Impact of in-Service Training Program for Nurses on Nursing Management for Children with Pneumonia Under Mechanical Ventilation at Ahmad Gasim Hospital, Khartoum, Sudan 2013

Eiman Ahmed Saad Mohamed[1, *], Hanan Mabrouk Ramadan[2]

[1]Pediatric Nursing Faculty of Nursing Sciences Sudan International University Khartoum, Sudan

[2]Pediatric Nursing Aljazeera University, Madani, Sudan

Abstract

Pneumonia is common disease in paediatrics mainly in infancy and early child hood. Mechanical ventilation is one of the major supportive modalities of treatment in the intensive care unit but it carries a lot of risks and complications. My research aims training of nurses in hospital to give proper immediate care and proper use of mechanical ventilation to prevent complication. Respiratory infections account to majority of acute illnesses in children, cause and course of these infections are influenced by age of child, season, living condition and pre-existing medical problem. This is aqusi experimental study aiming to assess the impact of in-service training program for nurses on nursing management for children with pneumonia under mechanical ventilation at Ahmed Gasem hospital. Khartoum State. The sample (50) nurses available during the research period. extended from December 2013 to July 2014 (pre and post training program). The data collected by using a questionnaire and a observational checklist for the purpose of the study was collected by the researcher before and after the training program. The educational program is designed to study. The data were analyzed using the Statistical package for social sciences (SPSS) and the results showed that the nurses were acquired knowledge after intervention specially participant's knowledge and practical regarding mechanical ventilation according their correct and wrong (88% ,79%and 90%). The result showed that the nurse practical skills improved after program The Relation between total knowledge and level of practice as (46%) for good (34%) fair (20%) poor. (75-100 good, 50-74 fair, less than 50 poor) The study recommended education and training programs on an ongoing basis to provide high quality nursing care and also circulating a protocol for how to handle a patient with pneumonia disease under mechanical ventilation. The study concluded that the nurses information about pneumonia in children has improved and mechanical ventilation have evolved dramatically among nurses.

1. Introduction

A mechanical ventilator is a machine that makes it easier for patients to breathe until they are able to breathe completely on their own. Sometimes the machine is called just a ventilator, respirator or breathing machine. Usually, a patient is connected to the ventilator through a tube (called an end tracheal tube) that is placed in the windpipe. Sometimes, patients can use a machine that assists breathing through a mask or mouthpiece but this may not work with severe

* Corresponding author

E-mail address: eimanshandi@gmail.com (E. A. S. Mohamed), hananmabrouk63@gmail.com (H. M. Ramadan)

respiratory problems. Despite their life-saving benefits, mechanical ventilators carry many risks. Therefore, the goal is to help patients recover as quickly as possible to get them off the ventilator at the earliest possible time. (Robert L chatpun, 2003)

Respiratory infections account majority of acute illnesses in children, cause and course of these infections are influenced by age of child, season, living condition and preexisting medical problem (MSN,Terri, 2008).

Respiratory tract infection is a frequent cause of acute illness in infant and children. Child responses to infection vary based on age of the child, causative organism: general health of child, existence of chronic medical conditions and degree of contact with other children (Nettina Sandra, 2001.)

Pneumonia is an inflammation of lung parenchyma it can be caused by a virus, bacteria mycoplasma or fungus it may also result from aspiration of foreign material into lower respiratory tract (aspiration pneumonia), pneumonia occurs more often in winter and early spring it is common in children but is seen most frequently in infants and young toddlers. Viruses are common cause of pneumonia in younger children and least common cause in older children. Viral pneumonia is usually better tolerated in children of all ages. Children with bacterial pneumonia more present with a toxic appearance but rapid recovery generally occur if appropriate antibiotic is instituted early. Pneumonia is usually a self limited disease. (Davidson Sir Stanley, 2000).

Some patients are not able to ventilate their lungs adequately, because of various disorders resulting in respiratory insufficiency or failure

Immediate interventions include:

Endotracheal tube (ETT).

Tracheostosmy.

Mechanical lung ventilator with positive pressure ventilation (PPV).

Mechanical ventilation is one of the major supportive modalities in the intensive care unit but it carries a lot of risks and complications, the most common one being ventilator associated pneumonia which can significantly affect the outcome of critically ill patients. The lungs are usually amongst the major organs involved in multiple organ failure and thus the challenge of delivering appropriate ventilation with as little complications as possible is extremely important .To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. It is characterized by a new or a progressive pulmonary infiltrate, fever, leukocytosis and purulent tracheobronchial secretions (Munro, Grap, Elswick, et al., 2006).

2. Objectives

2.1. General Objectives

To assess the Impact of in service training Program about nursing management for children with pneumonia on mechanical ventilation

At Ahmad gasem Hospital, Khartoum, Sudan 2014

2.2. Specific Objective

1. To assesses nurse's knowledge and care for children with pneumonia on mechanical ventilation in pediatrics unit.

2. To apply in service training program for nurses about dealing with daily living care of mechanically ventilated children with pneumonia.

3. To identify if there is any relation between training as well as years of experience and knowledge of intensive care nurses for prevention of ventilator with pneumonia.

4. To evaluate the impact of in service training program on improving the nurses knowledge and practice in dealing with pneumonia patent under mechanical ventilation

3. Material and Methods

3.1. Research Design

A quasi - experimental design use in conducting of this research .

3.2. Study Area

The study area was Ahmed Gasim hospital at Khartoum bahry, Sudan, which is located north of Khartoum.

3.3. Study Population

The population of this study includes all the nurses (either diploma nurses or B.S.c of nursing graduates regardless of their year of experience) who were caring for children with pneumonia at Ahmad Gasim hospital.

3.4. Sample Size

All the nurses who were caring for children with pneumonia at Ahmed gasem hospital in ICU pediatrics and pediatrics word 50 nurses (total number of nurses).

3.5. Tools of Data Collection

Two tools was used to collect the necessary data to achieve the aim of the study, they were:

1. Structured knowledge Questionnaire

2. Observational Checklist

3.6. Structured Knowledge Questionnaire

A structured interview sheet was developed by the researcher. It was included

3.6.1. Part I

The first part was about socio-demographic characteristics of the studied subjects such as biosocial data including age, sex, educational level,

3.6.2. Part II

The second part was developed to collect data about the nurse's knowledge about pneumonia such as definition, causes, manifestations, treatment, complications and nursing care. And nurses knowledge about mechanical ventilation definition, How to deal with it and Complication.

3.7. Observational Checklist

An observational checklist was developed by the researcher which was included chick list about: hand washing, gloving, use antiseptic solution, oxygen administration suction, vital sign, intubation and care of patent on mechanical ventilation.

3.8. Pre Intervention Phase

3.8.1. Pilot Study

A pilot study was carrying out before the development of the study and before embarking on the actual study (data collection). It was conducted in order to test applicability of the tools.

3.8.2. Field Work

Before conducting the study, nurses were assured that the data collected from the questionnaire was remained confidentiality and personal identification was not needed by any means. Nurses wear given the option to refuse to participate in the study, and withdraw from it at any time.

3.8.3. Interventional Phase

Each nurse was individually interviewed to assess his/her knowledge about mechanical ventilation and its care and prevention of pneumonia.

An educational program to study group was design by the researcher based on actual assessment of nurse's needs. Different teaching methodology such as lecture, discussion, demonstration, and re demonstration, was used. Different assisting learning methods were used as pamphlets, PowerPoint presentation, show pictures, posters, and real equipments. The intervention was implemented to nurses in small group (8-10 nurses).

A course of five days was offered for each group which included five lectures for two hours .the demonstration used for practical station for 4 hours at afternoon shift Atonal of (50) nurses was trained.

3.9. Post Interventional Phase

The questioner was distributed post of the intervention program for the nurse to assess their knowledge. Each nurse was evaluated by using and observational checklists collected by the researcher.

The researcher was assessed the nurses performance and their competency of application of mechanical ventilation protocols the nurses wear observed on time after three month post intervention data was collected by using questioner and chick list.

3.10. Statistical Design

The collect data in pre test and post test was organize, categorize, tabulate in tables using numbers and percentage, mean percentage and standard deviation. Test was use the statistical package for social sciences (SPSS version) was use for statistical analysis.

3.11. Inclusion and Exclusion Criteria

3.11.1. Inclusion Criteria

1 Certified diploma, bachelor, and master nurses working in pediatric ICU and pediatric word.

2 Collaborators in critical care units and pediatric word nurses who spend more than six month

3.11.2. Exclusion Criteria

• Nurses who refuse

• Nurse who does not finished the study

4. Results

Table (1). Shows early Nursing evaluation of pneumonia patient, Number of nurses (50).

early nursing evaluation of pneumonia patient	Frequency Pre tested	Percentage Pre tested	Frequency Post tested	Percentage Post tested
Chest occultation	12	24%	3	6%
Check V/S	31	62%	42	84%
Check O2 saturation	7	14%	5	10%
Total	50	100%	50	100%

Table (2). Shows what are the types of pneumonia according to causative agent?, Number of nurses (50).

What are the types of pneumonia according to causative agent?	Frequency Pre tested	Percentage Pre tested	Frequency Post tested	Percentage Post tested
Viral	18	36%	20	40%
Bacterial	26	52%	25	50%
Hydrocorponic	4	8%	3	6%
Lipid	2	4%	2	4%
Total	50	100%	50	100%

Table (3). Shows nursing management of pneumonia, Number of nurses (50).

nursing management of pneumonia:	Frequency Pre tested	Percentage Pre tested	Frequency Post tested	Percentage Post tested
Good ventilation	5	10%	18	36%
Cold compression	0	0%	8	16%
Check V/S	5	10%	2	4%
All of them	22	44%	40	80%
Total	50	100%	50	100%

Table (4). Shows Distribution of participant's knowledge regarding mechanical ventilation according their correct and wrong, Number of nurses (50).

Items		pretest Correct answer Freq.	Percent%	Post test correct answer Freq.	%	Posttest Wrong answer Freq.	%
1	Route for endotracial intubation	30	60.0%	39	78%	11	22%
2	Frequency of ventilator circuit changes	32	64.0%	37	74%	14	28%
3	Type of humidifier	26	52.0 %	41	82%	24	48%
4	Frequency of humidifiers changes?	29	58.0%	37	74%	21	42%
5	Methods of suctioning closed systems?	36	72.0%	36	72%	14	28%
6	Frequency of change in suction systems	24	48.0%	32	62%	26	52%
7	Endotracheal tubes with extra lumen for drainage of subglottic secretions	31	62.0%	39	78%	11	22%
8	Patient positioning	30	60.0%	41	82%	9	18%

Table (5). Shows Barriers to the implementation of scientific and proper nursing care for mechanical ventilation, Number of nurses (50).

Statement		Pretest YES Freq.	Percent%	Pretest no Freq.	Percent%	posttest Yes Freq.	%	Posttest No Freq.	%
a	Lack of knowledge	29	58.0%	21	42.0 %	45	90%	5	10%
b	Unavailability of material and cost constraints	31	62.0%	19	38.0%	37	74%	19	28%
c	Unforeseen in departmental protocol	26	52.0%	24	48.0%	36	72%	24	48%
d	Shortage of staff	25	50%	25	50 %	29	58%	21	42%
e	Training of staff members	37	74.0%	13	26.0%	39	78%	11	22%

Table (6). Shows Relation between *level of training and knowledge of nurses,* Number of nurses (50).

Total knowledge Training course in ICU	Good	Fair	Poor	Total
Yes	11 22.0%	4 8.0%	0 .0%	15 100.0%
NO	9 18%	19 38%	7 14.0%	35 100.0%
Total	20 40.0%	23 46%	7 14%	50 100.0%

P value = 0.064

Table (7). Shows the distribution of check list regarding their practice of nurses about dealing with daily living care of mechanically ventilated patients, Number of nurses (50).

ACTION		done Freq.	Percent%	Not done Freq.	Percent%
1	1. Identifies the indications for mechanical ventilation	37	74.0%	13	26%
2	a. Lists the steps in preparing for intubation: a. Notifies physician and respiratory therapist. b Assembles the necessary equipment	44	88.0%	6	12.0 %
3	a. Determines the patient's ventilator settings on a given ventilator and verifies against the physician's orders: a. FIO2, tidal volume, rate, and mode. b. Identifies additional settings according to patient orders.	26	52.0%	24	48.0%
4	Describes the various modes of ventilation and their implication	29	58.0%	21	42.0%
5	Describes at least two complications associated with patient's response to mechanical ventilation and their signs and symptoms	45	90.0%	10	10.0%

ACTION		done		Not done	
		Freq.	Percent%	Freq.	Percent%
6	Describe the causes of given ventilator alarms and nursing measures taken to trouble shoot given alarm	22	44.0%	28	56.0%
7	Describe some preventative measures taken aimed at prevention of ventilator- associated complications.	33	66.0%	17	24.0%
8	Given a nursing intervention in the care plan of the ventilated patient, be able to explain the rationale.	30	60.0%	20	40.0%
9	Verbalizes the standards of care according to care plan and documents pertinent information including the following: type of airway, position and size; type of ventilator and settings; breath sounds and pulmonary assessment; interprets ABG results; weaning attempts and patient tolerance.	38	76.0%	12	24.0%
10	Verbalizes ventilator standards IAW Infection Control Manual Guidelines and Respiratory Therapy in Intensive Care Units SOP.	27	54.0%	23	46.0%
11	Emergency equipment available in patient room: ambubag, mask, appropriate size suction catheter and no outdated equipment.	27	54.0%	23	46.0%

P value= 0.003 t=0.5

Table (8). Application of safety precautions and suitable position for ventilated patient: Number of nurses (50).

ACTION		done		Not done	
		Freq.	Percent%	Freq.	Percent%
1	Hand washing	39	78.0%	11	22%
2	Using gloves	42	84.0%	8	16.0 %
3	Semi setting position	46	92.0%	4	8.0%

P value= 0.007, t= 0.6

Table (9). Shows Relation between years of experience and level of practice, Number of nurses (50).

Level of practice Years of experience	Good	Fair	Poor	Total
<2 years	11 22.0%	13 26%	4 8%	28 100.0%
2-3 years	1 2%	9 18%	9 18%	19 100.0%
5 years	1 2%	0 .0%	2 4%	3 100.0%
Total	13 26.0%	22 44.0%	15 30.0%	50 100.0%

P value = 0 .041 t = 0.2

Table (10). Shows Relation of Level of practice And Training course in ICU pediatrics, Number of nurses (50).

Level of practice Training course in ICU pediatrics	Good	Fair	Poor	Total
Yes	10 20.0%	3 6.0%	2 4.0%	15 100.0%
NO	12 24%	14 28%	9 18%	35 100.0%
Total	22 44.0%	17 34.0%	11 22.0%	50 100.0%

P value =0.085 t= 0.8

5. Discussion

"An ounce of prevention is worth a pound of cure"

(Nancy M. Valentine)

Mechanical ventilation is a process by which gases are moved into and out of the lungs by means of a ventilator, a machine that delivers a flow of gas to a patient's airway. The indications for mechanical ventilation include respiratory arrest, acute lung injury, critical illness and respiratory support following surgery. (Withers J. 2009)

A critically ill patient presents a major challenge and consequent reward to nursing. The nurse should provide essential individualized care directed towards the survival of the patient. Each individual nurse is accountable to take appropriate measures to save the life of the patient under her care. The number of patients on mechanical ventilator is rapidly increasing. These patients may be conscious or unconscious. The nursing staffs have to assist or perform the various activities of living until the patient fully regains consciousness. (Joseph C, Vijayakumar C, Augustine J, Dr. John G 2004)

A quasi-experimental design was used in the conduction of this study in Ahmed gasem hospital (50) nurses wear included in this study in the period extending from December 2013 to July 2014. It involved total coverage from pediatric ICU and pediatric word.

According to nurses knowledge among pneumonia the pre test result showed nurse had in adequate knowledge .but post evaluation revealed high level of knowledge among nurses toward children with pneumonia.

Regarding nursing management of pneumonia (92%) of nurses answer correctly pneumonia management post test. The main findings of this study showed that: (26.0%) was poor, (30%) fair, (44%) was good knowledge's of participants'. Regarding mechanical ventilation in pediatric pneumonia. The fair knowledge and practice of nurses will reflect the patient care and affect morbidity and mortality.

Related to participants, availability of resources, training of staff members, staff motivation and compliance, team work, updated protocols and more nursing staff would contribute in the implementing the proper and scientific nursing care for mechanical ventilation . Unavailability of resources as well as cost represents a barrier to the implementation of proper and scientific nursing care for patent under mechanical ventilation the above findings have implications for patient safety and quality of care as well as on nursing education and training of ICU nurses. The majority of nurses' pre and post test reported training of staff member is very important (78%) (90%).

The results strongly disagree with Response rate was 61%. In most units, nurse managers reported that physicians and nurses usually collaborated in making decisions about initializing (63%) and adjusting (94%) ventilator settings and for determining weaning readiness (88%), weaning method (59%), extubation readiness (82%), and weaning failure (100%). Protocols for mechanical ventilation were available in 35% of units, some specific to weaning (18%) and others for noninvasive ventilation (35%). Automated closed loop systems were used in 18% of units. Competency training was required before nurses could adjust ventilator settings in 35% of responding units; in the remaining units, settings were adjusted by nurses who had no specific competency training(Bronagh Blackwood, Carol Junk , Jeremy David Morrell Lyons, Danny F. McAuley and lourise Rose2008)

Nurses' knowledge levels for prevention complication of mechanical ventilation for pneumonia patient. Oral vs. nasal route for endotracheal intubation According to the evidence based guidelines (EBG's) for applying mechanical ventilator the oral route is the recommended one

Amongst all participants, 30 (6.0%) answered correctly and

20 (40.0%) answered incorrectly, showing that nurses know that the oral route is preferred for endotracheal intubation.

According to Frequency of ventilator circuit changes, Types of humidifier, Frequency of humidifiers changes, open closed suction systems, Frequency of change in suction systems, Endotracheal tubes with extra lumen for drainage of subglottic secretions

And Patient positioning According to EBG's on mechanical ventilation the majority of nurses answered correctly after intervention 32 (64.0%), 26 (52.0%), 36 (72.0%), 30 (60.0%), 30 (60.0%)

These results are agreed with. (No association between knowledge and years of working experience (p- value 0.34), ICU training (p- value 0.64) and level of education (p- value 0.55). ICU nurses' practice on prevention of VAP was statistically associated with education level (p- value 0.03) but not associated with ICU training (p- value 0.53) and years of work experience (p- value 0.64). On observation large (By Ally Tatu Said 2012)

According to the evidence based guidelines (EBG's) for applying mechanical ventilator the oral route is the recommended one Amongst all participants, 30 (60.0%) answered correctly and 20 (40.0%) answered incorrectly, showing that nurses know that the oral route is preferred for endotracheal intubation this finding agree with112 qualified nurses, working in eleven different ICUs were asked to complete an anonymous questionnaire regarding endotracheal / tracheostomy tube cuffs. Results were summarized using frequencies, percentages or means or percentiles as appropriate. More than 90% of all respondents were unaware of the different types of cuffs available. 83% of respondents were felt that they were responsible for their patients cuff care management. Most respondents indicated that they were unaware of any specific protocol regarding the care of tube cuffs in their units. (Mol D. A, Villiers G. T, Classen A. J2009)

The observational check list' is designed and the researcher observe the practice of nurses during dealing with daily living care of mechanically ventilated patients, the result showed That: (43. %) fair practice, (32, %) poor practice, and (25.0%) have good practice of participants' regarding mechanical ventilator with pneumonia patent .the results nearly similar to study on Practice and knowledge of staff nurses regarding care of immobilized patients with a view to develop a protocol was done in Bangalore. 55 staff nurses were selected for the study. An observational checklist was used for assessing the practice and a structured knowledge questionnaire was used to assess the knowledge. The collected data was analyzed by descriptive and inferential statistics. The findings showed that overall practice mean

percentage was 62.77% and knowledge score was 53.28%. no significant relationship between knowledge and practice. Majority of the immobilized patients are prone for complications. It can be prevented by comprehensive nursing care. On the basis of study findings the investigator developed a protocol for caring immobilized patients as a guide for the nursing personnel (Manju V.2009)

The main findings of this study showed: that: (26.0%) was poor, (30%) fair, (44%) was good knowledge's of participants' regarding mechanical ventilation in pediatric pneumonia, (42.5%) fair practice, (32,50%) poor practice, and (25.0%) have good practice of participants' regarding applying mechanical ventilation with pneumonia. The fair knowledge and practice of nurses will reflect the patient care and affect morbidity and mortality.

Nurses' knowledge and practice are improved after intervention that is main objective of this study.

6. Conclusion

ICU trained nurses and experienced are expected to have better knowledge than those who have not undergone pediatric ICU training as they become shift leaders and supervisors of nursing care. The relation between ICU experience and knowledge levels was clinically not significant and therefore this indicates that working for longer periods in ICU does not necessarily Nurses have fair knowledge for mechanical ventilation and in order to implement measures to prevent complication, it is necessary to be aware of such measures. Without this knowledge, nursing practice and patient care are not of high standards. Nurses need knowledge on the topic so as to question measures that are being used in their units and their usefulness in mechanical ventilation.

This study was concluded for ICU trained and non ICU trained nurses working in ICUs of Ahmed Gasem pediatrics Hospital the results showed they did not have adequate knowledge for mechanical ventilation.

After this study nurses ware improvement in knowledge and practice also.

Recommendations

- Ongoing in-service training must be introduced into hospitals and ICUs to improve knowledge on mechanical ventilation, which is cause of a common nosocomial infection in the pediatric intensive care units.

- Orientation of new staff members in ICU's should include education on strategies for using mechanical ventilation as management for pneumonia

- Put ICU protocols and should be reviewed regularly as updates and new evidence for best practice are constantly emerging and staff should be educated on the updated protocols.

- Further research should be conducting to test knowledge levels of nurses prior to and after educational programmes on evidence based guidelines for mechanical ventilation to assess if nurses gained knowledge after exposure to educational programmed.

- For spatial pediatric hospital must be selecting expertise nurses manly in ICU pediatrics so it serous side and give them chances for external training such as scrap nursing, nursery, neonatology….ect.

References

[1]   Augustyn, B. 2007. Ventilator associated pneumonia: risk factors and prevention. *Critical Care Nurse*, vol. 27, no. 4, pp. 32 – 39.

[2]   Biancofiore, G., Barsotti, E. & Catalani, V., et al. 2007. Nurses' knowledge and application of evidence-based guidelines for preventing ventilator associated pneumonia. *Minerva Anestesiologica*, vol. 73, no. 3, pp. 129 – 134

[3]   Briel M, Meade M, Mercat A, et al. Mar 2010Higher vs lower positive end-expiratory pressure in patients with acute lung injury and acute respiratory distress syndrome: systematic review and meta-analysis. *JAMA*.;303(9):865-73. [Medline]

[4]   Branson RD, Johannigman JA. Feb 2005 The role of ventilator graphics when setting dual-control modes. *Respir Care*.;50(2):187-201. [Medline]

[5]   Bloos F., Muller S., Harz A. et. al. 2009 Effects of staff training on the care of mechanically ventilated patients: a prospective cohort study. Available at http://bja.oxfordjournals.org/cgi/content/abstract/aep114v1

[6]   Couchman, B.A., Wetzig, S.M. & Coyer, F.M., et al. 2007. Nursing care of the mechanically ventilated patient: What does the evidence say? Part one. *Intensive and Critical Care Nursing*, vol. 23, pp. 4- 14

[7]   Cason C L, Tyner T, Saunders S et. al. 2009Nurses' Implementation of Guidelines for Ventilator-Associated Pneumonia From the Centers for Disease Control and Prevention. Available at http://ajcc.aacnjournals.org/cgi/content/full/16/1/28 ; accessed on 29-07-.

[8]   Esan A, Hess DR, Raoof S, George L, Sessler CN. 2010 Severe hypoxemic respiratory failure: part 1--ventilatory strategies. Chest. 137(5):1203-16.

[9]   Eicher DJ, Wagner CL, Katikaneni LP, Hulsey TC, Bass WT, Kaufman DA, Horgan MJ, Languani S, Bhatia JJ, Givelichian LM, Sankaran K Yager JY. 2005 Moderate hypothermia in neonatal encephalopathy: efficacy outcomes. *Pediatr Neurol*. 32:11–17

[10] Ebell MH. 2010 Clinical diagnosis of pneumonia in children. Am Fam Physician.;82(2):192-3. Review

[11] Hansen BS and Severinsson E. 2005Intensive care nurses perceptions of protocol directed weaning- a qualitative study. Intensive Crit Care Nurs. 23(4):p. 196-205.

[12] Hockenberry, M., Wilson, D. & Barera, P. 2006. Implementing evidence based nursing practice in a pediatric hospital. *Pediatric Nursing*, vol. 32, no.4. pp. 371 – 377.

[13] Kendirli T, Kavaz. 2006 Mechanical ventilation in children. Turk. T. Pediatr.. -dec; 48(4):p.323-7.

[14] Kabra SK, Lodha R, Pandey RM. 2010 Antibiotics for community-acquired pneumonia in children. Cochrane Database Syst Rev.;(3). Review

[15] Lassi ZS, Haider BA, Bhutta ZA. Zinc 2010 supplementation for the prevention of pneumonia in children aged 2 months to 59 months. Cochrane Database Syst Rev.;12. Review

[16] Marilyn J. Hockenberry & David Wilson,2007.Wong's Nursing care of infants and children, Eighth edition, Mosby

[17] Marino P, "The ICU Book", 3rd Edition, 2006 Lippincott Williams & Wilkins

[18] Mol D. A, Villiers G. T, Classen A. J. 2009 Use and care of an endotracheal/ tracheostomy tube cuff — are intensive care unit staff adequately informed?. Available at http: //ajol.info/index.php/sajs/article/viewFile/44470/27979.pdf; accessed on 29-07-.

[19] Manju V. 2009 A study to assess the practice and knowledge of staff nurses regarding care of immobilized patients in St. Johns Medical College Hospital, Bangalore with a view to develop a protocol. Unpublished Dissertation

[20] Niederman M. 2009 In the clinic. Community-acquired pneumonia. Ann Intern Med. 2009; 151(7):ITC4-2-ITC4-14. Review. Erratum in: Ann Intern Med.; 151(11):827.

[21] Pravikoff, D., Tanner, A. & Pierce, S. 2005. Readiness of U.S nurses for evidence based practice. *American Journal of Nursing*, vol. 5, no. 9, pp. 40 -51

[22] Ranson RD, Johannigman JA. Feb 2005 The role of ventilator graphics when setting dual-control modes. Respir Care.;50(2):187-201.

[23] Rose L, Nelson S. Issues in weaning from mechanical ventilation: Literature review. J Adv Nurs.2006 Apr; 54(1):p. 73-85

[24] Rose Marie Nieswldomy PhD, RON2008 Foundation of nursing research, first edition

[25] Sandra F.Smith, Rn, Ms, ABD 2008. Clinical Nursing Skills, Seven Edition, Person Education.

[26] Solsona JF, Diaz Y, Vazquez A, Gracia MP, Zapatero A, Marrugat J. Apr 14 2009 A pilot study of a new test to predict extubation failure. *Crit Care*

[27] Terri, MSN, CPNP, 2008. Essentials of Pediatric nursing - Lippincott, Williams &Wilkins.

[28] Tehrani, F. T., 2005 "The origin of adaptive support ventilation," the International Journal of Artificial Organs, Volume28, No. 10: 1051-2,

[29] Tehrani, F. T., August 2007 "A New Decision Support System for Mechanical Ventilation," Proceedings of the International Conference of IEEE Engineering in Medicine & Biology Society, Volume 29: 3569-3572,

[30] Tehrani, F. T., Roum, J. H., 2008 A New Computerized System for Mechanical Ventilation," Journal of Clinical Monitoring and Computing, Volume 22:

[31] Withers J. 2009Criteria for using a nurse-led ventilator-weaning protocol. Available at http://www.nursingtimes.net/nursing-practice-clinical-research/criteria-for-using-a-nurse-led-ventilator-weaning-protocol/203803.article ; accessed on 28-07.

[32] WHO- neonatal & perinatal mortality rates (2009-2008-2009).