Taking Off the Gloves: Toward a Less Dogmatic Approach to the Use of Contact Isolation

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Strongly held beliefs about the need for contact isolation to prevent the spread of infections in the hospital have contributed to increased costs and decreased flexibility and, more recently, have driven aggressive diagnostic testing for colonization in asymptomatic patients. Examination of the evidence cited in support of the benefits of isolation and growing evidence of its unintended harms offer an opportunity to think differently about how contact isolation might best be applied. This review considers what we do and do not know about the potential benefits and harms of isolation as a public health measure and proposes a framework for considering under what circumstances it might optimally be used.

The Society for Healthcare Epidemiology of America and the Infectious Diseases Society of America recommend, as a “basic practice for prevention of methicillin-resistant Staphylococcus aureus (MRSA) transmission” [1, p. S65] for all acute-care hospitals, that patients with MRSA colonization or infection be placed under contact precautions [1, p. S66]. This use of contact precautions is a public health intervention and, as such, is similar to efforts to interrupt infectious disease transmission with use of isolation and quarantine that date back at least to the 14th century, when the Black Death swept across Europe [2]. Such measures have long been recognized to infringe on the personal rights of the individual in the name of protection of the public health [2].

When contact precautions or contact isolation are used according to the Society for Healthcare Epidemiology of America and Infectious Diseases Society of America recommendation, individuals thought to pose an infectious risk to others are placed in private rooms and cared for by health care workers (HCWs) wearing protective garb, often including gloves and gowns. The intended benefits are not for the isolated patient but for other patients who may be at risk of acquiring infection if isolation is not imposed. However, isolation is not without risk to the isolated patient. At best, it is restrictive to the patient’s free movement; at worst, the isolated patient may suffer psychologically or may receive a different level of care [3–6]. Moreover, isolation has costs, including the opportunity costs associated with the use of health care resources [7].

When an intervention is imposed to benefit one group at the potential cost of harming another, certain ethical principles must be upheld [8, 9]. These principles require clinicians to have justifiable goals and evidence for the effectiveness of the intervention in achieving those goals; to balance potential benefits against potential harms, with consideration of less harmful alternatives if available; and to ensure just, equitable application of necessary interventions.

This mini-review will examine current dogma about the use of contact isolation—gloves, gowns, and physical separation— as a public health intervention and will address the following questions. What are the goals of and rationale for using contact isolation? What do we know about its potential benefits? What do we know about its potential harm? Under what circumstances might the benefits outweigh or justify the harms? Is contact isolation the least restrictive alternative [10] for achieving the benefits? Is contact isolation imposed in a fair and equitable way? Finally, I will propose a framework for using the available evidence to make decisions about when to use contact isolation in the acute care setting.
GOALS OF AND RATIONALE FOR CONTACT ISOLATION

The overarching goal of contact isolation, similar to that for all infection-control interventions, is to prevent health care–associated infections (HAIs). For an HAI to occur, a pathogen has to first get to a patient and then gain access to a sterile body site, often through portals created by invasive devices or procedures or through a breakdown in skin integrity. Some HAIs are attributable to endogenous organisms in the patient; other HAIs occur after previously uncolonized patients acquire new pathogens in the hospital that then gain access to sterile body sites.

Hospitalized patients acquire new organisms in 3 ways: (1) directly, through contact with other patients (an uncommon occurrence in the hospital, even in shared rooms); (2) indirectly, by means of an intermediary, such as the contaminated hands of an HCW; or (3) indirectly, through environmental items, such as shared toilet seats or equipment. Contact isolation is used for a colonized or infected source patient, with the intent of interrupting these events in the following ways. Physical separation is intended to reduce the likelihood of direct contact between patients and to eliminate the possibility of transmission through a shared environment. Gloves and gowns are intended to reduce the risk that an HCW’s hands or clothing will become contaminated during care of the patient and inadvertently carry organisms to the next patient’s environment.

Because the ultimate goal of the intervention is to prevent infections, not simply interrupt transmission, it is important to keep in mind that the role of contact isolation is limited to interrupting transmission of new organisms to patients; transmission alone is neither necessary nor sufficient to cause infection. Once transmission has occurred, contact isolation is unlikely to play a role in preventing subsequent clinical infection, which requires that organisms gain access to sterile sites. For the same reason, contact isolation plays no role in preventing HAI caused by a patient’s endogenous flora.

POTENTIAL BENEFITS OF CONTACT ISOLATION

Despite the existence of dozens of published reports and a series of guidelines [1, 11–17] that cite these reports, evidence that contact isolation is necessary for the prevention of HAIs is inconclusive. There are significant limitations to the available evidence, much of which represents experiences in individual hospitals during outbreaks. These limitations are well delineated in 2 recent reviews of the use of isolation for the control of MRSA colonization and infection [18, 19]. One clear limitation of even the reviews is the merging of colonization and infection as an end point (e.g., “controlling MRSA”), which obfuscates our effort to determine effectiveness in preventing clinical infections. Other weaknesses of published studies include lack of clarity about specific interventions and targeted populations, use of multiple simultaneous interventions, failure to specify specific outcomes, and generally weak statistical analyses. Moreover, many studies fail to report compliance with interventions, making it difficult to determine whether the outcomes were truly associated with the interventions being assessed.

Cooper et al. [18] assessed 46 studies, 45 of which reported on multiple, often simultaneous, interventions; in one-third of the studies, no conclusions could be made. The strongest evidence was found in 6 interrupted time-series studies. Of these, 4 concluded that aggressive infection-control measures that included isolation were effective in “controlling MRSA” [20–24], and 2, conducted in settings of endemicity, failed to show an effect of isolation [25, 26]. These reviewers concluded that the evidence was inadequate to demonstrate the efficacy of isolation alone.

In their review, Marshall et al. [19] concluded that the articles cited as the evidence basis for using contact isolation to “control MRSA” were too methodologically weak to provide such evidence. Moreover, the authors indicate (as others have [27]) that the use of gloves and gowns should not be necessary if the hands of HCWs pose the greatest risk for transmitting pathogens, highlighting the paucity of studies addressing whether the use of contact isolation provides additional benefit beyond the practice of hand hygiene. The majority of studies cited in both reviews and in subsequent publications report a low level of hand-hygiene compliance or neglect to report it at all.

Several more-recent studies have examined the effectiveness of contact isolation in reducing pathogen transmission [28–30]. In a setting where gloves and aprons were used for the care of all patients, Cepeda et al. [28] found no additional benefit of isolating MRSA-colonized patients. Using daily nasal surveillance cultures for intensive care unit patients and molecular typing of isolates, Nijssen et al. [29] demonstrated a lack of cross-transmission of S. aureus, which suggests that clinical infections would not have been averted by isolating colonized patients. Kappstein et al. [30] reported lower rates of MRSA infection and transmission during a several-year period when standard precautions were used instead of contact isolation. In the hospital where I work (Dartmouth-Hitchcock Medical Center, Lebanon, NH), where 60% of beds are in single rooms and contact isolation is used only for patients with open wounds, diarrhea, or uncontrolled secretions (regardless of the organism), hospital-wide surveillance demonstrated control of all health care–associated bloodstream infections and S. aureus infections during a 5-year period [31].
Table 1. Locally variable factors that may influence the likelihood of benefit of contact isolation.

<table>
<thead>
<tr>
<th>Local factor</th>
<th>Lower likelihood of benefit</th>
<th>Higher likelihood of benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand-hygiene compliance by health care workers</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Epidemiology of health care–associated infections</td>
<td>Low endemic rates</td>
<td>Epidemic or uncontrolled rates</td>
</tr>
<tr>
<td>Organism of concern</td>
<td>All or easily treatable</td>
<td>Selected or difficult to treat</td>
</tr>
<tr>
<td>Prevalence of organism</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td>Clinical features of organism of concern</td>
<td>Asymptomatic</td>
<td>Open wound, diarrhea, or uncontained secretions</td>
</tr>
<tr>
<td>Clinical features of patients at risk of infection</td>
<td>Healthy</td>
<td>Vulnerable to infection because of age, immune status, or other risks</td>
</tr>
<tr>
<td>Physical environment</td>
<td>Clean, spacious, single rooms</td>
<td>Crowded, dirty wards</td>
</tr>
<tr>
<td>Available resources</td>
<td>Limited</td>
<td>Plentiful</td>
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POTENTIAL HARMs OF CONTACT ISOLATION

A small but growing body of evidence suggests that contact isolation can have unintended harmful consequences. Studies in both the nursing and the medical literature have reported that some isolated patients describe loneliness, stigmatization, boredom, anxiety, and depression [32–37]. The findings are inconsistent with regard to the impact of isolation on patient satisfaction scores [4, 6, 38]. From these small studies, the extent to which various aspects of isolation may contribute to the patients’ negative feelings is not clear. Single rooms are increasingly considered to be a standard for new hospital facilities. A recent review cites conflicting evidence regarding patient preferences for single versus multi-occupancy rooms, suggesting that responses vary on the basis of factors, such as the type of patient, the severity of illness, and the duration of hospitalization [39].

Several observational studies present evidence that contact isolation reduces the frequency and duration of encounters between HHCWs and patients. Studies in both medical and surgical units demonstrated that patients in contact isolation were seen by HHCWs half as often, compared with patients who were not isolated [3, 4]. Saint et al. [5] found that attending physicians (but not resident physicians) were half as likely to enter the room of a medical patient in isolation. These findings are indirectly supported in a retrospective study by Stelfox et al. [6] that assessed the safety of care provided to 2 groups of patients in isolation for MRSA colonization or infection and unisolated matched control subjects. In this study, conducted at 2 large teaching hospitals, isolated patients were more likely to have unrecorded or incompletely recorded vital signs and days without nursing notes or physician notes than were unisolated control subjects. There were apparent differences in the care that isolated patients with congestive heart failure received, including fewer inpatient diagnostic tests and changes in medication, less education at hospital discharge, and fewer follow-up appointments, compared with unisolated control subjects. Perhaps most concerning was the authors’ finding that isolated patients had significantly longer hospitalizations and experienced preventable adverse events (including falls and pressure ulcers) 6 times more often than did those not in isolation [6]. These studies raise questions about the mechanisms that might contribute to different patterns of care, a better understanding of which might allow development of mitigation strategies.

Management of isolation programs requires resources, and there are potential associated harms if this requires the diversion of resources away from essential infection prevention [7]. The costs of isolation vary depending on the frequency and duration of use and on how aggressively and with what type of technology we identify patients to be placed in contact isolation. Consider the potential difference in costs for a hospital that uses contact isolation for patients with clinically evident, draining wounds, compared with costs incurred by a hospital where asymptomatic MRSA-colonized patients are identified through weekly screening with a molecular test and are isolated for the duration of that and all subsequent hospitalizations. Costs include those for gowns and gloves, the use of a single room (or a double room for just 1 patient), and screening tests, as well as opportunity costs associated with delaying admission for other patients who require inpatient care. Who should pay the costs of isolation when it is used as a public health intervention, not for the benefit of the patient who is isolated, but for the theoretical benefit of others?

WEIGHING THE BENEFITS AND HARMS OF CONTACT ISOLATION

Unfortunately, currently available evidence is not compelling enough to support a firm conclusion regarding whether the benefits of contact isolation consistently outweigh the harms or the harms outweigh the benefits in all cases (table 1). There is evidence that, in outbreaks or other contexts in which HAIs are not controlled, multifaceted programs that include the use of contact isolation can be associated with improvement. No studies show a clear effect of isolation alone or in addition to
hand hygiene. Without evidence of clear independent benefit, even the small body of evidence that suggests potential harm must be carefully considered. Based on available studies, care appears to be different for patients in contact isolation, and some data suggest that some outcomes may be worse in isolated patients than in patients who are not isolated. However, neither the magnitude, the inevitability, nor the preventability of the harm is clear.

Given the real-world settings in which clinicians practice, it is likely that the benefit-to-harm balance will vary according to circumstances. Table 1 shows a list of local factors that might be considered when weighing the benefits and harms of isolation. At one end of the continuum is a healthy patient admitted electively to a hospital with a clean and spacious environment, a high level of hand-hygiene compliance, and low rates of HAI—a situation in which the benefits of contact isolation may be outweighed by the harms. At the other end of the continuum is a patient with a large draining wound in a crowded hospital with a low level of hand-hygiene compliance and an epidemic of MRSA infection—a situation in which contact isolation may be justified. Although it may be premature to create such a list for considering the likelihood of harm, it seems that, in some cases, patients who are most likely to be placed in isolation may be the ones who are most vulnerable to the negative effects of reduced contact with HCWs.

**THE LEAST RESTRICTIVE ALTERNATIVE**

The concept of a least restrictive alternative derives from the Model Public Health Act, which attempts to ensure that the pursuit of public good does not infringe more than absolutely necessary on the rights of individuals [10]. Contact isolation is imposed to interrupt transmission of pathogens with the intention of preventing HAIs. There is good evidence that HCW hand hygiene, an intervention that imposes no restrictions on patients, is adequate to interrupt such transmission [40]. For this reason, hand hygiene, not contact isolation, is the least restrictive alternative. HCW hand hygiene offers the additional benefit of occurring at ≥1 of the segments in the chain of events that leads to HAIs; if it is practiced prior to aseptic tasks and when an HCW moves from dirty to clean areas during patient care, it can prevent pathogens from accessing sterile body sites. Hand hygiene can and should be implemented universally for all patients.

In reality, however, most clinicians practice in settings where good hand hygiene practices are not universal. Although the imperative to improve hand-hygiene compliance is paramount, until this is achieved, the use of contact isolation may be needed in some situations to keep patients safe. Further research is needed to demonstrate whether and under what circumstances there is additional benefit to this intervention in a setting where the level of hand-hygiene compliance is high.

**ISSUES OF FAIRNESS**

If contact isolation is necessary for the prevention of HAIs, then one could argue for its use during all patient care. All patients are colonized with potential pathogens and can serve as sources of nosocomial transmission; any microorganism can cause a life-threatening HAI. Currently, contact isolation is used most often to control drug-resistant organisms and is applied variably to subsets of patients who are infected and/or colonized with these organisms. When applied only to patients whose clinical cultures grow a drug-resistant organism, many asymptomatically colonized patients are not identified or isolated [41]. Isolating only a subset of colonized patients unfairly subjects some patients to the risk of potential harm associated with being seen less frequently by HCWs, and it unfairly deprives some patients of potential protection from the transmission of pathogens.

Screening all patients for the presence of nasal MRSA colonization may partially reduce this particular inequity, although it would not identify patients colonized at other sites, including the throat and perineum [42, 43]. More importantly, universal screening does not address the larger inequities that stem from a narrow focus on only 1 strain of 1 organism. If local evidence suggests that MRSA is being transmitted from colonized patients, it is likely that unrecognized transmission of methicillin-susceptible *S. aureus* and many other organisms that colonize the nose, mouth, skin, or gastrointestinal tract of patients is also occurring. In this case, fairness might dictate a more universal application of infection-prevention measures so that all patients may be protected.

**CONCLUSIONS: RETHINKING DOGMA**

Current use of contact isolation may be driven more by strongly held beliefs and a desire to do something to prevent HAIs than by unambiguous evidence. It seems clear, after review of the issues, that an individualized approach is justified. Certainly, contact isolation is a tool that can be used to interrupt transmission of pathogens in a health care setting. However, its use is not without potential negative consequences, and its current application targeting selected organisms is not equitable when the larger burden of HAI is considered. Most importantly, there is good evidence that a less restrictive alternative exists that has the advantage of being universally applicable and acting at multiple sites in the chain of events leading to HAI. For this reason, efforts to improve hand hygiene should be prioritized by all hospitals. If those efforts are successful, the role for contact isolation will be limited.

Given the complexity of health care environments and the increasing evidence of the unanticipated consequences of well-intentioned interventions, a shift from asking yes-or-no questions about whether isolation should be used to more nuanced
questions about the circumstances under which the benefits of isolation outweigh the harms will yield more useful information. Guideline development that recognizes the need to consider context and real-world implementation will result in more robust and more flexible tools that fit a variety of situations and will allow for the continuous incorporation of new knowledge.

Acknowledgments
I thank Dr. Elizabeth Talbot for her thoughtful review of an earlier draft of the manuscript.

Potential conflicts of interest. K.B.K.: no conflicts.

References
37. Newton JT, Constable D, Senior V. Patients’ perceptions of methicillin-