

## Relationship Between Nursing Care Provided for Children on Mechanical Ventilation and their Clinical Outcomes

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### Abstract

**Background:** Indication of mechanical ventilation are variable and diverse. It is required whenever the child is unable to maintain adequate alveolar oxygenation or ventilation. **Objective:** To assess the relationship between provided nursing care for children on mechanical ventilation and their clinical outcomes. **Setting:** The Pediatric Intensive Care Unit (PICU) of Alexandria University Children's Hospital (AUCH) at El-Shatby. **Subjects:** Study subjects were included both nurses and children. The first part of the study are all nurses (30) worked at the previously mentioned setting were included this inclusion was regardless of their level of education and years of experience. The second part is a convenient sample of 50 children were aged from 1 month to 3 years, just upon starting mechanical ventilation, without any previous complication including ventilator associated pneumonia, pressure ulcer, eye or oral infection. **Tools:** Three tools were used; characteristics of nurses and children, nursing care Provided for children on Mechanical Ventilation Observational Checklist and clinical outcomes of mechanically ventilated children. **Results:** All studied nurses had satisfactory level of performance in assessing critically ill children, suction, positioning, chest physiotherapy, skin care, eye care and oral care procedures. There was no statistical significant relation between clinical outcomes and the total mean score of nurses' care performance. **Conclusion:** all studied nurses had satisfactory level of performance regarding care provided for children on mechanical ventilation. All studied children had positive clinical outcomes except less than one third of them of them who had ventilator associated pneumonia (VAP) at the third days from admission and more than one third of them had VAP after the fifth days from admission.

**Key words:** Mechanical ventilation, Provided nursing care, Children clinical outcome.

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### Introduction

Critically ill children commonly have a disease process that may affect multi-organ system. Those children are managed in PICU with the aim of achieving the best outcomes. Most of these children may require mechanical ventilation during their hospital stay. Mechanical ventilation is one of the most

trivial procedure that are performed in PICU (Sahoo et al., 2018) .

In 2022, there were 41.7 cases of acute respiratory failure for every 100 children in the United States and Colombia, with 9.2 % of those cases necessitating mechanical ventilation (Vargas Muñoz et al., 2022).

In Minia Egypt 2022 the incidence of utilizing mechanical ventilation in children was 25.6%. Respiratory failure in 19.1% infants. Pneumonia was the commonest respiratory indication for mechanical ventilation in 33.5% according to medical report that was done in pediatric department, faculty of medicine, Minia University (Abdelrazic et al., 2022).

In 2022, In Alexandria University Children hospital (AUCH) the number of cases admitted to the pediatric intensive care unit was 230 according to statistical record of the unit; while 95 of them received mechanical ventilation (Unpublished statistical pediatric intensive care unit record).

Mechanical ventilation is used to improve pulmonary gas exchange or to relieve respiratory distress. It regulates lung mechanics and provide cardiopulmonary support in cases of respiratory failure. It is also used in condition of inadequate oxygenation/ventilation ratio or complete respiratory arrest. (Khilnani, 2020) .

Settings of mechanical ventilator allow the ventilator parameters to be tailored according to the patient's needs. It also permits selection of the desired ventilation mode. Alarms are an integral part of MV because it supports vital life functions as oxygenation and ventilation. For example, high or low minute ventilation and apnea alarms (Lucking et al., 2021) .

Mechanical ventilation is lifesaving procedure. But like any other medical interventions it is not without harms. Complication of MV include ventilator-induced lung injury, cardiovascular compromise, gastrointestinal disturbances, pneumothorax and ventilator associated pneumonia (Kliegman & St Geme, 2017).

Clinical outcomes for children on mechanical ventilation include positive and negative ones. It is the result of any healthcare intervention which is done for the child. Positive outcomes include improved lung function and stable hemodynamics. Negative

outcomes may include ventilator associated pneumonia, pressure ulcer, eye and/or oral infection (Zimmerman, 2021).

General nursing management for children receiving mechanical ventilation include measuring vital signs, calculating fluids intake and output, daily weighing, providing proper nutrition, skin care, eye care, sedation and pain management. Psychological needs of child and family must also be met. So the pediatric nurse should balance the needs of child's safety with developmental and emotional needs (Richardson, 2022).

Specific nursing management of mechanically ventilated children include several aspects. Airway must be cleared. Suctioning should be performed according to the latest approved standards. Supportive care of child on mechanical ventilation include checking equipment function, performing chest physiotherapy and changing position. Children attached with mechanical ventilation are very critical and need highly qualified comprehensive nursing management (Matzo & Sherman, 2010). This makes it very important to study comprehensive nursing care provided for those children and its relation to their clinical outcomes .

### **Aim of the study**

The aim of the study was to assess the relationship between nursing care provided for children on mechanical ventilation and their clinical outcomes.

### **Research Question:**

What is the relationship between nursing care provided for children on mechanical ventilation and their clinical outcomes?

### **Operational Definition**

In this study, nursing care referred to chest physiotherapy, suction, position changing, eye care and oral care.

Clinical outcomes referred to the presence or absence of ventilator associated pneumonia, pressure ulcer, eye and oral infections.

## Materials and Method

**Design:** Descriptive correlational research design was used.

**Settings:** This study was conducted at the Pediatric Intensive Care Unit (PICU) of Alexandria University Children Hospital (AUCH) at-El Shatby

### **Subjects:**

- 1- All nurses who work at the previously mentioned setting regardless their level of education and years of experiences accomplish the study subjects.
- 2- Convenient sample of 50 children who fulfill the following criteria :

### **Inclusion criteria:**

- Aged from 1 month to 3 year.
- Just upon starting mechanical ventilation
- Without any complication

**Tools:** Three tools were used for data collection.

### **Tool I: Characteristics of Nurses and Children**

These tools were developed by the researcher (Slota, 2018; Urden et al., 2017; Ward & Hisley, 2015).

It included two parts as follows:

#### **Part A: Characteristics of Nurses.**

It included age, level of education, qualification, years of experiences and previous attendance of educational courses on mechanical ventilation.

#### **Part B: Characteristics of Children.**

It included age, gender, birth order, medical history and diagnosis

**Tool II: Nursing Care Provided for Children on Mechanical Ventilation Observational Checklist.** It included two parts as follows

**A: Nursing Assessment of Critically Ill Child** It was adapted and modified from the guidelines of the systemic approach for assessing the critically ill child. These

guidelines were included in the American heart association (AHA) and American Academy of Pediatrics (AAP) on pediatric advanced life support 2015 (Slota, 2018; Urden et al., 2017; Ward & Hisley, 2015). It comprised three parts as follows: **Initial impression** by inspection to identify life threatening manifestations through assessment of appearance such as consciousness and ability to interact, work of breathing through evaluating child's work of breathing, position, any audible breath sounds and looking for signs of absence or increased respiratory effort and finally circulation was assessed by evaluation child's skin color, temperature, heart rate, blood pressure and capillary refill time (Winters & Wilcox, 2020).

**Primary assessment.** It included Airway, Breathing, Circulation, Disability, Exposure approach (ABCDE). Airway was assessed by looking for movement of the chest or abdomen, listening to breath sound. Breathing assessment included the evaluation of respiratory rate, respiratory effort, chest expansion, breath sounds and oxygen saturation by pulse oximetry. Moreover circulation was assessed by the evaluation of heart rate, pulses, capillary refill time and skin color. Disability meant the assessment of neurological function by evaluation include alert, responsive to voice, responsive to pain unresponsive, Glasgow coma scale, pupil response to light and blood glucose test and finally exposure is assessed by physical examination to observe any signs of bleeding or injuries.

**Secondary assessment** which included the assessment of focused medical history, signs and symptoms as wheezing, tachycardia or tachypnea. Allergens as foods or medication. Medications as inhalers or last dose and time. Past medical history as hospitalization, medical problems as asthma or surgeries. Last meal as time and nature of intake or affects treatment. Events as events leading to disease, treatment during interval from onset of disease, treatment during interval from onset of disease and time of onset. Physical examination include

assessment of primary area of concern of the illness as child with respiratory distress assessed from nose/mouth for signs of obstruction, chest /lung, heart and level of consciousness (Vasudev & Shah, 2017).

### **(B) Nursing Interventions Checklists:**

It included six checklists for, suctioning, positioning, chest physiotherapy, skin care, eye care and mouth care. Those checklists were developed by the researcher after reviewing the relevant literature (Davies & McDougall, 2018).

### **Tool III: Clinical Outcomes of Mechanically Ventilated Children Observational checklist**

It was developed by the researcher after reviewing the recent literature (Esquinas, 2016; Shein & Rotta, 2020; Sterni & Carroll, 2016).

It comprised of four items as follows:

- 1- Incidence of ventilator associated pneumonia
- 2- Incidence of pressure ulcer using Braden Q scale for predicting pediatric pressure ulcer risk (Braden Q scale)(Romanelli et al 2018).
- 3- Incidence of corneal ulcer or eye infection assessing the presence of eye discharge or redness
- 4- Incidence of oral fungal infections by assessing the presence of white patches of tongue and mucous membrane and drooling. Clinical Outcomes were assessed as present or absent.

### **Method**

1. Approval of the Research Ethics Committee of faculty of nursing Alexandria University was obtained before carrying out this study.
2. Written approval was obtained from the Faculty of Nursing; Alexandria University and directed to the responsible authorities of the previously mentioned setting to take their permission to conduct the study This approval is taken after explaining

the aim of the study and the research design.

3. Tool I was developed by the researcher (hospital medical record).
4. Part A of tool II was adapted from AHA&APA guidelines (Aehlert, 2017).
5. Part B of tool II was developed by the researcher after thorough review of the relevant literature (Arora, 2020; Hough, 2017; Khilnani, 2019; Perry et al., 2021; Slota, 2018; Zimmerman, 2021).
6. Tool III was developed by researcher except part two represented the Braden Q scale and it was adopted (Romanelli et al., 2018).
7. The tools were tested for its content validity by five experts in the pediatric nursing field. Their validity was 96%.
8. Reliability of the tool was ascertained using the Cronbach's Coefficient Alpha Test The tools were reliable for ventilated children as  $r = 0.94$
9. A pilot study was carried out on 10% of the subjects to test the feasibility of the study and applicability of the tools. This percent was excluded from the total subjects.
10. Every nurse was observed individually three times during her/his working hours with the mechanically ventilated children using tool II.. Observations were done two times in the morning and one in the evening shifts.
11. Every nurse was interviewed individually to obtain his or her characteristics by using part A of the tool I. This was done after finishing the observation to prevent contamination of the sample or bias. Each interview session lasted about 10-15 minutes.
12. Characteristics of children were obtained from child's medical record using part B of the tool I.
13. Clinical outcomes of children were assessed three times using tool III as follows:
  - a. Baseline assessment upon admitting the child to the PICU.

- b. On the third day after admission assessment was conducted for the presence of any complication.
  - c. On the fifth day to assessment of the child's progression either by improvement or regression.
14. The data was collected within a period of 12 months starting from July 2019 to the end of April 2020.
15. After completion of the data collection, the necessary statistical analysis was done to find out the relationship between nursing care provided for children and their clinical outcomes

#### **Ethical considerations:**

- Witness consent was obtained from the nursing director of the PICU department of Alexandria University children's Hospital after providing appropriate explanation about the purposes of the study.
- Confidentiality of the data was maintained throughout the implementation of the study.
- Privacy of nurses was considered throughout the study period

#### **Scoring system**

Nurse's performance was assessed on three points Likert scale in which:

Not done items were equal zero, incorrectly done items were equal one and correctly done items were equal two.

The total score of the items was summed up and were converted into a percent score as follow:

< 60% scored as Unsatisfactory

≥ 60 % scored as Satisfactory

#### **Statistical analysis:**

- The collected data were coded and entered in special format to be suitable for computer feeding.

- Following data entry, checking and verification process were carried out in order to avoid any errors.
- Data were analyzed using the statistical package for social science SPSS (version 20).
- The following statistical analysis measures were used:
  - **Descriptive statistical measures**, which included: numbers, percentages, and averages (Minimum, Maximum, Arithmetic mean ( $\bar{X}$ ), Standard deviation (SD).
  - **Statistical analysis tests**, which included: Chi square, student T test and paired T test.

#### **Results:**

##### **Table (1) Distribution of the studied nurses according to their characteristics:**

It was found from the table that (33.3%) of nurses aged from 25 to less than 30 years While, the age of 6.7% of them was 35 to less than 40 years with a mean age of  $30.00 \pm 7.418$ .

As regards level of education 60% of nurses had the bachelor degree and only 10% of them had the diploma of technical institute of nursing. Concerning years of experience, 40% of nurses had less than 5 years of experiences. While 16.7% of them had 15 years of experience or more. In addition, 80% of nurses attended educational courses on mechanical ventilation.

##### **Table (2). Distribution of the studied children according to their characteristics.**

It was found from the table that, 80% of children aged less than 12 months and 54% of them were females.

Regarding birth order, 38% of them were the first child in the family.

Forty-eight percent of children who were admitted to PICU diagnosed with respiratory failure. Concerning to the

previous admission to PICU, 80% of children weren't admitted before. Finally 100% of children have negative family history of respiratory illness.

**Table (3): Distribution of the studied nurses according to their level of performance.**

It was found from the table that all nurses had satisfactory level of performance regarding to initial, primary, and secondary assessment (100.0% for each). Regarding to initial assessment, it was found that all nurses were satisfactory for assessment of circulation (100.0%) and the majority of them had satisfactory level of performance about assessment work of breathing and child appearance (86.7& 96.7 respectively). In primary assessment all nurses had satisfactory level of performance for assessment of the airway patency, breathing circulation and focused assessment (100% for each), while half of them were satisfactory regarding to assessment of disability (50.0%)

As regard to secondary assessment all nurses had satisfactory level of performance in eye care, pre procedure oral care (100.0% for each) and majority of them were satisfactory for procedure of oral care (96.7%). In endotracheal closed suction, all nurses had satisfactory level of performance about pre procedure and procedure (100.0% for each) while minority of them had satisfactory level of performance regarding to post procedure (23.3%). All nurses had satisfactory level of performance in nasopharyngeal suction, oral suction, endotracheal open suction (pre procedure, procedure, post procedure) (100.0% for each).

In addition, all nurses 100% had satisfactory level of performance in chest physiotherapy; procedure regarding middle lobes, upper lobes, and post procedure care .Furthermore (73.3%), of them had satisfactory level of performance lower lobes while 46.7% of them had satisfactory level in pre procedure steps.

As regard for Positioning, all nurses had satisfactory level of performance for preparation of Supine position (100.0% for each) while 50.0% of them had satisfactory level of performance for prone position. Moreover, all nurses 100% had satisfactory level of performance regarding to Skin care; bathing, moisture, and massage

**Table (4). Assessment of clinical outcomes of the studied children On admission, After3 and 5 days from admission**

It was found from the table that, all studied children did not have VAP on admission (100%).While 30.0% of them have VAP after 3days from admission. Moreover, 34.0% of studied children had VAP after 5 days. All studied children 100% did not have pressure ulcer or eye infection. Furthermore 98% of the studied children had no oral infection. There was no statistical significant difference between three assessment point of clinical outcomes of studied children .

**Table (5) Relationship between the studied children's clinical outcomes and the total mean score of nurses' performance**

It was found from the table that there was no statistically significant relation between clinical outcomes and the total mean scores of nurses' performance after third& fifth days from admission.

**Discussion**

Mechanical Ventilation is widely used in the pediatric Intensive Care Units worldwide for various emergency indications. So,the pediatric nurses must be knowledgeable about the function and of ventilator modes. They should also be aware of causes of deterioration of ventilation and appropriate nursing management in order to provide high-quality patient-centered care (Shelledy & Peters, 2019) .

Regarding to diagnosis for children, the present study clarified that about half of

them were diagnosed as respiratory failure this can be attributed to the fact that those children are in need of MV(**table 2**) The present study is congruent with Vargas Muñoz et al. (2022) who found that about half of studied children had respiratory failure .

Concerning nurse's care performance. The present study revealed that, all nurses had satisfactory level of performance regarding care provided for children on mechanical ventilator. This could be attributed to the fact that one third of nurses were newly graduated and aged from 25-30 years so they are more energetic and actively participated for caring children on MV. Moreover more than half of studied nurses had bachelor degree of Nursing so they were high qualified as well as competent. The PICU at AUCH has a nurse to child ratio of one to one, this ratio ensures that the nurse is available all times to monitor and manage changes in the child's status. Finally eighty percent of study nurses attended training courses this enable them to meet the child's health care and enhance skills and practices . The present study is similar with Ebrahim et al. (2023) who found that that half of the nurses at age group 25-30 years and about two third of studied nurse had attended previous training courses about mechanical ventilation.

While the finding of the present study was in line with Hassen et al. (2023). the results revealed that about three quarter of studied nurses had bachelor degree in nursing (**table 1&3**).

Ventilator associated pneumonia (VAP) is one of the commonest healthcare associated infections in PICUs. It is defined as pneumonia that develops at least 48 hours after mechanical ventilation (Shaffner et al., 2023) .

The finding of the present study illustrated that all study children hadn't VAP on admission and increased after 3&5 days (**table 4**). This could be attributed to the fact VAP occurring 48 hours from mechanical ventilation, length of stay on hospital. Moreover it may be related to age group less

than 1 year and the smaller airway diameters with any inflammation make them easily susceptible to catch infectious agents (Bertrand & Sánchez, 2020). The finding of the present study was similar with Antalová et al. (2022) who reported an incidence of twenty three percent of children had VAP in PICUs

Children in PICU are at risk for developing pressure ulcers. This occurs due to the clinical profile of hemodynamic instability, poor perfusion and sedation on MV, that require a complex care to those mechanically ventilated children. Regarding to incidence of pressure ulcer, among study children, (**table 4**) the present study results revealed that none of children had developed pressure ulcer. It may be related to highly efficient performance of study nurses the nurses, change position /2hours and performed skin care to avoid developing pressure ulcer. The present study is incongruent with Bargos-Munárriz et al. (2020) who found that pressure ulcer incidence ranging from three to twenty percent .

### **Conclusion:**

Based on the findings of the current study, it can be concluded that there were no statistical relationship between provided nursing care for children on mechanical ventilation and their clinical outcomes.

All study nurses had satisfactory level of performance regarding provided care children on mechanical ventilation. Moreover, all study children had positive clinical outcomes except small percent of them had VAP.

### **Recommendations:**

**Based on the results of the current study, the following recommendations are suggested:**

- 1- Manual handout should be provided to nurses containing all necessary information about procedures related to postural drainage in chest physio

therapy and oral care to mechanically ventilated children.

- 2- Graphs show assessment process initial, primary, secondary to the critically ill children.
- 3- Periodically workshop for nurses to refresh their knowledge and performance to avoid any complication and enhancement their performances.
- 4- Apply Braden scale for predicting pressure ulcer risk in children in the unit.
5. Written protocol for oral care procedure .



**Table (1) Distribution of the study nurses according to their characteristics:**

| Nurses' characteristics  | N=30 Total |             |
|--|------------|-------------|
|  | N          | %           |
| <b>Age (years)</b>   |            |             |
| ▪ 20-  | 8          | 26.7        |
| ▪ 25-  | 10         | 33.3        |
| ▪ 30-  | 4          | 13.3        |
| ▪ 35-  | 2          | 6.7         |
| ▪ 40-45  | 6          | 20.0        |
| Min – Max 20.0 – 45.0  | Mean ± SD  | 30.00±7.418 |
| <b>Qualification</b>   |            |             |
| ▪ Bachelor degree of Nursing                                       | 18         | 60.0        |
| ▪ Diploma of Technical Institute of Nursing                        | 3          | 10.0        |
| ▪ Diploma of Secondary School of Nursing                           | 9          | 30.0        |
| <b>Years of experience</b>   |            |             |
| ▪ < 5  | 12         | 40.0        |
| ▪ 5-   | 6          | 20.0        |
| ▪ 10-  | 7          | 23.3        |
| ▪ ≥15  | 5          | 16.7        |
| <b>Attendance of educational courses on mechanical ventilation</b> |            |             |
| ▪ No   | 6          | 20.0        |
| ▪ Yes  | 24         | 80.0        |

**Table (2) Distribution of the study children according to their characteristics**

| Children' characteristics                    | N= 50 Total |       |
|--|-------------|-------|
|  | No.         | %     |
| <b>Age</b>                                   |             |       |
| ▪ < 12 months                                | 40          | 80.0  |
| ▪ ≥ 1-3 years                                | 10          | 20.0  |
| <b>Gender</b>                                |             |       |
| ▪ Boys                                       | 23          | 46.0  |
| ▪ Girls                                      | 27          | 54.0  |
| <b>Birth order</b>                           |             |       |
| ▪ First                                      | 19          | 38.0  |
| ▪ Second                                     | 15          | 30.0  |
| ▪ Third                                      | 12          | 24.0  |
| ▪ Fourth and more                            | 4           | 8.0   |
| <b>Diagnosis</b>                             |             |       |
| ▪ Respiratory failure                        | 24          | 48.0  |
| ▪ Cardiopulmonary arrest                     | 2           | 4.0   |
| ▪ Neurological problems                      | 16          | 32.0  |
| ▪ Septic shock                               | 6           | 12.0  |
| ▪ Dehydration and hypovolemic shock          | 2           | 4     |
| <b>Previous admission to NICU/PICU</b>       |             |       |
| ▪ No   | 40          | 80.0  |
| ▪ Yes  | 10          | 20.0  |
| – Respiratory distress                       | 4           | 40.0  |
| – Jaundice                                   | 3           | 30.0  |
| – Sepsis                                     | 2           | 20.0  |
| – Dehydration                                | 1           | 10.0  |
| <b>Family history of respiratory illness</b> |             |       |
| ▪ No   | 50          | 100.0 |
| ▪ Yes  | 0           | 0.0   |

**Table (3): Distribution of the study nurses according to their level of performance**

|                                      | Levels of performance |       |              |       |
|--------------------------------------|-----------------------|-------|--------------|-------|
|                                      | Unsatisfactory        |       | Satisfactory |       |
|                                      | No.                   | %     | No.          | %     |
| – <b>Initial assessment</b>          | 0                     | 0.0   | 30           | 100.0 |
| ▪ Assess the child's appearance      | 1                     | 3.3   | 29           | 96.7  |
| ▪ Assess work of breathing           | 4                     | 13.3  | 26           | 86.7  |
| ▪ Assess circulation                 | 0                     | 0.0   | 30           | 100.0 |
| – <b>Primary assessment</b>          | 0                     | 0.0   | 30           | 100.0 |
| ▪ Assess the airway patency          | 0                     | 0.0   | 30           | 100.0 |
| ▪ Assess breathing                   | 0                     | 0.0   | 30           | 100.0 |
| ▪ Assess circulation                 | 0                     | 0.0   | 30           | 100.0 |
| ▪ Assess Disability                  | 15.0                  | 50.0  | 15           | 50.0  |
| ▪ Perform focused assessment         | 0                     | 0.0   | 30           | 100.0 |
| – <b>Secondary assessment</b>        | 0                     | 0.0   | 30           | 100.0 |
| – <b>Eye care</b>                    | 0                     | 0.0   | 30           | 100.0 |
| – <b>Oral care</b>                   | 0                     | 0.0   | 30           | 100.0 |
| ▪ Pre – procedure                    | 0                     | 0.0   | 30           | 100.0 |
| ▪ Procedure of oral care             | 1                     | 3.3   | 29           | 96.7  |
| – <b>Endotracheal closed suction</b> | 0                     | 0.0   | 30           | 100.0 |
| ▪ Pre procedure                      | 0                     | 0.0   | 30           | 100.0 |
| ▪ Procedure                          | 0                     | 0.0   | 30           | 100.0 |
| ▪ Post procedure                     | 23                    | 76.7  | 7            | 23.3  |
| – <b>Nasopharyngeal suction</b>      | 0                     | 0.0   | 30           | 100.0 |
| – <b>Oral suction</b>                | 0                     | 0.0   | 30           | 100.0 |
| – <b>Endotracheal open suction</b>   | 0                     | 0.0   | 30           | 100.0 |
| ▪ Pre procedure                      | 0                     | 0.0   | 30           | 100.0 |
| ▪ Procedure                          | 0                     | 0.0   | 30           | 100.0 |
| ▪ Post procedure                     | 0                     | 0.0   | 30           | 100.0 |
| – <b>Chest Physiotherapy</b>         | 0                     | 0.0   | 30           | 100.0 |
| ▪ Pre procedure                      | 16                    | 53.3  | 14           | 46.7  |
| ▪ Procedure                          | 0                     | 0.0   | 30           | 100.0 |
| o Lower lobes                        | 8                     | 26.7  | 22           | 73.3  |
| o Middle lobes                       | 0                     | 0.0   | 30           | 100.0 |
| o Upper lobes                        | 0                     | 0.0   | 30           | 100.0 |
| ▪ Post procedure                     | 0                     | 0.0   | 30           | 100.0 |
| – <b>Positioning</b>                 | 0                     | 0.0   | 30           | 100.0 |
| ▪ Preparation                        | 0                     | 0.0   | 30           | 100.0 |
| ▪ Supine position                    | 0                     | 0.0   | 30           | 100.0 |
| ▪ Semi- prone                        | 30                    | 100.0 | 0            | 0.0   |
| ▪ Pre- prone                         | 8                     | 26.7  | 22           | 73.3  |
| ▪ Prone                              | 15                    | 50.0  | 15           | 50.0  |
| – <b>Skin care</b>                   | 0                     | 0.0   | 30           | 100.0 |
| ▪ Bathing                            | 0                     | 0.0   | 30           | 100.0 |
| ▪ Moisture                           | 0                     | 0.0   | 30           | 100.0 |
| ▪ Massage                            | 0                     | 0.0   | 30           | 100.0 |

**Table (4): Assessment of the clinical outcomes through observational checklist On admission, After 3 days and After 5 days from admission**

| Clinical outcomes                              | On admission            |     |         |     | After 3 days from admission |       |         |      | After 5 days from admission |       |         |      |
|--|-------------------------|-----|---------|-----|-----------------------------|-------|---------|------|-----------------------------|-------|---------|------|
|  | Absent                  |     | Present |     | Absent                      |       | Present |      | Absent                      |       | Present |      |
|  | No.                     | %   | No.     | %   | No.                         | %     | No.     | %    | No.                         | %     | No.     | %    |
| ▪ Incidence of ventilator associated pneumonia | 50                      | 100 | 0       | 0.0 | 35                          | 70.0  | 15      | 30.0 | 33                          | 66.0  | 17      | 34.0 |
| Test of Significance                           | X <sup>2</sup> = 8.8974 |     |         |     |                             |       |         |      | P = 0.012                   |       |         |      |
| ▪ Incidence of pressure ulcer                  | 50                      | 100 | 0       | 0.0 | 50                          | 100.0 | 0       | 0.0  | 50                          | 100.0 | 0       | 0.0  |
| Test of Significance                           | X <sup>2</sup> = NA     |     |         |     |                             |       |         |      |                             |       |         |      |
| ▪ Incidence of corneal ulcer or eye infection  | 50                      | 100 | 0       | 0.0 | 50                          | 100.0 | 0       | 0.0  | 50                          | 100.0 | 0       | 0.0  |
| Test of Significance                           | X <sup>2</sup> = NA     |     |         |     |                             |       |         |      |                             |       |         |      |
| ▪ Incidence of oral fungal infection           | 50                      | 100 | 0       | 0.0 | 49                          | 98.0  | 1       | 2.0  | 49                          | 98.0  | 1       | 2.0  |
| Test of Significance                           | X <sup>2</sup> = NA     |     |         |     |                             |       |         |      |                             |       |         |      |

\* Statistically significant at p ≤ 0.05 X<sup>2</sup> Chi square test

**Table (5): Relationship between the study children’s clinical outcomes and total mean score of nurses’ performance**

| Clinical outcome   | Total Nurses’ Performance Mean Scores | Test of Significance |
|--|---------------------------------------|----------------------|
|  | Mean ± SD                             |                      |
| <b>Number of complications after 3 days from admission</b> |                                       |                      |
| ▪ No complication  | 521.11 ± 9.713                        | F= 0.879             |
| ▪ One  | 516.00 ± 12.17                        | P= 0.427             |
| ▪ Two  | 524.00 ± 0.000                        |                      |
| <b>Number of complications after 5 days from admission</b> |                                       |                      |
| ▪ No complication  | 518.19 ± 11.25                        | F= 0.406             |
| ▪ One  | 521.75 ± 9.692                        | P= 0.670             |
| ▪ Two  | 524.00 ± 0.000                        |                      |
| <b>Risk for pressure ulcer</b>                             |                                       |                      |
| ▪ Low  | 520.68 ± 11.34                        | t= 0.830             |
| ▪ High   | 517.00 ± 9.349                        | P= 0.370             |

F= ANOVA Test t= Student T Test \* Statistically

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