



# A closed model on intensive care leads to a superior outcome in critical surgical patients

## CON:

Many articles have been published over the last few years that demonstrate support and/or advocate the implementation of the “closed” unit as the model of choice for management of an intensive care unit (ICU). Indeed, the arguments are very strong and seemingly convincing. From all that we have been told, the closed model seems to be superior to an open model. Yet, another commonly used model, the semi-closed model, has received very little attention. Certainly, at the current time, there is an insufficient number of intensivists available to allow for the implementation of closed units in all hospitals in the U.S. In 1997, only 36.8% of all ICU patients in this country had care provided to them by an intensivist<sup>1</sup>. So the possibility that most ICUs will be able to provide a closed model does not exist in the foreseeable future. Regardless, it is time that the semi-closed model get evaluated a bit more closely since there are compelling reasons as to why this model, at times, may be preferred over the closed model.

For the purpose of this discussion, a semi-closed ICU is defined as one in which a critical care team provides direct patient care, but in collaboration with other “privileged” physicians who are also allowed to write orders. In a closed unit, members of the critical care team are the only clinicians allowed to have direct patient care and also write orders. Semi-closed models frequently exist in ICUs where there is a small number of primary physicians who are not part of the ICU team per se but desire to remain actively involved in their patients’ care. Many surgical and cardiothoracic ICUs maintain this model.

In an effort to understand why a semi-closed unit may be preferred over a closed unit, it is necessary to understand what components of the closed model make it preferable to an open model. By doing this, we can then see how such goals can be attained in the semi-closed unit. We also need to understand other organizational and staffing patterns that exist outside of the closed vs. open unit concept that may enhance an ICU’s ability to provide optimal patient care.

A number of studies and reviews demonstrate positive effects on ICU length of stay, mortality rate and overall complication rates<sup>2,3,4</sup>. The reasons appear to be as follows:

1. Better understanding and management of ICU pathology
2. Better use of evidence-based medicine
3. Increased usage of protocols
4. Better ventilation management.

The assumption is that a closed unit model provides a setting where the intensivist can freely provide appropriate patient care without the interference of those who do not have state of the art knowledge of how to manage a critically ill patient. Primary physicians do not necessarily practice evidence-based critical care medicine nor do they plan to learn the most recent concepts of critical care management. A well structured semi-closed unit creates a situation where intensivists, who understand ICU pathology and practice evidence-based medicine, steer patient management. It also creates a flexible situation where care can be delivered in a collaborative manner with a strong multidisciplinary team – a team that may also include



*Gregory E. Kerr, MD, MBA  
Weill Medical College  
of Cornell University,  
New York, NY*

the primary physician(s). Indeed, patients enjoy continued involvement of their primary physicians who are more likely to continue their interaction if they are at least partially involved in the care of the patient.

Protocol-driven care has been shown to be very effective in improving various aspects of patient care in the ICU setting. Robust, well written protocols created by a team led by an intensivist can provide effective patient care without the immediate presence of a physician. In fact, Brook et al demonstrated that nursing-implemented sedation protocols not only deliver optimal sedation, but can also decrease a patient’s duration on mechanical ventilation<sup>5</sup>. Other patient care issues that can be positively influenced by the use of protocols implemented by non-physician healthcare providers include those associated with anemia<sup>6</sup>, mechanical ventilation<sup>7,8</sup>, and management of ARDS/ALI<sup>9</sup>. Thus, it is obvious that well-written protocols can have very positive impact in semi-closed units.

Certain members of the team can improve outcome without the use of protocols. For example, Leape et al showed that ICUs can reduce the rate of preventable adverse drug events by 66% with the presence of a clinical pharmacist<sup>10</sup>. The knowledge of the clinical pharmacist improves outcome without the use of protocols or the immediate presence of an intensivist. This effect can be seen in both closed and semi-closed units as long as the culture of the ICU creates an environment where input by a qualified pharmacist is readily accepted.

Having twenty four hour-a-day coverage by an intensivist is a feat that is unrealistic for most hospitals due to perceived costs and the scarcity of intensivists. Additionally, an aging population will exacerbate the undersupply of intensivists that already exists<sup>1</sup>. Burnout amongst the specialty is already a problem<sup>11</sup> and would only get worse if intensivists were asked to carry a heavier load than they already do. Including the primary physician in the ICU patient’s care not only makes the patient and primary physician happier, but also reduces the hospital cost of employing more intensivists, and eases the burden of the intensivist overseeing patient care.

Studies have not compared the semi-closed ICU model which has robust protocol-driven care and strong multidisciplinary teams against the closed ICU management model. With the continued rising costs of healthcare and the persistent undersupply of physicians board-certified in critical care, the semi-closed ICU model may make more sense to hospitals since the primary physician, under the guidance of the intensivist, can also help manage the patient when the intensivist is not immediately available. The stewardship and knowledge base of the intensivist and multidisciplinary team along with protocol-driven care and the presence of the primary physician can lead to patient care comparable to that seen in the closed unit model. It is now time for us to look at the semi-closed unit more seriously.

1. Angus DC, Kelley MA, Schmitz RJ, White A, Popovich J Jr. Caring for the critically ill patient. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an ageing population? *JAMA*; 284:2762–2770, 2000
2. Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremizov TT, Young, TL. Physician Staffing Patterns and Clinical Outcomes in Critically Ill Patients. *JAMA*; 288(17), 2151-2162, 2002
3. Carson SS, Stocking C, Podsadecki T, Christenson J, Pohlman A, MacRae S, Jordan J, Humphrey H, Siegler M, Hall J. Effects of organizational change in the medical intensive care unit of a

- teaching hospital: a comparison of 'open' and 'closed' formats. *JAMA*; 276:322–328, 1996
4. Ghorra S, Reinert SE, Cioffi W, Buczko G, Simms HH. Analysis of the effect of conversion from open to closed surgical intensive care unit. *Ann Surg*; 229(2) 163-171, 1999
  5. Brook AD et al. Effect of a nursing-implemented sedation protocol on the duration of mechanical ventilation. *Crit Care Med*; 27(12) 2609-2615, 1999
  6. Hebert PC, et al. A Multicenter, Randomized, Controlled Clinical Trial of Transfusion Requirements in Critical Care. *NEJM*; 340(6), 409-417, 1999; 340
  7. Kolleff MH et al. A randomized, controlled trial of protocol-directed versus physician-directed weaning from mechanical ventilation. *Crit Care Med*; 25(4):567-574,1997.
  8. Ely EW, Meade MO, Haponik EF, Kollef MH, Cook DJ, Guyatt GH, Stoller JK. Mechanical Ventilator Weaning Protocols Driven by Nonphysician Health-Care Professional: Evidence-Based Clinical Practice Guidelines. *NEJM*, 120; 454-463, 2001
  9. ARDS NET. Ventilation with Lower Tidal Volumes as Compared with Traditional Tidal Volumes for Acute Lung Injury and the Acute Respiratory Distress Syndrome. *NEJM*; 342(18), 1301-1308, 2000
  10. Leape LL, Cullen DJ, Clapp MD, Burdick E, Demonaco HJ, Erickson JI, Bates DW. Pharmacist Participation on Physician Rounds and Adverse Drug Effects in the Intensive Care Unit. *JAMA*; 281(3), 267-270, 1999
  11. Guntupalli KK, Fromm RE. Burnout in the internist-intensivist. *Intensive Care Med*; 22, 625–630, 1996