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ARTICLE CRITIQUE

Coronary care units continue to be effective at improving patient outcomes

Andrea Driscoll BN, MN, MEd, PhD*

Department of Epidemiology and Preventive Medicine, Monash University, 89 Commercial rd, Melbourne, Australia

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Introduction

Coronary care units (CCUs) were developed in the 1960s to prevent death post acute myocardial infarction (AMI) resulting in a 15—20% reduction in mortality.[1] However since that time the patient population in CCU has dramatically changed. Over the past half a century CCUs have been transformed from emergency management of arrhythmias post AMI to managing a patient with an intra-aortic balloon pump and/or temporary pacing, management of chronic cardiac disease and post percutaneous coronary intervention (PCI) including arterial sheath removal.

These changes and advances in the treatment of cardiovascular disease suggest that contemporary CCU may be very different from that of first implemented in the 1960s. Data concerning patients admitted to today's CCU are largely taken from randomised controlled trials with strict inclusion and exclusion criteria so they are largely unrepresentative of the overall CCU population. Large scale registries have also included patients admitted to CCUs but are usually restricted to a specific illness, such as acute coronary syndrome or patients post PCI, which again is not reflective of the overall cohort of patients admitted to CCU. This study addresses this knowledge gap by conducting a large epidemiological study into the patient characteristics of all patients admitted to one CCU over 17 years.

Objective of the study

This study retrospectively examined an administrative database of consecutive admissions to the CCU at Duke University hospital from January 1st 1989 to December 31st 2006. The objective of the study was

* Tel.: +61 3 9903 0588; fax: +61 3 9903 0556.
E-mail address: andrea.driscoll@monash.edu

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to describe long-term temporal trends in patient characteristics, processes of care and in-hospital outcomes of patients admitted to CCU.

Method

A retrospective data analysis of an administrative database of 29,275 CCU admissions was examined. This database captured medical diagnosis demographic co-morbidities, procedural and in-hospital outcomes for all patients admitted to CCU. Three physicians independently reviewed the medical diagnostic and procedural data. Baseline distribution of demographic data, length of stay in CCU and in-hospital mortality were presented descriptively in 3 yearly intervals. Further analysis involved logistic regression for dictomous variables and general linear model for continuous variables. The protocol for data analysis was approved by the Duke University Hospital Institutional Review Board.

The Charlson co-morbidity index was calculated for all CCU admissions using ICD-9 codes. A sensitivity analysis was performed on the diagnostic variables that represented chronic co-morbidities. Logistic regression was used to determine a relationship between year of admission and mortality, major diagnoses and procedure. Multivariable logistic regression for mortality was adjusted for age, race and gender.

SAS version 8.2 was used for all statistical analyses. Statistical significance was set at 0.05 and in addition to statistical significance, clinical significance was also considered.

Results

The majority of patients were male (60%) with a mean age of 62.5 years. They found that the severity of admissions increased significantly from 1989 to 2006 and median length of hospital stay decreased (from 8.7 to 5.3 days, $p < 0.0001$) but CCU length of stay was unchanged with a median stay of 2 days ($p < 0.001$). There was a significant increase in non-ST-elevated myocardial infarction (NSTEMI) admissions to CCU but ST-elevated myocardial infarction (STEMI) CCU admissions decreased ($p < 0.0001$). On an adjusted basis, CCU and inhospital mortality decreased over time (CCU mortality: OR 0.98, 95%CI 0.98—0.99; in-hospital mortality OR 0.99, 95%CI 0.98—0.99). This is despite a significant increase in severity of co-morbidities in patients admitted to CCU ($p < 0.0001$). The prevalence of diabetes and COPD also increased from 1989 to 2006 ($p < 0.0001$).

The number of people diagnosed with a STEMI (OR 0.93, 95%CI 0.93—0.94, $p < 0.001$) and complete heart block (OR 0.96, 95%CI 0.95—0.97, $p < 0.001$) decreased over the 17 years, and a diagnosis of NSTEMI (OR 1.13, 95%CI 1.13—1.14, $p < 0.001$), cardiogenic shock (OR 1.02, 95%CI 1.01—1.03, $p < 0.001$), heart failure (OR 1.01, 95%CI 1.01—1.02, $p < 0.001$), atrial fibrillation (OR 1.03, 95%CI 1.03—1.04, $p < 0.001$), and infective endocarditis (OR 1.04, 95%CI 1.03—1.04, $p < 0.001$) increased. The number of procedures also decreased over time with a reduction in transvenous pacing (OR 0.81, 95%CI 0.80—0.82, $p < 0.001$) swan ganz catheter (OR 0.94, 95%CI 0.94—0.95, $p < 0.001$), pericardiocentesis (OR 0.95, 95%CI 0.93—0.98, $p < 0.001$) and intra-aortic balloon pump (OR 0.96, 95%CI 0.96—0.97, $p < 0.001$).

Critique

This study is one of the largest studies to examine the patient population of those admitted to CCU. The study highlights the temporal trend over a 17 year period of patient characteristics, discharge diagnosis and outcomes. Over time the results showed a pattern of increasing patient complexity with multiple co-morbidities, evolving critical illness and an increase in resource utilisation. This study provides vital evidence that will assist in the planning of future critical care services and resource allocation. It also cements the need and benefits of a coronary care unit as heart disease continues to be the number one killer in Australia.[2] However, there are several limitations of the study which raise some important issues for discussion.

The results showed several unadjusted regression models but very few adjusted analysis were provided. The authors stated that the analyses were unadjusted and that adjusted analyses were adjusted for age, race and gender. In light of this the results should be interpreted with caution. The adjustment for confounding variables in this large study is vital in order to accurately determine the size of effect that various predictor variables have on the outcome variable. For example, during the 17 year period of data collection beta-adrenergic receptor blockers, angiotensin receptor blockers and angiotensin converting enzyme inhibitors were introduced for the management of acute myocardial infarction. These medications are now first