Nurses' Perspectives toward Administration of Traditional Positive Inotropic Drugs in Critical Care Unit in Omdurman Military Hospital Khartoum - Sudan

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Abstract

The uses of positive inotropic have been plagued by serious concern regarding increased morbidity and mortality. In fact, the nurse plays a major role in drug administration, observations and prevention of side effects of medications which decrease the length of hospitalization, cost, morbidity and mortality. **The aim** of this study was to assess nurses' perspectives toward the administration of positive inotropic drugs in critical care units. **Methods:** It was a descriptive cross-sectional hospital based study carried out at Omdurman Military Hospital among the nursing staff of the CCU of the hospital. The sample size was (100) nurses, and the data about knowledge and attitudes about positive inotropes administration were collected by using a questionnaire, and then they were processed by using the Statistical Package for Social Sciences (SPSS) – version (21), and presented in simple frequency tables, figures and cross-tabulations. The test was considered to be significant at p-value less than 0.05 and we used Likert scale to measure the attitude level. **The results**: overall results of knowledge about positive inotropes administration indicated poor knowledge (56%); however, the majority (60%) of the nurses demonstrated a positive attitude toward inotropes administration. Association between overall knowledge of the nurses and their qualification was not significant.

Conclusion: Generally, nurses had poor knowledge about positive inotropes administration while more than half of them got positive attitudes.

Key terms: Inotropes administration, nurses, knowledge, attitude.

المستخلص

لقد كانت استخدامات الأدوية المنشطة للقلب (الإينوتروب) مصحوبة بمخاوف كبيرة بشأن زيادة المراضة والوفيات. في الواقع، يلعب الممرض دورًا رئيسيًا في إدارة الأدوية والملاحظات ومنع الآثار الجانبية للأدوية التي تقلل من مدة الاستشفاء والتكلفة والمراضة والوفيات. كان الهدف من هذه الدراسة هو تقييم وجهات نظر الممرضين تجاه إدارة الأدوية المنشطة للقلب في وحدات الرعاية الحرجة .

الطرق: كانت هذه الدراسة : وصفية مقطعية تم تنفيذها في مستشفى أم درمان العسكري بين أفراد الطاقم التمريضي في وحدة العناية المركزة بالمستشفى. كان حجم العينة (100) ممرضًا، وتم جمع البيانات المتعلقة بالمعرفة والمواقف حول إدارة الأدوية المنشطة للقلب باستخدام استبيان، ثم تم معالجتها باستخدام برنامج التحليل الإحصائي للعلوم الاجتماعية - النسخة (21)، وتم عرضها في جداول تكرارية بسيطة، ورسوم بيانية، وجداول متقاطعة. تم اعتبار الاختبار ذا دلالة إحصائية عندما كانت قيمة الـ **(p)** أقل من 0.05 واستخدمنا مقياس ليكرت لقياس مستوى المواقف .

النتائج: أظهرت النتائج العامة للمعرفة حول إدارة الأدوية المنشطة للقلب أن المعرفة كانت ضعيفة (56%)؛ ومع ذلك، أظهر الغالبية (60%) من الممرضين موقفًا إيجابيًا تجاه إدارة الأدوية المنشطة للقلب. لم يكن هناك ارتباط ذو دلالة بين المعرفة العامة للممرضين ومؤهلاتهم .

الخلاصة: عمومًا، كان لدى الممرضين معرفة ضعيفة بشأن إدارة الأدوية المنشطة للقلب، بينما كان أكثر من نصفهم يحملون مواقف إيجابية .

الكلمات المفتاحية: إدارة الأدوية المنشطة للقلب، الممرضين، المعرفة، الموقف

Introduction:

Positive inotropic drugs are widely used to enhance myocardial contractility in critically ill patients [1]. However, their administration requires frequent monitoring due to potential adverse effects, including prolonged hospital stays, increased costs, disability, and even death [2,3,4]. Traditional positive inotropes, such as Dopamine, Dobutamine, Norepinephrine, and Epinephrine, are primarily beta-agonists used to support cardiac function in conditions as heart failure, myocardial infarction, and septic shock [5,6,7]. Despite their therapeutic role, studies have highlighted their risks, including increased mortality in heart failure patients [5,2,8]. Ahmed Amine and Majjed Malike noted that clinical trials documented excess mortality in patients treated with Dopamine and Dobutamine [5,2,8].

Indeed, the care of critically ill patients is majorly centered on medication support. That obviously helps improve patients' health, but if administered incorrectly medication may result in incidence of medication administration errors which are worldwide under-estimated, [9] their effect extends the increase hospital stay, medical fees, may result in patient's disability, and even death. Secondary consequences include harm that involved nurse concerning his or her personal and professional status, practice, and self-confidence. [10,5]

The administration of medications in critical care is largely the responsibility of nurses, making their knowledge of drug actions, interactions, dosages, and side effects essential [11]. Medication errors, which are often underestimated, can occur at any stage from prescription to monitoring, leading to extended hospital stays, higher medical costs, disability, or death [9,12,13]. Nurses are responsible for assessing patient needs, ensuring safe drug administration, monitoring treatment effects, and educating patients about medications [11]. Incorrect drug administration remains a common issue due to lack of knowledge, unethical drug promotions, and irrational prescribing habits [14]. Nurses, alongside pharmacists, play a role in both the preparation and administration of medications [15].

Medication administration remains one of the highest-risk aspects of nursing practice [16]. Nurses hold accountability not only for their actions but also to themselves, their patients, the profession, their employing institution, and society [17]. This responsibility requires thorough preparation to prevent their own medication errors and to identify mistakes made by other healthcare providers during medication management [13].

In critical care settings, nurses work closely with the healthcare team and take on multiple responsibilities, including patient monitoring, drug administration, updating families on patient progress, maintaining a clean and infection-free environment, and managing rapidly changing patient conditions [18,19,20,21]. Given the complexity and urgency of their role, nurses must be well-equipped with the necessary knowledge to respond effectively during emergencies.

Given their high-risk nature, inotropic medications must be carefully administered via infusion devices, with continuous monitoring of heart rate, blood pressure, and perfusion indicators [13]. Improper administration can result in serious complications, including arrhythmias and myocardial ischemia, increasing patient

morbidity and mortality [5]. Durham [13] emphasized the importance of integrating pharmacokinetics and pharmacodynamics principles into clinical practice to enhance patient safety. Nurses must be well-equipped with knowledge to handle emergencies, ensuring safe and effective inotropic therapy while preventing adverse outcomes [22,23,24,25,26]. The use of inotropic drugs increases nurses' responsibility in caring for patients, ensuring timely therapeutic interventions, and improving future care [25,26]. This requires comprehensive knowledge of drug actions, interactions, dosages, potential side effects, and their management to enhance patient safety and treatment effectiveness [27]. Proper administration requires dilution before infusion, gradual dosage adjustments, and monitoring for side effects such as extravasations [28,29,30,31].

Materials and Methods

This was a descriptive cross-sectional study conducted at Omdurman Military Hospital which was located in Omdurman city.

The Critical Care Unit (CCU), where the study was conducted, includes medical and surgical cases. The population of this study consisted of permanent nursing staff who had been working at the CCU. They had various academic qualifications (diploma, bachelor, and master degree in nursing science). They worked in two shifts; morning and night. National service nurses and nurses with experience less than 3 months were excluded from the sample. The total size of the sample was (100) nurses. The total coverage technique was adopted, as the total census was less than (200).[32]

The relevant data of the study were collected using a structured questionnaire that designed by the researcher depend on revised literature; The developed knowledge and attitudes questionnaire was reviewed by two panel of experts in critical care nursing to ensure its validity.

The information collected included, in addition to the personal and demographic data, the respondent nurses' knowledge about positive inotropes definition, indication, administration, nursing roles, side effects, complications, information regarding the nurses' attitudes towards positive inotropes.

Score system:

Knowledge: For the knowledge items, (1) was awarded for each correct response or for "yes" responses in yes/no questions and the incorrect answers are given (zero). The scores of the items were summed-up and the total percent of 75% or more was considered as a 'good level', 'acceptable' if the percentage score was between 50%-75% and poor if the percentage was less than 50%. **[10]**

Then these percentages were converted to a mean score in order to assess the levels (poor, acceptable, good). **The scale has three items (1, 2, 3) so the mean was calculated as 2/3=.66 The Level of knowledge is estimated by that** Knowledge was considered as followed means (1-1.66 = Poor, 1.67-2.33 = Acceptable, 2.34 -3 = Good score).

Attitudes: A five-level Likert scale (Agree, Strongly Agree, Neutral, Strongly Disagree, Disagree) was used in the questionnaire to assess the nurses' attitudes.

The scale has five items (1, 2, 3,4,5) so the mean was calculated as 4/5 = .8

All Agree statement and nutria are considered as acceptable attitudes wile all Disagree statement are considered as unacceptable attitudes

The data analysis was carried out by the Statistical Package for Social Sciences (SPSS), version 21. Measures included percentage and mean, and the binary outcome variable was created. The data of the study were presented in

frequency and percentage tables; The level of significance selected for this study was p-value equal to or less than (0.05).

The study proposal received ethical clearance from the Ethical Committee of Al-Neelain University, followed by permission from Omdurman Military Hospital. The study's purpose, expected outcomes, benefits, and potential results were explained to the head nurse, who agreed to the study's conduction. Participants were informed about the study's aims and data collection methods in clear and simple language. They were made aware of their rights, including the right to know the study's purpose and findings, to participate voluntarily, to withdraw at any time without providing a reason, and to refuse to answer any questions. Verbal informed consent was obtained from each respondent. Additionally, all participants were assured of anonymity, confidentiality, and privacy. Confidentiality and anonymity were further maintained by coding all collected data.

Results

Demographic characteristics of MH nurses in CCU (n=100)

Table 1: Distribution of respondents according to Age in years (n =100)

	Frequency	Percent	Valid Percent	Cumulative Percent
20 -30	97	97.0	97.0	97.0
31 -40	2	2.0	2.0	99.0
>40	1	1.0	1.0	100.0
Mean age: 25.46+or- **SD** .234				

In table (1) almost of the responding nurses are yang, their age range between 20-30 years represent (97%) and their mean age is 25.46 +or- .234

Table 2: Distribution of respondent nurses according to their qualification (n =100)

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	2	2.0	2.0	2.0
Bachelor degree	94	94.0	94.0	96.0
M.Sc. (Master)	3	3.0	3.0	99.0
Ph.D.	1	1.0	1.0	100.0
Total	100	100	100	100

Oure results revealed that most (94%) of our respondents are well qualified as they holding Bachelor degree in nursing

Table 3: Distribution of respondent nurses according to their years of experience (n =100)

	Frequency	Percent	Valid Percent	Cumulative Percent
>1 year	57	57.0	57.0	57.0
1- 3 years	21	21.0	21.0	78.0
3-5 years	12	12.0	12.0	90.0
>5 years	10	10.0	10.0	100.0
Total	100	100	100	100

In table three more than half of our study group has had a little working experience in in critical care units which is less than a year followed by experience between 1 – 3 years that is reach 21% of the studied nurses

Table 4(A): Distribution of nurse's knowledge regarding Definition uses and correct method of administration of inotropes (n = 100)

	Poor knowledge Frequency	Accept knowledge Frequency	Good knowledge Frequency	Mean	Level of knowledge
Definition	60	30	10	1.49	Poor
Uses of inotropes	41	17	42	2.01	Acceptable
Common inotropes used in practice	55	10	35	1.80	Acceptable
Route of administration	73	21	6	1.33	Poor
Total knowledge				1.76 SD.37	Acceptable

Knowledge Scale (by mean): 1-1.66 = Poor 1.67-2.33 = Acceptable 2.34 -3= Good

This is a three items scale (1, 2, 3) so the mean was calculated as 2/3=.66

Table 4 (A) reflect that the studied nurses had acceptable knowledge regarding definition uses, correct method of administration of all types of positive inotropes drugs in critical care patients

Table 4(B): Distribution of nurse's knowledge regarding Nurse's role concerning positive inotropic administration and abrupt interruption of drug (n = 100)

	Poor knowledge Frequency	Accept knowledge Frequency	Good knowledge Frequency	Mean	Level of knowledge
Nurse role before administering positive inotropes (obtain base line vital sign, assess peripheral circulation prior to starting infusion, assess IV line prior administration, known side effect)	37	11	52	2.15	Acceptable
Nurse role during administering positive inotropes (Monitor carefully blood pressure and urine output. Observe infusion site hourly for signs of extravasation, Assess peripheral circulation during infusion)	44	11	45	2.01	Acceptable
Nurse role in abrupt interruption positive inotropes (Monitor carefully blood pressure and urine output, Observe infusion site hourly for signs of extravasation, Assess peripheral circulation during infusion)	45	20	35	1.66	Poor
Total knowledge				1.94 SD .52	Acceptable

Knowledge Scale (by mean): 1-1.66 = Poor 1.67-2.33 = Acceptable 2.34 -3= Good

This is a three items scale (1, 2, 3) so the mean was calculated as 2/3=.66

In Table 4(B) the nurses have acceptable knowledge concerning their role before and during administering the positive inotropes but they had poor knowledge when abrupt interruption of drug occurs

Table 4 (C): Distribution of nurse's knowledge regarding Epinephrine uses, side effect, investigations and monitoring during administration (n = 100)

	Poor knowledge Frequency	Accept knowledge Frequency	Good knowledge Frequency	Mean	Level of knowledge
Uses	61	52	72	1.52	Poor
Side effects	26	32	21	1.64	Poor
Investigations and monitoring during administration	13	16	7	1.35	Poor
Total knowledge				1.50 SD .40	Poor

Knowledge Scale (by mean): 1-1.66 = Poor 1.67-2.33 = Acceptable 2.34 -3= Good

This is a three items scale (1, 2, 3) so the mean was calculated as 2/3=.66

In table 4(C) the studied nurses had poor knowledge about Epinephrine uses, side effect, investigations and monitoring during administration of this drug

The overall knowledge level of the nurses in this study is acceptable by mean of 1.76 and .24 SD

Table 5: Distribution of nurses' attitudes about positive inotropes administration at Omdurman Military Hospital's CCU (n = 100)

Items	**Strongly agree**	**Agree**	**Neutral**	**Dis agree**	**Strongly disagree**	**Mean**	**Attitude Level**
	Frequency	**Frequency**	**Frequency**	**Frequency**	**Frequency**		
Positive inotropic drugs considered safe life medications.	47	41	6	5	1	1.72	Strongly disagree
Worker's motivation can improve professional performance during the whole medication process	34	46	7	11	2	2.01	Disagree
Ongoing specific training on safe management of IV drugs could reduce the risk of error	35	39	6	11	9	2.20	Disagree
Some authoritative guidelines drawn up taking into account the available scientific evidence are necessary for safe management of the entire managing process of IV drugs	26	52	7	12	3	2.14	Disagree
Medication errors should be reported in order to provide an opportunity for improving care	43	34	9	6	8	2.02	Disagree
Positive inotropes can be given in the ward	14	18	19	3	46	3.49	Agree
Over all attitudes						**2.38**	**Disagree**

*** Likert scale of attitudes:** Strongly disagree = 1-1.80 Disagree = 1.81-2.60
Nutrial = 2.62-3.41 Agree = 3.42- 4.22 Strongly agree = 4.23-5

The scale has five items (1, 2, 3,4,5) so the mean was calculated as 4/5 = .8

* -Agree is acceptable attitudes - Disagree in unacceptable attitude

In this table (5) the participant shoo unacceptable attitudes in almost of items as the disagree for the most of their respond and their overall attitude is disagreeing with mean of 2.38 which considered unacceptable attitudes

Discussion:

Medication administration is an important part of the nursing practice and an important responsibility for nurses.[33] In **CCUs,** the nurses as clinicians are expected to have professional competencies including a wide-ranging knowledge and positive attitudes to intervene in a appositive way to prevent adverse effects and manage patients' safety by regulating drugs, fluids, and other therapeutics to keep the patient stabilized,[34] as they are rightly included in the decision-making process for the management of patients which is mainly supported by their knowledge and attitudes. This was descriptive cross-sectional hospital-based study carried out to assess nurses' knowledge and attitudes toward positive inotropes administration.

Our study showed that almost (97.0%) of the respondents are young in age, as their ages fall in the age group between 20-30 with mean age of 25.46 ± SD .234. This finding was supported by findings of three similar studies done in other places which reported that the mean age of the studied nurses was (27.28±6.82) (32.32±6.70) and (27.89±7.9) respectively.[35,36,37] It is also consistent with the result of another study conducted in India in 2019 in which (94%) the nurses were between 22-25 years**.**[38] Moreover, almost (94.0%) of our respondents are qualified with Bachelor's degree in nursing; this is similar to many studies which declared that most of their studied nurses had a Bachelor's degree in nursing science.[38,39] Notwithstanding, it disagrees with the study of Eman Aziz and her colleague who stated that less than half of their study nurses were graduates of nursing institutes,[35] and also disagrees with another study done in Egypt in which most of the nurses were qualified by Diploma degree and graduates of technical institutes.[37]

Concerning years of experience, most of the participants (78.0%) have less than three-year of experience; this indicates that most of those nurses graduated recently, young and new to the environment of work. This was in alignment with the result of the study done by Sreelatha in India,[40] but different from the results of many other studies in which most of their studied nurses had a maximum of five years of nursing experience. [35,41,42,43,44]

With regard to general pharmacological information, most (60%) of our participants have got poor knowledge regarding the definition of *inotropes*. This result disagrees with a corresponding result of a study entitled "Knowledge of Nurses about Vasoactive Drugs" in which all of the studied nurses had correct responses regarding the meanings of the term *inotrope* (100%), definition of vasodilators (87.5%), and of vasopressors (100%). [41] Moreover, most (73%) of the nurses included in the current study had poor knowledge regarding the correct route of inotropes administration, a result which is supported by the result of another similar study in which only 12.5% of the respondents correctly answered that Dobutamine should absolutely be administered via central venous catheter, and no exclusion for other drugs.[41] This is mainly due to that most of their respondents are specialized in cardiology while our nurses mostly are general nurses working in critical care units (CCUs).

Our study revealed satisfactory knowledge of nurses concerning uses of inotropes with a mean score of (2.01); this agrees with a study done in India in which (72%) of their respondents had fair knowledge with a mean score of 7.58± 2.59.[45] In addition, more than half of them had acceptable/satisfactory knowledge about the common drug used in practice (Dopamine, Dobutamine, Epinephrine, and epinephrine).

This result is in agreement with one study in which their respondent nurses recorded that the drugs most used in ICUs are Dobutamine, Dopamine and Noradrenaline.[41] Indeed, the total knowledge of general inotropes pharmacological information is acceptable by a mean of 1.76 with .37 SD, which verified mastery over the theme. Moreover, regarding pharmacological information of epinephrine uses with their side effects, important investigations and monitoring are needed during administration, as the respondent nurses' demonstrated poor knowledge; and with poor total score of knowledge by a mean of 1.50 with .40 SD. This finding is in consistency with many studies carried out in different countries worldwide; [40,46] In fact the result of study done in Iran notify that about half of life threatening medication errors are related to poor nurses' knowledge; More over results of study of Mohamed Elsayed in Egypt also warn that more than half of life threatening errors are related to poor nurses' knowledge regarding inotropic medications.[47,48]

Our respondents showed acceptable knowledge regarding the nurse's role before and during the administration of positive inotropic drugs, namely Epinephrine; Nurses have very important responsibilities in the prevention of medication errors as they play a key role in the medication process,[49] and they have a fundamental role in drug administration as it is an important part of their practice responsibility.[33] Their distinct position is frequently strengthened by their professional information regarding drugs managed, along with their responsibility for the preparation and monitoring of the treatments, observing, controlling and preventing the adverse effects of the drugs.[50,51] However, our study revealed poor knowledge by a mean of 1.66 regarding the nurses' role in abrupt interruption of drugs when adverse effects appear; this poor knowledge probably related to little experience of the sample studied here. Our general finding is in agreement with the results of the study conducted by Warda and her colleagues that was done in Egypt.[37] The poor knowledge may also be attributed to the poor work conditions. Nevertheless, the overall level of knowledge for our respondents concerning the pharmacological information is satisfactory/acceptable by a mean of 1.76 with SD .24; this is consistent with the results of study done on nurses of a specialty hospital in Egypt concerning the knowledge of high alert medications (especially: Epinephrine, Norepinephrine, Dopamine, Dobutamine) which revealed that 87.1 % of the studied subjects had satisfactory total knowledge, and also consistent with the finding of another study in which 79% of participants had got satisfactory total score of knowledge regarding inotropes medication but disagree with a yet a third study that declared nurses' knowledge was unsatisfactory.[46]

Nurses are faced with the ever challenging responsibility of ensuring safe and effective drug therapy for their patients. Nurses must integrate drug information – in CCUs most that used are inotropes – into their patients' care quickly and in an informed manner.[46] Some authoritative guidelines and available scientific evidence are necessary for safe management of IV drugs, documentation of medication errors so as to provide opportunity for improving care. It was declared that one-third of all medication errors occur during the medication administration, so it essential for the nurses to identify the challenges they face when administering medications to their patients. Because nurses consistently administer medications, they're well positioned to prevent medication errors. Nurses must be prepared to not only catch their own errors, but

also the errors of healthcare providers, pharmacists, and others in the chain of medication administration;[13] indeed the vast majority of the studded nurses had negative attitudes regarding consideration of positive inotropic drugs as safe life medications and necessary of presence of guidelines for safe management and reporting of medication errors**.** Moreover, Critical care nurses have a developing role in decision making regarding invasive procedures and drug prescriptions as ventilation, fluid and inotrope administration, and renal replacement therapy. They can achieve good outcomes by using of clinical guidelines and protocols.[52]

In the present study, the participants had a positive attitude toward the administration of drug in the ward; this use of these potent agents is largely confined to critically ill patients that admitted to CCU with profound hemodynamic impairment.

Conclusion: Generally, nurses had poor knowledge and positive attitude about positive inotropes administration.

Conflict of interest: The authors have nothing to declare.

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