



## Survival Predictor (Surgical Mortality)

### Composite Measures for Surgical Procedures

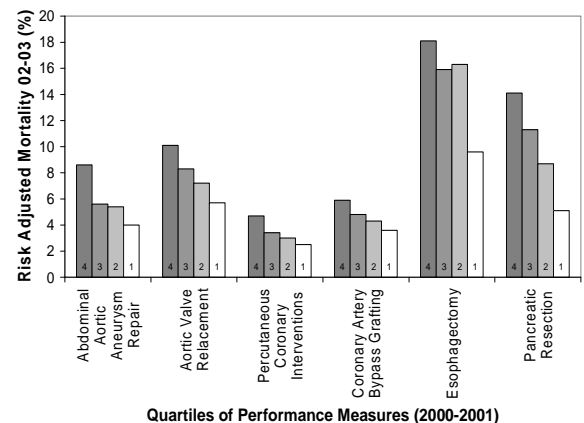
The Leapfrog Group’s evidence-based hospital referral (EBHR) standards for surgery consider information pertaining to procedure volumes, selected processes, and risk-adjusted mortality. For each surgical procedure, these factors are combined according to predetermined weights and used to determine whether 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 will provide 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 risk-adjusted 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 risk-adjusted mortality rate observed at each hospital and the risk-adjusted 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 risk-adjusted 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 hospital's 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

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