

The Effect of Treatment Delays Associated with Inpatient Inter-hospital Transfer from Peripheral to Tertiary Hospitals for the Surgical Treatment of Cardiology Patients



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Background

Nearly 100,000 presentations to non-tertiary hospitals per year result in an inpatient transfer [1]. The timely inter-hospital transfer of patients for cardiothoracic surgery is significant to their overall outcomes. We hypothesised that patients with a prolonged pre-operative admission were at risk of nosocomial infection, leading to prolonged hospitalisation, morbidity and mortality.

Methods

Patients admitted to a non-tertiary centre (Frankston Hospital, Group 1) and requiring transfer to tertiary centres for cardiac surgery were compared to patients presenting directly to tertiary centres (Alfred Hospital, Group 2; St Vincent's Hospital, Group 3) from June 2011–July 2012. Data was obtained from medical records and the National Cardiac Surgery Database.

Results

Eighty-seven patients in Group 1, 78 patients in Group 2 and 65 patients in Group 3 were identified. A higher proportion of total admission time was spent awaiting surgery in Group 1 compared to Group 2 (52.8% vs. 38.3%, $p \leq 0.001$) and Group 3 (52.8% vs. 26.3%, $p \leq 0.001$). Nosocomial infections occurred more frequently in Group 1 compared to Group 2 (20.7% vs. 5.1%, $p = 0.04$) and Group 3 (20.7% vs. 6%, $p < 0.001$).

Conclusion

Presentation to a non-tertiary centre requiring inpatient cardiothoracic surgery is associated with longer pre-operative waiting time and higher rates of hospital-acquired infections.

Keywords

Cardiovascular Diseases • Infection • Cardiac Surgical Procedures • Regional health planning • Public Health

Introduction

A significant number of patients present to non-tertiary hospitals and then require definitive inpatient surgical treatment at a tertiary centre. Thirty-two per cent of all

Australian public hospital emergency department presentations are to hospitals not classified as principal referral centres, accounting for over two million presentations per year. From this group, nearly 100,000 presentations per year result in an inpatient transfer, further emphasising the role

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of initial management and referral by non-tertiary centres [1].

In order to properly service this demand, services such as coronary angiography and angioplasty are now readily available in peripheral centres, despite the lack of on-site cardiothoracic services. Recent studies have demonstrated the procedural safety of this approach with no increased risk of adverse outcomes [2]. Yet, for a variety of clinical and logistical reasons, a subset of patients treated at such peripheral sites will require definitive surgical treatment in an inpatient setting. Specialised cardiothoracic surgery (CTS) requires significant human and technological resources, resulting in such services congregating in larger, usually metropolitan based, tertiary centres. Thus increasingly, inter-hospital transfers between peripheral and tertiary centres are required for definitive management of these patients. This is particularly the case in the Australian health system where large cities such as Sydney and Melbourne have geographically vast greater metropolitan areas, serviced by relatively sparse peripheral centres, with a clustering of tertiary referral centres in and around the CBD [11]. The inter-hospital transfer of such patients consequently becomes an important component of the patient's overall management. Previous studies have focussed on the timely transfer of critically ill patients such as those with ST elevation acute myocardial infarction [3], or severe sepsis but have not specifically looked at the effect of inter-hospital transfer for definitive treatment in patients already partially evaluated. This population is growing, particularly in cardiology (both locally and worldwide), as peripheral catheter laboratories undertake initial evaluation of presenting patients [2,5–7].

We sought to assess the outcomes of patients initially presenting to a cardiology unit in a peripheral Melbourne non-tertiary centre who required inpatient transfer to a tertiary centre for cardiothoracic surgery. We hypothesised that patients with a prolonged pre-operative admission were at risk of acquiring a nosocomial infection, leading to prolonged hospitalisation and increasing risk of morbidity and mortality.

Methods

We evaluated all patients admitted to Frankston Hospital (Group 1), a non-tertiary centre, over a 14-month period (1st June 2011 to 31st July 2012) who then required inpatient transfer to a tertiary centre for definitive cardiothoracic surgical treatment. For comparison, similar data was obtained from patients presenting directly to the tertiary centres, the Alfred (Group 2) and St Vincent's Hospitals (SVH) (Group 3) who required inpatient cardiothoracic surgical treatment over the same 14-month period. These hospitals were chosen as a representative sample of patients presenting to peripheral and tertiary centres respectively. Alfred and SVH were chosen as, firstly, these were the most common referral institutions for patients presenting to Frankston Hospital and, secondly, to minimise the potential confounding impact of varying surgical or peri-operative practices between

centres. A tertiary centre was defined by the presence of a cardiothoracic surgery unit. A peripheral centre was one that could provide coronary angiography services, including angioplasty, but without on-site cardiothoracic services.

To generate Group 1, all patients presenting to Frankston Hospital over the study period were evaluated. Those patients requiring inpatient transfer to a tertiary centre for the purpose of definitive surgical treatment were included in Group 1. The clinical necessity of inpatient surgical treatment for patients was made at the discretion of the treating team in each hospital. Typically those patients would include patients with either, or combination of, critically diseased coronary anatomy, clinical instability (elevated biomarkers or ongoing symptom) or co-existing structural heart disease (left ventricular dysfunction or valvular heart disease). For Groups 2 and 3, a list of cardiothoracic procedures performed at each tertiary centre was analysed from the National Cardiac Surgery Database (NCSDB). The medical records were then assessed to determine initial presenting hospital of each patient. Those patients presenting initially to the same tertiary centre, and who received inpatient surgery, were included in the group for analysis. Elective and outpatient procedures were excluded, however for the purposes of this study a small number of elective angiograms identifying unexpectedly severe disease requiring inpatient surgical treatment (for example severe left main disease) were considered as non-elective admissions. Outcome data for patients in each group was obtained from the NCSDB and correlated with the inpatient medical record. Admission times and transfer dates were obtained from each respective hospital patient management system.

The primary outcome measures included total inpatient admission time and total inpatient pre-operative time. Secondary endpoints included overall mortality and the incidence of hospital acquired infections. Infections were defined according to accepted definition in the NCSDB. Infection required evidence of positive cultures in addition to clinical findings consistent with infection. In addition to being recorded in the NCSDB, evidence of infection was also obtained from the inpatient medical record. Relevant demographics and outcomes were compared using a multi-variant analysis students paired t-test for continuous variable and chi-squared test for binary variables. Values were presented as the mean \pm standard deviation. $P < 0.05$ was deemed statistically significant. Ethics for the use of gathered data was sought and approved by the individual hospital ethics committees.

Results

Of the 8024 cardiology admissions across the three study hospitals during the study period, 230 patients met the inclusion criteria – 87 patients in Group 1, 78 patients in Group 2 and 65 patients in Group 3 (see Figure 1). There were no significant differences between the groups with regards to baseline demographics (age and sex), Euroscore score and

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