Effect of a Nursing Training Program about Anticoagulant Therapy on Nurses knowledge and Practices at Orthopedic Surgical Units

Abeer Mohamed EL-Shatby Moursy[1] NaglaaFathallaElsayed[2]

[1]Assistant professor, Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt

[2]Lecturer, Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt

Abstract: Patients who have had major orthopedic trauma of the lower extremities are among those at highest risk for DVT which can result in a fatal pulmonary embolism (PE). Thus, anticoagulants are agents that prevent the formation of blood clots, by affecting blood coagulation factors. Objective: To determine effect of a nursing training program about anticoagulant therapy on nurses knowledge and practices at orthopedic surgical units. Setting: The study was conducted at all orthopedic surgical departments at El-Hadara Orthopedic and Traumatology Hospital, Alexandria University. Subjects: 50 nurses were involved in direct patient care and responsible for administering patient's medications. Tools: Two tools were used to elicit the necessary data; orthopedic nurses' knowledge about anticoagulants structured interview schedule and orthopedic nurses' practices administering anticoagulants observational checklist. Results: It was found that the majority of the studied nurses had poor knowledge score before application of the nursing training program, while, after one and 3 months results showed marked improvement in their knowledge post application of nursing training program with significant difference throughout the study period (P =0.000).Also, It was found that all the studied nurses had poor practice score before application of nursing training program, while, after one and 3 months results showed marked improvement in their practice post application of nursing training program with significant difference throughout the study period (P =0.000). Conclusion: The provision of nursing training program about anticoagulant therapy showed improvement on the orthopedic nurses' knowledge and practice than before its application. Recommendations: Develop medication safety policies and procedures that enhance the ability of healthcare workers to use anticoagulants safely and use of standardized practices in the hospital setting

Keywords: Orthopedic surgery, nursing training program, anticoagulants therapy, nurses' knowledge and practice.

1. INTRODUCTION

Anticoagulants are one of the most widely prescribed drugs in the world. They are indicated for prophylaxis and treatment of venous thrombosis and its extension, pulmonary embolism (PE). Patients who have had major orthopedic trauma of the lower extremities are among those at highest risk for DVT and can result in a fatal pulmonary embolism (PE)[1]. In the United States, DVT and PE result in up to 600000 hospitalizations a year and nearly 50000 individuals die annually as a result of PE. Deep vein thrombosis is reported to occur in 66% of patients with lower extremity fractures [2].

Venous thromboembolism (VTE) is a potentially life threatening complication in patients undergoing orthopedic surgery and is associated with morbidity, mortality and health care expenditure [3]. The main etiology of VTE is release of thromboplastin from the soft tissue and bone during the process of dissection which increases the risk for high rates of DVT. Added to this is the venous stasis during the operation, as well as the postoperative bed recumbence [4].Thus, anticoagulants are agents that prevent the formation of blood clots, by affecting blood coagulation factors. The mechanism of action of anticoagulation varies depending on the agent. Patients taking anticoagulants often continue taking the medications after they leave the hospital [5].

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: **www.noveltyjournals.com**

Anticoagulation therapy is a lifesaving drug that has many benefits, but also is associated with frequent and serious Adverse Drug Events (ADEs) in both inpatients and outpatients [6]. Lack of standardized dosing guidelines and appropriate monitoring can lead to serious harm associated with this class of medications. There is considerable variation in the dosing and monitoring of patients on unfractionated heparin [7]. Nurses have a unique role in caring of patients who had taken anticoagulant therapy. Nurses' roles include carefully assess and closely monitor of laboratory values is essential to maintaining the balance between under-coagulation, which can result in development of clots, and over-coagulation, which increases the risk of bleeding and hemorrhage(8). Dosages require adjustments, sometimes frequently, but adjustments must be made carefully and with a variety of data in mind, including laboratory values for coagulation and renal function, diet, clinical condition, weight, and age (9).

Medication administration to patients is a part of clinical nursing practices with high risk of errors occurrence. Literature review revealed that some of the common errors that occur are nursing errors. Lack of nurse's knowledge about anticoagulation therapy, its side effects, drug interactions, food interactions, drug precautions, importance of laboratory testing, and follow up. In addition, incorrect dosages, improper mixing and overly rapid infusions are the commonest medication errors. [9, 10 -13]. Reports of accidental deaths and overdosing due to the improper use of anticoagulants have received significant public attention. Anticoagulants have been identified as one of the top five drug types associated with patient safety incidents in the United State [14]. In the United Kingdom, anticoagulants are one of the classes of drugs commonly associated with fatal medication errors. Heparin has been one of the most commonly reported products involved in errors overall and one of the leading medications involved in harmful errors [15].

Nurses are responsible for ensuring the safety and quality of patient care at all times [16]. So to help nursing staff to safeguard their practices with a high alert medication from any errors necessitates continuously equipping nurses with adequate knowledge and skills in order to ensure patients' safety and reduce probability of complications development [17]. Finally, effective education program is a central part of the practice of nurses among all health professionals because it helps to ensure safe and effective anticoagulant administration.

Aim of the study

The study aimed to determine the effect of a nursing training program about anticoagulant therapy on nurses' knowledge and practices at orthopedic surgical units.

Research hypotheses

1- Orthopedic nurses' knowledge level about anticoagulant therapy after attending the nursing training program is higher than that before their attendance.

2- Orthopedic nurses' practice level about administration of anticoagulant therapy after attending the nursing training program is better than that before their attendance.

2. MATERIALS AND METHOD

Materials

Design: It is a Pre/post- test one group quasi-experimental research design.

Setting: The study was conducted at the inpatient orthopedic surgical departments at El-Hadara Orthopedic and Traumatology Hospital, Alexandria University. There were 4 wards (A&B male wards and A&B female wards)**.** Bed capacity in each ward was approximately 50 beds with total beds 200.

Subjects: The study comprised all available nurses approximately 50 nurses who were involved in providing direct patient care and responsible for administering medications. The study subjects 50 nurses were distributed as follows: 17 nurse from ward (A) male, 17 nurses from ward (A) female, 8 nurses from ward (B) male and 8 nurses from ward (B) female.

Tools of the study: Two tools were developed by the researcher and used for the purpose of data collection:

TOOL I: This tool consisted of two parts.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: **www.noveltyjournals.com**

Part I: this part of the questionnaire included 8 items related to biosociodemographic and nurses profile data such as age, sex, the department, nurses' qualifications, years of experience, nurse to patient ratio, number of work hours and attendance of any training program in relation to medications.

Part II: Orthopedic nurses' knowledge about anticoagulants structured interview schedule: This tool was developed by the researcher after reviewing the current national and international related literature [7, 18, 19, 20 - 22] to assess nurse's knowledge about anticoagulant therapy. The questionnaire included 25 open and closed questions. 5 questions related to anticoagulants indications and contraindications information, 5 questions about measures to be taken before anticoagulants administration, information about drug side effects this included 4 questions, and the remaining 11 questions were used to assess general instructions during management with anticoagulants.

Scoring system: In relation to nurses knowledge answers were scored on three points Likert scale as the following:

- Don't know or incorrect answer =0

- Correct incomplete answer =1

- Correct complete answer = 2

The minimum score nurses could receive was 0 while the maximum was 50. Then total scores for nurse's knowledge were converted to percent then classified as the following:

- More than 75% categorized as good level of knowledge.

- Less than 75-50% categorized as fair level of knowledge

- Less than 50% categorized as having poor knowledge

TOOL II

Orthopedic nurses practices during administration of anticoagulants observational checklist: This tool was developed by the researcher after reviewing the current national and international related literature [9, 19, 20, 22 - 24].It was used to assess the nurses practices regarding anticoagulant therapy administration for orthopedic patients .This tool included (15) items. These items consisted of two sections:

Section I: It comprised of items related to drug preparation and administration. It includes five parts:

Part one: this part included items related to nurse preparations such as: check physician written orders, medication rights, and wash hands.

Part two: this part included items related to medication preparation such as: check the expiry date of drug, preparing equipment and supplies, preparation of ampoule such as: wipe the neck of the ampoule with antiseptic swab, hold the ampoule in non-dominant hand, lightly tap the top chamber until all fluid flows into the bottom chamber, place cotton sponge around the neck of ampoule, and medication withdrawing such as: choose suitable syringe, remove the syringe from its package, twist the attached needle to make sure it is firmly in place.

Part three: this part included items related to patient preparations such as: check patient name, obtain complete health history include allergies, drug history and possible drug interaction, assess baseline coagulation study, assess blood pressure and assess history of bleeding disorder.

Part four: this part included items related to environmental preparations such as: close the door and the windows, ask visitors to leave the room and check lighting.

Part five: this part included items related to administration of anticoagulant therapy such as select the site of injection, site preparation, subcutaneous injection performance (remove the needle cap, holding the needle with dominant hand, inject with a 90°angle), safe discarding of needle and syringe.

Section II: It comprised items related to recording and reporting which includes patient name, route, dose, allergy, adverse drug reactions, and drug interactions if present.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: **www.noveltyjournals.com**

Scoring system:

Items in this tool consisted of several practices and steps that were checked and scored on a 3 point likert rating scale ranging from:

- **Correct complete practice**=2.

- **Correct but incomplete practice**= 1.

- **Not done/incorrect practice**=0.

The total score summed up to give a total score, ranging from 0 to 30 and converted into percent nurses practice evaluated as the following:

- Those who have a practice score more than 75% categorized as having good level of nursing practice.

- Those who have a practice score less than 75-50% categorized as fair level of nursing practice.

- Those who have a practice score less than 50% categorized as having poor level of nursing practice.

Methods

-An official letter from the faculty of nursing was submitted to the director of the El-Hadara Orthopedic and Traumatology Hospital, Alexandria University after explanation of the purpose of the study.

-Tools of the study were developed by the researchers after extensive review of relevant literature.

-Content validity of the study tools were ascertained by a jury of 5 experts in the fields of medical surgical nursing and necessary modifications were done accordingly. – Tools were tested for reliability by using Cronbach Alpha Coefficient Test tool I (r= 0.727) and of tool II (r= 0.842).

-Pilot study was carried out on 10% of the study sample to assess clarity and applicability of the tools. Those samples were excluded from the study subjects.

-**Data collection**: Data were collected during period starting from the first of January 2018 to the end of May 2018.Each nurse was interviewed individually to collect the necessary data. It took approximately 20-30 minutes to complete part I of tool I. The study was carried out through four phases: assessment phase, planning phase, implementation phase and evaluation phase.

I- **Assessment phase**: On admission the researcher built therapeutic communication with nurses to get cooperation after explaining the purpose of the study. In the initial assessment a pre-test was distributed among nurses to measure knowledge about anticoagulant therapy by using tool I. It took approximately 45-60 minutes. The nurses' practice was observed individually during preparation of medications and its administration throughout morning and afternoon shift by using tool II. This phase lasted for 2 weeks.

II- Planning phase: Based on the results of assessment phase and the review of related literature, the nursing training program was developed, the objective of training program was established to improve orthopedic nurses knowledge and practice about anticoagulant therapy.

Various teaching methods were used in the form of group discussion, demonstration and interactive discussion. Teaching aids and guides, including power point slides and handouts were purpose prepared and utilized.

III- Implementation Phase: During the implementation phase, nurses were interviewed in the conference room at morning shift from 10 to 12 Pm. Nurses were divided into five groups (10 nurses per each group) .The nursing training program was implemented in 2 successive sessions,2 times /week for 5 weeks. Each group of nurses attended 2 sessions. Each session took 120 minutes, the first 30 minute for knowledge and the remaining 90 minute for practices and skill demonstration. Firstly, discussion of the session objectives and content were dedicated. Then time was available for nurses' participation and interaction. Each session was followed by a summary of knowledge presented about anticoagulant therapy for about 15 minutes. Different methods of instructions and teaching aids mentioned before were used.

The first session consisted mainly of theoretical aspects of anticoagulant therapy included: information about anticoagulant action, indications, dosage, laboratory tests, contraindication, side effects, precautions and patients' measures to deal with these side effects, drug-food interactions, drug-drug interactions, and importance of follow up and nursing role.

The second session consisted mainly of practical aspects for administration of anticoagulant therapy: it included nurse preparations, medication preparations, patient preparations and environmental preparations. Also, steps followed during administration of anticoagulant therapy .In addition recording and reporting after administration of anticoagulant therapy.

<u>**IV- Evaluation phase**</u>: Post- implementations of the nursing training program, evaluation were done 3 times for each group using the same tool I,II of pre-test as post-test, after one month and after 3 months. Comparison of pre and post results was carried out using appropriate statistical analysis in order to determine the effect of nursing training program about anticoagulant therapy on nurse's knowledge and practice among orthopedic patient.

Ethical Considerations

Informed written consent of the nurses was obtained after explanation of the aim of the study. Privacy and anonymity was maintained for all participants. Confidentiality of the collected data was assured. Participation in the research was voluntary. Right to withdraw from the study at any time was confirmed.

Statistical analysis of the data

After data collection, they were coded, transferred into a specially designed format to be suitable for computer feeding, then entered, checked, and verified to avoid any error during data entry. Statistical analysis was performed using Statistical package for Social Sciences (SPSS version 20). The level of significance selected for this study was p equal to or less than 0.05.

The used tests were

1 - Chi-square test: For categorical variables, to compare between different groups

2 - Pearson coefficient: To correlate between two normally distributed quantitative variables

3- Mean score percentage (No and %) were used for describing and ranking the qualitative data.

3. RESULTS

Table (1): shows frequency distribution of the studied orthopedic nurses according to their biosociodemographic and nurses profile data. The majority of the studied nurses were female and their aged ranged from 40 to less than 50 years. More than three quarter of the nurses had diploma degree. Considering the years of experience 48% of the nurses had experience more than 18 years, assigned to care more than 15 patients / shift with 12 hours of working / day. Finally as regards attendance of training program about anticoagulant therapy, all the studied nurses did not any attend training program previously.

Table (2): reveals comparison of the study group regarding to their knowledge about anticoagulants therapy pre, one month post and three months post application of nursing training program. The results revealed that pre application of nursing training program the majority of the studied nurses did not know the indication for anticoagulant therapy, precaution before administering anticoagulants therapy and contraindications for oral therapy(56%,74%,72%) respectively, while, post one month from application of nursing training program their knowledge had improved to be correct and incomplete answer by(88%,74%, 94%) respectively and after 3 months their knowledge raised to complete answer by (56%,74%, 28%) respectively. Regarding measures to be done before anticoagulants administration, the highest percentage of the studied nurses (70%, 80%,70% , 68%) mentioned incorrect answer pre application of nursing training program , however, after one month their knowledge were correct which complete answers and their knowledge were improved until the end of the study. Also, More than half of the studied nurses (70%, 62%) did not know the drugs interaction with anticoagulant therapy pre nursing training program, while, after one month and 3 months the majority (66%,44%, 70%, 62%) respectively, had correct and incomplete answers post application of the nursing training program. Moreover, when asked about the anticoagulants general instructions that should be followed during management

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: www.noveltyjournals.com

with anticoagulants 74% , 68% of the studied nurses did not know if the warfarin was to be given on an empty stomach and antidote medication for warfarin pre application of the nursing training program , while, one month and 3 months post application of nursing training program all nurses had correct and complete answers.

Furthermore, there was a statistically significant difference pre, one month and 3 months post application of the nursing training program in relation to all items of knowledge among the studied nurses (p= 0.000).

Table (3): represents comparison of the study group regarding to percent score level of knowledge about anticoagulants pre, post one month and post three months of application of nursing training program. It was found that the majority (82%) of the studied nurses had poor knowledge scores before application of the nursing training program, while, after one and 3 months results showed a marked improvement in their knowledge post application of nursing training program with significant differences throughout the study period (P =0.000).

Table (4): illustrates comparison of the study group regarding their practice in administering anticoagulants therapy pre, post one month and post three months of application of nursing training program**.** it can be observed that, all the studied nurses did not check sterility and expiratory date of equipment and supplies pre nursing training program, while, after one and 3 months post application nursing training program correct and complete practices were observed by 86%, 90%, respectively of the studied nurses. Also, the results showed that 82%, 96% of studied nurses did not perform hand hygiene before and after injection pre application of nursing training program , while, after one and 3 months only 40%,26%, 18%, 18% had performed correct and complete practice post application of the nursing training program.

Regarding subcutaneous injection technique, the majority (78%) of studied nurses performed it correctly but incomplete pre application of the nursing training program, while, after one month 56% of studied nurses performed it as a correct and complete practice, however, only 22% of nurses performed correct and complete practice post application of nursing training program. Also, the results showed that all the studied nurses did not perform patient observation and evaluation pre nursing training program, while, after one and 3 months 72%, 80% of nurses performed it correct but incomplete post application of the nursing training program.

Moreover, there were statistically significant differences among the study group pre, one month and 3 months post application of the nursing training program in relation to all items of practice.

Table (5): elaborates comparison of the study group regarding their total percent score of practice in administering anticoagulants pre, post one month and post three months of application of the nursing training program. It was found that all the studied nurses had poor practice score before application of nursing training program, while, after one and 3 months, results showed a marked improvement in their practice post application of the nursing training program with significant differences throughout the study period (P =0.000).

4. DISCUSSION

Medication safety is a major concern and a global issue related to quality and safety of patient care. The medication administration process is error prone because of the many environmental and workload issues encountered by nurses[25] Therefore, it is extremely important that the nurse should be knowledgeable about medication effect, indications, contraindications, side effects and safety precautions. Also, the nurses must be implementing the standard rules of medication administration.

The findings of the present study demonstrated that most of the studied nurses had poor knowledge related to anticoagulant medication pre the application of nursing training program. This result may be due to all of the studied nurses did not attend any training program related to anticoagulant medication .However, after application of the nursing training program their knowledge was improved. These results might be due to the nursing training program which provided nurses' information about indication, contraindication, precaution, measures to be applied before and during anticoagulants administration, drug side effects, drug to drug interaction, drug to food interaction and general instruction during management with anticoagulants.

Supporting this finding Lavery (2011)[26] ensured that regular and comprehensive training programs with theoretical and practical elements are given to nurses for safe and effective practices and skills and kept their up to date throughout their

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: **www.noveltyjournals.com**

practice lifetime. Also, the study done by Shahin (2012) [27] mentioned that attending a training program have benefits of keeping nurses up to date and refining their practices, especially in carrying out procedures.

As regards to the nurse's practice during administration of anticoagulant therapy, the finding revealed that the majority of the studied nurses did not check the sterility and expiry date of medication and equipment or supplies. This is in line with the Nursing and Midwifery Council (NMC)(2017)[28]which stressed that the nurse must check sterility and expiry date of medication and equipment or supplies before administration of anticoagulant therapy to ensure patients safety.

In relation to, hand hygiene; this study revealed that the majority of studied nurses were not washing their hands especially before doing procedure and after injection. In this regard, from the researcher observation poor hand hygiene may be due to long distance between patient room and hand washing place, lack of supplies, shortage of nurses and busy workload. This result is in harmony with Kaphle et al (2014) [29] and Abd-Elhady et al (2011) [30] who mentioned that, the majority of nurses did not performed hand washing before and after administration of anticoagulants. Also, it is in contrast with the Mayo Foundation for Medical Education and Research (2012) [31], which stated that, hand washing is considered as one of the most effective infection control measures, and that hand washing is important in every hospital settings.

Regarding to total score of practice, the results showed that the majority of studied nurses had poor performance of administration of anticoagulant therapy .In this regards , a study conducted by Kamal (2018)[32] found that nurses safety practices performance for heparin administration were poor and the majority of studied nurses were not following drug administration safety. Also, the study done by Fekery (2016) [33] showed that the majority of studied nurses had poor safety nursing practices during administration of medication. On the other hand, these results are disagreement with The Joint Commission TJC (2012) [34] which emphasized that administration of medication is one of the most important nursing interventions and should be done with excellence.

From the researcher point of view, poor nurses' practices during administration of anticoagulant therapy may be due to lack of knowledge, shortage of staff, increased patients to nurses ratio which leads to increased workload on nurses and decrease their productivity. However, after application of the nursing training program about anticoagulant therapy a marked improvement of nurses' knowledge and practice was observed. This indicated that the nursing training program has a positive impact on nurse's performance which helps to prevent medication errors occurrence and improve quality of care .Also, they helped in achieving safe and successful outcome of the treatment plan provided for patients post orthopedic surgery. Furthermore, these results were in line with Amel et al (2014)[35]and Debra (2008)[36] who stated that training programs need to be implemented worldwide to specifically educate nurses on basic and advanced nursing practice in administration of anticoagulant therapy.

Therefore orthopedic nurses require not only extensive knowledge and training regarding high alert medications, but also an understanding of the nature of the medications, the impact of this type of medication on the patient health and how to prevent the medications errors [37]. The nursing profession is advancing with high standards and specialized knowledge through research and evidence-based practices. Knowledge changes the attitude and develops confidence for practice.

5. CONCLUSION

Based on findings of the present study, it can be concluded that results of this study confirmed the hypothesis as orthopedic nurses' knowledge about anticoagulant therapy after attending the nursing training program is higher than that before their attendance. Furthermore, orthopedic nurses' practice about administration of anticoagulant therapy after attending the nursing training program is better than that before their attendance.

6. RECOMMENDATIONS

- Develop medication safety policies and procedures that enhance the ability of healthcare workers to use these medications safely.

- Anticoagulant education should be routinely and consistently provided to all newly enrolled nurses

- Provide nursing staff with adequate supervision and guidance regarding dealing with anticoagulant medications.

- Periodic evaluation of nursing practices by nursing supervisor for enhancing level of practices.

REFERENCES

[1] Yang L, Wang C, Lee T and Lin F. Early diagnosis of deep vein thrombosis in female patients who undergo total knee arthroplasty with measurement of P-selectin activation. J Vasc Surg 2002; 35: 707-12.

[2] Bozic K, Vail T, Pekow P and Maselli J. Does aspirin have a role in venous thromboembolism prophylaxis in total knee arthroplasty patients? J of Arthroplasty 2010; 25 (7): 1053-1060.

[3] Abdel Monaem F, Abou-Donia S, Abdel Gawad M et al; Establishing Nursing Standards for Prophylaxis of Deep vein Thrombosis among Patients Undergoing Hip Surgery. Unbublished Doctoral Thesis of Nursing Science. Faculty of Nursing, Alexandria University. 2010.

[4] Coyle D, Coyle K, Cameron C. Cost-effectiveness of new oral anticoagulants compared with warfarin in preventing stroke and other cardiovascular events in patients with atrial fibrillation. Value health 2013; 16(4):498-506.

[5] Weitz JI &Brunton LL. Blood Coagulation and Anticoagulant, Fibrinolytic, And Antiplatelet Drugs. Goodman & Gilman's the pharmacological basis of therapeutics. 12th edition. Vol. 211. New York, McGraw Hill Medical 2011; 848–76.

[6] Ageno W, Gallus a &Wittkowsky A. Oral anticoagulant therapy, Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest. 2012; 141(2): 44-88.

[7] Roughead E &Semple S. Medication Safety In Acute Care in Australia: Where Are We Now? Part 1: a review of the extent and causes of medication problems (2002-2008). Australia and New Zealand Health Policy 2009; 6(1):18.

[8] Lucado, J., Paez, K. and Elixhauser A. Medication-Related Adverse Outcomes in U.S. Hospitals and Emergency Departments, 2008. HCUP Statistical Brief #109. April 2011.

[9] American Society of Hospital Pharmacists. ASHP Guidelines on Preventing Medication Errors in Hospitals. Am J Hosp Pharm 2011; 50:305–14.

[10] Australian Government Department of Human Services. Home Medicines Review (HMR) http://www.medicareaustralia.gov.au/provider/pbs/fifth-agreement/home-medicines-review.jsp. Canberra, 2013.

[11] Tompson A, Peterson G, Jackson S & Raymond K. Utilizing Community Pharmacy Dispensing Records To Disclose Errors In Hospital Admission Drug Charts. International Journal of Clinical Pharmacology and Therapeutics 2012; 50:639-46.

[12] Chan EW, Taylor SE, Marriott J & Barger B. An intervention to encourage ambulance paramedics to bring patients' own medications to the ED: impact on medications brought in and prescribing errors. Emergency Medicine Australasia 2010; 22(2):151-8.

[13] Kahn SR, Lim W, Dunn AS & Akl EA. Prevention of VTE in nonsurgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest. 2012; 141(2): 195-226.

[14] Valenstein PN, Walsh MK & Meier F. Heparin Monitoring and Patient Safety: a College of American Pathologists. Arch Pathol Lab Med 2004 Apr; 128(4):397-402.

[15] Gresham C, Levine M &Ruha AM. Case Files of the Medical Toxicology Fellowship at Banner Good Samaritan Medical Center in Phoenix, AZ. A Non-Warfarin Anticoagulant Overdose. J Med Toxicol 2009; 5:242–49.

[16] James J. A .New Evidence-based Estimate of Patient Harms Associated with Hospital Care. Journal of Patient Safety September 2013; 9 (3):122–8. Retrieved 10/21/13.

[17] Cohen MR .High-Alert Medications: Safeguarding against Errors. Part IV, Chapter 14, Medication Errors. Washington DC, American Pharmacists Association1. The International Warfarin Pharmacogenetics Thrombolysis 2008; 31: 326-43.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 1, pp: (863-875), Month: January - April 2019, Available at: www.noveltyjournals.com

[18] Westbrook J, Woods A, Rob M, Dunsmuir W & Day R. Association of Interruptions With An Increased Risk And Severity Of Medication Administration Errors. Archives of Internal Medicine 2013; 170(8).

[19] Cousins DH, Gerrett D & Warner B. A Review of Medication Incidents Reported to the National Reporting and Learning System in England and Wales over 6 years (2005–2010). Br J ClinPharmacol 2012; 74(4):597–604.

[20] Institute for Safe Medication Practice medication safety alert. Survey Suggests Possible Downward Trend In Identifying Key Drugs/Drug Classes As High-Alert Medications July3, 2014. www.ismp.org/newsletters/acutecare/showarticle.aspx?id=83

[21] Alsulami Z1, Conroy S & Choonara I. Medication Errors in the Middle East countries: A Systematic Review of the Literature. Eur J Clin Pharmacol 2013; 69:995–1008.

[22] Hodgkinson MR, Dirnbauer NJ &Larmour I. Identification of Adverse Drug Reactions Using the ICD-10 Australian Modification Clinical Coding Surveillance. Journal of Pharmacy Practice and Research 2009; 39(1):19-23.

[23] Classen, D. C., Pestotnik, S. L., Evans, R. S & Burke, J. P. Adverse Drug Events among Hospitalized Medicare Patients: Epidemiology and National Estimates from a New Approach to Surveillance. Jt. Comm J Qual Saf 2010 Jan; 36 (1):12-20.

[24] Omorogbe V, Omuemu S, Isara A. Injection safety practices among nursing staff of mission hospitals in Benin City, Nigeria. Ann Afr Med J 2012; 11 (1): 36-41.

[25] Elliot J. Nursing-related medication errors: A review of factors that facilitate and hinder error reporting and recommendations for improvement. Published Master thesis of Public Health. School of Public Health, University of Texas, 2010.

[26] Lavery I. Intravenous therapy: preparation and administration of IV medicine. BR J Nurs 2011; 20 (4): 28-34.

[27] Shahin M. Impact of a Designed Instructional Program about Enteral Nutrition on the Nurses' Knowledge and Practices at the Critical Care Department of Al-Manial University Hospital. Master Thesis .Faculty of Nursing .Cairo University. 2012.

[28] Nursing and Midwifery council (NMC). Standards for medicines management. 2017.

[29] Kaphle H, Poudel S, Subedi S, Gupta N, Jin V. Awareness and practices on injection safety among nurses working in hospitals of Bokhara, Nepal. Int. Med. J Health Sci.2014; 3(4): 301-7.

[30] Abd El-Hady A. Khalifa M ,Nagwa A, Hemdan H. Effect of an Infection Control Competency Based Protocol on the Occurrence of Blood Borne Infection in Pediatric Hemodialysis Unit at Minofiya University Hospital .Asian J Med Pharm 2011; (1): 26-38.

[31] Mayo Foundation for Medical Education and Research. Hand washing. 2012. Available at: http;//www.mayoclinical.com/health/hand- washing /HQ00407. (Retrieved on: 9/8/2017)

[32] Kamal A. Safety nursing practices related to administration of anticoagulant therapy for cardiovascular diseased patients. Unpublished Master Thesis. Faculty of Nursing. Alexandria University. 2018.

[33] Fekery M. Safe nursing practices applied for patients post hip joint replacement. Unpublished Master Thesis . Faculty of Nursing. Alexandria University. 2016.

[34] The Joint Commission (TJC). Hospital national patient safety goals. Oak Brook: TJC 2012.

[35] El-Naby A, Hashem H, and Ismail G. Evaluation of a Designed Warfarin Educational Program on Patients' Knowledge and Incidence of Side Effects. Global J. Pharmacol. 2014; 8 (4): 592-600.

[36] Debra A. The Role of Nurses in Hospital Quality Improvement, 2008. Available at: http://www.hschange.org/CONTENT/972. [Retrieved on: 25-3-2018]

[37] Miran K, Gyeongae S. Errors in high-risk intravenous injections administered by nurses: The causes according to healthcare professionals. Konyang University, Daejeon, Korea. Health Science Journal.2014; 8 (2).

Table (1): Frequency distribution of the studied nurses according to their biosociodemographic and nurses profile data (N=50)

Biosociodemographic and nurses profile data	N= 50	
	No	%
Age (years)		
20 –<30	5	10.0
30 –<40	7	14.0
40 –<50	27	54.0
50-≤60	11	22.0
Total	50	100
Mean ± SD	46.57±6.97	
Sex		
Male	3	6
Female	47	94
Total	50	100
Qualification of nurses		
bachelor	2	4
Technical	10	20
Diploma	38	76
Total	50	100
Years of experience in the assigned department (years)		
<Less than 3	1	2
3- <8	9	18
8- <12	13	26
12-<18	3	6
≥More than 18	24	48
Total	50	100
Nurse to patient ratio		
1-4	3	6
5-9	14	28
10-15	9	18
More than 15	24	48
Total	50	100
Numbers of work hours		
6 hours	27	54
12 hours	23	46
Total	50	100
Attendance of training program related to anticoagulant therapy		
Yes	0	0
No	50	100

Table (2): Comparison of the study group regarding to their knowledge about anticoagulants therapy pre, one month post and three months post application of nursing training program.

No = 50

Items of nurses' knowledge	Pre nursing training program						One month post nursing training						Three months post nursing training program						Significance test	
	Don't know or incorrect answer		Correct incomplete answer		Correct complete answer		Don't know or incorrect answer		Correct incomplete answer		Correct complete answer		Don't know or incorrect answer		Correct incomplete answer		Correct complete answer		χ^2 P1	χ^2 P2
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%		
Indications and contraindications: Indications for anticoagulants	28	56.0	12	24.0	10	20.0	6	12.0	44	88.0	0	0.0	2	4.0	20	40.0	28	56.0	χ^2= 42.521 P =0.000*	χ^2= 33.059 P =0.000*
Contraindications for anticoagulants	18	36.0	4	8.0	28	56.0	15	30.0	35	70.0	0	0.0	4	8.0	18	36.0	28	56.0	χ^2= 52.913 P =0.000*	χ^2= 62.382 P =0.000*
Precautions before administering anticoagulants therapy.	37	74.0	7	14.0	6	12.0	13	26.0	37	74.0	0	0.0	6	12.0	7	14.0	37	74.0	χ^2= 41.372 P =0.000*	χ^2= 17.818 P =0.000*
Are anticoagulants given for patients undergoing orthopedic surgery?	12	24.0	38	76.6	0	0.0	0	0.0	0	0.0	50	100	0	0.0	12	24.0	38	76.0	$\chi^2$2100.000 P =0.000*	χ^2= 36.520 P =0.000*
Contraindications for oral anticoagulants	36	72.0	14	28.0	0	0.0	3	6.0	47	94.0	0	0.0	0	0.0	36	72.0	14	28.0	χ^2= 45.775 P =0.000*	χ^2= 59.680 P =0.000*
measures to be done before anticoagulants administration: Initial blood tests that should be evaluated before started anti-coagulants	35	70.0	9	18.0	6	12.0	0	0.0	20	40.0	30	60.0	0	0.0	15	30.0	35.0	70.0	χ^2= 55.172 P =0.000*	χ^2= 41.876 P =0.000*
Anticoagulants coagulation profile should be checked before every administration.	40	80.0	0	0.0	10	20.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2= 66.666 P =0.000*	χ^2= 66.666 P =0.000*
Blood investigation should be observed carefully for patients treated with anticoagulants	35	70.0	9	18.0	6	12.0	11	22.0	39	78.0	0	0.0	0	0.0	38	76.0	12	24.0	χ^2= 37.271 P =0.000*	χ^2= 54.893 P =0.000*
Has to follow-up vital signs of patients receiving anticoagulants	3	6.0	41	82.0	6	12.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2=78.571 P =0.000*	χ^2= 78.571 P =0.000*
Vital signs of patients receiving anticoagulants checked before every administration	34	68.0	16	32.0	0	0.0	6	12.0	44	88.0	0	0.0	0	0.0	34	68.0	16	32.0	χ^2= 32.666 P =0.000*	χ^2= 56.440 P =0.000*
Drugs interactions and side effects: Drugs that interact with anticoagulants and affect efficiency should be excluded.	19	38.0	20	40.0	11	22.0	17	34.0	33	66.0	0	0.0	10	20.0	15	30.0	25	50.0	χ^2= 14.229 P =0.000*	$\chi^2$28.591 P =0.011*
Drugs that increase efficiency of anticoagulants	35	70.0	15	30.0	0	0.0	17	34.0	33	66.0	0	0.0	0	0.0	35	70.0	15	30.0	χ^2= 12.980 P =0.000*	χ^2= 58.000 P =0.000*
Drugs that decrease efficiency of anticoagulants	31	62.0	19	38.0	0	0.0	19	38.0	20	40.0	11	22.0	0	0.0	31	62.0	19	38.0	χ^2= 13.905 P =0.000*	χ^2= 52.880 P =0.000*
Side effects of anticoagulants	17	34.0	33	66.0	0	0.0	7	14.0	43	86.0	0	0.0	0	0.0	17	34.0	33	66.0	χ^2= 5.482 P =0.000*	χ^2= 55.120 P =0.000*
General instructions: You must stop the anti-coagulant drugs before operations or by the physician orders	35	70.0	15	30.0	0	0.0	4	8.0	46	92.0	0	0.0	0	0.0	35	70.0	15	30.0	χ^2= 34.766 P =0.000*	χ^2= 58.000 P =0.000*
Can warfarin be given on an empty stomach	37	74.0	13	26.0	0	0.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2= 100.000 P =0.000*	χ^2= 100.000 P =0.000*
Foods that contain vitamin K, which interact with warfarin	33	66.0	17	34.0	0	0.0	3	6.0	41	82.0	6	12.0	0	0.0	33	66.0	17	34.0	χ^2= 40.391 P =0.000*	χ^2= 55.120 P =0.000*
What you have to do if you forgot to give anticoagulants on time	38	76.0	12	24.0	0	0.0	7	14.0	43	86.0	0	0.0	0	0.0	38	76.0	12	24.0	χ^2= 5.482 P =0.000*	χ^2= 36.520 P =0.000*
Antidote medication for Heparin	20	40.0	30	60.0	0	0.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2= 5.482 P =0.000*	χ^2= 55.120 P =0.000*
Antidote medication for warfarin	34	68.0	1	2.0	15	30.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2= 38.828 P =0.000*	χ^2= 55.120 P =0.000*
What happens if the patient had to undergo surgery or take off some of the teeth while being treated with anticoagulants	20	40.0	30	60.0	0	0.0	0	0.0	0	0.0	50	100	0	0.0	0	0.0	50	100	χ^2= 25.000 P =0.000*	χ^2= 25.000 P =0.000*
Do you have to notify the dietitian about patients treated with anticoagulants	29	58.0	21	42.0	0	0.0	1	2.0	49	98.0	0	0.0	0	0.0	29	58.0	21	42.0	χ^2= 16.385 P =0.000*	χ^2= 51.280 P =0.000*
Exact time between discontinuing intravenous and beginning of oral anticoagulants	37	74.0	0	0.0	13	26.0	8	16.0	42	84.0	0	0.0	0	0.0	37	74.0	13	26.0	χ^2= 73.688 P =0.000*	χ^2= 74.000 P =0.000*
Factors that increase the effect of oral anticoagulants therapy.	34	68.0	16	32.0	0	0.0	14	28.0	36	72.0	0	0.0	0	0.0	34	68.0	16	32.0	χ^2= 16.025 P =0.000*	χ^2= 56.480 P =0.000*
Can anticoagulants be given through IM injection	17	34.0	33	66.0	0	0.0	6	12.0	44	88.0	0	0.0	0	0.0	17	34.0	33	66.0	χ^2= 6.832 P =0.009*	χ^2= 55.12 P =0.000*

χ^2 = Chi-Square.

*Significant difference at P level ≤ 0.05.

P1=p value comparing between the study group pre in-service training and one month post nursing training program.

P2= p value comparing between the study group pre in-service training and three month post nursing training program.

Table (3): Comparison of the study group regarding to percent score level of knowledge about anticoagulants pre, post one month and post three months of application of nursing training program.

Percent score level of Knowledge	N=50						Significance test	
	Pre nursing training program		One month post nursing training program		Three months post nursing training program			
	No	%	No	%	No	%	χ2 P1	χ2 P2
Poor knowledge	41	82.0	10	20.0	4	8.0	χ2= 41.372 P =0.000*	χ2= 62.382 P =0.000*
Fair knowledge	9	18.0	25	50.0	16	32.0		
Good knowledge.	0	0.0	15	30.0	30	60.0		
Total	50	100	50	100	50	100		
Min. – Max.	14.0-28.0		18.0- 28.0		22.4- 46-67			
Mean ± SD	23.68± 4.18		24.28± 3.18		37.73±5.12			

χ2 = Chi-Square.

*Significant difference at P level ≤ 0.05.

P1=p value comparing between the study group pre nursing training program and one month post nursing training program.

P2= p value comparing between the study group pre nursing training program and three month post nursing training program.

Table(4): Comparison of the study group regarding their practice in administering anticoagulants therapy pre, post one month and post three months of application of nursing training program.

Practice items	No= 50																		Significance test	
	Pre nursing training program						One month post nursing training program						Three months post nursing training program						χ2 P1	χ2 P2
	Not done/incorrect practice		Correct but incomplete practice		Correct complete practice		incorrect practice		Correct but incomplete practice		Correct complete practice		incorrect practice		Correct but incomplete practice		Correct complete practice			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%		
Check physician written order	0	0	50	100	0	0	0	0	0	0	50	100	0	0	0	0	50	100	Z=1.254 P=0.000*	Z=1.254 P =0.000*
Check medication rights	0	0	50	100	0	0	0	0	11	22.0	39	78.0	0	0	0	0	50	100	χ2= 41.372 P =0.000*	Z=1.236 P =0.000*
Check sterility and expiry date of equipment's and supplies	50	100	0	0	0	0	10	20.0	6	12.0	34	86.0	0	0	5	10.0	45	90.0	χ2= 66.667 P =0.000*	χ2= 99.454 P =0.000*
Perform hand hygiene before preparation	41	82.0	9	18.0	0	0	27	54.0	3	6.0	20	40.0	0	0	41	82.0	9	18.0	χ2= 25.882 P =0.000*	χ2= 70.480 P =0.000*
Prepare equipment	34	68.0	16	32.0	0	0	13	26.0	37	74.0	0	0	34	68	14	28.0	2	4.0	χ2= 17.703 P =0.000*	χ2= 2.133 P =0.000*
Prepare anticoagulants medication	2	4.0	48	96.0	0	0	9	18.0	8	16.0	33	66.0	2	4.0	38	76.0	10	20.0	χ2= 66.062 P =0.000*	χ2= 11.162 P =0.000*
Patient preparation	16	32.0	34	68.0	0	0	18	36.0	32	64.0	0	0	16	32.0	16	32.0	18	36.0	χ2= 0.172 P =0.064	χ2= 24.480 P =0.000*
Environmental preparation	50	100	0	0	0	0	38	76.0	12	24.0	0	0	20	40.0	20	40.0	10	20.0	χ2= 13.636 P =0.000*	χ2= 42.857 P =0.000*
Appropriate selection of injection site	42	84.0	8	16.0	0	0	3	6.0	47	94.0	0	0	0	0	42	84.0	8	16.0	χ2= 61.454 P =0.000*	χ2= 73.120 P =0.000*
Appropriate preparation of injection site	43	86.0	7	14.0	0	0	7	14.0	29	58.0	14	28.0	0	0	43	86.0	7	14.0	χ2= 107.730 P =0.000*	χ2= 75.920 P =0.000*
Correct subcutaneous injection technique	0	0	39	78.0	11	22.0	4	8.0	18	36.0	28	56	0	0	39	78.0	11	22.0	χ2= 19.147 P =0.000*	χ2= - P =.
Safe discarding of syringe and equipment	0	0	50	100	0	0	0	0	36	72.0	14	28.0	0	0	50	100	0	0	χ2= 16.279 P =0.000*	χ2= - P =.
Perform hand hygiene after injection	48	96.0	2	4.0	0	0	0	0	37	74.0	13	26.0	0	0	41	82.0	9	18.0	χ2= 92.410 P =0.000*	χ2= 92.372 P =0.000*
Patient observation and evaluation	50	100	0	0	0	0	0	0	36	72.0	14	28.0	0	0	40	80.0	10	20.0	χ2= 99.200 P =0.000*	χ2= 98.122 P =0.000*
Accurate documentation	0	0	50	100	0	0	0	0	50	100	0	0	0	0	45	90.0	5	10.0	χ2- P =.	χ2= 81.818 P =0.000*

χ2 = Chi-Square.

*Significant difference at P level ≤ 0.05.

Z= Z test.

P1=p value comparing between the study group pre in-service training and one month post in-service training.

P2= p value comparing between the study group pre in-service training and three month post in-service training

Table (5): Comparison of the study group regarding their total percent score of practice in administering anticoagulants pre, post one month and post three months of application of nursing training program.

Total Percent score of practice level	N=50						Significance test	
	Pre nursing training program		One month post nursing training program		Three months post nursing training program			
	No	%	No	%	No	%	χ2 P1	χ2 P2
Poor practice.	50	100	8	16.0	1	2.0	χ2= 72.413 P =0.000*	χ2= 96.078 P =0.000*
Fair practice.	0	0	40	80.0	5	10.0		
Good practice.	0	0	2	4.0	44	88.0		
Total	50	100	50	100	50	100		
Min. – Max.	33.33 – 46.67		43.33 – 73.33		43.33 – 76.67			
Mean ± SD	38.86± 2.82		63.26 ± 6.61		63.26 ± 7.69			

$χ2$ = Chi-Square.

*Significant difference at P level ≤ 0.05.

P1=p value comparing between the study group pre nursing training program and one month post nursing training program.

P2= p value comparing between the study group pre nursing training program and three month post nursing training program.