F A C T S H E E T

THE LEAPFROG GROUP
Informing Choices. Rewarding Excellence.
Getting Health Care Right.

Survival Predictor (Surgical Mortality)

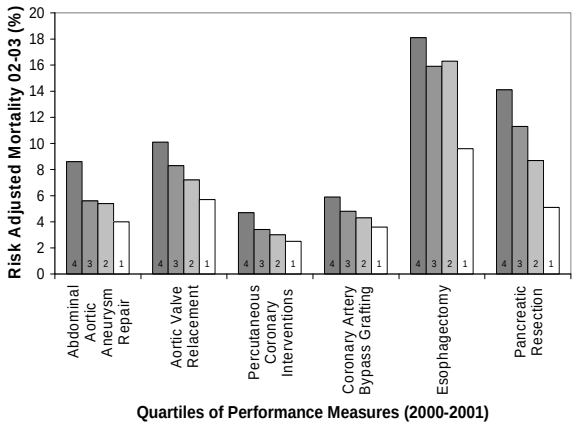
Composite Measures for Surgical Procedures

The Leapfrog Group's evidence-based hospital referral (EBHR) standards for surgery consider information pertaining to procedure volumes, selected processes, and some risk-adjusted mortality information for specific procedures. For each surgical procedure, these factors are combined according to predetermined weights and used to determine whether hospitals receive full or partial credit for meeting the EBHR standard. Although it reflects the fact that different quality indicators may vary in importance by procedure, weights used in the Leapfrog Group's scoring system have until now been guided primarily by expert opinion and clinical judgments.

Starting in 2008, new methods developed by Leapfrog Group consultants provided a more empirical basis for summarizing hospital performance with specific procedures. With funding from the National Institute of Aging (NIA), Drs. Justin Dimick and John Birkmeyer from the University of Michigan and Douglas Staiger, PhD, an economist at Dartmouth Medical School have been developing composite measures for surgical procedures selected for EBHR. These composite measures are designed to optimally forecast hospital performance, based on prior hospital volumes and observed inpatient mortality rates.

Using the national Medicare database, a validation study was performed on this composite measure. In this study, hospital-specific mortality rates and hospital volume were calculated for a two-year period (2000-2001). The composite measure was then created as a weighted combination of the mortality rate observed at each hospital and the volume-predicted mortality rate expected given the hospital's volume. The observed mortality rate was weighted according to reliability (largely a function of the sample size at that hospital). In a sensitivity analysis, the composite measure was tested and found to be as good a predictor of subsequent hospital performance as risk-adjusted mortality (2002-2003).

Figure. Future risk-adjusted mortality rates (2002-2003) for quartiles of hospital rankings based on the empirically-derived composite measure of mortality and volume (2000-2001).



These composite measures make optimal use of all available information pertaining to hospital quality. Mortality rates receive weights according to the extent that they are reliable (a reflection of hospital sample size). Hospital volume is only weighted to the extent that it predicts performance with that procedure. As might be expected, these composite measures have proved to be considerably better than either mortality rates or hospital volume alone at forecasting subsequent hospital performance for high risk surgery.

Leapfrog standard

The first version of the composite measure will be a weighted combination of hospital volume and observed mortality rates. The weights placed on the observed mortality rates will be empirically derived for each operation and are largely based on the observed sample size at the hospital. Larger hospitals will have more weight placed on the mortality rate and less on the volume component. In contrast, smaller hospitals will have less weight placed on the mortality component and more on the volume component.

Future composite measures

Although the current composite measures combine only two domains of quality, it is possible to combine many more measures to optimally predict a hospitals true mortality rate. Other potential inputs include mortality rates with other, related procedures with shared structures and processes that lead to high quality care. Recent work has shown that mortality rates with other related procedures may be an overlooked source of information in quality measurement. As the evidence linking processes of care to outcomes becomes more robust, future iterations may also include these variables as inputs.

References

1. Staiger DO, Dimick JB, Baser O, Fan Z, Birkmeyer JD Empirically derived composite measures of surgical performance. Med Care 2009 Feb; 47(2):226-33.

2. Birkmeyer JD, Dimick JB, Birkmeyer NJ. Measuring the quality of surgical care: structure, process, or outcomes? *J Am Coll Surg* 2004;198:626-632.

3. Dimick JB, Welch HG, Birkmeyer JD. Surgical mortality as an indicator of hospital quality: The problem with small sample size. *JAMA* 2004; 292:847-851.

4. Dimick, JB, Birkmeyer, JD. Composite Measures for Predicting Hospital Mortality with Surgery. February 2008. Available on The Leapfrog Group website (www.leapfroggroup.org).

5. McClellan M, Staiger DO. Comparing the Quality of Health Care Providers. In: Garber A, ed. Frontiers in Health Policy Research, Volume 3. Cambridge, MA: The MIT Press; 2000: 113-136

6. Dimick JB, Staiger DO, Birkmeyer JD. Are mortality rates for different operations related? Implications for measuring the quality of noncardiac surgery. *Med Care* 2006;44: 774-778.

7. DimickJB, Staiger DO, Baser O, Birkmeyer JD. Composite Measures for Predicting Surgical Mortality in the Hospital. *Health Affairs* 2009, Vol 28:4, 1189-1198.

Contacts

Justin B. Dimick, MD, MPH
University of Michigan
jdimick@umich.edu

John D. Birkmeyer, MD
University of Michigan
jbirkmey@umich.edu

Douglas O. Staiger, PhD
Dartmouth Medical School
doug.staiger@dartmouth.edu