

Review

Pro/con clinical debate: Isolation precautions for all intensive care unit patients with methicillin-resistant *Staphylococcus aureus* colonization are essential

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Abstract

Antibiotic-resistant bacteria are an increasingly common problem in intensive care units (ICUs), and they are capable of impacting on patient outcome, the ICU's budget and bed availability. This issue, coupled with recent outbreaks of illnesses that pose a direct risk to ICU staff (such as SARS [severe acute respiratory syndrome]), has led to renewed emphasis on infection control measures and practitioners in the ICU. Infection control measures frequently cause clinicians to practice in a more time consuming way. As a result it is not surprising that ensuring compliance with these measures is not always easy, particularly when their benefit is not immediately obvious. In this issue of *Critical Care*, two experts face off over the need to isolate patients infected with methicillin-resistant *Staphylococcus aureus*.

Keywords hand-washing, infection control, intensive care, isolation, methicillin-resistant *Staphylococcus aureus*

The scenario

You are working in the intensive care unit (ICU) and you get a call from the infection control nurse, who tells you that one of your newly admitted ICU patients has tested positive on a nasal swab for methicillin-resistant *Staphylococcus aureus* (MRSA). The nurse informs you that it is essential that the patient be

moved to a single room, the door be closed, and entrance into the room be monitored. Those entering should wear a gown and gloves, and disinfect their hands on entry and exit. You worry about the impact of these procedures on the patient's care and wonder whether they are really that important.

Pro: Yes, isolation precautions for all ICU patients with MRSA colonization are essential

Barry M Farr

To minimize nosocomial MRSA transmission and thereby nosocomial MRSA infection rates, isolation appears to be essential in patients colonized with MRSA [1,2]. This seems important because MRSA infections have been associated with significantly greater prolongation of hospital stay and greater mortality than methicillin-susceptible *S aureus* infections, after adjustment for patients' underlying severity of illness [3,4]. Many studies have reported significantly better control using surveillance cultures and contact precautions,

including multiple studies in ICUs [4,5]; the consistency of evidence in different studies conducted by different investigators and in different populations was one of the criteria for causal inference advocated by Hill [6]. High strength of association, reversibility, a dose-response relation, and specificity have also been demonstrated [4], and these features also suggest causality [6]. Although most of those studies used historical controls, multiple studies have used concurrent controls [4]. To date, all cost-effectiveness

studies have concluded that it is less expensive to pay for detection and control than it is to use inadequate measures and let MRSA spread [4,7].

Randomized controlled trials (RCTs) are usually optimal for demonstrating reversibility with an intervention because they minimize selection bias (i.e. they ensure that patients cared for using an intervention are similar to controls), but such studies have not been conducted regarding the surveillance cultures/contact precautions approach to MRSA control. Possible reasons include the following. First, the US Centers for Disease Control and Prevention have recommended since 1983 that colonized patients be cared for with contact precautions, and there was a lack of support from the US National Institutes of Health or the Centers for Disease Control and Prevention for such studies from 1970 to 2000. Also, many studies have reported control using surveillance cultures/contact precautions, and there are ethical concerns about randomizing controls to what many studies suggest may be suboptimal protection against potentially lethal infection. Finally, with respect to cost, RCTs are in general expensive, and the expense is greater still for RCTs that must take account of widespread intrafacility and interfacility transmission [8] by making large facility clusters the unit of randomization. Recent meta-analyses of RCTs found that their results showed as much and sometimes more variability than those from unrandomized studies examining the same

question, which neither overestimated nor underestimated the central tendency of the RCT results [9].

A recent, unrandomized study reported a statistically significant increase (i.e. 31 versus 15 per thousand patient-days) in some adverse effects among MRSA isolation patients (mostly falls, pressure sores, and fluid/electrolyte disorders), but no increase in numerous other types of adverse effects or deaths [10]. Far more studies have demonstrated the adverse effects of inadequate isolation for important nosocomial infections (e.g. one MRSA neonatal ICU outbreak continued for 51 months, resulting in 75 MRSA bacteremias and 14 deaths) [7].

The worldwide emergence of virulent *mec IV* strains of MRSA that are able to spread in the community as well as in hospitals has led some to believe that it is no longer worthwhile trying to contain nosocomial MRSA spread. Recognized for almost a decade, *mec IV* strains have not yet resulted in population-based studies demonstrating a high MRSA national prevalence in any country, nor has their documented presence in Northern Europe (where surveillance cultures/contact precautions are used routinely) resulted in failure to control nosocomial MRSA infections to very low levels [1,2,4]. This suggests that control of nosocomial MRSA infections is still possible and as important as it ever was.

Con: No, isolation precautions for all ICU patients with MRSA colonization are not essential

Geoffrey Belligan

To reduce the spread of MRSA, I agree that universal precautions, including gloves, hand-washing, disposable aprons, cleaning equipment and the environment, and regular surveillance cultures, are important and all are practiced in our ICU. I question, however, the validity of isolation or cohort nursing to further prevent MRSA transmission, and whether this a safe strategy in the critically ill.

Numerous articles have proposed isolation/cohort nursing in addition to universal precautions [11–13], and many concluded that isolation reduces MRSA transmission. When closely examined, however, isolation/cohort nursing were in all but one case introduced as part of a varied package of measures, including closure of units, surveillance, re-emphasis on hand washing, reduction in overcrowding, infection control nurses, and addition of other treatments [14]. A recent review of 46 studies of isolation policies in the management of MRSA by Cooper and coworkers [14] concluded that it was usually impossible to adjust for any variation in MRSA reservoir in different phases of these studies and most lacked proper statistical analysis. Furthermore, few studies were prospective, and many seemingly prospective studies occurred in response to new high MRSA levels. Of those that provided the strongest evidence, four suggested that infection control measures,

including isolation, were effective whereas two implied that isolation failed to prevent endemic MRSA. Mathematical models also propose that isolation should be effective, but where infection is endemic they show that, despite effective control measures, the status quo can be maintained by new admissions [14,15]. This suggests that the prevalence of MRSA is an important part of the equation. Across the world this varies enormously, with 60% of ICUs in Germany reporting no MRSA, contrasting with 11.4% acquiring MRSA in ICU in Australia and a point prevalence of 16.2% in UK ICUs [16–18].

Not only is the evidence weak that isolation is effective, but also there is evidence that it may be detrimental. Evans and coworkers [19] observed that, despite isolated patients being more dependent than nonisolated ones, they had less contact time with clinicians. Furthermore, isolation frequently necessitates moving critically ill patients, with well recognized associated risks.

In view of this we recently conducted a study in two London ICUs to determine prospectively the effect of removing isolation/cohort nursing on MRSA transmission [20]. All patients admitted for longer than 48 hours over a 1-year period were studied. They were screened on admission and

weekly thereafter. In the first 3 months MRSA-positive patients were isolated/cohort nursed as usual. For the following 6 months MRSA-positive patients were not moved and then for the final 3 months patients were again isolated. Universal precautions were practiced throughout. The patient population was similar in each management phase. The primary outcome was time to acquisition of MRSA, and the Cox proportional hazards model showed no evidence of

increased transmission associated with nonisolation, and neither was there any increase in individual hospitals, even after adjusting for colonization pressure.

Hence, I believe that where the background incidence of MRSA is high there is no evidence that isolating MRSA-positive patients reduces cross-infection, and it may indeed restrict patient care inappropriately.

Pro response: MRSA rates higher with standard precautions in most studies

Barry M Farr

MRSA infections have been more deadly than nosocomial MSSA infections, MRSA is usually acquired only by spread, and the vast majority of studies have shown significantly better MRSA control with surveillance cultures and contact isolation than with standard precautions. (This includes the review by Cooper and coworkers [14], cited prominently by Dr Bellingan, which noted studies' methodologic shortcomings but concluded that

surveillance cultures and isolation work and should be used.) Without mentioning statistical power, the proportion excluded because their stay in the ICU was shorter than 48 hours, and the proportion refusing consent to participate, Dr Bellingan cites his own negative, unpublished and unrandomized, historical comparison study [20], which does little to counterbalance scores of studies showing the opposite.

Con response: Risks of isolation may outweigh any benefits

Geoffrey Bellingan

Effective infection control policies for MRSA, including active surveillance and contact precautions, are essential. What I question is whether this can be achieved through rigorous adherence to universal precautions alone or whether we also must physically isolate ICU patients, with attendant risks of reduced carer input and increased adverse events. No

studies have, until now, specifically addressed the efficacy of single room isolation, and our study [20] throws new light on current recommendations. It highlights the continued importance of universal precautions while suggesting that single room isolation confers no additional benefit. Other studies suggest that isolation may indeed be harmful.

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