Surgical versus medical care for postoperative cardiac surgical patients at the general ward

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Abstract

Objectives: To shorten hospital stay after cardiac surgery, several risk factors have been defined to identify patients who can be discharged early. These risk factors are dependent on the patient; no studies exist on the influence of the treating physician himself on postoperative patient stay. Methods: In a university affiliated cardiac surgical clinic we investigated patients who were postoperatively treated either on medical wards with no cardiac surgeon’s presence or on a cardiac surgical ward; at both types of wards physicians had several years experience with cardiac surgical patients. Taking several risk factors for postoperative morbidity into account, postoperative length of stay and incidence of wound healing complications have been compared. Results: Within a 3-month period, 84 patients were treated at the cardiac surgical ward, 102 patients at the medical wards. Risk factors for postoperative morbidity were present in 87% of patients, statistically independent of postoperative wards. Although demographic data and median ICU-stay of both patient groups was comparable, the median post-ICU stay was 9 days at the surgical and 13 days at the medical wards (P < 0.0001). Incidence of wound healing complication was higher (19.6%) at the medical wards than at the surgical ward (10.7%), without reaching statistical significance. Conclusion: As patients at the respective wards were statistically not different, the difference in post-ICU stay, infection and costs must depend on the treating physicians. As a consequence, postoperative care for cardiac surgical patients in all cases should include direct cardiac surgical participation.

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1. Introduction

In recent years many efforts have been spent to reduce the postoperative hospital stay of patients after cardiac surgical operations: fast-track intensive care unit (ICU) protocols [1–3] have been implemented, as an alternative, selected patients are transferred to a general surgical recovery ward instead of to an ICU [4–6]. Thereafter, patients are discharged as early as possible, either home, to primary care hospitals, or to rehabilitation clinics [2,3,7–9]. Another factor to consider is the need to reduce the total costs of surgery and to minimize the financial risk associated with treating patients. If the duration of hospital stay is reduced, both patients and providers benefit. In order to identify patients who can be discharged early, several risk factors have been defined [3,8,10–16]. However, all these risk factors are more or less dependent on the patient and no studies exist on the influence of the treating physician himself on the length of hospital stay.

In our hospital with approximately 1000 cardiac operations per year, after their stay at the ICU, patients are transferred (without an intermediate care ward in between) to general wards with different care concepts. One ward is run mainly by a team of cardiac surgeons together with medical physicians. The other wards generally do not provide cardiac surgeons’ care, but on demand only and are run solely by medical physicians. In the present study, we evaluated the influence of cardiac surgeons’ presence and compared the patient’s outcome at the respective...
wards in respect of length of hospital stay and the rate of wound healing complications.

2. Methods

Our clinic (Herzchirurgische Klinik der Ludwig-Maximilians-Universität München am Augustinum) basically is a cardiologic clinic, additionally equipped with operating rooms and an intensive care unit for cardiac surgical patients and affiliated to the Department of Cardiac Surgery and the Department of Anesthesiology of the University of Munich. The general wards of the clinic consist of one cardiac surgical ward and five interdisciplinary medical wards, all with a similar capacity of 30 beds. At the surgical ward only pre- or postoperative patients are admitted and treated mainly by cardiac surgeons, supported by medical physicians. On the medical wards medical physicians treat patients alone; cardiac surgeons are present on demand only, e.g. for a consultation. Patients on these wards consist of cardiac surgical patients, patients for interventional cardiologic therapy, and patients with medical but non-cardiac treatment. Percentage of cardiac surgical patients differs between 5% and 50%, depending on the general amount of cardiac surgical patients in the clinic and the occupancy of the surgical ward.

After the operation, all patients are transferred to the ICU for immediate postoperative care. On leaving the ICU, patients are retransferred to those normal wards, where they have been treated before surgery. Here they stay until dismissal to rehabilitation clinics or home is possible.

Between 1 December 1997 and 28 February 1998 all patients who underwent open heart surgery and who were not directly transferred from our ICU to other hospitals were included in this study. Operations were performed by five surgeons of similar training and skill, together with eight assistants in varying teams. We monitored postoperative intensive care and general ward stay as a whole and divided by postoperative wards, the incidence of wound healing problems and costs generated by the different treatment concepts. To enable this comparison, demographic data, diagnoses, operations, surgeons and risk factors for prolonged postoperative stay or wound-healing problems were recorded. As risk factors for this postoperative morbidity we considered unstable or acute angina pectoris, percutaneous transluminary coronary angioplasty (PTCA) during the same admission, cardiac re-operations, diabetes, chronic obstructive pulmonary disease, obesity, peripheral arterial occlusive disease, pre-existing renal insufficiency, use of intrathoracic arteries as bypass grafts, ejection fraction lower than 50%, nicotine abuse, and postoperative cardiac arrhythmias of any kind, which necessitated therapeutic intervention [12–18]. Wound healing complications were defined as superficial or deep wound dehiscence or infection at the sternum and/or wound dehiscence or infection at the saphenectomy sites.

2.1. Statistics

To analyze the dependencies between the respective wards and several variables, Student’s t-test for unpaired samples was used for patient age, χ²-test for sex, diagnosis, operation type, and incidence of wound healing complications. The χ²-test was used to detect differences in distribution of risk factors in respect to patient’s sex and postoperative wards; the Mann–Whitney U-test was utilized to detect influences of risk factors and age on postoperative stay. A case number estimation was performed for the survival analysis. The length of postoperative stay was investigated by Kaplan–Meier survival analysis and Log–Rank test in relationship to postoperative wards. Continuous variables are presented as mean ± standard deviation; all statistic analyses were performed by SPSS for Windows (Version 8.0, SPSS Inc., Chicago, USA).

<table>
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<th>CABG</th>
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<td>5</td>
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* AVR, aortic valve replacement; MVR, mitral valve replacement; CABG, coronary artery bypass grafting.
3. Results

3.1. Results of all patients

A total of 189 patients were operated. The mean patient age was 63.8 ± 9.6 years with a mean age of males of 61.9 ± 9.9 years and 67.8 ± 7.5 of females, which differed significantly ($P = 0.02$). Ages of all patients together with an underlying Gauss’ curve of normal distribution are depicted in Fig. 1. Table 1 shows the various operations performed in total and broken down according to patient sex. Number and operations were not statistically significant between male and female patients; surgical teams were allocated randomly to different operations and patients. Twenty-two patients (12%) had no risk factors, 53 (28%) had one risk factor, 66 patients (35%) had two risk factors, 41 (21%) had three and seven (4%) patients had four or more risk factors. Obesity was statistically significant; more frequent than in male patients (26% vs. 14%, $P = 0.04$), the opposite was true in regard to nicotine abuse (1.6% vs. 20%, $P = 0.0001$). All other risk factors did not vary significantly between male and female patients. There was no intraoperative mortality. The median postoperative ICU stay of the patients was 2 days (0–28 days, mean 2.5 ± 2.3 days). Distribution of sex was not statistically significant different between patients with a postoperative stay longer or shorter than the median; risk factors had also no significant influence on the length of the ICU stay. 3 patients died during the ICU stay, accounting for an overall perioperative mortality of 1.5%.

Median post-ICU stay was 11 days (0–41 days, mean 12.7 ± 7.3 days) which summarized with the ICU stay to an overall median postoperative stay of 13 days (0–44 days, mean 15.2 ± 7.9). Post-ICU stay is graphically depicted in Fig. 2. Post-ICU stay did not depend on patient age and sex and all but three risk factors: Patients having diabetes ($n = 49$, $P = 0.01$) or peripheral arterial occlusive disease ($n = 15$, $P = 0.04$) had a significantly longer, patients with a history of nicotine abuse ($n = 41$, $P = 0.02$) had a significantly shorter post-ICU stay. Postoperative arrhythmias, which necessitated therapeutic intervention were apparent in 39% ($n = 73$) of the patients. As there was no death during the post-ICU stay, the overall hospital mortality of our patients remained at 1.5%.

Twenty-nine patients (15%) developed wound-healing problems. None of these led to a lethal complication, however this complication significantly ($P = 0.004$) prolonged the postoperative patient stay. Only diabetes had a significant ($P = 0.04$) influence on wound problems, meaning a higher incidence, whereas no other risk factors were associated with an increased rate of healing complications. After dismissal, no patient had to be readmitted due to surgical problems.

3.2. Results of patients by wards

Ward distribution of the 186 patients, transferred from the ICU is listed in Table 2. Eighty-four patients were transferred to the surgical ward, whereas 102 patients were dispensed between the various medical wards. In all wards, preceding median ICU stay of it’s patients was 2 days and thus not statistically different. Distribution of age and sex of patients was also not statistically different, nor were the diagnoses. Patients with PTCA during the same admission were significantly more frequent at the medical wards, the presence of other risk factors was randomly distributed between the wards. Patients, whose ICU stay exceeded the median of 2 days, were equally distributed among the wards and not different concerning their post-ICU location.

The median post-ICU stay of patients at the surgical ward was 9 days (4–39 days, mean 10.5 ± 6.1 days), whereas at the medical wards the median stay was 13 days (5–41 days, mean 14.5 ± 7.8 days). This difference was statistically highly significant ($P < 0.0001$) and is depicted in the Kaplan–Meier analysis in Fig. 3. The post-ICU patient stay was not different within the medical wards itself.

Patients having one or more risk factors for wound-healing problems were equally distributed among the wards,
Fig. 3. Post intensive care stay of cardiac surgical patients divided in surgical and medical wards. Median stay was 9 days at the surgical ward and 13 days at the medical wards.

However the number of real wound healing problems was higher at the medical wards (Fig. 4). Although having a ratio of 1.1:1 (82:75 patients) between medical and surgical wards for patients without healing complications, we found a complication ratio of 2.2:1 (20:9 patients). This resulted in a healing complication rate of 20% at the medical wards, compared to an incidence of 11% at the surgical ward, however this difference did not reach significance level ($P = 0.07$).

If all patients who actually developed a wound healing complication, were excluded from the comparison concerning the post-ICU stay, the median stay was still 9 days at the surgical and 13 days at the medical wards, only the means and ranges changed to 9.1 ± 6.9 (4–33 days) for the surgical ward and 12.6 ± 7.1 (5–39 days) for the medical, which was still significantly different ($P = 0.002$).

4. Discussion

The main result of our study is that patients after cardiac surgical operations treated at the general ward by non-cardiac surgeons have a significantly longer postoperative stay than those treated by cardiac surgeons.

However before discussing this result and possible consequences, it must be proved that this comparison is statistically correct. One major precondition therefore is an equal distribution of the investigated patients. The composition of our patient group is comparable to those of other cardiac surgical centers [19]. With more than 70%, the main diagnosis was coronary artery disease, more than two-thirds of the patients had one or more risk factors, and the patient age was normally distributed. There were more male than female patients, but women were statistically older than men at the time of the operation, a fact that is also known [20] and comparable to other centers. With the exception, that women were more often obese, whereas nicotine abuse was more frequent in men, no sex-related differences could be found concerning kinds of operation, risk factors, ICU-stay, post ICU-stay and incidence of wound healing complications. The fact that patients with diabetes and peripheral arterial occlusive disease showed a longer post-ICU stay is explainable, as both diseases were shown to have an influence on postoperative morbidity [12], which is also true for wound healing complications [12,21]. The reason for the shorter stay of patients with nicotine abuse is initially surprising, however those patients were generally younger and age is also known to influence postoperative hospital stay [8,22]. All patient groups mentioned were equally distributed among the wards and all other patient characteristics showed also no discrepancy between the wards. Median ICU stay was identical, and patients whose ICU stay exceeded the median were equally distributed to the wards. This shows, that ICU courses of the patients were comparable and patient’s illness therefore must have been of similar severity. Comparable ICU-stays are also the answer when addressing surgical skills: whereas the patients were adequately randomized between wards, all cardiac surgeons come from one center; patients can therefore not be considered to be an random sample for all surgeons. However, surgical skills and techniques affect the ICU-stay more than the post-ICU stay, so we can assume comparable surgical skills in both groups. With regards to healing complication, surgical skills clearly may influence the post ICU-stay too, as those complications among other things depend on the technique of wound closure. This is mostly done by younger surgeons-in-training and thus can affect the infection rate and the hospital stay. However as surgical teams varied between all patients and wards, this possible difference should tend to level out.

In general, we thus can state, that patient groups at the surgical and the medical wards were comparable.

Up to now, the investigation is justified and the analyses should be correct, however this does not explain the results.

Early dismissal after cardiac surgery is not harmful to the patients, as results in the US show [3,8,9,12,14,17,20]. In these reports patients were discharged even earlier, although this is not recommended for all patients [23]. As patient groups in this study were comparable, any resulting differences must be caused by the treating staff itself. A possible explanation might be less experience of physicians at the medical wards with postoperative cardiac surgical patients. Table 1 shows that during the study period, between 12 and 29 patients were at the medical wards, whereas 84 were treated at the surgical wards. However, our clinic has been running this concept for several years, which implies that...
there is a constant cardiac surgical patient flow at the medical wards too. This should have enabled the treating physicians to gain experience with those patients even if the absolute number is lower. Less experience is thus not the primary reason concerning patient stay, but may be the key concerning the higher incidence of healing complications at the medical wards. As only a small portion of the patients develop healing complications, this number of patients must clearly be less frequent at a ward with less cardiac surgical patients. Having more experience means to recognize an imminent complication earlier, which in turn often enables preventing it by simple means, e.g. antimicrobial wound dressing for an inflamed skin incision can prevent a pronounced wound infection. This kind of experience is surely less at non-surgical wards, the same is true for the awareness of the possibility of wound infection generally.

Third, but coherent to the latter, may be less interest of medical physicians to care for surgical wounds, as long as they are dressed properly. When the wound dressing gets wet from puriform fluid, the healing complication becomes apparent, however by then it is too late for prevention. A third reason could be the patient and accordingly the disease composition at medical wards. Although in all wards patients with infected wounds are separated from preoperative and non-infected postoperative patients, patients at the medical wards may get into contact with patients easier who are seen as impure from a surgical point of view, e.g. patients scheduled for a coloscopy. However, all these theories concerning the wound healing complications are speculative and one might not forget that the difference in incidence did not reach statistical significance.

Nevertheless, concerning hospital stay contact of surgical to non-surgical patients may basically not be neglected. Elderly patients, hospitalized on a general medical ward were found to have a significant number of iatrogenic illnesses, especially when they were taking several medications [24]. This phenomenon comes into effect mainly in medical patients, but may be adapted in surgical patients by transference. It may also arise out of it’s own in our patients. The risk for this effect to come true, increases with every day of hospitalization and is thus a vicious circle.

With regards to psychological effects one should also stress the characters of surgeons and medical doctors. Generally surgeons are told to have a more brisk and aggressive personality, which may result in a different attitude towards patient treatment. In other words earlier dismissal is the result of being less cautious and retentive. This attitude is further intensified by the need to have free beds available for newly admitted or ICU-discharged patients, the awareness of the length of the patient waiting list and last but not least the surgeons intention to operate more.

The post-hospital outcome of our patients at the medical wards was not worse than at the surgical ward, which corresponds to the literature where it has been shown, that early transfer to smaller, non-specialized hospitals is not harmful for the patients [25]; nevertheless total hospital stay after coronary surgery in this mentioned study was higher than the average.

All these considerations confirm the general trend in medicine towards a specialization during the last decades to be the right way. Specialization should not only take
place in the operating room or the ICU, but at the general wards as well, because there is also the potential to save time and money. The median stay of patients at the medical wards was 4 days longer than at the surgical ward, the costs for these patients were therefore higher for 4 days. Especially in countries where reimbursement is based on diagnosis-related groups [26] such a difference in costs should not be neglected by the hospitals administration.

However, we are not of the opinion, that only cardiac surgeons are able to handle cardiac surgical patients. The cautious and careful medical physicians behavior and their knowledge, combined with the more aggressive thinking of the surgeon may be an even better way towards optimal patient care and handling. As we could show, this is definitely superior to patient care by non-specialists and may also be superior to patient care by cardiac surgeons alone. It remains clear however, that the presence of cardiac surgeons has distinct advantages.

References