the intensivist does not affect the survival of such patients.^{5,10}

CONFLICT BETWEEN SURGEON AND INTENSIVIST

In an intensivist-driven ICU model, the operating surgeon must relinquish a significant amount of control of the management of his or her postoperative patient. Tension between the operative surgeon and managing intensivist may affect goals of patient care among the managing team.¹² Surgeons have a heightened sense of ownership of their patients as opposed to nonoperating colleagues and tend to see operative cures as personal successes and poor outcomes as personal failures.^{11,12} This viewpoint may affect the ability of the medical intensivist to address suffering and futility.¹³ This discrepancy may result in conflict and disagreement regarding course of action and patient care. Communication between physicians, patients, and their families may suffer if conflicts between teams are not mitigated or resolved.¹³ Conflicts between surgeon and intensivist are common, reported at rates of 60% in closed units and 41% in open units.¹² Setting communication standards and addressing conflict resolution between surgeon and intensivist are necessary to decrease conflict and improve patient care as well as physician well-being.

ICU admission criteria and admittance to an ICU can be significant sources of conflict between intensivist and surgeon. Whereas surgeons often advocate for their individual patient, intensivists are often obliged to manage patient flow in a larger population throughout

focus on a narrow range of diagnoses, reduction in treatment variability, increased nursing expertise and education, and focused training for fellows.⁴ Although this model has been shown to improve survival in some populations, it is unclear whether a specialized ICU is needed for general surgery patients. Surgeons likely have a different relationship with their patients compared with nonsurgeon physicians and often are considered by the patient or family members to be the primary managing physician. This may complicate the ICU management even after the surgery is completed while the patient is being managed by a medical team.⁵ A potential advantage of surgeon management of surgical ICU patients is that the surgeon is already well versed in surgical diseases, understands principles of surgery and critical care, and may have an advantage in communicating with the operative surgeon due to common backgrounds.⁵ Several studies have suggested that surgical patients cared for by surgical intensivists have better outcomes than patients cared for by intensivists in other specialties.^{3,5} Admission to a neurosurgical ICU has been shown to improve the survival of patients who have intracranial hemorrhage.⁶ The combination of a multidisciplinary team trained to address the needs of neurosurgical patients in conjunction with a full-time intensivist is attributed to the decreased mortality of intracerebral hemorrhage patients in a neurosurgical ICU. In one study, mortality was increased in a nonneurosurgery ICU compared with a specialty neurosurgical ICU, with an odds ratio of 3.4.⁶ Consequently, specialized ICUs can be argued to benefit patients with neurological injuries and diseases.

Cardiac surgery patients represent another patient population who likely benefit from a specialized ICU given their unique postoperative physiological characteristics. The intensivist caring for these patients postoperatively must have extensive knowledge of cardiopulmonary physiology as well as the plethora of possible postoperative complications.⁷ Traditionally, the cardiac surgeon was the person responsible for the preoperative care of cardiac surgery patients. The field has evolved significantly given the

large number of cardiac ICUs that are organized and managed by anesthesia critical care or pulmonary critical care staff. An interdisciplinary approach to care with specialized nurses, respiratory therapists, intensivists, and surgeons in a specialized ICU has been shown to improve survival and outcomes in this patient population.^{7,8} Communication between all members of the team as well as protocols to “fast track” patients postoperatively facilitates success in these units.⁷ The communication between the intensivist and cardiac surgeon regarding intraoperative events, goals of care, and treatment plans is considered key to optimize patient care.

The trauma ICU is a good example of a specialized ICU that has provided care for specific patients: those who have been injured. Trauma patients often have injuries to multiple organ systems and require prolonged care in an ICU. The interdisciplinary approach of the trauma ICU, including multiple healthcare and supportive care specialists, has led to better outcomes for these complex patients.⁹ In addition, many trauma ICUs have adopted management protocols for problems specific to trauma patients, such as multiple rib fractures, and such protocol-driven practices contribute to a cohesive treatment pattern.¹⁰ Weaning from mechanical ventilation can be achieved via standardized protocols and may be successfully driven by respiratory therapists,⁹ demonstrating the importance of multidisciplinary care in the trauma ICU. The use of well-trained team members working toward clearly defined, common goals of treatment leads to successful management of trauma patients in the ICU.^{11,12}

The remaining acute care surgical patients, encompassing a large range of surgical diagnoses, may also require a prolonged ICU stay. Researchers have examined whether these patients need to be cared for in a surgical ICU versus a mixed ICU. One study found that general surgery patients who underwent abdominal surgery had a 30% higher mortality rate when “boarded” in a diagnosis-inappropriate ICU.⁴ The initial conclusion suggested that these patients needed care in a surgical

Who Should Manage Surgical Patients in the ICU?

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Objectives

- ▣ Discuss the care of surgical patients in the ICU, including whether a specialized unit is needed for general surgery patients
- ▣ Discuss communication strategies to improve the care of surgical patients in closed ICUs

Key words: surgical critical care, intensive care unit, communication

Many ICUs have adopted the high-intensity model of delivering critical care, which has resulted in a decrease in the morbidity and mortality of critically ill patients.^{1,2} After the Leapfrog Group, a consortium of 130 employers and 65 Fortune 500 companies that purchase healthcare for their employees, recognized a high number of in-hospital deaths due to medical error, the group launched an effort to improve the quality of the healthcare delivered to their employees.³ This led to recommendations regarding ICU physician staffing.

The two basic physician staffing models of an ICU affect the outcomes of patients. In traditional open ICUs, surgical patients are cared for by their operating surgeon as well as a critical care-trained physician, who may have little input regarding the patient's care plan. In the closed or high-intensity ICU model, a critical care-trained intensivist takes control over the management of the patient, and the surgeon acts as a consultant. The closed ICU model has been shown to improve patient survival, decrease duration of mechanical ventilation, decrease length of stay, decrease medical errors, decrease readmission rates, and improve patient satisfaction.²⁻⁴

Physicians who are board certified in critical care may have different training backgrounds, including general surgery, anesthesia, and pulmonary critical care. Closed ICUs may be specialized or nonspecialized.⁵ Several different

types of ICUs have evolved, including cardiac, neurosurgery, trauma or acute care surgery, medical, and mixed units. Although having a closed unit has been shown to improve patient outcomes, it is unclear whether specialized ICUs are needed for all types of patients.⁶

Only 3% of the critical care provided in the United States is provided by surgeon intensivists, and the current shortage in surgical critical care intensivists is expected to worsen in the future.¹ A 46% shortage in surgical critical care intensivists is expected by 2030, which is compounded by the lack of demand for surgical critical care fellowship spaces, currently 50% underfilled.¹⁻⁴ Given that the majority of critically ill surgical patients are, therefore, cared for by medically trained intensivists, it is imperative that intensivists working in mixed ICUs are prepared to care for surgical patients. The needs of general surgery patients who require admission to the ICU are similar to those of nonsurgical patients: fluid resuscitation, invasive monitoring, ventilator management, and treatment for septic shock. These treatments do not differ appreciably between medical and surgical patients in the ICU.² Our goal in this chapter is to highlight and offer insight into the subtle differences in the management of these two patient groups, describe how to succeed in a mixed ICU model, and stress the importance of communication between surgeon and intensivist in order to provide quality patient care in the ICU.

SPECIALTY UNITS AND SURGICAL PATIENTS

The last few decades have seen an increase in the number of specialty ICUs that care for a unique group of patients using a multidisciplinary team trained to care for the needs of these patients. The proposed benefits of specialized ICUs are physician convenience, ability to

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