

Role of Head Nurses in Managing the Safety of High Alert Medications in Critical Care Units

Nagah Abd El-Fattah Mohamed Aly¹ Tamer A. Maher Ghoneim² Osama Saeed Hassan³

1.Nursing Administration¹, Faculty of Nursing, Alexandria University, Matrouh Branch, Egypt

2.Anesthesia & Surgical Intensive Care Faculty of Medicine, Alexandria University, Egypt

3.Critical Medicine, Faculty of Medicine, Alexandria University, Egypt

Abstract

high-alert medication is a medication that bears a heightened risk of causing significant patient harm when used in error. Head nurses are responsible for managing and improving the safety of high alert medications within the critical care unit. Nurses receive directions and cooperation with their head nurses to achieve this target. A total of 236 nurses were willing to participate in the descriptive cross-sectional study. The first aim of this study was to develop a new questionnaire to describe the role of head nurses towards the nurses during practices of the safety of high alert medications. A secondary aim was to identify the factors influencing these roles. The key results of this study were the establishment of the questionnaire to describe the head nurse role in managing the safety of high alert medications as a reliable and valid tool that can be used to assess nurses' perception in this respect. Head nurses role in this study was generally mild. Evaluation role was lesser than management, patient care and supervision and development roles. These results can be attributed to a combination of factors, some related to an organizational system and the other to managerial factors.

Keywords: head nurses, role, high alert, medications

INTRODUCTION

High-alert medications are medications that are most likely to cause significant harm to the patient when misused. Mistakes with these medications may not be more common but may be more devastating to the patient if an error occurs (Byers fJ et al , 2004 ; Kizior RJ et al ,2005). Additionally, the consequence of an error with these medications is far more devastating for patients in critical care units (Corcoran J , 2007). The harm leads not only to patient suffering but also to additional costs associated with the care of these patients. According to the Institute of Medicine in the USA, adverse drug events occur in 6%–10% of all hospitalized patients. When these adverse events involve high-alert medications, patients are at a greater risk of suffering serious harm (Corcoran J, 2007). Safe practices during prescribing, dispensing and administration of these medications can reduce the potential harm to patient (Institute for Healthcare Improvement, 2008). Improving the safety of high-alert medications is a part of the Joint Commission's International Patient Safety Goal and Egyptian Hospital Accreditation standards (Joint Commission International, 2008 ; Robert A et al , 2008 ; Egyptian Healthcare Accreditation Organization , 2013). The Joint Commission and Egyptian Hospital Accreditation standards require that managers of organizations develop processes for managing high alert medications (Joint Commission International, 2008; Robert A et al, 2008; Egyptian Healthcare Accreditation Organization, 2013).

Managers in the hospital have a legal and moral obligation to improve care and to ensure high quality of patient care. These managers are in a prime position to mandate policy, systems, procedures and organizational safety climates (Parand A ; 2016). Medication safety is one of the highest priorities of head nurses. Head nurses are required to perform special considerations to ensure safe medication practices and to eliminate medication errors that cause harm to the patient. The plan of head nurses in managing the safety of high alert medication is identifying all high alert drugs and establishes policies and process to minimize the risk associated with the use of these drugs (Thrall T, 2006). The head nurses also reduce the risk of errors by standardizing the ordering , storage , preparation and administration of these products ; improving access to the high alert list , using auxiliary labels and automated alerts and employing redundancies such as automated or independent double check when necessary (Sanders B H et al , 1996) .

The head nurse role in managing the safety of high alert medications is currently seen as one of the hardest, most complex roles in healthcare (Thrall T, 2006). Nowadays, little is known about what head nurses are doing in practice to ensure and improve the safety of high alert medications. If head nurses roles are better understanding and well practicing, the health care organizations are able to anticipate and solve any errors that could arise in the future. Also, they achieve many benefits regarding the patient, nurses, and health care outcomes. Therefore, the present study is aimed to develop a new Egyptian questionnaire to describe strengths and weaknesses of head nurses role towards the nurses during practices of the safety of high alert medications in their units. Also, it aimed to identify factors influencing head nurse role in managing the safety of high alert medications.

MATERIAL AND METHODS

Study Setting: the study setting included 14 critical care units within the Alexandria University Hospitals.

Study design: a descriptive cross-sectional survey

Sample size: informed consent was obtained from 236 nurses to participate in the study after explaining the objective of the study to them.

Data collection: Data was collected by a questionnaire which included three parts:

- I. **First part:** is composed of demographic questions such as job title, age, years of experience in units and hospitals
- II. **Second part:** consists of a head nurses rating scale questionnaire developed by the researchers and based on literature review (Øvretveit J, 2005; Thompson PA et al, 2005; U.S Department of Health and Human Services, 2012; The Northern California Regional Medication Safety Committee, 2010; The Joint Commission Accreditation Hospital, 2015; Suzanne Graham S et al, 2008). The questionnaire study was used to describe head nurses role towards the nurses during practices of the safety of high alert medications in their units. It was tested by:

A. Validity

- **Content validity:** Content validity was measured by 5 experts. The experts evaluated the relevance of each item of the questionnaire by using Likert scale from 1 = not relevant to 4 = very relevant. The agreement among experts regarding the importance, appropriateness and clarity were calculated for each item. The mean scores of agreement with importance, appropriateness and clarity for each item were computed by content validity index (CVI) (Waltz CE et al, 1991; Waltz CF et al 1983). CVI was calculated based on the percentage of items rated as relevant by the experts. The items that do not achieve the 80% of agreement (i.e. $CVI < 0.80$) should be eliminated from the instrument. CVI of ≥ 0.80 indicated that questionnaire has high content validity. 12 items of total 42 questionnaire items were less than 0.80 and deleted. Finally, the 30 items of questionnaires were used in the study. This questionnaire was also translated into Arabic and back-translated into English.
- **Construct validity:** The construct validity was established by factor analysis using a Principle Component Analysis with Varimax Rotation. 30 questionnaire items were subject to factor analysis. Four factors and 25 items were extracted. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity for each factor were measured. Factor loading with a value less than 0.50 was not taken into analysis. Factors having Eigenvalue greater than one were retained.

B. Reliability

- **Internal consistency reliability:** The internal consistency of questionnaire was examined by cronbach's alpha. Total reliability of the questionnaire was 0.796 and subscale reliabilities of four factors ranged from 0.624 to 0.678.
- **Test-retest reliability:** Pilot testing of questionnaires involved 30 nurses who obtaining their informed consent. The purpose of the pilot test was to identify how much time is needed to finish the questionnaires and what problems are encountered during the pilot study. After 3 weeks, the questionnaires were distributed to the same 30 nurses again to examine test-retest reliability using Pearson's product moment correlation. Test-retest value was 0.768.

A five-point Likert scale was used to measure the nurses' perspectives as following: 1= head nurse performed her role, not as the item stated; 2= head nurse performed her role less as the item stated; 3= head nurse performed her role mild as the item stated; 4= head nurse performed her role moderate as the item stated; and 5= head nurse performed her role much likely as the item stated. All nurses' responses were estimated by anonymous and kept confidentially. The total score and the dimension scores were calculated and presented as the mean scores. The mean scores were categorized into four levels as follow: Poor = < 2.5 ; Mild = $2.5 - 3.4$; Moderate = $3.5 - 4$; and Good = > 4

III. **Third part:** include open question concerning factors influencing head nurses role in managing the safety of high alert medications in critical care units

Statistical Analysis: Data was analyzed through SPSS version 18 and as following: 1) percentages were applied to describe personal characteristics of nurses; 2) factor analysis based on Principle Component Analysis with Varimax Matrix for construct validity of questionnaire 3) internal consistency of questionnaire was measured by cronbach's alpha, and 4) Means were determined to describe head nurses role.

RESULTS

Table 1 showed that personal characteristics of nurses who participated in critical care units. It was clear from the table that 54.7% of nurses were practical nurses while 30.5% of nurses were professional nurses and 14.8% of them were a technical nursing diploma. Regarding nurses' age groups, 41.9% of nurses were in the age group ranging from 30 to less than 40 years while 4.7% of nurses were in the age group of 50 years and more. Concerning years of experience in the hospital about 31.9% of nurses had less than 10 years of experience in

nursing while only 26.2% had 20 years and more years of experience in Hospital. 51.7 % of nurses had less than 10 years of experience compared to 12.7% of nurses had 20 + years and more of experience in critical care.

Table 2 showed construct validity and cronbach’s alpha of head nurses role in managing the safety of high alert medications questionnaire. The table was illustrated that 25 items were extracting in four factors with 74.968 % of total variance according to factors analysis. These factors were management role (8 items), supervision and development role (5 items), patient care role (7 items) and evaluation (5 items) .Loading of factors ranged from 0.500 to 0.963. KMO value for the whole questionnaire was 0.707 and KMO value of four factors ranged from 0.510 to 0.617. Statistical significant of Bartlett’s Test of Sphericity was present. The consistency reliability for the whole tool was 0.796 and Alpha of four factors was 0.624 to 0.678.

Table 3 revealed mean scores of head nurses role in managing the safety of high alert medications. In this table according to nurses’ perception, the highest mean scores of management role were consulting with physicians and pharmacists about high alert medications (2.97 ± 0.451), guidelines to achieve safety high alert medications by double check with another nurse (2.96 ± 0.272) and list of high- alert medications to nurses (2.95 ± 0.325). The lowest mean scores of management role were the policy of high alert medications to all nurses (2.79 ± 0.582) and investigating errors and implementing corrective actions to prevent future errors (2.68 ± 0.618). Concerning supervision and development role, the highest mean scores were preparing medication in a safe and clean environment (3.17 ± 0.481) and following aseptic technique when handling high alert medications during their preparation and administration to patients (3.25 ± 0.293), while periodic education on types of errors, adverse effects and safe administration of high alert medications were recorded low mean scores (2.50 ± 0.299).

Regarding patient care role, the highest mean scores were reviewing medication prescription or orders for appropriateness (3.02 ± 0.420) and using the five rights methods (5 R) before drugs are given to patient (3.0 ± 0.358) while lowest mean scores were monitoring and communicating accurate patient medication information (2.85 ± 0.317). Concerning evaluation role, the highest mean scores were documentation of medication sheet including five rights methods (3.09 ± 0.430), reviewing and updating of the list and check the dispensing system of high alert medications in their units (2.95 ± 0.320) while the lowest mean scores were compliance with safe high alert medication practices (2.80 ± 0.659).

Table 4 represented mean scores of head nurses’ role categories in managing the safety of high alert medications. It was seen from the table that overall head nurses role in managing the safety of high alert medications was 2.90 ± 0.426 . The highest mean scores of nurses’ perception regarding head nurses roles were patient care role (2.95 ± 0.379) followed by management role (2.90 ± 0.437) and supervision role (2.92 ± 0.452) while the lowest mean score was evaluation role (2.87 ± 0.322).

Table 5 illustrated factors influencing head nurses role in managing the safety of high alert medications. It showed from the table that above seventy percent of nurses have the perception that time constraints, limited resources, low salary, the personality of head nurses did not aspire to be a manager, lack of incentive, and inability to continue education in professional development are factors that hinder nurses role in their units. Above fifty percent of nurses have the perception that lack of training in management and leadership, lack of support from top management, inappropriate and unprepared to a management position and nature of critical care unit while unable to carry management responsibilities and lack of management models were mentioned by above thirty percent of nurses.

Table (1): Personal characteristics of nurses who participated in the study

| Personal characteristics | No. = 236 | % |
|--|-----------|------|
| Job Title | | |
| Professional nurses | 72 | 30.5 |
| Technical Nursing Diploma | 35 | 14.8 |
| Practical nurses | 129 | 54.7 |
| Age | | |
| 20- | 83 | 35.2 |
| 30- | 99 | 41.9 |
| 40- | 43 | 18.2 |
| 50+ | 11 | 4.7 |
| Years of experience in hospital | | |
| < 10 | 75 | 31.9 |
| 10- | 99 | 41.9 |
| 20+ | 62 | 26.2 |
| Years of experiences in Critical Care | | |
| < 10 | 122 | 51.7 |
| 10- | 84 | 35.6 |
| 20+ | 30 | 12.7 |

Table (2): Construct validity and Cronbach's alpha of head nurses role in managing the safety of high alert medications questionnaire

| Head nurses role in managing the safety of high alert medications | Factor (1) | Factor (2) | Factor (3) | Factor (4) |
|---|-----------------|--------------------------------|-------------------|-----------------|
| | Management role | Supervision & development role | Patient care role | Evaluation role |
| Nurses receive directions regarding: | | | | |
| (12) policy of high alert medications | .963 | | | |
| (22) list of high- alert medications to nurses | .524 | | | |
| (24) goal of safety high alert medications based on hospital standards | .561 | | | |
| (7) guidelines to achieve safety high alert medications by using five rights methods (5 R) | .630 | | | |
| (9) guidelines to achieve safety high alert medications by double check with another nurse | .730 | | | |
| (5) Detailed planning for managing the safety of high alert medications process | .805 | | | |
| (1) Consulting with physicians and pharmacists about high alert medications | .875 | | | |
| (20) Investigating errors and implementing corrective actions to prevent future errors | .907 | | | |
| Nurses receive supervision regarding : | | | | |
| (21) the safety high alert medications during their practices | | .822 | | |
| (29) periodic education one types of errors , adverse effects , safe administration of high alert medications | | .639 | | |
| (27) Monitoring side effects of high alert medications | | .515 | | |
| (3) Preparing medications in a safe and clean environment | | .796 | | |
| (23) Following aseptic technique when handling high alert medications during their preparation and administration to the patients | | .963 | | |
| Nurses are followed up regarding : | | | | |
| (28) using the five rights methods (5 R) before drugs are given to patients | | | .896 | |
| (26) double- check of high alert medications with another nurse | | | .554 | |
| (10) Arranging drugs which look alike obviously | | | .500 | |
| (11) labeling high alert medications and medication containers (e.g. syringe , medicine cups & basin) | | | .926 | |
| (13) Monitoring and communicating accurate patient medication information | | | .700 | |
| (16) Reviewing medication prescription or orders for appropriateness | | | .798 | |
| (15) Storing look alike high alert medications separately from each other | | | .887 | |
| Nurses are evaluated and monitoring regarding | | | | |
| (30)compliance with safe high alert medication practices | | | | .662 |
| (25)incident reports particularly in high alert medication administration | | | | .896 |
| (2) the dispensing system of high alert medications in their units | | | | .907 |
| (8) reviewing and updating of the list | | | | .963 |
| (4) documentation of medication sheet including five rights methods | | | | .926 |
| Eigen values | 3.811 | 2.804 | 2.232 | 1.486 |
| % Variance Explained | 15.245 | 11.215 | 8.926 | 5.944 |
| Total % Variance Explained | 40.883 | 60.097 | 69.024 | 74.968 |
| KMO & Bartlett's Test of Sphericity for all items | .707 (.000) | | | |
| KMO & Bartlett's Test of Sphericity | .612(.000) | .510(.000) | .617(.000) | .517(.000) |
| Cronbach's Alpha of total scale | .796 | | | |
| Cronbach's Alpha | .663 | .635 | .624 | .678 |

Table (3): Mean scores of head nurses role in managing safety of high alert medications

| Head nurses role | Mean scores | SD |
|---|-------------|------|
| Management role: nurses receive directions regarding : | | |
| (5) policy of high alert medications | 2.79 | .588 |
| (6) list of high- alert medications to nurses | 2.95 | .325 |
| (7) goal of safety high alert medications based on hospital standards | 2.91 | .233 |
| (8) guidelines to achieve safety high alert medications by using five rights methods (5 R) | 2.85 | .654 |
| (9) guidelines to achieve safety high alert medications by double check with another nurse | 2.96 | .272 |
| (10) Detailed planning for managing the safety of high alert medications process | 2.94 | .358 |
| (11) Consulting with physicians and pharmacists about high alert medications | 2.97 | .451 |
| (12) Investigating errors and implementing corrective actions to prevent future errors | 2.68 | .618 |
| Supervision & development role :nurses receive supervision regarding : | | |
| (13) the safety high alert medications during their practices | 2.83 | .297 |
| (14) Periodic education one types of errors , adverse effects , safe administration of high alert medications | 2.50 | .299 |
| (15) Monitoring side effects of high alert medications | 2.75 | .391 |
| (16) Preparing medications in a safe and clean environment | 3.17 | .481 |
| (17) Following aseptic technique when handling high alert medications during their preparation and administration to patients | 3.25 | .293 |
| Patient care role : nurses are followed up regarding : | | |
| (18) using the five rights methods (5 R) before drugs are given to patients | 3.0 | .358 |
| (19) double- check of high alert medications with an another nurse | 2.99 | .466 |
| (20) Arranging drugs which look alike obviously | 2.96 | .513 |
| (21) labeling high alert medications and medication containers (e.g. syringe , medicine cups & basin) | 2.91 | .346 |
| (22) Monitoring and communicating accurate patient medication information | 2.85 | .317 |
| (23) Reviewing medication prescription or orders for appropriateness | 3.02 | .420 |
| (24) Storing look alike high alert medications separately from each other | 2.98 | .389 |
| Evaluation role: nurses are evaluated and monitoring regarding | | |
| (25) compliance with safe high alert medication practices | 2.59 | .593 |
| (26) incident reports particularly in high alert medication administration | 2.80 | .659 |
| (27) the dispensing system of high alert medications in their units | 2.94 | .580 |
| (28) Reviewing and updating of the list | 2.95 | .320 |
| (29) documentation of medication sheet including five rights methods | 3.09 | .430 |

Table (4): Mean scores of head nurses' role categories in managing the safety of high alert medications

| Head nurses role | Mean | SD |
|--------------------------------|-------------|-------------|
| Management role | 2.90 | .437 |
| Patient care role | 2.95 | .379 |
| Evaluation role | 2.87 | .322 |
| Supervision role | 2.92 | .452 |
| Overall head nurse role | 2.90 | .426 |

Table (5): Factors influencing head nurses role in managing the safety of high alert medications.

| Factors influencing head nurses role in managing safety of high alert medications | N=236 | % |
|---|-------|------|
| 1. Time constraints | 220 | 93.2 |
| 2. Limited resources | 196 | 83.1 |
| 3. Lack of training in management & leadership | 157 | 66.5 |
| 4. Lack of support from top & middle management | 157 | 66.5 |
| 5. Inappropriate & unprepared to management position | 118 | 50.0 |
| 6. low salary | 207 | 87.7 |
| 7. Lack of incentives | 177 | 75.0 |
| 8. Inability to continue education in professional development | 177 | 75.0 |
| 9. Unable to carry management responsibilities | 88 | 37.3 |
| 10. Lack of management models | 77 | 32.6 |
| 11. The personality of head nurses did not aspire to be manager | 198 | 83.9 |
| 12. Nature of critical care units | 125 | 53.0 |

DISCUSSION

The role of the head nurse in the critical care nursing area not only provides administrative and clinical leadership but also has 24-hour accountability for all patient care activities in the unit and monitoring and evaluation patient outcomes. Therefore, head nurses role is important because it is the direct link between the administrative duties and the direct care provider (Sanders B H et al, 1996; Sanders B H, 1996; Thrall T, 2006; Sullivan E, 2009). Medication safety is an important part of patient care activities (Lin Lin H et al, 2009). Effective head nurses role in high alert medications is essential to ensure patient safety, better health outcomes and greater patient satisfaction. The present study aimed to develop an Egyptian questionnaire to describe the role of head nurses towards the nurses during practices of the safety of high alert medications and identify the factors influencing these roles.

Construct validity of an Egyptian questionnaire was established by factor analysis using a principal component analysis method (**Table 2**). The findings of the present study presented that the factor analysis extracted four factors and accounted for 74.968% of the variance. These factors were a managerial role (8 items), supervision and development roles (5 items), patient care roles (7 items) and evaluation roles (5 items). This means that all the four factors were unifactorial and it confirms that the questionnaire has construct validity. Also, there was a strong correlation between four factors and interrelation between them indicated by highly loading factors (loading factor ranged from 0.500 to 0.963). KMO values for each factor were calculated separately and they were seen as satisfactory with positive and significant of Bartlett's test of sphericity. KMO showed adequacy and appropriateness of sample size (**Table 1**). The results of the present study were congruent with Peet et al (2003)⁽²²⁾ and Kaiser (1974)⁽²³⁾ recommendation. Eigenvalue of this questionnaire confirmed with Torbica (1997)⁽²⁴⁾ who reported that "the number of components determined has been based on the criterion that the Eigenvalue for each component must be more than one"

The reliability of the analysis of the questionnaire was determined by the cronbach's alpha (**Table 2**). The Cronbach's of the questionnaire was 0.796 and alpha for all factors was within acceptable range. It was indicated that there was an interlink between questionnaire items. Reliability can be considered as internal consistency, this is the degree of inter-correlation within the items which compromises the scale (Nunnally JC et al, 1994). The present study proved that the suitability of a factor analysis solution, the items in a questionnaire scale describe the role of head nurses in managing the safety of high alert medications and this questionnaire can be generalized in Egyptian hospitals to identify this role.

Head nurses roles are the front line fire-fighting service of the nursing care. They have three main areas namely: patient care management to ensure that patient total needs are met; staff development and supervision to utilize, guide, evaluate; and directing staff nurses in their nursing practice; as well as management role to ensure its smooth running to fulfill hospital goals (Hermina M et al , 2003 ; Walsh M et al ; 2007). Head nurse's role is to coordinate all unit activities to achieve positive outcomes for the organization and the patient (Tumulty G, 1992; Chase L, 2010). Therefore, head nurses empower and influence patient care in their units. They can greatly influence the success of high alert medications safety because of their management, supervision, and development, patient care and evaluation roles at the unit level. The present study revealed that the overall head nurses role in managing the safety of high alert medications was mild (**Table 4**). Evaluation role had slightly lowest mean scores compared to mean scores of management, supervision and development and patient care roles (**Table 4**).

Management was the first role of head nurses in managing the safety of high alert medications. The items in this role reflected slightly acceptable of the head nurses' ability to set double check guidelines of high alert medications; set planning for managing the safety of high alert medications process and controlling process of high alert medications. The slight adequacy of controlling process was represented in mild investigations of errors and implementation of corrective actions to prevent future errors (**Table 3**).

Head nurses play a key role in controlling the flow of patient information, providing support to nurse, interpreting and implementing policies and standards , a conduit of communication between upper management and the bedside staff and solving nurses' complaints at the unit-level (Chase LK , 2010 ; Tongmuangtunyatep K et al ,2015; Thorman KE et al , 2006; Nadzam DM, 2009). The results of present study found that the head nurses role was faintly sufficient to directing of staff, this was indicated by a little adequacy of communicating the policy, list and guideline of high alert medications to nurses as well as vaguely suitable to communication of goals of safety of high alert medications based on Egyptian hospital accreditation standards to nurses (**Table 3**). Also, the head nurses had quietly sufficient coordination and organization with physicians and pharmacists regarding this issue. This was indicated by slightly sensible consultation with them regarding high alert medication process (**Table3**).

The second role was supervision and development of staff. It comprises a monitor, supervise and educate staff in the safety of high alerts medications process (**Table 3**). Marriner (1995)⁽³⁴⁾ emphasized that development and supervision of staff nurses is one of head nurses' duties and responsibilities. The finding of the present study represented that the head nurses in the study units had a less considerable role in using supervision,

education, and monitoring skills which are essential for the safety of high alert medications. Head nurses have a responsibility to supervise and teach their staff how to implement the safe high alert medications process. The safe high alert medications process includes the correct communication of prescription order, labeling high alert medications, safely storage, safely administration and monitoring side effects and reactions. The results of the current study were congruent with the study in Mansoura University Hospital in 2007 which revealed that the most of the head nurses followed patient- centered activities like administering medication, exchange information related to patient and provide direct care (Mostafa GM et al , 2007).

In the present study, there was a prudent head nurse role concerning check medication prepared in a safe and clean environment and check nurses follow aseptic technique when handling high alert medications during preparation and administration to the patient (**Table 3**).

The third role was patient care; it had items reflecting the nursing care during implementing high alert medications process (**Table 3**). This affects the health of patients in units. The present study indicated that the head nurses were mildly guiding all nurses for labeling high alert medications and medication containers (e.g. syringe, medicine cups & basin) and monitoring and communicating accurate patient medication information. In the same field, there was reasonable role of head nurses regarding emphasis for all nurses to use five rights methods (5 R) before drugs are given to patient, review medication prescription or ordered for appropriateness, encourage all nurses to do double- check with a second nurse and storing look alike high alert medications a separate from each other and arrange drugs which look alike obviously (**Table 3**).

The fourth role was evaluation role which refers to the ability of head nurses to evaluate staff during implementing safety of high alert medications process .The items of this role reflected a little tolerable role of head nurses regarding monitoring of the staff nurse compliance with safe high alert medication practices , audit the incident report particularly in high alert medication administration, check the dispensing system of high alert medications in their units, reviewing and updating of the list . Moreover, there was the practice of evaluating the documentation of medication sheet including five rights methods (**Table 3**).

The results of the present study proved that the mild role of head nurses in managing the safety of high alert medications was not only caused by the direct head nurses' act, but a range of organizational system and managerial factors could play a role. The barriers that hinder head nurses role in managing the safety of high alert medications from perspectives of nurses in this study were time constraint, limited resources, lack of training in management and leadership, lack of support from top and middle management, inappropriate and unprepared to management position, limited salary and incentives, inability to continue education in professional development, lack of management models , the personality of head nurses did not aspire to be manager , unable to carry management responsibilities and unique nature of critical care units (**Table 5**).

The nurses in the study units felt that head nurses were overloaded with management duties and tasks such as arranging the work schedules, staff assignment, doing management paperwork, housekeeping activities and resolve conflicts between nurses themselves and physicians. Moursi (2007) argued that head nurses were consistently under pressure from trying to maintain a balance between clinical practice and managerial responsibilities. Therefore, the effort of head nurses was torn in many directions, no time to build supportive relationships with their staff to improve the work environment and spend less time to become engaged in patient care.

These results are in accordance with a study conducted in Assiut University Hospital in 2015 where it was found that time spends in patient -centered activities were limited and nurse manager spends more time in the clerical task than other activities (Rashed S AE et al ,2015) . Similar findings were also reported by several studies conducted in Alexandria University Hospital and Mansoura University Hospitals from 2002 to 2009 where head nurses were under work stress that a gave a limited time to spend in guidance and encouraging staff, teach staff, develop new skills, and participating in training program of their staff (Mostafa GM et al , 2007 ; Mohamed N et al , 2002 ; Mostafa HW , 2005 ; Aly N , 2009) .

Nursing staff always see their managers as a role model (Mostafa HW, 2005). So, the head nurses should develop better relationships and a better understanding of the problems that face nurses during their work to improve the safety of high alert medications (Stewart L et al, 2010). Nurses want more communication with management about the allocation of resources and the creation of an environment that is conducive to high-quality care (Sanders B H et al , 1996) . Head nurses know that they cannot do work alone and need to cooperate with their staff (Moursi RA, 2007 ; Stewart L et al , 2010) .

Nurses also believed that the head nurses felt frustrated and stressed due to lack of resources, lack of support for their own career development and limitation of salary and incentives. The nurses felt that head nurses get little support from the top and middle management. Hospital management system did not give much support to potential head nurses. There was the insufficient providence of management or leadership training. This may be lead to the head nurses become inappropriate and unprepared to act as role model and set a personal example of what they need and create a supportive environment to a achieve medication safety goal. These findings were agree with other studies from 2005 to 2015 in other countries where they identified that the head nurses face

difficulties to connect their knowledge and skills with patient care when holding the head nurse position (Filej B et al , 2009 ; Meretoja R et al , 2004 ; Tongmuangtunyatep K et al 2015).

According to Curry (1994), head nurses should be prepared with special continuing education programs to hold the position of the head nurse especially those related to different roles of the head nurse, different abilities that should be possessed, and a variety of skills needed to accomplish their duties and responsibilities. These results of the present study conform to those of a Mansoura University Hospital in 2007 which insisted on the importance of education training for head nurses because training will enhance their ability to apply managerial skills to ensure their staff follows policies of hospitals (Mostafa GM et al , 2007) . Similar results were reported in two studies in Slovenia in 2009 and USA in 1994 (Filej B et al , 2009 ; Curry J , 1994).

Another contributing factor identified in the present study was specific nature and the unique structure system of critical care units (**Table 5**). These units included high- risk patients and widely varying diagnosis with long stay. Patients in study units are a vulnerable group because they receive multiple intravenous high alert medications. The head nurses in study units are responsible for rapid responses to patient care and controlling quality of nursing care. Generally, the critical care units in any hospital are large and highly structured systems that require greater preparation for taking over a head nurse's position from the viewpoint of functional management and leadership to direct patient care (Filej B et al,2009) . Similar findings were also reported by several other studies in Egypt from 2002 to 2014, two studies in Jordan in 2002 and in Kuwait in 1995 (Aly N , 2009 , Abo El-Maged N et al , 2002 ; Al-Momani M , 2002 ; Al-Youssef AS et al , 2013 ; Samy R et al , 2014 ; Al-Kandari F et al , 1998).

CONCLUSION

This study shows the role of head nurses in managing the safety of high alert medications was mild. Both validity and reliability analysis of the developed questionnaire have been conducted and it has been concluded that the developed questionnaire is acceptable reliable and valid. This can be applicable to describe head nurses role in managing the safety of high alert medications.

The present study also revealed that the head nurses are seen as a key to the successful safety of high alert medications in critical care units. Head nurses should enhance their managerial capabilities and personality through clinical and management continuous education. As a consequence of better education and training of head nurses, they will be more and more competent in managing the safety of high alert medications in their units.

The head nurses should have more managerial support to manage patient care and be provided with resources to educate their staff. The head nurses have a role model for staff to manage patient care. Head nurses are instrumental in role modeling and setting expectations for staff nurses regarding the importance of safety of high alert medications and high- quality of patient care. The head nurses should have enough time to contact and support their staff to improve their work. Any factors that hinder the role of head nurses should be eliminated and any problems should be solved to help them carry out their vital role in managing the safety of high alert medications.

Further research: It would be useful to carry out further research to assess head nurses role in managing the high alert medications from perspectives of head nurses by using the same tool. This research could ensure the applicability of the questionnaire in assessment of the role of head nurses in managing the safety of high -alert medications in critical care units.

REFERENCES

- Abo El-Maged N, El-Shemy, Gaber E, El-Maghraby M (2002). Relationship between work setting and the occurrence of medication errors among nurses of Assiut University Hospital, Assuit Med.J, 26 (3): 55-66.
- Al-Kandari F, Ogundeyin W (1998). Patients' and nurses' perceptions of the quality of nursing care in Kuwait, Journal of Advanced Nursing, 27(5): 914-21.
- Al-Momani M (2002) . Quality of nursing care provided in the neonatal intensive care unit of Princess Badi Teaching Hospital, Jordan Doctor thesis of High Institute of Public Health, Alexandria University.
- Aly N (2009) . Drug administration errors and their determinates in Intensive Care Units of El-Shatby Pediatric University Hospital in Alexandria. Ph.D. in Public Health sciences (Hospital Administration), High Institute of Public Health, Alexandria University.
- Al-Youssef AS, Mohamed KL, Mohamed SN (2013) . Nurses' Experiences toward Perception of Medication Administration Errors Reporting, Journal of Nursing and Health Science, 2013; 4(1): 56-70.
- Byers fJ, White S (2004). Patient safety: Principles and practice .1st ed. New York: Springer publishing company, p.28.
- Chase L (2010). Nurse Manager Competencies. JON, 24 (45): 56-64.

- Chase LK (2010). Nurse Manager Competencies. The Doctor of Philosophy degree in Nursing in the Graduate College of The University of Iowa. Available at: <http://ir.uiowa.edu/etd/2681/> (Accessed : 23 August 2015)
- Corcoran J, Duncan J (2007). Pediatric high alert medications: Evidence -based safe practices for nursing Professionals' .1st ed. USA: Saint Paul MN.
- Curry J (1994) . Nurse Practitioners in the emergency department: Current Issue, Journal of Emergency Nursing, 20(3): 207- 12.
- Egyptian Healthcare Accreditation Organization. Standards for Hospitals (.April 2013) .Ministry of Health and Population. 2nd ed. Egypt: Ministry of Health and Population Training and Research Sector.
- Filej B, Skela-Savič B, Vicić V, Hudorović N (2009). Necessary organizational changes according to Burke–Litwin model in the head nurses system of management in healthcare and social welfare institutions—The Slovenia experience, Health Policy, 90(3):166-74.
- Hermína M, Nabawy Z, Baddar F (2003). Head Nurses Perception and Performance of the Elements Promoting Effective Team Work, Bulletin Alexandria Scientific Nursing Journal, 2(2): 85- 101.
- Institute for Healthcare Improvement (2008). Getting Started Kit: Preventing Harm from High-Alert Medications. Available at: www.cha.com (accessed: 4 August 2015)
- Joint Commission International a division of joint Commission resources (2008) . Joint Commission International Accreditation standards for Hospital. 3rd ed. USA: Joint Commission Resources, Inc (JCR); P 31-3. Available at: <http://www.jointcommissioninternational.org/Programs-Hospitals/> (Accessed: September 2015)
- Kaiser HF (1974) . "An index of Factorial Simplicity". Psychometrika , 39: 31-6.
- Kizior RJ, Hodgson B (2015) . Saunders nursing drug handbook. New York: W. B. Saunders Co.
- Lin Lin H, Che Lee W, Ting Huang M, Hui Hsiao W, Chi Kuo L, Man Chan H, Nong Lin J, Hsien Chuang Y (2007). Factors Influencing the Competency of Head Nurses When Assisting With In -hospital Cardiopulmonary Resuscitation, TZU CHI MED J, 21 (3): 185-275.
- Marriner, A (1996) . Guide to nursing management. 5th ed. Philadelphia: St.Louis, the C.V. Mosby Co., 183-5.
- Meretoja R, Leino-kilpi H, Kaira A (2004). Comparison of nurse competence in the different hospital works environments, Journal of Nursing Management, 12: 329–36.
- Mohamed N, El -Bialy G. , Hassan A (2002) . Managerial skills of the head nurses at Mansoura University, Bulletin of Alexandria Faculty of Medicine, 38(1): 23-30.
- Mostafa GM, Mohamed N, Mahmoud HG (2007) . Job description for Head Nurses in Surgical Units at Mansoura University Hospital. ASNJ, 6 (2) .15-22
- Mostafa HW (2005) . The relation between head nurses' leadership styles and their nurses' job satisfaction. Master thesis. Faculty of Nursing, Alexandria University.
- Moursi RA (2007). The relationship between leadership behavior of head nurses and nurses' organizational commitment. Master degree of nursing sciences (Nursing administration). Faculty of nursing, Alexandria University.
- Nadzam DM (2009) . Nurses' Role in Communication and Patient Safety, J Nurse Care Qual, 24 (3): 184–8.
- Nunnally JC, Bernstein RL (1994). Psychometric theory. 3rd ed. New York: McGraw-Hill.
- Øvretveit J (2005). The Leaders Role in Quality and Safety Improvement: A review of research and guidance. Fourth Report. Available at : <http://www.ihl.org/resources/Pages/Publications/TheleadersroleinqualityandsafetyimprovementAreviewofresearchandguidance.aspx> (Accessed : 3 May 2015)
- Parand A, Dopson S, Renz A, Vincent C (February 25, 2016). The role of hospital managers in quality and patient safety: a systematic review. BMJ, 1-15.
- Pett MA, Lackey NR, Sullivan (2003). Making sense of factor analysis. Thousand Oaks CA: Sage Publications.
- Rashed S AE, Al Torky MA, Morsy MS (2015) . Performance of head nurses management functions and its effect on nurses' productivity at Assiut University Hospital, IOSR Journal of Nursing and Health Science, 4(5):38-49.
- Robert A, Wylie C, Gaudett V, Harris J, Dell D, Hinckley C, Macfarlane C (2008). High alert medications: Strategies for improving safety. USA: Joint Commission Resources, Inc (JCR), P. 34, 134.
- Samy R, Kalil N, Youssef W (2014). High alert medications: Assessment of nurses' knowledge and practice among critically ill patients. 1st ed. Germany: Lambert Academic Publishing.
- Sanders B H, Davidson AM, Price S A (1996). The impact of nursing leadership on patient safety in a developing country, Nursing Management, 27(1):42-45.
- Sanders B H, Davidson AM, Price SA (1996) . The impact of nursing leadership on patient safety in a developing country, Nursing Management, 27(1): 42-5.
- Stewart L, Usher K (2010). The impact of nursing leadership on patient safety in a developing country, Journal of Clinical Nursing, 19: 3152–60.

- Sullivan E (2009). Leadership, and management. 3rd ed. Philadelphia: Spring House Corporation.
- Suzanne Graham S, Clopp MP, Kostek NK(2008) . Implementation of a High-Alert Medication Program, The Permanente Journal, 12 (2): 15-22
- The Joint Commission Accreditation Hospital (2015) . Hospital National Patient Safety Goals. Available at : <http://www.jointcommission.org/> (Accessed : 4 May 2015)
- The Northern California Regional Medication Safety Committee (2010). Medical center administrative policy and procedures; 2010. Available at : <http://www.chps.org/sites/main/files/file-attachments/201004s2.pdf>.(Accessed : 25 April 2015)
- Thompson PA, Navarra BM, Antonson N (2005). Patient safety: four domains of nursing leadership, Nursing economics, 23 (6): 331.
- Thorman KE, Capitolo KL , Dubow J , Hanold K , Noonan M , Wehmeyer J (2006) . Perinatal Patient Safety From the Perspective of Nurse Executives: A Round Table Discussion, JOGNN, 35 (3): 409-16.
- Thrall T (2006) . Nurturing your nurse managers. *H&HN: Hospitals and Health Networks*, 80(4): 71-4.
- Tongmuangtunyatep K, Kunaviktikul W, Nantsupawat R, Akkadechanunt T (2015) . Development of a Competency Assessment Scale for Head Nurses in Community Hospitals, Pacific Rim Int J Nurs Res, 19 (2): 123- 34.
- Torbica ZM, Stroh RC (1999) . The impact of Total Quality Management on Home Buyer Satisfaction. *J,Construction Engineering and Management*, 125 (3):198-203.
- Tumulty G (1992) . Head nurse role redesign, improving satisfaction and performance , *JONA*, 22(2):41-48.
- U.S Department of Health and Human Services (May 2012) . Implementation guides to reducing harm from high-alert medications, May 2012. Available at: http://www.ihconline.org/UserDocs/Pages/HRET_HEN_Change_Packages_AllMay2012.pdf. (Accessed : 20 February 2015)
- Walsh M, Kent A (2001). Accident and emergency nursing. 4th ed. Philadelphia: J.B. Lippincott Williams Wilkins, p. 48- 56.
- Waltz CE, Strickland OL, Lenz ER (1991). Measurement in nursing research. 2nd ed. Philadelphia: EA. Davis Company.
- Waltz CF, Bausell RB (1983). Nursing research: Design, Statistics, and Computer Analysis. 2nd ed. Philadelphia: FA Davis Company.