Cardiac Enzyme Availability and Hospital Length of Stay

In this issue of Clinical Chemistry, Wu and Clive report an association between hospital length of stay (LOS) and the potential availability of CK-MB results (i.e., anticipated turnaround times, given the institutional approach to measurement) at acute-care hospitals in Massachusetts [1]. They report a 0.7-day reduction in mean hospital LOS for those patients with an acute myocardial infarction (AMI) and complication(s) who were managed at hospitals performing CK-MB tests more than once or twice per day. They comment that if this reduction in LOS is real, the small increase in institutional cost to provide more-rapid enzyme results would be more than offset by savings related to the shorter hospital LOS.

To put this study into context, one must address several issues: What methodological issues might bias these study results? How are LOS values shortened by the more rapid turnaround times for cardiac enzymes? And why weren't shorter LOSs seen in other DRG categories?

What methodological issues might bias this study? This retrospective observational study design used a claims-based database. Such a billing database may insufficiently permit patient risk stratification for hospital LOS. For example, from such a database alone, we know nothing of patients' socioeconomic status and little about their underlying health status. Both factors may significantly affect clinical disposition decisions. Further, the analysis performed did not address the impact of other factors such as infarct location or procedural interventions (e.g., angioplasty or thrombolysis) on hospital LOS.

There also is significant potential for selection bias at those institutions where a short-stay "observation service" chest pain unit is used to rule out AMI in outpatients [2, 3]. It is unclear whether such patient evaluations would appear in what is stated to be a Medicare inpatient database. If such workups were excluded, then those hospitals with more-frequent enzyme availability (needed to run a successful short-stay observation service or to rule out lower-risk patients with an extended emergency department stay) would tend to admit fewer patients with "stable" angina or noncardiac chest pain. However, if such patients were admitted at hospitals having frequent CK-MB availability, they would generally have other coexistent diseases (e.g., pneumonia) for which the availability of cardiac enzymes would be unlikely to affect LOS significantly. In contrast, at the hospitals with less-frequent enzyme availability, more of these uncomplicated patients (who will subsequently be found to have stable angina or noncardiac chest pain) are likely to be admitted. These latter patients will probably have a brief hospital LOS, once the enzyme results finally become available.

Another database issue is whether unique patient identifiers were used to link those patients who were transferred between hospitals, so that the authors could determine the total LOS for these patients. Such cases are likely to fall into the AMI with complications subgroup, precisely the group in which Wu and Clive noted a significant reduction in mean LOS.

Finally, quality of care issues were not addressed by this analysis [1]. For example, we do not know whether AMI patients at hospitals having more frequently available CK-MB results were admitted to more intensively monitored settings. Hemodynamically stable patients with a nondiagnostic electrocardiogram and early CK-MB increases appear to be at greater risk for in-hospital complications than are other chest pain patients with similar electrocardiograms [4, 5]. Did earlier recognition of these patients lead to more-aggressive and timelier cardiac care? How might these decisions impact hospital LOS?

How could cardiac enzyme availability shorten LOS? Collinson et al. [6] demonstrated that more-rapid availability of CK-MB results led to shorter stays in the coronary care unit (CCU). Those without continued ischemic chest pain or a documented AMI were believed to be the major recipients of a shorter CCU stay. Apple et al. [7] similarly demonstrated the potential for cost savings by earlier release of CCU patients without coronary ischemia. Certainly, the sooner one can confirm that an AMI is not in evolution, the sooner one can address other issues definitively and plan a disposition from the hospital. Hence, one would anticipate that patients who receive the diagnosis of stable angina (DRG 140) or noncardiac chest pain (DRG 143) would have shorter hospital LOSs, if clinicians used cardiac enzymes to make their disposition decision and if those enzymes were more rapidly available.

In patients with an uncomplicated AMI (DRG 122) or complicated AMI (DRG 121), earlier detection or confirmation of the AMI might drive earlier interventions (e.g., angioplasty or emergency bypass surgery), which, if successful, might shorten LOS. The analysis by Wu and Clive [1] does not provide procedural information, and this potential explanation must remain speculative.

Why wasn't LOS shortened in other DRG categories? Wu and Clive found that the mean LOS for complicated AMIs was lower in those hospitals with more-frequent enzyme availability. Such an effect was not found for those admitted patients without an AMI. As noted above, selection bias might favor those hospitals that lack the ability to rule out the diagnosis of AMI by using an extended emergency department or observation service evaluation. That is, clinicians at hospitals without a rapid CK-MB turnaround time might admit more patients who have undefined chest pain or stable angina, pending the results of CK-MB tests. These patients would have relatively short hospital LOSs compared with those patients having the same diagnoses who were admitted at hospitals with an observation service capability. The latter patients would generally have been admitted solely because of other coexistent diseases, which would prolong the LOS. It would be helpful to know if coexistent DRGs were
associated with longer LOSs in patients with DRGs 140 and 143.

Patients with an uncomplicated AMI also had no dramatic shortening of LOS when CK-MB results were available more frequently. In these patients with proven AMI, more-rapid enzyme results could theoretically set in motion earlier discharge-planning activities, given that the diagnosis was no longer in doubt. Although this sounds good in theory, it is unclear whether laboratory results available 6–12 h sooner would truly impact this discharge process. Many clinicians prefer to observe their AMI patients for a fixed period to be able to manage any delayed complications. This time frame is generally referenced to the time of hospital admission rather than the time of first CK-MB abnormality. Hence, more-rapid CK-MB results may not impact LOS decision-making in these patients.

What does this all mean? While this reported association between mean hospital LOS for a subclass of AMI patients and the general availability of CK-MB results is an interesting observation and stimulates speculations about why it occurred, the exact mechanism(s) by which the more frequent availability of CK-MB results may contribute to a shorter hospital LOS in this patient subgroup remains elusive. Furthermore, future efforts to address the impact of more-rapid CK-MB availability should evaluate the entire population at risk (i.e., all patients presenting to acute-care hospitals with chest discomfort, whether admitted or not). Concurrent evaluation of quality of care measures also should occur. Such measures should include the rate of inadvertent patient releases from the hospital outpatient setting (i.e., from the emergency department and chest pain observation unit), the rate of reperfusion interventions for AMI patients, and delays from AMI patient presentation until clinical interventions.

If more-rapid CK-MB availability does impact clinical decision-making [8], it is incumbent on us to evaluate the mechanism of that effect and the entire spectrum of resulting clinical outcomes. Wu and Clive [1] have made an important observation; clinical correlation is required.

References


Jerris R. Hedges
Department of Emergency Medicine
School of Medicine
Oregon Health Sciences University
3181 SW Sam Jackson Park Rd., UHN-52
Portland, OR 97201-3098
Fax 503-494-7689
E-mail Hedges@ohsu.edu