Kovačević et al. Scr Med. 2024 Jul-Aug;55(4):409-17. DOI:10.5937/scriptamed55-50374

ORIGINAL ARTICLE

Nurses Thoughts on Using Drugs Database Created by Clinical Pharmacist as Help Tool for Preparation and Administration of Drugs

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Abstract

Background/Aim: Intravenous therapy is a complex process usually requiring the preparation of the medicine before administration to the patient and it is well known that errors in preparation and administration can cause harm to patient. Systems that use information technology are key components of strategies to prevent medication errors in developed countries. Therefore, aim of study was to investigate nurses' perspective on medicines database in clinical information system implemented in university hospital.

Methods: A convenience sample of 79 nurses at the bedside from four different hospital wards in the 1200-bed university hospital were asked to participate in the study. The questionnaire included twenty-three questions organised in three different sections and it assessed 3 components of the medicines usage: (1) medicines preparation; (2) medicines administration; (3) clinical information system usage. Mean scores were calculated for the 4-item Likert-type scale.

Results: Most nurses found information in drug database reliable (Likert scale mean = 1.42 ± 0.778) and believed that using medicines database can decrease drug preparation and drug administration errors (mean: 1.35 ± 0.717) with no significant difference in mean between four different wards. Similarly, most nurses were familiar with the drug database in clinical information system (mean: 1.22 ± 0.613).

Conclusion: Pharmacist as a drug expert could introduce medicines database to nurses, train them how to use it in everyday practice and explain how using information technologies can help in decreasing medication errors which leads to increasing patients' safety during hospitalisation.

Key words: Database; Pharmaceutical technology; Pharmaceutical preparation; Drug labelling; Medication error; Nurses.

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Citation:
Kovačević T, Dragić S, Momčičević D, Zlojutro B, Jandrić M, Kovačević P. Nurses thoughts on using drugs database created by clinical pharmacist as help tool for preparation and administration of drugs. Scr Med. 2024 Jul-Aug;55(4):409-17.

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Received: 10 April 2024
Revision received: 10 June 2024
Accepted: 10 June 2024

Introduction

A definition for medication error introduced by the European Medicines Agency refers to any unintentional error in the prescribing, dispensing or administration of a medicinal product while in control of the healthcare professional, patient or consumer.[1] Intravenous therapy is a complex process usually requiring the preparation of the medicine before administration to the patient and harm following medication errors such as wrong drug, dose, diluent and cross

contamination errors with intravenous therapy has been reported.[2, 3]

Almost 50 % of medication errors account to administration error compared to 18 % for dispensing and 16 % for prescribing according to United Kingdom's National Patient Safety Agency.[4] A systematic literature review in Iran on medication error also indicated that reported prevalence of medication administration errors holds the highest ranges that is from 14.3 to 70 % compared to 29.8–47.8 % for prescribing error, 3–33.6 % for dispensing error and from 10 to 51.8 % for transcribing errors.[5] The volume of medicines information associated with keeping up to date on pharmacotherapeutic interventions is frequently overwhelming for medical practitioners despite the development of tools such as clinical practice guidelines and systematic reviews that are intended to reduce the need for practitioners to evaluate original research.[6, 7]

Evidence from many studies show that systems that use information technology, such as automated dispensing cabinets, computerised physician order entry, electronic medication reconciliation, bedside bar-coded medication administration are key components of strategies to prevent medication errors and to save up billions of dollars in developed countries.[8, 9] Hospitals with automated notes and records and clinical decision support systems have fewer complications, lower mortality rates and lower costs.[10, 11] There are scarce data on usage and benefit of these systems in developing countries.

This study was designed to find out on what knowledge or information resources nurses rely on when preparing and administering medicines for parenteral use in hospitalised patients and their awareness of possible errors in preparing and administering medicines. In researched university hospital, clinical information system with medicines database as its integral part has been recently established. Medicines database has been created by pharmacists and it provides information for medical staff on several critical points of drug use in concise form which is not overwhelming to read for a busy physician or nurse. Regarding nurse's responsibility on medicine handling, there are precise information on medicines preparation, administration and stability for each drug in hospital's formulary. Therefore, aim of this study was to investigate nurses' perspective on medicines database in clinical information system, which is intended to be a clinical decision support system.

Methods

The study was a descriptive survey design. A convenience sample of 79 nurses at the bedside from four different hospital wards in the 1200-bed university hospital (University Clinical Centre of the Republic of Srpska, Banja Luka, The Republic of Srpska, Bosnia and Herzegovina) were asked to participate in the study.

A descriptive questionnaire was explicitly designed for nurses by the research team. The questionnaire took approximately 10 minutes to complete. The questionnaire included 23 questions organised in three different sections. The questionnaire assessed 3 components of the medicines usage: (1) medicines preparation; (2) medicines administration; (3) clinical information system use.

The questionnaire assessed 3 components:

a) Medicines preparation
This section consisted of 10 questions on medicines preparation, out of which eight questions were designed as 4 items Likert-type scale (1 - I Agree completely, 2 - I agree somewhat, 3 - I am not sure, 4 - I disagree). Questions/statements were as follows: 1. Preparation of medicines is done in separate room intended for drug preparation; 2. I only administer medicines which I prepare personally; 3. Before preparing the medicine, I read carefully information written on the primary package; 4. I visually inspect the drug before preparation; 5. I am often not sure how to prepare certain medicine; 6. Wrong preparation is frequent medication error; 7. Error in preparation can harm the patient; 8. Error in preparation should be reported. Two questions on what nurses rely on and what they trust the most when preparing medicines for parenteral use were designed as 5-item scale where nurses could choose from 5 different answers: 1 - knowledge gained in school for nurses; 2 - own experience; 3 - instruction obtained from another health professional (nurse, physician, pharmacist); 4 - using drug summary product characteristics; 5 - information from literature source (formulary, the Internet).

b) Medicines administration
This section consisted of 8 questions on medicines preparation, out of which seven questions were designed as 4 items Likert-type scale (1 - I Agree completely, 2 - I agree somewhat, 3 - I am not sure, 4 - I disagree). Questions/statements were as follows: 1. Before administering the medicine, I read carefully information written on the primary package; 2. I visually inspect the drug before administration; 3. I am often not sure how to administer certain medicine; 4. I completely trust my preferred source of information; 5. Wrong administration is frequent medication error; 6. Error in administration can harm the patient; 7. Error in administration should be reported. One question on what nurses rely on and what they trust the most when administering medicines for parenteral use were designed as 5-item scale where nurses could choose from 5 different answers: 1 - knowledge gained in school for nurses; 2 - own experience; 3 - instruction obtained from another health professional (nurse, physician, pharmacist); 4 - using drug summary product characteristics; 5 - information from literature source (formulary, the Internet).

c) Clinical information system – medicines database
This section consisted of 5 questions on clinical information system and medicines database as its integral part, designed as 4 items Likert-type scale (1 - I Agree completely, 2 - I agree somewhat, 3 - I am not sure, 4 - I disagree). Questions/statements were as follows: 1. I am familiar with the drug database in clinical information system; 2. Drug database is quite useful in everyday work; 3. I find the information in drug database reliable; 4. Using drug database can decrease drug preparation and drug administration errors; 5. Every ambiguity noted in the clinical information system should be reported to administrator.

Data were reviewed for completeness and analysed using SPSS version 26 (*IBM Corp*, Armonk, NY) for analysis. Descriptive statistics (mean, standard deviation (SD), skew and kurtosis) were performed and each variable was assessed for normality of distribution. Percentages were calculated for categorical variables. Mean scores were calculated for the Likert-type scales. Cronbach's alpha measured the internal consistency of the instrument. A One-way analysis of variance was used to determine if there was a difference in mean responses and the χ^2 test was used to assess differences in categorical variables. A p value < 0.05 was considered statistically significant.

Results

Seventy-nine nurses working at bedside on four different wards in the tertiary care university hospital completed survey by fulfilling the questionnaire. All nurses were female gender and with high school degree, 25 from the Medical Intensive Care Unit (MICU), 20 from the Gynaecology Ward (GW), 16 from the Pulmonology Ward (PW) and 18 from the Internal Diseases Ward (IDW).

Medicines preparation

For statements related to medicines preparation the highest scores were statements "I am often not sure how to prepare medicine" (mean: 3.42 ± 0.91) and "Preparation error is frequent medication error" (mean: 2.58 ± 1.26) with no significant difference in mean between four different wards (Figure 1). The lowest scores (1-4 scale) was "I visually inspect medicine before preparation" (mean: 1.09 ± 0.328). Significant difference ($p < 0.05$) was detected in 4 out of 8 questions/statements between different wards. For example, nurses from MICU and GW read more often medicine labels before starting to prepare medicines for parenteral use compared to PW and IDW, $F(1.79) = 5.009$; $p = 0.003$. Also, PW nurses least frequently inspected medicine before preparation, $F(1.79) = 3.786$, $p = 0.014$ and were least aware that preparation error can harm the patient compared to other wards, $F(1.79) = 2.687$, $p = 0.052$.

Nurses were asked to what source of knowledge or information they rely on when preparing medicines for parenteral administration and they were able to choose from five provided answers. There was no significant difference in answers between 4 different wards, but nurses from the PW and IDW mostly relied on their own experience while nurses from GW mostly relied on information medicines' summary of product characteristics while MICU nurses relied almost equally on knowledge gained in school and instruction obtained from another health professional (Figure 2).

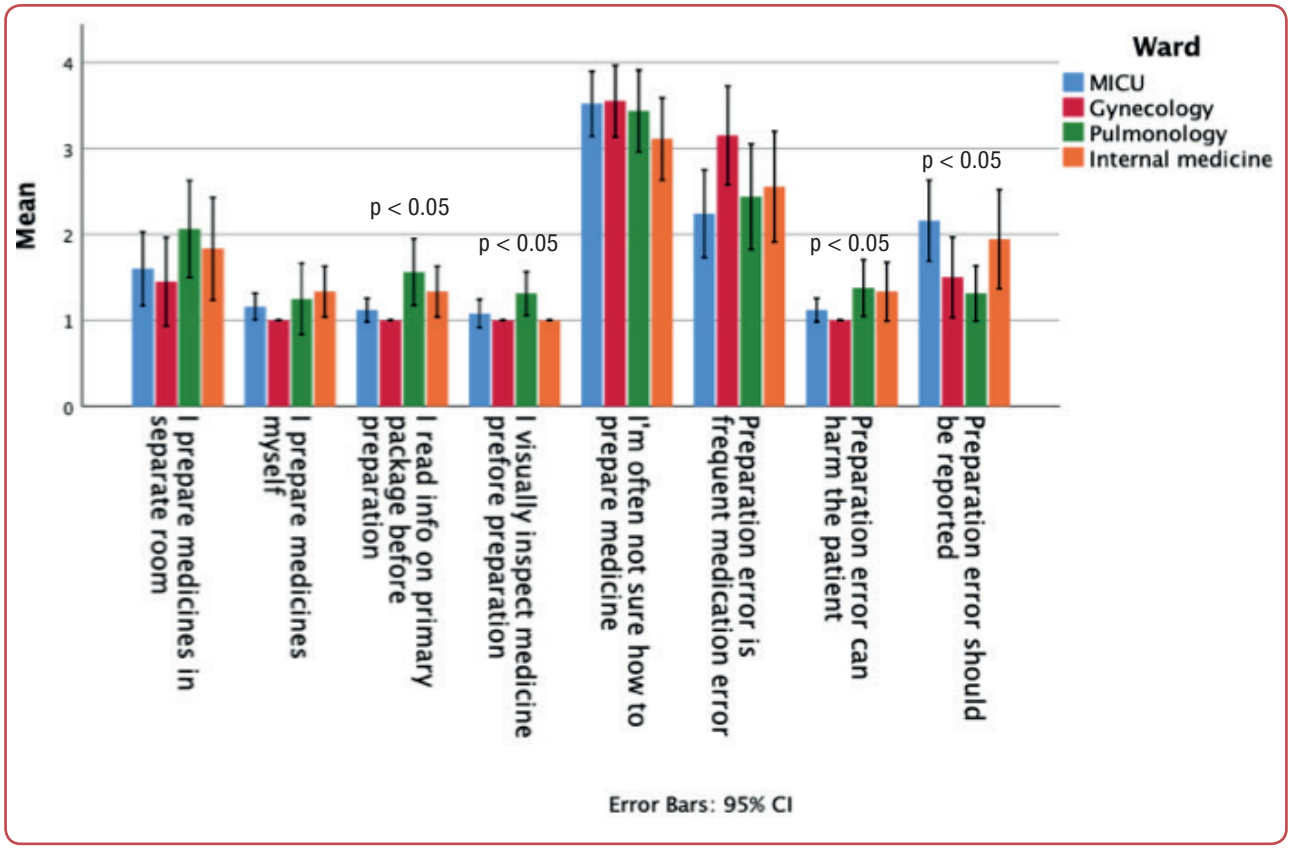

Figure 1: Statements of nurses from four different hospital wards on preparing medicines for parenteral use

Mean: mean value of 4 items Likert-type scale (1-I Agree completely, 2-I agree somewhat, 3-I am not sure, 4-I disagree);

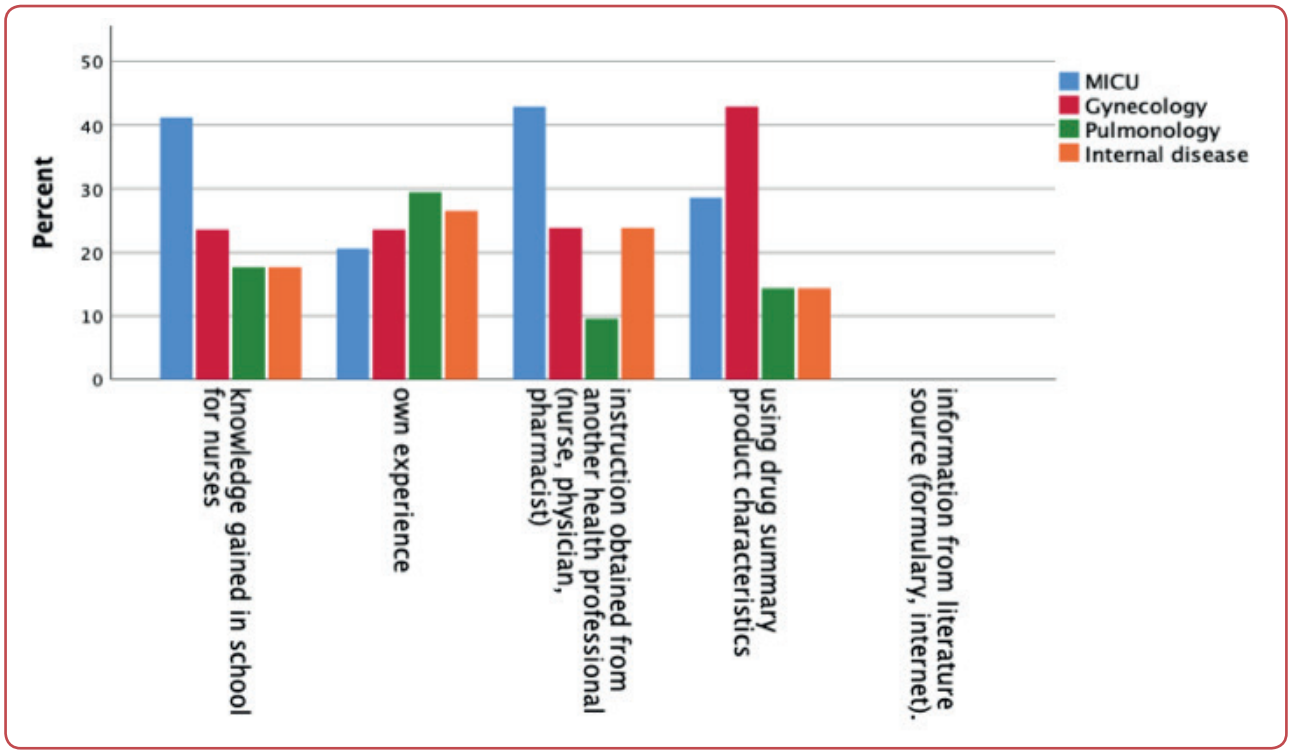

Figure 2: Statements of nurses from four different hospital wards on the source they rely on when preparing medicines for parenteral use

Nurses were asked to what source of knowledge or information they trust the most when preparing medicines for parenteral administration and they were able to choose from five provided answers. There was no significant difference in answers between 4 different wards, but nurses from different wards trusted different source of information, all nurses from IDW stated that they trust information from literature the most and MICU nurses trusted knowledge gained in school the most (Figure 3).

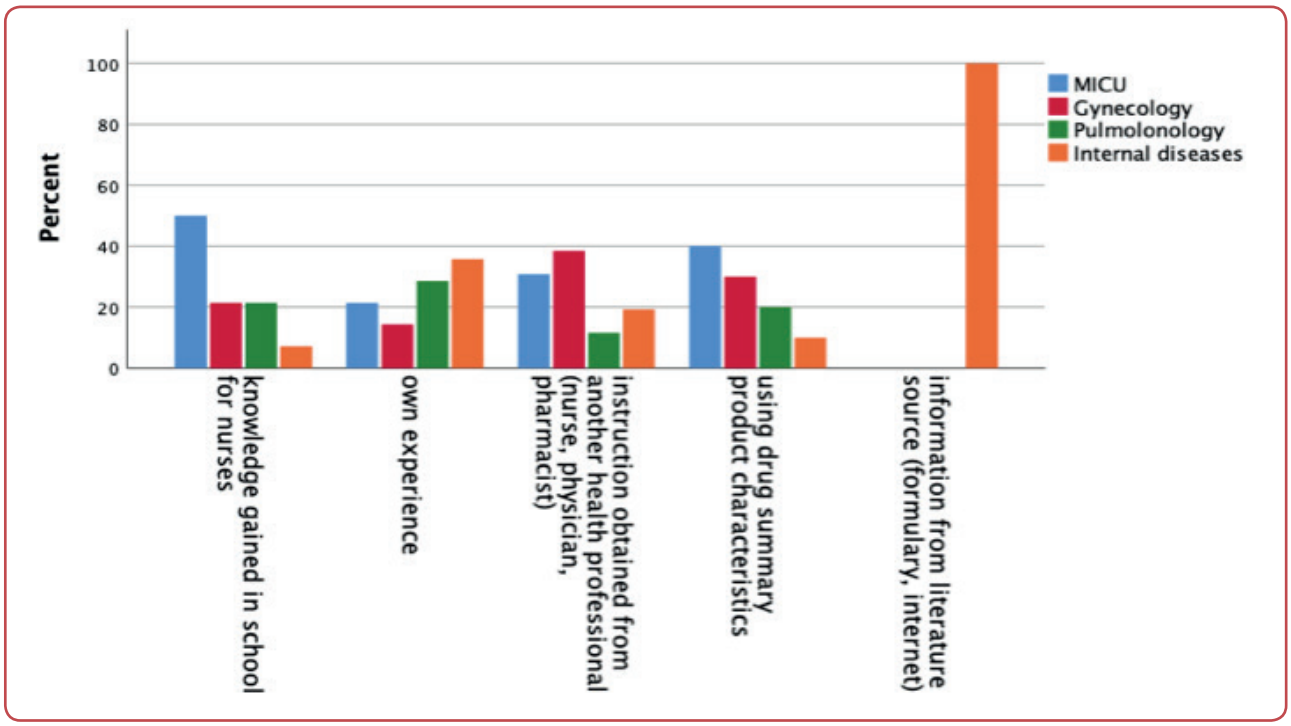

Figure 3: Statements of nurses from four different hospital wards on the source they trust most when preparing medicines for parenteral use

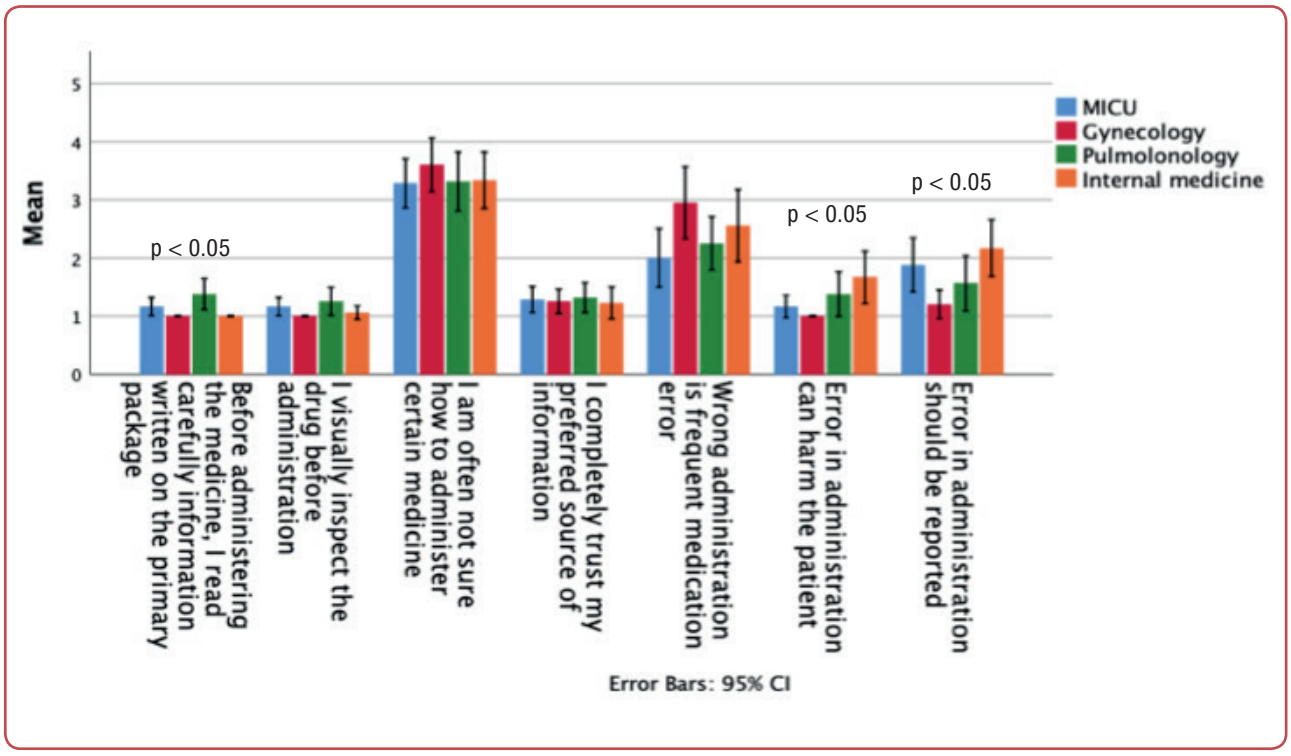

Figure 4: Statements of nurses from four different hospital wards on drug administration issues

Mean: mean value of 4 items Likert-type scale (1-I Agree completely, 2-I agree somewhat, 3-I am not sure, 4-I disagree);

For statements related to medicines administration the highest scores had staements "I am often not sure how to administer certain medicine" (mean: 3.38 ± 0.978) and "Wrong administration is frequent medication error" (mean: 2.42 ± 1.226) with no significant difference in mean between four different wards (Figure 4). The lowest score had statement "I visually inspect medicine before administration" (mean: 1.11 ± 0.320). Significant difference ($p < 0.05$) was detected in 3 out of 8 questions/statements between different wards. For example, nurses from GW and IDW read more

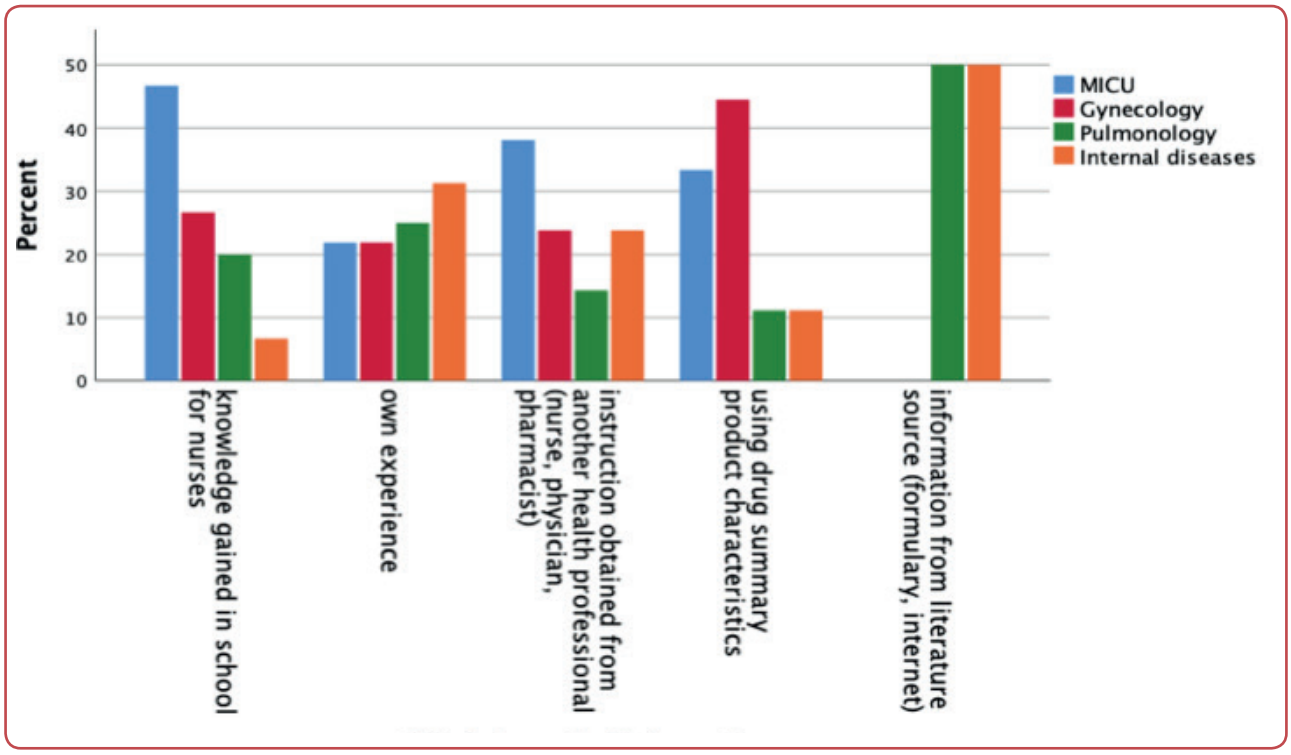

Figure 5: Statements of nurses from four different hospital wards on the source they rely on when administering medicines

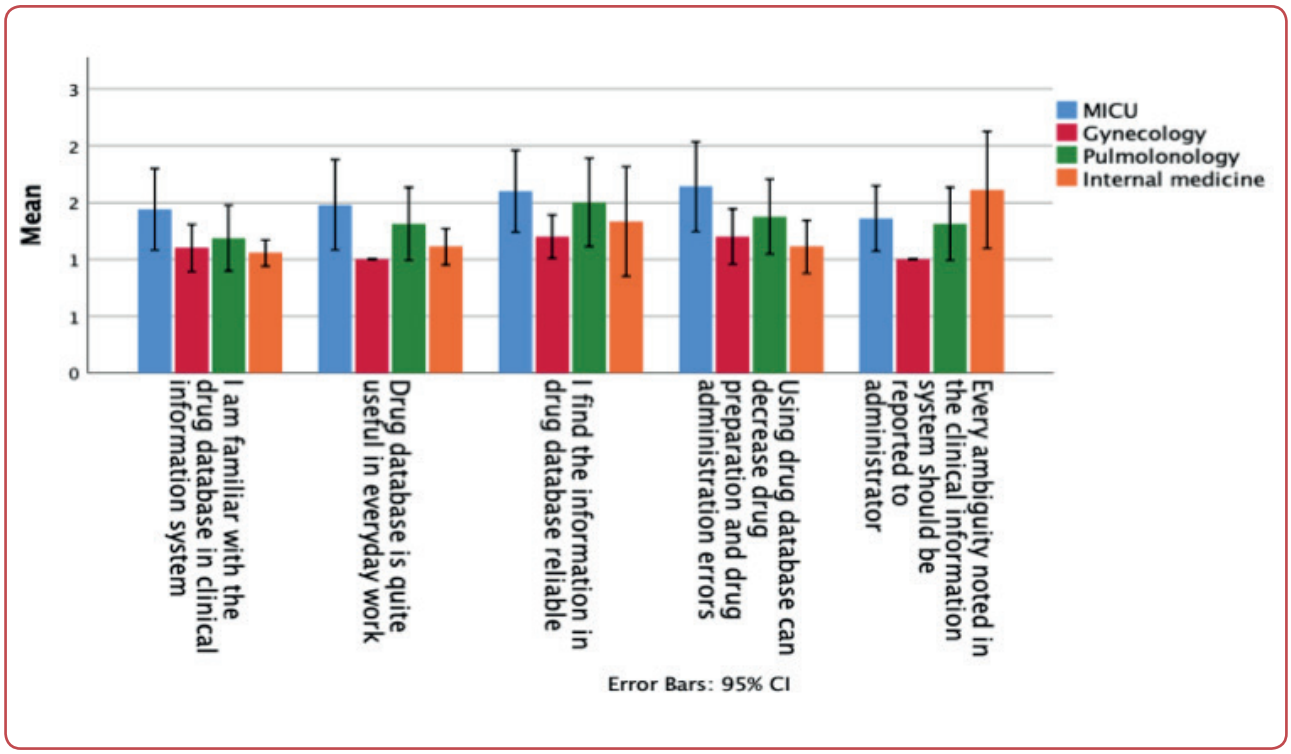

Figure 6: Attitudes of nurses from four different hospital wards towards medicines database in the hospital clinical information system

Mean: mean value of 4 items Likert-type scale (1-I Agree completely, 2-I agree somewhat, 3-I am not sure, 4-I disagree);

often medicine labels before starting to prepare medicines for parenteral use compared to MICU and PW, F (1.79) = 5.711; p = 0.001. Besides, IMW nurses were least aware that administration error can harm the patient compared to other wards, F (1.79) = 4.393, p = 0.007 and that error in administration should be reported, F (1.79) = 3.900, p = 0.012.

Nurses were asked to what source of knowledge or information they rely on when administering medicines and they were able to choose from five provided answers. There was no significant difference in answers between 4 different wards, but nurses from the MICU mostly relied on their own experience while nurses from GW mostly relied on information medicines' summary of product characteristics while PW and IDW nurses relied mostly on information from literature source (formulary, the Internet) (Figure 5).

Clinical information system – medicines database

For questions related to medicines database the highest scores (1-4 scale) had statements "I find the information in drug database reliable" (mean: 1.42 ± 0.778) and "Using medicines database can decrease drug preparation and drug administration errors" (mean: 1.35 ± 0.717) with no significant difference in mean between four different wards (Figure 6). The lowest score (1-4 scale) was on statement "I am familiar with the drug database in clinical information system" (mean: 1.22 ± 0.613). MICU and PW ward nurses least believed that drug database is useful in everyday work and as they did not find them reliable.

Discussion

Main finding of this study is that nurses have positive attitude towards using clinical information system's medicines database as a decision support tool, but some of them are not aware that it is available for everyday practice in their university hospital and some of them are not sure if its usage can decrease medication errors.

Most nurses from four different university hospital wards relied on their knowledge gained in high school for nurses or their experience in preparing medicines for parenteral administration. This is probably due to lack of continuing professional education that should periodically renew the knowledge of nurses and introduce them to new information available for medicines. Unfortunately, laws are often not strict in developing countries regarding separate space and enough time to adequately prepare medicines for parenteral administration (which includes all necessary steps such as visual inspection, mixing, dissolving, labelling etc) and hospitals' management do not spend enough money and time to improve this process.

Although most nurses were aware that inadequate preparation and administration of medicines can seriously harm the patient, they did not find it important to report it. As part of the health care team and the last health professional who can prevent the harm to patient, whether the nurses are the source of an error, a contributor, or an observer, they have a professional responsibility to recognise and report medication administration errors that could harm patient safety by clarifying ambiguous orders and questioning orders that are inappropriate.[12] Error reporting is crucial step in prevention future similar and perhaps even more serious errors, but health workers are often reluctant to that because of fear of disciplinary actions or experience of blame and punishment.[13]

Another tool for prevention of medication preparation and administration errors can be found in information technology clinical decision support systems. Important obstacles in implementing information technology systems is high cost which can be overcome by internal creation of medicines database as it was done in the University Clinical Centre of the Republic of Srpska.[14] Clinical information system with medicines database has recently been implemented in this university hospital and presented to all medical staff. Medicines database has been created and it is regularly updated by clinical pharmacists. Nurses' perception and satisfaction with database was investigated and it was found that nurses do not always use it as a support system during medicines manipulation. Some nurses do not trust information presented in medicines database and do not believe that using this system can significantly decrease medication errors. Other studies came to similar conclusion.[15]

Nurse education is one type of intervention to reduce medication errors as shown in number of studies.[16, 17] Providing nurse training and infor-

mation on using medicines database in clinical information system could increase awareness of possibility for medicines' preparation and administration errors as well as increase trust in information presented. Pharmacist as drug experts can have significant role in this.[17]

Presented study has few limitations. Nurses were interviewed in single university hospital. Processes of preparation and administration of medicines or usage of medicines database was not observed but nurses were asked to anonymously answer the questions in printed questionnaire.

Conclusion

Most nurses found medicines database useful in everyday work. As certain number of nurses in this study did not think that information in medicines databases in clinical information system are reliable and are resilient to use it as a clinical decision tool, training and information provision to nurses by clinical pharmacist is needed. Pharmacist as a drug expert can introduce medicines database to nurses, train them how to use it in everyday practice and explain how using information technologies can help in decreasing medication errors which leads to increasing patients' safety during hospitalisation.

Ethics

Ethical approval was not required for this study because it did not include any intervention on humans in accordance with the local legislation and institutional requirements.

Acknowledgement

None.

Conflicts of interest

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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