

## Understanding patient and healthcare worker experiences and perspectives of multidrug-resistant organisms

Eliza Watson <sup>1</sup>, Tess Tsindos<sup>2,3</sup>, Anton Y. Peleg<sup>1,4</sup>, Pauline Bass<sup>1</sup>, Andrew J. Stewardson<sup>1</sup>, Darshini Ayton<sup>2,3</sup>† and Trisha Peel<sup>1\*</sup>†

<sup>1</sup>Department of Infectious Diseases, Alfred Hospital and Central Clinical School, Monash University, Level 2, 85 Commercial Road, Melbourne, Victoria 3004, Australia; <sup>2</sup>Health and Social Care Unit, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria 3800, Australia; <sup>3</sup>Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Victoria 3004, Australia; <sup>4</sup>Infection and Immunity Theme, Monash Biomedicine Discovery Institute, Department of Microbiology, Monash University, Clayton, Victoria 3800, Australia

\*Corresponding author. E-mail: trisha.peel@monash.edu  
†Co-last authors.

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**Objectives:** Transmission of MDR organisms (MROs) such as carbapenemase-producing Enterobacteriaceae (CPE) and VRE in healthcare facilities is a major issue globally. Knowledge gaps exist, including the impact of these microorganisms on patients, and healthcare worker understanding of infection control approaches for MROs. This study aimed to explore patient and healthcare worker experiences and perspectives of MROs.

**Methods:** A sequential exploratory mixed-methods study was performed at a large metropolitan acute and sub-acute hospital. This involved semi-structured face-to-face interviews with patients with confirmed MROs to explore their understanding of these microorganisms and perceptions of their time in hospital. Healthcare workers participated in an online survey about their understanding of MROs and the care of patients with these microorganisms. Qualitative data were analysed using the COM-B framework, and were triangulated with the descriptive quantitative analysis.

**Results:** The overarching theme from the triangulated data was uncertainty amongst both patients and staff about MROs. Insufficient explanations from staff left patients lacking a proper understanding of their diagnosis, and patients felt that staff did not always follow isolation protocols. Staff felt they did not receive enough education on MROs. However, patients felt that the overall care they received was very good, and most valued the privacy gained from being in isolation.

**Conclusions:** This study demonstrates that there is a need to focus on new strategies of communication with patients and staff education to improve understanding of MROs and increase adherence to protocols.

### Introduction

The impact of MDR organisms (MROs: microorganisms that have non-susceptibility to at least one class of antimicrobial agent) has been experienced globally.<sup>1–4</sup> The prevalence of two MROs encountered in the hospital system, VRE and carbapenemase-producing Enterobacteriaceae (CPE), is increasing in Australia.<sup>5,6</sup>

In Australian hospitals, once a patient is identified as being colonized or infected with an MRO, infection prevention measures are initiated to prevent transmission.<sup>7,8</sup> The role of healthcare workers (HCWs) in preventing transmission of MROs is vital.<sup>7,8</sup> However, literature has demonstrated staff compliance with infection prevention precautions for MROs can be mixed.<sup>9,10</sup> In addition, there are limited data on HCWs' knowledge about MROs and

their confidence in delivering patient education. Finally, patient experiences of MROs and the measures for controlling them are not well known.<sup>2,4,11</sup>

This study aimed to explore experiences and perspectives of patients colonized or infected with an MRO. The study also aimed to identify HCW knowledge about MRO infection prevention strategies, and understand what information and support services could be developed or improved to address knowledge gaps and patient concerns.

### Methods

An exploratory mixed-methods study (Figure 1) was conducted, which applied the capability (physical and psychological), opportunity (social

and environmental opportunities) and motivations (reflective and automatic) to behaviour (COM-B) model.<sup>12</sup> We aimed to identify barriers and enablers to following infection prevention guidelines for MROs from the perspective of patients and HCWs.

## Setting

This study was conducted at the Alfred Hospital, a public, quaternary, university-affiliated hospital in Melbourne, Australia. The hospital has established guidelines for infection prevention of patients with MROs, including VRE. The Infection Prevention & Healthcare Epidemiology Unit at Alfred Hospital undertakes routine surveillance for MRO infections and acquisition. In December 2015, in response to increased incidence of CPE, the Department of Health and Human Services, Victoria, released guidelines for the detection and control of CPE in healthcare facilities.<sup>7</sup> Following the release of these guidelines, the local hospital infection control guidelines for MROs were updated to align with the department guidelines. These hospital guidelines are available to all staff on the hospital intranet and hospital in-service training and education was provided by the Infection Prevention & Healthcare Epidemiology Unit. Infection prevention measures were in keeping with Australian guidelines and included patient screening, isolation, dedicated equipment, personal protective equipment for HCWs, cleaning of the patient's environment and optimization of hand hygiene, in addition to staff and patient education.<sup>7,8</sup>

## Data collection

### Qualitative study

Patients admitted as inpatients to Alfred Health, with known infection or acquisition of CPE or VRE, as recorded by the Infection Prevention & Healthcare Epidemiology Unit, and their carers were invited to participate in the study. Face-to-face interviews were conducted between 6 October 2017 and 3 December 2018. Initially, patients with known infection or acquisition of CPE were targeted; however, on 16 August 2018, the study protocol was amended to include patients with known infection or acquisition of VRE, to enrich the study population. Interviews ranged from 15 to 60 min and were conducted by an experienced qualitative researcher (T.T. or D.A.). Interview topics explored the patient's experience of isolation and information provision about MROs and infection prevention. Themes were mapped to the COM-B domains (see Interview Guide, Table S1, available as [Supplementary data](#) at JAC-AMR Online).

### Quantitative study

HCWs were eligible to participate if they were working at Alfred Health, at either the acute or the subacute sites, and had undertaken direct or supervised clinical care of a patient. HCWs were invited to participate in an online 34-item survey conducted using the Qualtrics™ software (Table S1—Interview Guide). Survey questions were mapped to the COM-B domains and refined based on the results of the patient interviews. Given the recent introduction of the statewide guidelines for

CPE<sup>7</sup> and updated healthcare specific guidelines, the survey specifically targeted CPE. Demographic information was collected on profession and years of experience, and an option to provide main ward or area of work. A link to the survey with an invitation to participate was included in the staff newsletter and flyers were posted throughout the hospital.

## Data analysis

### Qualitative study

Interviews were recorded, transcribed verbatim and uploaded to NVivo version 12 (QSR International).<sup>13</sup> Analysis of interview data was continuous, with deductive coding applied for the three COM-B domains and inductive coding to identify new themes that were explored and tested for applicability and consistency. Three researchers (D.A., T.T., E.W.) independently coded transcripts using a process of open, axial and thematic coding.<sup>14,15</sup> Discrepancies were resolved by discussion between the qualitative investigators as required. Demographic data were analysed in STATA/SE 16.

### Quantitative study

Data from the online survey were analysed in STATA/SE 16. Frequencies of responses were calculated as a total for each question and as proportions for each professional group.

### Triangulation

The data from the qualitative and quantitative study were analysed separately with a process of triangulation applied during the interpretation stage whereby the findings were examined to determine if they were convergent, complementary or contradictory.<sup>16</sup>

## Ethics

The study was approved by the Alfred Ethics Committee (project ID 333/17) and the Monash University Human Ethics Committee (project ID11593). All participants provided verbal and written informed consent to take part in the interview.

## Results

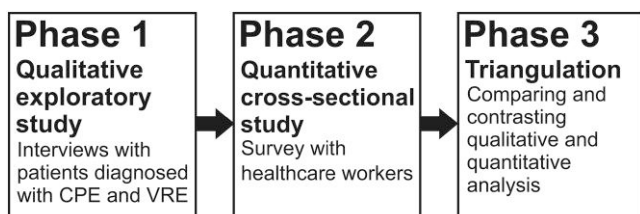
### Participants

Over the study period (6 October 2017 to 3 December 2018) there were 2935 non-same day admissions with MROs recorded by the Infection Prevention & Healthcare Epidemiology Unit, including 63 patients with CPE. A total of 109 patients were screened (63 CPE and 46 VRE cases), of whom 33 were not eligible (22 were unable to provide consent, 7 were too unwell to participate in the interview and 4 had been discharged); 76 patients were approached and 20 patients agreed to be interviewed (11 CPE and 9 VRE; Table 1). The majority were male, older than 52 years of age and retired.

The majority of HCWs completing the survey were nursing staff ( $n = 72$ ; 68%), followed by allied health ( $n = 18$ ; 18%), medical staff ( $n = 10$ ; 9%) and pharmacists ( $n = 5$ ; 5%) (Table S2). Over half (59%) had graduated over 10 years ago. Over three quarters (80%) had cared for a patient with CPE (Table S3).

### Key themes

Key COM-B domains and quotes from the interviews with patients are listed in Table 2 and Table S4. The overarching theme from the triangulated data was that of uncertainty amongst patients and



**Figure 1.** The three phases of this exploratory mixed-methods study.

**Table 1.** Patient participant characteristics

Characteristics	Total, n=20	CPE, n=11	VRE, n=9
Age, years, median (IQR)	61 (14)	64 (15)	61 (17)
Sex, n (%)			
Female	4 (20)	1 (9.09)	3 (33.33)
Male	16 (80)	10 (90.91)	6 (66.67)
Education level, n (%)			
Up to Year 11 or equivalent	8 (40)	5 (45.45)	3 (33.33)
Completed high school	3 (15)	1 (9.09)	2 (22.22)
Diploma	3 (15)	3 (27.27)	0 (0)
Bachelor degree	4 (20)	1 (9.09)	3 (33.33)
Postgraduate	1 (5)	0 (0)	1 (11.11)
Unclear	1 (5)	1 (9.09)	0 (0)
Occupation, n (%)			
Currently working	6 (30)	3 (27.27)	3 (33.33)
Not currently working	2 (10)	1 (9.09)	1 (11.11)
Retired	11 (55)	6 (54.55)	5 (55.56)
Never worked	1 (5)	1 (9.09)	0 (0)

staff about MROs and the protocols surrounding them. Key staff survey data focusing on responses from nursing and medical staff are presented in Figures 2–4, with full survey responses in Tables S3 and S5.

### Capability: barriers

#### *Patients were too unwell to take in information*

Many patients stated they were initially too unwell to be concerned about the acquisition of an MRO. They felt they lacked the psychological and physical strength to engage with their diagnosis, and did not have energy to seek information or ask questions. HCWs were cognisant of the patient's poor health, with 66% agreeing or strongly agreeing with the statement 'the patient often has more immediate health issues than CPE' (Figure 2, Table S5).

#### *Patients lacked understanding about MROs*

Patients were frequently unaware of how they acquired the MRO, whether there were long-term impacts and about precautions required when leaving hospital. The concept of colonization was not well understood, with patients unsure how they could be positive for the presence of an MRO without having an active infection. This also led to confusion about how infectious it was and the necessity of isolation.

Staff understood some theory of CPE prevalence and spread, with 84% agreeing that reducing use of inappropriate antimicrobials was important in preventing CPE (Table S3). However, almost three-quarters (73%) of all surveyed staff did not feel that they had expert knowledge of CPE, and 86% confirmed they would seek additional information from the Infection Prevention team (Figure 2, Table S5). Staff responses were almost evenly split between yes, no and unsure in response to the question 'patients with a previous diagnosis of CPE can be considered cleared of CPE based on a negative swab' (Table S3). Several staff

commented that there is 'no education on CPE' (Nursing staff, more than 20 years' experience) and called for improvements.

#### *Staff did not always follow isolation protocols*

Patients felt confused about isolation protocols for MROs because of variations in their care between staff. Patients discussed a lack of signage on doorways, inconsistencies as to whether they were allowed to leave the room with or without gloves or a gown and that the attitudes of staff differed, with some unaware of prompts on the patient case notes.

Staff were aware of the importance of infection prevention protocols, with 97% agreeing they are effective in preventing the spread of CPE (Figure 2, Table S5), and 90% agreeing it is necessary to isolate patients with CPE (Table S3). However, they lacked knowledge and certainty about these protocols. Just over a third (35%) of all staff surveyed—including 30% of medical staff—indicated they would know exactly what to do if a patient with CPE was admitted under their care (Figure 2, Table S5). Staff also noted that CPE-positive patients were not required to isolate in the emergency department or as outpatients, and that this difference in treatment frequently caused confusion amongst staff.

### Opportunity: barriers

#### *Explanations from staff about MROs were not always sufficient*

Patients felt comfortable asking HCWs questions. Some felt their questions were well answered, but many felt uncertain and confused due to insufficient or contradictory explanations from staff.

Almost half (48%) of staff agreed or strongly agreed that they often do not have enough time to talk with a patient and their next of kin if they ask questions, including 57% of nursing staff surveyed, indicating that patient interactions may be rushed (Figure 3, Table S5). In contrast, the vast majority of staff (91%) agreed or strongly agreed that patients need to be made aware of their CPE status and what it means for them (Figure 3, Table S5). Further, 70% of medical staff and 54% of nursing staff believed it was their role to actively educate patients about CPE and ensure the patient has an adequate understanding of the diagnosis (Figure 3).

### Opportunity: enablers

#### *Patients appreciated the high level of care received*

Patients valued the high level of care they received, and felt it was not impacted by isolation. Patients appreciated support from family members and friends, including visits during isolation and advocating for them by asking questions. Family members were able to interpret information at times when the patient could not.

### Motivation: barriers

#### *Patients felt that being in isolation impacted on practical aspects of their care*

Being in isolation was at times impractical, particularly regarding staff bringing in meals. One patient found the experience stigmatizing. Staff were aware of the impacts that isolation can have on

**Table 2.** Key themes from patient and next-of-kin interviews, mapped to the COM-B domains

COM-B domain	Themes
Capability	<p><b>Barriers</b> Patients were too unwell to take in information</p> <p><i>“There was some reading material that was provided downstairs, which is amongst my stuff, but again, because of circumstances, I wasn’t in a position to read it at the time because I’m bedridden. I haven’t been out of bed to read it since and I don’t know where it is.”</i> Patient 1</p> <p><i>“When you’re on so many painkillers you’re not really going to take it all in if it’s not life threatening. So, the timing wasn’t quite right and I’m thinking how important is this? Can you not do it in three months’ time? We’re actually dealing with things on a minute by minute basis. I think I’ve picked out what they tell you of all the words that’s important—it’s colonized, it’s not in the rest of your system, it’s not going to be affecting you immediately. At the moment that’s what I want to hang on to. The rest is irrelevant almost.”</i> Carer for Patient 2</p> <p>Patients lacked understanding about their infection</p> <p><i>“It doesn’t have a long-term effect does it?... I mean it’s not in my blood at the moment, so do you have to re-catch it or is it something that stays in your system?”</i> Patient 1</p> <p><i>“I had a bug, the doctor said that they cleared it, they got rid of it. But you’ll always have the bug. I can’t understand what that they’re talking about really.”</i> Patient 5</p> <p><i>“Surely enough [my partner’s] exposed to it I suppose, but we were told that what I’ve got is not infectious. The state that it’s in with me, it’s just sitting in my gut.”</i> Patient 2</p> <p><i>“A little bit tired but that’s all. I don’t know whether it’s the heart attack or the CPE, I don’t know.”</i> Patient 16</p> <p><i>“[VRE] means that I am resistant to certain medicines.”</i> Patient 6</p> <p><i>“I’m an ANM (associate nurse manager) and I’ve had very little information unless I’ve actively called and sourced advice from infection prevention.”</i> Nursing staff (6–10 years’ experience)</p> <p>Staff did not always follow isolation protocols</p> <p><i>“All of the staff don’t follow the procedures for infection control. We were told we had to tell the nurses to gown up if they came into the room ungowned. We didn’t like this and felt it wasn’t our responsibility to tell the nursing staff to follow procedures so we didn’t tell nurses to gown up if they weren’t gowned.”</i> Patient 3</p> <p><i>“That little sign they put on the door, I don’t think anyone actually saw it. It seems to be that people (staff) just walked past it and I had to say, ‘Did you see that sign? Go and have a read.’ It was an A4 sign, but it seemed to be universally ignored or missed by people who came through.”</i> Patient 8</p> <p><i>“Consultant and Registrar level doctors and experienced nurses have very limited knowledge around isolation in CPE, both around the implications of screening on a ward and to a patient, and then future ED admissions. I believe the hospital needs to educate ALL staff on this to reduce the spread of CPE. Clinicians also need information so they can educate patients confidently and competently.”</i> Nursing staff (11–20 years’ experience)</p> <p><i>“We have had an increasing number of patients who are isolated for confirmed CPE ... and there is a lack of understanding amongst the nursing staff about what this means for the patient, how CPE is spread and what the testing process involves.”</i> Nursing staff (1–5 years’ experience)</p> <p><i>“Staff do not take isolation rooms seriously.”</i> Nursing staff (more than 20 years’ experience)</p> <p><i>“Frequently see patients as outpatients who are not isolated (as an inpatient would be) causes confusion as to appropriate care and post care cleaning requirements”</i> Nursing staff (11–20 years’ experience)</p> <p><i>“My biggest question is why do we isolate patients on ward and not ED for CPE?”</i> Nursing staff (6–10 years’ experience)</p>
Opportunity	<p><b>Barriers</b> Explanations from staff about infection were not always sufficient</p> <p><i>“With this bug, they’ve got to explain to you what it means, what it could do, how it can harm you and all that. But all they said to me was ‘Everybody’s got it (VRE). Everybody’s got it’. Even the doctor said ‘I’ve got it’. But what makes it come out? Is it under control now or I walk outside... I went home for two weeks and I said ‘Can it hurt anybody else?’ Just no one really gets into explaining it to you.”</i> Patient 5</p> <p><i>“I’ve asked how long is it going to last, how long am I going to be quarantined. Nobody seems to know. What happens when I leave here for example. I don’t know.”</i> Patient 2</p> <p><i>“I was getting annoyed where every second admission, they’d say I wasn’t [positive for VRE], and I wasn’t getting a private room, and I was in a room with everyone else. And then I’d get admitted again, not even a week later, and I was all of a sudden VRE. There was no consistency.”</i> Patient 6</p> <p><i>“No information was given about long term outcomes. We find the whole thing odd. There are no backups, no systems.”</i></p>

Continued

Table 2. Continued

COM-B domain	Themes
Enablers	<p>When I asked if I could just go to my GP (general practitioner) as usual, they didn't answer me." Patient 3</p> <p>"I'm not sure what symptoms I'm supposed to experience. It hasn't been explained it to me." Patient 2</p> <p>Patients appreciated the high level of care received</p> <p>"The staff are fantastic. Even though you're in isolation and you're on your own, it doesn't feel like they're away because they're always coming in and out and checking on you and all that." Patient 9</p> <p>"One of the doctors, plus the head of the infectious diseases unit has also spent time with me talking about it and I'm more than happy." Patient 14</p> <p>Family members were supportive</p> <p>"They told me, they spoke to my parents and all that...if they explained to me, I was just in pain and agony. They did the right thing. They explained to my parents, my family. I was in no state to hear anything." Patient 9</p> <p>"[Mum]'s been a real big support. It's great when she's here and the doctors are doing their rounds and my mum's here it's like, yes. Because she knows what's going on and she can explain it to me when I'm unsure ... She's a really smart cookie." Patient 17</p>
	Motivation

patients, with 44% agreeing or strongly agreeing that it can negatively affect patient care and well-being (Figure 4, Table S5).

### Motivation: enablers

#### Patients valued privacy from being in isolation

The majority of participants expressed appreciation for the privacy that being in isolation provided. They noted the benefits of not having other patients overhearing their personal and medical conversations, and felt that being in isolation aided recovery as there were fewer disruptions, allowing them to rest more easily.

#### Patient suggestions for information provision

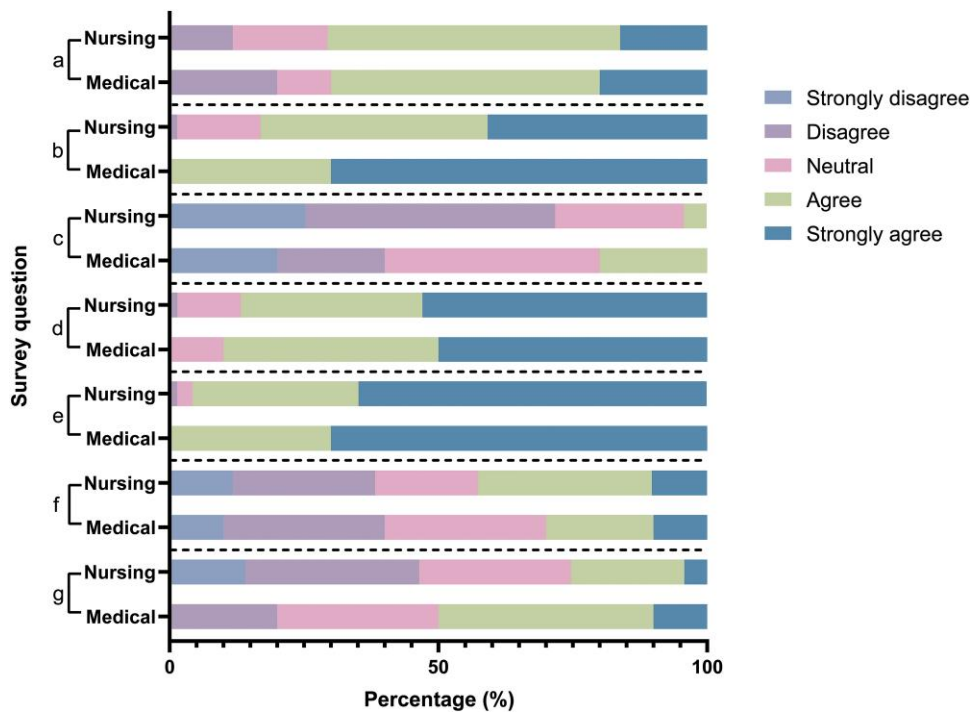
Participants had varied opinions about how information provision could be improved. Some patients and their family members

stated they wanted to receive written information (e.g. brochures), so they could read it in their own time and refer to it when it suited them. Others appreciated receiving written information but felt that verbal discussions with HCWs were most beneficial to clarify information and have questions answered (Table S4).

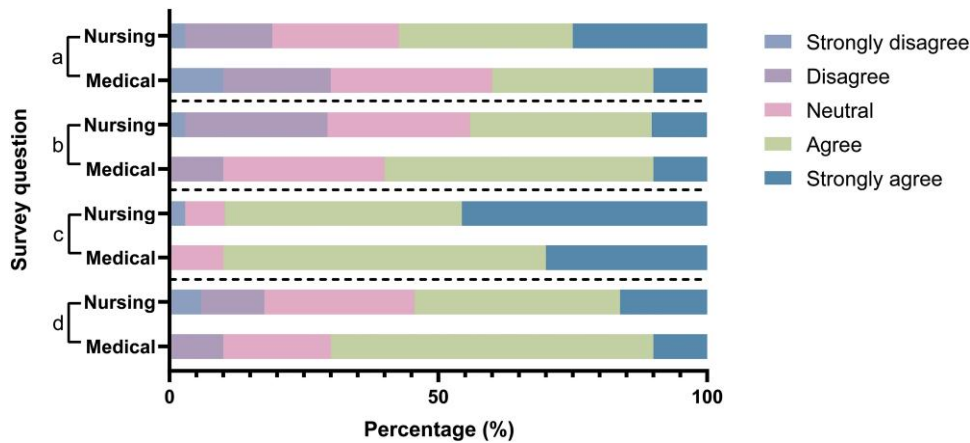
### Discussion

Despite the rising prevalence of MROs, few studies have explored the experiences of patients, or HCWs' knowledge of these micro-organisms and infection control protocols.<sup>5,6</sup> This information is vital to improve patient in-hospital experiences and staff knowledge.

Many patients described being too overwhelmed by other health concerns to take in information about MROs, similar to



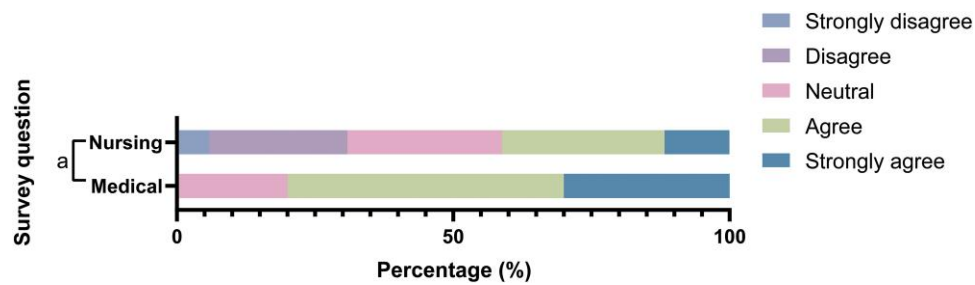
**Figure 2.** HCW survey responses that were triangulated to capability barriers. Frequency of responses from nursing and medical staff for Likert-scale questions. (a) The patient often has more immediate health issues than CPE. (b) Reducing inappropriate use of antimicrobials is important for preventing CPE. (c) I have expert-level knowledge of CPE. (d) I would actively seek advice from the Infection Prevention team about how to care for a patient with CPE. (e) Effective infection control protocols can prevent the spread of CPE. (f) If a patient with CPE was admitted to my ward, or was under my care, I would know exactly what to do. (g) I am able to identify if a patient requires pre-emptive isolation and screening for CPE.



**Figure 3.** HCW survey responses that were triangulated to opportunity barriers. Frequency of responses from nursing and medical staff for Likert-scale questions. (a) I often feel that I do not have enough time to talk with a patient and their next of kin if they ask me questions. (b) Talking about CPE will cause anxiety in the patient and their next of kin. (c) The patient and their next of kin need to be made aware of their CPE status and what it means for them. (d) It is my role to actively educate the patient and their next of kin about CPE, and ensure that they have adequate understanding of all aspects of CPE.

previous studies.<sup>17,18</sup> Having access to appropriate information can help put patients at ease.<sup>19</sup> Most participants felt that written information was most convenient; however, others preferred verbal information as it provided an opportunity for interaction with

HCWs. Previous studies have similarly shown mixed preferences for information.<sup>17,20</sup> Participants in Yeoh et al.'s<sup>20</sup> study noted a benefit of written information was the ability to share it with family and friends at a later time; this aligns with preferences



**Figure 4.** HCW survey responses that were triangulated to motivation barriers. Frequency of responses from nursing and medical staff for Likert-scale questions. (a) Isolation for positive CPE status has negative effects on patient care and well-being.

identified in our study. HCWs must be cognisant of patient preferences for information, and give patients the opportunity to discuss diagnoses, alongside written information.

Many participants felt that the provision of information and explanations from staff were inadequate. Participants were largely unaware of the specifics of the MRO, including how it was acquired, the need for isolation and infectivity when discharged from hospital. These are common issues for patients diagnosed with other MROs.<sup>17,21,22</sup> Participants also expressed confusion about the consequences of the MRO, a finding consistent with other studies.<sup>22,23</sup> Staff were similarly uncertain, and this may have impacted the education they provided to patients.

Staff responses to the survey revealed knowledge gaps. Previous studies have shown that staff are conscious of the negative impact their lack of knowledge of MROs can have on the patients' feelings and experience.<sup>21,24</sup> Increasing HCW education and training about infection control guidelines for MRO has been associated with improved confidence in patient care and protocol adherence.<sup>24,25</sup>

Staff uncertainty may stem from broader knowledge gaps about MRO colonization, as reflected in heterogeneous recommendations for patient isolation. Current State Guidelines<sup>7</sup> state 'Once a person is identified as a case of CPE, they are considered potentially infectious indefinitely'. In contrast, Australian national guidelines suggest clearance of CPE may be possible 12 months after a positive result,<sup>8</sup> noting, however, the lack of 'high-quality evidence' to determine the clearance of CPE.<sup>6</sup> Furthermore, the optimal methods to confirm clearance are unclear, while the risk factors for non-clearance have been imperfectly defined.<sup>26-28</sup> Similarly, several HCWs commented that the difference in isolation needs for CPE patients when they are outpatients or in the emergency department compared with inpatient admissions created confusion about infection control precautions. Jamal *et al.*<sup>29</sup> discussed similar difficulties in the Canadian context, highlighting the challenges for appropriate practice for CPE where there is a lack of evidence and frequently updated guidelines. More consistent guidelines and training for staff may improve confidence in treating patients with MROs, and provide more assurance to patients that they are receiving appropriate care.

Despite their diagnoses, many patients appreciated the high level of care they received. This contrasts with previous studies, where patients in isolation had lower levels of satisfaction, and visits from staff were less frequent.<sup>30,31</sup> Similarly, previous research has found that contact precautions for patients with MROs can have negative impacts on psychological well-being,

with increases in depression, anxiety and loneliness.<sup>30,32</sup> In contrast, patients in our study indicated that isolation aided their recovery, with more opportunities for uninterrupted rest. Patients in previous studies have indicated the benefits of reduced noise and distraction in isolation.<sup>17,22,23</sup> Participants reported practical issues including delays in receiving meals, which other studies have identified as having an adverse impact on mood and stigmatization.<sup>17</sup> Only one participant in our study discussed the feeling of being stigmatized, in contrast to previous studies, which have shown that isolation is a stigmatizing experience for the majority of patients.<sup>21,33</sup>

This study has several strengths, including the use of a validated framework (COM-B) and the rigorous analytic process. The study capitalized on the introduction of the updated hospital MRO guidelines, which encompassed CPE management. The study did have limitations. Participants were primarily male, and participants who were too unwell or had negative experiences may have not wished to participate in the interview. Staff were sent a link to participate in the survey through an all-staff newsletter and via flyers around the hospital. It is unclear how many eligible staff members viewed the survey advertisement and chose not to participate. It is possible that there may have been common characteristics in those who chose to participate, which could have led to bias.

## Conclusions

This study identified key barriers to MRO knowledge including inconsistent protocol adherence by hospital staff and patients being too unwell to engage with information. Patients identified key aspects that improved their understanding of MROs, including provision of information in a variety of formats and supportive family members. These data suggest a need to focus on staff education and developing new strategies to communicate with patients about MROs.

## Acknowledgements

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## Transparency declarations

None to declare.

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## Supplementary data

Tables S1 to S5 are available as [Supplementary data](#) at JAC-AMR Online.

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