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Original Article

The impact of open to collaborative care model in cardiovascular surgical unit

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Abstract

Background: When compared with open care model, a closed one improves patient care in intensive care units (ICUs), mixed ICUs, surgical ICUs and trauma centers. We wanted to evaluate the benefit of a collaborative care model in highly specialized cardiovascular care unit.
Methods: This study was a retrospective, observational study conducted in the cardiovascular care unit of a teaching hospital. All patients who were above 20 years old and had received cardiovascular operation were enrolled for data collection and analysis.
Results: A total of 270 subjects were enrolled for analysis during the 2-year study period. In the collaborative care model, the CVSU length of stay ($p = 0.001$) and CVSU-free days ($p = 0.0008$) were significantly better than those in an open care model.
Discussion: The collaborative care model improved postoperative outcome in the cardiovascular surgical unit for those needing prolonged ICU care.

Keywords: Cardiovascular surgery; Collaborative care model; Intensive care unit; Intensivist; Open care model

1. Introduction

Intensive care units (ICUs) are set up for critically ill patients and are the costliest units in hospitals. From the data of Taiwan's Bureau of National Health Insurance, ICU fees accounted for 25% of overall hospitalization costs in 2003.[1] Effective management is important to reduce the length of ICU stay, ICU mortality rate and hospital mortality rate.[2–5] Moreover, high-quality supportive care in the ICU is a key factor impacting hospital costs, complications and mortality affecting critical ill patients.

The delivery of care service in ICU falls into three broadly defined models. The first one is an "open" intensive care unit. The assignment of patient care and order prescription are based on the primary field of the patient's physicians. The physicians may work outside the ICUs. They are not always available to manage the patients in ICU promptly. The second is a "closed" intensive care unit. In this model, only the intensivists are responsible for patient care in the ICU. The intensivists make the clinical decisions

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and write the orders. They almost always stay in the ICU during their work hours to manage patients immediately.[6,7] This situation is also called critical care specialist, or an intensivist care model. The third one is the "collaborative" care model, which is considered to be another type of intensivist care model. In such setting, especially for surgical patients, the critical care involves an intensivist and a surgeon who is the primary admitting physicians.[8–10] The care decisions and orders were given in consensus. Patients are continuous served by primary admitting physicians and prompt actions by intensivists while the surgeon is working elsewhere. Reports from medical and traumatic intensive care units has disclosed that the intensivist care model, compared with open, can improve outcomes, reduce hospital mortality, length of ICU stay and augment cost-effectiveness.[8–13] But there are fewer articles examining the usefulness of the collaborative care model in a highly specialized surgical ICU.

In Taiwan, many ICUs, medical or surgical, used the "open" setting before. In order to assure high quality of critical care, a fixed intensivist in each ICU is necessary for annual hospital accreditation from the Department of Health of Taiwan and the Taiwan Joint Commission on Hospital Accreditation. Our hospital changed from using the old open care model of Cardiovascular Surgical Unit (CVSU) to the collaborative care model in April 2010. Pulmonologists certified in critical care were assigned to the CVSU as collaborative intensivists working with cardiovascular surgeons. Since the CVSU is a highly specialized care unit and patients there are more critical than in other ICUs, we compared in this study the effectiveness of post-operation intensive care in open versus collaborative care model in our CVSU.

2. Methods

2.1. ICU settings

Taipei Veterans General Hospital is a 3000-bed teaching hospital in Taiwan. This hospital contains 238 ICU beds allocated in 13 different ICUs carrying different missions. CVSU is one of them, and its main mission is dedicated care of patients recovering from open-heart and great-vessel surgery and heart transplant. The CVSU is a 16-bed unit that includes the 6-bed CVSU-A (Cardiovascular Surgical Unit A) and the 10-bed CVSU-B (Cardiovascular Surgical Unit B). The CVSU-A is designed as an upgraded recovery room for cardiovascular surgery and is directly connected to the operating room. Most patients are observed and extubated in this place before being transferred to ordinary ward. Some patients are so sick due to uncontrolled diseases that even after surgery, they may pass away in the CVSU-A. Those who survive in the CVSU-A and need prolonged ICU care are further transferred to the CVSU-B. In this study, we only enrolled those who had been admitted to the CVSU-B, i.e. those who could not be stabilized soon after surgery, for further analysis.

2.2. Study design

In this retrospective study, the surgical reports and perioperative records were collected for all post-operation patients admitted to our CVSU-B. The study period was from April 1st, 2009, one year before the collaborative care model started, to March 31st, 2011. Obtaining informed consent from patients was judged unnecessary by the Institutional Review Board of Taipei Veterans General Hospital.

Patients were excluded from the study if they were younger than 20 years old, had been admitted to CVSU for less than 24 h, had received no cardiovascular surgery, had incomplete clinical data (the chart unavailable of any reason), had undergone heart transplantation, or had received simple vascular surgery only, such as stent grafting for aortic aneurysm.

The first study period (April 2009 to March 2010) was for investigation of open ICU service. During this period, the surgical team (an attending physician, fellows and residents as a team) was the one and the only caregiver. They still had other works outside the CVSU, such as outpatient clinics, general ward rounds or other operations. They remained on call to the CVSU but were not always available immediately. The second study period (April 2010 to March 2011) looked at collaborative ICU service. During those days, two medical intensivists certified by the Taiwan Society of Critical Care Medicine cooperated with surgeons for patient care in the CVSU. During daytime of weekdays, at least one of the two intensivists stayed in the CVSU. Surgeon and intensivists decided on all patients' critical management together. If opinions differed, they would discuss further and arrive at a final decision. The medical intensivists remained on call at night and through the weekend. Other CVSU settings including the nursing staff, duty shifts of CVSU residents and CVSU equipment were the same in open and collaborative care models.

2.3. Data collection

Patient socio-demographic characteristics and operation type were obtained by chart review. Charlson Comorbidity index (CCI)[14–16] was calculated from medical records. Status of operation was classified as emergency, urgent and elective surgery. The urgency of operation was defined based on guidelines of the Society of Thoracic Surgeons.[17] Operations were divided into coronary artery bypass grafting (CABG) and non-CABG. The latter included vascular heart surgery, aortic surgery, aneurysm repair, repair of ventricular rupture, pericardial-window creation and cardiac tumor surgery.

The patient outcome measurements include 30-day mortality rate (calculated from the first day in the CVSU),[18] mortality rate after discharge from CVSU, ICU length of stay, ICU-free days and ICU re-admission rate within 14 days. ICU-free days were calculated as 30 days minus ICU length of stay. If the patient had stayed in the ICU for more than 30 days or expired in the ICU, the ICU-free days would be zero.[18] Ventilator-associated outcome variables were days on mechanical ventilation, ventilator free days and ventilator

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