AUDIT

In-hospital audit underestimates early post-operative morbidity after cardiac surgery

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Abstract

Background—The demand for open heart surgery has driven current practice towards early postoperative discharge and interhospital transfer to maximise patient throughput. The extent to which this redirects morbidity to other healthcare providers is unknown.

Objective—To define the incidence of in-hospital and early postoperative morbidity within 6 weeks of primary hospital discharge after cardiac surgery.

Design—Prospective in-hospital data for 322 consecutive adult patients undergoing cardiac surgery were compared with retrospective information obtained by postal questionnaire.

Results—Mean (SD) primary postoperative hospital stay was 8.3 (3.1) days. There were 13 in-hospital deaths (4%), and three patients died within 6 weeks of primary discharge. Retrospective information was obtained from 297 patients (96%). Of these, 77% patients were discharged home directly, while 23% were transferred to other hospitals for continued medical care. Mean (SD) hospital stay after transfer was 12 (8.4) days and required 741 additional hospital bed days. Thirty nine patients (13%) were readmitted to hospital, requiring a further 275 hospital bed days. The readmission rate was lower in patients sent home directly (10%), than in those who were transferred (22%; $P < 0.001$).

Conclusions—In-hospital audit underestimates early morbidity after cardiac surgery. The burden transferred to other healthcare providers is considerable and has important financial implications for purchasers.

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Keywords: cardiac surgery; in-hospital audit; post-operative morbidity

There has been a considerable increase in the demand for adult open heart surgery, principally through the acknowledged symptomatic and prognostic benefits of myocardial revascularisation and heart valve surgery. Cardiac surgery has proven to be cost effective in terms

of increased survival, improved capacity for work, and improved quality of life in all age groups.^{1,2} Concerns about the economics of healthcare, particularly with reference to high cost interventions, and increasing service demands, have influenced surgical practice.³ As a consequence, current practice aims towards earlier postoperative discharge, either directly home or by transfer to referring hospitals to maximise surgical throughput. The extent to which this approach to postoperative care redirects early morbidity to secondary healthcare providers, however, has not been defined. The purpose of this study was to investigate the incidence and significance of early postoperative morbidity within 6 weeks of discharge after cardiac surgery, and to compare this with data obtained from prospective in-hospital audit.

Methods

Some 322 consecutive adults (229 men; mean (SD) age 60.4 (9.6) years, with 14.9% over 70) who had cardiac surgery over a 14 month period from May 1993 to June 1994 under the care of one surgical team were studied. Prospective in-hospital data were collected on all patients with respect to demographic characteristics, preoperative and operative data, and in-hospital morbidity and mortality. Preoperative risk stratification was carried out using the Parsonnet score.⁴ This provided an estimate of the expected mortality based upon preoperative characteristics, although it is accepted that the score tends towards an over-estimation of about 5% at the higher end. Information relating to the period between discharge from the cardiac ward and 6 week follow up was collected retrospectively by means of a postal questionnaire. This was supplemented by telephone interview and hospital note review in a minority of patients who failed to respond. For all patients readmitted during this period, further information was obtained from the admitting hospital by retrospective review of the notes.

STATISTICAL METHODS

Results are expressed as mean (SD) unless otherwise stated. Univariate statistical comparisons were performed using χ^2 analysis or the Mann-Whitney U test for continuous variables. A P value of 0.05 or less was considered significant.

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Primary postoperative hospital stay in 322 patients.

Results

Prospective in-hospital audit data for 322 consecutive patients showed that the majority underwent coronary artery bypass grafting (72%), or valve repair or replacement (24%). Patients were classified according to surgical priority as elective cases—that is, admitted from the waiting list, urgent cases—that is, requiring operation within the same hospital admission, or emergencies—that is, requiring immediately life saving surgery. Thus, operations were performed as urgent cases in 97 patients (30%) and as emergencies in 29 (9%). Risk stratification classified 50% of patients into Parsonnet scores 0–4—that is, an expected mortality of 0–4%, while 11% had a score over 20—that is, a mortality of over 20%. Mean (SD) primary postoperative hospital stay in the cardiac centre for the 309 survivors was 8.3 (3.1) days (median (range) 7 (3–23) days; 18 patients < 6 days, fig).

There were 13 in-hospital deaths (4%), and another three patients died within 6 weeks of discharge from the cardiac ward. Intra-aortic balloon pump support was required in 19 patients. In-hospital major sternal wound problems requiring further surgery occurred in three patients. Only one minor leg wound infection requiring antibiotics and dressings was noted.

Retrospective data relating to the early postoperative period were obtained in 297 patients (96%). Of these, 230 (77%) were discharged home directly and the remainder were transferred to another hospital for continuation of hospital based medical care. After exclusion of five patients known to have been sent to convalescence hospitals, the mean (SD) hospital stay after transfer was 12.0 (8.4) days and required 741 additional hospital bed days. Thirty nine (13%) of the 297 patients required readmission to hospital, adding a further 275 hospital bed days (mean (SD) 7.1 (5.8) days). Of these, 35 patients (90%) were admitted to hospitals other than the regional cardiac centre

Table 1 Indications for early readmission to hospital

Indication for readmission	No of patients
Pneumonia/pleural effusion	7
Suspected DVT or PE	5
Chest pain	6
Arrhythmia	6
Wound complications	5
Gastrointestinal bleeding	1
Renal failure	1
Other	8

DVT, deep venous thrombosis; PE, pulmonary embolism.

Table 2 Characteristics of patients from whom retrospective postoperative data were obtained with respect to readmission within 6 weeks of primary discharge

Characteristic	Patients readmitted to hospital (n = 39)	Patients discharged home without readmission (n = 258)
Male sex (%)	74.4	70.5
Age (years)	58.2 (9.6)	60.6 (9.7)
Parsonnet score >14 (%)	17.9	14.3
Elective surgery (%)	69.2	67.8
CABG (%)	70.3	69.8
Valve surgery (%)	22.2	25.7
IABP use (%)	10.3	8.3
Primary stay (days)	7.8 (2.8)	8.4 (3.2)

CABG, coronary artery bypass grafting; Values are mean (SD). Readmission versus discharged home without readmission values are not significant. IABP, intra-aortic balloon pump.

(28 of whom lived more than 50 miles away and were sent to their local hospital). Table 1 gives the reasons for readmission. Among these, three patients presented with major sternal wound complications requiring debridement or plastic reconstruction. Ninety patients (30%) complained of minor wound problems. Of these, 54 received oral antibiotics, and another two patients required leg wound debridement under general anaesthesia. The incidence of readmission to hospital was 22% (15 of 67) in those who were initially transferred to other hospitals compared with 10% (24 of 230) in those sent home directly from the cardiac ward ($P < 0.001$). Readmission was not related to age, sex, preoperative Parsonnet score, operation type or urgency, balloon pump use, or length of primary hospital stay (Table 2; readmission versus discharged home directly without readmission values are not significant). Primary hospital stay for patients transferred to other hospitals was 9.6 (4.2) days (range 5–20 days; readmission versus discharged home directly without readmission values are not significant).

Discussion

Concerns over the rising cost of medical care within a climate of an increasing demand for cardiac surgical procedures have introduced the practice of early postoperative discharge.^{5,6} This has been achieved by the introduction of fast tracking of suitable patients to minimise intensive care requirements,^{7,8} and by either early discharge home or transfer to other hospitals. Contemporary data do indeed suggest that postoperative hospital stay has decreased from about 13.5 days in 1986⁶ to 7.5 days in 1990,⁸ some units discharging patients even earlier than this.⁹ Although reducing the length of hospital stay may increase surgical throughput, there is controversy as to whether this reduces overall healthcare costs.^{10,11} A saving in bed days may have a secondary effect on the use of resources elsewhere.⁸ This was demonstrated in the present study where despite the fact that median primary postoperative hospital stay was 7 days a considerable number of additional hospital bed days were still used after discharge from the cardiac unit. This was particularly the case for patients transferred to other hospitals for continuing medical treatment.

The geography of supraregional cardiac centres implies that some patients travel far from home for their operation. There will always be the tendency therefore to transfer patients back to their local hospital as soon after surgery as possible. Furthermore, patients developing complications remote from the cardiac centre may be less likely to be re-referred back there. This was reflected in the present study where the majority of patients readmitted to hospital within 6 weeks of primary discharge were admitted to their local hospitals.

The time related incidence of complications suggests that it may not be safe to discharge patients until the eighth postoperative day.⁵ There is evidence, however, suggesting that the prospective identification of patients at risk of readmission after primary discharge can be used effectively to reduce primary postoperative hospital stay. Stanton *et al*¹² looked at 326 patients as part of a prospective study of recovery after elective coronary artery bypass surgery and found that factors such as length of intensive care stay, occurrence of severe non-cardiac complications during initial hospitalisation, intra-aortic balloon pump use, preoperative resting angina, and shorter preoperative symptom duration were associated with an increased readmission rate within 6 months of surgery. The overall readmission rate in this group was 24%. Krohn *et al*⁹ using a combination of strict discharge criteria and daily telephone follow up for the first week after surgery in 240 patients undergoing a range of cardiac procedures recorded a rate of readmission within 6 months of only 2.5%. Specifically, the successful completion of an exercise test identified patients who were well enough to go home and who were perceived to have fewer problems during telephone follow up. Median postoperative stay was only 4 days in the study. Nugent and William¹³ identified key categories of care, including cardiac status, nutrition, and diagnostic tests, and introduced a "critical pathway program" to assess when a patient could be safely transferred or discharged. The median length of postoperative stay was reduced from 7 to 6 days in patients undergoing primary elective coronary revascularisation, with an increase from 20% to 40% in the proportion of patients discharged at 5 days or less. Mortality and readmission rate, however, (10.5% after introduction of the programme) remained stable. In the present study the only predictor of increased risk was for those patients who were transferred to other hospitals for continuing medical treatment. The primary hospital stay was similar irrespective of whether patients were transferred or sent home directly, suggesting that the threshold for discharge was not reduced by the "security" offered by interhospital transfer. Age, sex, preoperative Parsonnet score, operation type or urgency, balloon pump use, and primary hospital stay were not important predictors.

Inhospital data collection underestimated both morbidity and mortality in the postoperative period. Of particular concern was the late presentation of three patients with major sternal

wound dehiscence after discharge from the cardiac unit. Lack of appreciation of the seriousness of this event by patients and their local doctor led to delays in their referral back to the regional centre. Furthermore, although only one patient developed minor wound infection during the postoperative period before discharge from the cardiac unit, a considerable number of patients (30%) complained of wound problems after discharge. A more objective measure was the incidence of antibiotic prescription for presumed minor wound infections in 18% of patients after discharge. Although this may represent an overestimate of the true incidence of this complication due to the inevitable overprescription of antimicrobial medication, it nevertheless demonstrates the inadequacy of inhospital audit in estimating the extent of early postoperative morbidity.

The observations made in the present study have important financial implications for purchasers of healthcare. Perceived differences in costs between centres may be a consequence of transfer of costs back to a purchaser rather than an actual difference in costs.

Introduction of methods by which patients, or their general practitioner, could obtain advice with regard to early morbidity after cardiac surgery may be helpful in reducing the burden placed on hospital resources in dealing with such problems, as well as providing a means for early recognition of those complications requiring re-referral to the primary care centre. The designation of a community liaison nurse may be one such approach.

Conclusion

Inhospital audit underestimates the extent of early morbidity after cardiac surgery. The subsequent burden placed on other healthcare providers is considerable and has important implications for purchasers of healthcare.

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