INTERNATIONAL JOURNAL OF MEDICAL INFORMATICS 77 (2008) 33–40

journal homepage: www.intl.elsevierhealth.com/journals/ijmi

The role of perceptions of clinicians in their adoption of a web-based antibiotic approval system: Do perceptions translate into actions?

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ARTICLE INFO

Article history:
Received 8 June 2006
Received in revised form
27 November 2006
Accepted 27 November 2006

Keywords:
Decision Support Systems
Broad-spectrum antibiotics
Perceptions
Clinicians
Adoption

ABSTRACT

Purpose: Computerized Decision Support Systems have been shown to improve clinicians' performance. Clinicians' adoption of these systems is crucial for their success. Studying clinicians' perceptions can provide an insight into the determinants of clinicians' adoption of such systems. The aim of this study was to measure clinicians' perceptions of ease of use and usefulness of a web-based antibiotic approval system, and to investigate the relationship between the reported perceptions and use of the system.

Methods: Potentially identifiable coded surveys were sent to a total of 70 senior and 150 junior medical staff, and 30 pharmacists all working at a tertiary care referral teaching hospital of Melbourne, Australia. Clinicians' perceptions of ease of use and usefulness of the antibiotic approval system; clinicians' general computer use; and clinicians' usage of the antibiotic approval system were measured.

Results: The overall response rate from the clinicians was 53.4%. The majority of the participants (70% and above) found it easy to obtain antibiotic approval using the system. More than 80% of the participants believed that the system will decrease the inappropriate use of antibiotics at the hospital. Clinicians who were more likely to use the system also found it easy to learn ($Rho = 0.392$, $p = 0.001$), easy to show others how to use the system ($Rho = 0.298$, $p = 0.014$), easy to find additional information ($Rho = 0.317$, $p = 0.009$), and easy to use it within their daily workflow ($Rho = 0.268$, $p = 0.028$). In addition, the clinicians were also more likely to use the system if they believed that it will improve their adherence to evidence-based practice ($Rho = 0.352$, $p = 0.003$).

Conclusion: The majority of clinicians in an independent investigation of the antibiotic approval system found the system easy to use and useful to them. A number of clinicians' perceptions about the system were found to be correlated with the actual usage of the system by the clinicians.

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doi:10.1016/j.ijmedinf.2006.11.008

1. Introduction

There has been a rapid growth in the development and implementation of Clinical Information Systems (CIS) in health care, such as Physician Order Entry (POE), Decision Support Systems (DSS) and Electronic Medical Records (EMR) [1–3]. Despite advancements in the field of information technology, the success of such systems in health care has remained unchanged over the last 3 decades, as evident from extensive reviews of their evaluations [4–6]. A recent review of the literature attempts to identify the features of DSS, a subset of CIS, that were associated with success, and found that the systems that provided recommendations as a part of the daily workflow and at the time of the decision making are more likely to be successful and used by clinicians [7].

Development and implementation of a DSS requires an enormous amount of financial and human resources and therefore failure of such systems is a significant waste of already limited health care resources. Despite the fact that failure of DSSs is not an uncommon occurrence, few studies have attempted to formally investigate such failures [8]. One longitudinal qualitative interview study that investigated the failure of a chronic disease management DSS concluded that poor workflow integration and negative perceptions of its users were some of the reasons for failure [9]. It is important, therefore, to study clinicians' perceptions of DSSs and the role such perceptions play in their adoption of these systems. The importance of studying clinicians' adoption is also endorsed by a relative increase in the number of papers reporting such studies over recent years [10–13].

As in other countries, there is considerable interest in the development and implementation of DSS throughout Australia. In 2002, Sintchenko and co-workers undertook an inventory of DSS implementation in Australia and found that there were 35 DSS in routine use [14], and the numbers are increasing [15,16]. Since Australia is relatively younger in the development and implementation of DSS, studies focusing on clinicians' perceptions as well as identification of barriers and facilitators to clinicians' adoption of DSS and related technologies are much needed.

1.1. Background

Inappropriate use of antimicrobial agents is perhaps one of the most serious and chronic medicine-use problems experienced within hospitals world wide, and Australian hospitals are no exception. It is estimated that up to 50% of courses of antibiotics are inappropriately prescribed [17]. The Royal Melbourne Hospital (RMH) is a tertiary referral centre and teaching hospital in Melbourne, Australia. Since 2000, the infectious diseases department has been developing and implementing computerized decision support tools. A web-based antibiotic approval system launched in March 2001 successfully reduced the usage of third generation cephalosporins [18]. Recently, a web-based system (Guidance DS®) that provides electronic approval for prescribing of broad spectrum antibiotics, computerized clinical guidelines, and antibiotic decision support was introduced at the RMH. The antibiotic approval module of Guidance DS®, iApprove®, was implemented in February 2005 to replace the older antibiotic approval program for third generation cephalosporins. A detailed presentation about Guidance DS® including iApprove® can be accessed via the internet [19]. The aims of the present study were to investigate the perceptions of clinicians (senior and junior medical staff and pharmacists) of iApprove® and, since the use of iApprove® by clinicians was not compulsory, to investigate the relationship between their perceptions and use of iApprove®.

2. Methods

2.1. The participants

The clinicians whose perceptions were investigated were: Junior Medical Staff (JMS; interns, residents and registrars.); Senior Medical Staff (SMS); and Pharmacists. These categories of clinicians represented those using iApprove® as a part of their daily workflow to seek approval for prescribing of broad spectrum antibiotics (JMS), those who were monitoring antibiotic approvals (Pharmacists) and those who normally were not using the system themselves but were often making the clinical decisions that could affect the usage of iApprove® (SMS).

2.2. Survey development

A survey instrument was developed that comprised of items for demographic information, self-rated sophistication of computer use, estimated number of hours of computer use per week and three scales to measure clinicians' usage of computers, perceived ease of use of iApprove®, and perceived usefulness of iApprove®; a copy of the survey instrument is provided as Appendix 1. Individual five-point Likert scales were used to measure clinicians' usage of computers, perceived ease of use of iApprove®, and perceived usefulness of iApprove®. The first scale measuring the clinicians' usage of computers was adapted from Cork et al. [20] and asked the respondent about the frequency of the routine clinical tasks they perform using computers. In relation to the second scale, 10 items were constructed to measure perceived ease of use of iApprove® in accordance with the heuristics proposed by Neilson and Molich [21], Davis's scale of perceived ease of use [22] and common sense of what would be considered as ease of use of an electronic antibiotic approval program. For the third scale, 10 items to measure the perceived usefulness of iApprove® were constructed in the light of the scale of perceived usefulness proposed by Davis [22] and common sense of what would be considered usefulness of iApprove®.

The survey instrument was piloted on two each of SMS, JMS and pharmacists. The pilot study found that the SMS were unlikely to use the system, as JMS usually obtained antibiotic approvals. It was therefore deemed inappropriate to ask the SMS to rate the perceived ease of use of the system.

2.3. Survey deployment and usage of the antibiotic approval system

Ethical approvals were obtained from Monash University Ethics Committee and RMH Human Ethics and Research Committee. To preserve individual identities, all surveys were

coded with unique identification codes. The coded survey along with the participant information sheet, responding instructions and postage paid self-addressed envelope were mailed to a total of 150 JMS; 50 each of interns, residents and registrar; 70 SMS and 30 pharmacists working in inpatient wards on 1st of June 2005. A stratified random sampling method was used to select all of the above participants to ensure adequate representation from all clinical wards except interns and pharmacists because of their low numbers. A reminder email was sent to all of the above-mentioned clinicians 2 and 4 weeks after the initial distribution. Another reminder was sent with repeat surveys to the non-respondents 8 weeks after the initial distribution. The permission to monitor the usage of iApprove® by the participants was also obtained as a part of seeking consent. A computerized usage log of JMS (SMS and Pharmacists were not obtaining approvals) was automatically generated by the system from February 1 to August 31, 2005; the usage log showed the number of times an individual clinician obtain approval for restricted antibiotics.

2.4. Data analysis

Reliability of all three survey scales was measured using Cronbach's Alpha co-efficient [23]. Means, medians and percentages were calculated for the clinicians' usage of computers as well as for ease of use and usefulness scales. The Kruskal–Wallis test was chosen for analysis of ordinal data which did not meet the assumptions of the parametric statistical test.

Spearman's rho technique was used to study the correlations between variables; an alpha value of 0.05 was set to test the significance of correlations. SPSS version 11.5 was used for all of the above data analyses.

3. Results

29 completed surveys were received from the SMS, 65 completed and 2 incomplete surveys from the JMS and 19 completed surveys from the pharmacists. In addition, we received a total of 35 survey packs from the hospital mail office as unclaimed returned mail, 10 of the 35 were from the SMS, while 25 were from the JMS. Subtracting the number of surveys that were unclaimed, we had an overall response rate of 54.4%. A breakdown of response rates across the groups, together with respondents' demographics are shown in Table 1.

3.1. Clinicians' usage of computers

It is evident from Table 2 that the clinicians were not using computers to document patient care activities and obtain advice for their patients. Clinicians were however routinely using computers for accessing clinical laboratory data, performing online literature searches and for preparation of presentations. A statistically significant difference was observed among participants regarding the frequency of accessing laboratory data ($p = 0.024$, $\chi^2 = 9.805$); the difference is likely to be between interns and SMS (see Table 2).

3.2. Reliability of the scales

Scales to measure perceived ease of use as well as perceived usefulness of iApprove® have demonstrated excellent reliability; Cronbach's alpha of the perceived ease of use and perceived usefulness of iApprove® was 0.917 ($n = 78$) and 0.891 ($n = 111$), respectively. On the contrary, the scale to measure clinicians' usage of computers was found to have at best; marginal reliability (Cronbach's alpha = 0.554, $n = 115$). A complete description of the reliability analysis is included as an Appendix 2. In summary, the reliability analysis of perceived ease of use and usefulness of iApprove® suggests that none of the items needs to be removed from either of the scales to achieve substantial improvement in their reliability coefficient. On the other hand, the reliability analysis of clinicians' usage of computer scale suggests removing a particular item addressing managing patients' appointment using computers; it was found later that the patients' appointments in the study hospital are managed mainly by the administrative staff.

3.3. Perceived ease of use of iApprove®

A comparison of the perceived ease of use of iApprove® among JMS and pharmacists is shown in Table 3 (as discussed above, SMS were not asked to rate the ease of use). Significant differences were detected among the different groups of participants concerning the perceptions of ease of logging into the system ($p = 0.024$, $\chi^2 = 9.460$), use of the system within the daily workflow ($p = 0.009$, $\chi^2 = 11.5$) and learnablity ($p = 0.038$, $\chi^2 = 8.4$). The differences were most likely to be among registrars and residents as only 65.0% of registrars found it easy to

Table 1 – Demographics of the respondents to the survey[a]

	All		JMS		SMS	Pharmacist
	$n = 115$	Interns $n = 25$	Residents $n = 19$	Registrars $n = 23$	$n = 29$	$n = 19$
Age (years)	33.9 (30)	27.0 (25)	26.4 (26)	31.5 (32)	48.4 (48)	30.7 (27)
Number of males	65 (56%)	14	10	14	24	3
Number of females	50 (44%)	11	9	9	5	16
Mean experience (years)	8.89 (5.5)	1.02(0.5)	2.73 (2)	7.45 (7)	22.78 (20.5)	6.48 (4.5)
Response rate (%)	54.4	53.0	47.5	60.0	48.3	63.3

[a] Median values of variables are shown in brackets, unless otherwise specified.

Table 2 – Clinicians' usage of computers[a,b]

	All	JMS			SMS	Pharmacist
	$n = 115$	Interns $n = 25$	Residents $n = 19$	Registrars $n = 23$	$n = 29$	$n = 19$
Mean hours of computer use/week	12.3 (10)	10.2 (10)	15.8 (10)	8.1 (10)	14.4 (10)	13.00(10)
Self-rated sophistication of computer use[b]	2.8 (3)	2.5 (2)	2.5 (3)	3.1 (3)	3.1 (3)	2.7 (3)
Below, use of computer for:						
Documenting patient care	2.07 (2)	2.16 (2)	2.05 (2)	1.91 (2)	1.89(2)	2.47 (2)
Accessing patients' laboratory data	4.21 (4)	4.56 (5)	4.42 (5)	4.26 (4)	3.89 (4)	4.00 (4)
Communicating with colleagues	3.38 (3)	3.44 (4)	3.31 (3)	3.04 (3)	3.55 (4)	3.52 (4)
Obtaining advice for patients	3.08 (3)	3.20 (3)	2.94 (3)	3.13(3)	2.89 (3)	3.33 (3.5)
Managing patients' appointments	1.87(1)	2.20 (2)	1.84(1)	1.68(1)	1.93(1)	1.63(1)
Preparing clinical presentations	4.24 (5)	3.92 (4)	4.05 (5)	4.39 (5)	4.58 (5)	4.15 (5)
Searching medical literature	4.46 (5)	4.56 (5)	4.20 (5)	4.59 (5)	4.58 (5)	4.26 (4)

[a] Self-rated sophistication of computer use; 1 being 'very unsophisticated' to 5 being 'very sophisticated'.
[b] Clinicians' usage of computers was measured on a scale from 1 to 5 where 1 means 'never performed this task', 2 means 'never performed this task using a computer' while 5 means 'always perform this task using a computer'.

log in compared to the 94.1% of residents. Similarly, only 35.0% of registrars found the system to be integrated with their daily workflow compared to 88.3% of residents. In addition, 94.1% of residents found it easy to learn the system whereas only 50.0% of registrars were in agreement with them. Less than 10% of the participants found it difficult to log in and log out of the system, to find what they were looking for and to find additional information regarding the system's recommendations. In addition, less than 10% of the participants found it difficult to learn the system and show others how to use it. A similar percentage of participants found it difficult to obtain antibiotic approval and calculate doses of antibiotics using iApprove®.

3.4. *Perceived usefulness of iApprove®*

Table 4 shows the perceptions of JMS, SMS and pharmacists about the usefulness of iApprove®. Statistically significant differences among the groups were observed only on the perceived cost-effectiveness of the system ($p = 0.02$, $\chi^2 = 11.11$); the individual scores identify that it is more likely to be between pharmacists and SMS or residents and SMS. Less than 5% of the participants disagreed that the system will improve the documentation of patient care activities and decrease the inappropriate use of antibiotics and cost-effective use of antibiotics. In addition, less than 5% of the participants believed that the system would not improve their knowledge or adherence to the evidence-based use of antibiotics. Moreover, less than 5% of the participants disagreed that the system will increase their knowledge related to local antibiotic guidelines. Although about 35% of the participants believed that the implementation of iApprove® would improve the timely delivery of antibiotics to the patients, an equal percentage of the participants (35.2%) believed that it would not improve it.

3.5. *Usage and correlation studies*

A total of 144 doctors obtained 784 restricted antibiotic approvals using iApprove® during the study period. Of the 784 approvals, 321 were obtained by 49 JMS who participated in the study, thus representing about 41% of total approvals generated by iApprove®. A description of total usage of the system, including the usage by the study participants, is shown

Table 3 – Perceived ease of use of iApprove® [a] (% who 'strongly agree' or 'agree')

It is easy for me to:	All	JMS			Pharmacist
	$n = 84$	Interns $n = 25$	Residents $n = 19$	Registrars $n = 21$	$n = 19$
Log in to the system	77.8	68.0	94.1	65.0	89.4
Find out what I am looking for	70.0	52.0	88.3	68.4	79.0
Learn how to use the system	72.8	76.0	94.1	50.0	73.7
Obtain antibiotic approvals	75.2	80.0	82.4	63.2	NA[b]
Log out of the system	79.0	80.0	94.1	65.0	79.9
Show others how to use the system	58.1	60.0	70.6	55.0	47.4
Use with my daily workflow	59.2	60.0	88.3	35.0	57.9
Calculate the doses of antibiotics	55.3	48.0	47.1	70.0	NA[b]
Find additional information	49.4	48.0	47.1	50.0	52.6
Correct my mistakes	30.9	28.0	41.2	30.0	26.3

[a] SMS were not asked to rate perceived ease of use as they were not using the system.
[b] Pharmacists were not using it to obtain antibiotic approval and calculate doses of antibiotic.

Table 4 – Perceived usefulness of iApprov® (% who 'strongly agree' or 'agree')

In my opinion, the implementation of iApprove will:	All	JMS			SMS	Pharmacist
	$n=113$	Interns $n=25$	Residents $n=19$	Registrars $n=21$	$n=29$	$n=19$
Increase my knowledge related to the antibiotic guidelines at the RMH	84.7	84.0	100.0	70.0	86.3	84.2
Increase my knowledge related to the evidence-based use of antibiotics	78.4	80.0	94.4	75.0	75.9	68.4
Decrease the inappropriate use of antibiotics	82.9	76.0	100.0	80.0	86.3	73.7
Improve documentation of patient care related to antibiotic use	74.8	72.0	72.2	65.0	82.8	78.9
Improve my adherence to evidence-based Practice related to antibiotics	73.9	72.0	72.2	60.0	82.8	78.9
Improve the communication between doctors and pharmacists	71.2	68.0	83.3	60.0	69.0	73.6
Increase the cost-effectiveness of antibiotic use	64.0	60.0	77.8	60.0	51.7	78.9
Improve the quality of patient care related to antibiotic use	64.3	64.0	83.3	50.0	55.2	73.7
Decrease the time I spend in obtaining antibiotic approvals for my patients	53.1	52.0	72.2	50.0	86.3	52.6
Increase the timely delivery of antibiotics to the patients	35.2	36.0	50.0	30.0	20.7	47.3

in Fig. 1. The number of years of experience had a negative correlation ($Rho=-0.31$, $p=0.004$) and self-rated computer sophistication of users had a positive correlation ($Rho=0.26$, $p=0.032$) with the actual use of the system. A positive correlation was also found between the frequency of accessing laboratory data ($Rho=0.30$, $p=0.012$.) and usage of iApprove® by the clinicians to obtain approval for prescribing of antibiotics. The clinicians were more likely to use the system if they perceived it to be easy to learn ($Rho=0.39$, $p=0.001$) and easy to show others how to use the system ($Rho=0.29$, $p=0.014$) as well as if they perceived the system to be integrated into their daily workflow ($Rho=0.26$, $p=0.028$). The perceived ease of finding additional information related to the system's recommendations ($Rho=0.31$, $p=0.009$) and logging out of the system ($Rho=0.25$, $p=0.034$) were also correlated with the actual use of iApprove® by the clinicians. Clinicians believing that the system will increase their knowledge about the evidence-based practice of antibiotic prescribing ($Rho=0.43$, $p=0.000$), of local antibiotic guidelines ($Rho=0.33$, $p=0.006$) and of their adherence to evidence-based practice ($Rho=0.35$, $p=0.003$) were also correlated with their actual use of iApprove®. No significant correlations were found between the number of estimated hours clinicians spent using computers and their use of iApprove®.

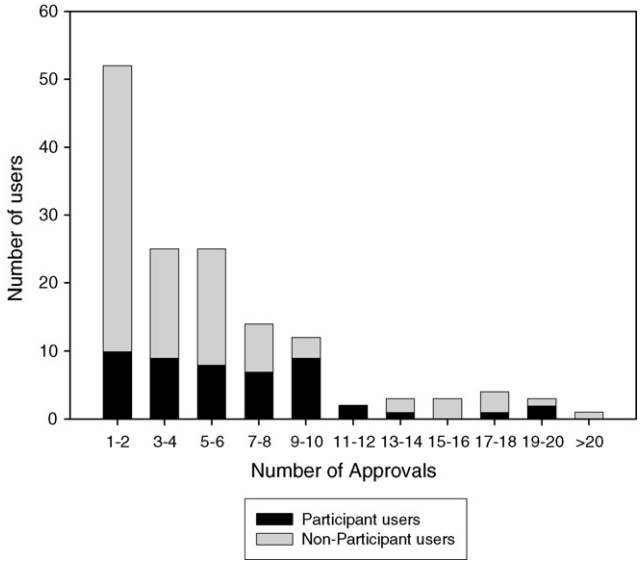

Fig. 1 – Usage of the system by the participants and non-participants of the study.

4. Discussion

4.1. *Study findings*

Several findings from this study deserve discussion. The significant differences in the perceptions of registrars and residents relating to iApprove® can be explained by the cultural and organizational roles of the medical staff in the hospital. The most junior staff, such as residents and interns, perform the majority of routine paperwork, followed by registrars then SMS. Despite the differences in the perceptions of ease of use among participants, the majority found it easy to login and logout of the system, easy to learn to obtain antibiotic approvals, and easy to find what they were looking for in the system. All of the above have been reported to be desirable characteristics of DSS [7,24–26].

It was interesting to find that although 82.9% of the participants believed that the system would decrease the inappropriate use of antibiotics at the hospital, only 64.3% believed that it would improve the quality of patient care. This can partly be explained by the fact that only 35.2% believed that it will increase the timely delivery of antibiotics to the patients, perhaps because the hospital used a floor stock drug distribution system so that medicines were readily available on the wards. It was also encouraging to find that the majority of the participants believed that the system will improve their adherence to evidence-based use of antibiotics (73.9%),

increase their knowledge about evidence-based use of antibiotics (78.4%) and increase their knowledge about the local antibiotic prescribing guidelines (84.7%). Lack of such factors are well known as barriers to the adoption of clinical guidelines by clinicians. [27] It was surprising to see that only 53.1% of the participants believed that the system will save them time especially when the system was far quicker and easier than telephoning for an ID consultation; the alternate way of obtaining an antibiotic approval. After reviewing the usage of the system it was found that clinicians often requested approvals for certain indications that were not listed in the knowledge base of iApprove®.

The ability to easily access additional information regarding the system's recommendations is one of the important features that predicted the usage of iApprove®. Clinicians learn from each other in healthcare and the fact that ease of showing others how to use the system correlated well with the actual use highlights the importance of the ease of learnablity of DSS in clinical practice. The positive correlations between the perceived increase in the knowledge of, and adherence to, evidence-based practice related to antibiotic prescribing and local antibiotic guidelines can be explained in terms of self-efficacy, a factor whose lack is reported as a major barrier to concordance with clinical guideline [27].

4.2. *Limitations*

Certain limitations of this study should be considered. The response rate was relatively low, but remarkably similar to the average response rate (54%) for surveys of physicians [28]. Nevertheless, a fair representation of clinicians from different clinical wards across the study hospital was achieved thus minimizing non-respondent bias. The fact that our surveys were potentially identifiable may have contributed to low response rate. It was not possible to identify the reasons for the non-participation of the clinicians as well as the usage of iApprove® by the clinicians who did not consent to participate; however, as evident from Fig. 1, the participants in this study represent the views of a broad cross-section of users ranging from infrequent users (1–2 approvals) to frequent users (5–6 approvals and above). As the actual usage needed to be linked with the perceptions, the surveys were potentially identifiable and the possibility of a Hawthorne effect [29] cannot be eliminated in our results; nevertheless all participants were well aware that the research was conducted by external investigators.

4.3. *Comparing previous studies*

Compared to the enormous number of studies focusing on effectiveness of DSS [4,7], relatively fewer studies have attempted to measure clinicians' perceptions of these systems [30,31]. In addition, limited studies have attempted to correlate clinicians' perceptions and the actual use of systems [11,13,32]. The system in this study is an antibiotic DSS that delivers clinical practice guidelines at the point of care, unlike the prescription expert [32] or information system [11] studied by others. The system studied by Zheng et al. [13] was a clinical reminder system based on evidence-based guidelines and therefore was more related to the system investigated in the present study; however, the system studied by Zheng et al. [13] was implemented in an ambulatory care setting. Participants in the Zheng et al. study [13] were mainly the medical residents and were chosen based on the availability to participate; participants in the present study represent a wide range of clinicians ranging from the most junior (interns) to the most senior (consultants) medical staff and were chosen based on stratified random sampling. Despite the above-mentioned differences, some of our findings are in keeping with those of Zheng et al. [13]. For example, Zheng et al. found that heavy users did not find the system disruptive to their workflow [13]. The perception of users in the present study that the system is not a disruption to their normal daily workflow was significantly correlated with their actual use of the system. Furthermore, the majority of the participants in our study believed that the system will improve antibiotic prescribing practices. Participants in the study of Zheng et al. [13] also held a general consensus that the system had positive influence on their medical practice.

4.4. *Applicability of the study*

Most commonly, systems like the one we have studied are implemented as a hospital policy and decision to use them by the clinicians are often influenced by the policy. It is important to note that the use of iApprove® was voluntary throughout the study period. In addition, the majority of studies reporting the evaluation of DSS were conducted by the developers and/or the implementers of the systems and therefore may have been subjected to bias. [33] The authors of the present study were external to not only the development and implementation team but also to the hospital where the system was being implemented. Although this study only involves clinicians at one hospital, the study participants represent a range of clinicians typical of any urban hospital. In addition, the system under study delivers antibiotic guidelines as a decision support tool via the internet and can be transferable to any hospital. In fact, a couple of other hospitals in Melbourne were in the process of implementing a similar system at the time of this study. Therefore, findings from this study can be generalized to other hospitals that either have an internet-based decision support tool or are planning to have one.

5. Conclusion

The majority of clinicians in this study found the program easy to use and useful to them; a number of clinicians' perceptions about the system were found to be correlated with the actual usage of the system by the clinicians. The scarcity of reliable and valid tools has been identified as a dilemma often faced by researchers studying clinical information systems [34]; we have reported the reliability and the findings from three scales that measure clinicians' usage of computers and clinicians' perceptions of ease of use and usefulness of an electronic antibiotic approval system. Although two of the scales were newly designed and developed for the specific DSS we studied, they may be adopted with or without modification for evaluation of other DSS. The perceived ease

Summary of research results

What was known before the study?

While DSSs have been proven to improve clinical practice in a number of clinical areas, a number of DSSs failed to achieve their intended outcome.

Limited studies exploring reasons for failure of DSSs found clinicians' perceptions of ease of use and usefulness can affect clinicians' adoption of DSSs.

Studies measuring clinicians' perceptions as well as correlations between perceptions and actual use of DSS are lacking. In addition, there is a need to develop and validate measures that can be used to study clinicians' perceptions of DSSs.

What the study has added to the body of knowledge?

Developed and reported the reliability of two scales to measure clinicians' perceptions of ease of use and usefulness of an antibiotic DSS.

Studied perceptions of an antibiotic DSS from the perspective of a range of clinicians (senior and junior medical staff and pharmacists) in a hospital setting.

Clinicians in the present study are more likely to use a DSS if they found it easy to learn and easy to use with their daily workflow as well as if they believe that using the system will improve their adherence to evidence-based practice.

of use and usefulness scales used in this study were found to be highly reliable. Findings from the study were fed back to the developers and implementers at the hospital to aid them in implementation and on-going improvement of the system. Future investigations using similar measures on other decision support systems will enrich the understanding of the role of such clinicians' perceptions in their adoption of DSS.

Acknowledgements

Dr. Heather Smith, Manager, Medical Education Program, The Royal Melbourne Hospital, for facilitating the distribution and collection of the surveys.

Marion Robertson, Drug Use Evaluation Pharmacist, Department of Clinical Pharmacology, The Royal Melbourne Hospital for facilitating the development and distribution of surveys.

Prof. Graham Brown, Dr. James F Black, Dr. Karin Thursky and Dr. Kirsty Buising, Victorian Infectious Diseases Service, The Royal Melbourne Hospital for providing us with the opportunity to evaluate implementation of iApprove®

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ijmedinf.2006.11.008.

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