LETTERS TO THE EDITOR

The Importance of Good Data, Analysis, and Interpretation for Showing the Economics of Reducing Healthcare-Associated Infection

To the Editor—In a recent review article in *Infection Control and Hospital Epidemiology*, Umscheid et al[1] summarized published data on incidence rates of catheter-associated bloodstream infection (CABSI), catheter-associated urinary tract infection (CAUTI), surgical site infection (SSI), and ventilator-associated pneumonia (VAP); estimated how many cases are preventable; and calculated the savings in hospital costs and lives that would result from preventing all preventable cases. Providing these estimates to policy makers, political leaders, and health officials helps to galvanize their support for infection prevention programs. Our concern is that important limitations of the published studies on which Umscheid and colleagues built their findings are incompletely addressed in this review. More attention needs to be drawn to the techniques applied to generate these estimates.

The ambitious goal of Umscheid and colleagues was to synthesize all evidence on the effectiveness of interventions to prevent CABSI, VAP, CAUTI, and SSI. The scope of this review might be too broad to allow a sufficiently detailed appraisal of the evidence found. Preventability is a moving target because technologies and behaviors change, and inferences about causal effects depend on an explicit specification of alternatives.[2] Other evidence synthesis studies for infection control interventions have been narrower in scope and more cautious in interpreting the data. Gould et al[3] registered a review of the effectiveness of hand hygiene interventions with the Cochrane Collaboration. Of 48 articles and 1 thesis revealed by the search strategy, only 2 studies were included. The rest were excluded because they were small scale or poorly controlled or because their long-term impacts were not assessed. Some of the studies included by Umscheid et al that report infection control effectiveness had significant methodological flaws. Harris et al[4] discuss the challenges that researchers face when trying to estimate the effectiveness of infection prevention.

The information that Umscheid et al use to estimate the annual number of infections should be treated with caution. Large variability in the quality of infection surveillance data for CABSI was found by Lin et al.[5] Whether other types of infection are surveyed with greater accuracy is unknown.

None of the studies used to estimate the clinical and economic consequences of these infections appropriately accounted for length of stay or risk of death, either because the timing of infection was ignored altogether or because of conditioning on the future.[6] The consequence is that results are biased upward.[7] Barnett et al[8] showed that 11.23 extra days in the hospital were attributable to a case of healthcare-associated infection when the timing of infection was ignored and that, when the timing of infection was appropriately included, the additional duration of hospital stay was reduced to 1.35 days. Problems of bias may also arise when attributing death risk to infection.

Umscheid et al used cost data prepared by hospital accountants to make an economic argument. This is inappropriate, because accountants and economists have different objectives and require different information.[9] Accounting costs are unlikely to capture the opportunity cost of infections. The alternate use of resources released from reduced infection is easily misinterpreted when presented as cash savings to hospitals.[10]

The findings of Umscheid et al[1] were that between 23,545 and 53,483 lives would be saved every year as a result of preventing preventable cases of CABSI, VAP, CAUTI, and SSI. Annual cost savings to hospitals would be between $3.43 billion and $23.44 billion. Using a conservative estimate of $5.5 million per statistical life saved,[11] the total economic benefit from eliminating preventable infections suggested to policy makers is between $136 billion and $341 billion annually. We suggest that flaws in the underlying data used to make these estimates exaggerate the result and will improperly raise expectations about the value of future investments in prevention programs. A potential negative consequence for the infection control community is reduced credibility. Another risk associated with reporting such large numbers is that government health regulators might use them to justify withholding large cash reimbursements to hospitals when (preventable) infections do happen, and this might create an economic incentive to underreport infections,[12] which is a quality-reducing activity.

Relentless growth in healthcare costs means that decision makers will demand high-quality economic evidence prior to committing resources to healthcare programs. Reliable economic arguments are important for obtaining extra resources and even for keeping existing ones. Those working toward reducing the number of infections should carefully craft economic arguments on the basis of sound methods and good quality data,[13] and they should use the evidence base to build sustainable and cost-effective infection control programs.

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Reply to Graves et al

To the Editor—We appreciate the interest by Graves et al[1] regarding our recent article estimating the proportion of healthcare-associated infections (HAIs) that are reasonably preventable and the related mortality and costs.[2] In their letter, Graves and colleagues suggest that our estimates were intended to galvanize support for infection prevention programs and were generated using studies with important limitations. We wish to address these concerns in this response.

Our analysis was originally performed in 2008 for the Society for Healthcare Epidemiology of America (SHEA), to be included in its written testimony on HAIs to Congress.[3] To inform its testimony, SHEA requested that we review the published literature to estimate the proportion of HAIs that might be preventable. This was a critical question, because the federal government was considering a policy of nonpayment for HAIs as an incentive to reduce HAIs.[4] Although some believed this was an effective strategy to reduce HAIs, others were concerned that not all HAIs were preventable and that the incentive under consideration would present challenges to hospitals caring for patients at high risk for HAIs.[5] To estimate the proportion of preventable HAIs in the most efficient and accurate manner, we used an up-to-date federally funded systematic review that examined the effectiveness of single and multimodal interventions on HAI prevention[6] as well as the most recent and valid estimates of HAI incidence.[7] We also conducted our own systematic review of studies examining the incremental costs of individual HAIs.[2] The dilemma at the time was whether to make an estimate based on data of limited quality or to avoid making such an estimate because of the data limitations and take the chance that other estimates derived using a less scientific approach would inform the policy discussion. SHEA opted to inform the discussion with the best estimates available from the published literature, so the intent of our analysis and our subsequent article was to present those estimates while highlighting their key limitations and caveats.

To ensure that we provided the most accurate and generalizable data on the effectiveness of HAI prevention interventions, we estimated ranges of preventability and included the lowest and highest risk reductions reported by only those studies that were conducted in the United States, were published within the previous 10 years, and received a quality score of moderate or good from the federally sponsored systematic review.[6] Of the 64 studies originally included in the