Assessment of Efficiency of using Clinical Pulmonary Infection Score (CPIS) among Mechanically Ventilated Cases

Thesis

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Sara Ahmed Ayman Mahmoud Heikal

Abstract

Ventilator-associated pneumonia (VAP) is the most frequent nosocomial infection in the intensive care unit. VAP is defined as pneumonia that develops more than 48 hours after tracheal intubation.

VAP prolongs the duration of ventilation, ICU stay and hospital stay, and increases healthcare costs, morbidity, and mortality.

The challenges of managing VAP include the requirement for appropriate antimicrobial therapy, and the need to avoid administering unnecessary antibiotics to prevent emergence of resistant microorganism and to avoid excess hospital cost and prolonged hospital stay.

In our study we use the clinical pulmonary infection score (CPIS) to help clinicians in early diagnosis of VAP, continuous monitoring of the VAP patients and to guide their decision to initiate or withhold antibiotic therapy with de-escalation according to the culture results and associated comorbidity of the patients.

Key words:

- ICU
- VAP
- CPIS
- APACHE II score
- Antibiotic cost.
- Medication cost and total hospital cost.
- Length of stay.
- Duration of Mechanical ventilation.
- Morbidity and mortality.

Contents

List of Abbreviations

APACHE	Acute physiology and chronic health evaluation
BAL	Broncho-alveolar lavage
CAP	Community acquired pneumonia
CCI	Charlson's comorbidity index
CDC	Center for disease control and prevention
CDC's NHSN	CDC's National health care safety network
CNS DISEASE	Central nervous system disease
COPD	Chronic obstructive pulmonary disease
CPIS	Clinical pulmonary infection score
CVS disease	Cardiovascular system disease
DCL	Disturbed conscious level
HAI	Health care associated infection
HIS	Hospital Information System
ICU	Intensive care unite
JCI	Joint commission international
LOS	Length of stay
MDR	Medical drug resistant
MRSA	Methicillin-resistant Staphylococcus aureus
MV	Mechanical ventilation
RF	Respiratory failure
VAP	Ventilator associated pneumonia

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Introduction

Quality means the degree to which the activities of healthcare services increase the likelihood of desirable health related welfare for individuals and population groups, and the services are performed in accordance with current professional knowledge. It also implies the adequacy of healthcare services to the needs and expectations of clients/patients and the best possible performance ***(Rygh-Helgeland, 2010 and Lohr, 1990).***

Patient safety is an integral part of the quality agenda; it is difficult to provide effective care where safety is compromised. Although the patient safety events may not be completely eliminated but the harm to patients can be reduced, and the goal is always zero harm ***(Brennan-Sampson et al., 2005).*** Reducing the risk of health care associated infection (HAIs) is one of international patient safety goals ***(Joint commission international, 2016).***

HAIs represent a major public health problem in many developing countries, particularly in intensive care units (ICU), represent a major threat to patient safety and it's one of the most common sources of preventable harm ***(Klevens et al., 2007).***

HAIs from invasive medical devices, particularly central line-associated bloodstream infection (CLABSI), ventilator associated pneumonia (VAP), and catheter-associated urinary tract infection (CAUTI), lead to significant threats to patients in ICUs, associated with prolonged hospital stays, greater health care costs, and increased mortality ***(EL-Kholy-Saied et al., 2012).***

Better evaluation of the costs of these infections could help providers and payers to justify investing in prevention of the HAIs. The leadership of patient safety professionals will allow hospitals to realize cost savings and shifting it to prevent HAIs ***(Zimlichman-Henderson et al., 2013).***

ICU patients are more vulnerable to medical errors and HAIs due to complexity and number of interventions, the severity of illness, time spent in hospital, and breadth of care being provided. Predictive scoring systems works by taking known clinical variables and deriving a numerical or severity score for the outcome of interest ***(Hemmila and Wahl, 2016).***

The four major ICU predictive scoring systems used in the ICU setting are the Acute Physiology and Chronic Health Evaluation (APACHE) system, the Simplified Acute Physiologic Score (SAPS), the Mortality Prediction Model (MPM), and the Sequential Organ Failure Assessment (SOFA) ***(Hemmila and Wahl, 2016).***

The Clinical Pulmonary Infection Score (CPIS) was proposed in 1991 as a diagnostic method for ventilator associated pneumonia (VAP) and has also been studied as a tool for reducing unnecessary antibiotic use in critically ill patients. The CPIS relies in part on microbiologic data that are usually not immediately available, and a modified CPIS was developed which only includes data immediately available on patient presentation ***(Pugin-Auckenthaler et al., 1991; Singh-Rogers et al., 2000 and Fartoukh-Maiˆtre et al., 2003).***

The CPIS score has good correlation with National Health care Safety Network criteria (CDC's NHSN)- is the nation’s most widely used healthcare-associated infection tracking system - but does not offer a

major advantage over NHSN criteria for VAP surveillance ***(Safdar-O'Horo et al., 2013).***

Ventilator associated pneumonia (VAP) impacts 10%-20% of patients requiring mechanical ventilation and nearly doubles the risk for mortality in critically ill patients ***(Safdar et al., 2005).***

VAP is defined as pneumonia that develops more than 48 hours after tracheal intubation or tracheotomy. The challenges of managing VAP include the requirement for appropriate antimicrobial therapy, and the need to avoid administering of unnecessary antibiotics ***(Iregui-Ward et al., 2002).***

Inappropriate use of antibiotic is quite common all over the world and the threat of antimicrobial resistant organisms is a growing concern worldwide. Many health care professionals have long warned against the overuse of antibiotics. However, serious outbreaks of resistant bacteria still occur around the world. As a result of frequent and inappropriate antibiotic use in ICUs, the infections with multiple drug resistant microorganisms are developed and difficulties are experienced in treating those ***(Salah El-DinHamdy-Shabban et al., 2014).***

Aim of the Work

* Goal:

The goal of the study is reducing morbidity in mechanically ventilated patients in critical care department of Kasr El-Aini Hospital Cairo University.

* Specific objectives:

1. Assessment of mortality rate from ventilator associated pneumonia (VAP) in the studied group.
2. Early detection of cases of (VAP) using clinical pulmonary infection score (CPIS).
3. Measurement of cost efficiency of using CPIS for patients with VAP as regards duration and cost of hospital stay and cost of the antimicrobial therapy.

Quality in Health Care

Concepts

Thousands of patients die each year because of hospitals' failure to adhere consistently to standard procedures of safe and effective medical care. Accordingly, an effective way to promote quality improvement is to implement standard practices for the safety and care of hospitalized patients ***(Michael et al., 2007).***

Quality of care is the level of attainment of health systems' intrinsic goals for health improvement and responsiveness to legitimate expectations of the population. Another issue in regards to quality is that care should be provided in a continuum. That is to say care should be initiated, rendered, evaluated, improved and continuously monitored even after the patient is cured. Care is extended to include wellness, health promotion and disease prevention ***(WHO, 2004).***

The institute of medicine (IOM) defines the quality by the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge ***(IOM, 2013).***

Quality from the perspective of the administrator is to provide effective care in a cost conscious environment that may include the rationing of health care, especially when resources are limited. From the patient's perspective, on the other hand, quality is getting my care when and where I need it and from whomever I choose to cure my condition in the fastest possible way ***(WHO, 2004).***