



Impact of a Multidisciplinary Team Approach Including an Intensivist on the Outcomes of Critically Ill Patients in the Cardiac Care Unit

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Abstract

Objective: To investigate the impact of integrating a medical intensivist into a cardiac care unit (CCU) multidisciplinary team on the outcomes of CCU patients.

Patients and Methods: We conducted a retrospective cohort study of 2239 CCU admissions between July 1, 2011, and July 1, 2013, which constituted patients admitted in the 12 months before and 12 months after the introduction of intensivists into the CCU multidisciplinary team. This team included a cardiologist, a medical intensivist, medical house staff, nurses, a pharmacist, a dietitian, and physical and respiratory therapists. The primary outcome was CCU mortality. Secondary outcomes included hospital mortality, CCU length of stay, hospital length of stay, and duration of mechanical ventilation.

Results: After the implementation of a multidisciplinary team approach, there was a significant decrease in both adjusted CCU mortality (3.5% vs 5.9%; $P=.01$) and hospital mortality (4.4% vs 11.1%; $P<.01$). A similar impact was observed on adjusted mean CCU length of stay (2.5 ± 2.0 vs 2.9 ± 2.0 days; $P<.01$), adjusted mean hospital length of stay (7.0 ± 4.5 vs 7.5 ± 4.5 days; $P<.01$), and adjusted mean ventilation duration (2.0 ± 1.0 vs 4.3 ± 2.5 days; $P<.01$).

Conclusion: The implementation of a multidisciplinary team approach in which an intensivist and a cardiologist comanage the critical care of CCU patients is feasible and may result in better patient outcomes.

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The role of the cardiac care unit (CCU) has evolved over time from a unit designed to care for patients after acute myocardial infarction (MI) with a focus on arrhythmia detection and hemodynamics to a more complex cardiac intensive care unit dealing with an increasingly diverse patient population, including patients with both complicated and uncomplicated MI, decompensated heart failure and frank cardiogenic shock, severe valvular heart disease, high-grade conduction disturbances, refractory ventricular arrhythmias, complications of percutaneous procedures, and sequelae of intravascular device infections. The optimal care of these patients includes management of comorbidities,¹ especially in light of the substantial increase in the rate of sepsis and acute renal failure in the CCU population

and the increase in the proportion of patients requiring mechanical ventilation, bronchoscopy, or renal replacement therapy during their CCU stay.^{2,3}

There is increasing evidence that intensivist staffing in critical care settings is associated with not only improvements in both intensive care unit (ICU) and hospital mortality but also with lower medical resource use.⁴⁻⁷ Evidence for decreased mortality has led to increased involvement of physicians trained in critical care in multidisciplinary care teams in both medical units and ICUs, a trend that has not been adopted to any notable extent in CCUs in the United States.¹

Given the breadth of critical illness and the remarkable patient diversity observed in our CCUs, we should anticipate an imminent challenge to the general cardiologists who currently



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staff these units. Therefore, we hypothesized that the addition of dedicated intensivists to a multidisciplinary team approach would assist in caring for critically ill patients with cardiovascular conditions and would lead to improved quality of care and patient outcomes in CCUs.

PATIENTS AND METHODS

Multidisciplinary Team Approach

A multidisciplinary team approach was considered standard care in our CCU before the intervention. This team consisted of cardiologists, cardiology fellows, medical residents, nurses, a respiratory therapist, and an ICU pharmacist. Critical care consultation was available and occurred on an ad hoc basis when more complex ventilation management was needed or if multiorgan failure developed. The rate of this consultation was 21%. Starting in July 2012, a formal program integrated a board-certified medical intensivist with training in internal medicine and pulmonary/critical care into the daily management in the CCU at Christiana Hospital. There was no change in the cardiology staffing model before or after the intervention.

The role of the intensivist was to comanage patient care with the attending cardiologist. Responsibilities were delineated such that the intensivist primarily managed noncardiac issues, deferring primary cardiologic issues to the cardiologist. During multidisciplinary team rounds that included an intensivist, a daily checklist was utilized to ensure that important clinical issues regarding each patient were addressed. These items included assessments for any potential for harm to the patient, measures ensuring infection prevention, early mobility, and ventilator weaning readiness.

Additionally, a plan of care was developed and clearly articulated to all members of the health care team. There was no need to hire new intensivists during this approach; intensivists responsible for consultation outside the medical ICU managed their schedule to be available for the daily rounds and any potential additional need in the CCU after the daily rounds. No other changes were introduced in attending cardiologist coverage, ICU triage, nurse shifts or ratios, or night coverage. Protocols to prevent central venous line and urinary catheter

infections and hospital- and ventilator-acquired infections were already enforced as a part of the standard care before our intervention.

Data Collection, Study Population, and Outcomes

An electronic medical record review of patients admitted to the Christiana Care Health System CCU for 12 months before and 12 months after the integration of the intensivist into the cardiac care team was conducted. Christiana Care is a large system that comprises 2 hospitals with more than 1100 beds as well as a variety of outpatient and other service facilities. Christiana Care provides the majority of cardiovascular care in Delaware and the surrounding area, with an estimated 6000 diagnostic catheterizations, 1700 percutaneous interventions, 1800 electrophysiology laboratory procedures, 100 structural heart procedures, and 685 open heart surgical procedures annually. The CCU contains 12 beds and has a 2:1 nurse to patient ratio.

Two risk scores (the Acute Physiology and Chronic Health Evaluation III [APACHE III] and the Simplified Acute Physiology Score [SAPS II]) were used to risk stratify the patients before and after the intervention. The primary outcome was CCU mortality. Secondary outcomes included hospital mortality, CCU length of stay, hospital length of stay, and duration of mechanical ventilation.

Statistical Analyses

The Student *t* test for continuous variables (summarized as mean \pm SD) and χ^2 test for categorical variables (summarized as number [%]) were used to compare baseline characteristics of patients before and after implementation of the new policy. Propensity scores to estimate the probability, on the basis of patient and hospital characteristics, that patients would be admitted to the CCU after implementation of the multidisciplinary protocol were developed with use of logistic regression to adjust for baseline characteristics of the patients and changes of hospital admission pattern before and after implementation of the new policy.^{8,9}

Patient-level covariates in the propensity model included age, sex, race, smoking status, history of coronary artery disease, diabetes, chronic and/or acute renal failure, hypertension,

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