Assessment of Health Care Burdens of Ventilator Associated Pneumonia in Pediatric Intensive Care Units

Thesis

*Submitted in Partial Fulfillment of the Master Degree in **Nursing Sciences (Pediatric Nursing)***

By

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Samar Othman Mustafa

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List of Abbreviations

APACHE	Acute Physiological and the Chronic Health Evaluation
ARDS	Acute Respiratory Distress Syndrome
ABC	Awakening and Breathing Controlled
CDC	Centers for Disease Control
CASS	Continuous Aspiration of Subglottic Secretions
DALYs	Disability Adjusted Life Years
DCPP	Disease Control Priorities Project
ETA	Endotracheal aspiration
ETT	Endotracheal Tube
GP	General Practitioner
GBD	Global Burden of Disease
HAI	Healthcare-associated Infections
IHI	Institute of Healthcare Improvement
IHME	International Health Metrics and Evaluation
LOS	Length of Hospital Stay
MV	Mechanical Ventilation
MDI	Metered Dose Inhalers
MDR	Multi Drug Resistant
MOSF	Multiple organ system failure

PICU	Pediatric Intensive Care Unit
PPIs	Proton Pump Inhibitors
SBTs	Spontaneous Breathing Trials
ATS	The American Thoracic Society
VAP	Ventilator Associated Pneumonia
WHO	World Health Organization
YLDs	Years Lost due to Disability
YLL	Years of Life Lost
YPLL	Years of Potential Life Lost

Abstract

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Health care burden of Ventilator Associated Pneumonia (VAP) can be represented by the prolonged hospital stay, long-term disability, and the massive additional financial costs for the health care system. **Aim:** To assess the health care burdens of ventilator associated pneumonia in Pediatric Intensive Care Units. Design: A descriptive design was utilized. **Setting:** The study was conducted in Pediatric Intensive Care Units at Children's Hospital that is affiliated to Ain Shams University. **Subjects:** A purposive sample of children suffering from VAP (40 children), a convenient sample of pediatric nurses working in the PICU (40 nurses), **Tools:** Structured questionnaire sheet to assess nurses' demographic data, and their knowledge regarding VAP. Assessment of children characteristics, treatment, and diagnostic studied; Observational checklist for nurses' performance; PICUs environment physical assessment; and parameters of VAP health care burdens. **Results:** The majority of the studied nurses had poor level of knowledge regarding VAP, while about two thirds of them were incompetent regarding care of children with VAP. Most of the studied children' age was less than one year, while the minority of them were more than 11 years old. The Incidence of VAP was 563 per 1000 children high risk for VAP. Total hospitalization cost was 496696.8 LE for the total number of the studied children with VAP. **Conclusion:** Based on the study findings, it could be concluded that, ventilator associated pneumonia had a great burden among the mechanically ventilated children in the pediatric intensive care units, which is strongly related to the poor levels of nurses' knowledge and practices regarding VAP. **Recommendation**: Burden parameters of ventilator-associated pneumonia should be adopted as blueprints for PICU staff adherence to the guidelines.

Key Words: Ventilator Associated Pneumonia, Burden, Pediatric Intensive Care Units

Introduction

Ventilator Associated Pneumonia **(**VAP) is defined as an inflammation of lung parenchyma that occurs after 48 hours or more from the initiation of the mechanical ventilation (MV). Ventilator associated pneumonia is categorized into two formations based on the time of onset. Early onset VAP occurs within the initial four days of MV; while, late onset VAP occurs after five or more days ***(Iqbal and Jamali, 2018)***.

Pathogenesis of VAP involves direct interaction between the invading microorganisms, host and host defenses and the risk factors. The primary route of the bacterial transmission to the lower respiratory tract occurs through aspiration ***(Wright, 2013).*** In mechanically ventilated children, contaminated tubing condensate, inhalation of aerosol, and leakage of oral secretions and bacteria around the endotracheal cuff are among the most common routes of VAP infections ***(Parra et al., 2013)***.

In the critically ill children on mechanical ventilation, the clinical symptoms and signs of pneumonia are non-specific and varied. VAP should be suspected in all intubated pediatric patients with clinical symptoms and

signs of sepsis. The symptoms observed in most pediatric patients with VAP are fever, new onset of purulent tracheal secretions, change in character of tracheal secretions, increased respiratory secretions, increased suctioning requirements, new onset or worsening cough, dyspnea and tachypnea **(*Si Guo et al., 2016).***

The various systemic signs of VAP are rales or bronchial breath sounds, worsening gas exchange (e.g. O2 desaturations (e.g., PaO2/FiO2 < 240), increased oxygen requirements, increased ventilator demand, leukopenia (<4000 WBC/mm3) or leukocytosis (>12,000WBC/mm3) and the presence of a new and/or persistent radiographic infiltrate ***(Adam et al., 2015; Hayden, 2016).***

The American Thoracic Society (ATS) has formulated certain guidelines for management of pediatric patients with VAP. Prompt and early administration of antibiotic therapy is very important as a delay in appropriate antibiotic therapy is associated with excess morbidity and mortality ***(Eiland et al., 2015)*.** The selection of specific agents should be based on cost, feasibility, availability and knowledge of local microbial flora ***(Jiang and Shen, 2016)*.**

Reducing hospital-acquired pneumonia continues to pose a challenge for healthcare providers. Among critically ill children in acute-care facilities, pneumonia is one of the most common hospital-acquired infections. Pediatric patients receiving mechanical ventilation are more likely to develop hospital-acquired infections than those who are not ***(Ahmed and Abosamra, 2015).*** The artificial airway of the ventilator or the Endotracheal (ET) tube can transmit microorganisms to the lungs. VAP in critically ill pediatric patients is an adverse outcome and a national patient-safety concern. It increases ventilator days, patient morbidity and mortality, and healthcare costs ***(Chadani et al., 2017).***

Health care burden of VAP can be represented by the prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobial agents, and the massive additional financial costs for the health care system. Thus, to serve pediatric patients and help shape a world in which the holistic, patient/family/community centric vision of the profession of nursing can become a reality, nurses need a confident command of economic terms and ideas to be able to apply them in the practice settings ***(Penner, 2017).***

Significance of the study:

In Egypt, according to study done at Abo Reesh Hospital that affiliated to Cairo University to determine VAP incidence among pediatric patients in the PICUs. There are 427 pediatric patients who received Mechanical Ventilation (MV) were included in this prospective study during the period from September 2014 until September 2015. Nearly, 31% of them had got VAP among the entire cohort. The incidence density was 21.3 per 1000 ventilator days. Mortality rate among the VAP group was significantly higher compared to the non VAP one (68.2% vs. 48.5%, $p<0.001$) ***(Galal, 2016)***.

Considerably, there is a growing body of research related to the outcomes of VAP. The majority of these researches focus on the risk factors related to this health problem and ignored the burden caused by VAP. In addition, there are few databases in Egypt regarding the burden of VAP. Estimating the burden of VAP is a current challenge that nurses should take the lead as it gives the necessity for a good quality care for pediatric patients in hospitals, and enlightens the patient safety standards. Pediatric nurses have to advocate children rights in a high