HHS Public Access

Author manuscript

Clin Microbiol Infect. Author manuscript; available in PMC 2021 June 01.

Published in final edited form as:

Clin Microbiol Infect. 2020 June ; 26(6): 684–695. doi:10.1016/j.cmi.2020.01.022.

Patient care experience with utilization of isolation precautions: A systematic literature review and meta-analysis

Rajeshwari Nair[1,2], **Eli N. Perencevich**[1,2], **Michihiko Goto**[1,2], **Daniel J. Livorsi**[1,2], **Erin Balkenende**[1,2], **Elizabeth Kiscaden**[3], **Marin L. Schweizer**[1,2]

[1]Center for Access & Delivery Research & Evaluation (CADRE), Iowa City Veterans Affairs, Health Care System, Iowa City, IA, USA

[2]Department of Internal Medicine, University of Iowa Carver College of Medicine, Iowa City,IA, USA

[3]Hardin Library for Health Sciences, University of Iowa, Iowa City, IA, USA

Abstract

Background: Use of isolation precautions (IP) may represent a trade-off between reduced transmission of infectious pathogens and reduced patient satisfaction with their care.

Objective: Perform a systematic literature review and meta-analysis to identify if and how IPs impact patients' care experiences.

Data sources: MEDLINE, ClinicalTrials.gov, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE, PsychInfo, HSRProj, and the Cochrane Library databases.

Study eligibility criteria: Interventional and observational studies published January 1990 to May 2019 were eligible for inclusion.

Participants: Patients admitted to an acute-care facility.

Interventions: Isolation precautions versus no isolation precautions.

Methods: Six reviewers screened titles, abstracts, and full-texts. Experience of care reported by patients using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey was assessed as the outcome for the meta-analysis. Pooled odds ratios were calculated using the random effects model. Heterogeneity was assessed using the I^2 value.

Corresponding author: Marin L. Schweizer, Address: 601 Highway 6 West, Iowa City, IA 52246, marin-schweizer@uiowa.edu, Tel. (319) 338-0581, Fax. (319) 887-4932.

Declaration of Interests

All authors report no conflicts of interest relevant to this article.

Interim results from this study were presented at the Society for Healthcare Epidemiology of America (SHEA) Spring meeting, St. Louis, MO, March 29–30, 2017.

Results: After screening 7,073 titles and abstracts, 15 independent studies were included in the review. Pooling of unadjusted estimates from the HCAHPS survey demonstrated that IP patients were less likely to give top scores on questions pertaining to respect, communication, receiving assistance, and cleanliness compared with the no IP patients. Patients under IP with longer length of stay appeared to have more negative experiences with the care received during their stay compared with no IP.

Conclusions: Patients under IP were more likely to be dissatisfied with several aspects of patient care compared with patients not under IP. It is crucial to educate patients and healthcare workers in order to balance successful implementation of IP and patient care experiences, particularly in healthcare settings where it may be beneficial.

INTRODUCTION

Isolation precautions (IP) have been used as an integral part of infection control practices to prevent transmission of pathogens (1). One of the key components of IP includes isolation or cohorting of hospitalized patients with known or suspected colonization or infection with pathogens that may be transmitted within hospitals (e.g., multidrug resistant organisms [MDROs]) (2). Studies have noted unintended consequences of isolation on several aspects of supportive care to patients (3–6). Two independently conducted systematic reviews observed decreased frequency and duration of healthcare personnel visits; increased frequency of preventable physical adverse events; negative impact on behavior and mental well-being; and negative patient experience due to lack of awareness of their treatment plan (7, 8). A large cluster randomized trial of intensive care units in US hospitals noted that use of universal contact precautions significantly increased exit hand hygiene compliance and decreased methicillin-resistant *Staphylococcus aureus* (MRSA) acquisitions compared with the control arm. This trial also noted that while use of universal contact precautions reduced the rate of health care worker (HCW) room entry it did not affect the rate of physical adverse events (9).

There is variable evidence regarding the effectiveness of precautions, particularly contact precautions at preventing transmission of MDROs in healthcare settings (10–17). Variation in implementation and poor compliance are potentially responsible for disparate results on the effectiveness of these practices (18, 19). A major limitation that affects the validity of results in the published literature is lack of risk adjustment for underlying comorbidities and severity of illness. Risk-adjustment is necessary since patients placed under IP typically are infected or colonized with MDROs and would be expected to have higher severity of illness or comorbidity (20, 21). Severely ill patients are noted to be less satisfied with their care (22).

The objectives of our study were to perform a systematic literature review and to conduct a meta-analysis to assess the association between IP use and patient experience

METHODS

We conducted a systematic literature review to evaluate the association between use of IP for healthcare-associated pathogens and patient experience. This review was conducted per the

Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (23). The study was registered with the international prospective systematic review register (PROSPERO CRD42015027816).

Study Eligibility Criteria

Inclusion and exclusion criteria were established *a priori*. The search strategy and reasons for exclusion are detailed in Figure 1. Studies were included if IP (contact/droplet/airborne) was assessed as an exposure and results on patients' experience with care was reported as one of the outcomes. Experience with care was not pre-defined for this review and definitions provided by each study measuring this outcome was considered as presented. Original articles, human studies, and studies on patients admitted to an acute-care facility were eligible for inclusion. Observational (cohort, case-control), quasi-experimental (before-after or time-series analysis), and intervention studies were eligible for inclusion. No other limiters such as language or length of follow-up were used. Studies without a control group were included in the review for descriptive purposes but not included in the meta-analysis. We excluded reviews, editorials, correspondence, commentaries, and outbreak studies.

Study Search Strategy

A health sciences librarian (EK) performed extensive literature searches in MEDLINE, ClinicalTrials.gov, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE, PsychInfo, HSRProj, and the Cochrane Library databases from years 2009 to 2018. A search strategy for MEDLINE was developed using headings and keywords for terms including *disease transmission, cross infection, patient isolation, protective clothing, anxiety, depression, patient satisfaction,* and *adverse effects*. For the full search strategy, please see Supplemental Table 1. Studies published with patient care experience outcomes before 2009 were identified from two systematic literature reviews published prior to this period (7, 8). Reference lists of published articles were reviewed and a ProQuest search between 1990 and 2017 was conducted to identify additional studies. We also reviewed proceedings for major conferences such as IDWeek and Society for Healthcare Epidemiology of America (SHEA) to find abstracts for unpublished studies. An additional search was conducted in MEDLINE to identify studies published between January and May 2019 during the drafting of this manuscript.

Data Extraction and Quality Assessment

Titles of articles were screened to ascertain relevance to this review. We screened abstracts and articles by title to assess eligibility after excluding duplicates. Six independent reviewers (RN, MLS, MG, DJL, EB, ENP) abstracted data using a pilot-tested abstraction form developed for this study by the double-data entry method. Study data were collected and managed using Research Electric Data Capture (REDCap) electronic data capture tools hosted at the University of Iowa (24). Data was abstracted on study design, population, healthcare setting, specifics on implementation of IP, tools used to measure patient experience, and responses on patient experience measures. We used the Newcastle-Ottawa scale to assess the quality of included studies (25). Disagreements between reviewers were resolved by consensus.

Data Analysis

A priori, we planned to present a single pooled estimate of the outcome measure and separately present qualitative data on the outcome as extracted from studies. We planned to abstract raw data for patient experience measures for IP and no IP groups and generate unadjusted odds ratios (OR) and 95% confidence intervals (CI) using the generic inverse variance method. We decided not to use risk-adjusted estimates for the meta-analysis since studies did not report risk-adjusted estimates or adjusted for different risk factors when reporting patient experience. We planned to report the pooled estimate obtained using a random-effects model as we expected heterogeneity among included studies. Heterogeneity between studies were reported using the I^2 value.

The Cochrane Review Manager version 5.2.11 for Windows (Nordic Cochrane Center, Cochrane Collaboration) was used to generate the PRISMA flow diagram and forest plots.

RESULTS

The literature search yielded 7,073 unique records. After screening titles and abstracts, we reviewed 268 articles in detail and included 15 independent studies in the review. The search strategy and reasons for exclusion are detailed in the Figure 1. On reviewing the 15 studies, we noted that seven studies compared patient experience using the Hospital Consumer Assessment of Healthcare Providers and Systems hospital (HCAHPS) survey. The Center for Medicare and Medicaid Services (CMS) requires hospitals to use this tool to measure patient satisfaction, as part of the value-based purchasing program. Six of the seven studies used the tool in the original format. We chose to meta-analyze these six studies that reported on common HCAHPS questions. These six studies assessed experience with care among 3,041 patients in IP and 28,457 no IP patients.

Patient experience was assessed on questions listed in the HCAHPS survey and was not assessed as a single outcome measure. Communication with healthcare workers (HCWs), respect from HCWs, assistance during hospital stay and during discharge, and environmental cleanliness measured using the HCAHPS survey were assessed as outcome measures. Patients overall rating of the treating hospital and willingness to recommend the hospital to family and friends was also assessed using the survey questionnaire.

Characteristics of included studies

Of the 15 studies, eight were prospective cohorts (6, 26–32), four were retrospective cohorts (3, 5, 33, 34), one was a case-control study (35), and two were surveys (36, 37) (Table 1). The majority were studies of adults, except one that was conducted in a pediatric inpatient setting (27). Eight studies implemented IP in conjunction with passive surveillance (if patients had an infection or if their colonization status was known) of which two did not specify the organism targeted for surveillance (30, 31) and one study used IP in anybody at risk for MRSA and MDR gram-negative colonization or infection (28). Eight studies used IP for patients with MRSA colonization or infection (3, 5, 6, 26, 29, 32, 35, 37), and seven for patients with *Clostridioides difficile* infection (6, 26, 29, 32, 33, 36, 37). Other organisms targeted in studies were vancomycin resistant enterococci (VRE) colonization or infection

(26, 29, 37), gram-negatives (29, 37), tuberculosis (6, 32), scabies (32, 36), other MDROs (26, 33, 36), and one each for infection due to extended-spectrum beta lactamases producing pathogen (32), influenza (33) and varicella (32). The pediatric study performed active surveillance (test high risk patients for colonization) and implemented IP in patients with fever, diarrhea, or if they were transferred from a facility with high prevalence of MDRO (27). Eight studies used contact precautions (CP) by itself (3, 5, 6, 28, 29, 35–37) while seven implemented CP in conjunction with airborne (27, 30–34), six with droplet (26, 27, 31–34), and one with enhanced respiratory (33) precautions.

Five studies matched IP and no IP patients in study design (3, 28, 30, 32, 36) and four studies adjusted for confounders in analysis (3, 29, 34, 35) (Table 1). Studies in which IP patients had significantly longer length of stay compared with no IP patients were observed to have more negative experiences, suggesting the potential for confounding by the duration of hospital stay (3, 5, 33, 34) (Table 2).

Only three studies assessed adherence to IP during the study period (26, 35, 37) and three assessed length of IP (6, 28, 35). None of the studies reported that their hospitals prepared patients for IP or had a strategy for removal of patients from IP. Of the four studies that compared prior history of hospitalizations (27, 28, 31, 35), one reported a significant difference in history of hospitalizations between the IP (35.7%) and no IP (20.1%) groups (p=0.01) (35).

Patient experience data was collected at different time points using methods such as interview or semi-structured interviews (5, 6, 26, 30, 31), self-reporting using questionnaires (28, 32, 37) and medical record abstraction of patient experience scores (3, 31). Seven studies used HCAHPS survey for data collection on patient experience with and without use of IP of which only six used questions in the format specified in the original tool (29, 30, 32–36). Of these six studies, three matched IP and no IP patients (30, 35, 36), three adjusted for potential confounders in the analysis (29, 34, 35), and only one did not match or statistically adjust for confounders (33).

Study Quality Assessment

Majority of the included studies had appropriate selection of the representative cohort, ascertainment of the use of IP, and sufficient follow-up of patients to measure their satisfaction with use of IP (Supplement Table 2). Three of the 15 studies did not use a control group to compare patient experience with and without IP (6, 28, 37). Ten studies did not assess patient experience before the start of the study, eight studies used self-reporting tools with no independent assessment of the response, and nine studies did not report adequacy of follow-up of cohorts by the IP group to ensure that being lost to follow-up was not related to the use of IP or due to patients' experience with care. Two of the six meta-analyzed studies did not assess patient experience prior to study (30, 36), and one lacked in cohort comparison since they did not risk-adjust or match on confounders (33).

Meta-analysis of HCAHPS questions

We chose to meta-analyze each question in the HCAHPS survey instead of providing a pooled estimate given the heterogeneity in responses on questions. Raw data on the number

of patients marking top box responses on each HCAHPS question was collected from IP and no IP groups. Calculated OR identified the likelihood of top box responses (marked "always" or "definitely yes", or "9" or "10") on survey questions. Top box responses from the no IP group was considered the reference category such that an estimated OR < 1.00 suggests that patients in the IP group were less likely to pick top scores for the question on the HCAHPS survey compared with the no IP group.

Among the six meta-analyzed studies, IP patients had a lower likelihood of giving top scores on questions about doctors treating them with respect (OR=0.70, 95% CI 0.56–0.89, I^2=26%), doctors explaining things in an understandable manner (OR=0.75, 95% CI 0.66–0.85, I^2=5%), nurses treating them with respect (OR=0.78, 95% CI 0.69–0.88, I^2=0%), nurses explaining things in an understandable manner (OR=0.74, 95% CI 0.61–0.88, I^2=20%), receiving help after pressing the call button (OR=0.67, 95% CI 0.61–0.73, I^2=0%), and reporting that their room or bathroom was kept clean (OR=0.71, 95% CI 0.65–0.78, I^2=0%) compared with no IP patients (Figure 2A).

The IP group was less likely to pick top scores for recommendation of the hospital to family and friends (n=3, OR=0.67, 95% CI 0.50–0.88, I^2=0%) and patients' overall rating of the hospital (n=4, OR=0.69, 95% CI 0.62–0.76, I^2=0%) (Figure 2B). Patients under IP were 30% (n=5, 95% CI 0.62–0.79, I^2=4%) and 23% (n=5, 95% CI 0.70–0.86, I^2=0%) less likely compared with no IP patients, to give top scores to questions that HCWs (doctors and nurses respectively) listened to them carefully. IP patients were also 38% less likely to assign top scores to the question that the staff did everything to help them with pain (n=5, 95% CI 0.57–0.69, I^2=0%) and 25% less likely to report that their pain was well controlled (n=5, 95% CI 0.68–0.82, I^2=0%) compared with the no IP group. IP patients were less likely to give top scores to the question on being informed about symptoms and problems to look for after discharge (n=4, OR=0.79, 95% CI 0.65–0.97, I^2=6%) compared with no IP patients. The groups did not differ on explanation of new medicine by staff, description of adverse events of new medicine by staff, and staff discussing help after discharge (Figure 2B).

Patient reported experiences with use of IP

Table 2 describes patient experiences that could be considered as negative perceptions with use of IP. Spinal cord injury patients who were under IP for a MRSA infection reported that IP adversely affected their rehabilitation process due to lack of assistance and space for physiotherapy, and that isolation negatively affected their adjustment to injuries (6). Another study found that adult inpatients under contact precautions were more likely to be discharged to a second facility compared with adult inpatients who were under airborne precaution (33). A third study conducted among acute care patients found that patients under IP reported significantly higher dissatisfaction with getting help with daily living activities, and human relations (32).

Conversely, there were also some factors that patients reported as a positive experience with use of IP (Table 2). A study in which the duration of isolation was recorded between 1–8 weeks found that more than half of their patients reported that they had enough information on IP, someone was available to give more information, had correct reason for isolation, and were satisfied that they were kept up to date with isolation (6). More than 80% patients in

another study reported being informed about measures and thought that isolation was safe, short, and useful (36). A study conducted in Spain observed that more than 50% of their isolated patients were explained the importance of hand hygiene while only 25% of non-isolated patients got this information (30). Moreover 97% of patients in this Spanish study reported that the room atmosphere was sufficiently quiet. A fourth study reported that the rationale for use of isolation was explained to > 60% of their patients, > 90% believed that isolation prevented infections, about 80% of their staff adhered to isolation practices, and > 80% of patients reported that they were happy to be treated in a hospital with isolation (37).

DISCUSSION

This systematic literature review and meta-analysis observed that based on unadjusted data from published studies, the use of IP negatively affected perceptions of care among patients under IP in acute care facilities, particularly if patients had longer length of stay compared with no IP patients.

Our findings on patient experience with IP are similar to the findings from other studies. A cross-sectional study that interviewed all patients under IP with and without a personal protective equipment (PPE) free zone in the room noted that patients expressed concerns about interaction and visibility of HCWs, unanswered questions, and long response time, regardless of the PPE free zone. Patients also expressed feelings of distress, alienation or being a burden to healthcare staff, and confusion related to IP. Over half of the patients in that study received little to no education on use of IP (38). Morgan et al published a review to aid in decision-making on the use of IP for endemic MRSA and VRE in US hospitals (39). Their review of studies on potential harms associated with IP established that modification of HCW behavior towards IP resulted in significantly fewer bedside visits, shorter contact time, and less frequent patient examinations. Longer admission time, delayed discharge or transfer time, and rates of adverse events were inconsistent among studies included in their review and were mostly impacted by low study quality. A semi-structured interview of HCWs identified barriers such as patient care demands, time pressures, practices of other peers, and need for additional signs to indicate patient's necessity for IP, with implementation of IP for MRSA, (40). A recently published systematic review by Rump et al., noted that MDRO carriers had limited understanding of the benefit of IP and felt stigmatized due to isolation from their social circle (41). Our review was different from that review in that we included all studies regardless of the causative pathogen and meta-analyzed data collected on patient care experience by a standardized survey tool. Despite the difference in methodologies, our review found similar results on the potential for indifferent behavior by HCWs towards patients in isolation, patient perception of delay in receiving care, and impact of isolation on the quality of care. These concerns have resulted in complete elimination of IP in some hospitals, which could potentially result in increased transmission of pathogens that could have been controlled using IP.

One of the major limitations of our review was the inclusion of studies that did not risk-adjust for important confounders. This was due to limited availability of studies that accounted for confounders in evaluating the association between patient experience and use of IP. The validity of results in such studies may be questionable, as noted by the ORION

statement (42). We noted that global patient satisfaction differed significantly in IP groups in a study that presented results that were not adjusted for confounders (32) while patient care experiences between IP groups did not differ in studies that either blinded patients to study objectives (27) or reported risk-adjusted results (35). Due to the limited number of studies included in the meta-analysis, we did not assess for publication bias. There is potential for publication bias given the ambiguity in use of IP that could affect the publication of completed studies. Reporting bias due to negative results attributed to lack of power, no effect of IP, or opposite than estimated effect of IP could result in misinformation in developing recommendations for implementation of IP. Identification of methodological concerns with the existing literature such as inconsistent risk-adjustment methods is one of the major strengths of our review, which can be used to design and conduct better studies to report on the association between patient experience and IP.

In summary, our systematic literature review observed that use of IP negatively affected some experiences of care among patients admitted to acute care facilities. Given the lack of risk-adjustment for potential confounders among included studies, these results should be considered with caution. The leading infection control societies in US recommend the use of IP, particularly when caring for patients colonized or infected with MRSA or VRE (43–45). Alternate strategies such as horizontal infection control measures that reduce the burden of all microorganisms, and discontinuation of IP for MRSA and VRE in hospitals with low endemic rates have been proposed (21). While HCWs are susceptible to compliance fatigue in application of IP components, patients are negatively affected by seclusion or insufficient contact with HCWs while under IP (46).

Based on these results we recommend the following IP practices in acute care facilities. Firstly, determine which patient populations are highest priority for IP to ensure judicious management of resources. Second, develop educational toolkits to prepare patients before putting them under IP, have a strategy for removal of patients from IP once they are no longer colonized or infected, and educate patients on the benefit and perceived harms of IP. Third, involve a patient's closest social circle in the caregiving process to deter feelings of isolation. Finally, assign dedicated IP trained staff to alleviate the perception of lack of care among isolated patients, to avoid HCW burnout, and to avoid potential gaps in treatment of isolated patients.

A weak evidence base of published studies is one of the major challenges in formulation of relevant recommendations that support or challenge the use of IP. Based on findings from our systematic literature review and meta-analysis, we recommend conducting well-designed studies that use a comparable homogeneous control group, collect data on care experience from patients before and after implementation of IP using a validated tool, risk-adjust for important confounders, and assess "ideal" implementation of IP compared with standard implementation in building the foundation to make impactful decisions on use of IP as an efficient infection control measure.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This work was supported by the CDC RFA-CK-15–004, Epicenters for the Prevention of Healthcare Associated Infections (HAIs).

The content is solely the responsibility of the authors and does not necessarily represent the official views of the CDC or NIH. The VA Office of Research and Development had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; or preparation of the manuscript. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States Government.

Research reported in this publication was supported by the National Center For Advancing Translational Sciences of the NIH under Award Number UL1TR002537.

We would also like to acknowledge Dr. Nasia Safdar and Dr. Daniel Morgan for their contribution to the literature on isolation precautions.

References

1. Cohen CC, Cohen B, Shang J. Effectiveness of contact precautions against multidrug-resistant organism transmission in acute care: a systematic review of the literature. J Hosp Infect. 2015;90(4):275–84. [PubMed: 26051927]
2. Tran K, Bell C, Stall N, Tomlinson G, McGeer A, Morris A, et al. The Effect of Hospital Isolation Precautions on Patient Outcomes and Cost of Care: A Multi-Site, Retrospective, Propensity Score-Matched Cohort Study. J Gen Intern Med. 2017;32(3):262–8. [PubMed: 27752880]
3. Stelfox HT, Bates DW, Redelmeier DA. Safety of patients isolated for infection control. JAMA. 2003;290(14):1899–905. [PubMed: 14532319]
4. Morgan DJ, Day HR, Harris AD, Furuno JP, Perencevich EN. The impact of Contact Isolation on the quality of inpatient hospital care. PLoS One. 2011;6(7):e22190.
5. Kennedy P, Hamilton LR. Psychological impact of the management of methicillin-resistant Staphylococcus aureus (MRSA) in patients with spinal cord injury. Spinal Cord. 1997;35(9):617–9. [PubMed: 9300970]
6. Rees J, Davies HR, Birchall C, Price J. Psychological effects of source isolation nursing (2): Patient satisfaction. Nurs Stand. 2000;14(29):32–6.
7. Abad C, Fearday A, Safdar N. Adverse effects of isolation in hospitalised patients: a systematic review. J Hosp Infect. 2010;76(2):97–102. [PubMed: 20619929]
8. Morgan DJ, Diekema DJ, Sepkowitz K, Perencevich EN. Adverse outcomes associated with Contact Precautions: a review of the literature. Am J Infect Control. 2009;37(2):85–93. [PubMed: 19249637]
9. Harris AD, Pineles L, Belton B, Johnson JK, Shardell M, Loeb M, et al. Universal glove and gown use and acquisition of antibiotic-resistant bacteria in the ICU: a randomized trial. JAMA. 2013;310(15):1571–80. [PubMed: 24097234]
10. Landelle C, Pagani L, Harbarth S. Is patient isolation the single most important measure to prevent the spread of multidrug-resistant pathogens? Virulence. 2013;4(2):163–71. [PubMed: 23302791]
11. Aboelela SW, Saiman L, Stone P, Lowy FD, Quiros D, Larson E. Effectiveness of barrier precautions and surveillance cultures to control transmission of multidrug-resistant organisms: a systematic review of the literature. Am J Infect Control. 2006;34(8):484–94. [PubMed: 17015153]
12. Apisarnthanarak A, Khawcharoenporn T, Mundy LM. Practices to prevent multidrug-resistant Acinetobacter baumannii and methicillin-resistant Staphylococcus aureus in Thailand: a national survey. Am J Infect Control. 2013;41(5):416–21. [PubMed: 23098775]
13. Boyce JM, Havill NL, Kohan C, Dumigan DG, Ligi CE. Do infection control measures work for methicillin-resistant Staphylococcus aureus? Infect Control Hosp Epidemiol. 2004;25(5):395–401. [PubMed: 15188845]
14. Cooper BS, Stone SP, Kibbler CC, Cookson BD, Roberts JA, Medley GF, et al. Isolation measures in the hospital management of methicillin resistant Staphylococcus aureus (MRSA): systematic review of the literature. BMJ. 2004;329(7465):533. [PubMed: 15345626]

15. De Angelis G, Cataldo MA, De Waure C, Venturiello S, La Torre G, Cauda R, et al. Infection control and prevention measures to reduce the spread of vancomycin-resistant enterococci in hospitalized patients: a systematic review and meta-analysis. J Antimicrob Chemother. 2014;69(5):1185–92. [PubMed: 24458513]
16. Munoz-Price LS, Quinn JP. Deconstructing the infection control bundles for the containment of carbapenem-resistant Enterobacteriaceae. Curr Opin Infect Dis. 2013;26(4):37887.
17. Tschudin-Sutter S, Frei R, Dangel M, Stranden A, Widmer AF. Rate of transmission of extended-spectrum beta-lactamase-producing enterobacteriaceae without contact isolation. Clin Infect Dis. 2012;55(11):1505–11. [PubMed: 22955436]
18. Cohen CC, Shang J. Evaluation of conceptual frameworks applicable to the study of isolation precautions effectiveness. J Adv Nurs. 2015;71(10):2279–92. [PubMed: 26179813]
19. Zastrow RL. Emerging infections: the contact precautions controversy. Am J Nurs. 2011;111(3):47–53.
20. Fitzpatrick F, Perencevich EN. Putting contact precautions in their place. J Hosp Infect. 2017;96(2):99–100. [PubMed: 28262434]
21. Young K, Doernberg SB, Snedecor RF, Mallin E. Things We Do For No Reason: Contact Precautions for MRSA and VRE. J Hosp Med. 2019;14(3):178–80. [PubMed: 30811326]
22. Merlino JI, Kestranek C, Bokar D, Sun Z, Nissen SE, Longworth DL. HCAHPS Survey Results: Impact of Severity of Illness on Hospitals' Performance on HCAHPS Survey Results. J Patient Exp. 2014;1(2):16–21. [PubMed: 28725804]
23. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Ann Intern Med. 2009;151(4):W65–94. [PubMed: 19622512]
24. Harris PATR, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42(2):377–81. [PubMed: 18929686]
25. Wells GA, Shea B, O'Connell D, Peterson J, Welch V, Losos M, Tugwell P. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. [cited 2019 March 12]. Available from: http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp.
26. Evans HL, Shaffer MM, Hughes MG, Smith RL, Chong TW, Raymond DP, et al. Contact isolation in surgical patients: a barrier to care? Surgery. 2003;134(2):180–8. [PubMed: 12947316]
27. Cohen E, Austin J, Weinstein M, Matlow A, Redelmeier DA. Care of children isolated for infection control: a prospective observational cohort study. Pediatrics. 2008;122(2):e411–5. [PubMed: 18676528]
28. Wassenberg MW, Severs D, Bonten MJ. Psychological impact of short-term isolation measures in hospitalised patients. J Hosp Infect. 2010;75(2):124–7. [PubMed: 20381912]
29. Mehrotra P, Croft L, Day HR, Perencevich EN, Pineles L, Harris AD, et al. Effects of contact precautions on patient perception of care and satisfaction: a prospective cohort study. Infect Control Hosp Epidemiol. 2013;34(10):1087–93. [PubMed: 24018926]
30. Lupion-Mendoza C, Antunez-Dominguez MJ, Gonzalez-Fernandez C, Romero-Brioso C, Rodriguez-Bano J. Effects of isolation on patients and staff. Am J Infect Control. 2015;43(4):397–9. [PubMed: 25721058]
31. Lau D, Majumdar SR, McAlister FA. Patient isolation precautions and 30-day risk of readmission or death after hospital discharge: a prospective cohort study. Int J Infect Dis. 2016;43:74–6. [PubMed: 26751237]
32. Guilley-Lerondeau B, Bourigault C, Guille des Buttes AC, Birgand G, Lepelletier D. Adverse effects of isolation: a prospective matched cohort study including 90 direct interviews of hospitalized patients in a French University Hospital. Eur J Clin Microbiol Infect Dis. 2017;36(1):75–80. [PubMed: 27612471]
33. Vinski J, Bertin M, Sun Z, Gordon SM, Bokar D, Merlino J, et al. Impact of isolation on hospital consumer assessment of healthcare providers and systems scores: is isolation isolating? Infect Control Hosp Epidemiol. 2012;33(5):513–6. [PubMed: 22476279]

34. Siddiqui ZK, Conway SJ, Abusamaan M, Bertram A, Berry SA, Allen L, et al. Patient isolation for infection control and patient experience. Infect Control Hosp Epidemiol. 2018:1–6.
35. Livorsi DJ, Kundu MG, Batteiger B, Kressel AB. Effect of contact precautions for MRSA on patient satisfaction scores. J Hosp Infect. 2015;90(3):263–6. [PubMed: 25799481]
36. Gasink LB, Singer K, Fishman NO, Holmes WC, Weiner MG, Bilker WB, et al. Contact isolation for infection control in hospitalized patients: is patient satisfaction affected? Infect Control Hosp Epidemiol. 2008;29(3):275–8. [PubMed: 18205528]
37. Chittick P, Koppisetty S, Lombardo L, Vadhavana A, Solanki A, Cumming K, et al. Assessing patient and caregiver understanding of and satisfaction with the use of contact isolation. Am J Infect Control. 2016;44(6):657–60. [PubMed: 26897698]
38. Baubie K, Shaughnessy C, Safdar N. Exploring patient perceptions of contact precautions. Am J Infect Control. 2019;47(2):225–6. [PubMed: 30471977]
39. Morgan DJ, Murthy R, Munoz-Price LS, Barnden M, Camins BC, Johnston BL, et al.Reconsidering contact precautions for endemic methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococcus. Infect Control Hosp Epidemiol. 2015;36(10):1163–72. [PubMed: 26138329]
40. Seibert DJ, Speroni KG, Oh KM, Devoe MC, Jacobsen KH. Preventing transmission of MRSA: a qualitative study of health care workers' attitudes and suggestions. Am J Infect Control. 2014;42(4):405–11. [PubMed: 24559596]
41. Rump B, Timen A, Verweij M, Hulscher M. Experiences of carriers of multidrug-resistant organisms: a systematic review. Clin Microbiol Infect. 2019;25(3):274–9. [PubMed: 30832898]
42. Stone SP, Cooper BS, Kibbler CC, Cookson BD, Roberts JA, Medley GF, et al. The ORION statement: guidelines for transparent reporting of outbreak reports and intervention studies of nosocomial infection. Lancet Infect Dis. 2007;7(4):282–8. [PubMed: 17376385]
43. Jain R, Kralovic SM, Evans ME, Ambrose M, Simbartl LA, Obrosky DS, et al. Veterans Affairs initiative to prevent methicillin-resistant Staphylococcus aureus infections. N Engl J Med. 2011;364(15):1419–30. [PubMed: 21488764]
44. Jones M, Ying J, Huttner B, Evans M, Maw M, Nielson C, et al. Relationships between the importation, transmission, and nosocomial infections of methicillin-resistant Staphylococcus aureus: an observational study of 112 Veterans Affairs Medical Centers. Clin Infect Dis. 2014;58(1):32–9. [PubMed: 24092798]
45. Maragakis LL, Jernigan JA. Things We Do For Good Reasons: Contact Precautions for Multidrug-resistant Organisms, Including MRSA and VRE. J Hosp Med. 2019;14(3):194–6. [PubMed: 30811332]
46. Dhar S, Marchaim D, Tansek R, Chopra T, Yousuf A, Bhargava A, et al. Contact precautions: more is not necessarily better. Infect Control Hosp Epidemiol. 2014;35(3):213–21. [PubMed: 24521583]

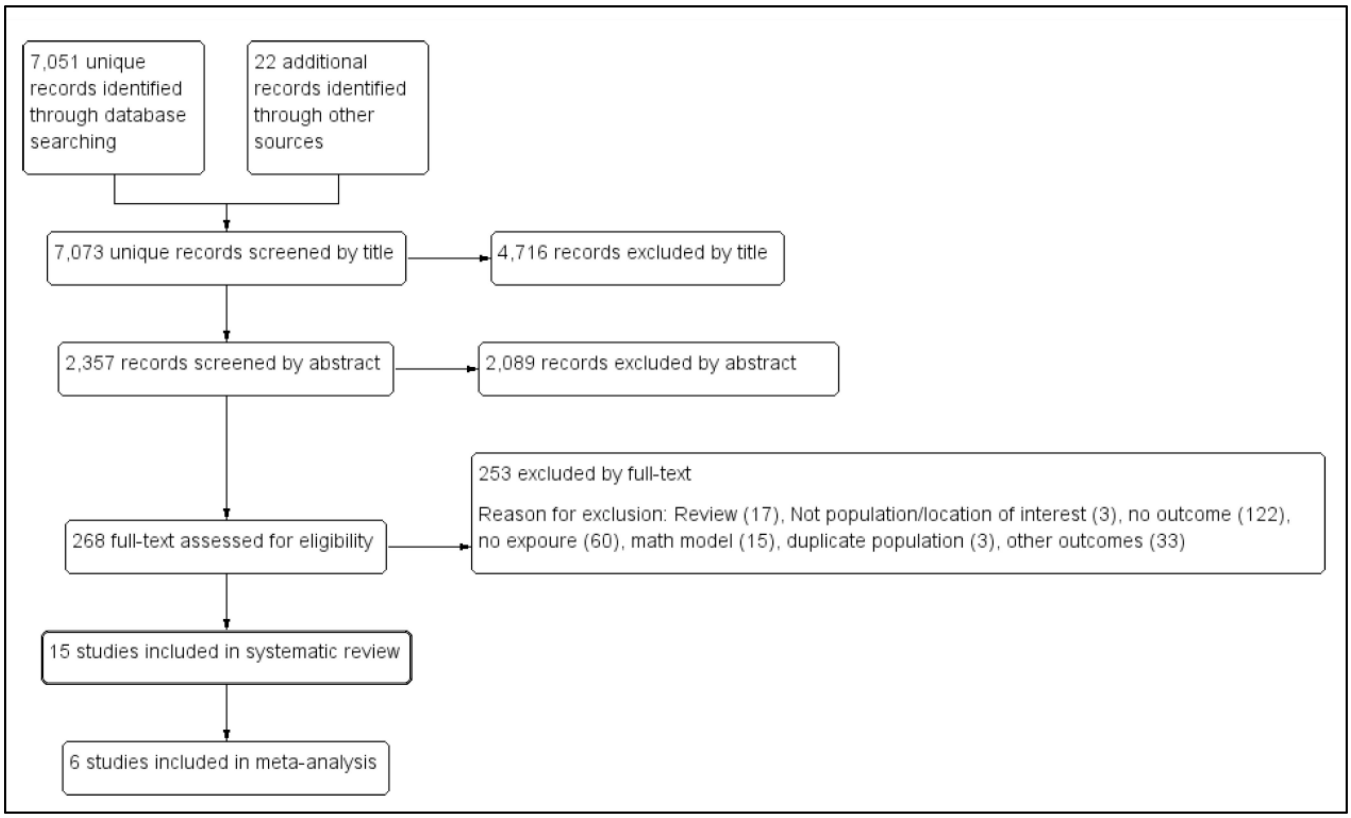

Figure 1.
PRISMA diagram on literature search for articles on use of isolation precautions and patient experience

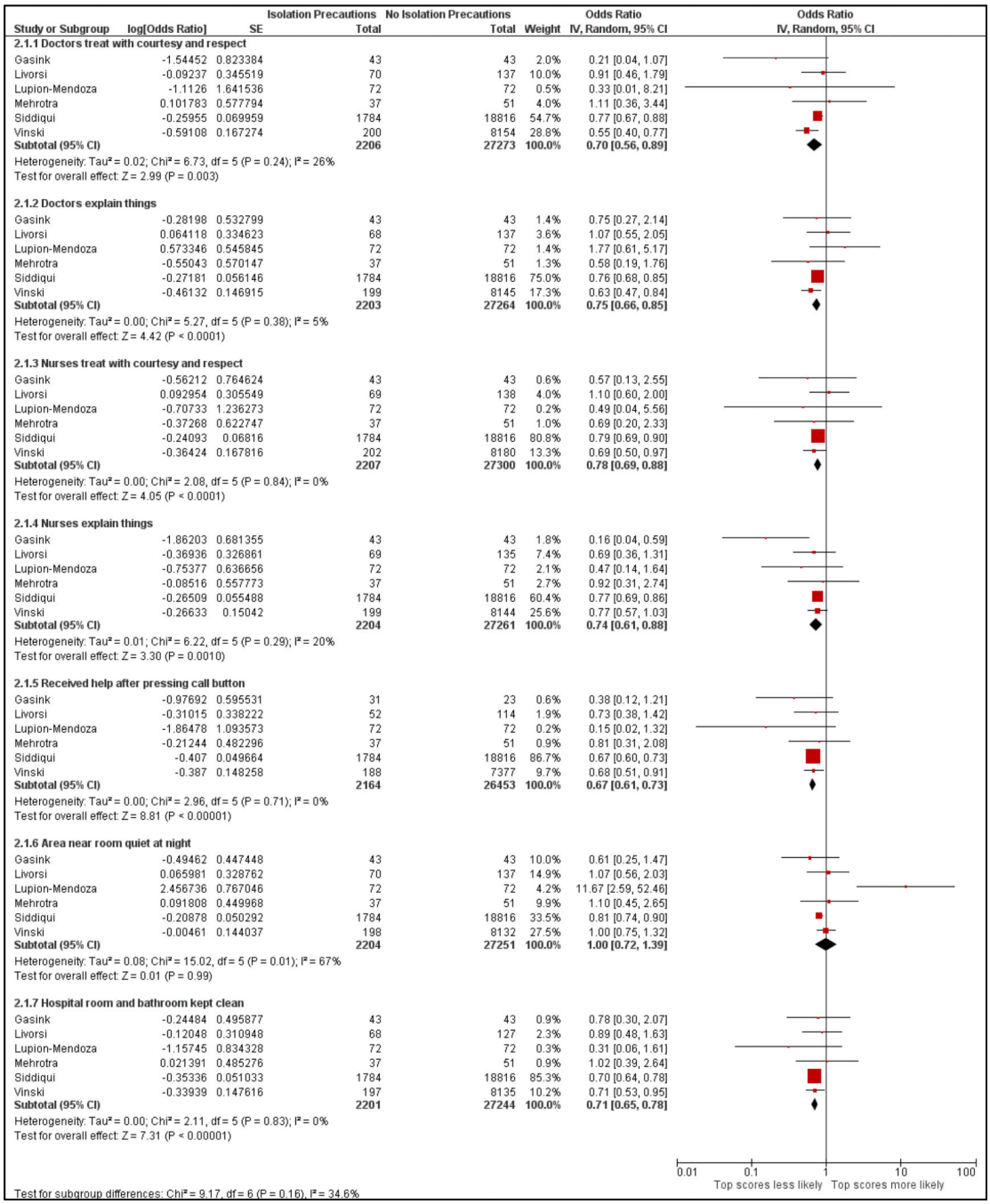

Figure 2A.

Forest plots for Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey questions measuring patient care experience with isolation precautions Abbreviations: CI – confidence interval, IV – inverse variance, SE – standard error

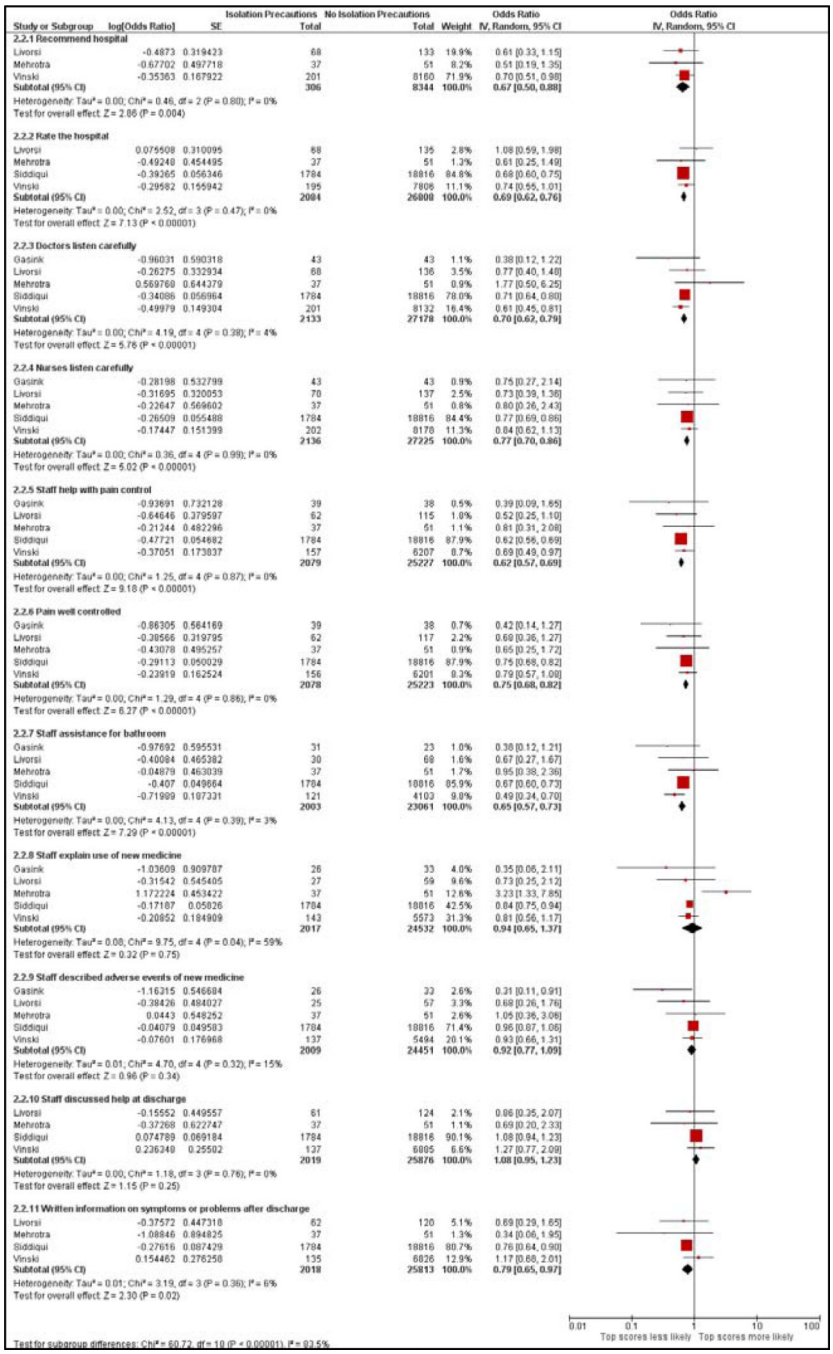

Figure 2B.

Forest plots for Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey questions measuring patient care experience with isolation precautions Abbreviations: CI – confidence interval, IV – inverse variance, SE – standard error

Table 1.

Summary of key characteristics of publications included in the systematic review for patient care experience with isolation precautions

Author, Year, Country	Study Design	Setting and population	Number of patients in IP/ control & Inclusion eligibility	Reason for IP	Type and definition of IP (exposure)	Satisfaction measurement tool	Risk of Bias score (maximum=9)	Patient satisfaction measure (outcome)	Risk-adjustment for confounders
Studies with control group									
Kennedy, 1997, UK	Retrospective cohort	Spinal cord injury unit at a spinal injuries center	16/16 At least 2 weeks of isolation	All MRSA positive patients	Contact	Semi-structured interview to collect patient experiences of MRSA induced isolation	4	Assessed impact of isolation on outcomes such as rehabilitation, general mood of patient, adjustment to injury, and relationships	No risk adjustment to assess patient satisfaction scores in analysis Control group was matched in design for age, sex, level of traumatic spinal cord injury, and time since admission or injury
Evans, 2003, USA	Prospective cohort	Surgical ICU and wards in a tertiary-care hospital	24/24	Active surveillance for infection or colonization with MRSA or VRE, *C difficile* infection, infection with other MDROs	Contact (private room or cohorti ng, gowns, gloves, alcohol -based hand wash, dedicated equipment), Droplet (mask including contact methods)	Patient interviews using a16-item questionnaire developed for the study	8	Patient perception of isolation by amount of contact with HCW, comfort taking with HCW, and proximity of contact with HCW	No matching in design or risk adjustment performed in analysis
Stelfox, 2003, USA	Retrospective cohort	Entire general teaching hospital	150/300 At least 2 days of isolation	Active surveillance for MRSA colonization or infection in general and congestive heart failure patients	Contact (private room, gloves, gowns, limited to room, dedicated equipment)	Review of medical records using Nettleman and Nelson method Unsolicited complaints identified from public relations office files	6	Any complaint, formal complaint, informal complaint	Risk adjustment for study cohort (general/congestive heart failure), demographic, hospital, and clinical characteristics performed in analysis to measure patient dissatisfaction
Cohen, 2008, Canada	Prospective cohort	General pediatric inpatients at Hospital for Sick Childre n	24/41	Active surveillance for children with infectious symptoms such as fever and diarrhea, and children	Contact, Droplet, Airborne per guidelines	Pediatric Family Satisfaction Questionnaire (PFSQ) completed by parents	4	Hospital services and accommodation, nursing care, medical care, safety/ incident reports filled, and overall rating per item as	No matching in design or risk adjustment performed in analysis

Author, Year, Country	Study Design	Setting and population	Number of patients in IP/ control & Inclusion eligibility	Reason for IP	Type and definition of IP (exposure)	Satisfaction measurement tool	Risk of Bias score (maximum=9)	Patient satisfaction measure (outcome)	Risk-adjustment for confounders
				transferred from institution with high prevalence of MDRO				measured by the PFSQ	
Gasink, 2008, USA	Survey	Medical and surgical wards in academic tertiary care center	43/43 At least 3 consecutive days	Passive surveillance in patients with infection with *C difficile* or other MDROs, and scabies	Contact (gloves, gowns)	HCAHPS survey used to interview patients during hospitalization	8	Items measured by the HCAHPS questions	No risk adjustment to assess patient satisfaction scores in analysis Control group was matched in design by ward and type of service (medical/surgical)
Vinski, 2012, USA	Retrospective cohort	Entire tertiary-care hospital	203/8234	Passive surveillance for *C difficile* infection, other MDROs, and influenza A	Contact (gowns, gloves), Droplet (mask), Airborne (respirator), Enhanced respiratory (gown, glove, respirat or, eye protection)	Retrospectively collected HCAHPS survey data from internal database	7	Items measured by the HCAHPS questions	No matching in design or risk adjustment performed in analysis
Mehrotra, 2013, USA	Prospective cohort	Medical and surgical units in a tertiary care teaching hospital	238/290	Active or passive surveillance for infection or colonization with MRSA or VRE, Acinetobacter infection, *C difficile* infection, other gram-negatives	Contact (gloves, gowns, single or cohort rooms)	HCAHPS survey administered by telephone between 7–30 days of discharge	9	Items measured by the HCAHPS questions	Factors such as Charlson comorbidity score, length of stay in days, history of depression, and education (some college or more) were adjusted in analysis to assess the effect of IP on patient perception of poor care and global hospital rating in HCAHPS
Livorsi, 2015, USA	Case-control	All ICU and non-ICU units, except psychiatry, burns, and obstetric s in a safety-net facility	70/139	Passive surveillance for MRSA colonization and infection	Contact (private room, dedicated equipment, gloves, gowns)	HCAHPS survey administered by telephone within 30 days of discharge	9	Items measured by tool adapted from the HCAHPS questions	Control group patients were selected closest to case's discharge date. Overall hospital rating assessed by adjusting for age, gender, education,

Author, Year, Country	Study Design	Setting and population	Number of patients in IP/ control & Inclusion eligibility	Reason for IP	Type and definition of IP (exposure)	Satisfaction measurement tool	Risk of Bias score (maximum=9)	Patient satisfaction measure (outcome)	Risk-adjustment for confounders
									Charlson comorbidity score, surgery (yes/no), number of days of previous hospital stay
Lupion-Mendoza, 2015, Spain	Prospective cohort	Medical and surgical wards in tertiary hospital	72/72 At least 5 days of isolation	Passive surveillance	Contact, Airborne	Locally developed and validated tool used to collect data via semi-structured interviews	7	Items measured by tool adapted from the HCAHPS questions	No risk adjustment to assess patient satisfaction scores in analysis Cases and controls were matched in design for ward, time, length of previous hospital stay, and Charlson comorbidity score
Lau, 2016, Canada	Prospective cohort	Internal Medicine wards of two tertiary-are teaching hospitals	75/422	Passive surveillance	Contact, Droplet, Airborne	Patient experience determined at time of discharge by structured interview and chart review	6	Patient satisfaction at discharge	No matching in design or risk adjustment performed in analysis
Guilley-Lerondeau, 2017, France	Prospective cohort	Medicine and medical specialty wards, surgical wards, emergency department in acute-care hospital	30/60 First episode of isolation, at least 3 days of isolation	Active surveillance for MRSA or *C difficile* infection, and infection with ESBL enterobacteria aceae, tuberculosis, scabies, varicella	Contact (gloves, gowns, single room preferred, Droplet (surgical mask), Airborne (surgical mask)	Locally developed questionnaire administered from 3 days after implementation of precautions	5	Items adapted from the HCAHPS questions measured on a scale ranging from very satisfied to very dissatisfied	No risk adjustment to assess patient satisfaction scores in analysis Control group was matched in design by ward, date of hospitalization, and length of stay at time of interview
Siddiqui, 2018, USA	Retrospective cohort	Entire academic tertiary care hospital	1,784/18,816 >50% of hospital stay should be in isolation	Not specified	Contact (gloves, gowns), Droplet (gloves, gowns, face mask), Airborne (negative pressure room, gloves, gowns, N95 face mask)	Retrospective analysis of HCAHPS and Press-Ganey patient survey data collected after discharge	7	Items measured by tool adapted from the HCAHPS questions	Adjusted for confounders such as age, sex, race, payor type, length of stay, all-payer related refined diagnosis-related group – severity of illness, clinical service type

Author, Year, Country	Study Design	Setting and population	Number of patients in IP/ control & Inclusion eligibility	Reason for IP	Type and definition of IP (exposure)	Satisfaction measurement tool	Risk of Bias score (maximum=9)	Patient satisfaction measure (outcome)	Risk-adjustment for confounders
Studies without control group									
Rees, 2000, UK	Prospective cohort	Acute and rehabilit ation settings, medical and ear, nose, throat wards	21/-	Patients with MRSA, *C difficile,* or tuberculosis infection	Contact	Questionnaires developed for the study and collected by interviewing patients and nearest caregivers	4	Overall satisfaction with hospital, confidence in ability of clinical team, perception of likely duration of hospital care, knowledge of reason for isolation, and satisfaction with information provided regarding care in isolation	Not applicable
Wassenberg, 2010, The Netherl ands	Prospective cohort	Entire university hospital	42/- At least 24 hours up to 48 hours	Passive surveillance in patients with high risk for MRSA and drug-resistant gram-negatives	Contact (gloves, gowns)	Isolation evaluation questionnaire developed for the study with visual analogue scale filled by patients	4	Patient attitude towards isolation, and patient perceptions on different aspects of isolation measures and influence of isolation on quality of care	Not applicable
Chittick, 2016, USA	Survey	Entire tertiary-care hospital	249/- At least 48 hours of isolation	Passive surveillance for infection or colonization with MRSA, VRE, *C difficile*, and a variety of gram-negative bacilli	Contact (gloves, gowns, single or cohort rooms)	Survey developed for study administered to patients and a caregiver separately	3	Patient understanding on the use of isolation measures, perception of care while in isolation, overall satisfaction with care	Not applicable

Abbreviations: d – days, ICU – intensive care unit, ESBL – extended spectrum beta lactamases, HCW – healthcare worker, MDRO – multidrug resistant organisms, MRSA – methicillin resistant *S aureus*, IQR – interquartile range, OR – odds ratio, SD – standard deviation, UK – United Kingdom, USA – United States of America, VRE – vancomycin resistant enterococci

Table 2.

Descriptive outcomes reported by individual studies for patient care experience with isolation precautions

Author, Year, Country	Length of stay (IP vs. no IP)	Patient experience not in favor of IP	Patient experience in favor of IP
Kennedy, 1997, UK	Prior to interview median (IQR): 10d (5–18) vs. 6d (3–9), p=0.005	69% believed rehabilitation had been adversely affected 10% found isolation detrimental to adjustment to their injury Some lack was perceived in method of calling for assistance, space for physiotherapy, and view from the ward	60% reported that relationships were not affected 20% found privacy to help their relationship
Rees, 2000, UK	Length of isolation: 1 – 8 weeks	There were indications that lower belief in the importance of the clinical team was associated with higher depression scale scores and willingness to estimate likely duration of isolation was associated with higher anxiety scale scores	67% felt they had enough information 86% reported that someone was available for more information 76% had the correct reason for isolation 62% were satisfied that they were kept up to date with isolation 38% had received infection information 91% felt that regular contact with staff was most important 86% rated room cleanliness very highly
Evans, 2003, USA	-	-	No significant difference in perception of care delivery
Stelfox, 2003, USA	Total median (IQR): 31d (1069) vs. 12d (7–24), p<0.001	Any complaint OR=23.5 (8.20–66.4) Informal complaint OR=17.0 (6.11–47.6) Formal complaint OR=14.8 (3.07–71.3)	-
Cohen, 2008, Canada	Total mean (SD): 4.5d (3–9) vs. 2d (2–5.5), p=0.01	-	No difference between patient groups on mean scores for overall rating (4.7 vs. 4.8, p=0.21) hospital services and accommodation (4.5 vs. 4.7, p=0.18) nursing care (4.9 vs. 4.9, p=0.54) medical care (4.7 vs. 4.8, p=0.31)
Gasink, 2008, USA	-	Isolated patients responded with low scores for nurse communication to explain things (32.6% vs. 7%, p=0.007) staff communication on possible side effects of new medicine (61.5% vs. 33.3%, p=0.02) There was general trend in less favorable response in isolated groups although not statistically significant	-
Wassenberg, 2010, The Netherlands	Prior to study median (IQR): 48d (24150) vs. 72d (48–192), p=0.07	-	95% patients reported being informed about measures 47% received written information Proportion of isolated patients indicating positive attitudes: Not severe (57%), quiet (76%), trusted (60%), clean (98%) 88% of patients thought isolation was safe, short, and useful
Vinski, 2012, USA	Total median (IQR): 7d (3–28.5) vs. 4d (2–7), p<0.001	Isolation was associated with lower scores for physician communication (p=0.0001) staff responsiveness (p=0.003) Contact precautions group got less bathroom assistance (p=0.006) were more likely to be discharged to another facility (p=0.013) compared with airborne and enhanced respiratory groups	-
Mehrotra, 2013, USA	Total mean (SD): 3.8d (4.9) vs. 3.0d (3.4), p<0.01	-	No differences between patients based on their contact precautions status After risk adjustment, no association between contact precautions and overall hospital rating (OR=1.79, 0.65–5.00)
Livorsi, 2015, USA	-	Age (OR=1.59, 1.21–2.10) and educational status (OR=0.51, 0.26–0.98) were associated with patient experience	No association between overall hospital rating and isolation status (OR=1.05, 0.52–2.15)
Lupion-Mendoza, 2015, Spain	-	The food tray was promptly removed only in 47% of isolated patients compared with 88% of non-isolated patients (p<0.001)	66.6% of isolated and 25% of non-isolated patients got explanation of the importance of hand hygiene by staff (p<0.001) 97% of isolated patient's reported that the room atmosphere was sufficiently quiet (75% non-isolated, p=0.006)

Author, Year, Country	Length of stay (IP vs. no IP)	Patient experience not in favor of IP	Patient experience in favor of IP
Lau, 2016, Canada	-	-	Mean satisfaction scored at the time of discharge was not significantly different (8.39 vs. 8.50, p=0.61)
Chittick, 2016, USA	-	<20% patients reported negative consequences of isolation	>60% thought that the rationale for use of isolation was explained >90% believed it prevented infections 70–79% staff adhered to isolation practices >80% patients reported that they were happy to be treated in a hospital with isolation and felt safer
Guilley-Lerondeau, 2017, France	-	Significant differences in dissatisfaction between patients based on help with daily living activities (20% vs. 0%, p<0.001) human relations (10% vs. 0%, p=0.02) overall rating of hospital (17% vs. 0%, p<0.001)	-
Siddiqui, 2018, USA	Total mean (SD): 7.5d (10.6) vs. 5.0d (6.0), p<0.001	Adjusted analysis showed patient isolation to be associated with inferior experience on responsiveness to toileting needs (OR=0.77, p=0.0009) responsiveness to call button (OR=0.78, p<0.0001) staff doing everything to help with pain (OR=0.77, p=0.0001) overall rating (OR=0.78, p<0.0001)	Dose-response analysis scaled to measure associations for every 25% increase in isolation time did not find any survey items to be associated with patient experience