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Review

Adverse effects of isolation in hospitalised patients: a systematic review

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SUMMARY

The use of transmission precautions such as contact isolation in patients known to be colonised or infected with multidrug-resistant organisms is recommended in healthcare institutions. Although essential for infection control, contact isolation has recently been associated with adverse effects in patients. We undertook a systematic review to determine whether contact isolation leads to psychological or physical problems for patients. Studies were included if (1) hospitalised patients were placed under isolation precautions for an underlying medical indication, and (2) any adverse events related to the isolation were evaluated. We found 16 studies that reported data regarding the impact of isolation on patient mental well-being, patient satisfaction, patient safety or time spent by healthcare workers in direct patient care. The majority showed a negative impact on patient mental well-being and behaviour, including higher scores for depression, anxiety and anger among isolated patients. A few studies also found that healthcare workers spent less time with patients in isolation. Patient satisfaction was adversely affected by isolation if patients were kept uninformed of their healthcare. Patient safety was also negatively affected, leading to an eight-fold increase in adverse events related to supportive care failures. We found that contact isolation may negatively impact several dimensions of patient care. Well-validated tools are necessary to investigate these results further. Large studies examining a number of safety indicators to assess the adverse effects of isolation are needed. Patient education may be an important step to mitigate the adverse psychological effects of isolation and is recommended.

Introduction

Antimicrobial resistance has reached near epidemic proportions in US hospitals, leading to establishment of mandatory infection control programmes. Multiple modalities to prevent transmission of resistant organisms have included the development of antimicrobial stewardship programmes, promotion of hand hygiene products, heightened education, and use of strict barrier and isolation precautions.[1]

Since 1996 the Centers for Disease Control and Prevention (Atlanta, GA, USA) have recommended the use of Standard and Contact Precautions for multidrug-resistant organisms (MDRO) such as meticillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococcus (VRE) and certain Gram-negative bacilli (GNB) that are 'judged by an infection control program … to be of special clinical and epidemiologic significance.'[2]

To prevent transmission of these MDRO, use of contact isolation in patients known to be colonised or infected with these MDRO is recommended and widely used in healthcare institutions. Although essential for preventing transmission of multidrug-resistant pathogens in healthcare institutions, patient isolation has recently been associated with adverse effects in patients, including the possibility of less than optimal care.[3] For example, some have mentioned that the requirement to wear gown and gloves before patient examination may impede the physician's ability to perform adequate physical examination, or provide a disincentive for healthcare workers to enter patient rooms.[4,5] Similarly, other studies have pointed out the concern that isolation may negatively affect patients' mental health.[6–10]

We undertook a systematic review of the literature to determine whether or not there are physical and psychological adverse effects that are associated with patient isolation.

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Methods

Literature search and selection

We searched the Medline and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases by using the search term 'isolation' plus 'adverse effect', 'psychological impact' or 'safety'. The search was limited to articles written in the English language, involving either children or adults from 1966 to 30 April 2009. Studies were included if (1) hospitalised patients were placed under isolation precautions for an underlying medical indication (i.e. MDRO infection or immune suppression) and (2) any adverse events related to the isolation were evaluated. A list of trials that did not meet inclusion criteria and the reasons for exclusion are available from the authors.

Data extraction and validity assessment

Data were extracted independently and corroborated by all authors using a standard data collection form. We extracted data on setting, study design, methodologic quality, type of intervention, and outcomes.

Statistical analysis

The studies were descriptive and heterogeneous, and a formal statistical analysis could not be performed.

Results

We identified a total of 40 studies that described the use of hospital isolation precautions for a medical indication.[1,4–42] Of these, 16 met our inclusion criteria.[1,4,5,9,10,26–28,31,32,34,36,37,39,40,42] Two of these articles formed a two-part study series and will be combined in this review henceforth.[37,42] The remainder were excluded due to the following reasons: there was no clinical assessment involved,[7,11,14,15,19–22,24] patients were isolated in Life-Islands (germ-free isolation units),[16,18,23,25] which are no longer in use, the reason for or specific type of isolation was not specified,[6,8,12,29,30,33,35,38,41] or patient-related events were not evaluated.[13,17] The details of the literature search leading to final selection are shown in Figure 1.

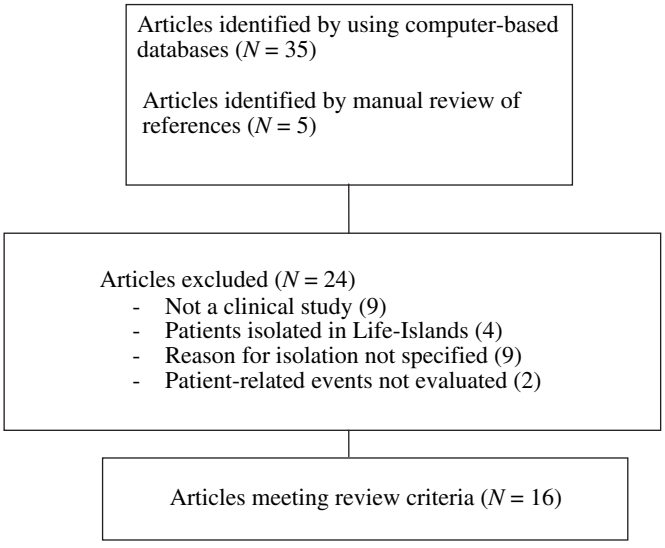

Figure 1. Literature search process.

Of the 15 studies included in the review, seven were case/control studies.[1,5,10,26–28,39] The rest were prospective cohorts except one which was retrospective.[34] There was a single randomised controlled trial.[32] Most studies had small sample sizes, of which the smallest was $N = 19$.[34,36] The largest study comprised a total of 234 patients.[39]

The majority of the studies included adults.[1,4,5,9,10,27,28,31,34,36,37,39,40,42] There were two studies that included children.[2,26] Most of the studies were located in the general ward; two were undertaken in the intensive care unit,[5,32] and two involved both sites.[1,34] For all included studies, the reason for isolation was infection. Of these, five exclusively identified VRE or MRSA infection.[10,31,36,39,40] Three reported infection with either hospital-acquired or multidrug-resistant organisms.[1,5,26] One used protective isolation for severe acute respiratory syndrome (SARS),[34] and the remaining studies used isolation for infections by several different organisms including *Salmonella* spp., *Clostridium difficile*, *Scabies* spp., and *Mycobacterium tuberculosis.*[27,28,37,42] Three did not identify the specific type of infections.[4,9,32] In 11 studies, patients were placed exclusively under contact isolation.[4,5,9,10,27,28,31,32,36,39,40] In the remaining four studies, a combination of either airborne, contact, or droplet precautions was used.[1,26,34,37,42] A summary of study demographics is shown in Table I.

Seven studies used a standardised scoring scale to assess the psychological impact of isolation.[9,10,27,28,31,37,40,42] These included Hamilton Anxiety/Depression Rating Scale (HAM-D or HAM-A), Hospital Anxiety and Depression Scale (HADS), Health Illness Questionnaire (HIQ), Self-Esteem Scale (SES), Consumer Assessment of Healthcare Providers and Systems (CAHPS), Beck Depression Inventory (BDI), State Anxiety Inventory (STAI), Profile of Mood States (POMS), Abbreviated Mental Test Score (AMTS), Barthel Index, Geriatric Depression Scale (GDS), and Crown–Crisp Experiential Index (CCEI). Two studies developed their own questionnaire or patient survey to evaluate their primary outcomes.[1,26] Three other studies used direct observation,[4,5,32] and two used the interview method.[34,36] A number of studies used one or more of these methods in combination (Table II).[1,26,39]

Study results and outcome

Impact of isolation on patient psychological well-being

The main outcome for most of the studies was assessment of the impact of isolation on patient psychology and behaviour.[9,10,27,31,34,36,40] A few studies focused on the effect of isolation on patient safety,[39] satisfaction,[28] or time spent in direct patient care.[1,4,5,26] Rees *et al.* focused on the impact of isolation on both patient psychology and satisfaction.[37,42] The primary outcome of the study by Klein *et al.* was incidence of nosocomial infection, but it also examined the influence of isolation on quality of care.[32]

Among the studies that focused on the psychological impact of isolation, the majority showed a negative impact on patient psychology and behaviour, including higher scores for depression and anxiety,[9,10,27,40] higher anger–hostility scores,[31] and reports of fear and loneliness.[34,36]

In the study by Catalano *et al.*, for example, the HADS scores of patients in isolation increased in proportion to their length of isolation, from 7.25 at baseline to 8.83 at week 1 and 11.5 at week 2.[10] By contrast, the scores of controls decreased from 9.78 at baseline to 5.44 at week 1, and finally 4.22 at week 2 ($P < 0.001$). Similarly, Gammon found that patients on day 7 of isolation also had higher mean scores for anxiety (12.75 vs 8.15) and depression (12.45 vs 7.3), and lower self-esteem scores (14.35 vs 16.1) compared to controls.[27] Tarzi *et al.* also found that patients in isolation had significantly higher rates of depression ($P < 0.01$) and

Table I
Study demographics

Study	Study design	Controls	Target population	No. of patients (*N*) cases/controls	Setting	Reason for isolation	Type of isolation
Catalano *et al.*[10]	Case–control	Non-isolated patients with infection	Adults	27/24	Infectious disease ward	VRE, MRSA	C
Cohen *et al.*[26]	Case–control	Patients on standard precautions	Children	24/41	Medical ward	HAI	C, A, D
Evans *et al.*[1]	Case–control	Non-isolated matched controls in SICU/ward	Adults	48/48	Surgical ward/ICU	HAI	C, D
Gammon[27]	Case–control	Non-isolated patients in the ward for at least 7 days	Adults	20/20	Medical ward	Mixed infection	C
Gasink *et al.*[28]	Case–control	Non-isolated patients in the ward for at least 3 days	Adults	43/43	Medical/surgical ward	Mixed infection	C
Kennedy and Hamilton[31]	Prospective cohort	–	Adults	16/16	Medical ward	MRSA	C
Klein *et al.*[32]	Randomised controlled trial	Patients randomised to standard hospital care	Children	32/38	ICU	Infection, NS	C
Kirkland and Weinstein[5]	Case–control	Non-isolated patients in the ICU	Adults	29/88	MICU	MDRO	C
Maunder *et al.*[34]	Retrospective cohort	–	Adults	19	ICU, medical ward	SARS	A, C
Newton *et al.*[36]	Prospective cohort	–	Adults	19	Medical ward	MRSA	C
Rees *et al.*[37,42]	Prospective cohort	–	Adults	21	Rehabilitation ward	Mixed infection	A, C
Saint *et al.*[4]	Prospective cohort	–	Adults	31/108	Medical ward	Infection, NS	C
Stelfox *et al.*[39]	Case–control with two matched cohorts: a general cohort plus a CHF cohort	Non-isolated patient who occupied the same bed, and was admitted immediately before, or after the patient in isolation	Adults	78/156 (72/144)	Medical ward	MRSA	C
Tarzi *et al.*[40]	Prospective cohort	–	Adults	22/20	Rehabilitation ward	MRSA	C
Wilkins *et al.*[9]	Prospective cohort	–	Adults	41	Infectious disease ward	Infection, NS	C

VRE, vancomycin-resistant enterococcus; MRSA, meticillin-resistant *Staphylococcus aureus*; HAI, hospital-acquired infection; SICU, surgical intensive care unit; SARS, severe acute respiratory syndrome; NS, not specified; C, contact; A, airborne; D, droplet; CHF, congestive heart failure.

anxiety ($P < 0.02$) than non-isolated patients.[40] There was no significant difference in anger scores. By contrast, Kennedy and Hamilton did not find any statistically significant difference in terms of depression and anxiety between isolated and non-isolated patients, but found higher anger–hostility mean scores for patients in isolation (12.4 vs 4.9, $P = 0.037$).[31]

Maunder *et al.* focused on the psychosocial response of both patients and healthcare staff to a SARS outbreak.[34] Although no quantitative analysis was performed, the authors found that in patients isolated for SARS, the most prominent emotional effects included fear, loneliness, boredom and anger. In Rees *et al.*'s cohort where patients were isolated for different types of infections, they found that 12 of 21 patients had mood disturbances as evidenced by high HADS scores.[37,42] In Newton *et al.*'s study, among a total of 19 patients, seven felt isolated and complained about lack of attention from nursing staff. Nevertheless 10 patients identified the positive impact of isolation including greater freedom and privacy. Interestingly, most of the patients did not have a clear understanding for the reason for isolation.[36] Wilkins *et al.* had a cohort of 41 isolated patients.[9] Their CCEI scores for anxiety and hysteria were found to be higher than that in the general population. Scores were also higher on admission than on discharge. Not surprisingly, history of mental illness was associated with higher scores for anxiety.

Impact of isolation on patient contact, satisfaction and safety

Four studies focused on the difference in time spent in direct patient contact.[1,4,5,26] In the study by Evans *et al.*, there was a total of 485 patient–provider encounters spent with patients in isolation over a period of 91.6 h (5.3 encounters/h), compared with 1002 encounters in non-isolated patient rooms observed for 91.2 h (10.9 encounters/h).[1] In addition, they found that providers spent less time with isolated versus non-isolated patients regardless of whether it was in the ward (29 ± 5 vs 37 ± 3, $P = 0.008$) or ICU setting (42 ± 10 vs 47 ± 5 min/h, $P = 0.03$). Similarly, Kirkland and Weinstein also found that healthcare workers were about two times less likely to enter the room of patients in contact isolation, with mean room entry/h of 3.9 vs 7.9 ($P = 0.06$).[5] Contact was also two-fold less in isolated patients, with mean contacts/h of 2.1 vs 4.2 ($P = 0.03$). The duration of interaction was not significantly different between isolated patients and controls (4.5 vs 2.8, $P = 0.6$). By contrast, Saint *et al.* found no difference in the number of examinations by senior medical residents among patients in isolation and controls [risk ratio (RR) = 0.96, $P = 0.58$].[4] However, attending physicians examined patients in isolation less frequently than their non-isolated counterparts (RR = 0.49, $P < 0.001$).

Two studies showed no difference in either direct patient care or quality of care between isolated patients and controls.[26,32] In the study by Cohen *et al.*, attending physicians were found to spend an average of 9 min in the patients' rooms, regardless of whether they were in isolation or not (516 vs 480, $P = 0.503$). Overall PFSQ scores, to assess quality of care were also similar in both groups (4.7 vs 4.8, $P = 0.209$).[26] Similarly Klein *et al.* found that frequency of contact between patients in isolation and between those under standard precautions was comparable. Patients in isolation also tolerated this well, without apparent adverse effects.[32]

Gasink *et al.* evaluated patient satisfaction by using the CAHPS survey.[28] Among a cohort of 86 patients, of whom half were isolated, they did not find any statistical difference between the responses of patients in isolation and patients not in isolation, regarding inpatient care. Of the 39 patients in isolation, only 3 (7.7%) thought that isolation worsened their care, whereas 24 (61.5%) thought that it improved theirs. In the second part of the two-part study by Rees *et al.*, patient satisfaction was greatest in the patients who were kept informed regarding their care.[37] Among the 21 patients, 66.7% felt that they were given enough information, and 85.7% felt that they knew someone they could ask regarding healthcare issues.

Table II
Summary of study methodology and outcomes

Study	Methodology	Psychometric tools	Main outcome	Time of assessment	Results
Catalano *et al.*[10]	Psychometric tools	Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A)	Psychological impact	At day 7 and day 14	HAM-D and HAM-A scores were higher for cases than controls ($P < 0.0001$)
Cohen *et al.*[26]	Direct observation by a single worker not part of the healthcare team during morning rounds. Questionnaire	Pediatric Family Satisfaction Questionnaire (PFSQ)	Time spent in direct patient care. Quality of care	At 48 h	No difference in either direct patient care or quality of care
Evans *et al.*[1]	Direct observation by a healthcare worker. Questionnaire	16 item questionnaire	Time spent in direct patient care	2 h daily for 5 weeks	No. of encounters/h and contact time/h was higher for non-isolated than for isolated ($P < 0.001$, and $P = 0.0078$)
Gammon[27]	Multiple psychometric tools	Hospital Anxiety and Depression Scale (HADS), Health Illness Questionnaire (HIQ), Self-Esteem Scale (SES)	Psychological impact	At day 7	Mean Anxiety and Depression scores higher in isolated patients ($P < 0.001$, and $P < 0.001$). Mean self-esteem scores lower in isolated patients ($P < 0.005$)
Gasink *et al.*[28]	Questionnaire	Consumer Assessment of Healthcare Providers and Systems (CAHPS)	Patient care satisfaction	At day 3	No difference in patient care satisfaction
Kennedy and Hamilton[31]	Multiple psychometric tools	Beck Depression Inventory (BDI), State Anxiety Inventory (STAI—Form), Profile of Mood States (POMS)	Psychological impact	In isolation for at least 2 weeks	Isolated patients with higher POMS Anger—Hostility scores
Klein *et al.*[32]	Direct observation by investigator	–	Incidence of nosocomial infection	For 1 h on days 1, 3 and 7	Isolation reduced nosocomial infection rates. Patient care was not compromised, and isolation was well-tolerated
Kirkland and Weinstein[5]	Direct observation (not specified by whom)	–	Frequency of patient encounters	35 observation periods lasting 1 h each, over 7 months	Patients in isolation: fewer room entries/h ($P = 0.06$), contacts/h ($P = 0.03$). No difference in duration of interaction ($P = 0.6$)
Maunder *et al.*[34]	Interview of patients with and without SARS by mental health professionals and consultation—liaison psychiatrists	–	Psychological impact	4 weeks	Isolated patients reported fear, loneliness, anxiety, depression
Newton *et al.*[36]	Interview by infection control nurse	–	Psychological impact	During isolation	Mixed patient experiences during isolation
Rees *et al.*[37,42]	Psychometric tools	HADS	Psychological impact and patient satisfaction	During isolation	12/21 had depression, based on HADS. Satisfaction was related to information/education
Saint *et al.*[4]	Direct observation by study investigator	–	Time spent in direct patient care	On several days/month for 6 months, during morning rounds	Attending physicians spent less time examining patients in isolation (RR = 0.49, $P < 0.001$)
Stelfox *et al.*[39]	Medical chart review	–	Patient adverse events, described as injuries caused by medical management	During isolation	Cases had fewer vital sign recordings ($P = 0.02$), less nursing narrative ($P < 0.001$) and physician notes ($P < 0.001$) in the chart, and were twice as likely to experience adverse events (20 vs 3/1000 days, $P < 0.001$). Cases had more complaints and were less satisfied with their care (30 vs 8, $P < 0.001$)
Tarzi *et al.*[40]	Multiple psychometric tools	Abbreviated Mental Test Score (AMTS), Barthel Index (BI), Geriatric Depression Scale (GDS), POMS	Psychological impact	–	GDS scores were higher in isolated patients ($P < 0.01$)
Wilkins *et al.*[9]	Psychometric tools	Crown—Crisp Experiential Index (CCEI)	Psychological impact	On admission	Admission scores for hysteria, anxiety and total scores were increased for patients in isolation

In a study that assessed patient safety, the authors found that compared with patients not in isolation, isolated patients had more errors in processes of care, and had increased likelihood for adverse events.[39] For example, isolated patients were more likely to have either incomplete recordings of vital signs (14 vs 9%, $P < 0.001$), or to have days with no vital sign recordings at all (5 vs 1%, $P = 0.02$). In addition, they had more days with either no nursing narrative notes (14 vs 10%, $P < 0.001$), or physician progress notes (26 vs 13%, $P < 0.001$) recorded in the chart. Isolated patients were twice as likely as control patients to experience adverse events per 1000 days (31 vs 15, $P < 0.001$). This reflected preventable (20 vs 3, $P < 0.001$) as opposed to non-preventable events (11 vs 12, $P = 0.98$). Specifically, patients in isolation were as much as eight times more likely to experience supportive care failures such as falls, ulcers, and fluid and electrolyte abnormalities. There were no significant differences in terms of severity of adverse event or death. Not surprisingly, patients in isolation expressed greater dissatisfaction regarding their care, as reflected by both formal and informal complaints (30 vs 8%, $P < 0.001$). A summary of these findings is shown in Table II.

Discussion

Our systematic review examines the impact of isolation precautions on patients' psychological well-being, provider contact with patient, patient satisfaction and patient safety. The majority of the literature we reviewed suggests that adverse psychological consequences of isolation exist. Our results update, and are in keeping with, a recent systematic review published on this subject.[43]

Most of the studies that focused on patient psychology used standardised scoring scales to assess patient mood and behaviour. However, the use of several different scoring scales makes comparison among studies challenging. In addition, the timing of assessment during isolation was also highly varied. This may have impacted the overall results because of recall bias. Nevertheless, the majority of studies found that the physical process of isolation has a negative impact on patients' moods, including increased rates of depression, anxiety, fear, and hostility.

The reason behind the psychologically negative effects of isolation is probably linked to uncertainty and loss of control, which is derived from multiple sources, but ultimately stems from isolation itself.[27] Some authors have suggested that preparing these patients emotionally, prior to isolation, may help decrease their anxiety.[29] Similarly, patient education regarding the isolation may also be beneficial and may help patients understand the necessity for isolation and cope with it better.[33] Rees *et al.*'s study corroborates this, as they found that a patient's satisfaction, regardless of being in source isolation, was highly associated with keeping in good communication with their healthcare providers.[37] The Joint Commission's Patient Safety Goals for 2009 include a recommendation for patient education regarding MDRO and isolation.

We found that although patient isolation is an established and important aspect of infection control, it may also negatively influence direct patient care. Studies included in our review found that time spent by healthcare professionals in direct patient care is either less frequent or shorter with patients in isolation, than with patients not in isolation. Some have postulated that the requirement to don a gown and a pair of gloves has itself become a barrier for healthcare workers, as it provides an additional, occasionally cumbersome, step that needs to be performed prior to entering patients' rooms. Whether the less frequent contact or shorter time spent with patients is associated with adverse clinical outcomes is unclear, but deserves further study.

Our review has several limitations. We only included studies in the English language. Several other studies done in laminar air-flow units, and which also looked at the impact of source isolation on patient psychology, were excluded due to the lack of information regarding the specific type of isolation. The studies were limited by sample size, were heterogeneous, and lacked adjustment for severity of illness.

In conclusion, we find that although studies have shown that isolation may negatively impact patient psychological well-being, patient safety and satisfaction, and patient care, well-validated tools and larger studies are needed to examine this further. Patient education at the time of isolation is a critical component of the process to reduce anxiety and distress. Future studies to assess the adverse impact of isolation precautions should examine a broader array of safety indicators, in addition to the psychological aspects. As the problem of antibiotic-resistant bacteria in healthcare institutions continues to grow, isolation will remain and increase in importance as a critical infection control intervention to reduce nosocomial transmission of MDRO. Attention must be paid to the possible collateral damage of isolation, and adverse effects should be monitored closely.

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None declared.

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