

Nurses' knowledge and Practice regard Care of Patient with Chest Drains in Sudan Heart Center, Khartoum, Sudan

Dr. Badria A. Elfaki¹, Dr. Hassanat E. Mustafa², Prof. Alaadin Hassan Ahmed³

^{1,2} (Department of Nursing Practice, Faculty of Nursing, Um Al Qura University, Makah, Al Neelain University, Khartoum, Sudan)

³ (Professor of Medicine, Faculty of Medicine, University of Khartoum, Sudan)

Abstract: The study aim to assess nurses' knowledge and practice for patient connected to chest drain. A descriptive design was used. Questionnaire and checklists were administered on (50) nurses employed in Sudan Heart Centre hospital. Data processed by (SPSS) program. The study reflected majority of nurses were females. All nurses were known chest drain is sterile procedure, and more than 60.0% were known the chest drain needs inform consent, indications and site of insertion. Although more than 60% of them didn't know exactly underwater-seal, position of patient during insertion the tube, routine milking or striping will increase pleural pressure and mobility of patient with chest drain. Also nurses had average knowledge about the basic principles of drain function, complications, actions when tubes leakage, displacement or dislodge. The nurses with master degree and experience from 1-5years had insignificant high knowledge than those with bachelor degree and experience more than 5 years (P -value > 0.05). Majority of nurses demonstrated poor level of practice towards preparation of equipment for insertion the chest drains and routine patient care. The study concluded nurses were demonstrated deficit in knowledge and practice.

Keyword: Chest drain, knowledge, Nurses, Practice, Sudan Heart Center

I. Introduction

A chest drain is a tube placed in the pleural space to drain its contents (fluid or air) and remains in place until drainage is complete [1]. And written consent should obtain except in emergency situations and inserted with full aseptic precautions [1]. A chest tubes it inserted to help treat pneumothorax, hemothorax, empyema, pleural effusion [2] and chest trauma and after thoracic surgery. Chest tubes and a closed drainage system are used to re-expand the collapse lung and to remove excess air, fluid, and blood [3]. After inserted into the pleural space it was attached to an underwater seal drainage system [4]. The chest drainage systems have a suction source, a collection chamber for pleural drainage, and a mechanism to prevent air from re-entering the chest with inhalation [3]. Chest drain usually removed when the drainage become less than 200ml over 24 hours, resolution of the pneumothorax or when the drain is no longer functioning; bubbling has ceased and chest x-ray will confirm that the underlying problem has been resolved [1].

Patients with chest drains should receive care by medical or surgical teams who were experience on management and care and known what the patient needs. Nursing staff who give caring for this patient must have received training and demonstration to become competent [5]. British Thoracic Society Guidelines (2010) for chest drain insertion highlight the importance of ensuring staff involved in all aspects of the patient's care must be sufficiently skilled to undertake the procedure. Incorrect placement and management of a chest drain can lead to significant morbidity and mortality and therefore medical and nursing staff must be trained in all aspects of patient's care [6]. Chest drains insertion it is responsibility of the doctor but the nurse and the doctor both they were responsible to maintain the drain and derange system function in addition to monitor the patient. Safe practice is requiring understanding of anatomy and physiology of the respiratory system and the heart, knowledge and skills on how chest drainage functions [7].

Nursing care of chest drain aim to maintaining an intact sterile system to prevent contamination and introduction of infection through the derange system into the pleural space, ensure the hole system remains straight, secure all connections tubes to prevent tension pneumothorax and water aspiration and monitoring the patient to prevent risk of complications [5]. In addition to encouraged patients to take responsibility for their chest tube and drainage system. The patients should be taught to keep the underwater seal bottle below the level of their chest and to report any problems such as accidentally pulling drain from insertion site and educational material for safety should be available for patients and nursing staff [1]. There are serious complications may occur when a chest tube is in place which include; pain, chest tube dislodge, diaphragm damage, injury to internal organs, occlusion, serious harm and death. Some causes of these serious complications related to insertion of the drain [8]. National Patient Safety Agency (NPSA) reported in 2008, 12 deaths and 15 cases from 2005-2008 related to chest drains risk [6]. Chest tube dislodgement can be partial or total it can be prevented by proper care and good technique of drain insertion [9].

To ensure optimal outcomes for patients with a pleural drains care needs to provide by appropriately skilled staffs that maintain close monitoring of the patient, pleural drain and under water drainage system and perform appropriate action when an event of complications arise [10]. Care of chest drain and management appear complicated but a good understanding of the basic aspects related to drain insertion and system function is important to improve outcomes for patient and reduce the risk of complications.

1.1.Aim of the study: To assess nurses' knowledge and practice for patients connected to chest drain to raise nurses' level of knowledge and enhance their practice to prevent and minimize chest drains risk and complications as well as improving patient outcome.

II. Material And Method

2.1. Research Design: It was quantitative descriptive hospital based study.

2.2. Study setting: The study setting was Sudan Heart Center hospital. Specialized center located in Khartoum state, established in 1999 so as to provide medical and nursing services for entire people such as cardiac and respiratory diseases, cardiothoracic surgery and vascular surgery.

2.3. Study population: Population of the studied were nurses employed in different departments' in Sudan heart center outpatient clinic, medical and surgical ward, and intensive care unit.

2.4. Sample size: A non-probability sampling, the sample size was (50) nurses included all nurses working in Sudan Heart Center which was taken as the total coverage [11] and fill full specific criteria.

2.5. Inclusion Criteria: The studied included register nurses, both gender male and female, within different age, permanently worked, with different qualifications and different experiences years in nursing and working years in Sudan heart center and agree to participate in the study.

2.6. Exclusion Criteria: The studied excluded unregistered nurses, trainee and those who were disagree to participate in the study.

2.7. Data collection tools: Data was collected using standardized structural questionnaire and checklists. The questionnaire consists of two parts; first part for demographic data gender, age, qualification, experience years in nursing and working in Sudan heart center. The second part of questionnaire for knowledge data; chest drains insertion procedure, indications, emergency actions when tube displace, dislodged or leakage, patient mobility, drain removal and complications. Two check lists to assess practical part one for equipment prepared for insertion the drain and other for routine and daily patient care.

2.8. Data collection technique: Data was collected following direct interviewed to collect knowledge data and observational method for practical part.

2.9. Pretest: The study tools structured questionnaire and check lists were tested for reliability and validity. Also information was reviewed for quality and legitimacy and pre tested was done among five subjects and modification for some questions were made.

2.10. Data Analysis: Data was analyzed using computer software program (SPSS) version 16 after pre-coded, pre-tested and suitable descriptive statistics was done. Data analysis was included both univariate [12] and bivariate analysis [13]. Univariate analysis was carried out to describe a single variable such as socio-demographic factors; gender, age, qualification, experience years in nursing and working in Sudan Heart Center. Bivariate involves the analysis of two variables for the purpose of determining the relationship between the nurses' level of knowledge and some sociodemographic factors and the data was presented in form of percentage table. Knowledge of the subjects was analyzed based on adapted "Likert-type scale" that categorized into level of very poor, poor, average, good and excellence and compared with some of subjects' background information and the chi-squared and p-value to ensure of the significances.

2.11. Ethical considerations: The study was approved by an ethical clearance from Institutional Review Board of academy of medical sciences and technology faculty of nursing sciences, official permission was obtained from leaders of Sudan Heart Center Health Institutions and written consent from entire participants.

III. Result

Table (3-1): Background characteristics of the study subject (n=50).

Background characteristics		Percentage
Department	ICU	40.9%
	Theater	4.5%
	Ward	31.8%
	Outpatient	22.7%
	Total	100.0%
Gender	Male	27%
	Female	73%
	Total	100.0%
Age groups	21-25 years	15.9%
	26-30 years	25.0%

	31-35 years	38.6%
	36-40 years	11.4%
	41-45 years	9.1%
	Total	100.0
Qualification	BSc.	86.4%
	MSc.	13.6%
	Total	100.0
Experience years in Sudan Heart Center	< 1 year	15.9%
	1-5 years	45.5%
	>5 years	38.6%
	Total	100.0
Experience years in nursing	< 5 year	43.2%
	5-10 year	40.9%
	10-15 years	11.4%
	< 15 year	4.5%
	Total	100.0

Table (3-2): knowledge of nurses regard some statement of chest drain (n=50).

Statement	Know	Don't know	Total
Obtain a consent form before insertion	70.5%	29.5%	100.0%
Chest drain insertion sterile procedure	100.0%	0.0%	100.0%
Site of chest tube insertion	86.4%	13.6%	100.0%
Position of patient during chest tube insertion	15.9%	84.1%	100.0%
Definition of under water-seal	25.0%	75.0%	100.0%
Fluctuation of fluid in the water-seal bottle indicate function of the system	61.4%	38.6%	100.0%
Routine milking or striping increase the pleural pressure and cause harm.	31.8%	68.2%	100.0%
Transporting (Mobility) of the patient with chest drain.	22.7%	77.3%	100.0%

Table (3-3): levels of nurses' knowledge about indications, basic principles, action when emergency arise and time to remove the chest drain (n=50).

Variable	Levels of knowledge			
	Poor	Average	Good	Excellent
Indications	18.2%	18.2%	40.90%	22.70%
Basic principles	22.72%	50%	9.1%	18.18%
Complications	15.9%	43.2%	29.54%	11.36%
Action when the tubes leakage	0.0%	43.2%	38.63%	18.18%
Action during displacement of the tube	45.45%	2.27%	18.18%	0.0%
Action when tube dislodge	0.0%	61.4%	15.90%	22.7%
Time to remove the chest drain	0.0%	15.90%	56.8%	27.3%

Table (3-4): levels of knowledge about the indications and complications of chest drain insertion versus qualification of study subject (n=50).

Indications	Qualifications		Total	P value
	BSC.	MSC.		
Very poor	10.5%	0.0%	9.1%	0.635
Poor	15.8%	0.0%	13.6%	
Average	15.8%	33.3%	18.2%	
Good	31.6%	33.3%	31.8%	
Excellent	26.3%	33.3%	27.3%	
Total	100.0%	100.0%	100.0%	
Complications				0.410
Very poor	2.6%	0.0%	2.3%	
Poor	21.1%	16.7%	20.5%	
Average	36.8%	33.3%	36.4%	
Good	28.9%	33.3%	29.5%	
Excellent	10.5%	16.7%	11.4%	
Total	100.0%	100.0%	100.0%	

Table (3-5): levels of knowledge about the indications and complications of chest drain insertion versus experience year's of the nurses (n=50).

Indications	Experience in Sudan Heart Center			Total	P-Value
	< 1 year	1-5 years	>5 years		
Very poor	100.0%	7.1%	11.1%	12.5%	0.085
Poor	0.0%	14.3%	11.1%	12.5%	
Average	0.0%	21.4%	22.2%	20.8%	
Good	0.0%	57.1%	22.2%	41.7%	
Excellent	0.0%	0.0%	33.3%	12.5%	
Total	100.0%	100.0%	100.0%	100.0%	
Complications					
Poor	100.0%	14.3%	11.1%	16.7%	0.410
Average	0.0%	42.9%	55.6%	45.8%	
Good	0.0%	35.7%	33.3%	33.3%	
Excellent	0.0%	7.1%	0.0%	4.2%	
Total	100.0%	100.0%	100.0%	100.0%	

Table (3-6): Preparation of equipments for insertion of the chest tube procedure among nurses (n=50).

Equipments	Prepared	Not prepared	Total
Several pairs of sterile gloves	100.0%	0.0%	100.0%
Sterile drape	20.5%	79.5%	100.0%
Petadine solution (Iodine)	86.4%	13.6%	100.0%
Alcohol (spirit)	95.5%	4.5%	100.0%
Lidocaine 1% - 2%	84.1%	15.9%	100.0%
Syringes 10cc	56.8%	43.2%	100.0%
Sterile forceps	27.3%	72.7%	100.0%
Plade(size 10)	63.6%	36.4%	100.0%
Clamp forceps	29.5%	70.5%	100.0%
Sterile gauze pads	95.5%	4.5%	100.0%
Scissors	20.5%	79.5%	100.0%
Chest tube (different sizes)	95.5%	4.5%	100.0%
Trocar	9.1%	90.9%	100.0%
Suture & needle holder	68.2%	31.8%	100.0%
Thoracic drainage system	95.5%	4.5%	100.0%
Oxygen source	0.0%	100.0%	100.0%
Suction	20.5%	79.5%	100.0%
Plaster or tape	97.7%	2.3%	100.0%
Emergency tray	0.0%	100.0%	100.0%

Table (3-7): Routine care given by nurses for the patient connected to chest drain (n=50).

Observation	Done	Not done	Total
Respiratory rate	61.4%	38.6%	100.0%
Oxygen saturation	27.3%	72.7%	100.0%
Heart rate	43.2%	56.8%	100.0%
Body temperature	54.5%	45.5%	100.0%
Blood pressure	40.9%	59.1%	100.0%
Pain and discomfort	35.5%	65%	100.0%
Insertion site dressing	73.0%	27.0%	100.0%
Subcutaneous emphysema	30.0%	70%	100.0%
Tubes connection	75.0%	25.0%	100.0%
System suction.	80%	20.0%	100.0%
Measuring of drain output.	100%	0.0%	100.0%

IV. Discussion

The nurses who given care for patients connected to chest drains should be knowledgeable about managing this chest drains [8] and patients with chest drains should be managed in areas with registered nurses who are competent to give care [6].

The study was included fifty nurses, their age range from 21- 45years, the majority of them were females 73%, more than eighty percent with qualification of bacheloria and only 13.6% have master degree. In spite of their difference working experience in nursing and at Sudan Heart Center, but the majority of them had never been worked in chest units before "Table:3-1". All nurses were known that chest drain is sterile procedure and about70.5% known it needs inform consent from the patient or his relative prior to insertion. In spite of more than 80% of the study subject were known well the site where the chest drain insertion, but they were not known the right position of patient when the chest drain insertion. The patient should be positioned supine or at

45° angle, the arm on the affected side should be abducted and externally rotated, the palm of the hand is behind the patient's head which will stretch the intercostals space [9]. An alternative position for the patient is to sit upright leaning over an adjacent table with a pillow under the arms¹. It is very important for nurses to know this position well to facilitate and help physician in insertion of the chest drain safely.

Regard underwater-seal definition and function, about 75.0% of the nurses did not know exactly what the underwater-seal. In routine practice the nurse would have known that it is important to connect the chest tube to the bottle with secure cover and suction. In addition, 61.0% of the subjects were known that fluctuation of fluid in the derange system indicate derange system function "Table: 3-2". The fluid in the water-seal can fluctuate with patient respiration, air bubbling is normally occurs in the water-seal chamber and fluctuation is rising with inspiration and falling with expiration in spontaneous breathing but more air bubbling indicate system leak [14]. Traditional strip or milk the tubes may increase the negative pressure in the pleural space. Concerning current scientific evidence, no strong evidence was found to support need for routine strip or milk of chest tubes to help drainage. Stripping chest tubes may significantly increase negative intra-thoracic pressures which could cause harm. Drainage from the tubes is aided by suction and proper positioning of tubes [14]. About 68.2% of nurses were not known and they were doing this phenomenon especially in the intensive care unit they assumed their excused to the surgeon order to prevent the formation of clots inside the tube. This result disagree with the result from survey of practice in manipulation of chest tube for patency, which found about 72% of nurses reported they were not permitted to strip tubing and 74% of surgeons allowed stripping for their patients. Overall, studies show no advantage to tube manipulation to enhance drainage [15]. Milking and stripping of chest tubes is controversial and only performed with a physician's order. Research shows that milking and stripping causes increased negative pressure. Always follow specific policy and procedures for these techniques and milk/strip away from the patient toward the drainage system [16]. So the nurse should have performed patient care based on evidence. Also their knowledge regard mobility of patient with chest tube was poor about 77.3% of nurses not known how to mobilize the patient properly "Table: 3-2". The patient can be mobilized with the chest tube unclamped because if the tube clamped during mobilization the fluid will return back and accumulate in the pleural space increasing the pleural pressure and the patient may develop tension pneumothorax or cardiac tamponad, the patient with chest tube can be mobilized or transporting as the closed drainage system remains below the chest tube level to prevent the flow back of the fluid to the pleural space [8].

Nurses had good knowledge about indications and time for chest tube removal and average knowledge about the basic principles of chest derange system function, complications, action when tube leakage and dislodge and had poor knowledge to do action when the tubes displacement "Table:3-3". The chest tube must be removed once the fluid drainage has decreased to less than 200 ml per day, resolution of the pneumothorax¹ or if there is no fluctuation of fluid in the water- seal and the chest x-ray film confirms the full re-expansion of the lungs [14]. As soon as the tube is removed, apply an airtight sterile petroleum dressing [2]. The nurses must understand how to deal with emergency when arises, this study found the nurses had average knowledge toward their actions when the tubes dislodge, leakage and displaced. I think these consider a poor knowledge; these emergency situations must require alert and quick actions from the nurse to save the patient life and prevent any complication that it may arise. If the chest tube becomes dislodged, cover the opening drain site immediately with petroleum gauze and apply pressure to prevent negative inspiratory pressure from sucking air into the chest, inform doctor and collect equipment for reinsertion the tube while keep the opening closed, reassure the patient and monitor him closely for signs of tension pneumothorax [2,16] . Unfortunately their knowledge reveals unsafe practice. Comparing qualification of nurses with their knowledge about the indications and complications of chest drain, knowledge of those with master degree had insignificance high than those with bacheloria degree (P value > 0.05) "Table: 3-4". Also the studied showed insignificance high level of knowledge about the indications and complications of chest drain insertion versus experience years among nurses worked from 1-5years P value > 0.05 "Table: 3-5". Education and working experience insignificantly influenced nurses' knowledge.

On the other hand, nurses practice toward preparation of equipments which were needed in the insertion of the chest drain; majority of them were performed improper preparation of equipment in spite of availability of facilities at hospital. This was subsequent with their practice towards routine patient care "Tables: 3-6, 3-7". These result is similar with studies conducted to identify nurses' level of knowledge and practice such study in Dublin city in Ireland school of nursing and midwifery 2005 [17], a survey in a Nigerian semi urban university hospital [18] and study conducted in surgical wards at Teaching Hospitals in at Alhariri, Alyarmouk during 2012-2013 [19]. These studies were revealed deficit in knowledge and practice of nurses regard care of patient with chest drainage system which seriously impact the patient life.

V. Conclusion

The study demonstrated variations in nurses' level of knowledge and practice, most of them their knowledge between poor and average these were reflected in their nursing practice. Many nurses were unaware of recommended practice and a number demonstrated potentially unsafe practice. Also the study was raised concern about all aspects of chest drains care and highlighted the needs for changes in practice and develops body of knowledge.

VI. Recommendations

The study recommended the needs of extensive changes in nurses' knowledge and practice through: Impetus for each nurse to provide evidence base care, it's a nurse responsibility to develop body of knowledge in her work area, nurses must be supported by local practice development and personal, identify gaps in knowledge, seek appropriate training and resources and all practice should be based on evidence.

Acknowledgment

We would like to express our gratitude to Alwaleed Essa for his continuous encouragement, gratefully acknowledge our faculty of nursing, all nursing staff members in academy of medical science and technology, Sudan Heart Center and special thank for Dr. Ahmed Allseed for his continuous encouragement, advice and help.

References

- [1]. British Thoracic Society Pleural Disease Guideline 2010, *International Journal of Respiratory System*, 65 (Supple II), ii1-ii76, 2010.
- [2]. M. Eckman, K. Komerford, *Medical Surgical Nursing Incredibly easy* (3rd ed. Philadelphia-Lippincott, Willms and Wilkins, 2012).
- [3]. S. C. Smeltzer, G. B. Brenda, L. H. Janice and H. C. Kerry, *Brunner & Suddarth's Textbook of Medical-surgical Nursing* (12^{ed}. Philadelphia- Lippincott, Willms and Wilkins, 2012).
- [4]. D. Briggs , Nursing Care and Management of Patients with Intrapleural Drains: *Nursing Standard*, 24 (21), 47-55,2010.
- [5]. A.C. Frazer, Managing Chest Tubes, *Academy of Medical Surgical Nurses*, 21(1) 10-23, 2012.
- [6]. National Health Service Foundation Trust, Intrapleural Chest Drains Insertion and Management, Salisbury, England.
- [7]. A. Snow, How to Insert a Chest Drain, *South Sudan Medical Journal*, 2 (Issue 1), 2009. Available at:
- [8]. R. Durai, H. Hoque and W.t. Davies, Managing Chest Tube and Drainage System. *AORN journal*, 91 (2), 275-280, 2010.
- [9]. I. Kuhajda I, K. Zarogoulidis, I. Kougioumtzi and H. Huang, Tube Thoracostomy Chest Tube Implantation and follow up, *Journal of Thoracic Disease*, 6(Supple4), S470-S479, 2014.
- [10]. Agency for Clinical Innovation, A consensus Guideline Pleural Drains in Adults, *ACI Respiratory Network* (1) 2-55, 2016.
- [11]. D. I. Glenn, Determining Sample Size. University of Florida, 2009.
- [12]. Univariate analysis From Wikipedia, the free encyclopedia, Available on line at: http://en.wikipedia.org/wiki/Univariate_analysis.
- [13]. Bivariate analysis From Wikipedia, the free encyclopedia, Available on line at: http://en.wikipedia.org/wiki/Bivariate_analysis
- [14]. L. Pamela, *Skill Checklists for Taylor's Clinical Nursing Skills, Nursing Process Approach* (3rd ed. Brigantine, New Jersey-Lippincott Williams & Wilkins 2011).
- [15]. American Association of Critical-Care Nurses, *Evidence-Based Care of Patients with Chest Tubes* (National Teaching Institute, **ExpoEd** -MAQUET GETINGE GROUP 1-23, 2015).
- [16]. J. Rhoads, B. J. Meeker, *Davies's Guide to Clinical Nursing Skills* (Philadelphia-F. A. Davis Company, 2011).
- [17]. D. Lehwaldt, F. Timmins, Nurses' knowledge of Chest Drain Care: an exploratory descriptive survey, *National Institute of Health*, 10(4), 192-200, 2005.
- [18]. E. B. Kesieme, I. S. Essu, B. J. Arekhandia, K. Welcker and G. Prisadov, Nurses' knowledge of care of chest drain: A survey in a Nigerian semi urban university hospital, *Ann Afr Med* 15, 28-33, 2016.
- [19]. J. Suad J, S.A. Ahmed, A. Hussein and A. A. Ganmi, Evaluation of the Nursing Management for Patients undergoing to water seal chest tube drainage system, *Kufa Journal For Nursing Sciences* 5 (2), 2015.