

More lives saved with 24/7 enhanced staffing in medical ICU

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In a first-of-its-kind study to measure the impact of the highest recommended specialist staffing levels in an intensive care unit, researchers at the University of Maryland School of Medicine found that increased staffing by specially trained physicians and other health care professionals can enhance patient survival and enable patients to breathe sooner without assistance. The results of the study have been released online ahead of print in the journal *Critical Care Medicine*.

The researchers analyzed the files of patients in the Medical [Intensive Care Unit](#) (MICU) at the University of Maryland Medical Center (UMMC) in Baltimore two years before and two years after a move from a 10-bed MICU to a 29-bed state-of-the-art facility with larger patient rooms.

"The older MICU was already performing very well in the care of patients, and yet we found the changes with the transition to the new MICU made an even greater difference. The changes resulted in a 19 percent decrease in mortality in the intensive care unit and a 16 percent decrease in hospital-wide mortality," says principal investigator Giora Netzer, M.D., assistant professor of medicine and epidemiology and preventive medicine at the University of Maryland School of Medicine and a pulmonologist and critical care specialist at the University of Maryland Medical Center.

Prior to the move, the MICU was staffed eight hours daily, seven days a week, with physicians who specialize in intensive and [critical care](#)

[medicine](#). The unit also had a nursing ratio of one nurse for every 1.7 patients, a ratio that is associated with better outcomes. The physician staffing level was consistent with the recommendations of the Leapfrog Group, an organization that publishes a national, public comparison of hospitals on key safety and quality issues.

After the move, UMMC's MICU adopted an even higher level of staffing, 24-hour critical care physician coverage, as recommended by the American College of Critical Care Medicine. In addition, clinical pharmacists were assigned to evaluate patients at the bedside daily. Also, the number of respiratory therapists was increased to bring the pre-move ratio of one therapist for every 24 patients to the post-move ratio of one therapist for every 10 patients. The nursing staffing remained unchanged.

"We believed that increasing staffing levels to meet the American College of Critical Care Medicine guidelines would save more lives, but the recommendations had never been tested in an intensive care unit," says Dr. Netzer. "This was the first study to actually examine the effect of those recommendations. We found that taking the staffing to an even higher level may save even more lives."

Dr. Netzer continues, "Other research indicates that if every urban intensive care unit adopted the Leapfrog Group's recommendations nationally, we would save 50,000 lives per year. Our study suggests that if all units increased the staffing even further to the levels that we achieved, we could actually save an additional 20,000 lives if implemented nationwide."

The researchers conducted a single-center, retrospective, observational study of 1,263 patients admitted to the University of Maryland Medical Center MICU between April 19, 2004, and April 18, 2006, before the move to new quarters, and 2,424 patients admitted between September

5, 2006, and September 4, 2009, after the changes.

Patients admitted to the new MICU were similar to those before the changes. There were no differences in gender, co-existing illnesses and risk factors or expected intensity of care. The medical director of the MICU did not change nor did the nursing leadership. There was no change in laboratory, radiology or consultant services after the switch, which continued to be fully available 24 hours daily.

In addition to greater survival rates, the changes in MICU staffing resulted in other important clinical outcomes, including substantial decreases in daily doses of sedatives for patients receiving those medications. "Sedation has been shown to be a factor in causing delirium in patients, prolonging ventilation and it is an independent risk factor for death," says Carl Shanholtz, M.D., study co-author and medical director of the MICU at the University of Maryland Medical Center. "If you over-sedate patients, they stay longer on ventilation, have more complications and a longer stay in the MICU," says Dr. Shanholtz, who is also associate professor of medicine at the University of Maryland School of Medicine.

Also following the changes, the proportion of patients receiving mechanical breathing assistance for one or more days was smaller, while there was a significant increase in ventilator-free days among those who required a ventilator.

The length of stay in the MICU increased slightly after the changes, from a median 2.4 to 2.7 days, but there was no change in total hospital length of stay. The researchers report that they could not ascertain what caused the longer stay, but say the reduction in deaths may have resulted in patients who would have previously died with a short length of stay now surviving with a commensurately longer stay.

MICU costs rose after the changes, from a median of \$4,071.10 per patient admission to \$6,232.20. The total per admission hospital variable costs also increased from median \$11,819.90 to \$13,178.90.

"With improvements in the staffing model, we were able to implement major changes in clinical practice," says Dr. Shanholtz. "On the sedation front, for example, we increased the number of critical care physicians who know the need to reduce sedation, clinical pharmacists to create drug algorithms and protocols, respiratory therapists to help wean patients from ventilation and coupled that with a great nursing staff and modern physical plant. A lot of folks can take credit for this important clinical care package."

Dr. Netzer says it may be difficult for most hospitals to achieve the level of resources and staffing realized at the University of Maryland Medical Center. "I think it brings into question whether we need to stratify or regionalize our hospitals into different levels of care, just as the trauma system has done," he says. Maryland has developed a statewide trauma system that provides rapid access to centers of excellence in the treatment of traumatic injuries.

"Our MICU has become a major, first-call resource for growing numbers of critically ill patients over the past three years as a result of our investment in the highest quality staffing and state-of-the-art facilities," says Jeffrey A. Rivest, president and CEO of the University of Maryland Medical Center.

"We applaud our colleagues at the University of Maryland Medical Center for the enhancements they made to their Medical Intensive Care Unit, which enabled our faculty physicians to improve already high levels of care to their patients," says E. Albert Reece, M.D., Ph.D., M.B.A., vice president for medical affairs at the University of Maryland and dean of the University of Maryland School of Medicine. "This study

shows how fresh thinking, teamwork and the marshalling of resources can advance patient care."

More information: Netzer G, Liu X, Shanholtz C, Harris A, Verceles A, Iwashyna TJ. "Decreased mortality resulting from a multicomponent intervention in a tertiary care medical intensive care unit." *Critical Care Medicine*. Published online ahead of print November, 2010.

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