



# EMERGING Infections

## The Contact Precautions Controversy

*Automatic assignment of contact precautions may do more harm than good.*

**M**ary McGary, a 42-year-old elementary school teacher, is admitted to the neurologic ICU after experiencing a subarachnoid hemorrhage. (This case is a composite based on my experience.) Her underlying arteriovenous malformation is corrected with interventional radiology, but she requires extended hospitalization to monitor for vasospasm. Because the U.S. state she lives in requires active surveillance cultures in the ICU, nasal swabs are used to assess for the presence of methicillin-resistant *Staphylococcus aureus* (MRSA). Her cultures reveal colonization with MRSA, and she's placed under contact precautions for the remainder of her 12-day hospital stay.

### A MATTER OF CONTROVERSY

If you practice hospital nursing, or have in the past 25 years, you're probably familiar with the concept and use of standard precautions and contact precautions. Standard precautions apply to all patients. Contact precautions apply to some patients, are more restrictive, and often involve isolation. Their routine use for prevention of transmission in a colonized patient remains controversial, however.

**What they are.** According to Centers for Disease Control and Prevention (CDC) guidelines, standard precautions "include a group of infection prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any

setting in which health care is delivered." These include "hand hygiene; use of gloves, gown, mask, eye protection, or face shield, depending on the anticipated exposure; and safe injection practices." The worker decides on the level of protection based on anticipated exposure to potentially infectious materials such as blood, nonintact skin, mucous membranes, and excretions (except sweat).<sup>1</sup>

Contact precautions constitute one of three more stringent levels of transmission-based precautions, the other two being droplet precautions and airborne precautions. Transmission-based precautions "are used when the route(s) of transmission is (are) not completely interrupted using standard precautions alone." Under contact precautions, a gown and gloves are worn for "all interactions that may involve contact with the patient or potentially contaminated areas in the patient's environment." Personal protective equipment is put on upon room entry and discarded upon exiting; a private room for the patient is recommended.<sup>1</sup>

The rationale for contact precautions has traditionally been that additional protection is required to prevent the transmission through direct contact of certain infectious agents, "including epidemiologically important microorganisms, which are spread by direct or indirect contact with the patient or the patient's environment. . . ." Current uses of contact precautions include both infection and

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colonization with multidrug-resistant organisms such as MRSA and vancomycin-resistant *Enterococcus* (VRE), among various other specific organisms. Many states now mandate routine screening for certain resistant organisms. According to the Association for Professionals in Infection Control and Epidemiology (APIC), 15 states and the District of Columbia currently require active surveillance and screening for or reporting of MRSA colonization, and four states have legislation pending.<sup>2</sup> Contact precautions "apply where the presence of excessive wound drainage, fecal incontinence, or other discharges from the body suggest an increased



Nurses Dennis Holpp (left), Karena Kinnaird (center), and Rachel Greenway, suit up in gowns, gloves, and masks before entering a patient's contact isolation room in the ICU at Cookeville Regional Medical Center in Cookeville, Tennessee. Photo by Ty Kernea / Herald-Citizen Photo.

potential for extensive environmental contamination and risk of transmission.”<sup>1</sup>

There are circumstances in which virtually all health care workers and experts would agree that contact precautions are necessary. For example, a patient with a MRSA-positive wound infection and purulent drainage should certainly be isolated and placed under contact precautions to prevent spread of the pathogen. An incontinent patient with VRE-associated urinary tract infection requires additional precautions as well.

However, patients merely colonized, rather than infected, with these organisms represent a gray area. In many settings, the use of contact precautions in any colonized patient has been unquestioned; one might ask, however, whether there's any significant difference in infection risk between a patient with MRSA colonization and a patient colonized with methicillin-susceptible *Staphylococcus aureus* (MSSA). One could also argue that a patient with an open, draining wound

infected with a drug-susceptible organism presents a greater risk of transmission than one colonized with a multidrug-resistant organism. Conversely, one might ask whether colonization with a resistant organism is more dangerous because of the difficulty in treating a subsequent infection. These are difficult questions to answer.

### LIMITATIONS OF CONTACT PRECAUTIONS

If all possible transmission of multidrug-resistant organisms—and all infections with them—occurred in health care facilities, contact precautions could prevent every case of infection and colonization. Of course, we know that isn't the case. Contact precautions are, therefore, inherently limited. Many factors contribute to disease transmission, and many opportunities to disrupt transmission exist.

Current theory in infection control often refers to either the agent–host–environment model of infection or the web of causation model. In both of these

models, several factors contribute to the acquisition of infection.

**The agent–host–environment model.** The classic model of epidemiology stems from work by Leavell and Clark.<sup>3</sup> In this model, disease results from disequilibrium between the elements of an agent (its inherent nature, viability, resistance, infectivity, pathogenicity, antigenic power, and dissemination), factors related to the host (age, genetics, habits, customs, defense mechanisms, and agent–host interactions), and the environment (the “aggregate of all external conditions, including physical, social, economic, and biologic factors . . .”).<sup>3</sup>

### The web of causation model.

The web of causation model is similar to the agent–host–environment model, although it's less specific and can be used in many types of epidemiologic investigations; it attempts to take into account any potentially influencing factor. Because the agent–host–environment model provides categories and examples specific to infection acquisition, it may be more valuable for understanding the concept.

Research on possible disparities and unintended consequences associated with isolating patients with MRSA while not isolating those with MSSA should be objectively analyzed. National and international studies show that a majority of infections don't involve multidrug-resistant organisms.<sup>4,5</sup> Given that contact precautions aren't routinely instituted in cases of infections not related to multidrug-resistant organisms, they obviously don't influence the transmission of those infections. Community-acquired MRSA also presents an emerging source of colonization and infection over which the health care community has limited control.

As noted in an extensive review by Marshall and colleagues, many studies find success with different levels and implementation of contact precautions, and some similar interventions have failed.<sup>6</sup> Variations in the interventions used in published studies make determining the benefits—and the individual elements—of contact precautions difficult to

than MSSA, that attention may not be entirely justified, especially with regard to contact precautions. MRSA is viewed as alarming because of the reportedly higher mortality rate associated with it and some dramatic cases that have been sensationalized in the media. However, direct comparison of MRSA and MSSA infection may be con-

a serious infection, but the useful clinical differences between MRSA and MSSA are difficult to determine.

Both MRSA and MSSA likely contaminate the environment similarly.<sup>11</sup> Hospital outbreaks of MSSA often involve neonatal units<sup>12, 13</sup>; although MSSA skin infection might not raise suspicion in acutely ill adults, it does

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evaluate and compare; the addition of other interventions, such as hand hygiene programs, further complicates evaluation. However, despite the fact that this reduces the generalizability of studies from a scientific standpoint, a multifactorial approach can actually be a strength from a quality standpoint; multiple simultaneous interventions can improve the odds of success.<sup>7</sup> Adoption of current recommendations by the Society for Healthcare Epidemiology of America (SHEA), the CDC, and APIC may not reflect the traditional rigorous scientific approach to infection prevention, but rather an assumption that contact precautions make sense and generally appear to be effective. It's possible that the recommendations also reflect the safe stance, or the knowledge that nothing better exists at this time. Unfortunately, these recommendations may also minimize our ability to identify or mitigate harm that can be caused by contact precautions.

**MRSA vs. MSSA.** Although MRSA infections and outbreaks receive more media attention

founded by other factors, as may direct comparison of their associated mortality.<sup>8</sup> For example, although patients with more severe illness are more likely to be cultured, the mere presence of MRSA doesn't necessarily denote severe illness. A systematic review of MRSA- and MSSA-related mortality indicates that patients with MRSA experience significantly higher mortality than those with MSSA,<sup>9</sup> but one of the authors of that analysis pointed out in a later blog posting (see <http://bit.ly/91Nbom>) that such findings are inherently difficult to interpret accurately, both because patients who acquire MRSA tend to be sicker to begin with and because vancomycin, which is often used in cases of MRSA, is a poor antibiotic. He suggests that patients with MSSA might fare just as poorly if they were all given vancomycin. Perhaps even more interestingly, one study has found a lower rate of death from *S. aureus* infections among nasal carriers of the bacterium than among noncarriers, although the carriers were more likely to become infected.<sup>10</sup> MRSA can be

in otherwise healthy newborns and mothers. MSSA outbreaks in neonates have been linked to ultrasound gel, adhesive skin protectant, and gross environmental contamination.<sup>12-14</sup> Of course, MSSA colonization isn't routinely tested for, and patients with MSSA aren't placed under contact precautions. And MSSA outbreaks occur in community and hospital settings, but the health care community treats MRSA and MSSA differently.

Some infection preventionists would argue that routine use of contact precautions in MRSA cases creates either the illusion that staff must know which pathogen they're trying to protect the patient from or a false sense of security. Tuberculosis and influenza require special treatment because of their virulence; diagnosis of those diseases is extremely helpful in preventing transmission. With other organisms, like MRSA and MSSA, routine hygiene procedures should significantly lessen the risks of transmission or environmental contamination. When we routinely isolate for an infection that can be prevented by

good hygiene, it can contribute to the feeling that a nonisolated patient is “clean,” when she or he does in fact have organisms on the skin that might cause an infection if introduced into a wound or passed to another patient. Health care workers’ gloves are readily contaminated by MRSA and VRE, which implies that excellent hand hygiene remains imperative to prevent infection.<sup>15</sup> Dirty gloves carry at least as great a potential for harm as dirty hands. In addition, research has shown that workers often neglect to change contaminated gloves when moving from routine care to care requiring aseptic technique<sup>15</sup> (although the authors of that study did conclude that gowns and gloves are effective barriers to infection), which raises concern that infections may be related to same-patient contamination rather than cross-contamination from other patients.<sup>16</sup>

### WHAT THE EVIDENCE SAYS—AND DOESN'T SAY

Consensus opinion leans toward the use of contact precautions because the combined weight of several mostly quasiexperimental studies appears most often to support the use of contact precautions.<sup>1</sup>

Authors of systematic reviews of the impact of contact precautions on MRSA and other resistant organisms make their conclusions on the basis of evidence that’s of generally low strength. As discussed above, the nature of this type of research makes clinical trials impractical. As occurs in many other areas of health research, contact precautions are rarely implemented alone but rather as part of a series of interventions designed to mitigate an identified problem. This makes their individual impact very difficult to discern. Study settings

and interventions also often differ significantly, complicating comparisons. Many studies cover only one site, are inadequately powered, have small sample sizes, and lack adequate control groups.

Understandably, results of the studies that do exist are mixed. A recent systematic review of the impact of surveillance cultures and barrier precautions (not necessarily contact precautions) rated only seven articles (out of 29 deemed worth examining) as high in quality.<sup>17</sup> Of the seven highest quality articles, three found no benefit when isolation or personal protective equipment was added to routine care (but as was noted is common in such studies, not all three had a control group and experimental group): Cepeda and colleagues found no difference in MRSA acquisition when patients who were colonized or infected with MRSA were isolated (in single rooms or in a cohort) or remained in ward settings, although aprons were worn on all shifts and glove use in all invasive procedures during which “washing or turning the patient, contact with mucous membranes or body fluids, and disposal of body fluids” was expected.<sup>18</sup> The authors refer to this practice as “standard plus” precautions, somewhere between standard precautions and contact precautions. Slaughter and colleagues found that the addition of gowns to routine care of patients colonized with VRE didn’t reduce acquisition rates.<sup>19</sup> And the study by Trick and colleagues found no difference in MRSA- or VRE-acquisition rates with or without contact precautions at a long-term care facility; they also saw significant cost savings when contact precautions were eliminated.<sup>20</sup>

The four remaining high-quality studies in the review support the use of contact precautions.

A study by Silverblatt and colleagues of entrants into a nursing home setting found that a rigorous contact precautions and decolonization protocol prevented all transmission of VRE<sup>21</sup>; given that the studies described above found minimal differences in VRE transmission with several types of precautions, it’s difficult to determine whether the increased precautions were responsible for the lack of VRE transmission. A case-control study in a French ICU by Chaix and colleagues found a 14% reduction in MRSA infection rate in a MRSA-endemic intensive care environment.<sup>22</sup> In another study comparing gowns and gloves with the use of gloves alone, Srinivasan and colleagues found lower rates of VRE acquisition with the gowns and gloves; the acquisition rate was 1.8 per 100 days versus 3.78 per 100 days, respectively.<sup>23</sup> No data on compliance with the intervention were reported. In a German hospital, Wernitz and colleagues found that screening patients at high risk for MRSA infection and placing MRSA-positive patients under contact precautions resulted in a substantial (48%) decrease in the predicted number of hospital-acquired MRSA infections.<sup>24</sup>

Whether contact precautions lead to increased or decreased compliance with hygiene interventions varies according to the study,<sup>19, 20, 25, 26</sup> although because study designs and interventions vary so widely, comparisons are difficult. Overall, contact precautions research overlooks the measurement of compliance with precautions, which threatens the validity of results.

### CAN CONTACT PRECAUTIONS LEAD TO HARM?

Several systematic reviews have been conducted on the impact

of contact precautions on patients. Troubling common themes of harm emerge from these sources, and problems associated with contact precautions have sometimes been reported.

### **The psychological impact.**

Both qualitative and quantitative studies examining the psychological impact of contact precautions on patients exist. Only one quantitative study exploring the psychological impact of contact precautions on hospitalized adult patients failed to find any detrimental effect, and the patients examined knew of their infection status prior to hospitalization.<sup>27</sup> Others have found common themes of loneliness as well as a feeling of stigmatization.<sup>28</sup> Standardized inventory instruments for a variety of psychological constructs enables numeric or quantitative comparison of outcomes. Using such scales, research consistently finds statistically significantly higher levels of depression and anxiety among patients placed under contact precautions or in isolation.<sup>29-32</sup> One of these studies (the review by Gammon and colleagues) also found evidence of low self-esteem and a loss of sense of control through standardized measures.<sup>29</sup> In another study, patients in isolation had higher scores on measures of anxiety and depression one week after admission than did those in a control group, and those differences persisted over at least two weeks.<sup>32</sup>

Relatively little research exists regarding interventions to decrease these deleterious effects in patients placed under contact precautions. A novel engineering approach has been proposed, in which interactive multimedia stations would be installed in patient rooms in the ICU with the goal of preventing the feelings of isolation experienced by contact precautions patients. These installations

involved music and sound and images projected on the wall. According to a report on the project, content included “live video and still images from visually dynamic locations chosen by [an] artist, family, and friends if the patient wish[ed].”<sup>33</sup> Feelings of anxiety and depression may be reflected in lower patient satisfaction, manifested in one study as significantly higher numbers of formal complaints in patients placed under contact precautions,<sup>34</sup> although another study didn’t find statistically significant differences in satisfaction scores.<sup>35</sup> In the study by Gasink and colleagues, despite the lack of statistical significance, “isolated patients consistently responded less favorably than nonisolated patients to nearly all of the questions.”<sup>35</sup>

nurse or physician. Several studies show that providers spend less time with patients under contact precautions and enter the room far less often. In fact, separate studies have shown that caregivers were less likely to enter the room of a patient under contact precautions<sup>25,36</sup> or that they were less likely to examine patients if they did.<sup>37</sup> Furthermore, the amount of time spent with patients was significantly lower when patients were in contact precautions, from 23% to 39% less time than with patients under standard precautions.<sup>36</sup>

Time and effort are required to gown and glove before entering a room, and gowns are frequently made of uncomfortable nonporous plastic, making extended wear unpleasant for the

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Families are often encouraged to adhere to contact precautions when patients are in care facilities; such a use of contact precautions can mean a severe decrease in skin-to-skin contact for a patient who’s already in distress. There’s a paucity of evidence regarding optimal precautions for visitors. The social isolation issue remains problematic for patients isolated in long-term care facilities.

Some of the detrimental psychological impact and the decrease in patient satisfaction can be traced to a lack of interaction with care providers. After all, therapeutic relationships cannot develop in the absence of the

staff. Although that’s no excuse for clinicians to steer clear of patients under contact precautions, it might explain some of the problem with reliable compliance.

It will likely come as no surprise that such a reluctance on the part of clinicians to enter and stay in a room adversely affects patient care. In a small qualitative analysis of patients’ reactions to isolation, one patient remembered being so frustrated by the lack of help with getting to the bathroom that he threw a spoon at a window to get the attention of the nurses.<sup>38</sup> Although the relationship between isolation and patient outcomes hasn’t been

widely explored, one study showed that “isolated patients were twice as likely to experience adverse events” and eight times more likely “to experience supportive care failures such as falls, pressure ulcers, and fluid and electrolyte disorders.”<sup>34</sup> The study also revealed poorer documentation and statistically significantly worse compliance with recommended congestive heart failure care on a heart failure unit with patients in isolation.

### WHERE THE PROFESSIONAL ORGANIZATIONS STAND

Both APIC and SHEA oppose blanket active surveillance legislation.<sup>39</sup> Additionally, CDC guidelines recommend that facilities base interventions on detailed risk assessments, rather than on broad mandates, although the CDC does acknowledge that in some cases facility-wide surveillance may be necessary.<sup>1</sup>

Although the CDC, APIC, and SHEA all support the routine use of contact precautions for colonized patients with multidrug-resistant organisms,<sup>1, 40, 41</sup> a recent symposium at SHEA’s Fifth Decennial International Conference on Healthcare-Associated Infections in 2010 revealed significant disagreement among infection preventionists and epidemiologists. Before a planned debate on the use of contact precautions in all patients colonized with multidrug-resistant organisms, 49% said they agreed with the practice; after the debate, that number had dropped to 31%. This issue clearly deserves more attention from experts. (A report on the conference can be found on the Web site *Infection Control Today*: <http://bit.ly/iaEnoG>.)

### MS. MCGARY: SAME FLOOR, DIFFERENT DAY

Several months after Ms. McGary’s discharge from the

hospital—after she’s returned to work and resumed family activities—she’s readmitted to the medical floor with an unrelated problem. Because of her history, however, she’s placed in a private room and contact precautions are instituted. Her family is instructed not to touch her, and she often goes for hours without seeing another person.

### Looking toward the future.

As cases like Ms. McGary’s and the paucity of high-quality research on contact precautions show, there is ample room for further research and improvement in this field. Some research suggests that the costs related to surveillance and contact precautions are offset by reductions in infection<sup>22</sup>; however, existing studies of costs associated with contact precautions and isolation tend to be older, and updated figures might be beneficial. Although a large number of quasi-experimental studies have been reported, as have some that are related to quality improvement projects, it’s important to design multisite, randomized clinical trials with few interventions, allowing focused interpretation. This is, admittedly, a daunting task, given the many clinical and ethical difficulties inherent in conducting such studies. It’s also important that measurements of compliance with contact precautions and hand hygiene protocols be included in research. Virtually all current research involves MRSA and VRE, but emerging resistant pathogens may behave differently. More research is also needed on the prevention of harm in isolated patients; the few studies that have been conducted are now dated.

The era of the superbug may just be beginning. Will we accept multidrug-resistant organisms as a fact of life and employ better basic hygiene practices? Will we

focus more resources on attempting to manage infection and colonization in acute care facilities, our most controllable sphere of influence? We should continue to search for definitive research-based answers while protecting our current patient population. At the very least, patients should understand why contact precautions are used. There is obviously confusion over the issue. A recent study showed that more than half of isolated patients believed that contact precautions benefitted both them and others. And that may be true, but protection of the isolated patient isn’t the primary function of contact precautions, and that should be openly communicated in the interest of patient autonomy.

Contact precautions are implemented for one patient with the aim of protecting other patients. But what if contact precautions present the potential for harm to that one patient—as has been suggested? Special care must be taken to ensure the need for contact precautions. If that doesn’t occur, the ethical principles of nonmaleficence and beneficence might well be violated when contact precautions are employed.

With such a dearth of high-quality research related to the use of contact precautions, and in light of the harm we may well be doing to patients and the controversy over their routine use to prevent transmission in a colonized patient, our profession should ask whether our actions are scientific and logical. And we should do our best not to expose our patients to harm. ▼

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