Drug Information Resources Preferred by the Prescribers in Queen Elizabeth II Hospital (HQEII), Kota Kinabalu

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Abstract

Introduction: In line with the increasing drug information resources (DIRs) available for prescribers' reference, the credibility of information obtained towards safe and judicious therapeutic decisions has become a concern. **Objective:** To explore DIRs preferred by the Queen Elizabeth II Hospital (HQEII) prescribers and factors identified by the prescribers that determine their choice of DIRs.

Method: This was a cross-sectional, self-administered questionnaire survey involving prescribers working in HQEII from May to July 2018. The questionnaire comprised questions about demographic information, preferred DIRs according to the information required, factors determining the choice of DIRs, frequency of DIRs use and subscription of paid DIRs.

Results: Among the 117 respondents, majority were male (n=66; 56.4%) and medical officers (n=81; 69.2%) with median age of 28 years old (interquartile range=3). The three most preferred DIRs were consistent across all types of required drug-related information, comprising online/mobile medical database, consultation with pharmacists and senior medical officers. Accessibility (n=107; 91.5%), comprehensiveness (n=63; 53.8%) and urgency (n=58; 49.6%) were identified to be the factors influencing the choice of DIR. The most frequently used online/mobile DIRs were My Blue Book (n=54; 46.2%), Medscape (n=51; 43.6%) and UpToDate (n=50; 42.7%). Twenty-eight respondents (23.9%) subscribed to paid online/mobile resources, with UpToDate having the most subscription (n=25; 89.3%). For hardcopy references, Clinical Practice Guidelines (n=39; 33.3%), Sarawak Handbook of Medical Emergencies (n=33; 28.2%) and Oxford Handbook of Clinical Medicine (n=20; 17.1%) were most frequently used. Out of 22 prescribers (18.8%) who purchased hardcopy references, Sarawak Handbook of Medical Emergencies was most purchased by the prescribers (n=10; 45.5%).

Conclusion: Overall, prescribers in HQEII preferred online medical databases or mobile applications and peer consultation over hardcopy DIRs. Healthcare facilities or MOH may consider subscribing to the preferred DIRs to support the access to reliable databases which would facilitate safe and judicious prescribing decisions. **Keywords:** drug information resources, prescribers, Hospital Queen Elizabeth II, applications, hardcopy

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Introduction

Health plays a fundamental role in the sustainability and progression of the population worldwide. In line with the increasing population, recent decades have witnessed a growing prevalence of various epidemic outbreaks and chronic diseases, such as malaria, tuberculosis, cardiovascular diseases, diabetes and cancer (1,2). Pharmacotherapy has since become pivotal in the healthcare system and remains the primary mode of treatment until today (3).

Drug explosion in the past decades has widened the range of treatment options for the prescribers. However, in addition to facilitating rationale therapeutic decisions, it has also increased the likelihood of medication errors, such as inappropriate medication, inappropriate dose regimen and polypharmacy (4). It is therefore common for the healthcare professionals (HCP) to look up drug information resources (DIRs) to consolidate their personal medical knowledge when managing a wide variety of health conditions.

There is a wide range of DIRs available for prescribers' reference. These include journals, product information leaflets, reference books, evidence-based guidelines, online databases, mobile applications and interpersonal consultation with other HCPs such as the pharmacists (3,4). The choice of resources used varies among the prescribers, depending on various factors such as the field of practice and accessibility. However, the credibility of resources used has been one of the utmost concerns in making safe and judicious therapeutic decisions (3). Until 2017, there have been approximately 325,000 mobile health applications available for download (5). This is further challenged by the constant invention of new drugs and dissemination of new medical information into healthcare practice (3).

A retrospective review from 2009 to 2012 revealed that over three-quarters of medication errors in Malaysia were attributed to prescribing errors (6). It is therefore important for prescribers to utilise reliable and up-to-date DIRs to avoid prescribing errors and putting patients' health in jeopardy. To date, limited information about the prescribers' preference on DIRs is available. Therefore, the objective of this study was to explore the DIRs preferred by the prescribers in Queen Elizabeth II Hospital (HQEII) as well as the factors identified by the prescribers that determine their choice of DIRs.

Method

This was a cross-sectional, self-administered questionnaire survey involving the prescribers working in HQEII that was conducted from May to July 2018. A questionnaire was developed in English language, content and face-validated, and pre-tested. The questionnaire comprised questions about demographic information, the preferred DIRs according to the type of information required, factors identified by the prescribers that determine their choice of DIRs frequency of online medical database or mobile applications and hardcopy references use, and current subscription of paid DIRs.

Based on the "sample size calculator for prevalence studies" with finite population correction (7), the calculated sample size was 93. The study population were prescribers who were working in the clinics or wards of HQEII during the data collection period and the ones who were involved in prescribing medications. Upon consent, the prescribers were required to complete the questionnaire and return to the investigators on the spot. The questionnaire took approximately 10-15 minutes of each respondent's time.

This study was conducted in accordance to the ethical principles outlined in the Declaration of Helsinki and Malaysian Good Clinical Practice Guideline. Ethical approval was obtained from the Ministry of Health (MOH) Medical Research and Ethic Committee (MREC) and the study was registered with the National Medical Research Register (NMRR) before the commencement of research. No identifiable data was collected in the questionnaire. Completed questionnaires were kept by the investigators only for data analysis purpose. No personal information was disclosed during the communication between relevant departments. Individual subjects were not identified when publishing the survey outcomes.

Data analysis was performed using SPSS version 17. Descriptive analysis was used to present the results of this study. Numerical data was presented in mean and standard deviation or median and interquartile range (IQR) depending on data normality. Categorical data was presented as frequency (n) and percentage.

Results

A total of 117 prescribers participated in the study. Sixty-six were male (56.4%) with the median age of 28 (IQR 3.0) years old and the average working experience of 4.2 (SD 2.2) years. Majority of the respondents were medical officers (MO) (n=81; 69.2%) and were from the Medical Department (n=66; 56.4%). The participants' characteristics were summarised in Table 1.

Seven categories of DIRs were outlined in the questionnaire and the respondents were asked to select up to three DIRs of their preference for each type of the drug-related information required. It was found that the three most preferred resources were consistent across all types of drug-related information, which were online medical database or mobile applications, consultation with the pharmacists and consultation with colleague or senior MO (Figure 1). The main factors identified by the prescribers that influence the prescribers' choice of DIRs were found to be accessibility (n=107; 91.5%), comprehensiveness (n=63; 53.8%) and urgency (n=58; 49.6%).

Variable	n (%) / median (IQR) / mean (SD)					
Gender, n (%)						
Male	66 (56.4)					
Female	51 (43.6)					
Age, year, median (IQR)	28 (3.0)					
Position, n (%)						
Specialist	4 (3.4)					
Medical Officer (MO)	81 (69.2)					
House Officer (HO)	32 (27.4)					
Department, n (%)						
Medical	66 (56.4)					
Non-medical						
Cardiology	19 (16.3)					
Cardiothoracic	7 (6.0)					
Neurosurgery	9 (7.7)					
Orthopaedic	10 (8.5)					
Surgery	6 (5.1)					
Working Experience, year, mean (SD)	4.2 (2.2)					
Abbreviation: IQR – interguartile range; SD – standard deviation						

Table 1: Demographic characteristics of respondents (n=117)





In the question about online medical databases or mobile applications, respondents were given the options of "Always", "Sometimes", "Rarely" and "Never" to indicate the frequency of using each of the listed online or mobile DIRs. If the resources other than those listed were used, they were asked to specify in the questionnaire. The online resources that were used most frequently were My Blue Book, Medscape and UpToDate, which had the most "Always" and "Sometimes" answers. It was found that Lexicomp was the least used online database (Table 2). Twenty-eight respondents (23.9%) reported subscribing to paid online or mobile

resources. Most of them subscribed UpToDate (n=25; 89.3%), and the remaining three respondents subscribed British Medical Journal (BMJ), Orthobullets and Epocrates (n=1, 3.6% respectively).

Similar to the question about online or mobile DIRs, participants were given the same options to indicate the frequency of using each of the listed hardcopy references. Clinical Practice Guidelines (CPG), the Sarawak Handbook of Medical Emergencies and the Oxford Handbook of Clinical Medicine were "Always" and "Sometimes" used by most of the respondents. Seven participants indicated that they always refer to the Drug Doses booklet, more commonly known as Frank Shann (Table 3). Twenty-two prescribers (18.8%) purchased hardcopy references, and the Sarawak Handbook of Medical Emergencies was the most commonly purchased (n=10; 45.5%), followed by the Oxford Handbook of Clinical Medicine (n=8; 36.4%) and Frank Shann (n=4; 18.2%).

Online / Mobile DIRs	Al	ways	Sometimes		Rarely		Never		Not Answered	
My Blue Book	54	(46.2%)	32	(27.4%)	13	(11.1%)	14	(12.0%)	4	(3.4%)
Medscape	51	(43.6%)	47	(40.2%)	10	(8.5%)	4	(3.4%)	5	(4.3%)
UpToDate	50	(42.7%)	34	(29.1%)	15	(12.8%)	13	(11.1%)	5	(4.3%)
MyNAG *	21	(17.9%)	29	(24.8%)	27	(23.1%)	29	(24.8%)	11	(9.4%)
MIMS Gateway	10	(8.5%)	24	(20.5%)	34	(29.1%)	41	(35.0%)	8	(6.8%)
Sanford #	4	(3.4%)	14	(12.0%)	19	(16.2%)	67	(57.3%)	13	(11.1%)
Lexicomp	2	(1.7%)	10	(8.5%)	12	(10.3%)	77	(65.8%)	16	(13.7%)
Micromedex	1	(0.9%)	6	(5.1%)	21	(17.9%)	75	(64.1%)	14	(12.0%)

Table 2: Frequency of using online medical database or mobile applications (n=117)

* MyNAG – National Antibiotic Guidelines; # Sanford – The Sanford Guide to Antimicrobial Therapy

Table 3: Frequency of using hardcopy references ((n=117)
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Hardcopy DIRs	Al	ways	Sometimes		Rarely		Never		Not A	Not Answered		
Clinical Practice Guidelines (CPGs)	39	33.3%	55	47.0%	13	11.1%	9	7.7%	1	0.9%		
Sarawak Handbook of Medical Emergencies	33	28.2%	46	39.3%	26	22.2%	8	6.8%	4	3.4%		
Oxford Handbook of Clinical Medicine	20	17.1%	46	39.3%	26	22.2%	18	15.4%	7	6.0%		
CURRENT Medical Diagnosis and Treatment	6	5.1%	18	15.4%	28	23.9%	56	47.9%	9	7.7%		
British National Formulary (BNF)	1	0.9%	20	17.1%	32	27.4%	57	48.7%	7	6.0%		
Others: Frank Shann*	7	6.0%										

* Drug Doses booklet by Frank Shann

Discussion

The constant invention of new drugs and dissemination of new medical information have been prompting HCPs to look up DIRs in their daily practice. Although studies have documented variable resources used and mixed preferences among the HCPs across the globe (8-15), it was noted that hardcopy texts were generally preferred prior to the digital era. For example, a systematic review of studies conducted in Australia, United States of America, New Zealand, Hong Kong, Greece, Canada, Denmark, United Kingdom and Singapore from 1994 to 2005 revealed that text books were most preferred, followed by colleagues' advice and electronic resources (8). The trend has, however, changed following the advancement in information technology with the increasing accessibility to the Internet and popularity of electronic devices. In fact, handheld computers such as smartphones and tablets are now widely used by the HCPs to obtain drug related information (13). The authors of Epocrates, one of the most commonly used drug reference application in the Western countries, found that 90% physicians use mobile applications to access to drug information (16). This phenomenon, together with the plethora of mobile health applications, has switched prescribers' preference of DIR from hardcopy to electronic. This is reflected by the study in Abu Dhabi in 2013, where almost three-quarters of their physicians prefer online

over hardcopy resources (9). In Malaysia, study conducted among hospital pharmacists in 2013 to 2014 revealed that 86.6% of them looked up DI via handheld devices (13). The outcome of our study correlates with these findings, where most prescribers prefer online/mobile resources over hardcopy sources as shown in Figure 1.

Consultation with the pharmacists and colleague or senior MOs are the next preferred DIRs for HQEII prescribers. This finding again correlates with other studies where peer consultation is found to be one of the favourite DIRs. In fact, such preference has been consistent over time even before the digital era (8,9,14,15), due to reasons such as availability and timesaving (14). This could be explained by the HQEII environment where there are usually more than one doctors working in a same shift, enabling instant peer consultation. Most of the wards are also assigned with a clinical pharmacist who joins the doctors' ward rounds, making consultation with pharmacist quicker and easier. Otherwise, the Pharmacy Department at HQEII is also equipped with a Drug Information Centre (DIC) which answers drug-related queries from prescribers. The DIC is easily accessed via phone call through the hospital operator. Similar studies in Malaysia are few and most were limited to the pharmacists. The FrEEDoM Qualitative Study done in the rural primary care setting in Pahang showed similar results to our study, where mobile applications and peers were the common DIRs used by the doctors (15).

Looking into the preference pattern according to the type of drug-related information required, it was found that online or mobile resources are favoured for DI categories of dose regime, drug-drug interactions, side effects and contraindications, compatibility as well as choices of pharmacotherapy. On the other hand, pharmacist consultation is preferred for renal or hepatic dose adjustment, dose for pregnancy and lactation, drug availability, therapeutic drug monitoring (TDM) as well as drug administration. The incline towards online/mobile source is likely due to their increasing comprehensiveness, such as Medscape and UpToDate, which are found to be among the prescribers' most visited applications (13,17). However, prescribers still prefer pharmacist consultation for certain drug information. Of these, well over 90% of HQEII prescribers choose to refer to pharmacists for information on renal/hepatic dose adjustment and TDM. For dose adjustment, it was possibly because of the variable adjustment regimes for different drugs and different extents of renal or hepatic impairment of the same drug. For TDM, it is not surprising that pharmacist referral was the favourite source of information as TDM is managed by Pharmacy Department, where the specially trained pharmacists will perform sample screening, lab result retrieval and interpretation as well as recommendation of dose adjustment to prescribers.

Our study found that prescribers in HQEII used My Blue Book, Medscape and UpToDate more often than other online or mobile resources. Even though My Blue Book had the lowest score for comprehensiveness in the study done by Apidi *et al.* (17), it was still preferred possibly due to the convenience of accessing the basic information necessary for prescribing. Firstly, the database of the application was based on the Ministry of Health Malaysia (MOH) Medicines Formulary which was also known as the Blue Book or FUKKM. The MOH Medicines formulary consists of a list of drugs approved for use in the MOH health institutions. Hence, the use of drugs not listed in the formulary, which requires special authorization by the Director-General of Health (18), can be easily identified through the My Blue Book application. Secondly, information about the categories of prescribers' allowed for each drug is also available on My Blue Book. This is important to ensure that prescribers prescribe medications according to their prescribing category, particularly for medicines that require authorisation by the specialists and consultants. However, My Blue Book is relatively less comprehensive compared to the other online databases as it lacks various information such as dose adjustment, drug-drug interactions, contraindications and precautions. It is also updated less frequently compared to other applications and therefore the information may not be as up-to-date and accurate (17).

Medscape and UpToDate were the other favoured application due to their comprehensiveness. They were among the most comprehensive online tools according to Apidi *et al.* (17). They provide comprehensive information on various drugs, calculations related to medical areas and materials for medical education. They are relatively up to date as the versions and databases of the applications are frequently updated. Another advantage of Medscape is that no paid subscription is needed and it can be used offline (13). Due to these features, Medscape was one of the most frequently used applications among the HCPs worldwide including Malaysia and our setting. The disadvantage of UpToDate is that it requires paid subscription for full access (13,17). Despite the fact that UpToDate and Lexicomp are sharing similar databases, over three quarters of the

prescribers have never used Lexicomp, probably because Lexicomp only contains information specific to individual drug profile, unlike UpToDate which covers not only general drug information, but also diseasesbased information. This could explain why UpToDate was the top subscribed online database among the HQEII prescribers.

Among the hardcopy DIRs, CPGs, the Sarawak Handbook of Medical Emergencies and the Oxford Handbook of Clinical Medicine were most frequently used. The preference for the first two resources could be due to the fact that they are constantly updated and tailored to the local practice. More than half of the participants had never used the British National Formulary, unlike physicians in other countries (9), possibly because it does not coincide with local practice. The Frank Shann Drug Doses booklet was also listed by some prescribers as the frequently used reference. It is a quick and easy reference for paediatric dose regime, which is especially important for doctors at the Paediatric Cardiology and Emergency departments. The hardcopy references purchased by prescribers are consistent with the most used references, comprising the Sarawak Handbook of Medical Emergencies, Oxford Handbook of Clinical Medicine and Frank Shann. CPG was not on the list of purchase as they are available for free access online.

Among the factors identified to affect the choice of DIRs, accessibility and comprehensiveness were reflected by their preference of online or mobile resources which contain information on various aspects, can be used offline and without paid subscription. Urgency could be explained by the use of peer consultation in acquiring drug-related information, as the pharmacists and peer doctors are easily accessible at the workplace.

This was a single-centred study at HQEII, hence the results could not be generalised to the prescribers in other health facilities. Exploratory study on the association between factors or barriers and the resources preferred, as well as the relationship between the prescribers' position and DIRs preferred may better facilitate in interpreting the prescribing pattern in HQEII.

Conclusion

The study showed that prescribers in HQEII preferred online medical databases or mobile applications and peer consultation over hardcopy DIRs. Since peer consultation was one of the preferred DIRs, information conveyed may need to be verified against credible resources to ensure the accuracy. Subscription to reliable databases may also be considered by the healthcare facilities or MOH to support the access to the preferred DIRs for accurate information, which would facilitate safe and judicious prescribing decisions.

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Conflict of Interest Statement

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