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Review

Non-pharmacological interventions designed to support carriers of multi-drug-resistant organisms (MDROs): a systematic literature review

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SUMMARY

Background: Carriers of multi-drug-resistant organisms (MDROs) often experience stigma, anxiety and uncertainty. Many feel inadequately informed, leading to distress and dissatisfaction.

Aim: To evaluate research on non-pharmacological interventions to support carriers of MDROs with their informational and psychological needs.

Methods: This systematic literature review followed the PRISMA guidelines, and MEDLINE, EMBASE and PsycINFO were searched between January 2000 and October 2024. Moreover, a comprehensive citation search was conducted to identify interventions. Findings on study characteristics, intervention types, and outcomes were synthesized narratively with a thematic analysis of reported implementation challenges and considerations.

Finding: Only four studies were identified, comprising a total of 238 participants. All interventions included educational components, and one also incorporated an emotional support element. The interventions aimed to improve knowledge, well-being and behavioural outcomes among MDRO carriers. Education was associated with improvements in knowledge, perceived informedness, and satisfaction, although findings on behavioural outcomes and well-being were mixed. Implementation challenges included resource constraints, integration into clinical workflows, sustainability, and variability in healthcare settings.

Conclusions: The main outcome of this review is the striking lack of research on how to address the non-medical needs of MDRO carriers. Although the limited available evidence suggests that education and emotional support interventions may be beneficial, methodological shortcomings limit the generalizability of these findings. This review highlights the urgent need for robust, scalable, patient-centred interventions to improve the experiences of MDRO carriers.

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Introduction

The rise of multi-drug-resistant organisms (MDROs) is of global concern, increasing the risk of life-threatening infections with limited therapeutic options [1–3]. Extensive effort has been dedicated to developing new antibiotics and alternative therapies [4–7], while much less attention has been given to improving the experiences of people affected by MDROs.

Most research on the experiences of MDRO carriers focuses on exposure to contact precautions and isolation measures in hospitals (e.g. [8–11]) aimed at reducing transmission [12–16]. While contact isolation is considered essential for infection prevention and control (IPC), it is well established that it can harm patients' health and well-being. Many studies, including systematic reviews, have shown an association between contact isolation and adverse health outcomes and patient dissatisfaction [9,10,17–23], while only one review did not find a significant link [11]. Additionally, patients frequently feel insufficiently informed about their MDRO status and the reasons for the contact precautions [9,18,24–27]. For many, the negative impact of being an MDRO carrier extends beyond hospitalization, such as persistent stigma, social isolation, uncertainty about appropriate behaviours at home and in public, anxiety about future healthcare interactions, and financial concerns [27–29].

Consequently, there is a need for interventions that address the comprehensive informational and emotional support needs of affected individuals. However, strategies to reduce these adverse outcomes and improve experiences are scarce. Only one literature review has evaluated interventions to improve outcomes for patients in contact isolation, identifying six articles, but none of the interventions included patients with MDROs [30].

This systematic literature review seeks to identify and evaluate research on non-pharmacological interventions to support MDRO carriers. Specifically, it aims to answer the following key questions: What types of non-pharmacological interventions have been implemented? What are the intended outcomes of these interventions? What challenges are associated with their implementation?

Methods

This review was registered in the PROSPERO prospective register (ID: 614662) and follows the reporting guidelines outlined in the PRISMA statement [31].

Eligibility criteria

The PICO framework was applied to define the eligibility criteria and search strategy [32] (see Table I). Additionally, only original research was included, such as randomized controlled trials, non-randomized trials, crossover designs, cohort studies, case–control studies, pre–post studies and time series, published since 2000. Studies focusing solely on pharmacological or other medical treatments, interventions that targeted healthcare workers (HCWs) alone, non-peer-reviewed publications, editorials and opinion pieces were excluded.

Search strategy

MEDLINE, EMBASE and PsycINFO were searched using the Ovid interface for relevant studies in October 2024 (see the online supplementary material for the search strategy for each database). The reference lists of included studies and relevant systematic reviews were screened manually to identify further studies.

Selection process

All authors screened titles and abstracts, with 20.1% of articles double-screened by two reviewers. Studies that passed the initial screening underwent independent full-text review by two reviewers. Disagreements at any stage were resolved through discussion between the reviewers.

Table I
PICO-based inclusion criteria

Criteria	Determinants
Population	Studies involving individuals who screened positive for one or more MDROs, such as meticillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci or multi-drug-resistant Gram-negative rods. Studies on drug-resistant tuberculosis were excluded. This category includes both patients in contact isolation and all other individuals carrying MDROs.
Intervention	Studies describing a non-pharmacological intervention designed to support MDRO carriers, including, but not limited to, the following elements: • Educational: Interventions intended to inform and educate carriers and/or their carers and families about MDROs, their management, medication adherence, and infection prevention and control measures. • Psychosocial: Interventions providing mental health or social support, such as counselling, support groups or therapy. • Environmental: Interventions involving modifications to the healthcare setting, such as adjustments to isolation strategies.
Comparison	Studies that report any comparison, including those between individuals who received an intervention and those who did not, comparisons between two interventions, or pre–post-intervention analyses.
Outcome	Studies that report patient-centred outcomes, including, but not limited to, quality of life, well-being, satisfaction, adherence, knowledge and understanding, physical health outcomes, mental health outcomes, adverse events, ability to self-manage, and perceived stigmatization.

MDRO, multi-drug-resistant organism.

Data extraction

A spreadsheet was developed to ensure consistent data extraction across studies. It captured study characteristics (e.g. authors, year, study design), participant details (e.g. target population, sample size, demographics), intervention specifics (e.g. type, delivery method, duration), outcomes, additional measures/controls and results. One reviewer (SG) extracted the data, and a second reviewer (MP) verified the process.

Risk-of-bias assessment

Two reviewers (SG and MP) independently assessed the risk of bias in the included studies using the Mixed Methods Appraisal Tool (MMAT) [33], designed to appraise the methodological quality of various types of studies. Disagreements were resolved through discussion.

Data synthesis

A narrative synthesis was performed by summarizing the findings in text and tables. The results were organized by study characteristics, interventions and outcomes. Moreover, a thematic analysis was performed to identify and analyse patterns or themes related to implementation challenges and considerations for future interventions.

Results

This systematic search identified 3316 unique publications, of which 78 underwent full-text screening. Furthermore, a manual backward and forward search of the reference lists and citations of included studies and relevant systematic reviews identified 20 additional studies. Ultimately, only four studies, including a total of 238 participants, met the inclusion criteria (see Figure 1).

Study characteristics

Table II provides an overview of the study characteristics. All studies were conducted in high-income countries and employed different designs, including a pre–post study without [34] and with [35] a control group, a block-randomized controlled trial [36] and a case–control interview study [37].

The populations varied, with two studies targeting inpatients in contact isolation due to MDROs [34,35]; one included outpatients with meticillin-resistant *Staphylococcus aureus* (MRSA) [37], and one focused on inpatient and outpatient veterans with and without MRSA [36]. Sample sizes were small to medium, ranging from two [37] to 111 [35]. Only one study conducted a power analysis to determine the sample size [35]. All studies included adults alone, with mean age reported in three studies ranging from the early to late 60s [34–36]. Gender distribution varied, with only 4.9% of females in one study [36], but more balanced in the other studies. While one study did not have a control condition [34], control group participants in the other studies received either usual care [36,37] or basic information on MDROs [35].

Interventions

All interventions were delivered face-to-face and emphasized education [34–37]. Only one study also incorporated an emotional support component [35].

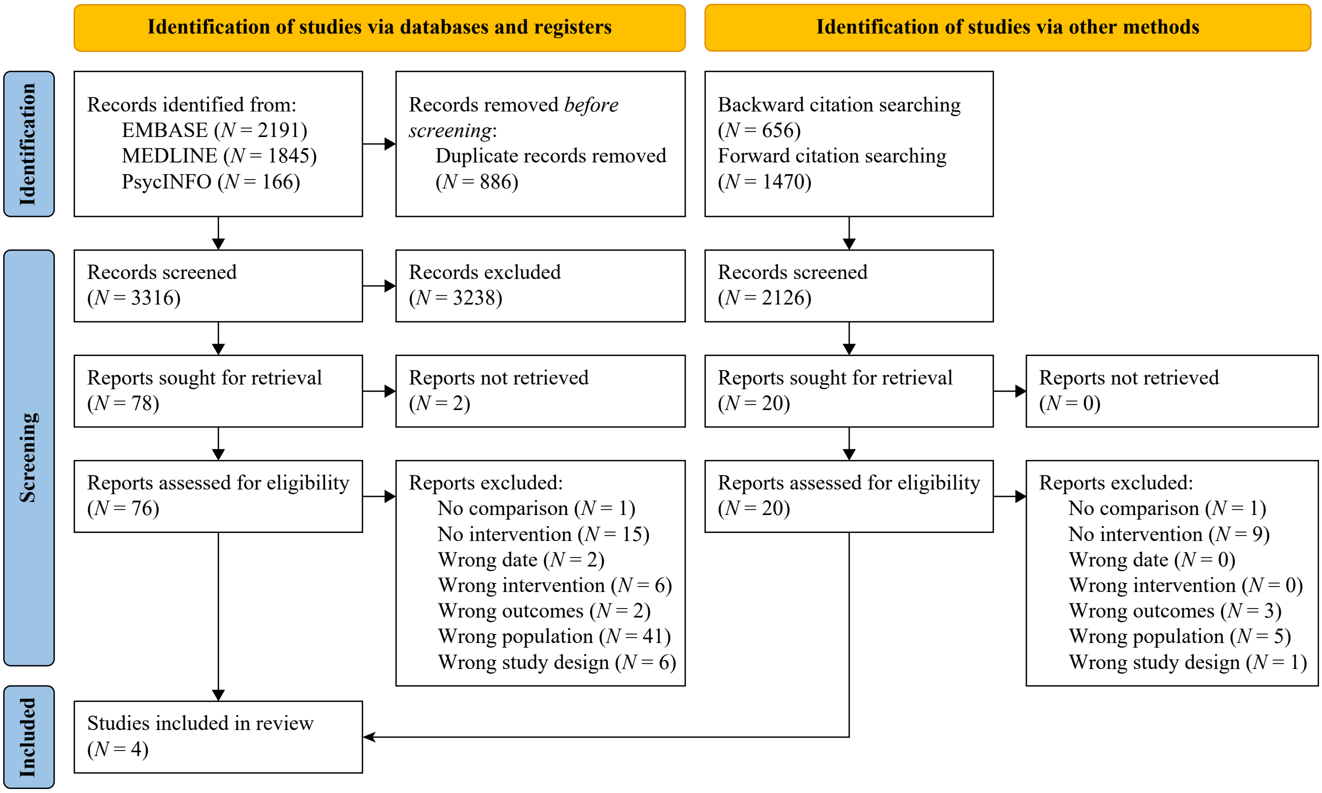

Figure 1. PRISMA flow diagram.

Table II
Characteristics of included studies

Authors, year, citation	Study design	Setting, country	Intervention type	Patient population	Sample size (intervention/total)	Age, years (SD)	Gender (% female)	Control	Outcomes
Gillitzer et al., 2024 [34]	Pre—post study	Tertiary university hospital, Germany	Education	Patients in contact isolation due to MRSA, VRE or multi-drug-resistant Gram-negative rods	64/64	60.3 (12.2)	43.8%	No control	Dissatisfaction, Informedness
Lee and Choi, 2022 [35]	Pre—post quasi-experimental design	Tertiary university hospital, South Korea	Education and emotional support	Patients in contact isolation due to VRE or CPE	56/111	69.5 (12.8)	61.3%	Basic education	Uncertainty, anxiety, depression, knowledge
Evans et al., 2014 [36]	Block-randomized controlled trial	Two Veterans Affairs spinal cord injury centres, USA	Education	Veterans with and without MRSA	30/61	64.5 (11.10)	4.9%	Usual care	Knowledge, self-reported hand hygiene behaviour
Robinson et al., 2014 [37]	Qualitative case—control study	Community setting, UK	Education	Patients with MRSA	1/2	Not reported	50.0%	Usual care	Information received, knowledge about preventing the spread of MRSA, asking questions about MRSA

MRSA, meticillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant enterococci; CPE, carbapenemase-producing Enterobacterales.

Gillitzer *et al*. developed a personalized education intervention to improve knowledge and satisfaction for patients in contact isolation [34]. A well-trained medical student delivered the one-off, one-on-one tailored counselling sessions. These sessions provided patients with relevant MDRO information, including medical implications and the reason for contact isolation. Patients received guidance on appropriate behaviours during their hospitalization, future healthcare settings, and everyday life. The sessions were aided by a checklist developed by an IPC team to ensure consistency and comprehensiveness. Sessions lasted between 10 and 30 min and allowed patients to ask questions about their condition and necessary precautions.

Lee and Choi developed an isolation-coping programme to mitigate the psychological burden of contact isolation [35]. It was delivered by an infection control nurse and consisted of three structured one-on-one sessions over 7 days. On the first day of isolation, patients received a 20-min educational session covering topics such as hand hygiene, transmission, isolation protocols, use of personal protective equipment, and general IPC measures, followed by a 20-min emotional support session allowing patients to express anxiety, fear or dissatisfaction. On day 3, patients joined a follow-up session where their understanding of the initial education was assessed, and they were encouraged to share their emotional experiences related to isolation, including discomfort, sleep issues and movement restrictions. On day 7, a final session focused on emotional support, allowing patients to express their feelings while the nurse provided empathy and reassurance. The control group received verbal isolation guidelines from medical staff and written materials.

Evans *et al*. developed an education programme to enhance MRSA knowledge, improve hand hygiene, and encourage engagement with HCWs regarding MRSA [36]. It involved a one-off, one-on-one educational session delivered by a trained nurse, supplemented by a brochure and a flip chart to facilitate discussion, which lasted approximately 25 min. The education covered five areas: (i) MRSA; (ii) risks for patients with spinal cord injuries; (iii) risks to others; (iv) prevention; and (v) hand hygiene. Patients were encouraged to ask questions and were asked to recall information and demonstrate or describe correct handwashing procedures to ensure understanding. After the session, patients received the brochure. The control group only received a standard MRSA information brochure.

Robinson *et al*. developed an education tool based on local MRSA guidelines to improve patients' understanding of MRSA in a community setting [37]. A trained nurse conducted a one-off, one-on-one education session, providing information on MRSA decolonization treatment and the importance of maintaining a clean environment. The session included a knowledge check to ensure comprehension and the patient's understanding of treatment instructions. The control group received usual care, which was not further described.

Outcomes

The studies used different outcomes to evaluate the interventions. Table III provides an overview of the primary outcomes, with an extended version that includes additional measures available in the online supplementary material.

Knowledge

The most frequent outcome was patient knowledge regarding MDROs, but it was neither operationalized nor measured consistently. One study assessed isolation-coping knowledge using a pre- and post-intervention questionnaire [35]. The intervention group showed significantly increased knowledge compared with the control group. Another study measured MRSA and hand hygiene knowledge using true-or-false questions before and after the intervention [36]. However, both domains were averaged into one score, which may have obscured learning differences across topics. The knowledge score only improved significantly in the intervention group. However, the change in knowledge between groups was not significant. A third study assessed patient knowledge about MRSA treatment and prevention via post-intervention interviews. It focused on whether patients' responses indicated they understood how to follow MRSA treatment and preventive behaviours at home [37]. There was no objective measure of knowledge, and there was no control for pre-intervention knowledge. The authors claimed that the patient receiving enhanced education reported better treatment understanding and more MRSA prevention knowledge.

Perceived understanding/uncertainty

One study measured how well patients felt informed about their MDRO status and the required behaviours for future healthcare encounters and daily life before and after the intervention [34]. After the intervention, patients reported feeling significantly better informed. Similarly, another study [35] assessed patients' uncertainty in symptoms, diagnosis, treatment, relationship with caregivers, and planning for the future pre- and post-intervention. Patients receiving the intervention showed a significantly greater reduction in uncertainty compared with the control group.

Well-being

One study assessed anxiety and depression among isolated patients before and after the intervention [35]. The intervention group showed a significant reduction in both measures compared with the control group. It should be noted that another study also assessed anxiety and depression as well as loneliness before and after the intervention. However, they only reported these scores as predictors of patient dissatisfaction before the intervention [34]. Re-analysing their data, there was no significant reduction in anxiety, depression and loneliness, indicating that an education-focused intervention alone may not improve mental well-being.

Patient satisfaction

One study assessed patients' dissatisfaction with their hospital experience before and after the intervention [34]. Patient dissatisfaction decreased significantly after the intervention, which was mediated by feeling better informed.

Behavioural outcomes

One study examined self-reported hand hygiene before and after the intervention [36]; however, mean scores were not reported. The change in self-reported hand hygiene was not significant between groups. The same study also assessed patients' perceived change in hand hygiene and whether they asked HCWs about their MRSA status during the post-intervention survey. The intervention group were more

Table III
Main intervention outcomes

Study	Outcome	Outcome measure	Intervention			Control			Level of comparison	Effect score (*t*)	*P*-value	Conclusion
			Pre-score (SD)	Post-score (SD)	Mean change (SD/CI)	Pre-score (SD)	Post-score (SD)	Mean change (SD/CI)				
Gillitzer *et al.* [34]	Dissatisfaction	German version of the Picker Patient Experience Questionnaire	5.62 (3.70)	4.41 (3.02)	-1.22 (2.74)	N/A	N/A	N/A	Pre–post	*t*3.56	0.001	Patients reported feeling significantly less dissatisfied with their hospital experience after the intervention.
Gillitzer *et al.* [34]	Informedness	Questionnaire adopted from [26]	2.45 (1.14)	3.54 (0.89)	1.09 (1.14)	N/A	N/A	N/A	Pre–post	7.67	<0.001	Patients reported feeling significantly better informed after the intervention.
Lee and Choi [35]	Uncertainty	Korean version of the Mishel Uncertainty Illness Scale	117.71 (16.94)	81.98 (15.03)	-35.73 (20.47)	111.91 (16.85)	105.04 (14.06)	-6.87 (12.79)	Between groups	-8.93	<0.001	Compared with the control group, the intervention group showed a significant reduction in uncertainty.
Lee and Choi [35]	Anxiety	Korean version of the Hospital Anxiety and Depression Scale	15.05 (4.18)	10.07 (4.52)	-5.45 (5.50)	15.87 (3.13)	15.47 (3.88)	0.46 (3.37)	Between groups	-6.13	<0.001	Compared with the control group, the intervention group showed a significant reduction in anxiety.
Lee and Choi [35]	Depression	Korean version of the Hospital Anxiety and Depression Scale	12.68 (4.02)	8.23 (4.71)	-4.45 (4.95)	13.22 (2.94)	13.91 (4.15)	0.69 (3.90)	Between groups	-5.38	<0.001	Compared with the control group, the intervention group showed a significant reduction in depression.
Lee and Choi [35]	Knowledge	Self-developed (12 items)	4.75 (2.18)	9.79 (1.83)	5.04 (1.92)	4.87 (2.28)	6.07 (2.35)	1.20 (1.52)	Between groups	-8.37	<0.001	Compared with the control group, the intervention group showed a significant increase in knowledge.
Evans *et al.* [36]	Knowledge	Self-developed (21 items)	13.20 (3.80)	14.90 (3.55)	1.70 (0.25–3.15)	11.65 (5.38)	13.10 (5.01)	1.45 (−0.08 to 2.98)	Pre–post/ between groups	Not reported	0.02 (I) 0.06 (C)/0.81	Knowledge improved in both groups post-intervention, but it was only significant in the intervention group. The change in knowledge between groups was not significant.
Evans *et al.* [36]	Self-reported hand hygiene behaviour	Self-developed (eight items)	Not reported	Not reported	2.50 (2.23)	Not reported	Not reported	2.40 (1.94)	Between groups	Not reported	0.83	The change in self-reported hand hygiene behaviour scores was not significant between groups.

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Table III (*continued*)

Study	Outcome	Outcome measure	Intervention			Control			Level of comparison	Effect score (*t*)	*P*-value	Conclusion
			Pre-score (SD)	Post-score (SD)	Mean change (SD/CI)	Pre-score (SD)	Post-score (SD)	Mean change (SD/CI)				
Robinson *et al.* [37]	Treatment knowledge	Interviews	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	The patient in the intervention group reported better knowledge and understanding of the treatment than the patient in the control group.
Robinson *et al.* [37]	Prevention knowledge	Interviews	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	The intervention patient reported more correct MRSA prevention knowledge than the control patient.
Robinson *et al.* [37]	Asking about MRSA	Interviews	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	The intervention patient reported feeling able to ask healthcare providers questions about MRSA (no comparison with control).

MRSA, meticillin-resistant *Staphylococcus aureus*.

likely to report having changed their hand hygiene and having asked about their MRSA status. The interview study explored whether the patient receiving enhanced education demonstrated greater adherence to decolonization procedures and better preventive behaviours (e.g. handwashing and changing of bedding) as evidenced by their ability to recall correct application techniques and behaviours, for which they reported positive results [37]. Moreover, the authors reported that the patient receiving the intervention felt better equipped to ask questions about MRSA. Neither study included an objective behavioural measure, relying instead on self-reports, which is inherently biased. Furthermore, one study did not control for pre-intervention behaviours [37].

Intervention evaluation

One study assessed if patients' evaluation of the intervention influenced its effectiveness [34]. However, the association between the evaluation and change in informedness was not significant. Another study evaluated the intervention among patients and nurses delivering that intervention [36]. Most patients reported that the intervention was interesting, clear, informative, believable and reassuring. However, some patients also found the discussion scary. The nurses found the intervention to be high quality and appropriate.

Implementation challenges and considerations

While each paper identified at least one implementation challenge, none of them provided a detailed account of the difficulties encountered during intervention delivery. However, all offered valuable considerations for implementing similar interventions.

Resource constraints

All studies referred to limited resources as key challenges for intervention delivery and scalability [34–37]. One important consideration is the availability of well-trained staff with specialized knowledge [35], which is important for patients to trust the information [37]. However, competing clinical demands and staffing shortages can hinder implementation [36]. Challenges in integrating the intervention into routine workflows highlight the need for process changes [36]. Given the global HCW shortage, institutions may consider digital tools such as chatbots or trained medical students to support intervention delivery [34].

Reliability and generalizability

Variability in how interventions were administered, such as differences between nurses, was noted as a potential factor affecting outcomes [36]. This underscores the importance of training staff and using checklists to maintain consistency [34]. Another consideration was evaluating the effectiveness of the intervention beyond MDRO-related isolation to improve applicability and generalizability [34].

Sustainability

Maintaining intervention effects on patient behaviour beyond inpatient settings was highlighted as a challenge [37]. Patients' capacity to follow instructions at home may be hindered by factors such as poor health and comorbidities.

Tailoring

All studies emphasized the importance of tailoring the intervention to the target population [34—37]. Factors such as age, cultural background, language proficiency, literacy and comorbidities/disabilities may impact patients' understanding of, and engagement with, the intervention. Tailoring includes customized communication strategies, translation, inclusive material design, and HCW-led discussions rather than relying solely on brochures [34—37]. Moreover, the type of MDRO and its associated stigma should be considered when designing interventions to ensure the relevance of the information [35]. Delivering interventions individually rather than in group settings has been suggested as a way to mitigate stigma-related fears [35]. Finally, involving patients in the design of interventions was highlighted as a key strategy for tailoring them effectively [35].

Risk of bias

The risk-of-bias assessment using the MMAT is available in the online supplementary material. While all studies carry some risk of bias, the degree varies considerably. Several limitations extend beyond the MMAT categories. None of the studies accounted for prior MDRO education, and one study even noted that ongoing MRSA education may have influenced their trial [36]. Three studies were conducted at a single centre, limiting their generalizability [34,35,37]. Three studies did not make their study materials and data publicly available, reducing replicability [35—37]. One study had a sample size of only two, preventing meaningful conclusions [37]. Two other studies also acknowledged sample size limitations [34,36]. The absence of a control group in one study [34] is another limitation. The enrolment strategy remained unclear in one study [35]. The interview study lacked a methods section, making it impossible to determine how the intervention was delivered, how patients were recruited, and how interviews were conducted and analysed [37].

Discussion

Only four studies that met the inclusion criteria were identified, underlining a striking gap in the evidence base for non-pharmacological interventions to support MDRO carriers. This is concerning given the well-documented negative impact of MDRO carriage and contact isolation on patients' physical and mental well-being, satisfaction with healthcare experiences, and social participation [9,10,17—23,27,28]. The included interventions targeted isolated and non-isolated patients with MDROs and were delivered face-to-face, either in hospital or outpatient settings, with sample sizes ranging from two to 111. The interventions primarily focused on education, with one also incorporating an emotional support component.

Overall, the findings indicate that education-based interventions enhance patients' MDRO-related knowledge [35,36], perceived informedness [34] and understanding [37], while also reducing uncertainty [35]. Consequently, they effectively address commonly reported concerns related to informational and communication deficits [9,18,24—27], which may, in turn, contribute to improved patient satisfaction [24,26,34]. The addition of emotional support was associated with significant reductions in anxiety and depression [35], indicating that multi-faceted interventions may be particularly valuable in alleviating the well-documented mental health burden associated with MDRO carriage and contact isolation [9,18,24,25,27]. However, the findings should be interpreted with caution due to methodological limitations across all studies. Notably, none of the interventions specifically targeted stigma and self-isolation resulting from MDRO carriage, which are also major concerns [18,25,27,28].

The included studies identified several implementation challenges, including limited resources to ensure well-trained personnel to deliver the interventions, difficulties integrating interventions into clinical workflows [34—36], and sustaining their effects beyond inpatient settings [37]. Importantly, other studies have shown that HCWs often lack sufficient knowledge about MDROs and IPC, which leads to insecurities and prevents them from providing adequate support to patients without substantial training [38—40]. The studies highlighted the importance of tailoring interventions to patient needs, and recommended patient involvement in design to improve effectiveness [34—37]. While digital tools were proposed as a scalable alternative [34], the importance of in-person delivery was emphasized [34,35,37].

Additional publications relevant to the topic that did not meet the inclusion criteria, as no comparisons were reported, were identified. One study examined the information needs of patients, HCWs and the public regarding MRSA using data from a public health network helpdesk, where a qualified nurse answered calls [41]. The helpdesk model is interesting as it is a centralized, expert-led service that offers personalized guidance. Unfortunately, the study did not evaluate the intervention; instead, it focused on the type of callers, questions and helpdesk activities. Another study explored ways to improve patients' experience in contact isolation using human-centred design [42]. The study utilized patient journey mapping and personas to identify gaps in information provision and emotional support to develop an interactive information bundle. However, they did not evaluate the effectiveness of the materials. Another study assessed MRSA notification cards to facilitate patient disclosure of colonization in healthcare settings [43]. Findings indicate that patients experienced stigma, fear and unprofessional treatment when presenting the card, highlighting the need for alternative systems and for improving MDRO education among HCWs to minimize stigma. Finally, one study used video-reflexive ethnography to evaluate patients' understanding of IPC [44]. Patients viewed and discussed recordings of their MRSA screening procedure, enabling them to articulate their infection risks and identify their role in IPC. This approach underscores the potential of participatory methods to enhance patient involvement in MDRO management, although its practicality may be limited.

For future interventions, lessons can be drawn from support programmes for patients with drug-resistant tuberculosis (DR-TB). Studies related to DR-TB were excluded from this review because the treatment involves prolonged, complex regimens with public health involvement due to its transmission mode and potential for widespread community impact [45,46] that differ significantly from those used for other MDROs. Nevertheless, interventions for patients with DR-TB highlight the effectiveness of integrated social support [47]. Informational and emotional support — delivered through home visits, counselling sessions, specialist referrals, support group sessions, and patient education materials — can improve patient engagement, treatment success and well-being while reducing stigma, social rejection and psychological burden [48—50]. Comprehensive multi-language digital platforms, such as ExplainTB (https://www.explaintb.org/en), provide educational videos, resources and customizable patient handouts. These approaches highlight possible ways to provide holistic, patient-centred interventions that address informational, practical and emotional challenges in a way that is feasible for use in daily life. Similar strategies could be adapted relatively easily for MDRO carriers.

Limitations

The main limitation is the small number of studies identified despite a comprehensive literature search, highlighting the scarcity of research on this topic. This is partly due to the eligibility criteria, which were informed by the PICO framework and restricted the inclusion of some potentially relevant papers. The methodologies of the included studies were highly diverse, and some had significant limitations, which affected the validity and generalizability of their findings. Contributing to this, one study did not target MDRO carriers exclusively but rather patients with spinal cord injuries, a substantial proportion of whom were MRSA carriers; however, the outcomes were not stratified by patient group. Moreover, taxonomy in the IPC literature is inconsistent, which may have led to missed papers despite the comprehensive search strategy.

In conclusion, this is the first systematic review to evaluate research on non-pharmacological interventions designed to support carriers of MDROs. The findings highlight the scarcity of research on this topic. Given the vast body of literature on the adverse effects of being an MDRO carrier on well-being and the growing threat of antimicrobial resistance, there is a clear research gap and an urgent need for effective interventions. Current evidence suggests that even brief educational interventions can enhance patients' understanding of their condition and improve their experience.

Future research should employ larger sample sizes, more rigorous methodologies and transparent reporting to assess the effectiveness of innovative approaches to MDRO education, alongside providing practical and emotional support for patients and caregivers. These studies should consider adopting a mixed methods approach to evaluate not only the quantitatively measurable effects of interventions, but also their qualitative impact on patients' lived experiences and emotional well-being. Future interventions should use contextual tailoring to account for cultural, linguistic and community-specific differences that may affect patients' understanding and engagement. For example, involving affected individuals and community HCWs who understand local norms in the intervention design, and providing multi-lingual translations could enhance reach and effectiveness. Finally, exploring the potential of technology-enhanced interventions, such as chatbots or telehealth services, could help ensure scalability in settings where staff resources are constrained.

Declaration of generative AI in scientific writing

During the preparation of this work, the authors used ChatGPT and Microsoft Copilot to improve readability and language. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication. Moreover, the authors used Rayyan's advanced deduplication feature to identify and remove duplicate references.

Author contributions

S. Gaube: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Visualization, Writing — original draft, Writing — review & editing. M. Pan: Investigation, Validation. A. Rath: Conceptualization, Investigation, Writing — review & editing. A. Caplunik-Pratsch: Conceptualization, Investigation, Writing — review & editing.

Conflict of interest statement

S. Gaube has received corporate sponsorship in the form of an unrestricted gift from Google Ireland Limited to support the attendance of academic conferences outside the scope of the submitted work. She has also given paid seminars on academic project management for LMU Munich, which are unrelated to this review. A. Rath has regularly delivered paid lectures, including reimbursement for expenses and travel, for the Bavarian Health and Food Safety Authority (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit), and has delivered a single lecture for the Deggendorf Institute of Technology. These lectures typically address infection prevention and control in hospitals, but are unrelated to this review. M. Pan's PhD is funded by Arpara Technology Co. Ltd., which had no involvement in the review. A. Caplunik-Pratsch reports no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jhin.2025.07.019.

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