CHAPTER SIX:
SELECTION AND INCLUSION OF HOSPITALS

Certain hospitals may not be directly comparable with the great majority of hospitals caring for AMI patients in California. For example, non-acute care hospitals are not organized and staffed to treat patients with acute conditions. Any AMI records from such hospitals are probably either miscoded or represent atypical patients. In addition, the data received from several acute care hospitals had important limitations that precluded evaluating these facilities in 1995. This chapter describes the universe of hospitals eligible for study and the specific criteria used to exclude eligible hospitals.

HOSPITALS ELIGIBLE FOR STUDY

The original study sample for the California Hospital Outcomes Project included cases from all non-federal acute care hospitals in California, as noted in Chapter Three. Hospitals operated by the US Department of Veterans Affairs or Department of Defense do not report data to OSHPD and therefore could not be included.

Many hospitals provide more than one type of care (e.g., acute care plus skilled nursing care or rehabilitation). Before January 1, 1995, these hospitals were encouraged but not required to submit separate bundles of abstracts, or reports, from each type of care. If a hospital failed to distinguish its acute care abstracts from its other abstracts, OSHPD assigned the same "type of care" to every discharge abstract from that hospital. (Beginning January 1, 1995, hospitals are required to distinguish the type of care on the discharge abstract.) This assignment was based on the types of licensed units at the hospital and the proportion of records that fell into each Major Diagnostic Category. In 1990, 37% of hospitals with psychiatric units, 59% of hospitals with rehabilitation units, and 40% of hospitals with skilled nursing or intermediate care units did not submit separate reports to OSHPD.[1] Cases from these units might have been included in the California Hospital Outcomes Project, whereas they would have been excluded if the type of care had been reported correctly. Some skilled nursing or rehabilitation patients experience AMIs and are not transferred to acute care (by prior agreement). As a result, the AMI outcome statistics may be misleading for

[1] E Meux, written communication.

hospitals that provide multiple levels of care but fail to submit separate bundles of abstracts from each level.

Although hospitals devote considerable effort to producing accurate discharge abstracts, the guidelines that professional coders follow when they abstract medical records are sometimes ambiguous and subject to multiple interpretations. Hospitals also face financial incentives that affect how diagnoses are coded, particularly for Medicare beneficiaries. As a result, different hospitals may code the same record in different ways. This is an important problem. Hospitals may appear to have better or worse risk-adjusted outcomes than comparable facilities if they fail to list all relevant diagnoses on their discharge abstracts or if they use vague diagnoses when more specific diagnoses are appropriate.

To make outcome comparisons across hospitals as fair as possible, facilities with two unusual patterns of data were excluded. The most common pattern was a surprisingly low proportion of patients with a common risk factor, such as diabetes. The other pattern was a surprisingly high proportion of patients with an uncommon or unduly vague risk factor, such as unspecified infarct site.

Without reviewing individual medical records at excluded hospitals, it was impossible to tell whether these data were incorrect or simply reflected an unusual patient population or an unusual practice pattern. Written comments submitted by several hospitals that were excluded from the 1993 analyses, and a subsequent survey of these excluded hospitals, support both explanations. As more is learned about why certain hospitals have unusual patterns of data, it may be possible to include them in future studies.

Missing Transfers To Other Hospitals

As noted in Chapter Five, the outcome of interest for AMI cases was in-hospital 30-day mortality. This was defined in terms of whether the patient ultimately left a hospital alive, even if the patient was transferred one or more times after the original admission. As a result, linkage of serial hospitalizations was quite important for the analysis. If a hospital reported that it discharged a patient to another hospital but no subsequent record could be located in the data base, that patient's true outcome was unknown. A large number of missing records for post-transfer hospitalizations could artificially reduce a facility's mortality rate simply because some of those subsequent hospitalizations might have ended in death. An attempt was made to minimize this problem by using variables in addition to the social security number to facilitate record linkage, as described in Chapter Four. Nonetheless, 23.3% of all subsequent hospitalizations that were suspected to have occurred, based on reported discharge dispositons, could not be found.

There are several possible explanations for the failure to find these subsequent hospitalizations: (1) a patient may have been transferred during the study period (i.e., before May 31, 1992), but his or her subsequent discharge may have occurred after the end of that semi-annual reporting period (i.e., after June 30, 1992); (2) a patient may have been transferred from a non-federal hospital to a Department of Defense or Veterans' Affairs medical center that does not report data to OSHPD; (3) a patient may have been transferred from a California hospital to an out-of-state hospital that does not report data to OSHPD; (4) an unstable patient may have been emergently transferred to another hospital before identifying information could be obtained, or the patient may have died *en route*; (5) the initial discharge disposition should have been coded as SNF, ICF, or other facility rather than as acute hospital; (6) the patient was never admitted to the receiving facility because he or she refused admission or required only outpatient treatment; (7) data elements used for linkage were missing or incorrect on one or both records (e.g., social security number, date of birth, gender, zip code). A series of exploratory analyses performed in 1993 revealed that the last of these explanations is probably the most important statewide, although other explanations may be more important at individual hospitals.

To minimize potential bias due to missing data, hospitals were excluded if 20% or more of their AMI cases had a reported disposition of acute care hospital but a subsequent hospitalization could not be identified. This was done out of concern that the available data for these hospitals might significantly misrepresent their actual in-hospital 30-day mortality rate. This rule excluded 16 hospitals (Table 6.1) with a total of 632 cases. Of note, 10 of these 16 hospitals are in border areas of California. These rural hospitals may appropriately send patients to referral centers in nearby areas of Oregon, Nevada, or Arizona.

Possible Miscoding of Risk Factors

The prevalence of various AMI risk factors across hospitals was extremely variable. Some hospitals reported far fewer cases with associated conditions than would be expected based on their statewide prevalence and the total sample size from those hospitals. If this variability reflects unusual documentation practices by physicians or coding practices by medical records personnel, it could seriously bias comparisons of outcomes across hospitals.

To avoid this problem, hospitals with the most unusual data related to important patient risk factors were excluded. The exclusions were applied to all linked records in a treatment sequence as described in Chapter Four. The criteria listed below were derived after reviewing the prevalence of every risk factor across hospitals, and considering possible reasons for excess variability. For example, the proportion of AMI patients with a history of

coronary bypass surgery could vary widely because some hospitals specialize in treating complex patients. On the other hand, conditions such as hypertension and diabetes should be distributed more evenly across hospitals, controlling for age.

There are two basic ways to identify hospitals with unusual patterns of data. First, a fixed cutoff could be applied based on clinical considerations or face validity; all hospitals at which the reported prevalence of a risk factor is below (or above) that level would be excluded. Second, a probability cutoff could be applied, based on the statistical significance of the difference in the reported prevalence of a risk factor between one hospital and the statewide average. All hospitals at which the true prevalence of a risk factor is extremely unlikely to be the same as the statewide average would be excluded. To minimize the number of excluded hospitals, a set of criteria were developed that included both fixed and probability cutoffs.

The probability cutoffs were designed so there would be only a 5% chance of excluding one or more hospitals statewide, under the assumption that all hospitals had the same true prevalence of the risk factors of interest. This procedure is known as a correction for multiple comparisons. Because 417 California hospitals admitted AMI patients during the 1991-92 study period (after excluding 16 hospitals with high proportions of missing transfers), the probability that a particular hospital was excluded based on its reporting of key covariates was much smaller than the 5% chance that one or more hospitals statewide was excluded. Specifically, the exact probability that a particular hospital exceeded any of the four probability cutoffs by chance, using a one-tailed test, was $p < 0.00003075$ (or approximately 3 in 100,000).

Probability cutoffs help identify hospitals where the prevalence of a risk factor is very significantly different from the statewide average, in a statistical sense. However, they do not address the plausibility of such differences. For this reason, fixed cutoffs also were established for most of the variables involved in the exclusion process. Hospitals were excluded only if they exceeded **both** the probability cutoff and the fixed prevalence cutoff. These prevalence cutoffs represent the limits of clinical plausibility, based on literature review and discussion with specialists in the field.

Risk Factor	Direction	Cutoff	State Prevalence
Subendocardial site	undercoded	10.0%	30.3%
Hypertension	undercoded	10.0%	34.0%
Other/unspecified site	overcoded	25.0%	8.8%
Congestive heart failure	undercoded	15.0%	31.1%

Summary

One hospital, the Medical Center of the University of California, San Francisco, was excluded from the AMI analysis because of an error in the transmission of its hospital discharge data to OSHPD. This error has now been corrected and UCSF will be included in future reports.

The combined effect of these criteria was to exclude 35 of the 433 hospitals that admitted AMI patients during the study period. As a result, 3,424 cases were excluded from a total of 71,436. Table 6.1 lists the hospitals excluded from the AMI models.

Table 6.1: Hospitals excluded from AMI models			
Hospital	*County*	*Cases*	*Reason*
Feather River Hospital	Butte	190	4
Brookside Hospital	Contra Costa	243	4
Sutter Coast Hospital	Del Norte	120	1
Barton Memorial Hospital	El Dorado	151	1
Coalinga Regional Medical Center	Fresno	15	4
Selma District Hospital	Fresno	86	4
Glenn General Hospital	Glenn	28	4
Southern Inyo Hospital	Inyo	5	1
East Los Angeles Doctors Hospital	Los Angeles	37	4
L.A. Co Harbor/UCLA Medical Center	Los Angeles	199	2, 4
John C. Fremont Hospital	Mariposa	9	1
Modoc Medical Center	Modoc	6	1
Tahoe Forest Hospital	Nevada	76	1
Buena Park Doctors Hospital	Orange	9	1
Eastern Plumas District Hospital	Plumas	12	1
Plumas District Hospital	Plumas	21	1
Seneca Hospital	Plumas	10	1
Lakeside Hospital	Riverside	13	1
Palo Verde Hospital	Riverside	5	1
Riverside General Hospital - University Medical Center	Riverside	81	2
Loma Linda University Medical Center	San Bernardino	212	4
Needles Desert Communities Hospital	San Bernardino	51	1
San Bernardino County Medical Center	San Bernardino	96	4
Coronado Hospital	San Diego	84	1
San Diego General Hospital	San Diego	5	1
Sharp Chula Vista Medical Center	San Diego	198	3
Villa View Community Hospital	San Diego	29	2
Chinese Hospital	San Francisco	73	2, 4
Medical Center At U.C.S.F.	San Francisco	218	4, 6
St. Francis Memorial Hospital	San Francisco	202	2
St. Luke's Hospital	San Francisco	206	4
Good Samaritan Hospital Of Santa Clara	Santa Clara	352	5
Redding Medical Center	Shasta	302	3
Siskiyou General Hospital	Siskiyou	55	1
Trinity General Hospital	Trinity	25	4

Reason for Exclusion

1 At least >=20% of cases had unresolved transfers.
2 Subendocardial site of infarction possibly undercoded.
3 Hypertension possibly undercoded.
4 Other or unspecified site of infarction possibly overcoded.
5 Congestive heart failure possibly undercoded.
6 First secondary diagnosis not reported.