

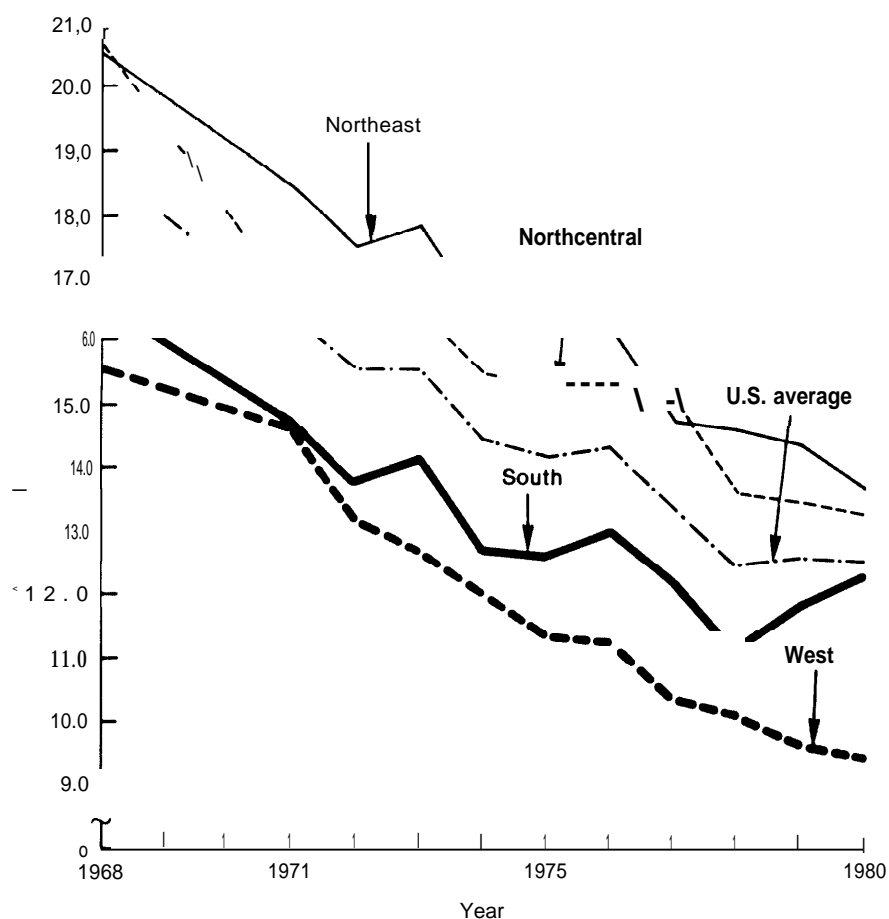
# **Length of Stay and Outcome: Myocardial Infarction**

## Length of Stay and Outcome: Myocardial Infarction

Myocardial infarction (MI) is the clinical condition most often studied in the attempt to find a relationship between length of stay (LOS) and health outcome. These studies are reviewed in depth in appendix A and are summarized here. Virtually all physicians prescribed prolonged bed rest (usually 6 to 8 weeks) for patients with MIs through the 1940's (109,112,123,179). By the early 1950's, a few centers were trying earlier ambulation and discharge (8,10,27,43,70,90,107,108).

Beginning in the 1960's and accelerating into the 1970's, increasing numbers of research studies of early ambulation for MI patients were published. Associated with the appearance of these studies has been a rapid decline in the United States LOS for MI patients. Figure 3 describes the extent of this decrease by region since 1968. Over the 12 years prior to 1980, LOS for MI patients in the United States fell by 33 percent, compared with 14 percent for LOS for all patients.

**Figure 3.—Regional Trends in Length of Stay for Myocardial Infarction**



SOURCE *Vital and Health Statistics*, series 13, Nos 2, 10, 14, 17, 19, 23, 26, 31, 41, 46, 55, 60, 64 (Washington, D.C.: National Center for Health Statistics, 1967-82)

The literature contains three different kinds of studies. The first group comprises studies that analyzed clinical data retrospectively trying to explain variations in treatment practices or to identify characteristics of low-risk MI patients who might be candidates for early discharge. Studies in the second group reported the effects of early ambulation and discharge programs for MI patients without providing any control data. Studies in the third group provided control data, including some that were randomized clinical trials (RCTs). The data provided by each of these groups of studies are summarized in turn, focusing on the third group. They are reviewed in detail in appendix A.

Several studies have attempted to examine variations in individual physician practices with respect to LOS for MI patients (46,76,137,147,177) with no conclusive results aside from demonstrating large variations in LOS among physicians. Another series of studies has attempted to define criteria that would identify low-risk MI patients (111,117,158,163,165,182,183). Of all these sets of criteria, the one most often studied is the one developed by McNeer and colleagues at Duke University. They first observed in 1975 (117) in an analysis of 522 consecutive patients with documented MIs, that patients who had suffered a serious complication *after* the first 4 hospital days also had had one *during* the first 4 days. The complications identified as serious were: death, ventricular fibrillation or tachycardia, second or third degree AV block, pulmonary edema, cardiogenic shock, persistent sinus tachycardia or hypotension, atrial flutter or fibrillation, and extension of infarct. They also found that of the patients without complications in the first 4 days, there was no in-hospital mortality during an average LOS of 17 days. The 6-month mortality was 8 percent. This compared with an in-hospital mortality of 14 percent and a cumulative 6-month mortality of 19 percent in the complication group. In their original series, patients with uncomplicated MIs made up 51 percent of the total MI population.

The Duke criteria have been replicated in three retrospective studies with similar results (158,165, 183). However, one cannot conclude from these

studies that patients without complications in the first 4 hospital days following an MI can be safely discharged after that time. All of the studies thus far mentioned were retrospective; no attempt was made to actually discharge the low-risk patients earlier than their physicians at the time thought appropriate. It is entirely possible, then, that earlier ambulation in preparation for earlier discharge would have proved harmful. The fact that all of these studies used almost identical criteria and found similar results lends added weight to the potential reliability and validity of these criteria as predictors of good prognosis and, therefore, of candidates for early discharge. Better data are needed, however, in order to establish this proposition conclusively.

Eight studies report results from uncontrolled attempts to mobilize and discharge uncomplicated MI patients early (2,22,26,27,35,53,173,174). It is difficult to draw definitive conclusions from these studies. First, none of them was performed in the United States. Second, the studies excluded significant, but varying portions of the population. Four excluded women, and two excluded the elderly. Third, the definitions of early ambulation and discharge varied among the different studies. But the most serious difficulty with these studies is the absence of any comparison data. Without carefully selected control groups, one does not know whether the patients who ambulated and left the hospital early would have done better or worse if treated for a longer time in the hospital.

Of those studies that have provided data from control groups, five reported results for controls selected in ways other than by random assignment (21,66,69,102,116). All of these studies developed protocols for identifying and discharging early low-risk patients with uncomplicated MIs. Their methods of selecting controls, however, prevents one from concluding that the differences they report between study and control patients are due solely to the early discharge program. One (66) allocated patients to study and control groups based on which of two physicians cared for the patients. One (69) allocated patients according to which of two hospitals was the site of treatment. A third (21) compared patients who left within

10 days to those who remained after that time. The fourth study (102) is unclear about how its controls were selected.

The fifth study (116) in this group is a prospective study conducted by McNeer and colleagues to test the Duke criteria. Using these criteria, the authors identified 67 of 158 consecutive patients with MIs as candidates for early discharge. Only 33 were actually discharged early (at 1 week), because most of the remaining patients did not have a home environment suitable for the planned intensive followup care. There were no deaths in either subgroup of patients at 6 months following discharge. There were five nonfatal complications at 6 months in the early subgroup and nine in the late.

This study and its accompanying editorial generated some lively correspondence (125,149). Many writers were concerned that the lack of randomly chosen control patients may have resulted in a control group that was different in subtle ways from the study group. Perhaps the less optimal home environments of the patients discharged late somehow contributed to their somewhat higher rate of nonfatal complications. Only a true RCT is capable of laying this kind of argument to rest.

Five RCTs have been reported that attempt to assess the health consequences of discharging low-risk MI patients early (5,17,71,86, 118). Two are so methodologically flawed that their results cannot be interpreted with a satisfactory degree of reliability (5,71). The three remaining studies merit close scrutiny. In the earliest one, Hutter and his colleagues (86) compared 2 weeks of hospital care with 3 weeks in the treatment of patients with uncomplicated MIs. Their criteria for an uncomplicated MI were quite strict, and only 17 percent of patients assessed for possible inclusion in the study were actually included. At 6 months following discharge, 4 percent of the patients discharged at 2 weeks were dead compared with 7 percent of those discharged at 3 weeks.

The other two RCTs, one from Scotland (118) and one from Switzerland (17), used similar protocols and studied the difference between 3- and

4-week hospitalizations for patients with uncomplicated MIs. They excluded patients over 70 in addition to those with complicated MIs, but 69 and 80 percent of patients assessed were actually included in the study. In the Scottish study, 11 percent of patients discharged at 3 weeks had died by the end of the 12-month followup period as opposed to 15 percent of the 4-week group. In the Swiss study, 6 percent of the early group had died by the end of an 11-month followup period compared with 10 percent of the late group. None of the differences between the early and late patient groups in any of these three RCTs was statistically significant at the 5-percent level.

Constructing 95-percent confidence intervals for the difference in mortality between the early and late groups in each of these three studies is very informative. In the first study, the findings are compatible with differences ranging from 11 percent in favor of the early group to 5 percent in favor of the late group. In the second study, the data vary from 9 percent in favor of the early group to 2 percent in favor of the late group. And the third study varies from 13 percent in favor of the early group to 5 percent in favor of the late group. Because zero is included in all of these confidence intervals, the findings of these studies—that slightly fewer patients in the early group died—does not attain statistical significance.

The principal conclusion that one may draw from these studies is that early discharge of patients with uncomplicated MIs, as defined in the studies, is unlikely to pose a major health hazard. It may carry with it a significant benefit, about a 10-percent decrease in mortality. But it may also carry with it a small adverse outcome, about a 5-percent increase in mortality. The studies do not rule out the possibility of a negative impact on health. Studies of much larger sample size would be required in order to settle the question definitively. Finally, with respect to the Medicare program, it is important to recall that since two of the three rigorous RCTs excluded patients over 70, there is a special dearth of data from which to draw any informed conclusions concerning the elderly and early discharge for MI patients.