Perception and practices of public hospital pharmacists towards the antimicrobial stewardship programme in the State of Selangor, Malaysia

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ABSTRACT

Objective The increase in antimicrobial resistance and the lack of new antimicrobial agents in drug discovery pipelines have called for global attention to mitigate the problem of antimicrobial misuse. While an antimicrobial stewardship (AMS) programme has been implemented in Malaysia, the perception and practices of public hospital pharmacists remain unknown. The aim of this study was to determine the perception and practices of Malaysian public hospital pharmacists towards the AMS programme in the state of Selangor, Malaysia.

Methods A cross-sectional study, using a validated 23-item self-administered questionnaire, was conducted among pharmacists from 11 public hospitals in the State of Selangor, Malaysia, from December 2016 to January 2017. All public hospital pharmacists (n=432) were invited to participate in the survey. A 5-point Likert scale was employed in the questionnaire; the perception section was scored from 1 (strongly disagree) to 5 (strongly agree) while the practice section was scored from 1 (never) to 5 (always). Both descriptive and inferential statistical analyses were used to analyse data.

Results Of the 432 pharmacists surveyed, 199 responded, giving a response rate of 46.0%. The majority of the respondents agreed (n=190, 95.5%) that the AMS programme improves patient care at their hospitals (median=5; IQR=1). Slightly less than half of the respondents indicated that a local antibiotic guideline was established in their hospitals (median=3, IQR=2.5), and had taken part in antimicrobial awareness campaigns to promote optimal use of antimicrobials in hospitals (median=3, IQR=1).

Conclusions Overall, the perception and practices of the surveyed hospital pharmacists towards AMS programme were positive. National antibiotic guidelines, which take into consideration local antimicrobial resistance patterns, should be used fully to improve antimicrobial usage and to reduce practice variation. Collaboration among healthcare professionals should be strengthened to minimise the unfavourable consequences of unintended use of antimicrobial agents while optimising clinical outcomes.

INTRODUCTION

Antimicrobial resistance has been a long-standing threat to individual patient safety and global public health. The increasing incidence of multidrug-resistant microbial infections coupled with an alarming decline in the development of new antimicrobial agents present great challenges to the healthcare systems in tackling antimicrobial resistance.[1] Globally, the number of deaths attributable to antimicrobial resistance is projected to be 10 million annually by 2050.[2] In addition, antimicrobial resistance has been associated with high mortality, substantial healthcare expenditure and prolonged hospital stay worldwide, including Malaysia (a developing country).[1–3]

To curb this overarching problem, antimicrobial stewardship (AMS) programmes, which aim to improve judicious and effective use of antimicrobial agents, have been introduced and implemented in many parts of the world. Previous studies have revealed that AMS programmes improved awareness of healthcare providers towards appropriate antimicrobial use and therefore reducing antimicrobial resistance with better clinical and economic outcomes.[4–6] In Malaysia, initiatives have been taken by the Ministry of Health (MOH) through the establishment of a protocol on AMS for all healthcare facilities in 2014.[7] While pharmacists play an important role in the AMS programme, the perception and practices of pharmacists at the Malaysian public hospital setting, however, remain unknown. The only relevant Malaysian study conducted focused on the perception and practices of AMS among the community pharmacists.[8]

METHODS

Study design, setting and participants

A cross-sectional study, using a pre-tested questionnaire, was conducted between December 2016 and January 2017. All pharmacists (n=432) practising at all 11 public hospitals in the state of Selangor, Malaysia were invited to participate in this study. The list of pharmacists, including their contact details, was obtained from the Pharmacy Board, MOH, Malaysia. The minimum sample size required was 167 based on a CI, margin of error and response distribution of 90%, 5% and 50%, respectively (Raosoft, Seattle, Washington, USA).

Questionnaire

The questionnaire used was adapted from a study conducted in Malaysia[8] and changes were made to suit the objective of this study that focused on the perception and practices in the public hospital setting. Changes were made mainly in the section surveying the practices of the participants, given

that there are differences in the way of practices (eg, dispensing) between the hospital and community pharmacy settings. For instance, questions such as 'I dispense antimicrobials without a prescription' and 'I dispense antimicrobials for durations more than prescribed by the physician on patient's request' were replaced by 'There is a local antibiotic guideline established in my hospital' and 'There is surveillance and feedback on antimicrobial utilisation activities conducted in my hospital'. The questions corresponded well with the national protocol of AMS (2014),[7] in which the key components highlighted in the protocol were included in this survey (ie, role of pharmacists in AMS, collaboration among healthcare professionals in implementing AMS, education on AMS programme, AMS activities). The adapted questionnaires included 23 questions on: (i) demographics of the participants (four items); (ii) participants' perception of AMS (eight items) and (iii) participants' AMS practices (11 items). A 5-point Likert scale was used for assessing perception and practices of the participants. The perception section was scored from 1 (strongly disagree) to 5 (strongly agree) and the practice section was scored from 1 (never) to 5 (always).

A pilot test was carried out by sampling 22 pharmacists from the public hospitals and these data were not included in the final analysis. Content validity was determined by a panel of three practising pharmacy academics with vast experience in survey validation and infectious diseases (ID). The content validity index (CVI) obtained was 0.81. Reliability was assessed using Cronbach's alpha value (the value was 0.88 for both the perception and practice sections). The survey responses were collected via two methods: (i) online web survey application and (ii) distribution of manual survey forms. For the online web survey application, an invitation email, consisting of a participant explanatory statement and a link to the web-based questionnaire, was sent to all the target pharmacists via their working email addresses. A total of five email reminders were sent within the survey period. In addition, distribution and collection of survey was done manually in Sungai Buloh Hospital, the tertiary referral hospital for ID.[9] Printed manual survey forms were distributed to the Sungai Buloh Hospital pharmacists who did not respond to the online web survey and to those who did not receive the online web survey. Informed consent was obtained from the pharmacists who opted for the manual survey while implied consent was considered when the pharmacists responded to the anonymous online survey.

Data analysis

Data were analysed using IBM SPSS Software version 21 (IBM Corp, Armonk, New York, USA) for both descriptive and inferential analyses. Descriptive statistics were employed to report the findings such as frequency, percentages, median and IQR. The normality of the data was determined by Kolmogorov–Smirnov and Shapiro–Wilks tests. The Mann–Whitney U test and Kruskal–Wallis test were used to determine the differences in median scores in view of the non-normal distribution of the data. A p value of <0.05 was considered as statistically significant.

RESULTS

A total of 432 pharmacists were invited to participate in the survey through the online web survey (n=397) or the printed manual survey forms (n=35). Of the 432 pharmacists, 199 responded to the survey, giving a response rate of 46.0%; this exceeded the minimum sample size requirement of 167. There were 165 and 34 pharmacists who responded to the web-based

Table 1 Respondents' demographic data

Variables	Frequencies (n)	Percentage (%)
Gender		
Male	23	11.6
Female	176	88.4
Age (years)		
20–30	105	52.8
31–40	86	43.2
41–50	4	2
51–60	4	2
>60	0	0
Educational level		
Bachelor's Degree	160	80.4
Master's Degree	37	18.6
Doctorate Degree	1	0.5
Others	1	0.5
Number of years of practice		
<1	31	15.6
1–4	44	22.1
5–9	88	44.2
≥10	36	18.1

surveys and the printed manual survey forms, respectively. The demographics of the respondents are shown in table 1. The majority of the respondents were female (n=176, 88.4%). Most of them were aged between 20 and 30 years (n=105, 52.8%), followed by 31–40 years (n=86, 43.2%). Very few respondents were aged 41–50 years (n=4, 2.0%) and 51–60 years (n=4, 2.0%). Most of the respondents were Bachelor's Degree holders (n=160, 80.4%). The majority of the respondents had been practising for 5–9 years (n=88, 44.2%).

As shown in table 2, most respondents agreed that AMS programmes improved patient care (n=190, 95.5%) (median=5; IQR=1) and reduced problems of antimicrobial resistance in their hospitals (n=180, 90.4%) (median=4, IQR=1). Almost all the participants agreed that adequate training on antimicrobial use should be provided to hospital pharmacists (n=191, 96.0%) (median=5, IQR=1) and that relevant conferences, workshops and educational activities should be mandatory for hospital pharmacists to enhance their understanding of AMS (n=195, 97.9%) (median=5, IQR=1). Furthermore, most of them agreed (n=175, 87.9%) that pharmacists had a responsibility to take a prominent role in AMS and infection control programmes in hospitals (median=4, IQR=1).

Of note, less than half of the respondents indicated that local antibiotic guidelines were often or always (n=95, 47.7%) established in their hospitals (median=3, IQR=2.5) (table 3). 52.2% (n=104) of the respondents indicated that they often or always collaborated with other healthcare professionals for infection control and AMS (median=4, IQR=1). Most respondents (n=122; 61.3%) often or always checked for additional information such as drug interactions, adverse drug reactions, allergy and others before deciding to dispense the prescribed antibiotic (median=4, IQR=2). However, only slightly more than half (n=110, 55.3%) of the respondents often or always screen the antimicrobial prescriptions in accordance with the hospital antibiotic guideline before dispensing (median=4, IQR=1). The majority of the respondents (n=152, 76.4%) reported that surveillance and feedback on antimicrobial utilisation activities were often or always conducted in their hospitals (median=4, IQR=1). The majority of the respondents (n=140, 70.4%)

Table 2 Respondents' perception towards antimicrobial stewardship programmes

Statements	Participants' responses					Median (IQR)
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
1. Antimicrobial stewardship programme improves patient care in hospitals	0 (0.0)	2 (1.0)	7 (3.5)	88 (44.2)	102 (51.3)	5 (1)
2. Antimicrobial stewardship should be incorporated in managing the usage of antimicrobial agents in hospitals†	2 (1.0)	1 (0.5)	3 (1.5)	70 (35.2)	123 (61.8)	5 (1)
3. Antimicrobial stewardship programme reduces problem of antimicrobial resistance in hospitals	0 (0.0)	3 (1.5)	16 (8.0)	97 (48.7)	83 (41.7)	4 (1)
4. Adequate training should be provided to hospital pharmacists on antimicrobial use*	3 (1.5)	0 (0.0)	3 (1.5)	42 (21.2)	149 (74.9)	5 (0)
5. Relevant conferences, workshops and other educational activity are required to be attended by hospital pharmacists to enhance understanding of antimicrobial stewardship	1 (0.5)	0 (0.0)	3 (1.5)	58 (29.1)	137 (68.8)	5 (1)
6. Individual efforts at antimicrobial stewardship has minimal impact on antimicrobial resistance problem	20 (10.1)	37 (18.6)	29 (14.6)	63 (31.7)	50 (25.1)	4 (3)
7. I think that prescribing physicians are the only professionals who need to understand antimicrobial stewardship	98 (49.2)	81 (40.7)	7 (3.5)	6 (3.0)	7 (3.5)	2 (1)
8. Pharmacists have a responsibility to take a prominent role in antimicrobial stewardship and infection control programmes in hospitals	4 (2.0)	2 (1.0)	18 (9.0)	94 (47.2)	81 (40.7)	4 (1)

*Statement with missing data reported in ≤1.0% of the respondents.
†Modified statement to suit the objective of the current study that focused on the AMS perception and practices in the public hospital setting.

indicated that hospital formulary restriction for dispensing of antimicrobial agents often or always existed (median=4, IQR=2). Most respondents (n=142, 71.4%) acknowledged that a team of specialist physicians and pharmacists were often or always available to provide individualised antimicrobial prescribing advice and feedback (median=4, IQR=2). Very few respondents (n=7, 3.5%) admitted that they rarely or never communicated with the prescribers if they were unsure about the appropriateness of an antibiotic prescription (median=4, IQR=1).

The median score with respect to the practices in AMS was significantly different between male and female pharmacists (median score: male=3 vs female=4) with a p value of 0.007 (table 4). Similarly, the median perception score towards AMS

was significantly different across the number of years of practice of the respondents (p=0.043). The median scores on the perception (p=0.03) and practices (p=0.019) towards AMS were significantly different between those with a Bachelor's Degree and those with a Master's Degree.

DISCUSSION

The Malaysian healthcare system is characterised by a two-tier system which consists of public and private healthcare sectors. The public healthcare sector system, with the exception of teaching hospitals, is funded by the government under the MOH and it is the largest healthcare service provider in Malaysia. The

Table 3 Respondents' practices towards antimicrobial stewardship programmes

Statements*	Participants' responses					Median (IQR)
	Never	Rarely	Occasionally	Often	Always	
1. There is a local antibiotic guideline established in my hospital†	35 (17.6)	20 (10.1)	47 (23.6)	46 (23.1)	49 (24.6)	3 (2.5)
2. My pharmacy unit/department consistently instils the importance of antimicrobial stewardship†	1 (0.5)	12 (6.0)	41 (20.6)	80 (40.2)	63 (31.7)	4 (2)
3. There is implementation of treatment guidelines and clinical pathways when they are available during dispensing of antimicrobials†	2 (1.0)	18 (9.0)	59 (29.6)	84 (42.2)	34 (17.1)	4 (1)
4. I screen the antimicrobial prescriptions in accordance with the hospital antibiotic guideline before dispensing	8 (4.0)	17 (8.5)	62 (31.2)	65 (32.7)	45 (22.6)	4 (1)
5. I collaborate with other healthcare professionals for infection control and antimicrobial stewardship	11 (5.5)	26 (13.1)	55 (27.6)	59 (29.6)	45 (22.6)	4 (1)
6. I communicate with the prescribers if I am unsure about the appropriateness of an antibiotic prescription	1 (0.5)	6 (3.0)	32 (16.1)	66 (33.2)	92 (46.2)	4 (1)
7. I sought additional clinical information (eg, drug interaction, ADRs, allergy, etc) before deciding to dispense the prescribed antibiotics	1 (0.5)	14 (7.0)	59 (29.6)	69 (34.7)	53 (26.6)	4 (2)
8. I take part in antimicrobial awareness campaigns to promote the optimal use of antimicrobials in hospitals	12 (6.0)	31 (15.6)	58 (29.1)	60 (30.2)	36 (18.1)	3 (1)
9. There is surveillance and feedback on antimicrobial utilisation activities conducted in my hospital†	2 (1.0)	11 (5.5)	30 (15.1)	76 (38.2)	76 (38.2)	4 (1)
10. There is a formulary restriction policy based on the category of the prescribers according to my hospital formulary restrictions settings for dispensing of antimicrobial agents†	9 (4.5)	15 (7.5)	33 (16.6)	62 (31.2)	78 (39.2)	4 (2)
11. There is a team consisting of a specialist physician and a pharmacist providing individualised antimicrobial prescribing advice and feedback in my hospital†	15 (7.5)	18 (9.0)	22 (11.1)	64 (32.2)	78 (39.2)	4 (2)

*All statements with missing data reported in ≤2.0% of the respondents,
†Modified statement to suit the objective of the current study that focused on the AMS perception and practices in the public hospital setting.

Table 4 Differences in median scores on respondents' perception and practices towards antimicrobial stewardship

Variables	Perception score (median)	Mean rank	P values	Practice score (median)	Mean rank	P values
Gender*						
Male	4	96.33	0.810	3	67.96	0.007†
Female	4	99.35		4	101.47	
Age (years)*						
20–30	4	97.82	0.429	4	90.19	0.286
31–40	4	91.55		4	98.67	
Educational level*						
Bachelor's Degree	4	102.14	0.03†	4	92.13	0.019†
Master's Degree	4	79.74		4	116.82	
Number of years of practice‡						
<1	4	122.69	0.043†	4	101.56	0.842
1–4	4	103.81		4	93.02	
5–9	4	90.26		4	96.02	
≥10	4	93.69		4	103.10	

*Mann-Whitney U Test
†P value of <0.05 was considered as significant.
‡Kruskal–Wallis test.

protocol on the AMS programme (2014)[7] is established for all the healthcare facilities in Malaysia, in particular the public hospitals and health clinics. In general, the public hospital pharmacists surveyed in this study reported a positive perception and practices towards the implementation of AMS in their hospitals, reflecting good understanding and good practices in line with the national AMS guideline. Findings from this study revealed that the hospital pharmacists agreed that the AMS programme improves patient care in hospitals, consistent with previous studies conducted in both developed and developing countries.[4 10] They also agreed that implementation of the AMS programme reduces problems of antimicrobial resistance in their hospitals. Implementation of the AMS programme is associated with an improvement in antimicrobial prescribing practices among the physicians and, thus, reducing antimicrobial resistance incidence over time.[11] Indeed, findings from a recent local observational study has shown a reduction in antimicrobial resistance among adult hospitalised patients after 1 year of implementation of the AMS programme.[12] Annual drug expenditure in the hospital setting was also found to be reduced following implementation of the AMS programme.[5] In addition, information on the number of days of therapy and the defined daily doses of antimicrobial, which could help in managing the usage of antimicrobial agents in hospitals, can also be determined through the AMS programme.

It is interesting to note that there was a mixed response among the respondents to the statement 'Individual efforts at antimicrobial stewardship have minimal impact on antimicrobial resistance problem', while most of them agreed that physicians are not the only professionals who need to understand AMS. The underlying reason for these observations remains to be explored. As highlighted in the literature, an effective AMS programme requires the support and input, as well as the engagement, of all the healthcare professionals involved in prescribing, administration and dispensing of antimicrobial agents.[13 14] AMS can only be successfully implemented in hospitals depending on good leadership and a coordinated multidisciplinary approach.[15]

There was a positive development in the collaboration between the pharmacists and other healthcare professionals in the AMS programme, as indicated by the majority of the respondents in this study. Prudent antimicrobial prescribing can be attained through the collaboration between the healthcare professional team, consisting of clinical pharmacists, medical microbiologists and ID physicians.[14 16] In line with this, most respondents agreed that pharmacists have a responsibility to take a prominent role in AMS. An Australian study showed that pharmacists seemed to be more engaged with the issues relevant to antimicrobial resistance and AMS, and were more willing to participate in AMS interventions introduced at the hospitals.[10]

With regard to AMS training, most respondents agreed that hospital pharmacists should be provided with proper training on antimicrobial use and they perceived that it is very important for pharmacists to attend relevant conferences, workshops and other educational activities for regular updates on issues related to antibiotic prescribing, antimicrobial resistance and ID management. The importance of continuous training could not be further emphasised where pharmacists with ID training are recognised as core members of the hospital AMS team.[16] As AMS core team members, these pharmacists were sent for attachments to do AMS rounds with ID physicians in other teaching institutions to ensure good antimicrobial clinical practices were adopted.[12] As part of the training programme, continuous medical education sessions highlighting issues on antimicrobial resistance are proposed to increase the awareness and prudent use of antimicrobial agents.

In terms of AMS practices, most of the respondents reported that there was a local antibiotic guideline established in their hospitals. However, compliance with the guideline remains unknown in the Malaysian setting. In Australia, more than 50% of the prescribers did not comply with antibiotic guidelines when prescribing at hospitals.[10] It is alarming to note that only slightly more than half of the respondents indicated that they often or always screen prescriptions with the antibiotic guideline. A similar situation was observed in Australia, where only 60.0% of the pharmacists surveyed complied with the available antibiotic guideline.[10] Compliance of pharmacists with antibiotic guidelines has to be improved to enhance the implementation of AMS and to strengthen the role of pharmacists in AMS.

The majority of the hospital pharmacists surveyed reported that surveillance and feedback on antimicrobial utilisation activities were performed in their hospitals. Surveillance and feedback activities on antimicrobial utilisation are one of the core activities in the AMS programme[15] and are almost always evaluated in the studies related to AMS. One of the surveillance activities includes formulary restriction. In the current study, the majority of the respondents reported that there was a formulary restriction policy at their hospitals. In Scotland, a restricted antimicrobial policy implemented by clinical pharmacists significantly reduced drug cost of the restricted antimicrobial agents 2 years after its implementation.[17] Hence, the practice of formulary restrictions should be enforced as it provides benefit in reducing antimicrobial usage and expenditure, and thus alleviates the antimicrobial resistance problem. Physicians, however, indicated that a formulary restrictions policy was the least favourable AMS intervention in both developed and developing countries.[4 10]

Most respondents indicated that there was a team consisting of a specialist physician and a pharmacist providing individualised antimicrobial prescribing advice and feedback in their hospitals. However, about 16.5% of the respondents revealed that they had never met or rarely meet the team.[12] It is worth noting that only a few hospitals in Malaysia that have implemented a comprehensive

AMS programme includes such a team of healthcare professionals, and this could be due to lack of ID specialist physicians.[12] Most respondents revealed that they communicated with the prescribers about the appropriateness of antibiotic prescriptions. Thus, it showed that there was a good relationship between the prescribers and the pharmacists in these hospitals in curbing the antimicrobial resistance issues. However, barriers do exist in their effort to contribute to the optimisation of antibiotic usage, as highlighted in a previous qualitative study.[18] For instance, difficulties in managing the relationship between pharmacists and physicians and issues related to the delineation of professional territories were the main barriers identified in implementing AMS.[18]

Several limitations ought to be considered when interpreting the findings of this study. First, the response rate in the current study was modest. Nonetheless, this response rate was comparable to the average response rate of other web-based surveys.[19] To maximise the response rate, the length of the questionnaire was kept to a minimum to explore only the perception and practices of hospital pharmacists towards AMS. Thus, the information on knowledge, attitude and effectiveness of AMS are still unexplored, especially in the local setting. In addition, the department or hospital where the pharmacists were employed was not captured by this questionnaire and, thus, their perception and practices towards AMS across different departments or hospitals could not be assessed. It is possible that their perception and practices towards AMS may differ according to their service disciplines. Likewise, the demographic characteristics of non-respondents cannot be determined, given the nature of an anonymous survey. The findings of this study mainly reflect the perception and practices of the hospital pharmacists practising in Selangor; generalisation of these findings to all the hospital pharmacists in Malaysia requires further consideration.

CONCLUSION

This survey has provided important insights into the perception and practices of public hospital pharmacists related to the implementation of the AMS programme at the local context. While the perception and practices towards AMS were positive, there is room for improvement in enhancing the implementation of the AMS programme with the involvement of pharmacists in the Malaysian public hospital setting. More emphasis should be given to increasing

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What this paper adds

What is already known on this subject
► The antimicrobial stewardship (AMS) programme leads to appropriate antimicrobial use and therefore reducing antimicrobial resistance.
► The AMS programme has recently been implemented in Malaysia, but the perception and practices of Malaysian public hospital pharmacists remain unknown.

What this study adds
► The perception and practices towards AMS were generally positive; however, there is room for improvement for pharmacists to enhance the implementation of AMS and to strengthen the role of pharmacists in AMS in the Malaysian public hospital setting.
► Adequate training and continuous educational activities pertaining to AMS are regarded by pharmacists as the cornerstone for successful implementation of AMS in the Malaysian public hospital setting.

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the reference to the local antibiotic guideline among hospital pharmacists during dispensing of antimicrobial agents. Collaboration among healthcare professionals involved with antibiotic usage should also be strengthened to optimise the clinical outcome. As there has been an increasing role for pharmacists in AMS over the recent years, future research should focus on evaluating the clinical and economic impacts provided by the pharmacists as part of a multidisciplinary AMS programme in Malaysia.

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