Reply to Lawes and Gould

Lawes and Gould [1] raise the question whether it is justified to discontinue “core elements of current control programs” based on a mathematical analysis of the results of a highly successful study [2].

Mathematical modeling can be used to (1) improve our understanding of nonlinear and time-delayed effects of interventions; (2) support the choice of interventions, both for studies and daily practice; (3) design studies, for instance, to estimate effect sizes of interventions; and (4) analyze data using a mechanistic model, as we did here [3].

We have used a very simple model, parameterized with data from Jain et al [2], and performed sensitivity analyses for the few unknown parameters. Lawes and Gould [1] correctly point out that our sensitivity analysis on the detection rate at the start and the end of the study may
not have been intensive enough. Admission screening compliance increased from 82% to 96%, and transfer/discharge screening compliance increased from 72% to 93%. But even if we assume that determination of acquisition was missed in 46% and 11% of the patients at the start and at the end of the study period (which implies that all patients with missed admission screening did have discharge screening and all with missed discharge screening had admission screening) and that patients who acquired colonization had a 5 times higher infection risk compared with patients already colonized on admission, we can only attribute at most 48% of the observed reduction in the number of infections to transmission prevention in intensive care units. Ergo, the measures aimed at transmission prevention (screening, isolation, and hand hygiene) cannot be considered to be effective based on this study. Of course, we cannot exclude that the total package of screening, isolation, and “institutional culture change” in the Jain study [2] contributed to the fantastic decrease in methicillin-resistant Staphylococcus aureus (MRSA) infections, but it is also possible that other interventions, such as better line management, decolonization, or better preoperative care were instrumental, or that the decrease in the infection rate started well before the reported interventions [2]. Therefore, the results of the Jain study cannot be used to advocate universal screening for MRSA carriage.

We advocate the use of properly designed randomized trials to investigate the effects of interventions, as has been recommended before [4]. Preferably, these trials should allow for estimation of the effects (on transmission, infection, and/or decolonization) of individual intervention measures, as this is a prerequisite to determine their cost-effectiveness. As shown, mathematical models can be extremely helpful in interpreting research findings.

Notes

Financial support. This work was supported by the European community (MOSAR network contract LSHP-CT-2007-037941) and the Netherlands Organization for Scientific Research (VICI-NWO grant 918.76.611 to M. J. M. B.).

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References


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Clinical Infectious Diseases 2012;55(7):1028–9
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DOI: 10.1093/cid/cis603

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