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## Reply to Widmer and Tschudin-Sutter

*To the Editor*—We appreciate the interest in our recent article<sup>1</sup> and would like to respond to issues raised by Widmer and Tschudin-Sutter<sup>2</sup> as possible explanations why 2 mL of a 70% alcohol handrub product did not completely eradicate methicillin-resistant *Staphylococcus aureus* (MRSA) from the hands of colonized patients. First, the assertion that the handrub used in the study did not meet the European Standards (EN 1500) requirements within 30 seconds of application is inaccurate. Although a product of the same brand name was evaluated by Kramer et al.,<sup>3</sup> that was a previous formulation based on 62% (vol/vol) ethanol. The product used in the current study is based on 70% (vol/vol) ethanol and meets both the EN 1500 efficacy requirements within 30 seconds and the US Food and Drug Administration Healthcare Personnel Handwash requirements at a 2 mL application.<sup>4</sup> Therefore incomplete MRSA eradication cannot be attributed to a lack of efficacy of the handrub product. Second, we acknowledge that a larger volume of product may have been more effective because handrub efficacy is highly dependent on application volume. Further studies to investigate the impact of product volume on clinical efficacy are warranted. We point out, however, that there is a practical limit to the volume of product end users will apply, which is largely influenced by dry-time. The volume of handrub used in this study (2 mL) takes approximately 30 seconds to rub dry and is consistent with World Health Organization recommendations; in contrast, a volume of 3 mL typically remains wet longer than 30 seconds and can take as long as 90 seconds to dry on hands.<sup>5</sup> Third, as stated in our article, patients were asked to rub their hands for 30 seconds with coaching to ensure proper technique according to World Health Organization recommendations. A majority of participants studied were elderly and some displayed diminished hand dexterity, which may have impacted our results. However, there is still debate whether the 6-step technique outlined by the World Health Organization provides an efficacy benefit.<sup>6,7</sup> We agree that the ability of

handrub products to meet established efficacy requirements, as well as product application volume and good technique to ensure adequate hand coverage, are all important variables that influence clinical efficacy. However, we caution against the generalization of the results obtained with this specific population of MRSA-colonized patients to make predictions on the ability of alcohol handrub products to eliminate transient MRSA from the hands of healthcare workers.

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## Response to McKinnell et al's Original Article "Cost-Benefit Analysis From the Hospital Perspective of Universal Active Screening Followed by Contact Precautions for Methicillin-Resistant *Staphylococcus aureus* Carriers"

*To the Editor*—We read with interest the cost-benefit analysis by McKinnell et al<sup>1</sup> who found that universal screening for methicillin-resistant *Staphylococcus aureus* (MRSA) may be relative costly for hospitals. We assessed the potential economic aspects of screening as part of a review of national MRSA control guidelines in Ireland.<sup>2</sup> We found that MRSA screening is generally advocated as part of infection prevention and control measures, but an important consideration is the cost-effectiveness of the type of screening approach.

For patients admitted to acute hospitals setting, 7 studies (United States, 4; Germany, 1; United Kingdom, 1; Ireland, 1) compared the cost of universal screening with targeted screening of at-risk patients. Costs were limited to direct medical costs and were evaluated from the perspective of the healthcare provider or hospital. Four studies were cost comparisons,<sup>3–6</sup> 2 reported cost-effectiveness of the strategies compared with a base case of no screening and relative to each other,<sup>4,6</sup> while 1 study provided a cost-benefit analysis of universal versus targeted screening.<sup>7</sup> In hospitals where MRSA is endemic, screening (targeted or universal) reduced infection rates and was cost saving compared with a policy of no screening.<sup>3,4</sup> Universal MRSA screening strategies were more effective but also more cost-intensive than targeted screening.<sup>4,6,7</sup>

In a retrospective review of a 3-year MRSA screening program that was implemented from 2006 to 2009 in the United Kingdom, only 7 extra MRSA cases were detected using universal screening compared with targeted screening, and in 1 month, universal screening generated 4,200 negative screens that incurred an additional €25,488 in laboratory costs.<sup>5</sup> Similarly, a prospective study by Creamer et al<sup>8</sup> found that extending screening to patients without risk factors (ie, universal screening) increased the number of screenings and the costs but did not result in the detection of a significant number of additional cases. In a 2011 US study, targeted screening was associated with lower costs and better outcomes than a policy of no screening, whereas universal screening was

associated with an average cost-effectiveness ratio of €11,769 per MRSA infection.<sup>6</sup> In a second cost-effectiveness analysis, targeted screening strategies were found to be more cost-effective than universal screening, with incremental cost-effectiveness ratios of €3,227 to €28,507, depending on the prevalence rate and testing used, compared with €103,169 to €183,269 per additional infection averted for universal screening.<sup>4</sup> Finally, a US prospective study comparing the clinical effectiveness and cost benefit of universal versus targeted screening reported a benefit-to-cost ratio of 0.50, indicating that for every additional euro spent on universal versus targeted screening, only €0.40 could be recovered in avoided costs due to a reduction in MRSA healthcare-associated infection.<sup>7</sup>

The control of MRSA is a multidisciplinary task involving surveillance, patient screening, decolonization, isolation and/or the cohorting of patients, environmental decontamination, antimicrobial stewardship, maintenance of adequate staffing levels, and hand hygiene. Although considerable coordination efforts may need to be invested in control, we demonstrate that the evidence strongly suggests that overall MRSA prevention and control strategies are associated with significant cost savings. The control measures have additional merits because they increase the awareness of the importance of all healthcare-associated infections and their implementation decreases other healthcare-associated infections.<sup>9</sup> However, MRSA control measures encompass a wide range of interventions, the efficacy and cost of some of which are dependent on prevalence rates, local resistance patterns, the characteristics of the patient population, and the hospital facilities, all of which will vary from country to country. Because the MRSA prevalence rate in Ireland is higher than in the United Kingdom and in other Northern European countries, MRSA prevention and control is very relevant in the potential efficient use of resources.

In conclusion, the evidence shows that screening, whether universal or targeted, is better than no screening, resulting in fewer MRSA infections. Although universal screening, as currently practiced in the United Kingdom, is the most costly but the most effective strategy, it is not as cost-effective as it is resource intensive. Universal screening detects few additional cases and results in a large number of additional negative screens. However, any evaluation of the effectiveness of screening methods should take account of healthcare costs, methods, the rapidity of test results, and the prevalence of colonization and infection.

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