EDITORIAL COMMENT

Early Discharge After Acute Myocardial Infarction: Who and When?*

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In recent decades, we have witnessed dramatic reductions in the mortality risk of acute myocardial infarction and, at the same time, concerted and fruitful efforts to reduce length of stay. In this issue, Senaratne et al. report the results of an expanded strategy of early discharge, which included most patients admitted to the Coronary/Intermediate Care Unit (CICU) of the Grey Nuns Hospital in Edmonton, Canada in 1995 and 1996 (1). Patients received usual medical care in the CICU, but instead of being transferred to a general medical unit when "stable," eligible patients remained in the CICU for a program of early ambulation, education and direct discharge. Stable patients were allowed to walk in their rooms on hospital day two, encouraged to walk around the CICU on day three and underwent low level exercise testing on day four. In all, 414 of 479 patients (83%) were discharged home from the CICU with a median length of stay of 4 days. The remaining 65 patients either died in the CICU or were transferred to other hospital units for extended care. For the entire cohort of 479 patients, the mean length of stay was 5.6 days. What is known about the safety of early discharge following acute myocardial infarction, and how do the observations made by Senaratne and his colleagues fit in?

In the era of reperfusion therapy for acute myocardial infarction, efforts to reduce length of stay began when Eric Topol and his colleagues at the University of Michigan randomly assigned 80 patients with uncomplicated hospital courses and no evidence of ischemia on a low level exercise test performed on day three to discharge later on day three or usual care (2). At 30 days, there were no deaths or reinfarctions in the group assigned to early discharge. Among those assigned to standard care, which usually amounted to an additional five days in hospital, three patients sustained reinfarction (p = NS). It is of note that there were no adverse psychosocial consequences of early discharge.

At about the same time, Sanz et al. conducted a feasibility study of early discharge in 358 patients with Q-wave myocardial infarction who were not treated with thrombolytic therapy or primary angioplasty (3). On hospital day four, 105 of these patients were free of heart failure, recurrent ischemia or serious arrhythmias. Although considered eligible for early discharge, these patients remained in the hospital for another 12 days, during which time there were four deaths, one reinfarction, one serious arrhythmia, one case of new onset congestive heart failure and eight cases of recurrent chest pain. Multivariate analysis demonstrated significant associations between age, diabetes and ejection fraction less than 40% and these complications. In a subsequent validation study, 67 of 122 patients with Q-wave infarction not treated with reperfusion therapy were clinically stable on hospital day four, and 18 of these patients were still classified as low risk after adjustment for age, diabetes, and ejection fraction <40%. One of these patients (5.6%) developed unstable angina over the ensuing week; there were no deaths.

In 1994, Parsons et al. reported the results of a retrospective analysis of the clinical, electrocardiographic and enzymatic correlates of death in patients aged <65 with acute myocardial infarction (4). Among those aged <60 without previous history of myocardial infarction, diabetes, admission heart rate <100, or significant Q waves on the admission electrocardiogram, a subgroup comprising about one third of the 6,746 patients in this large study, the mortality rate at 30 days was a mere 0.8%. Although congestive heart failure was not always factored directly into the analysis, related variables, such as heart rate and creatine kinase levels, were.

In a study that addresses the risk of early discharge more directly, Wilkinson et al. analyzed the risk of major adverse cardiac events (death, recurrent infarction, unstable angina or ventricular fibrillation) occurring in 412 consecutive patients with acute myocardial infarction but no clinical evidence of heart failure (5). These patients accounted for about 72% of all myocardial infarctions treated at a general hospital, and most patients received thrombolytic therapy. The estimated incidence of major adverse cardiac events was 5.9/1000 on hospital day 6, 3.4/1000 on day 10, and 0.9/1000 on day 21. The investigators estimated 3 deaths and 3 reinfarctions per 1,000 patients without heart failure between days 5 and 7. Because the study was retrospective, it is not known whether these adverse outcomes were preventable.

Newby et al. subsequently reported the incidence of major adverse events among patients in GUSTO I who survived the first four days of hospitalization without heart failure, recurrent ischemia, defibrillation, cardioversion or revascu-
lization (6). There were 23,497 patients, about 57% of the total patient population, who met this definition of uncomplicated myocardial infarction. The in-hospital rate of reinfarction (i.e., between day four and discharge) was 1.7%, and the 30 day mortality rate was 1.0%. If discharged on day three, this group would have had a reinfarction rate of 2.4% and a mortality rate of 1.2%. If discharged on day five, the figures would have been 1.3% and 0.9%. Quantitatively similar results were reported from TAMI 1-3 (7).

Finally, Grines et al. reported the results of a randomized clinical trial of transfer to a stepdown unit followed by discharge on day four versus standard care in 471 patients who had undergone successful primary angioplasty (8). Eligible patients were aged <70 years, had single or double vessel coronary disease, ejection fraction >45% and no serious arrhythmias. At six months, death or reinfarction had occurred in 1.7% of accelerated care patients and 0.9% of standard care patients (p = NS).

Most of the complications of acute myocardial infarction occur in the first few days. Simple clinical variables, particularly the absence of heart failure, recurrent ischemia or serious arrhythmias, can be used to define a low risk population. Given the lack of published data demonstrating the safety of early discharge in the elderly, and given their higher complication rate, it may be appropriate to modify plans for early discharge before applying them to the elderly, but the literature does not clearly define either “elderly” or the modifications that would be appropriate for this group. Measurements of left ventricular function, low level predischarge stress testing, and coronary arteriography may be used to refine risk stratification, but the cost effectiveness of these approaches is not well characterized. In particular, it should be noted that reinfarction and death, the complications of primary interest, may occur in the first week or two after myocardial infarction despite efforts to define left ventricular function and ischemic potential. Reinfarction remains a largely unpredictable event (9), and a substantial percentage of deaths occurring in otherwise uncomplicated patients in the first week after myocardial infarction are due to left ventricular free wall rupture (10).

In the present study, Senaratne et al. conclude that direct discharge from the CICU is “a feasible and safe strategy for the majority of patients.” In evaluating this approach, it is useful to break the strategy down into two components and analyze each separately. The first of these is a program of early ambulation, the second an extension of criteria used to define a population of patients suitable for early discharge.

Of early ambulation in the CICU, the authors state that “very little was done while on the medical ward which could not be achieved in an accelerated fashion within the [coronary care unit].” This statement is indisputable, but intensive care units are both labor and capital intensive, and with proper staffing it may be possible to achieve the same result for less money by combining one to three days in the coronary care unit with one to three days in a stepdown or telemetry unit. Thus, the location where this approach is applied, which is fundamentally an administrative decision, seems less important than the approach itself. As for the approach, the authors stated only that all patients were “mobilized in an accelerated fashion based on their clinical condition and physical mobility.”

As many as 30% of patients with acute myocardial infarction will experience some heart failure in the first four days after myocardial infarction (5), and 40 to 50% will experience heart failure, serious arrhythmias or recurrent ischemia (6). Because 83% of patients in the present study were discharged directly from the coronary care unit, it would seem that patients with refractory heart failure, arrhythmias or ischemia were excluded, whereas those whose complications responded to initial therapy were enrolled in the program of accelerated ambulation and early discharge.

The results constitute a cautionary tale. At six weeks, the mortality rate was 2.7%, with two of these deaths occurring within 48 hours of discharge. The authors assert that “this [mortality rate] cannot be considered excessive,” but in the absence of evidence that these deaths were unrepeateable, a mortality rate of 2.7% at six weeks in a low risk group should be considered excessive. This mortality rate compares to a mortality rate of 1% between days 4 and 30 in over 23,000 low risk patients from GUSTO I (6) and a 30 day mortality rate of 0.8% in over 2,000 low-risk patients in the study by Parsons et al. (4). Senaratne et al. do not report the reinfarction rate, but they do tell us that unscheduled return visits occurred in 4% by 48 hours and in 28% by 6 weeks. In total, 8% of the early discharge patients were readmitted to the hospital within 6 weeks. Unscheduled return visits were not associated with congestive heart failure or recurrent ischemia during the hospital phase, but this observation seems most likely due to a lack of power, because other, larger studies have consistently identified heart failure and recurrent ischemia as powerful predictors of late complications. In GUSTO I, for example, patients with complications in the first four days had a mortality rate of 8.9% between days 4 and 30, and the in-hospital reinfarction rates were 2.2 and 1.7%, respectively, for patients with and without complications in the first four days (6).

Judging the safety of any treatment strategy is often a complex matter, influenced as much by tradition as by reason. In the absence of data from randomized clinical trials that demonstrate that certain deaths and reinfarctions occurring in the first week or two after myocardial infarction are unpreventable, patients with heart failure, serious arrhythmias or recurrent ischemia occurring in the first three or four days after admission should not be considered low-risk, even if they respond to initial therapy. Such patients should not be considered suitable for early discharge unless definitive therapy (e.g., angioplasty for recurrent ischemia) has been applied. Patients without early complications are indeed at low risk, and it is reasonable to discharge most of them, especially those who are younger and those who have good social support, on or even before...
day five (i.e., four or even three days in the hospital). Noninvasive testing to characterize left ventricular function and the potential for recurrent ischemia, performed while the patient is still in the hospital, can refine risk stratification. The former seems particularly important when increased heart rate, serial electrocardiograms, or enzyme measurements indicate a relatively large infarct in an otherwise stable patient; the latter seems so on general principle. It behooves us as stewards of patient welfare to demonstrate that a patient whose coronary anatomy is unknown can safely perform activities appropriate for the first week or two at home. In addition, to the greatest extent possible, patients going home early should be discharged on beta-blockers. Ultimately, however, decisions should be individualized, and social as well as clinical conditions should be factored into the timing of discharge.

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