

Knowledge and understanding of patients and health care workers about multi-resistant organisms

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Abstract. *Background:* We have perceived a deficit in both patients' and health care workers' (HCWs) knowledge and understanding of multi-resistant organisms (MROs) which may influence care and compliance with infection control precautions. We aimed to explore the knowledge and understanding of patients and HCWs about MROs.

Methods: Between September 2011 and April 2012, a purposive sample of 19 newly identified and existing patients with MROs were recruited. A 15 to 20 min taped interview was conducted and analysed to identify common themes. In addition, 55 HCWs completed a questionnaire to assess knowledge regarding MROs.

Results: Almost half (47%) of the patients reported they 'know very little' or 'do not know anything' about terms including MRO, MRSA and VRE. Patients reported they were not provided with sufficient explanation regarding colonisation or infection. While seeing single-room accommodation as an advantage, some felt like an 'alien' and were 'lonely'. Precautionary measures used by HCWs were noted by patients but they were unaware of the reasoning behind them. HCWs (76%) explained the terms MRO, MRSA and VRE adequately. Only 36% of them adequately explained colonisation and infection. Only half of the RN and Medical Officer respondents informed patients about their MRO status. Explanation about the type of MRO, its spread, risk factors and preventative measures were the topics HCWs perceived as important to discuss with patients.

Conclusion: Our findings suggest that patients' knowledge of their MRO status is poor. Given the major role in educating patients, our study identified a deficit in HCWs' knowledge regarding MROs. The information patients and HCWs perceived as important will assist in the development of future educational resources.

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Introduction

Multi-resistant organisms (MROs) including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and extended-spectrum β -lactamase (ESBL)-carrying Enterobacteriaceae are an ever-increasing problem worldwide. Many of these MROs are difficult to treat and persist inside and outside the healthcare environment. Patients in the health care setting are typically at an increased risk for the acquisition of MROs due to the presence of multiple risk factors such as being elderly with co-morbid conditions, acutely ill with lines and catheters and on multiple antibiotics. It is therefore important that patients and HCWs have an understanding of MROs in order to minimise their transmission and severe consequences.

There is an abundance of literature exploring patients' knowledge and understanding of MRSA, but very little focusing on other MROs.^{1,4,5,6} The effects of isolation have been the major focus of many such studies.^{2,5,7–10} There are only a few studies based in Australia: one explored the patients' perception of infection and impact on quality of life,⁷ and more recently, a meta-synthesis explored the effects of source isolation on patients including changes in their lifestyle.¹⁰ Overwhelmingly, patients reported being diagnosed with MRSA as a negative experience.^{5,11} The literature also suggests that the quality of the patients' knowledge was poor^{1–3,10} and often based on media reports.^{1–3}

Similarly, research into the knowledge and perceptions of HCWs of MROs has found that the quality of knowledge is

Implications

- Training courses should continuously build and reinforce healthcare worker (HCW) knowledge and confidence with communicating information about multi-resistant organisms (MROs) to patients.
- Policies should include protocol for HCW responsibilities in patient education about MROs.
- Factsheets, for example, should be used to support patients and HCWs knowledge and fill gaps.

poor. While HCWs are aware of basic infection-prevention practices such as hand hygiene, isolation precautions, the use of personal protective equipment (PPE) and cleaning, this knowledge is not always reflected in infection-prevention practices adopted by HCWs.^{12–15} Inadequacy of HCWs' knowledge has also been reported as a barrier in their role as advocates in the promotion of infection-control practices.^{16,17}

At Liverpool Hospital, Infection Prevention and Control staff notify the ward nursing staff or the patient's medical team, who are then responsible for informing the patient of their MRO status and providing education. It has been perceived that there is a gap in the patients' knowledge and understanding of their MRO status which may influence their compliance with their care. This is based on recent patient complaints of not being informed of their MRO status. We sought to determine patients' and HCWs' knowledge and understanding of MROs such as MRSA, VRE and ESBL.

Methods

Liverpool Hospital is a principal teaching referral hospital with capacity for 875 beds. There is an average of 80 patients per day in residence who have either been previously or newly identified to have acquired a MRO. Thirty-five new cases of MROs per 10 000 occupied bed days (OBDs), including acquisitions within the hospital and cases detected on admission to the hospital, are reported each month; this includes MRSA, VRE, ESBL and other emerging MROs.

Between September 2011 and April 2012, a purposive sample (i.e. participants based on selected criteria) of previously and newly identified patients with MROs aged 18 years or over and identified as English-speaking were selected from the 'Daily Inpatients by Infection Control' list which was generated from Cerner electronic medical record (eMR). The eMR is an integrated database that provides real-time access to patient results and clinical information across care disciplines. The hospital's Infection Control Microsoft Access database was also used to extract information regarding the patients MRO history such as: type of MROs, date and type of acquisition (i.e. new case, on admission or readmission). A 15–30 min taped semi-structured interview was conducted. A taped interview was used as it is optimal for collecting data on individuals' histories, perspectives and experiences. The participants were

able to respond freely and express different opinions rather than being restricted to coded opinions.¹⁸ Two pilot interviews (included in the results reported in this study) were conducted in order to test the validity of the interview schedule. The interview schedule included a question relating to 'what patients know and understand' about their MRO status (i.e. words and terms such as MRSA, VRE etc.). Follow-up questions were provided such as: (i) by whom and when they were told; (ii) difference between colonisation and infection; (iii) effect of MROs and changes they have made in their daily activities; and (iv) precautions undertaken by HCWs as well as the precautions they utilise at home to prevent the spread of MROs (Appendix 1). Questions were encouraged, and recommendations and comments were also sought. All interviewed patients were provided with a thorough explanation of their MRO status and an information sheet.

The interviews were transcribed verbatim. The framework approach was used to analyse the data.¹⁸ Briefly, the transcripts were read by one investigator multiple times and recurrent themes noted (familiarisation stage). Emergent and *a priori* themes were then used to establish an initial coding framework (identifying a thematic framework stage). Themes and subthemes from the initial framework were identified and discussed. Systematic coding was conducted (indexing and charting) after which patterns, commonalities, differences and meanings were identified using a data matrix (mapping and interpretation).¹⁸

A self-report questionnaire was used to assess HCWs' knowledge regarding MROs. The questionnaire included a combination of the following types: open-ended, multiple choice and questions using a six-point *Likert* scale. Answers to open-ended questions were grouped into themes and frequency and cross tabulations were used where appropriate.

Approval to conduct the project was granted by the local district's Human Research and Ethics Committee.

Results

Nineteen patients were interviewed with a total interview time of 7.1 h, an average of 22.4 min per interview. The mean age of participants was 54 years (range: 18 to 85 years), more than half were female ($n = 11$, 58%). The majority of patients had MRSA ($n = 10$, 53%), followed by VRE ($n = 6$, 32%), both MRSA and VRE ($n = 2$, 11%) and ESBL ($n = 1$, 5%). Almost half of the patients had a combination of the following co-morbidities: chronic airways limitation, hypertension, Type 1 diabetes mellitus and renal conditions.

Knowledge and understanding of the terms multi-resistant organisms, MRSA, VRE, ESBL, colonisation and infection

Almost half ($n = 9$, 47%) of the patients reported that they 'know very little' or 'do not know anything' about the terms MRO, MRSA and VRE. For patients, information they received seemed to have been inadequate and unsatisfactory;

Table 1. Patient responses
All quotes are a true reflection of the original interview. HCWs, health care workers; MROs, multi-resistant organisms; MRSA, methicillin-resistant *Staphylococcus aureus*

Knowledge of MROs: colonisation versus infection	Effect of MROs and changes with activities of daily living	Precautionary measures used by HCWs	Precautionary measures at home	Recommendations
<p>'I have MRSA from 2005 to 2009. I was upset because I was not told. I have one elderly friend. She is afraid to see me because she might catch it, I was very upset. The Dr told her that I am more susceptible in catching infection because of my condition.' (i8)</p> <p>'Don't know anything... did not seem to find anyone to ask.' (i13)</p> <p>'I have been stuck in a single room all the time I come and no one has ever explained to me why.' (i19)</p> <p>'resistant to antibiotics.' (i3, i7, i10)</p> <p>'on life-long antibiotics.' (i8)</p> <p>'thrive on me and got to get rid of it... catchy... contagious' (i14)</p> <p>'harmful to my heart.' (i7)</p> <p>'pretty severe.' (i19)</p> <p>'float.' (i14)</p> <p>'picked.' (i13)</p> <p>'rampant.' (i6)</p> <p>'caught in hospital.' (i9)</p> <p>'probably in the old building.' (i15)</p>	<p>'They said I can't come for the appointment... because of the MRSA they have to reschedule... I am not sure why I was not allowed to come'. (i11)</p> <p>'wanted to make sure... not contagious to my grandchildren.' (i15)</p> <p>'was conscious of it, touching things.' (i4)</p> <p>'wash hands, toilet I'm the only one who use it;... hygiene... napsan... don't expose myself anywhere... family careful but nobody told them they should.' (i16)</p>	<p>'gowns and gloves... going to tell me aren't you' (i13)</p> <p>'How come other doctors and nurses don't wear gown and some do?' (i12)</p> <p>'I hate being stuck in a single room and everybody gowned up... only a few friends come or not come at all. They are afraid they might get the disease from me. No friends come and visit at home either... They don't understand.' (i8)</p> <p>'alien... lonely.' (i17)</p> <p>'single room is small... nothing inside... can't walk because of leg cellulitis, I need to be occupied... keep you thinking about it... need distraction.' (i8)</p>	<p>'Community nurse cleans wound. Has gel in room and use them as often as he could 3 or 4 times and then he washes his hand. Gel is more convenient for him because of his wounds. Community nurses use gel, gloves, same as in hospital.' (i10s wife)</p>	<p>'When the doctors come in, I know they are busy but I like to know more information about what exactly the infection is... don't expect the full story.' (i4)</p> <p>'I just wanted to know why and how is it that nurses and doctors and other people has to be covered up that they don't get this, but my grandkids kiss me and cuddle me but they don't get nothing. So this is what I don't understand why?' (i6)</p> <p>'I can't believe I haven't been told the first time.' (i12)</p> <p>'I would have liked this conversation earlier. I never knew what it was till today.' (i14).</p>

Table 2. Health care worker responses
HCWs, health care workers; MROs, multi-resistant organisms; MRSA, methicillin-resistant *Staphylococcus aureus*

Meaning of MRO	%	Explain MRSA, VRE, ESBL	%	Colonisation versus infection	%	Reservoir for MROs (multiple responses)	%	Factors in the acquisition of MROs (multiple responses)	%	Mode of transmission (multiple responses)	%	At risk patients (multiple responses)	%	Information HCWs perceive as important for patients to know (multiple responses)	%
Resistant bacteria, organism or bug	65	Full word provided (e.g. Vancomycin-resistant <i>enterococcus</i> for VRE)	62	Adequate answer	36	Hospital surrounds	62	Inadequate or prolonged antibiotics use	56	Direct contact	100	Immuno-suppressed	87	Type of MRO	78
Resistant to antibiotics, treatment, medication	78	Adequate answer	9	Inadequate answer	22	Colonised or infected patients	98	Prolonged or frequent hospitalisation	82	Indirect contact	62	Very old, very young	67	Description of type of MRO	84
Other	16	Inadequate answer	24	No answer	22	Secretions, excretions, blood	84	Invasive devices	65	Airborne	44	Post op	76	Difference between colonisation and infection	65
No response	5	No answer	5	Wrong answer	18	Patient equipment	82	Wounds	73	Droplet	47	Prolonged, frequent hospitalisation	89	Risk factors for MRO	86
						Health care workers	76	Low immunity	60	Visitors	55	Multiple co-morbidities	73	How MRO is spread	90
						Visitors	45	Lack of cleaning	89	Food, water	25	Anyone	49	Measures to prevent cross contamination	93
						Food, water	36	Shared medical equipment	89	Other	16	Critical care patients	75	What happens when the patient goes home	99
								Natural selection	15					What happens when the patient is readmitted	9
								Self medication	11					What happens if patient has outpatient appointment	83
								Lack of hand hygiene	100						

they therefore became upset and angry. Patients used varied descriptions including resistance to antibiotics and considered being MRO-positive as a lifetime burden. The seriousness of acquiring MROs was acknowledged by six patients. MROs being 'rampant' or more prevalent and the hospital setting as the source were claimed by five patients. Table 1 cites quotes from patient interviews.

Patients reported they were either not provided with any or sufficient explanation regarding colonisation or infection, indicating they assumed that there was a difference between infection and colonisation only because we specifically asked them about this topic. However, one out of the 19 patients seemed to have a limited understanding of the difference between the two terms: 'Colonisation comes from the outside, infection, deeper into the bone' (i13).

Effect of MROs and changes with activities of daily living

The majority of the patients ($n = 14$, 74%) stated that they were upset but did not make any changes to their daily activities. Patients expressed that they did not know if any changes to their lifestyle may be necessary because no one had told them. Not knowing was a cause for confusion and frustration. There was a feeling of uncertainty as to what needed to be done and what was expected after being discharged from hospital, including appointments that needed to be rescheduled. A few ($n = 3$) were concerned about their relatives and friends visiting. Two patients had taken steps to prevent the spread of infection to others (Table 1).

Precautionary measures used by HCWs

The precautionary measures that HCWs used were noted by all patients. The majority ($n = 11$, 58%) of patients, however, were unaware of the rationale behind them. The inconsistency with which HCWs used PPE was also questioned by one patient. Eight patients accepted and knew the precautions were used to prevent the spread to other people. While seeing single-room accommodation as an advantage because it was more comfortable, private and more decent, others expressed anger, feeling isolated and shut off. Distractions from boredom were recommended such as books, magazines and/or television (Table 1).

Precautionary measures at home

When asked about precautionary measures at home, patients immediately said 'no' measures thinking that the basic day-to-day activities at home such as hand washing, cleaning and the use of household disinfectants (such as Domestos) are not necessarily essential strategies that need to be undertaken to prevent the spread of MROs. Patients with wounds commented that in addition to cleaning and hand washing with soap and water, they also have the 'gel' and the gloves. This was a result of having observed community nurses using these measures. Newly identified patients with MROs stated the precautionary measures at home were hopefully yet to be discussed by their doctor (Table 1).

Recommendations

Patients recognised the workload HCWs were under. They recommended that HCWs, specifically doctors, spend time in providing patients like themselves with relevant and timely information. The majority expressed a wish that more information regarding MROs had been provided to them at the time of diagnosis (Table 1).

HCWs responses

Fifty-five HCWs completed the questionnaire, a return rate of 50%. The majority of respondents were nursing staff ($n = 37$, 67%); there were two medical officers and two medical students. The majority had been qualified for more than 1 year with only four being qualified for less than a year. Most HCWs (71%) were able to correctly explain the terms MRO, MRSA and VRE. Only 36% of respondents, however, adequately explained colonisation and infection. Eighty-nine percent disagreed or strongly disagreed with the statement 'MROs are not a risk to HCWs'; only 7% agreed. All HCWs agreed or strongly agreed that it is important for a HCW to know the patient's MRO status. The following themes were identified when asked as to 'why this knowledge is important': to prevent spread (57%), educate patients (15%), alert other HCWs (11%) and 7% wrote that patients had the right to know about their MRO status.

Most HCWs (84%) indicated that doctors should be responsible for notifying patients of their MRO status. Only 36% of the nursing staff admitted informing patients about their MRO status; those who answered 'no' stated it was 'out of the scope of their knowledge'. Despite a 'good' or 'average' level of knowledge about MROs in 78% of HCWs, only 47% of them felt comfortable talking to patients. Explanation about the type of MRO, its spread, risk factors and preventative measures were the topics HCWs perceived as important to discuss with patients.

Factors that HCWs identified as contributing to the spread of MROs included: poor hand hygiene compliance, poor environmental cleaning and shared medical equipment. Antibiotic use was identified as a contributing factor by only 56% of HCWs (Table 2).

Discussion

Our findings are consistent with several other studies.^{1,2,6,12-15,19} We have demonstrated that a patient's lack of knowledge and understanding about their MRO status can become a source of anxiety and distress which can also lead to inadequate compliance to basic infection-prevention and control practices. Patients recognised that HCWs, particularly doctors, have a heavy workload; however, the communication of relevant and timely information to patients identified as infected or colonised with MROs must still be a priority.

In agreement with a previous study⁹ regarding MRSA, patients in our study felt 'alone'. Patients also expressed being stigmatised because of their infectious status. Many participants imposed physical and social limitations on

themselves to reduce the risk of spreading MROs to others. Adequate explanations regarding expectations while in hospital and upon discharge, including appointments, should be provided to patients to alleviate their concerns. For example, HCWs who did inform their patients focused on the physical needs of the patient and issues such as PPE use, the need for a single room and how the patient could stop the spread of MROs. Ensuring that patients understood the information provided should also be a consideration.

Patients identified MRSA and other MROs as a hospital-based problem rather than something that can occur in the community; they did not always associate MROs with antibiotic use.⁴ Superlative words such as 'rampant', 'float', 'catchy' were indicative of their perceptions of the source and the magnitude of the problem as well as their lack of knowledge and the influence of media reports. These findings highlight the need for streamlining the policies and guidelines in the management of patients with MROs to include the provision of information regarding MROs to patients (e.g. who should relay the information, what is the information).

The findings regarding the inconsistencies with which PPE was used by HCWs suggest that there is a need for HCWs to adhere to guidelines and policies in order to avoid confusion amongst patients. Explanations of the rationale for the practices are of paramount importance in improving patient compliance. Patients view HCWs as role models. Practices by HCWs attending to patients therefore can be copied or mimicked in the home setting. PPE use and other infection-control practices, although observed, may not have been questioned as they were overshadowed by other issues.

A study has highlighted that single-room accommodation can be problematic for patients, having negative psychological and physical impacts on the patient's well being.⁷ Patients in our study residing in a single room may have limited their interactions with other patients and HCWs and therefore were unable to voice their frustrations. Our study identified that there were a myriad of other issues that patients felt were important to discuss including: waiting times in ED and admission as well as procedures and tests, cleanliness of toilets and rooms, hospital food, inadequacy and inconsistency of information about diagnosis and test results, and limited opportunity to speak to doctors. There is opportunity for further study to explore the identified issues.

HCWs acknowledged and recognised the need for patient education. HCWs were also concerned about acquiring infections themselves from patients and also valued the need for patient education about MROs including the role patients play in reducing their spread. Nurses, however, responded that it is not a nursing responsibility to inform patients and is not within the scope of their knowledge. There were also assumptions that 'most of the patients don't understand anyway' or 'patients are in a single room, so they know about their infectious or MRO status'. Other studies^{15,16} have similarly found that HCWs lacked ownership and personal

responsibility about how and where patients acquired MROs. Our study demonstrated that HCWs attributed MROs to patient factors including age, co-morbidities and the actions of visitors and other HCWs. These findings corroborate the inadequacy of the information that patients receive regarding their MRO status and the need for a streamlined approach to providing this type of information to patients. In addition, health care facilities need to ensure that HCWs possess adequate knowledge of MROs and infection prevention and control so that they could effectively communicate necessary information to patients and their families. For example, HCWs should be able to explain to patients the types of MROs and the precautionary measures that need to be undertaken to minimise their spread.

In contrast to numerous other studies exploring the knowledge and understanding of patients and HCWs in relation to MRSA, our study focussed on the MROs the study participants have, including VRE and ESBL. Our study has therefore added to the body of knowledge regarding the topic. The present study was conducted in a single hospital with a small sample size, and though this is not uncommon in qualitative studies, this may limit the generalisability of our findings. However, our setting and patient population are similar to other hospitals within NSW and four of our study participants acquired their MROs and had been admitted to three other hospitals within the district. It is important to note that the majority of our study participants were elderly, with numerous co-morbidities; recall of information therefore may have been varied, limited and at times inaccurate. In addition, our study did not include patients with non-English speaking backgrounds, which further limits our findings.

We presented our results and distributed MRO fact sheets to HCWs, patients and relatives. We developed a booklet on MRSA in collaboration with other infection-prevention and control professionals and community members. This information booklet is now being utilised by hospitals within our local health district. Information booklets for other common MROs are in the development phase. A follow-up study to assess the level of knowledge and understanding of patients (particularly with MRSA) after the introduction of the information booklet is envisaged.

HCWs are now provided with a choice of mandatory education on infection prevention and control as on-line or face-to-face presentations. Other strategies included empowering the infection-prevention and control resource nurses so that they could play a more active role in disseminating information as well as enforcing infection-prevention and control practices.

Given the major role in educating patients, HCWs should gain adequate knowledge regarding MROs and basic infection-prevention and control practices. As concluded by a study,¹⁷ HCWs should act 'interdependently' and share a common goal towards the prevention and control of infections. The information gained from this study identified educational needs of patients and HCWs regarding MROs,

particularly information patients perceive as important, which has assisted in the development of patient resources.

Conflicts of interest

None declared.

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Appendix 1. Patients with multi-resistant organisms (MROs): what are their knowledge and perceptions about their MRO status?

Good morning/afternoon Mr/Mrs/Ms My name is and this is We are Clinical Nurse Consultants from the Infection Prevention Unit. You have consented to participate in our study on looking into what you know about your MRSA/VRE etc. . . . status. Is it alright with you if I ask you those questions now? It would take ~15 to 20 min. Please do not hesitate to stop me anytime if you feel uncomfortable or you do not want to answer any more questions or if I could help you in any way.

. will be writing down some notes and we will also be taping this interview. Is it Ok with you if we use the tape? Can we start the interview now?

- (1) What do you understand by the term 'multi drug resistant organisms'?
- (2) What do you understand by MRSA, VRE etc.? or What have you been told about MRSA, VRE etc.?
Follow up questions:
 - When did you learn that you have acquired MRSA, VRE etc.
 - Can you remember who told you? or Can you remember who gave you the information?
 - What else do you know?
- (3) How has having MRSA, VRE etc. affected you and your family's life? or Have you or your family made any changes to your lifestyle?
- (4) What do you know about the precautions that are in place while the health care workers attend to you? Do you think that the use of these precautions make any difference to the spread of multi-resistant organisms or to the care that you receive?
Follow up questions:
 - What other steps could be taken to reduce the spread of multi-resistant organisms in the hospital setting?
- (5) How about the precautions that you and your family undertake at home?
- (6) Do you have any other suggestions to improve the care that you receive?
- (7) Do you have any other comments?