Healthcare-Acquired Pneumonia

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Quality improvement is an approach that provides data and research to improve the safety

and quality of healthcare. The Quality and Safety Education for Nurses (QSEN) challenges

student nurses by helping them develop the knowledge, skills, and attitudes necessary to provide

quality and safe care in the future (QSEN Institute, 2020). This project enables the student to

search for more effective and beneficial methods of patient care by utilizing research such as

quality improvement. By staying up to date on current research and protocols, the nurse can

ensure that the patient receives the best treatment possible. Lack of effort to keep up with current

information can lead to severe complications for the patient. Quality improvement can help

eliminate complications and help the healthcare team and patients work together more

efficiently. This paper will discuss healthcare-acquired pneumonia and the effectiveness of

current recommended preventative measures. Much of the care a patient receives comes from the

nurse, so understanding how patients develop healthcare-acquired pneumonia will assist the

nurse in taking the proper precautions to protect the patient. Healthcare-acquired pneumonia can

lead to serious medical complications, so prevention is essential.

**Hospital-acquired and ventilator-associated pneumonia: Diagnosis, management, and
prevention**

Ventilator-associated pneumonia, or VAP, is a lethal nosocomial infection located

predominantly in intensive care units of hospitals, with an estimated mortality rate of 13%. VAP

develops at least forty-eight hours after a patient is intubated, requires a more extended hospital

stay, and produces higher healthcare costs (Modi & Kovacs, 2020). Preventing ventilator-

associated pneumonia is just as essential as its diagnosis and management. One way to prevent

ventilator-associated pneumonia is preventing aspiration and colonization. Providing routine oral

care with chlorhexidine and an electric toothbrush, elevating the bed higher than thirty degrees,

assessing for and managing dysphagia, and screening for proton pump inhibitor therapy are all essential tasks in the prevention of aspiration and the colonization of infectious organisms (Modi & Kovacs, 2020). Respiratory therapy-driven weaning attempts at least once daily and converting to an orogastric tube from a nasogastric tube have also reduced VAP incidence (Modi & Kovacs, 2020). Utilizing these multiple strategies or practices to prevent VAP by an interprofessional healthcare team can significantly reduce the risk of aspiration, colonization, and the production of ventilator-associated pneumonia (Modi & Kovacs, 2020).

Another way to prevent ventilator-associated pneumonia is using infection control methods. Immunization of providers and patients against Streptococcus pneumoniae, influenza, and Haemophilus influenza is at the forefront of preventing or reducing the transmission of pathogens known for causing pneumonia in either the community or hospital setting (Modi & Kovacs, 2020). Additionally, frequent and appropriate hand hygiene, donning masks and appropriate personal protective equipment in every room, providing tissues for patients who frequently cough or sneeze, and frequently disinfecting nursing and procedural equipment reduce the risk of pathogen transmission, therefore, reducing the risk of ventilator-associated pneumonia development in intubated patients (Modi & Kovacs, 2020).

Synopsis

Simple measures such as immunizations and modifications by the nurse can significantly reduce VAP incidences. As the evidence indicates, proper patient positioning and oral care are actions the nurse can take to ensure the best outcome for the patient (Modi & Kovacs, 2020). Facilities should continue to re-evaluate and change protocol as new research becomes available.

Oral care strategies in patients in intensive care units

Ventilator-associated pneumonia (VAP) is a severe and potentially preventable complication of oral intubation. Tape, mouth props, and suctioning devices increase the patient's risk of developing VAP. In conjunction, inadequate oral care places the patient at additional risk (Sarangi et al., 2021). Patients intubated for greater than 24 have a much higher risk for VAP development, making diligent oral care especially important (Sarangi et al., 2021). The following study took place in a ten-bed intensive care unit (ICU), focusing on patients intubated for greater than 48 hours (Sarangi et al., 2021). This study continued for 48 months (Sarangi et al., 2021). Nursing compliance in performing frequent and thorough oral hygiene care is the focus of the study at hand. Recommendations by the American Association of Critical-Care Nurses (AACN) include brushing teeth, gums, and tongue twice daily using a pediatric or adult soft toothbrush, providing oral moisture to oral mucosa and lips every two to four hours, use of oral chlorhexidine gluconate (0.12%) soaked swab two times daily, and suctioning at least every two hours (Sarangi et al., 2021). Attention to using a soft toothbrush instead of a foam swab for performing plaque removal is critically important. Ultimately the soft toothbrush removed more plaque harboring bacteria (Sarangi et al., 2021). Prior to utilizing the recommendations above, VAP occurred at 12 per 1,000 ventilator days (Sarangi et al., 2021). After changes to oral care implementation, VAP occurrence decreased significantly to 8 per 1,000 ventilator days (Sarangi et al., 2021).

Synopsis

Ventilator-associated pneumonia can lead to increased mortality and morbidity. Nurses should perform optimal oral care and be aware of the associated benefits. Educating staff on how to perform effective oral care, including using a soft toothbrush vs. a foam swab to reduce

bacteria-harboring plaque, is indictive of essential and safe patient-centered care (Sarangi et al.,

2021).

**Efficacy of a bundle approach in preventing the incidence of ventilator associated
pneumonia (VAP)**

Ventilator-associated pneumonia (VAP) is a potentially preventable illness that may

develop following mechanical ventilation (Burja et al., 2017). Treatment costs are 40% higher in

patients with VAP due to more extended hospitalization, higher medical therapy, antibiotic

consumption, prolonged ventilation, and a greater need for radiological diagnostics (Burja et al.,

2017). A bundle of measures for the prevention of VAP consists of different measures which

may vary between hospitals and may include elevation of the head of the bed, oral care with

chlorhexidine, subglottic suctioning, daily assessment for extubation, the need for proton-pump

inhibitors, use of closed suction systems, and maintaining endotracheal cuff pressure at 25

cmH_2O (Burja et al., 2017).

Although the preventive measures differ in institutions, the broad availability of the

measures is essential when introducing a new bundle to prevent VAP (Burja et al., 2017).

Introducing these measures to prevent VAP can be done one measure at a time or all at once.

Introducing one at a time can show what works independently but does leave less time to prevent

VAP if it does not work. Having a set of measures presented simultaneously gives a higher

chance to prevent VAP in patients rather than hoping one thing will work. The VAP prevention

measures included in the bundle are widely applicable, and apart from ETTs with subglottic

suctioning, no specialized equipment is necessary (Burja et al., 2017). The goal is to trend

toward a lower incidence of VAP and a significantly lower incidence of late VAP after

implementing a multifaceted VAP prevention bundle (Burja et al., 2017).

Synopsis

A bundle for the prevention of VAP consists of different measures, including elevation of the head of the bed, oral care with chlorhexidine, subglottic suctioning, daily assessment for extubation, and the need for proton-pump inhibitors, use of closed suction systems, and maintaining endotracheal cuff pressure at 25 cmH2O (Burja et al., 2017). The goal is to determine the efficacy of a VAP prevention bundle consisting of the measures mentioned earlier by evaluating the incidence of VAP before and after the introduction of the bundle. Studies have shown support for using the VAP prevention bundle rather than using an individual measure.

Strategies for preventing ventilator-associated pneumonia: an integrative review

Healthcare-associated infections (HAI) are severe adverse events that affect hospitalized patients, mainly in the intensive care unit (ICU) (Alecrim et al., 2019). Among them, ventilator-associated pneumonia (VAP) is one of the most common. Defined as pneumonia associated with clinical, radiological, and laboratory criteria evidenced 48 hours after the start of mechanical ventilation (MV) (Alecrim et al., 2019). In the United States of America (USA), about 300,000 patients become mechanically ventilated every year (Alecrim et al., 2019). Despite the efforts to reduce VAP incidence, its density remains around 4.4 cases/1,000 MV-day (Alecrim et al., 2019).

For the research that assessed the rate of compliance with the bundled measures, studies show that the lower the adherence to them, the less impact they had on reducing VAP rates (Alecrim et al., 2019). Adherence rates higher than 90% are significantly associated with reducing VAP rates (Alecrim et al., 2019). VAP rates are close to zero when maintaining adherence to the measures in the long term (Alecrim et al., 2019). Adhering to the measures is essential when preventing VAP. Although significant progress has occurred concerning

implementing the best practices for preventing HAI, efforts are essential in reducing their frequency.

Synopsis

Monitoring the adherence to best practices, education, and establishment of process, structure, and outcome indicators is essential for reducing its incidence (Alecrim et al., 2019). In ICUs, it is crucial to carry out VAP surveillance with standardized definitions and criteria, calculate the VAP rates, report these rates to the healthcare team, and associate them with the relevant preventive measures (Alecrim et al., 2019). These actions can become essential in evaluating the quality of care.

Ventilator-associated pneumonia in adults: A narrative review

Ventilator-associated pneumonia (VAP) is one of the most reported illnesses in the ICU. Reported incidences vary from 5 to 40%, depending on the setting and diagnostic criteria (Papazian et al., 2020). VAP is associated with prolonged use of mechanical ventilation and prolonged ICU stay. The estimated mortality rate of VAP is around 10%, with higher rates in surgical ICU patients and patients with mid-range severity scores at admission (Papazian et al., 2020). The organisms associated with VAP vary according to many factors, including duration of mechanical ventilation, length of hospital and ICU stays before VAPs, timing and cumulative exposure to antimicrobials, the local ecology, and the occurrence of any potential epidemic phenomena in a given ICU (Papazian et al., 2020).

One of the improvements in diagnosing VAP is to decrease the time from sampling to pathogen identification (Papazian et al., 2020). It currently takes at least 24–48 hours to identify the pathogen responsible for infection and its sensitivity to antimicrobial treatment (Papazian et

al., 2020). Broad-spectrum antibiotic utilization occurs when it takes this long to receive results. The goal is to lessen the number of broad-spectrum antibiotics used when treating a disease.

The practices most consistently associated with VAP focus on limiting exposure to invasive mechanical ventilation by avoiding intubation and speeding up extubation (Papazian et al., 2020). Providing consistent oral care and suctioning are two ways to minimize VAP risks. A meta-analysis of three automated cuff pressure monitoring randomized trials reported significantly lower VAP rates with automated cuff pressure systems than manually monitoring cuff pressures every 8 hours (Papazian et al., 2020). Elevating the head of the patient's bed to prevent gastric reflux into the lungs is the most commonly practiced intervention to prevent VAP (Papazian et al., 2020). Probiotics may help protect patients from VAP by modulating the microbiome and inhibiting colonization with invasive pathogens (Papazian et al., 2020). The prevention practices most consistently associated with improving outcomes for ventilated patients have been those focused on avoiding intubation and minimizing exposure to invasive ventilation by using high flow oxygen or noninvasive ventilation as alternatives to intubation, lightening sedation, using spontaneous breathing trials to prompt early extubation, and early mobilization (Papazian et al., 2020).

Synopsis

Prevention of VAP relies on the prevention of intubation and prompt extubation. High flow oxygen and noninvasive ventilation are recommended over ventilation whenever possible. When intubation is not an option, the utilization of equipment such as automatic cuff monitoring systems can significantly reduce incidences of VAP (Papazian et al., 2020). As technology improves, quicker identification of the problematic pathogen and advancements in monitoring will help treat and prevent VAP.

Case Study

Ventilator-associated pneumonia (VAP) is a form of healthcare-acquired pneumonia which develops after 48 hours of mechanical ventilation. Oral hygiene is one of the most effective methods of preventing VAP. This study compares the effectiveness of toothbrushing in conjunction with 0.12% chlorhexidine (CHX) compared to the effectiveness of 0.12% CHX alone (Silva et al., 2021). CHX is a cationic biguanide that binds with the cell walls of bacteria, creating a bacteriostatic or bactericidal effect depending on the concentration (Silva et al., 2021). The study proceeded over nine years between 2009 and 2017 (Silva et al., 2021). Randomized controlled trials consisted of patients older than eighteen on mechanical ventilation (Silva et al., 2021). The study aimed to examine "Is toothbrushing combined with the use of 0.12% CHX (intervention) more effective in preventing VAP (outcome) among patients under mechanical ventilation (population) than using CHX along (comparison)?" (Silva et al., 2021).

Synthesis

Practice

Toothbrushing alone is a simple intervention that the healthcare team can perform on ventilated patients. Mechanical removal of plaque in combination with the bacteria-fighting effects of CHX decreases the likelihood of patients developing healthcare-acquired pneumonia (Silva et al., 2021). Studies show that patients mechanically ventilated for greater than four days had significantly more bacteria-harboring bacteria (Silva et al., 2021). Of these patients, one-third of the patient's plaque contained respiratory pathogens staphylococcus aureus and Pseudomonas aeruginosa. These bacteria have proven connections with respiratory infections (Silva et al., 2021). When utilized together, results show a 24% reduction in VAP occurrence due to a reduction in plaque and bacteria (Silva et al., 2021).

Education

Nurses need to understand the importance of oral care in reducing VAP. Education should focus on proper techniques for plaque removal, including using a soft toothbrush and ensuring to include brushing near the gum line where most plaque and bacteria accumulate (Silva et al., 2021). Nurses should understand that foam swabs are less effective than a soft toothbrush as they merely move the plaque around instead of mechanical disruption and removal.

Research

Toothbrushing and CHX, when used together, are proven to decrease VAP. Further studies with larger sample sizes and more specific criteria, including length of ventilation, hospital stay, and mortality, would better indicate CHX and toothbrushing effectiveness (Silva et al., 2021). From a nursing perspective, having evidence-based research is essential in providing safe and efficient patient care to prevent VAP.

Conclusion

Quality improvement is essential in improving nursing. QSEN challenges students to gain more knowledge and skills and develop attitudes that will enhance their transition into nursing (QSEN Institute, 2020). It allows the student to think critically about patient care and develop a foundation for making improvements. Prevention of healthcare-acquired pneumonia is essential as it can create serious, even life-threatening, complications for the patient. Simple infection prevention protocols can significantly impact the patient's overall safety. It is up to the nurse to use their knowledge of infection prevention and skills within their scope of practice to reduce their patients' chances of developing HAP and VAP. The nurse is the frontline in their care with each of these patients. Providing leadership to other staff members and holding themselves accountable for their actions can make all the difference in their patient's care.

References

Alecrim, R. X., Taminato, M., Belasco, A., Longo, M. C. B., Kusahara, D. M., & Fram, D.

(2019). Strategies for preventing ventilator-associated pneumonia: An integrative review.

Revista Brasileira de Enfermagem, 72(2), 521–530. https://doi.org/10.1590/0034-7167-

2018-0473

Burja, S., Belec, T., Bizjak, N., Mori, J., Markota, A., & Sinkovič, A. (2017). Efficacy of a

bundle approach in preventing the incidence of ventilator associated pneumonia (VAP).

Bosnian Journal of Basic Medical Sciences. https://doi.org/10.17305/bjbms.2017.2278

Modi, A. R., & Kovacs, C. S. (2020). Hospital-acquired and ventilator-associated pneumonia:

Diagnosis, management, and prevention. *Cleveland Clinic Journal of Medicine*, *87*(10),

633–639. https://doi.org/10.3949/ccjm.87a.19117

Papazian, L., Klompas, M., & Luyt, C. E. (2020). Ventilator-associated pneumonia in adults: A

narrative review. *Intensive Care Medicine*, *46*(5), 888–906.

https://doi.org/10.1007/s00134-020-05980-0

Sarangi, A., Sarangi, S., & Solaman, L. (2021). Oral Care Strategies in patients in Intensive Care

Units. *The Southwest Respiratory and Critical Care Chronicles*, *9*(39), 48–52.

https://doi.org/10.12746/swrccc.v9i39.783

Silva, P. U., Paranhos, L. R., Meneses-Santos, D., Blumenberg, C., Macedo, D. R., & Cardoso,

S. V. (2021). Combination of toothbrushing and chlorhexidine compared with exclusive

use of chlorhexidine to reduce the risk of ventilator-associated pneumonia: A systematic

review with meta-analysis. *Clinics, 76*, 1–9. https://doi.org/10.6061/clinics/2021/e2659

QSEN Institute (2020). QSEN Competencies. https://qsen.org/competencies/pre-

licensure-ksas/#quality_improvement