

## Monitoring outcomes of medical facilities and procedures

John D. Kalbfleisch <sup>\*†</sup>  
jdkalbf@umich.edu

Robert A. Wolfe <sup>\*‡</sup>  
bobwolfe@umich.edu

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An issue of substantial importance is the monitoring and improvement of health care facilities such as hospitals, nursing homes, dialysis units or surgical wards. In addressing this, there is a need for appropriate methods for monitoring health outcomes and the development of appropriate tools, on the one hand, to aid centers in instituting and evaluating quality improvement programs and , on the other hand, to aid overseers in identifying and addressing sub-standard performance. In the latter case, the aim is to identify situations where there is evidence that the facility's outcomes are outside of normal expectations ; such facilities would be flagged and perhaps audited for potential difficulties or censured in some way. We consider such issues when the outcome variable of interest is a failure time such as patient survival or disease free survival or, in the case of organ transplants, graft survival. Two primary methods in use involve risk adjustment through models where the centers are taken as fixed effects or random effects. We take a systematic approach to assessing their relative merits for the monitoring tasks mentioned above. We also consider issues of assessing the validity of a risk adjustment model ; often, the coefficient of concordance is touted as an appropriate measure of the validity of a model, but we argue that this is not justified. Instead we note that the idea of separating out what should be considered natural versus systematic variation underlies the main problem of assessing rules for flagging facilities for exceptionally poor or good performance. We review and examine some suggestions in this area and make some recommendations. The methods and approaches are illustrated in the context of the monitoring of US hemodialysis facilities for survival and transplant outcomes.

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\*Department of Biostatistics University of Michigan, School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109-2029, USA.

†Kidney Epidemiology and Cost Center, University of Michigan, 315 W. Huron, Suite 240 Ann Arbor, MI 48103-4262, USA.

‡Arbor Research Collaborative for Health, 315 W. Huron, Suite 360 Ann Arbor, MI 48103-4262, USA.