

Understanding Pharmacist Communication and Medication Errors: A Systematic Literature Review

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Abstract

Objective: To better understand the inter-professional clinical communication between pharmacists, other health professionals and medication errors.

Methods: This research study used a systematic literature review approach by searching online databases including Medline, PubMed and CINAHL to understand the relationship between pharmacist clinical communication and medication errors. The results of this study show that from 1158 studies that were screened and assessed, only 454 studies were initially selected after the application of inclusion and exclusion criteria. A PRISMA chart and descriptive analysis was used to present the result.

Results: The results concluded that of the 18 studies, 17 showed a relationship between communication and medication errors, while only one study indicated no relationship. Thematic synthesis was used to classify the result of the 17 studies. The result was classified into five general themes based on the literature review and similarity among the studies.

Conclusions: This systematic literature review investigated the interrelationship between communication and medication errors. In regards to patient safety, the research highlights that structured communication is effective in preventing medication errors. These errors can occur within the medication management cycle at any point of the drug distribution chain. This is due to the involvement of different health professionals, and different steps in the cycle from the correct prescription through to correct administration. Thus, to effectively prevent medication errors and reduce the rate of patient harm, structured communication (verbally and non-verbally) is highly recommended.

Abbreviations: GP – General Practitioner; SLR – Systematic Literature Review.

Key words: structured communication; health professional communication; medication; safety; pharmacist; medication error.

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Literature review

Medication errors are one of the top ten serious adverse events of medical errors, which directly or indirectly have a negative impact on the quality of care. [1,2]

Medication errors are defined as any factors that alter the distribution chain, which includes the prescribing, dispensing, preparation and administration of drugs. [3,4] Medication errors are a common preventable type of error that causes patient harm, unwanted hospitalisation, longer stay in hospital and even fatality. [5] Due to the complexity of the medication process, the contributing factors of medication errors within the hospital are either systematic or related to individual healthcare professional issues. [2,6] Pharmacists play various roles in the healthcare system and

pharmaceutical care requires the pharmacist's involvement to prevent and solve drug related problems. [7] Additionally, pharmacists help with improving safety of medication use, [8] quality assurance and care services, which can reduce or eliminate the risk of errors. [9] Medication errors can be due to prescribing, dispensing and drug administration errors and related factors to the drug distribution chain. [3, 10-14]

Medication errors issues and factors are significant safety problems in hospitals worldwide. [15-17] Approximately 2-3% of all admissions to Australian hospitals were medication related errors, which were predominantly caused by systematic rather than individual healthcare professional failure. [18-20]

Each year, over 1.5 million Australians experience adverse drug events. [21] Adverse drug events have been identified as one of the most significant causes of morbidity in Australia. [22] A recent Australian study suggested that medication-related incidents accounted for over 230,000 admissions and cost the Australian healthcare system approximately \$1.2 billion annually. [18,20] Medication errors in Australian hospitals were mainly reported as administration errors based on the ward stock, while dispensing errors were among the least common errors. [23] Medication error contributing factors can be categorised as knowledge-based, rules-based, action-based and or memory-based. [24] Clinical errors occurred in 20% to 25% of medication administration worldwide and are clinically significant within Australian medication error cases. [25,26] Additionally, Queensland Health reported that 27% of clinical incidents were due to communication failure and a leading contributing factor in staff or practitioner related SAC1 incidents. [27]

Various Australian studies related to medication errors found that 26% of 27,000 hospital incidents were medication related. [23] The Western Australian Health Clinical Handover Policy aims to achieve effective, high quality communication of clinical information when the responsibility for patient care is transferred. This results in reducing incorrect treatment, delays in diagnosis and treatment, adverse events, length of stay, expenditure, unnecessary tests, treatments and communication, patient complaints and malpractice claims. [28]

Whenever a patient's medication information is communicated, there is a potential for medication errors. [29] Thus, the accuracy of patient current medication information is important as it varies due to patient confusion; inadequate communication between General Practitioners, (GPs) pharmacists and specialists; the degree

to which relatives have been informed; and information about drug and dosage gained by informed healthcare workers. [30] Communication in the health sector affects all aspects of human health and it plays a unique role in health services. 'Health communication has become an accepted tool for promoting public health'. [31] The exchanging of information can happen in both verbal and non-verbal forms at various levels. [31-33]

Within the health sector, inter-professional communication regularly involves the interaction of various healthcare professionals. In such diverse fields at various stages of patient treatment, health professionals must work collaboratively together in complementary roles to reduce negative impact on care. Communication is the key to efficient collaboration between and within healthcare teams. [34-39] Issues in communication, especially the transfer of clinical information, have been identified as one of the most important factors in serious adverse events in Australian healthcare settings [40] and about 70% of medical incidents are caused by communication failure. [41] Inter-professional communication is complex and communication barriers can lead to ineffective communication within inter-professional teams. [31,42,43] The medication management cycle indicates that decisions from appropriate treatment to the transfer of verified information are all based on communication. [24]

A 2006 review of New South Wales public hospitals reported that medication errors occurred in 17,367 incidents. In 968 of these medication incidents, the results were primary and secondary patient harm. [44] In addition, the NSW Health Patient Safety and Clinical Quality Program reported that the major contributing factors causing medical errors were deficiencies in policies (25%), communication (25%) and knowledge competency (18%). [45] The Victorian public health system in 2008-09 and Queensland Health in 2005-06 reported that 20% of sentinel events were due to communication issues or failures and it was the second most common contributing factor to sentinel events. [46] Furthermore, another Australian study between 2005-2010 revealed that reported medication errors were caused by poor communication between GPs, pharmacists and patients (8.7%), and poor staff communication and coordination (9.6%). [47] The Queensland Health Patient Safety Report of 2005-06 indicated that medication incidents were one of the top five primary clinical incidents (21%). Of these medication incidents, communication was one of the top five contributing factors to sentinel events (20%) and it emphasised that staff to staff communication failure

was one of the top five sub-category contributing factors (13.7%). [48] However, by comparison, the Queensland Health Patient Safety Report of 2006-07 showed a reduction in medication incidents (12%) where 11% were caused by staff to staff communication failure. [49] Therefore, it could be suggested that there is a direct relationship between communication and medication incidents.

Various clinical strategies have been designed to reduce medical incidents and improve patient safety. The SBAR verbal communication framework is one of the strategies that have been introduced into health communication aimed at preventing medical incidents. [50] The SBAR communication model provides a framework to enable individuals with basic communication skills to accurately share information about the patient's current condition. [51] The SBAR verbal communication framework has been implemented and adapted in various countries such as Canada, America and United Kingdom hospitals. [52-54] The SBAR tool brought changes to communication processes and improved patient safety outcomes, teamwork and overall satisfaction of nurses, physicians, staff and patients. [35, 55-57] Expanded SBAR (or ISBAR or iSoBAR) is now being used across Australia to encompass the transfer of accountability and responsibility required at handover with the Australian Commission on Safety and Quality in Healthcare recommending the SBAR communication toolkit as a simple solution for most communication related issues. [40]

Despite all of the various studies that indicated the relationship between medication errors and communication, there was a paucity of literature to define interprofessional communication between pharmacists and other health professionals, medication errors and structured clinical communication. Additionally, the literature failed to identify studies that addressed structured communication and a reduction in medication error rates.

The study aims to find if a relationship exist between the communication among different health team members (particularly pharmacists and other health team members) and medication errors in different studies, and; does structured communication reduced the medication errors rate?

Research design and methods

The systematic literature review (SLR) process is commonly used in the field of healthcare and in this study the SLR was used to identify the relationship between medication errors and health communication, specifically to find

whether implemented structured communication reduces medication errors. PICO elements (Participants, Intervention, Comparators and Outcomes) were used for the question revision:

- Participants were considered to be all health professionals who communicate medication therapy within the drug distribution process in all medical fields;
- Intervention was the structured communication among health professional specifically pharmacists;
- Comparator considered any structured communication in written or verbal for mat and medication safety verses poor communication and medication errors; and
- Outcomes identified whether structured communication reduced medication errors rates and if there is any relationship between communication and medication safety.

A list of exclusion and inclusion criteria was generated according to the key questions, (Table 1). Studies were limited to those with outcomes and factors related to structured communication and reduced numbers of medication errors. Medication errors and health communication were defined according to previous studies and, to ensure that studies that were reviewed were relevant to current world practice, published English-language academic journal articles between the years 2000-2015 were chosen.

The inclusion criteria such as study population, study settings and geography, language, time period and publication criteria were considered prior to data extraction. In terms of the selection of suitable articles, four phases of the developed research's strategy such as identification, screening, eligibility and including phase were applied.

Using the key words 'health professional communication' and 'medication errors', 'structured communication' and 'medication errors', 'structured communication' and 'medication safety' and 'pharmacist', an electronic search of databases including CINHALL, PubMed and Medline was undertaken. A large number of potentially eligible records were assessed for inclusion against predetermined criteria. As the potential to duplicate the same article from multiple databases is inevitable, EndNote software was used to remove duplicates automatically to reduce biases. In the screening phase, the inclusion criteria was applied to the title and abstract of each study that was found during searching process. Additionally, a note taking strategy was used and the studies fulfilling the inclusion criteria were saved separately in a specific document.

Table 1: Inclusion and exclusion criteria of the study

INCLUSION CRITERIA	EXCLUSION CRITERIA
Study population: All health professionals involved in patient pharmaceutical therapy	Study population: <ul style="list-style-type: none"> All patient related studies are not linked to health professionals
Study settings: <ul style="list-style-type: none"> Studies conducted in the developed world including the United States, Australia, New Zealand and Europe 	Study settings: <ul style="list-style-type: none"> Developing countries
Time period: <ul style="list-style-type: none"> 2000 – 2015 	Time period: <ul style="list-style-type: none"> Before 2000
Language: <ul style="list-style-type: none"> English 	Language: <ul style="list-style-type: none"> Non-English
Publication Criteria: <ul style="list-style-type: none"> Peer reviewed Academic Journal article Full text and abstraction availability 	Publication Criteria: <ul style="list-style-type: none"> Peer reviewed paper

For eligibility purposes, the inclusion criteria were applied specifically the contents of each selected paper from the screening phase to determine their accuracy. In the inclusion phase, the final decision for included articles was made based on a close assessment of each paper’s contents and the application of the inclusion criteria using the PRISMA flow chart to report the selected study decision. The checklist used for the quality assessment of the selected papers, specifically, the Greenfield and Pawsey [58] quality

assessment tool, was used to examine the quality based on appropriateness of the research question, research design and justification, relevance of methodology, analysis of results, and logical presentation of the research (Table 2).

A data extraction process was used to provide an overview of all the data from included and selected studies. A data extraction form was designed based on the general information (author, article title, type of publication, year and setting), study characteristics (objective, study

Table 2: Assessment criteria adapted from Greenfield, Pawsey [58] study

FOR ALL STUDIES	ASSESSMENT CRITERIA
	Clearly specified and appropriate research question Clear details and justification of study design, including selection of cases and controls Detailed description of research setting, data collection methods and type of analysis performed Logical presentation and discussion of results and study conclusion Adequate sample size and response rate (>60%) relative to study
OVERALL RATINGS	ASSESSMENT CRITERIA
+++	All of the above criteria fulfilled
++	Almost all of the above criteria fulfilled, and those criteria that were not fulfilled were thought unlikely to alter the conclusions of the study
+	Some of the criteria were fulfilled, and those criteria that were not fulfilled were though unlikely to alter the conclusions of the study

design and unit of allocation), participant characteristics, settings, outcome measurement and results. [59] Accuracy and consistency of data entry was controlled and monitored through revision by two independent researchers on the data extraction and data entry process.

Results

The initial search identified a total of 1158 citations. After scanning citation titles, 454 were selected for further screening and their complete abstract and content were reviewed. Of these, only 18 studies were eligible to be included in the systematic review. Thirteen studies were excluded because these papers were not peer reviewed, or were unrelated to health communication, medication errors (multi-dose dispensing system, team management com-

munication and medication reconciliation rate) or explored the patient safety guidelines with the lack of research outcomes. The PRISMA flow chart (Figure1) was used to summarise the result of data extraction after the inclusion and exclusion criteria stage and to show the final selection result.

The quality assessment criteria were critically applied to the 18 studies and the result showed that seven studies fulfilled the all assessment criteria with +++ ratings and ten studies fulfilled almost all the criteria and failed in one to two criteria and were thought unlikely to alter the conclusions of the study. A summary of the quality assessment results can be seen in Table 3.

Figure 1: PRISMA Chart

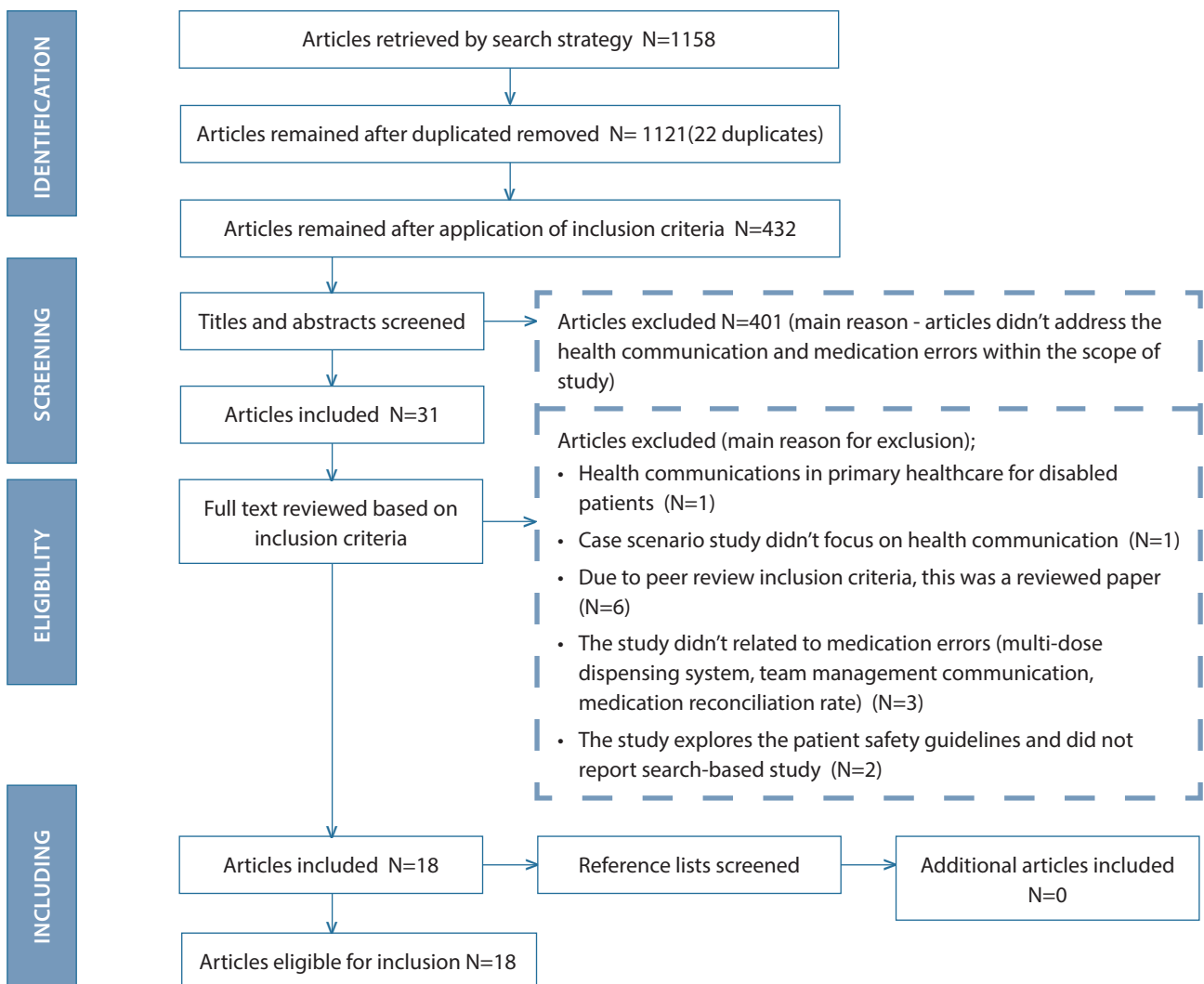


Table 3: The quality assessment results

NO	AUTHOR	THE STUDY TITLE	JOURNAL NAME	QUALITY RATING ACCORDING TO GREENFIELD ET AL
1	[60]	Poor communication on patients' medication across healthcare levels leads to potentially harmful medication errors.	Scandinavian Journal of Primary Healthcare	+++
2	[61]	Do you believe your patients are reasonably safe from medication errors, falls, and other adverse events? Compare your opinions and observations to those of nearly 5,000 nurses who responded to this major safety survey.	Nursing 2006	++
3	[62]	To illustrate variety of medication errors in the emergency department.	Academic Emergency Medicine	++
4	[63]	Bedside nursing handover: a case study.	International Journal of Nursing Practice	+++
5	[64]	Healthy work environments, nurse-physician communication, and patients' outcomes.	American Journal of Critical Care	++
6	[65]	Drug error in maternity care: a multi-professional issue	British Journal of Midwifery	++
7	[66]	Collaboration – integrating nursing, pharmacy and information technology into a barcode medication administration system implementation.	CARING	+++
8	[67]	Communication skills training to address disruptive physician behaviour.	AORN (Association of Perioperative Nurse) Journal	++
9	[68]	Applying airline safety practices to medication administration.	Academy of Medical-Surgical Nurses	+++
10	[69]	Barriers to safe medication administration in the nursing home-exploring staff perceptions and concerns about the medication use process.	Journal of Gerontological Nursing	++
11	[70]	Antecedents of severe and non-severe medication errors.	Journal of Nursing Scholarship	++
12	[71]	A secondary care nursing perspective on medication administration safety	Journal of Advanced Nursing	+++
13	[72]	Reflection and analysis of how pharmacy students learn to communicate about medication errors	Health Communication	++
14	[73]	Reducing medication errors and increasing patient safety: case studies in clinical pharmacology	The Journal of Clinical Pharmacology	++

Table 3: The quality assessment results

NO	AUTHOR	THE STUDY TITLE	JOURNAL NAME	QUALITY RATING ACCORDING TO GREENFIELD ET AL
14	[73]	Reducing medication errors and increasing patient safety: case studies in clinical pharmacology.	The Journal of Clinical Pharmacology	++
15	[74]	Comparison of medication safety effectiveness among nine critical access hospitals.	American Journal of Health System Pharmacy	+++
16	[75]	Errors in general practice: development of an error classification and pilot study of a method for detecting errors.	Quality and Safety in Healthcare	++
17	[76]	Communicating medication changes to community pharmacy post-discharge: the good, the bad, and the improvements.	International Journal of Clinical Pharmacy	+++
18	[77]	Pharmacists' inter-professional communication about medications in specialty hospital settings.	Routledge Taylor & Francis Group	+++

Table 4: Data extraction result from the data extraction results

REF NO	AUTHOR/ YEAR	TITLE	COUNTRY	PUBLICATION TYPE	OBJECTIVE	OUTCOME MEASURES	DESIGN	PARTICIPANTS	RESULTS	STUDY LIMITATION
7	[66]	Collaboration – Integrating Nursing, Pharmacy and Information Technology into a Barcode Medication Administration System Implementation.	United States.	Journal.	<p>To reduce medication errors when ordering/ transcribing medication.</p> <p>To standardise medication administration practices.</p> <p>To bring administration documentation to the point of care.</p>	<p>This study used three phases of unfreezing, moving and refreezing of Kurt Lewin organisational change model and named it as project origination, workflow redesign and implementation/acceptance/ integration.</p> <p>In this study a lot of various communications is used with different carts, evaluation rating, meeting, guidelines to identify potential issues with implementation of new system.</p>	Qualitative.	365 bed hospital, implemented a Barcode Medication Administration system.	<p>Barcode implementation caused dramatic increase in the reported prevented or near-miss medication error.</p> <p>It prevents from over 700 (average) medication errors per month that could cause real harm to patients.</p> <p>It helped to identify the total scope of potential errors and near misses.</p>	This study did not mention any limitations.

Table 4: Data extraction result from the data extraction results *continued*

REF NO	AUTHOR/YEAR	TITLE	COUNTRY	PUBLICATION TYPE	OBJECTIVE	OUTCOME MEASURES	DESIGN	PARTICIPANTS	RESULTS	STUDY LIMITATION
13	[72]	Reflection and analysis of how pharmacy students learn to communicate about medication errors.	UK.	Journal.	To examine how pharmacy students are socialised to apply communication strategies when responding to potential medication errors and their prevention.	30 min to 2 hours face to face interviews of 28 questions on topics such as memorable communication-related medication errors, reflections on medication errors made, and training on how to handle medication errors.	Qualitative.	44 participants who enrolled in a 6-year entry level pharmacy program and had completed at least one rotation (a period of 4 months). 33 female and 11 male participants.	The thematic analysis results showed five main themes regarding medication errors and communication that address the nature and extent to which pharmacy students are socialised to communicate about medication errors, and the role of communication in medication errors. These five themes were; pressure to be perfect, feeling comfortable talking about mistakes, assuming and communicating responsibility for error, learning how processes can contribute to errors and their prevention, and inadequate and inconsistent training on how to handle medication errors.	All the participants were from the same school. The principal investigator could not ask important follow up questions as the researcher student was asked to do interviews. The more specific questions about the role of disclosure in medication errors should be asked rather than the general questions.
14	[73]	Reducing medication errors and increasing patient safety: case studies in clinical pharmacology.	United States	Journal.	To summarise current known medication errors and translate the information into case studies illustrating common scenarios leading to medication errors.	Each case was analysed to provide insight into how the medication error could have been prevented. For this reason, the system errors are described and the application of failure mode effect analysis is presented to determine the part of the 'safety net' that failed.	Qualitative.	7 representative cases from clinical pharmacology, which failed and led to medication errors.	Case 1: Communication problems. Case 2: Origin of the informed consent doctrine. Case 3: Instruct patients to call when anything unusual or unexpected occurs (provide the patient with the information that he/she would want to know if receiving the medication). Case 4: Regarding the use of zeros in written prescriptions: always lead and never follow. Poor communication in the form of illegible medication orders, prescription-writing errors to correct. Case 5: Indicated that up to half of all medication errors arise from physician orders, (occurrence of medication errors in hospitalised patients: physician ordering = 39-49%, nursing administration = 26-38%, transcription = 11-12%, pharmacy dispensing = 11-14%), also inadequate monitoring is frequently included.	This study did not mention any limitations.

Table 4: Data extraction result from the data extraction results *continued*

REF NO	AUTHOR/ YEAR	TITLE	COUNTRY	PUBLICATION TYPE	OBJECTIVE	OUTCOME MEASURES	DESIGN	PARTICIPANTS	RESULTS	STUDY LIMITATION
									<p>Case 6: High alert medication and patient safety, pharmacological criteria for identifying high risk drugs.</p> <p>Case 7: System errors leads to medication errors. This study did not mention any limitations.</p>	
17	[76]	Communicating medication changes to community pharmacy postdischarge: the good, the bad, and the improvements.	UK.	Journal.	<p>To establish the extent to which community pharmacies currently receive discharge medication information, and for which patients.</p> <p>To determine community pharmacy staff opinion on where and how current communication practice could be improved.</p>	Reported receipt of discharge medication information from hospitals and general practices.	Qualitative.	14 community pharmacies.	<p>Receiving information: community pharmacists reported that the receipt of information regarding medication change was inconsistent and once they received patient discharge medication summary, it was helpful and informative. Also, pharmacists described lack of standardisation, and differences in quality and frequency of communication that they received from individual hospital trusts and between hospitals trusts.</p> <p>Pharmacists regularly did not receive information from hospital. Lack of standardised processes for the receipt of information within the pharmacy was another related problem to this study and mainly the pharmacists felt that the consequence of poor communication could be fatal and lead to patient harm. The main suggestion from pharmacy staff to improve current communication was for both hospital and medical practices to provide information more routinely, using standardised processes and encourage the widespread use of the limitation of this study was interviewing of participants during opening hours and the participants having an interrupted interview to serve customers. There were distractions during the interview.</p>	The limitation of this study was interviewing of participants during opening hours and the participants having an interrupted interview to serve customers. There were distractions during the interview.

Table 4: Data extraction result from the data extraction results *continued*

REF NO	AUTHOR/YEAR	TITLE	COUNTRY	PUBLICATION TYPE	OBJECTIVE	OUTCOME MEASURES	DESIGN	PARTICIPANTS	RESULTS	STUDY LIMITATION
17	[77]	Pharmacists' inter-professional communication about medications in specialty hospital settings.	Australia.	Journal.	What is the nature of the communication about medication between hospital pharmacist and health professionals from other discipline groups in specialty hospital settings?	Semi structured interviews with and the participant observations at different level of communication in the specialty hospital of Victoria.	Qualitative.	Pharmacists, nurses, and doctors.	Thematic analysis of the data showed four themes: <ul style="list-style-type: none"> • Task focused interprofessional communication • Little interprofessional collaboration • Interprofessional asymmetries in behaviour, knowledge and attitudes • Lesser visibility of clinical pharmacy 	Only one metropolitan hospital participated in this study and the data might not be transferable to other hospitals. Observations were not conducted in perioperative care setting and it is possible that one or more new themes could have emerged in this setting.

Note: The complete data extraction's table is available on request from the authors.

Discussion

The results showed that of the 18 studies, 17 showed a relationship between communication and medication errors, while only one study indicated that there was no relationship. Thematic synthesis was used due to nature of the research (qualitative) to identify patterned meaning across a database and to classify the results of the 18 studies. The themes were synthesised after a line-by-line coding of the included studies. The organisation of these codes into related areas helped to construct descriptive themes and finally, the development of analytical themes. [78]

The results of the studies were classified into five general themes based on the literature review and similarity among of the studies. These themes included:

- Relationship between medication error and communication;
- Structured communication and patient safety;
- Medication communication management cycle;
- Health professional communication education; and
- Pharmacist views about medication errors.

Relationship between medication error and communication

Five studies pointed directly or indirectly to a relationship between communication and medication errors at different stages of providing care to patients. [60-62, 64,75]

The application of a communication definition [31,32] to these studies indicates that failure in the transmission of clinical information from one healthcare provider to another has the potential for medication errors. [40] Nurses identified a breakdown in communication as the most significant factor related to medication error and failure in the exchanging of medication information (inadequate communication) within an interdisciplinary team leading to patient harm and medication error. [61] Similarly, research showed that the main cause of medication errors was prescription errors (42%) and poor communication (30%). [75] In addition, the critical evaluation of one case study indicated that the main issues were related to the medication communication process in the drug distribution chain. Furthermore, various strategies that were recommended to prevent medication errors in an emergency department were mainly focused on communication and exchanging of clinical information among various healthcare providers. [62] The relationship between medication errors and communication was supported as the study result showed that nurse-physician communication has an impact on medication errors. [64] In this context, it is believed that insufficient information, faulty exchanges of existing information, or ambiguous and unclear information as a part of poor communication lead to medical incidents. [79] According to the findings in these five studies, the researchers agreed that there is a strong relationship between the communication process and drug

distribution chain, with failure of communication during medication management playing a key role in medication error.

Structured communication and patient safety

Structured communication is one of the recommended solutions to prevent medical incidents and medication errors. [38,80] In this context, different pathways, guidelines, technology use and standardised charts have been used to improve patient safety. [14,81] In a three-hospital study, the handover sheets were used as a structured communication tool to communicate patient clinical information effectively and accurately at handover time. [63] Although involving a barcode medication administration system increased the workload of nurses and pharmacists, it also increased patient medication safety by reducing medication errors at the ordering, transcribing and administration stages of the medication process. [66] The use of bedside barcode systems combined with an interprofessional team and onsite pharmacy consultation reduced the number of medication errors. [74] Two studies [66,74] used the barcode system as a form of structured communication to reduce the medication incidents and to improve patient safety. The first step to reduce or eliminate recognised errors is to enhance communication skills and better interactions between the healthcare team and the patient to improve patient safety. [73] The findings of these studies highlighted that using structured communication avoids preventable medication errors, which costs both patient and healthcare system. Most of the researchers agreed that structured communication can improve patient medication safety rate but there are limited studies that measured the reduction in medication errors when using structured communication.

Medication management cycle

In the drug distribution chain, [3] the breach of the seven 'rights' (right patient, right drug, right dose, right time, right route, right reason and right documentation) along with inter-professional communication, prescription errors accounted for 70% of medication errors. [14] Medication administration errors occur in one in every five medication dosages. [6] Three of the reviewed studies reported that communication failure leads to medication errors and is due to poor communication by multidisciplinary teams through the drug prescription and drug administration cycle, [65] inadequate communication as the responsible person's attention was drawn away from achieving the medication administration goal [68] and communication issues at every stage of the cycle, were evident as a leading cause of medication errors. [69] According to the medication

management cycle [24] and these studies, [65,68,69] the researchers argued that communicating effectively and working collaboratively are important factors of medication safety.

Health professional communication education

Health professionals realise that there is a need to pay greater attention to communication in the workplace. This requires healthcare professionals to be formally trained in communication skills. The theoretically-based two days communication skills training program for nurses enabled them to identify situations that warrant crucial conversations regarding to patient safety. [67]

Similarly, educating pharmacy students about communication and medication errors enables them to communicate effectively around various medication errors. [72] These two studies indicated that education on how to communicate effectively, as a part of the socio-cultural environment of the healthcare system, is important and necessary for all health professionals to reduce communication-based medication errors.

Pharmacists and communication

Pharmacists play a primary role in preventing medication errors. Pharmacists' daily practices involve communication pathways from the physician's order, transcribing it onto a label for the patient and making sure that the right medication and right dose matches the patient prescription. All of these steps are based on communication and with it comes the potential for medication errors. Pharmacists among other health professionals are the ones who indicated the importance of effective communication. [16, 82-84] The reviewed study explored the importance of medication communication between community pharmacies and different healthcare providers during transfers of care and this study explained that the lack of a standardised process for the receipt of information within the pharmacy was another related problem and the pharmacists felt that the consequences of poor communication could be fatal or lead to patient harm. [76] The roles of pharmacists are often assumed to be 'guardians' in ensuring that medication errors do not occur. [2]

Thus, from the pharmacist's perception, communication plays a key role in patient medication management and safety. In addition, the result of another study showed that the reactive medication communication between pharmacists and other health professionals, like nurses and doctors, has expanded the pharmacist's role, involving them in decision-making at the treatment level. [77]

Other findings of the SLR

While the systematic review finding could be categorised into five main themes, other findings have emerged. Although the Chang and Mark [70] research indicated that there is no relationship between communication factors and medication error related factors, it did not define communication variables clearly. This study is in contrast with the 17 other studies, which highlight the relationship between communication and medication errors. Additionally, it could be argued that this study only measured communication with physicians and did not clarify the communication variable factors appropriately during the medication process use.

Thus, it could be suggested that there is a deficit in information about the measurement of the communication contributing factors during the drug distribution chain in this study.

In relation to the limitation of the included studies, eight of the studies did not mention any research limitation. [60-62, 65,66,69,73,74] Four studies could not be generalised due to their small sample size, participants' specific characteristics and measurement of the related factors. [68,71,75,77] In contrast to earlier findings, however, there was no evidence of structured communication reducing medication errors in longitudinal studies. Additionally, in relation to the medication management cycle, a considerable number of studies discussed the structured communication between nurses and physicians, pharmacists and doctors and nurses, nurses and nurses, especially in handover time and the outcome of the structured communication on medication errors. [61,65, 67-69, 71,75,77]

Controversially, there have been no studies specifically targeting structured communication between pharmacists and other health professionals who are involved in the patient medication management cycle and the effect of structured verbal or non-verbal communication between pharmacists and other health professionals on medication errors. Furthermore, the majority of the studies were from the United States, United Kingdom and Canada while there were only two studies from Australia.

What has not been highlighted is that while there have been a number of studies that have emphasised structured communication (barcode, electronic resources, SBAR, etc.), no study has accurately quantified the reduction in medication errors by using one or more of these approaches. There has not been any attempt to identify the 'gold standard' that is: does one of those structured communication approaches have a greater impact on reducing medication errors than the other reported approaches?

Limitations

The limitation of this study considered the publication bias among the included studies, although the peer reviewed search strategy was applied. To offset this potential bias, two researchers, unrelated to the study, reviewed the work for consistency and completeness. Additionally, the limitation in the search strategy was considered as the search protocol might have overlooked some important studies. This study included all the qualitative, quantitative and mixed method studies that fulfilled the inclusion criteria and this can influence the choice of studies outcome. The inclusion criteria of studies into a review process may be influenced by knowledge of the results of the set of potential studies. Unpublished research was not included in this study, to reduce the potential of this influence.

The limitation of quality assessment and data extraction was reduced by the review by two independent researchers.

Conclusion

The outcomes of this study are instructive for health managers in several ways.

Firstly, the study demonstrates the considerable cost implication of poor clinical communication and medication error. A focused approach on inter professional communications could significantly reduce hospital costs and poor patient outcomes. Secondly, improving communication in relation to medication errors can provide organisations with measurable improvements in patient safety and quality.

The finding of this study provides a deeper understanding of the relationship between communication and medication errors and offers an agenda for future study. As a result of this systematic review, future research could include:

- Does the use of structured verbal communication, like SBAR, between pharmacists and other health professionals involved in the medication management cycle reduce the medication error rates?
- Future research, using a longitudinal study approach, could examine whether the implementation of structured communication reduces the medication error rates and improves patient medication safety.
- From the perspective of quality of care and patient safety, what is the quantifiable outcome (savings to the patient and healthcare system, reduced cost of treatments through reducing medication errors, cost of reduced morbidity and mortality) of using structured communication to reduce the number of medication errors?

Overall, this SLR, with all its challenges and limitations, defines the relationship between communication and medication errors. Additionally, this study indicates the need for future longitudinal quantitative studies and qualitative research on the use of structured communication between health professionals and the reduction in medication errors.

Competing interests

The authors declare that they have no competing interests.

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