

## Variation in Length of Stay in Patients Hospitalized with Congestive Heart Failure

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In the current issue of *The American Journal of Managed Care*, Krumholz et al.<sup>1</sup> examine correlates of length of stay in patients with congestive heart failure. The issues raised in this paper are of considerable concern but may not all be obvious without some background information.

Congestive heart failure has come to be recognized as a major healthcare concern in industrialized societies.<sup>2</sup> In addition to causing unpleasant symptoms and quite often death in patients who suffer from it, heart failure results in considerable use of healthcare resources. Clearly, the approach of choice is prevention through risk factor control of coronary artery disease, careful control of hypertension, appropriate care for patients suffering acute myocardial infarction, and diagnosis of preventable causes of heart failure such as hemochromatosis. While a satisfactory cost-effectiveness analysis of prevention of heart failure may not be available, it is likely to be most cost effective in appropriately targeted groups, given the striking disability and cost associated with this syndrome.

Once patients develop heart failure, the goals of therapy are to decrease disability, prolong life, and control resource use. These 3 objectives can all be enhanced by patient education, control of sodium and water intake, daily weights, and careful pharmacologic therapy. Appropriate medical care can improve quality of life and prevent costly hospitalizations.

Once hospitalized, the first goal is to restore patients to their baseline condition of health and discharge them alive. The secondary goal is to reduce costs. Efforts to reduce costs can be approached using the same principles of cost-effectiveness analysis generalized for considering a new therapy. If the implementation of such efforts as care maps improves outcome and decreases cost then there is strong dominance and the effort is appropriate. If an effort decreases cost but results in a worse outcome, then the effort should be considered very carefully as to whether the worse outcome can be justified by the cost savings. The ability to gather sufficient data to make this determination may be quite difficult and uncertain. This provides a very real limitation to taking steps to reduce cost that could result in a worse outcome.

In an attempt to lower hospital costs, there have been efforts to decrease length of stay. Models for determining cost have consistently showed length of stay to be the most powerful correlate.<sup>3,4</sup> Thus, if principal length of stay is decreased, costs may similarly be decreased. A problem with using length of stay as a correlate of cost is that multiple other areas of resource use not adequately accounted for may be included within length of stay. Thus, length of stay should perhaps be thought of as a summary variable that tends to be highly colinear with cost, rather than as a correlate. More simply stated, length of stay is itself a measure of cost. [Finally, including length of stay in a model to predict cost limits the ability to examine other correlates of cost because as a summary measure it is colinear with cost.

With all these limitations, what is the usefulness of examining length of stay? For one thing, it is considerably easy to collect. Thus, it may be thought of as a "poor man's" measure of cost. Quite often in studies of length of stay, the distribution, a comparison of sites, and correlates of the length of stay are all presented.<sup>5,6</sup>

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The paper by Krumholz et al<sup>1</sup> addresses the issues of length of stay for 1046 patients hospitalized with congestive heart failure in 1996 at 49 acute care academic medical centers in the United States. The authors note a mean length of stay of  $4.9 \pm 0.9$  days. The distribution of length of stay was fairly typical of such studies with a median value of 4 days, or about a day less than the mean, an interquartile range of 3 to 6 days, and a long tail of patients with stays of up to 15 days or more. The authors note some variance across institutions, but the adjusted mean varies by just about 1 day from the institution with the shortest stays to the institution with the longest stays. There was limited ability to predict variability in length of stay, with patient data available on admission predicting just 8% of the variability, hospital factors predicting just 9% of the variability, and patient plus hospital factors explaining just 16% of the variability. This limited ability to predict is noted, despite the authors developing a comprehensive database, with multiple baseline and hospital course data points. Even the addition of the individual hospital to the model added only 10% to the ability to predict variability.

How is this to be interpreted? First, limited ability to predict length of stay or the variability of length of stay has been noted previously for congestive heart failure, as well as other cardiovascular conditions.<sup>4,7</sup> Unless there is some secular trend in medical care or some new insight, it would appear that there will be little ability to predict length of stay for major cardiac hospitalizations, including congestive heart failure, acute myocardial infarction, coronary angioplasty, and coronary bypass surgery. Why is this? Perhaps this is because there are underlying patient clinical characteristics or hospital course variables not adequately accounted for. One variable routinely missed is the influence of the weekend of length of stay. Length of stay may be longer for a patient admitted with heart failure on a Tuesday, who might otherwise go home on Saturday but is held over to Monday, while a patient admitted on Monday goes home on Friday. This is a difference of 2 days—a long period. A completely different problem is that variability in length of stay may be partially a stochastic problem with no underlying cause. Whether variability in length of stay truly can be said to be stochastic is an epistemologic problem beyond the bound of this paper.

The paper by Krumholz et al<sup>1</sup> also has bearing on efforts to shorten length of stay. In principle, shortening length of stay if care is not compromised is a good thing. Efforts to decrease length of stay would

appear to be a good way to reduce costs, as they are colinear. If, however, reducing length of stay results in an increase in intensity of care, then the decrease in costs will be lost. Length of stay is also colinear with total costs but may be less colinear with variable or marginal costs. If stay is shortened, the marginal costs are the ones that will be intensified, undercutting the ability to truly reduce resource use. Thus, shortening length of stay is unlikely to have a purely linear effect on costs, as perhaps a bit naively suggested by studies relating cost to length of stay. In addition, as pointed out by the authors, shortening length of stay may result in an increase in cost after the hospitalization. For instance, early discharge after coronary surgery may result in more readmissions for wound infections, pleural effusions, injuries from falls, or arrhythmias. In fact, readmission after coronary surgery within 1 month has been reported to be as high as 40%.<sup>8</sup>

Given all the limitations, what can be done about length of stay? Unless there are remaining inefficiencies in hospitals, perhaps not much can be done. The search for variability that can be reduced is not likely to be fruitful, unless there is an issue, such as the weekend problem, that can be systematically addressed. Care providers will seek to decrease complications independently of effect on cost and length of stay and have been doing so for decades with considerable achievement. The limited effect of complications of variability of length of stay and efforts to decrease complications already in place may make this an unlikely area in which to have much effect. However, complications probably have a stronger effect on cost directly than suggested indirectly by length of stay. The alternative to reducing length of stay by reducing variance is to seek to reduce mean stay. This will reduce costs most effectively if fixed costs are reduced over time (eg, closing beds) and if it is done safely and without increasing follow-up costs. With a median hospitalization for heart failure of 4 days, this may be difficult.

When considering length of stay and its impact on resource utilization, it is always wise to remember the perspective of the study. In principal, we are always concerned with the societal perspective. However, “society” is not a stakeholder in the medical care. Rather, there are individual stakeholders whose goals may conflict. Thus, the hospital paid by the diagnostic related groups (DRG) system will seek to shorten length of stay as much as possible, and be less concerned about repeat hospitaliza-

tions. The insurance company paying on the DRG system will not want length of stay shortened if it increases the chance of a rehospitalization. The patient will want a short stay if he or she feels ready to go home, if there is adequate social and medical support for discharge, and if the chances of a repeat hospitalization seem reasonably low. The physician is in a difficult and somewhat compromised position. Early discharge may not be in the patient's best possible medical interest, thus the physician is put in the position of making a judgment that is in part economic and is not necessarily acting fully as a patient advocate.

We see that the issues surrounding length of stay are quite complicated and not easily reducible to formulas such as "the shorter the stay the better." Clearly, the best way to shorten length of stay is to avoid hospitalizations in the first place. This is especially true for conditions such as congestive heart failure, for which good outpatient management has been shown to dramatically reduce hospitalizations.

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