

Georgia State University

ScholarWorks @ Georgia State University

Respiratory Therapy Theses

Department of Respiratory Therapy

12-14-2021

The Perceptions of Junior Intensive Care Unit Respiratory Therapists Toward Ventilator-Associated Pneumonia Preventive Strategies

Wayil Alanazi
Georgia State University

Follow this and additional works at: https://scholarworks.gsu.edu/rt_theses

Recommended Citation

Alanazi, Wayil, "The Perceptions of Junior Intensive Care Unit Respiratory Therapists Toward Ventilator-Associated Pneumonia Preventive Strategies." Thesis, Georgia State University, 2021.
https://scholarworks.gsu.edu/rt_theses/61

This Thesis is brought to you for free and open access by the Department of Respiratory Therapy at ScholarWorks @ Georgia State University. It has been accepted for inclusion in Respiratory Therapy Theses by an authorized administrator of ScholarWorks @ Georgia State University. For more information, please contact scholarworks@gsu.edu.



THE PERCEPTIONS OF JUNIOR INTENSIVE CARE UNIT RESPIRATORY THERAPISTS
TOWARD VENTILATOR-ASSOCIATED PNEUMONIA PREVENTIVE STRATEGIES

This thesis is submitted by:

Wayil Alanazi, BSRT

Under the supervision of
Dr. Rachel Culbreth

Presented in Partial Fulfillment of Requirements for
the Degree of Master of Science in
Health Sciences

With a concentration in Respiratory Therapy
in

The department of Respiratory Therapy
in

The Byrdine F. Lewis College of Nursing and Health Professions
Georgia State University

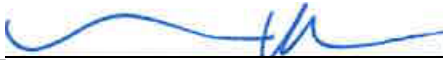
Atlanta, Georgia
Fall, 2021

ACCEPTANCE

This thesis, THE PERCEPTIONS OF JUNIOR INTENSIVE CARE UNIT RESPIRATORY THERAPISTS TOWARD VENTILATOR ASSOCIATED PNEUMONIA PREVENTIVE STRATEGIES, by Wayil Alanazi was prepared under the direction of the Master's Thesis Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Master of Science in Respiratory Therapy at the Byrdine F. Lewis College of Nursing and Health Professions, Georgia State University. The Master's Thesis Advisory Committee, as representatives of the faculty, certify that this thesis has met all standards of excellence and scholarship as determined by the faculty.



Thesis Chair: Rachel Culbreth, PhD, MPH, RRT



Thesis Committee Member: Corinne Battey-Muse, MS, RRT, RRT-NPS, AE-C



Thesis Committee Member: Brent Murray, MS, RRT

AUTHOR'S STATEMENT

In presenting this thesis as a partial fulfillment of the requirements for the advanced degree from Georgia State University, I agree that the library of Georgia State University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote, to copy from, or to publish this thesis may be granted by the professor under whose direction it was written, by the Byrdine F. Lewis College of Nursing and Health Professions director of graduate studies and research, or by me. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this thesis which involves potential financial gain will not be allowed without my written permission.

Signature of Author

Wayil Alanazi

NOTICE TO BORROWERS

All theses deposited in the Georgia State University Library must be used in accordance with the stipulations prescribed by the author in the preceding statement.

The author of this thesis is:

Wayil Alanazi, BSRT
2055 Barrett Lakes BLVD NW
Apt 1528
Kennesaw, GA, 30144

The director of this thesis is:

Rachel Culbreth, PhD, MPH, RRT
Assistant Professor
Department of Respiratory Therapy
Lewis College of Nursing and Health Professions
Georgia State University
P.O. Box 4019
Atlanta, GA 30302-4019

Users of this thesis not regularly enrolled as students of Georgia State University are required to attest acceptance of the preceding stipulation by signing below. Libraries borrowing this thesis for use of their patrons are required to see that each user records here the information requested.

NAME OF USER	ADDRESS	DATE	TYPE OF USE EXAMINATION ONLY (OR COPYING)
--------------	---------	------	---

Dedication

This thesis is wholeheartedly dedicated to my parents, who were and remain my guides and teachers throughout my life, for their endless love, support, and encouragement.

For my wife and two little sons, I am speechless that words cannot describe how I feel towards you. I truly appreciate and admire your patience and unlimited love.

For my uncle, Safooq, may his soul Rest in Pease. I will never forget his supportive messages throughout my life.

Wajid Alanazi

Acknowledgment

I would like to send my thanks to my thesis advisor Dr. Rachel Culbreth for her constant support, motivation, guidance, and patience with me. My completion of this thesis could not have been accomplished without her backing and direction. I greatly appreciate her tremendous encouragement and enthusiasm in motivating me throughout this thesis.

Wayil Alanazi

THE PERCEPTIONS OF JUNIOR INTENSIVE CARE UNIT RESPIRATORY THERAPISTS TOWARD VENTILATOR-ASSOCIATED PNEUMONIA PREVENTIVE STRATEGIES

By
Wayil Alanazi, BSRT
(Under the Direction of Dr. Rachel Culbreth)

ABSTRACT

BACKGROUND: Adherence to the VAP bundle guidelines remains crucial in preventing VAP occurrence in critical care areas. Despite the expanding research work regarding VAP prevention, there is a lack of literature in this area of research regarding perceptions of respiratory therapists towards VAP prevention, particularly comparing those of junior and senior status as critical care respiratory therapists. Therefore, it is essential to evaluate and assess the perceptions of critical care respiratory therapists toward VAP preventive strategies to address the need for designing a targeted intervention to enhance understanding and adherence toward VAP preventive strategies.

PURPOSE: This study aimed to evaluate the perceptions of junior intensive care unit respiratory therapists compared to senior intensive care unit respiratory therapists toward VAP preventive strategies.

METHODS: Data were collected through an electronic survey created using the guidelines released by the American Thoracic Society. A convenience sample of Respiratory Therapists working both in the United States and Saudi Arabia was collected online through social media platforms (Twitter, Facebook, and WhatsApp).

RESULTS: A total of 177 responses were collected. However, twenty-five responses were excluded as they didn't meet the study's criteria. Therefore, the sample size of this analysis was 152 (85.6%) of total responses. Eighty-nine (58.6%) were male, while 63 (41.4%) were female. The mean age of the total participants was 29.34 (SD± 5.935). Fifty-eight (38.2%) respondents were senior RTs, and 94 (61.8%) were junior RTs. Forty-eight (51.1%) of juniors were male, and 46 (48.9%) were female, with a mean age of 27.06 (±4.522). The results from the data analysis showed that junior ICU RTs have generally positive perceptions toward VAP preventive strategies, as they scored a mean of more than 3.5 (range 1-5) for the majority of the perception statements. There was a significant difference ($p=.010$) in the perceptions of VAP prevention between junior ICU RTs with more ICU experience compared to junior ICU RTs with less ICU experience. There was no significant difference ($p=.439$) in the perceptions of VAP prevention between junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees. Lastly, there was no significant difference ($p=.652$) in the perception of VAP prevention between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the United States.

CONCLUSIONS: Overall, junior ICU RTs showed positive perceptions toward VAP preventive strategies. Additionally, these results revealed a positive association between ICU experience and perceptions towards VAP preventive strategies. However, higher education degrees and country regions did not affect the perceptions toward the VAP prevention strategies in this study. Future studies should include a larger sample size and compare respiratory therapists to other ICU professionals for VAP perceptions.

TABLE OF CONTENTS

CHAPTER I	10
INTRODUCTION	10
Statement of the Problem	12
Purpose of the study	12
STUDY QUESTIONS.....	13
Significance of the Study	13
Summary.....	14
Definition of Terms.....	15
CHAPTER II.....	16
LITERATURE REVIEW	16
VAP overview:.....	16
VAP etiology and pathophysiology	18
Definition of VAP	19
VAP preventive strategies:.....	20
Limitation in VAP prevention:	23
Attitudes toward evidence-based practices preventing VAP.....	25
Summary.....	27
CHAPTER III	28
METHODOLOGY	28
Research Questions.....	28
Instrumentation	28
Research Design	28
Sample.....	29
Protection of Human Subjects.....	30
Data Collection	30
Data Analysis.....	30
Ethical considerations.....	31
CHAPTER IV	33

FINDINGS	33
Research Questions	33
Demographic findings.....	33
Finding Related to Research Question 1.....	35
Finding Related to Research Question 2:	42
Finding Related to Research Question 3:	43
Finding Related to Research Question 4:	44
Summary.....	44
CHAPTER V	46
INTEREPTATION OF FINDINGS.....	46
Overview of the study	46
Discussion	46
Implications for practice	50
Limitations.....	51
Conclusions.....	52
References.....	53
APPENDIX A: IRB APPROVAL	57
APPENDIX B: INFORMED CONSENT AND INVITATION LETTER.....	60
APPENDIX C: SURVEY QUESTIONNIRE.....	63

LIST OF TABLES

Table 1. Demographic characteristics among survey respondents.

Table 2: Findings Related to Research Question 1: Perceptions of Junior ICU Respiratory Therapists towards Ventilator-Associated Pneumonia (VAP) Bundle.

Table 3: Results from Cronbach's alpha (N=152).

Table 4: Findings Related to Research Question 2: Junior ICU RTs with more ICU experience compared to junior ICU RTs with less ICU experience.

Table 5: Findings Related to Research Question 3: Junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees.

Table 6: Findings Related to Research Question 4: Junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the United States.

LIST OF FIGURES

Figure 1: Frequency of treating VAP patients among junior RTs.

CHAPTER I

INTRODUCTION

Ventilator-associated pneumonia (VAP) is one of the most common obstacles facing both patients and health care providers. While pneumonia is a serious infection that targets lung tissues and is associated with prolonged hospitalizations, VAP occurs due to the aspiration of gastric secretions or the oropharyngeal and microbial colonization of the aerodigestive tract in the lower airways when an endotracheal tube is placed (Caple & Schwartz, 2018). Specifically, VAP is associated with invasive mechanical ventilation lasting more than 48 hours and characterized by a new infiltration sign found in chest x-ray (CXR) (Timsit et al., 2017). VAP complicates the course of treatment by extending the mechanical ventilation length of stay, which may increase mortality and morbidity rates and increase the medical cost for patients who are placed on the mechanical ventilator by 8–28% (Chastre & Fagon, 2002). Indeed, the mechanical ventilator is an essential lifesaving therapy for critically ill intensive care unit (ICU) patients with respiratory diseases, hemodynamic instability, or other forms of respiratory failure. Most ICU patients are connected to mechanical ventilation through endotracheal tube (ETT) intubation or directly through the trachea with a tracheostomy tube. However, the presence of either can increase the risk of pneumonia (i.e., VAP) that complicates the course of treatment by extending the time spent on the mechanical ventilator, which is also directly related to increased medical cost (Smith & Karakashian, 2018).

Moreover, VAP is a common mechanical ventilation occurrence that increases morbidity, mortality, and medical costs for ventilated patients. Patients on mechanical ventilation who develop VAP have mortality rate of 24–50 percent but can be as high as 76 percent in some cases (Chastre & Fagon, 2002). Also, increased medical costs are directly related to patients who

developed VAP (Smith & Karakashian, 2018). As such, VAP prevention may be challenging if there is no adherence to VAP bundle and prevention guidelines.

In 2005, the American Thoracic Society (ATS) established guidelines to prevent the incident of VAP (ATS, 2005). These guidelines are evidence-based practices known as the VAP bundle. Respiratory therapists (RTs) can prevent or minimize VAP events by implementing these certain evidence-based practices. Such preventive strategies include using sub-glottic ETT (D. Hunter, 2012) and connecting a sub-glottic tube to continuous intermediate negative pressure for sub-glottic secretions drainage (SSD) (Pozuelo-Carrascosa et al., 2020), using in-line suction or close suction systems (Coppadoro et al., 2019), maintaining ETT cuff pressures within the normal range, and performing daily assessments to measure the patient readiness for extubation. Accordingly, medical staff and RTs' awareness specifically of the VAP bundle, which are the known practices linked with decreasing VAP, play a significant role in reducing VAP incidence (Brierley J et al., 2012). Adherence to the VAP bundle helps prevent VAP, thus preventing medical cost, mortality, and morbidity rates of mechanically ventilated patients to increase. However, it's important to note that VAP may occur even with the strict adherence to the VAP prevention guidelines and VAP bundles. However, the VAP bundle is the most important first-line defense against VAP occurrence that medical professionals have currently.

Both senior RTs and junior RTs work with critically ill patients on mechanical ventilation. Senior RTs should have more experience with VAP prevention strategies compared to junior RTs. Junior RTs may have knowledge of VAP prevention strategies through their RT education, but they do not have the clinical experience of VAP prevention compared to senior RTs. Ensuring that all ICU RTs are aware and adhere to the guidelines and preventive tactics used to prevent VAP is a key factor in preventing VAP occurrence. Since the RTs are located as

the front line of managing patients before and after intubation, they can utilize specialized equipment that helps prevent VAP, such as sub-glottic ETT. Staff education and perception evaluation should be conducted among all RTs.

Statement of the Problem

In any respiratory therapy department, there are senior RTs who have sufficient experience, and as a result of that he/she is confident in preventing VAP using particular known practices. However, junior RTs may not have the clinical experience required to prevent VAP (Jurecki et al., 2016). Therefore, assessing junior ICU RTs' perception regarding VAP prevention strategies is necessary to implement educational interventions. Also, this research will assess the need to conduct educational sessions by the education sector in the respiratory care department to prepare junior RTs and assure their readiness in VAP prevention before releasing them to the ICU bedside.

Purpose of the study

In any ICU department, the medical team strives to protect their patients from becoming infected rather than inducing nosocomial infection. Since VAP occurrence is frequent, it is crucial to use the known practices to prevent its incidence. Therefore, the purpose of this study was to assess junior ICU RTs' perceptions toward VAP and its preventive strategies. The junior RTs are defined as respiratory therapists with less than five years since graduation from respiratory school with a bachelor's degree. Senior respiratory therapists are defined as respiratory therapists with more than five years since graduation from respiratory therapy school with a bachelor's degree. Moreover, this study will evaluate the perception of junior ICU RTs with two years or more of ICU experience and compare them to junior ICU RTs with less than two years of ICU experience to define if a difference in perceptions exists in the experience of

RTs. Also, this study will evaluate the need to perform educational sessions about VAP bundle to junior ICU RTs before releasing them to ICU bedsides.

STUDY QUESTIONS

This study is informed by four critical research questions:

1. What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?
2. Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?
3. Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?
4. What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?

Significance of the Study

This study explores the perceptions and self-reported adherence of junior ICU RTs and senior ICU RTs toward VAP preventive strategies using a convenience sample of Saudi Arabia and American RTs recruited from social media (Twitter, Facebook, and WhatsApp). Moreover, this study will evaluate the need to perform educational sessions about VAP bundle to junior ICU RTs before releasing them to ICU bedsides. A lack of VAP bundle adherence will result in inappropriate actions that can induce VAP and negatively affect patients. Since RTs are the primary decision-makers in some situations, they need to be well-prepared and confident in VAP prevention to prevent increasing mortality among mechanically ventilated patients ultimately.

Summary

Junior RTs might not be aware of VAP bundle due to a lack of experience or education provided by their academic institution. Thus, measuring their perceptions and adherence to VAP bundles (i.e., VAP prevention strategies) is necessary. Healthcare providers, especially RTs, should adhere to VAP preventive strategies and understand how VAP can complicate patients' course of treatment by extending the mechanical ventilator length of stay. Junior RTs should be confident in utilizing the right equipment and making the right decisions to prevent VAP.

Definition of Terms

VAP: Ventilator-associated pneumonia.

CXR: Chest x-ray.

MV: Mechanical ventilation.

IMV: Invasive mechanical ventilation.

ICU: Intensive care unit.

ETT: Endotracheal tube.

LOS: Length of stay.

ATS: American Thoracic Society.

RT: Respiratory Therapist.

SSD: sub-glottic secretions drainage.

CHAPTER II

LITERATURE REVIEW

The following literature review was performed to collect the recent studies regarding the VAP prevention strategies and awareness of junior ICU respiratory therapists among VAP preventive strategies. The database searched for this literature review include PubMed, Google Scholar, ELSEVIER, and EBSCOhost. The following keywords were used for the searching process: Ventilator-associated pneumonia, VAP awareness, VAP knowledge, VAP preventive strategies, VAP-bundle guidelines, VAP bundle adherence, VAP prevention protocol, VAP pathophysiology, VAP etiology, and preventive strategies in VAP. This chapter covers the following objectives:

- VAP overview.
- VAP etiology and pathophysiology.
- Definition of VAP
- VAP preventive strategies.
- Limitation in VAP prevention.
- Attitudes toward evidence-based practices preventing VAP.

VAP overview:

VAP is a broad topic in critical care. The definition of VAP has been a controversial issue for many years in healthcare institutions (Chawla, 2008). There is no specific consensus on the definition for VAP, particularly due to the lack of criteria distinguishing it from other critical respiratory diseases. In 2010, the Center for Disease Control (CDC) defined VAP as a lung infection that targets the lower airways in patients receiving mechanical ventilation support. In 2005, the American Thoracic Society (ATS), joining the Infectious Diseases Society of America,

released hospital-acquired pneumonia guidelines. They defined VAP as pneumonia in a patient receiving mechanical ventilation support for at least 48 hours, differentiated by new infiltration in the chest X-ray (CXR) along with signs of new infection such as increases in body temperature, abnormalities in complete blood count (CBC), and changes in sputum features like color and density (ATS, 2005)

Most of the researchers agree on the difficulty of defining VAP. VAP's presence is associated with a new negative alteration in the patient's chest film and abnormalities in the blood work or laboratory results. Moreover, researchers agree that the presence of the mechanical ventilation is a significant factor inducing VAP events in critical care settings. The onset of VAP is classified into two major types based on its antibiotic sensitivity and resistance: early-onset and late-onset. The early onset of VAP is due to antibiotic-sensitive pathogens and occurs within the first to the fourth-day post mechanical ventilation initiation. The late onset of VAP is due to the presence of antibiotic-resistant pathogens and occurs after the fifth day after initiation of the mechanical ventilation (Trouillet et al., 1998). For the purpose of this study, the ATS VAP definitions will be utilized.

VAP has been reported to have a higher occurrence rate compared to other healthcare-acquired infections in critical care settings (Magill et al., 2018). In 2015, a point-prevalence survey conducted in a sample of acute care hospitals in the U.S. by CDC found that pneumonia associated with invasive mechanical ventilation (IMV) had a higher percentage of infections than other infections by 32%. (Magill et al., 2018). In 2002, the most extensive U.S. study of patients with VAP concluded that VAP is a common infection occurring in 9.3 percent of patients who are mechanically ventilated for more than 24 hours (Rello et al., 2002). The onset of VAP can be seen as early as 48-96 hours after initiation of the mechanical ventilation and as late as four days

after initiation of mechanical ventilation. (Caple & Schwartz, 2018). Studies reported that 20% of patients who required mechanical ventilation might develop VAP if there was no adherence to VAP preventive strategies (Buckley et al., 2013). Unfortunately, research shows that even strict adherence to the VAP bundle prevention strategies may also result in VAP occurrences. However, the implementation of VAP bundle guidelines is the best evidence-based strategy to prevent VAP that critical care providers currently have.

VAP etiology and pathophysiology

VAP is a healthcare issue that can worsen the patient's medical condition and delay a patient's recovery. VAP is also associated with prolonged hospital stay and increased mortality and morbidity rates in the ICU. Patients undergoing mechanical ventilation treatment have a suppressed immune system to defend against infections that might attack the body. Thus, the presence of VAP may lead to significant complications in ventilated patients. Aspiration of gastric secretion, oropharyngeal and microbial colonization of the aerodigestive tract in the lower airways is linked with VAP occurrence (Caple & Schwartz, 2018). Accumulation of secretion and microbial colonization in the lower airways results in the development of VAP. Previous lung infections or pulmonary diseases are increasing the chance of multiplying the bacteria.

Numerous organisms can cause Ventilator-Associated pneumonia. In 2017, a study was conducted in Serbia regarding VAP to evaluate changes in infection events involving pathogens and changes in their resistance and concluded that gram-negative bacteria were the primary pathogen associated with VAP. In contrast, the most common bacteria was a highly drug-resistant (XDR) strain of *Acinetobacter* spp with no differences in pathogens between early and late-onset of VAP (Injac et al., 2017). However, Caple & Schwartz (2018) reported that common organisms associated with the early onset of VAP include *Streptococcus pneumoniae*,

Haemophilus influenzae, and *Moraxella catarrhalis*. In contrast, the common organisms present with the late onset of VAP are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Enterobacter*.

In Asian countries, VAP affects patients at the same rate as in wealthy countries and the U.S. Data were collected in terms of VAP etiology from ten Asian countries; *Acinetobacter* spp was found to be present in most countries like Malaysia, Thailand, Pakistan, and India, and it was the most commonly isolated pathogen in VAP. It was reported to be the second pathogen found in Taiwan. However, *P. aeruginosa* was the most common pathogen in China and the Philippines, causing VAP (Chawla, 2008).

Definition of VAP

The definition of VAP is unified between Saudi Arabia and the United States. Ventilator-Associated Pneumonia was defined as pneumonia that occurs in patients undergoing mechanical ventilation for more than 48 hours and is diagnosed by a new infiltration in the chest X-ray and culture and microscopic examination of lower respiratory airways secretions (ATS, 2005; CDC, 2019). This definition was similar to the definition used by Saudi Arabian healthcare institutions as they follow the American guidelines. Alotaibi et al. (2020) and Osman et al. (2020) had defined VAP in their studies conducted in Saudi Arabia as a nosocomial infection that develops 48 hours after initiation of the ventilation, referring to the same definition addressed by the CDC and ATS. This concludes that the definition of VAP in Saudi Arabia is similar to the one used in the United States.

Following the VAP bundle guidelines may vary from one country to another. However, reviewing the studies conducted in this manner in Saudi Arabia and the United States showed their similarity in following the same guidelines released from the American Thoracic Society.

Osman et al. (2020) conducted a study in Saudi Arabia to measure the effect of VAP prevention before and after implementing the VAP bundle in the pediatric intensive care unit. They developed a bundle relying on the reviewed medical literature and American Thoracic Society guidelines. The components of the bundle they used were imported from the American Thoracic Society guidelines for VAP prevention.

Similarly, Alotaibi et al. (2020) assessed the knowledge of the Saudi Arabian respiratory therapists working in the ICU regarding VAP prevention. They measured the respiratory therapists' knowledge using a survey that includes a vast component imported from the American Thoracic Society guidelines in VAP prevention. Moreover, Al-Thaqafy et al. (2014) aimed to validate the bundle related to VAP rate in a traditionally high VAP environment and examine its association with ventilator utilization. The authors relied on the ventilator bundle released by the Institute for Healthcare Improvement (IHI), which is part of VAP bundle guidelines released from the American Thoracic Society. Despite the limited literature found regarding the VAP prevention guidelines in Saudi Arabia, Saudi Arabian healthcare institutions showed that they follow the American guidelines in general and the American Thoracic Society regarding VAP prevention. There are no differences in VAP prevention guidelines between Saudi Arabia and the United States.

VAP preventive strategies

The CDC (1983) had released guidelines for nosocomial pneumonia prevention. Those guidelines were updated in 1997 to include measures to eliminate aspiration, prevent cross-contamination among healthcare practitioners, and reduce pathogenic microorganisms of oropharyngeal and gastric colonization. The guidelines were revised again in 2003 and expanded

to cover VAP, and a definition of VAP was established based on a chest X-ray, microbiology, and clinical diagnosis.

The VAP bundle includes the use of evidence-based strategies associated with decreasing VAP occurrence rate. The VAP bundle protocol initiation is significantly linked with reduced VAP events in clinical settings (Bird et al., 2010). In any ICU, VAP is likely to be present once the mechanical ventilation is initiated, and in order to prevent it, the VAP bundle should be used. Preventing the incidence of VAP will positively reflect on the patients' health by preventing ICU LOS, mechanical ventilation LOS, mortality, and morbidity rates to increase. According to a study conducted in Saudi Arabia, there was around a 73% improvement in the rate of VAP and approximately a 20% ventilator utilization improvement among adult ICU patients after implementing the ventilator bundle released by the Institute for Healthcare Improvement (IHI), which is part of VAP bundle guidelines released from the American Thoracic Society (Al-Thaqafy et al., 2014). Also, another study was conducted in the United States to measure the VAP bundle's effectiveness and its relation to reducing VAP incidence in 2009. The results showed that implementing the VAP bundle in the critical care area had lower VAP event rates from 4.9% to 0.2% (Bigham et al., 2009).

Standardizing the care provided in healthcare institutions leads to better outcomes and higher quality of care. Having clear guidelines to follow and effective staff education are essential in any healthcare institution. Melnyk et al. (2016) found that ensuring all healthcare providers are up to date with evidence-based practices while inspiring an environment supporting these practices is a key factor that results in a high level of quality. This is emphasized on the need to have a clear protocol to follow or a guideline to track in clinical care settings regarding evidence-based practices linked to fewer VAP events.

It is important to utilize VAP preventive strategies before and during the intubation period because every ventilated patient is at risk of developing VAP if there is no adherence to VAP preventive strategies. The VAP bundle is a group of evidence-based practices known to limit or reduce the incidence of VAP. Also, following the healthcare institutions' guidelines is a crucial factor resulting in better outcomes. Expert healthcare providers feel confident using these techniques to prevent VAP due to the vast knowledge they have gained from their experience. Therefore, juniors should be efficiently educated and trained to ensure they feel confident utilizing these strategies to prevent VAP.

Adherence to the VAP bundle results in an improvement in infection rates at healthcare institutions (Al-Thaqafy et al., 2014; Burja et al., 2018). The American Thoracic Society (2005) had standardized guidelines designed to reduce the occurrence of VAP. These guidelines can be utilized by a respiratory therapist (RT) when the patient is within his/her area of control. The recommendation includes avoiding intubation by the initiation of Non-Invasive Mechanical Ventilation when it is possible for respiratory failure before escalating the therapy to initiate the Invasive Mechanical Ventilation, introducing the endotracheal tube (ETT) through the oropharyngeal cavity rather than the nasopharyngeal cavity, continuing aspiration of sub-glottic secretion by using sub-glottic ETT and sub-glottic tracheostomy, maintaining appropriate ETT cuff pressure to prevent leaking the subglottic secretion toward the lower airway, frequently emptying the filled ventilator circuit due to water condensation from the heated humidifier, daily mouth care by the use of oral chlorhexidine, and daily measuring the readiness for patients with no contraindication of extubation for tube removal by performing daily spontaneous breathing trial (SBT) after performing sedation vacation or spontaneous awakening trial (SAT) by nurses (ATS, 2005). Additionally, the patient's position is one of the elements that play a significant

role in preventing VAP development. While supine position remains a risk factor for aspiration, semi-recumbent position (45-degree angle) prevents the aspiration of gastric content to the airways (Torres et al., 1992).

A comparative study conducted inside an ICU included ventilated patients at risk of developing VAP, aiming to evaluate the adherence to the VAP bundle and its effect on the VAP rate. The researchers claimed that the application of the VAP bundle is significantly producing an improvement in VAP rates and resulting in mortality rate reduction and decreased medical costs as a result of decreased the time spent on the mechanical ventilation (Samra et al., 2017).

Since utilizing the VAP bundle results in better outcomes such as preventing mortality, morbidity, and medical costs from increasing, healthcare institutions should emphasize and encourage using them to enhance the quality and delivered care to patients. Conducting frequent staff meetings, frequent staff education, simulation, and practical training to new healthcare providers are significant factors in standardizing the provided care. The RT plays a significant role in preventing VAP events by applying critical strategies that are highly recommended. Thus, the RT should be well trained and comfortable applying these strategies. Enhancing the RT department's education program is critical in ensuring that RTs can treat critically ill patients with high standards of care and prevent incidence such as VAP.

Limitation in VAP prevention

Various limitations exist in VAP prevention that serves as a strong barrier to systematically implementing VAP prevention and the VAP bundle. Lack of healthcare provider experience can negatively affect the quality of delivered care if individuals are unaware or uneducated about the VAP bundle and prevention of VAP. Therefore, effective staff education and sufficient training programs inside the ICU department should be established to ensure that

all healthcare providers, mostly juniors, are updated with the guidelines and confident in utilizing the VAP bundle. Despite the adherence to the VAP bundle, VAP events may occur if no high compliance to the VAP bundle was made. Marra et al. (2009) found that high compliance to policies or guidelines is needed to decrease infections rate; however, low compliance might result in the occurrence of infections.

Aloush & Al-Rawajfa (2020) had evaluated the compliance among nurses regarding VAP prevention guidelines. Two hundred ninety-four nurses have completed a self-reported questionnaire. The results revealed that 45% of nurses had insufficient compliance, 24.8% had weak compliance, and 29.6% had sufficient compliance. The researchers reported that nurses with higher experience and previous educational sessions in VAP prevention had scored higher than other nurses without experience and educational sessions. The researchers recommended in their study to apply an educational program to enhance the knowledge and skills of the healthcare providers.

Moreover, having specific equipment available may impact the quality of care regarding VAP prevention. A trial was conducted in France to determine the effectiveness of subglottic secretion drainage (SSD) in reducing VAP incidence revealed that using the SSD during mechanical ventilation results in a significant reduction in VAP rate (Unligil & Kumar, 2012). While focusing on staff education remains the primary element in improving healthcare outcomes by preventing VAP, the availability of specific equipment is essential due to its relation and facilitation of VAP prevention. Junior ICU RTs may lack adherence to specific strategies linked to reducing VAP due to a lack of experience. Therefore, implementing a competency program before releasing them into the bedside results in better outcomes and higher

quality of care. Also, requesting equipment facilitating VAP bundle applications and prioritizing them in the clinical care setting helps healthcare practitioners prevent VAP.

Attitudes toward evidence-based practices preventing VAP

Healthcare providers' attitudes towards evidence-based prevention practices for VAP are critical in the overall prevention of VAP. Deven Juneja et al. (2011), distributed a questionnaire aimed to evaluate the current practices among VAP prevention during the international conference of critical care medicine conducted in India. One hundred and twenty-six physicians completed a 10-point questionnaire form covering different aspects of VAP prevention, including usage elements of VAP bundles, VAP diagnosing criteria, and VAP treatment. The majority of intensivists (96.8 percent) reported using VAP bundles in their ICUs, with a large proportion reporting head elevation (98.4 %), chlorhexidine mouthcare (83.3 %), stress ulcer prophylaxis (96.8 %), HME (92.9 %), early weaning (94.4 %), and handwashing (97.6 %) as part of their VAP bundle. Many intensivists reported using subglottic secretion drainage (45.2 %) and a closed suction system (74.6 %). Only 22.2 percent of respondents reported using selective decontamination of the digestive tract (SDD). The questionnaire findings revealed that there was a great adherence to the VAP bundle among physicians. The distributed survey emphasized that the gap between the VAP bundle's recommendations and the actual applied practice is closing.

Kalyan et al. (2020) surveyed one hundred and eight ICU staff nurses assessing their knowledge and applied practice to prevent VAP in selected ICUs in India. Out of the 108 nurses who participated in the study, 82 (75.93%) had average knowledge, 24 (22.22%) had a good understanding, and only 2 (1.85%) had poor knowledge on VAP prevention. The assessment of the practices revealed that 68 (94.44 %) of the nurses had average practices towards VAP prevention, and only 4 (5.55 %) had good practices towards VAP prevention. The researchers

claimed that there was no link found between ICU nurses' knowledge and practices regarding VAP prevention. The findings concluded that a large percentage of ICU nurses had average knowledge and practice scores and a poor association. Also, the researchers are emphasizing the need to have well-defined tactics, strategies, and procedures to enhance the awareness and practice to prevent VAP occurrence with assuring high quality of care. This study illustrates the difference in understanding of certain practices between healthcare workers regarding VAP prevention. Understanding these practices may vary from one healthcare population to another based on their received education and experiences.

Alotaibi et al. (2020) assessed the ICU respiratory therapists' knowledge regarding evidence-based practices for preventing VAP at King Abdulaziz Medical City in Saudi Arabia between June – August 2019. Ninety respiratory therapists were responded to a questionnaire consisting of nine nonpharmacologic strategies known to prevent VAP. The findings revealed that (56%) of respondents scored below the average knowledge. A statistical significance was found between knowledge score and experience ($p=0.009$). The study recommended enhancing the educational program in that facility to minimize the VAP occurrence. The result of this study represents that the experience is associated with the knowledge in regard to VAP bundle. This study assessed the ICU respiratory therapists' knowledge in general regarding evidence-based practices preventing VAP but didn't differentiate between seniors and juniors. Thus this study seeks to differentiate between these two important categories.

Despite the limited researches found regarding the differences between master's and bachelor's degrees in respiratory therapy, the value of earning a higher education degree may differ based on the need in the workforce. Respiratory care managers reported that they prefer higher RTs with bachelor's degrees. Also, they revealed that a master's degree in respiratory

therapy is better in contributing to the management and clinical education rather than working at the bedside (Becker, 2003). Furthering education or earning higher education degrees for RTs is recommended to stay competitive in healthcare. (Myers, 2013). Earning a master's degree in respiratory therapy contributes to enhancing research skills and building clinical education for staff RTs, emphasizing that a master's degree in respiratory therapy focuses on research and leadership and does not differ from a bachelor's in respiratory therapy knowledge.

Summary

Ventilator-Associated pneumonia remains a serious event that may affect patients placed on mechanical ventilation. VAP has been reported to have a higher occurrence rate compared to other healthcare-acquired infections in critical care settings (Magill et al., 2018). Moreover, VAP occurrence can worsen the patient's medical condition and delay the patient's recovery. American Thoracic Society had standardized VAP bundle guidelines linked with reduced VAP events (ATS, 2005), including performing mouth care, utilizing a sub-glottic ETT, maintaining the head of the bed at or above 30 degrees, and pressure ulcer prophylaxis. Adherence to the VAP bundle results in decreasing infection rates (Burja et al., 2018). A significant variation in the level of adherence and perception toward the VAP bundle was observed among different healthcare professionals (Alotaibi et al., 2020; Kalyan et al., 2020). Perceptions and adherence of junior RTs working in the ICU toward VAP prevention are poorly studied in the current literature, thus justifying the need for the present study.

CHAPTER III

METHODOLOGY

In this descriptive, cross-sectional study, the researcher investigated junior and senior RTs' perceptions toward VAP prevention strategies. The researcher used a self-administered survey to explore the perceptions and adherence of junior RTs toward the VAP bundle. This chapter discusses the methods that were implemented in this study.

Research Questions

1. What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?
2. Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?
3. Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?
4. What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?

Instrumentation

The researcher used a 31-item survey measuring the perceptions of junior ICU RTs towards the VAP bundle. The survey was developed by the researcher and thesis chair, based on previous researches on VAP prevention and the ATS guidelines. The survey instrument includes three sections to collect data from participants. The first section of the survey contains 19 Likert scale statements evaluating the perception and adherence of junior ICU RTs toward the VAP bundle. For each of the 19 statements, the respondents can choose only one option (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree). The second section contains four

questions of true or false and multiple choices to measure the knowledge of VAP. Lastly, the third section of the survey contains one short answer question to collect age and seven multiple-choice questions to collect the other demographic data. Demographic data such as gender, age, profession, ICU experience years (in years), number of years since graduated from respiratory therapy school (in years), most recently awarded degree (i.e., bachelor's, master's), and geographic location of the RT. The survey was adjusted to accept only one answer for each question.

Research Design

This is a descriptive research design and cross-sectional survey. The survey was distributed electronically to junior ICU RTs and senior ICU RTs. Electronic surveys are a low-cost and time-efficient method of collecting data (Sax et al., 2003). Also, surveys are one of the most practical data collection methods in scientific research (Burns et al., 2008). The Junior RTs are defined as respiratory therapists with less than five years since graduation from respiratory school with a bachelor's degree. Senior respiratory therapists are defined as respiratory therapists with more than five years since graduation from respiratory therapy school with a bachelor's degree. Also, the junior RTs were classified into two categories, junior RTs with less than two years of ICU experience and junior RTs with two years of ICU experience or more, to assess the difference in experience regarding VAP preventive strategies perceptions. Junior and senior respiratory therapists received this survey via an online link through educational social media accounts such as Twitter, Facebook, and WhatsApp. These accounts are moderated by RT celebrities and followed by vast numbers of RTs.

Sample

A convenience sample was used in this cross-sectional study. Inclusion criteria for this study include all RTs From the United States of America and Saudi Arabia. Exclusion criteria are any participant who is not RT, not Saudi RT nor American RT, and RT students.

Protection of Human Subjects

The research proposal was reviewed by Georgia State University Institutional Review Board (H22038) to protect human subjects' rights. Confidentiality is granted as no personal information was collected from the participants in this study. Participation in this study was voluntary. Also, respondents to this survey remained anonymous.

Data Collection

The survey was implemented electronically using google forms, and a link to that survey was distributed through social media platforms (Twitter, Facebook, and WhatsApp). The target recruitment was a convenience sample, with approximately half of the sample consisting of junior RTs and half of the sample consisting of senior RTs. The student investigator tweeted a post on the Twitter app and received 83 retweets and 69 likes. RT celebrities moderating RT educational accounts on Twitter retweeted the post during the first week and the following week from distributing the survey. Also, the link to the survey was posted in general Facebook RT group containing around 27,000 RTs, and a WhatsApp message was sent to general RTs groups. The participants in the survey self-reported their country. After the first week of distributing the survey, a reminder was sent to social media platforms, and the survey was closed two weeks from the first distribution day. A total of 152 responses were able to be used in data analysis, as 25 responses were excluded because they didn't meet the inclusion criteria.

Data Analysis

Perceptions and adherence to the VAP bundle was assessed using descriptive statistics, including means and standard deviations to describe the overall sample. Additionally, descriptive statistics were computed on the demographic data. Descriptive statistics were also used to compare perceptions and adherence to the VAP bundle to answer research question 1. Based on the statements' direction in the questionnaire, which was in Likert-scale, perception statements were divided into VAP perception (10 items) and VAP practice (9 items). Two Cronbach's alphas were conducted to assess the reliability of the two domains. To compare junior ICU RTs with more ICU experience to junior ICU RTs with less ICU experience, junior ICU RTs with master's degrees to junior ICU RTs with bachelor's degrees, and junior ICU RTs from Saudi Arabia to junior ICU RTs from the United States, independent samples t-test was used to compare each item's mean (to answer research questions 2, 3, and 4). Two items from the perception statements were reversed coded to account for their framework for questions 2,3, and 4 means. Also, summation of means from perception statements was computed for questions 2, 3, and 4 as a higher mean was interpreted as more positive perceptions compared to a lower mean indicating more negative perceptions. A p-value <0.05 was considered as significant. The Statistical Packages for the Social Sciences (SPSS) program, version 27, was used to analyze the collected data for each participant.

Ethical considerations

To ensure security and confidentiality for the collected data, a password excel file was created from the google survey results. No personal identifiable information was collected. If personal identifiable information was inadvertently recorded, this information was

destroyed/deleted. The principal investigator (thesis chair: Dr. Culbreth) and the student investigator are only individuals who have access to that file.

Invitation letter and informed consent

An electronic invitation letter with informed consent was provided to all the participants in this study, as it was displayed on the first page of the survey. In order to proceed to the survey, participants were asked to read the initiation and agree to participate. If the participant disagreed to participate in the study, the survey ends directly before any further steps are processed.

CHAPTER IV

FINDINGS

The main purpose of this chapter was to evaluate the perception of junior ICU RTs compared to senior ICU RTs toward Ventilator-Associated Pneumonia preventive strategies. Demographic information and results of the statistical analysis are presented in this chapter.

Research Questions

1. What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?
2. Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?
3. Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?
4. What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?

Demographic findings

The study included a convenient sample of respiratory therapists from Saudi Arabia and the United States. A total of 177 responses were collected. However, twenty-five responses were excluded as they didn't meet the study's criteria. Therefore, the sample size of this analysis was 152 (85.6%) of total responses.

Out of 152 respondents, eighty-nine (58.6%) were male, while 63 (41.4%) were female, with a mean age of 29.34 (SD± 5.935). Fifty-eight (38.2%) respondents were senior RTs, and 94 (61.8%) were junior RTs. Forty-eight (51.1%) of junior ICU RTs were male, and 46 (48.9%) were female, with a mean age of 27.06 (±4.522). Sixty-four (68.1%) of juniors had less than two

years of ICU experience, while 30 (31.9%) of them had two years of ICU experience or more. The majority of junior ICU RTs had bachelor's degrees (n=85) (90.4%), and only nine (9.6%) had master's degrees. One-hundred and thirty (85.5%) respondents were Saudi Arabian RTs, while 22 (14.5%) were American RTs. Lastly, eighty-four juniors were Saudi Arabian RTs, while only ten juniors (10.6%) were American RTs. (See table 1).

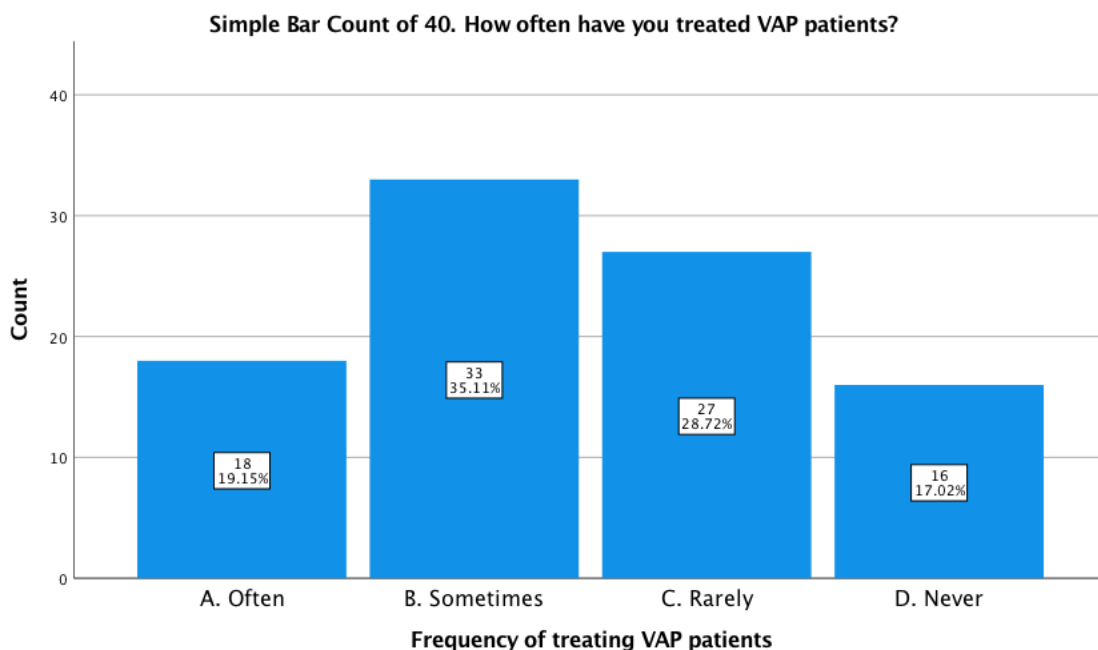
Approximately 40% of respondents revealed that they *sometimes* treated VAP patients (n=60), while 43 (28.3%) declared that they had *often* treated VAP patients. Thirty-two (21.1%) respondents reported *rarely* treated VAP patients, and seventeen (11.2%) answered *never*. Moreover, around 35% of juniors reported that they *sometimes* treated VAP patients (n=33), while 18 (19.1%) declared that they had *often* treated VAP patients. Twenty-seven (28.7%) juniors reported *rarely* treated VAP patients, and sixteen (17.0%) answered *never*. (Table 1 and Figure 1).

Table 1. Demographic characteristics among survey respondents.

Demographic Variable	Junior (n=94)	Senior (n=58)	Total (n=152)
Gender			
Male	48 (51.1%)	41 (70.7%)	89 (58.6%)
Female	46 (48.9%)	17 (29.3%)	63 (41.4%)
Mean Age (\pm SD)	27.06 (\pm 4.522)	33.03 (\pm 6.124)	29.34 (\pm 5.935)
Years since graduation			
5 years or more (senior)	0 (0.00%)	58 (100.0%)	58 (38.2%)
Less than 5 years (junior)	94 (100.0%)	0 (0.00%)	94 (61.8%)
Years of experience in the ICU			
Less than 2 years	64 (68.1%)	9 (15.5%)	73 (48.0%)
2 years or more	30 (31.9%)	49 (84.5%)	79 (52.0%)
Highest degree earned			
Bachelor's	85 (90.4%)	41 (70.7%)	126 (82.9%)
Master's	9 (9.6%)	17 (29.3%)	26 (17.1%)
Country of Practice			
USA	10 (10.6%)	12 (20.7%)	22 (14.5%)
KSA	84 (89.4%)	46 (79.3%)	130 (85.5%)
Frequency of treating VAP patients			

Often	18 (19.1%)	25 (43.1%)	43 (28.3%)
Sometimes	33 (35.1%)	27 (46.6%)	60 (39.5%)
Rarely	27 (28.7%)	5 (8.6%)	32 (21.1%)
Never	16 (17.0%)	1 (1.7%)	17 (11.2%)

Figure 1: Frequency of treating VAP patients among junior RTs



Finding Related to Research Question 1

The first question asked, "What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?" Data results are tabulated in Table 2, including survey statements, frequencies, percentages, mean scores, standard deviations of junior and senior RTs' perception separately. Also, the total frequencies, total percentages, and total mean scores and standard deviations for both seniors and juniors are presented together. Lastly, the table includes results from the independent samples T-tests (See table 2).

Together, senior and junior respiratory therapists reported the strongest agreement to the statement that "As a respiratory therapist, I understand the causes of VAP" with a total mean

score of $M=4.33$ and standard deviation of ($SD\pm .707$). Higher numbers correspond with a stronger agreement to the statements compared to lower numbers. The statement, "Only RT educators should be familiar with the practices that are known to prevent VAP" received the least agreement in response with a total mean score of $M=2.39$ and standard deviation of ($SD\pm 1.338$) (See table 2). This was one of the statements that were reverse coded.

Junior respiratory therapists reported the strongest agreement to the statement, "I believe a close-suction system reduces the risk of VAP occurrence," with a mean score of $M=4.31$ and standard deviation of ($SD\pm .830$). Whereas the statement, "Only RT educators should be familiar with the practices that are known to prevent VAP," received the least agreement in response with a total mean score of $M=2.50$ and standard deviation of ($SD\pm 1.358$) (See table 2).

Generally, junior ICU RTs showed positive perceptions toward implementing VAP preventive strategies based on their calculated mean and standard deviation for the 19 perception statements, as they scored a mean of more than 3.5 for most of the perception statements, except for the following statements, which received the lowest mean score respectively. The statement, which stated that "Only RT educators should be familiar with the practices that are known to prevent VAP" received the lowest agreement in response with a mean score of $M=2.50$ and standard deviation of ($SD\pm 1.358$). The statement, "A passive humidifier or heat-moisture exchanger (HME) has no role in reducing the incidence of VAP" received the second-lowest agreement in response with a mean score of $M=2.80$ ($SD\pm 1.151$). This was another statement that was reverse coded. Likewise, the statement, "Oral intubation is preferred over nasal intubation due to its role in decreasing the risk of developing VAP," received low agreement in response with a mean score of $M= 3.29$ and standard deviation of ($SD\pm 1.033$). Lastly, the statement stated, "In normal circumstances, I believe changing the ventilator circuit every week

can reduce the risk of developing VAP," received low agreement in response with a mean score of M=3.30 and standard deviation of (SD± 1.285) (See table 2).

The perceptions statements, which were in Likert-scale, were divided into two groups: VAP perception (10 survey items) and VAP practice (9 survey items). The division was based on the statements' direction, where statements measuring pure perception and belief toward VAP prevention were classified as VAP perception. In contrast, statements measuring a specific practice related to VAP prevention were classified as VAP practice. Reliability coefficients (Cronbach's alpha) was conducted on both domains and showed the results for VAP perception and VAP practice were ($\alpha=.703$) and ($\alpha=.711$), respectively (See table 3).

Table 2: Perceptions of Junior ICU Respiratory Therapists towards Ventilator-Associated Pneumonia (VAP) Bundle.

Survey Statement	Junior ICU RTs (n=94), Mean(±SD)	Senior ICU RTs (n=58), Mean(±SD)	Total (n=152), Total Mean(±SD)	T-value, (df), p-value
1. I believe that VAP contributes to an increased mortality in the Intensive Care Unit (ICU). <ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	4 (4.3%) 4 (4.3%) 9 (9.6%) 42 (44.7%) 35 (37.2%)	1 (1.7%) 1 (1.7%) 5 (8.6%) 24 (41.4%) 27 (46.6%)	5 (3.3%) 5 (3.3%) 14 (9.2%) 66 (43.4%) 62 (40.8%)	-1.444, (150), p= .151
Mean (±SD)	4.06 (±1.014)	4.29 (±.838)	4.15 (± .954)	
2. I'm familiar with the VAP bundle guidelines. <ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	0 (0.0%) 7 (7.4%) 20 (21.3%) 43 (45.7%) 24 (25.5%)	1 (1.7%) 1 (1.7%) 7 (12.1%) 30 (51.7%) 19 (32.8%)	1 (0.7%) 8 (5.3%) 27 (17.8%) 73 (48.0%) 43 (28.3%)	-1.595, (150), p= .113
Mean (±SD)	3.89 (± .873)	4.12 (± .818)	3.98 (± .857)	
3. As a respiratory therapist, it is important for me utilize the VAP bundle guidelines released by the				

American Thoracic Society (ATS). <ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	0 (0.0%) 5 (5.3%) 11 (11.7%) 48 (51.1%) 30 (31.9%)	1 (1.7%) 1 (1.7%) 12 (20.7%) 22 (37.9%) 22 (37.9%)	1 (0.7%) 6 (3.9%) 23 (15.1%) 70 (46.1%) 52 (34.2%)	.068, (150), $p=.946$
Mean (\pm SD)	4.10 (\pm .804)	4.09 (\pm .904)	4.09 (\pm .841)	
4. As a respiratory therapist, I utilize the VAP bundle guidelines released by the American Thoracic Society (ATS). <ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	1 (1.1%) 4 (4.3%) 14 (14.9%) 57 (60.6%) 18 (19.1%)	2 (3.4%) 1 (1.7%) 15 (25.9%) 24 (41.4%) 16 (27.6%)	3 (2.0%) 5 (3.3%) 29 (19.1%) 81 (53.3%) 34 (22.4%)	.310, (102.69), $p=.757$
Mean (\pm SD)	3.93 (\pm .779)	3.88 (\pm .957)	3.91 (\pm .848)	
5. As a respiratory therapist, I understand the causes of VAP. <ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	0 (0.0%) 3 (3.2%) 3 (3.2%) 54 (57.4%) 34 (36.2%)	1 (1.7%) 0 (0.0%) 3 (5.2%) 23 (39.7%) 31 (53.4%)	1 (0.7%) 3 (2.0%) 6 (3.9%) 77 (50.7%) 65 (42.8%)	-1.402, (150), $p=.163$
Mean (\pm SD)	4.27 (\pm .675)	4.43 (\pm .752)	4.33 (\pm .707)	
6. I believe that initiation of VAP bundle protocol is linked with reduced VAP incidents. <ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	0 (0.0%) 2 (2.1%) 10 (10.6%) 45 (47.9%) 37 (39.4%)	2 (3.4%) 0 (0.0%) 4 (6.9%) 24 (41.4%) 28 (48.3%)	2 (1.3%) 2 (1.3%) 14 (9.2%) 69 (45.4%) 65 (42.8%)	-.497, (150), $p=.620$
Mean (\pm SD)	4.24 (\pm .729)	4.31 (\pm .883)	4.27 (\pm .789)	
7. As a respiratory therapist, I believe it is important to stay up to date with recent guidelines of the VAP bundle released from the American Thoracic Society (ATS). <ul style="list-style-type: none"> Strongly Disagree Disagree Neutral 	1 (1.1%) 0 (0.0%) 14 (14.9%)	3 (5.2%) 1 (1.7%) 5 (8.6%)	4 (2.6%) 1 (0.7%) 19 (12.5%)	-.022, (150), $p=.982$

<ul style="list-style-type: none"> • Agree • Strongly Agree 	38 (40.4%) 41 (43.6%)	18 (31.0%) 31 (53.4%)	56 (36.8%) 72 (47.4%)		
Mean (\pm SD)	4.26 (\pm .789)	4.26 (\pm 1.052)	4.26 (\pm .895)		
8. Only RT educators should be familiar with the practices that are known to prevent VAP.				1.237, (150), $p=$.218	
<ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	7 (7.4%) 24 (25.5%) 7 (7.4%) 27 (28.7%) 29 (30.9%)	4 (6.9%) 10 (17.2%) 2 (3.4%) 21 (36.2%) 21 (36.2%)	11 (7.2%) 34 (22.4%) 9 (5.9%) 48 (31.6%) 50 (32.9%)		
Mean (\pm SD)	2.50 (\pm 1.358)	2.22 (\pm 1.298)	2.39 (\pm 1.338)		
9. VAP has a higher occurrence rate compared to other healthcare-acquired infections.					.352, (150), $p=$.725
<ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	1 (1.1%) 5 (5.3%) 35 (37.2%) 39 (41.5%) 14 (14.9%)	2 (3.4%) 3 (5.2%) 22 (37.9%) 21 (36.2%) 10 (17.2%)	3 (2.0%) 8 (5.3%) 57 (37.5%) 60 (39.5%) 24 (15.8%)		
Mean (\pm SD)	3.64 (\pm .841)	3.59 (\pm .956)	3.62 (\pm .884)		
10. Noninvasive ventilation (NIV) should be considered when possible over intubation for patients with respiratory failure.				-1.027, (150), $p=$.306	
<ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	4 (4.3%) 9 (9.6%) 16 (17.0%) 40 (42.6%) 25 (26.6%)	3 (5.2%) 3 (5.2%) 11 (19.0%) 17 (29.3%) 24 (41.4%)	7 (4.6%) 12 (7.9%) 27 (17.8%) 57 (37.5%) 49 (32.2%)		
Mean (\pm SD)	3.78 (\pm 1.079)	3.97 (\pm 1.139)	3.85 (\pm 1.102)		
11. Re-intubation increases the risk of developing VAP.					1.547, (150), $p=$.124
<ul style="list-style-type: none"> • Strongly Disagree • Disagree • Neutral • Agree • Strongly Agree 	1 (1.1%) 1 (1.1%) 10 (10.6%) 47 (50.0%) 35 (37.2%)	1 (1.7%) 4 (6.9%) 6 (10.3%) 30 (51.7%) 17 (29.3%)	2 (1.3%) 5 (3.3%) 16 (10.5%) 77 (50.7%) 52 (34.2%)		
Mean (\pm SD)	4.21 (\pm .760)	4.00 (\pm .918)	4.13 (\pm .827)		
12. I believe endotracheal tubes with subglottic secretion drainage (SSD) can significantly reduce the risk of developing VAP.				-1.722, (150), $p=$.087	
<ul style="list-style-type: none"> • Strongly Disagree 	2 (2.1%)	1 (1.7%)	3 (2.0%)		

<ul style="list-style-type: none"> Disagree Neutral Agree Strongly Agree 	2 (2.1%) 20 (21.3%) 43 (45.7%) 27 (28.7%)	1 (1.7%) 9 (15.5%) 20 (34.5%) 27 (46.6%)	3 (2.0%) 29 (19.1%) 63 (41.4%) 54 (35.5%)		
Mean (±SD)	3.97 (± .885)	4.22 (± .899)	4.07 (± .896)		
13. I believe maintaining endotracheal cuff pressure greater than 20 cm H ₂ O can reduce the risk of developing VAP.				.581, (91.92), <i>p</i> = .563	
<ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	1 (1.1%) 3 (3.2%) 16 (17.0%) 51 (54.3%) 23 (24.5%)	2 (3.4%) 7 (12.1%) 8 (13.8%) 20 (34.5%) 21 (36.2%)	3 (2.0%) 10 (6.6%) 24 (15.8%) 71 (46.7%) 44 (28.9%)		
Mean (±SD)	3.98 (± .803)	3.88 (± 1.141)	3.94 (± .944)		
14. A passive humidifier or heat-moisture exchanger (HME) has no role in reducing the incidence of VAP.					-.342, (150), <i>p</i> = .733
<ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	5 (5.3%) 26 (27.7%) 21 (22.3%) 29 (30.9%) 13 (13.8%)	3 (5.2%) 16 (27.6%) 14 (24.1%) 20 (34.5%) 5 (8.6%)	8 (5.3%) 42 (27.6%) 35 (23.0%) 49 (32.2%) 18 (11.8%)		
Mean (±SD)	2.80 (± 1.151)	2.86 (± 1.083)	2.82 (± 1.122)		
15. I believe that every ICU patient should be evaluated daily for possible extubation.				-.804, (150), <i>p</i> = .423	
<ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	1 (1.1%) 2 (2.1%) 12 (12.8%) 37 (39.4%) 42 (44.7%)	2 (3.4%) 1 (1.7%) 3 (5.2%) 20 (34.5%) 32 (55.2%)	3 (2.0%) 3 (2.0%) 15 (9.9%) 57 (37.5%) 74 (48.7%)		
Mean (±SD)	4.24 (± .838)	4.36 (± .931)	4.29 (± .874)		
16. A spontaneous breathing trial (SBT) is recommended to be performed daily more than once for every ICU patient when it is not contraindicated.					-2.539, (150), <i>p</i> = .012
<ul style="list-style-type: none"> Strongly Disagree Disagree Neutral Agree Strongly Agree 	6 (6.4%) 10 (10.6%) 20 (21.3%) 38 (40.4%) 20 (21.3%)	2 (3.4%) 1 (1.7%) 11 (19.0%) 22 (37.9%) 22 (37.9%)	8 (5.3%) 11 (7.2%) 31 (20.4%) 60 (39.5%) 42 (27.6%)		

Mean (\pm SD)	3.60 (\pm 1.129)	4.05 (\pm .981)	3.77 (\pm 1.095)	
17. Oral intubation is preferred over nasal intubation due to its role in decreasing the risk of developing VAP.				-.709, (150), <i>p</i> = .479
• Strongly Disagree	3 (3.2%)	4 (6.9%)	7 (4.6%)	
• Disagree	18 (19.1%)	6 (10.3%)	24 (15.8%)	
• Neutral	35 (37.2%)	21 (36.2%)	56 (36.8%)	
• Agree	25 (26.6%)	16 (27.6%)	41 (27.0%)	
• Strongly Agree	13 (13.8%)	11 (19.0%)	24 (15.8%)	
Mean (\pm SD)	3.29 (\pm 1.033)	3.41 (\pm 1.124)	3.34 (\pm 1.067)	
18. In normal circumstances, I believe changing the ventilator circuit every week can reduce the developing of VAP.				1.12, (108.38), <i>p</i> =.264
• Strongly Disagree	12 (12.8%)	11 (19.0%)	23 (15.1%)	
• Disagree	14 (14.9%)	15 (25.9%)	29 (19.1%)	
• Neutral	19 (20.2%)	6 (10.3%)	25 (16.4%)	
• Agree	32 (34.0%)	13 (22.4%)	45 (29.6%)	
• Strongly Agree	17 (18.1%)	13 (22.4%)	30 (19.7%)	
Mean (\pm SD)	3.30 (\pm 1.285)	3.03 (\pm 1.475)	3.20 (\pm 1.362)	
19. I believe a close-suction system is reducing the risk of VAP occurrence.				-.242, (150), <i>p</i> = .809
• Strongly Disagree	1 (1.1%)	1 (1.7%)	2 (1.3%)	
• Disagree	2 (2.1%)	4 (6.9%)	6 (3.9%)	
• Neutral	10 (10.6%)	4 (6.9%)	14 (9.2%)	
• Agree	35 (37.2%)	14 (24.1%)	49 (32.2%)	
• Strongly Agree	46 (48.9%)	35 (60.3%)	81 (53.3%)	
Mean (\pm SD)	4.31 (\pm .830)	4.34 (\pm 1.001)	4.32 (\pm .896)	

SD: Standard Deviation.

Note: Means are based on 5-point Likert-scale in which 1 indicates strongly disagree and 5 indicated strongly agree. A score above 3.5 indicates agreement with the statement.

Table3: Results from Cronbach's alpha (N=152).

Group	Cronbach's alpha
VAP perception	.703
VAP Practice	.711

Note: Classification was based on the statement direction. Statements measuring perception and belief were classified as VAP perception (10 items). Statements measuring a specific practice were classified as VAP practice (9 items).

Finding Related to Research Question 2:

The second question asked, "Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?" Comparison between junior ICU RTs with two years of ICU experience or more and junior ICU RTs with less than two years of ICU experience were tabulated and presented in table 4. There was a significant difference ($p=.010$) in the perception toward VAP prevention between junior ICU RTs with more ICU experience and junior ICU RT with less ICU experience. (See table 4).

Table 4: Findings Related to Research Question 2: Junior ICU RTs with more ICU experience compared to junior ICU RTs with less ICU experience.

Perception	How many years of experience do you have working in the ICU?	N	Mean	Std. Deviation	
		Less than 2 years	64	70.9531	7.85267
	2 years or more	30	75.3333	6.63498	
	Levene's Test for Equality of Variances	t-test for Equality of Means			
	Sig.	t	df	P-value	
Perception	Equal variances assumed	.639	-2.643	92	.010
	Equal variances not assumed		-2.809	66.406	.007

Note: p -value was obtained from Independent Sample t-test.

Means are based on 5-point Likert-scale for 19 perception statements in which highest score is 95 point and lowest score is 19 point, and summation of means from perception statements are represented in the table.

Finding Related to Research Question 3:

The third question asked, "Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?" Comparison between junior ICU RTs with master's degrees and junior ICU RT with bachelor's degrees were tabulated and presented in table 5. There was no significant difference ($p=.439$) in the perception toward VAP prevention between junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees (See table 5).

Table 5: Findings Related to Research Question 3: Junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees.

Perception	What is your most recent awarded degree in respiratory therapy?	N	Mean	Std. Deviation	
		Bachelor	85	72.5529	6.97360
	Master	9	70.4444	13.38013	
		Levene's Test for Equality of Variances	t-test for Equality of Means		
		Sig.	t	df	P-value
Perception	Equal variances assumed	.157	.777	92	.439
	Equal variances not assumed		.466	8.466	.653

Note: p-value was obtained from Independent Sample t-test.

Means are based on 5-point Likert-scale for 19 perception statements in which highest score is 95 point and lowest score is 19 point, and summation of means from perception statements are represented in the table.

Finding Related to Research Question 4:

The fourth question asked, "What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?" Comparison between junior ICU RTs in Saudi Arabia and junior ICU RTs in the United States were tabulated and presented in table 6. There was no significant difference ($p=.652$) in the perception toward VAP prevention between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the United States. (See table 6).

Table 6: Findings Related to Research Question 4: Junior ICU RTs in Saudi Arabia compared to junior ICU RTs in United States.

Perception	In what country do you work currently as a respiratory therapist?	N	Mean	Std. Deviation	
		USA	10	73.4000	6.97933
	KSA	84	72.2262	7.84081	
	Levene's Test for Equality of Variances	t-test for Equality of Means			
	Sig.	t	df	P-value	
Perception	Equal variances assumed	.942	.452	92	.652
	Equal variances not assumed		.496	11.879	.629

Note: p-value was obtained from Independent Sample t-test.

Means are based on 5-point Likert-scale for 19 perception statements in which highest score is 95 point and lowest score is 19 point, and summation of means from perception statements are represented in the table.

Summary

A total of 177 responses were collected. However, twenty-five responses were excluded as they didn't meet the study's criteria. Therefore, the sample size of this analysis was 152 (85.6%) of total responses. Eighty-nine (58.6%) were male, while 63 (41.4%) were female. The mean age of the total participants was 29.34 (SD± 5.935). Fifty-eight (38.2%) respondents were

senior RTs, and 94 (61.8%) were junior RTs. Forty-eight (51.1%) of juniors were male, and 46 (48.9%) were female, with a mean age of 27.06 (± 4.522). The results from the data analysis showed that overall junior ICU RTs have a positive perception toward VAP preventive strategies, as they scored a mean of more than 3.5 for most of the perception statements, except for four statements, which received the lowest mean respectively. There was a significant difference ($p=.010$) in the perceptions of VAP prevention between junior ICU RTs with more ICU experience and junior ICU RT with less ICU experience. There was no significant difference ($p=.439$) in the perception of VAP prevention between junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees. Lastly, there was no significant difference ($p=.652$) in the perception of VAP prevention between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the United States.

CHAPTER V

INTERPRETATION OF FINDINGS

This chapter is intended to elaborate on the findings, which were demonstrated in chapter IV. Also, this chapter includes an overview of the study, discussion of findings, implications for the practice of the study, limitations, recommendations, and conclusion.

Overview of the study

The purpose of this study was to assess junior ICU RTs' perceptions toward VAP and its preventive strategies. The following four questions were addressed to guide the study:

1. What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?
2. Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?
3. Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?
4. What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?

Discussion

The first question asked, "What are the perceptions of the junior RTs working in the ICU towards implementing the VAP bundle?" The overall findings of this question disclosed that junior ICU RTs had a positive perception of the VAP bundle as they scored a mean of 3.5 or more for most of the perception statements. The result goes in the same direction with Deven Juneja and colleagues (2011) when they investigated physicians' adherence to the VAP bundle.

They concluded that there was an excellent adherence to the VAP bundle among physicians, and the gap between implementing the VAP bundle and the recommended guidelines is closing.

Generally, junior ICU RTs showed a positive perception toward implementing VAP preventive strategies based on their calculated mean and standard deviation for the 19 perception statements, as they scored a mean of more than 3.5 for most of the perception statements, except for the following statements. The statement, "Only RT educators should be familiar with the practices that are known to prevent VAP" received the lowest agreement in response with a mean score of $M=2.50$ and standard deviation of $(SD\pm 1.358)$, which illustrates a positive perception toward the VAP preventive strategies. This suggests that junior ICU RTs believe that every RT should be aware of the VAP bundle. The statement, "A passive humidifier or heat-moisture exchanger (HME) has no role in reducing the incidence of VAP" received the second-lowest agreement in response with a mean score of $M=2.80$ ($SD\pm 1.151$), which indicate a negative perception toward VAP preventive strategies, as HME is effective in reducing the ventilator circuit colonization but has not been proven to reduce the incidence of VAP (ATS, 2005). Likewise, the statement "Oral intubation is preferred over nasal intubation due to its role in decreasing the risk of developing VAP", received low agreement in response with a mean score of $M= 3.29$ and standard deviation of $(SD\pm 1.033)$. The junior ICU RTs believed that nasal intubation is superior to oral intubation in decreasing the VAP events, which is a negative perception, and junior ICU RTs might be unsure if oral intubation is a practice that leads to VAP prevention and is preferred over nasal intubation. In 2005, the American Thoracic Society (ATS) had established guidelines to prevent the incident of VAP (ATS, 2005). These guidelines are evidence-based practices and contain a vast of recommendations known as the VAP bundle. Lastly, the statement, "In normal circumstances, I believe changing the ventilator circuit every

week can reduce the developing of VAP," received low agreement in response with a mean score of $M=3.30$ and standard deviation of ($SD\pm 1.285$). This indicates a positive perception toward VAP preventive strategies as regularly changing the ventilator circuit will decrease the colonization but not the VAP event (ATS, 2005).

Overall, junior ICU RTs showed a positive perception of VAP preventive strategies as per the mean perception scores. Junior ICU RTs showed a negative perception to two perception statements only, whereas the rest of the perception statements revealed a positive perception. The findings from our study emphasize the need to establish educational sessions for junior ICU RTs among VAP preventive strategies.

The perception statements were classified into two groups: VAP perception and VAP practice. VAP perception refers to statements measuring the beliefs toward VAP prevention, and they were ten items. VAP practice refers to a statement measuring perception regarding a specific practice that is related to VAP prevention. To assess the reliability of the two domains, two Cronbach's alphas were conducted on both parts in this study: VAP perception and VAP practice. The acceptable alpha values range from .70 to .95 (Tavakol & Dennick, 2011). The Cronbach's alphas for our study were ($\alpha=.703$) for the VAP perception group, which consisted of ten items, and ($\alpha=.711$) for the VAP practice group, which consisted of nine items indicating an acceptable internal consistency for our study.

The second question asked, "Do junior RTs with more ICU experience have more positive perceptions towards VAP prevention compared to junior RTs with less ICU experience?" There was a significant difference in the perception toward VAP prevention between junior ICU RTs with more ICU experience and junior ICU RT with less ICU experience. In our study, we divided junior ICU RTs into two groups. The first group was junior

ICU RTs with less than two years of ICU experience, whereas the second group was junior ICU RTs with two years or more of ICU experience. Junior ICU RTs with two years of ICU experience or more showed more positive perceptions regarding VAP preventive strategies than the other group. These results are aligned with Aloush and Al-Rawajfa's findings. According to Aloush and Al-Rawajfa, nurses with higher experience and previous educational sessions in VAP prevention had scored higher than other nurses without experience and educational sessions (Aloush & Al-Rawajfa, 2020). Also, these findings are similar to other results in a study conducted by Alotaibi et al. (2020) investigating the ICU respiratory therapists' knowledge and attitudes regarding evidence-based practices for preventing VAP. They found a statistical difference between knowledge score and experience and concluded that experience is associated with the knowledge in regard to the VAP bundle.

The third question asked, "Do junior RTs with master's degrees have more positive perceptions towards VAP prevention compared to junior RTs with bachelor's degrees?" Our results showed no difference in the perception toward VAP prevention between junior ICU RTs with master's degrees compared to junior ICU RTs with bachelor's degrees which indicates potentially equal perception and awareness among all junior ICU RTs with master's and bachelor's degrees. Only nine junior respiratory therapists had master's degrees, which may have provided insufficient power to detect significant effects on perceptions toward the VAP bundle. These results emphasize RTs with lower educational attainment are compliant with guidelines regarding the VAP bundle and are aware of evidence-based practices, similar to RTs with higher educational attainment. Mazurek et al. (2016) found that ensuring all healthcare providers are up to date with evidence-based practices while inspiring an environment supporting these practices is a crucial factor that results in a high level of quality.

The fourth question asked, "What are the differences in VAP bundle perceptions between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the U.S.?" There was no significant difference in the perception toward VAP prevention between junior ICU RTs in Saudi Arabia compared to junior ICU RTs in the United States. Junior ICU RTs in Saudi Arabia and the United States showed a similar perception of VAP preventive strategies. Adherence to ATS guidelines might explain the similarity resulting from both groups. Additionally, only ten respiratory therapists from the United States participated in the study, which may provide insufficient power to detect significant effects on perceptions toward the VAP bundle. However, the perceptions of the VAP bundle among healthcare providers differ between studies in different countries. Kalyan et al. (2020) measured the compliance and adherence among nurses in VAP prevention guidelines. The study illustrates the difference in understanding of certain practices between healthcare workers among VAP prevention, which means understanding these practices may vary from one healthcare population to another based on their received education and experiences.

Implications for practice

The findings of this study support the importance of adherence to VAP bundle guidelines. To our knowledge, this is the first study to explore the perceptions of junior ICU RTs toward VAP preventive strategies. Our findings indicate that education sessions and competency tests may be helpful to improve the overall perception and adherence of junior ICU RTs, especially newly graduate RTs, to VAP preventive strategies. The results from this study will help respiratory therapy departments improve their staff's quality and performance. This study's findings indicate the need to enhance the understanding of evidence-based practices preventing VAP occurrence, such as VAP bundle.

Limitations

Several limitations were experienced in our study. First, this study consisted of a small sample size of American RTs. A total of twenty-two American RTs participated in our study, and only ten were juniors. Second, we had a small sample size of junior ICU RTs holding master's degrees. A total of twenty-six RTs had master's degrees, but only nine juniors had master's degrees. Third, there is uncertainty whether the RTs knew they were taking care of VAP patients or whether the patient turned into a VAP patient after the RT had ended their shift/care. Fourth, Social media may limit generalizability because individuals who are recruited on social media may be younger and more affluent than the general population (Levine et al., 2011). Fifth, all participants might not have been aware of the American Thoracic Society (ATS) and its guidelines in VAP prevention. Sixth, we did not assess exposure to VAP cases, and this study assumed that experience equals exposure to VAP cases and treatment. Seventh, limited articles were available to compare our study with. Lastly, we did not assess the underlying rationale why the individuals disagreed or agreed with the VAP perception statements. Future studies would benefit from understanding the drivers for VAP non-compliance (such as inefficient time management skills, perceptions of inefficacy, or staff shortage). Despite the limitations of this study, this is the first study, to our knowledge, to explore the perception of junior ICU RTs toward VAP preventive strategies.

Recommendations

Future research studies are recommended on adherence and perceptions of VAP prevention among a broader range of RTs due to the limited literature. Replication of the study to include a larger sample size and compare respiratory therapists to other ICU professionals is recommended.

Conclusions

This study explored the perceptions of junior ICU RTs toward VAP preventive strategies. Generally, Junior ICU RTs overall showed positive perceptions toward VAP preventive strategies. The study findings revealed that experience positively impacts the perception toward VAP preventive strategies. Lastly, this study found that higher education degrees and country regions did not affect the perceptions toward the VAP preventive strategies.

References

- Al-Thaqafy, M. S., El-Saed, A., Arabi, Y. M., & Balkhy, H. H. (2014). Association of compliance of ventilator bundle with incidence of ventilator-associated pneumonia and ventilator utilization among critical patients over 4 years. *Annals of Thoracic Medicine*, 9(4), 221–226. <https://doi.org/10.4103/1817-1737.140132>
- Alotaibi, R. M., Almutairi, R. F., Alqahtani, M. A., Aljafn, N. M., Almasoud, M. A., Alenezi, F., Tambur, P., & Philip, W. (2020). Evaluation of Respiratory Therapist Knowledge of Evidence-Based Guidelines for Preventing Ventilator-Associated Pneumonia in King Abdulaziz Medical City. *Respiratory Care*, 65(Suppl 10), 3412583. http://rc.rcjournal.com/content/65/Suppl_10/3412583.abstract
- Aloush, S. M., & Al-Rawajfa, O. M. (2020). Prevention of ventilator-associated pneumonia in intensive care units: Barriers and compliance. *International Journal of Nursing Practice (John Wiley & Sons, Inc.)*, 26(5), 1–7. <https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=edb&AN=146382264&site=eds-live&scope=site&custid=gsu1>
- Becker, E. A. (2003). Respiratory care managers' preferences regarding baccalaureate and master's degree education for respiratory therapists. *Respiratory Care*, 48(9), 840–858.
- Bigham, M. T., Amato, R., Bondurant, P., Fridriksson, J., Krawczeski, C. D., Raake, J., Ryckman, S., Schwartz, S., Shaw, J., Wells, D., & Brill, R. J. (2009). Ventilator-Associated Pneumonia in the Pediatric Intensive Care Unit: Characterizing the Problem and Implementing a Sustainable Solution. *The Journal of Pediatrics*, 154(4), 582–587. <https://doi.org/10.1016/j.jpeds.2008.10.019>
- Bird, D., Zambuto, A., O'Donnell, C., Silva, J., Korn, C., Burke, R., Burke, P., & Agarwal, S. (2010). Adherence to Ventilator-Associated Pneumonia Bundle and Incidence of Ventilator-Associated Pneumonia in the Surgical Intensive Care Unit. *Archives of Surgery*, 145(5), 465–470. <https://doi.org/10.1001/archsurg.2010.69>
- Brierley J, Highe L, Hines S, Dixon G, Brierley, J., Highe, L., Hines, S., & Dixon, G. (2012). Reducing VAP by instituting a care bundle using improvement methodology in a UK paediatric intensive care unit. *European Journal of Pediatrics*, 171(2), 323–330. <https://doi.org/10.1007/s00431-011-1538-y>
- Buckley, M. S., Dzierba, A. L., Smithburger, P. L., McAllen, K. J., Jordan, C. J., & Kane-Gill, S. L. (2013). Chlorhexidine for the prevention of ventilator associated pneumonia in critically ill adults. *Journal of Infection Prevention*, 14(5), 162–169. <https://doi.org/10.1177/1757177413490814>

- Burja, S., Belec, T., Bizjak, N., Mori, J., Markota, A., & Sinkovič, A. (2018). Efficacy of a bundle approach in preventing the incidence of ventilator associated pneumonia (VAP). *Bosnian Journal of Basic Medical Sciences*, 18(1), 105–109. <https://doi.org/10.17305/bjbms.2017.2278>
- Burns, K. E. A., Duffett, M., Kho, M. E., Meade, M. O., Adhikari, N. K. J., Sinuff, T., & Cook, D. J. (2008). A guide for the design and conduct of self-administered surveys of clinicians. *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, 179(3), 245–252. <https://doi.org/10.1503/cmaj.080372>
- Caple, C. R. B. M., & Schwartz, S. R. M. F.-B. (2018). *Pneumonia, Ventilator-Associated*. CINAHL Nursing Guide.
- Chastre, J., & Fagon, J. Y. (2002). Ventilator-associated pneumonia. *American journal of respiratory and critical care medicine*, 165(7), 867–903. <https://doi.org/10.1164/ajrccm.165.7.2105078>
- Chawla, R. (2008). Epidemiology, etiology, and diagnosis of hospital-acquired pneumonia and ventilator-associated pneumonia in Asian countries. *American Journal of Infection Control*, 36(4, Supplement), S93–S100. <https://doi.org/10.1016/j.ajic.2007.05.011>
- Coppadoro, A., Bellani, G., & Foti, G. (2019). Non-Pharmacological Interventions to Prevent Ventilator-Associated Pneumonia: A Literature Review. *Respiratory Care*, 64(12), 1586–1595. <https://doi.org/10.4187/respcare.07127>
- D. Hunter, J. (2012). Ventilator associated pneumonia. *BMJ: British Medical Journal (Overseas & Retired Doctors Edition)*, 344(7859), 40–44. <https://doi.org/10.1136/bmj.e3325>
- Deven Juneja, Omender Singh, Yash Javeri, Vikas Arora, Rohit Dang, & Anjali Kaushal. (2011). Prevention and management of ventilator-associated pneumonia: A survey on current practices by intensivists practicing in the Indian subcontinent. *Indian Journal of Anaesthesia*, 55(2), 122–128. <https://doi.org/10.4103/0019-5049.79889>
- Guidelines for PREVENTING health-care--associated pneumonia, 2003. (n.d.). <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm>.
- Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia. (2005). *American Journal of Respiratory and Critical Care Medicine*, 171(4), 388–416. <https://doi.org/10.1164/rccm.200405-644ST>
- Injac, V., Batranović, U., Matijašević, J., Vukoja, M., Hadnadjev, M., Bukumirić, Z., Trajković, G., & Janković, S. (2017). Etiology and resistance patterns of bacteria causing ventilator-associated pneumonia in a respiratory intensive care unit. *Uzročnici Pneumonije*

- Jurecki, M. C., Chatburn, R. L., & Gole, S. (2016). Assessment of Mechanical Ventilation Knowledge of Newly Hired Respiratory Therapists at an Academic Hospital. *Respiratory Care*, 61(10), OF47–OF47.
- Kalyan, G., Bibi, R., Kaur, R., Bhatti, R., Kumari, R., Rana, R., Kumari, R., Kaur, M., & Kaur, R. (2020). Knowledge and Practices of Intensive Care Unit Nurses Related to Prevention of Ventilator Associated Pneumonia in Selected Intensive Care Units of a Tertiary Care Centre, India. *Iranian Journal of Nursing & Midwifery Research*, 25(5), 369–375.
https://doi.org/10.4103/ijnmr.IJNMR_128_18
- Levine, D., Madsen, A., Wright, E., Barar, RanaE., Santelli, J., & Bull, S. (2011). Formative Research on MySpace: Online Methods to Engage Hard-to-Reach Populations. *Journal of Health Communication*, 16(4), 448–454.
<https://doi.org/10.1080/10810730.2010.546486>
- Magill, S. S., O’Leary, E., Janelle, S. J., Thompson, D. L., Dumyati, G., Nadle, J., Wilson, L. E., Kainer, M. A., Lynfield, R., Greissman, S., Ray, S. M., Beldavs, Z., Gross, C., Bamberg, W., Sievers, M., Concannon, C., Buhr, N., Warnke, L., Maloney, M., ... Edwards, J. R. (2018). Changes in Prevalence of Health Care–Associated Infections in U.S. Hospitals. *The New England Journal of Medicine*, 379(18), 1732–1744.
<https://doi.org/10.1056/NEJMoa1801550>
- Marra, A. R., Cal, R. G. R., Silva, C. V., Caserta, R. A., Paes, Â. T., Moura, Jr. D. F., Pavão dos Santos, O. F., Edmond, M. B., & Durão, M. S. (2009). Successful prevention of ventilator-associated pneumonia in an intensive care setting. *AJIC: American Journal of Infection Control*, 37(8), 619–625. <https://doi.org/10.1016/j.ajic.2009.03.009>
- Mazurek Melnyk, B., Gallagher-Ford, L., & Fineout-Overholt, E. (2016). Improving healthcare quality, patient outcomes, and costs with evidence-based practice. *Reflections on Nursing Leadership*, 42(3), 1–8.
- Myers, T. R. (2013). Thinking outside the box: Moving the respiratory care profession beyond the hospital walls. *Respiratory Care*, 58(8), 1377–1385.
<https://doi.org/10.4187/respcare.02542>
- Osman, S., Al Talhi, Y. M., AlDabbagh, M., Baksh, M., Osman, M., & Azzam, M. (2020). The incidence of ventilator-associated pneumonia (VAP) in a tertiary-care center: Comparison between pre- and post-VAP prevention bundle. *Journal of Infection and Public Health*, 13(4), 552–557. <https://doi.org/10.1016/j.jiph.2019.09.015>
- Pozuelo-Carrascosa, D. P., Herráiz-Adillo, Á., Alvarez-Bueno, C., Añón, J. M., Martínez-Vizcaino, V., & Cavero-Redondo, I. (2020). Subglottic secretion drainage for preventing ventilator-associated pneumonia: An overview of systematic reviews and an updated meta-analysis. *European Respiratory Review*, 29(155), 190107.
<https://doi.org/10.1183/16000617.0107-2019>

- Rello, J., Ollendorf, D. A., Oster, G., Vera-Llonch, M., Bellm, L., Redman, R., & Kollef, M. H. (2002). Epidemiology and Outcomes of Ventilator-Associated Pneumonia in a Large US Database. *Chest*, 122(6), 2115–2121. <https://doi.org/10.1378/chest.122.6.2115>
- Samra, S. R., Sherif, D. M., & Elokda, S. A. (2017). Impact of VAP bundle adherence among ventilated critically ill patients and its effectiveness in adult ICU. *Egyptian Journal of Chest Diseases and Tuberculosis*, 66(1), 81–86. <https://doi.org/10.1016/j.ejcdt.2016.08.010>
- Sax, L. J., Gilmartin, S. K., & Bryant, A. N. (2003). Assessing Response Rates and Nonresponse Bias in Web and Paper Surveys. *Research in Higher Education*, 44(4), 409. <https://doi.org/10.1023/A:1024232915870>
- Smith, N. R. M. C., & Karakashian, A. R. B. (2018). Pneumonia, Ventilator-Associated: *Health Care Costs*. CINAHL Nursing Guide.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Timsit, J. F., Esaied, W., Neuville, M., Bouadma, L., & Mourvillier, B. (2017). Update on ventilator-associated pneumonia. *F1000Research*, 6, 2061. <https://doi.org/10.12688/f1000research.12222.1>
- Torres, A., Serra-Bailles, J., Ros, E., Piera, C., de la Bellacasa, J. P., Cobos, A., Lomena, F., Rodríguez-Roisin, R., Torres, A., Serra-Batlles, J., Ros, E., Piera, C., Puig de la Bellacasa, J., Cobos, A., Lomeña, F., & Rodríguez-Roisin, R. (1992). Pulmonary aspiration of gastric contents in patients receiving mechanical ventilation: The effect of body position. *Annals of Internal Medicine*, 116(7), 540–543. <https://doi.org/10.7326/0003-4819-116-7-540>
- Trouillet, J.-L., Chastre, J., Vuagnat, A., Joly-Guillou, M.-L., Combaux, D., Dombret, M.-C., & Gibert, C. (1998). Ventilator-associated Pneumonia Caused by Potentially Drug-resistant Bacteria. *American Journal of Respiratory and Critical Care Medicine*, 157(2), 531–539. <https://doi.org/10.1164/ajrccm.157.2.9705064>
- Udružene Sa Ventilatornom Potporom Bolesnika i Njihova Rezistencija Na Antibiotike u Pulmološkoj Jedinici Intenzivnog Lečenja., 74(10), 954. <https://doi.org/10.2298/VSP151216270I>
- Unligil, U. M., & Kumar, A. (2012). Intermittent Subglottic Secretion Drainage and Ventilator-associated Pneumonia: A Multicenter Trial. *Yearbook of Critical Care Medicine*, 2012, 64–66. <https://doi.org/10.1016/j.yccm.2012.01.026>

APPENDIX A: IRB APPROVAL



INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999 In Person: 3rd Floor
Atlanta, Georgia 30302-3999 58 Edgewood
Phone: 404/413-3500 FWA: 00000129

July 19, 2021

Principal Investigator: Rachel E Culbreth

Key Personnel: Alanazi, Wayil; Culbreth, Rachel E

Study Department: Georgia State University, Respiratory Therapy

Study Title: The Perception of Junior Intensive Care Unit Respiratory Therapists toward the Ventilator-Associated Pneumonia Preventive Strategies

Submission Type: Exempt Protocol Category 2

IRB Number: H22038

Reference Number: 366240

Determination Date: 07/16/2021

Status Check Due By: 07/15/2024

The above-referenced study has been determined by the Institutional Review Board (IRB) to be exempt from federal regulations as defined in 45 CFR 46 and has evaluated for the following:

1. Determination that it falls within one or more of the eight exempt categories allowed by the institution; and
2. Determination that the research meets the organization's ethical standards

If there is a change to your study, you should notify the IRB through an Amendment Application before the change is implemented. The IRB will determine whether your research continues to qualify for exemption or if a new submission of an expedited or full board application is required.

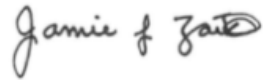
A Status Check must be submitted three years from the determination date indicated above. When the study is complete, a Study Closure Form must be submitted to the IRB.

This determination applies only to research activities engaged in by the personnel listed on this document.

It is the Principal Investigator's responsibility to ensure that the IRB's requirements as detailed in the Institutional Review Board Policies and Procedures For Faculty, Staff, and Student Researchers (available at gsu.edu/irb) are observed, and to ensure that relevant laws and regulations of any jurisdiction where the research takes place are observed in its conduct.

Any unanticipated problems resulting from this study must be reported immediately to the University Institutional Review Board. For more information, please visit our website at www.gsu.edu/irb.

Sincerely,

A handwritten signature in black ink that reads "Jamie f Zaikov". The signature is written in a cursive style with a large, stylized initial "J".

Jamie Zaikov, IRB Member

APPENDIX B: INFORMED CONSENT AND INVITATION LETTER

Georgia State University

Informed Consent

Title: The Perception of Junior Intensive Care Unit Respiratory Therapists toward the Ventilator-Associated Pneumonia Preventive Strategies.

Principal Investigator: Rachel Culbreth, PhD, MPH, RRT

Student Principal Investigator: Wayil Alanazi, BSc, RT

Dear Respiratory Therapist:

You are invited to take part in a research study. It is up to you to decide if you would like to participate in the study or not. The purpose of this study is to evaluate perception, adherence, and knowledge of junior respiratory therapists toward VAP preventive strategies. Your role in the study will last for up to 15 minutes.

You will be asked to do the following: answer questions about perception, adherence, and knowledge of junior ICU respiratory therapists toward VAP preventive strategies. Participating in this study will not expose you to any more risks than you would experience in a typical day. This study is not designed to benefit you. Overall, we hope to gain information about perception, adherence, and knowledge of junior ICU respiratory therapists toward VAP preventive strategies.

Purpose:

The purpose of the study is to evaluate perception, adherence, and knowledge of junior ICU respiratory therapists toward VAP preventive strategies. You are invited to take part in this research study because you are a respiratory therapist in Saudi Arabia or in United State of America.

Procedures:

If you decide to take part, you will fill out a survey with 40 questions.

If you decide to agree to participate, you will be asked to click the link and check the agree button. After that you will be asked to fill out the questionnaire.

- A total of 40 questions will be asked.
- The first 28 questions are statements you will need to choose to what extend do you agree with each of them. (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree)
- The rest of the questions are true/false and multiple-choice.
- Please select the option you are in favor of each question.
- This survey will take about 12-15 minutes to complete.

Risks:

In this study, you will not have any more risks than you would in a normal day of life. No injury is expected from this study, but if you believe you have been harmed, contact the research team as soon as possible.

Benefits:

This study is not designed to benefit you personally. Overall, we hope to gain information about perception, adherence, and knowledge of junior ICU respiratory therapists toward VAP preventive strategies.

Voluntary Participation and Withdrawal:

You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. The participants' rights are always reserved and safeguarded. Respondents to this survey will remain anonymous.

Contact Information:

Please Contact Dr. Rachel Culbreth at rculbreth@gsu.edu or 404-413-1224 in case any of the following occur:

- If you have questions about the study or your part in it.
- If you have questions, concerns, or complaints about the study.

The IRB at Georgia State University reviews all research that involves human participants. You can contact the IRB if you would like to speak to someone who is not involved directly with the study. You can contact the IRB for questions, concerns, problems, information, input, or questions about your rights as a research participant. Contact the IRB at 404-413-3500 or irb@gsu.edu.

Consent:

Your completion and submission of the survey implies that you agree to participate in this research.

Please note that you may withdraw at any time by not completing or by clicking the disagree button.

Thank you in advance for your cooperation

Sincerely,

Rachel Culbreth, PhD, MPH, RRT

Wayil Alanazi, BSc, RT

Please note: If you agree to participate in this research, please continue with the survey. You can print a copy of the form for your records.

- I Agree

- I Disagree

APPENDIX C: SURVEY QUESTIONNIRE



The Perception of Junior Intensive Care Unit Respiratory Therapists toward the Ventilator-Associated Pneumonia Preventive Strategies

Section 1: Perception and adherence:

Please answer each of the following statements by circling the number that best describes your opinion.

To what extent do you agree with each of the following statements?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I believe that VAP contributes to an increased mortality rate in the ICUs.	1	2	3	4	5
2.	I'm familiar with the VAP bundle guidelines.	1	2	3	4	5
3.	As a respiratory therapist, it is important for me utilize the VAP bundle guidelines released by the American Thoracic Society (ATS).	1	2	3	4	5
4.	As a respiratory therapist, I utilize the VAP bundle guidelines released by the American Thoracic Society (ATS).	1	2	3	4	5
5.	As a respiratory therapist, I understand the causes of VAP.	1	2	3	4	5
6.	I believe that initiation of VAP bundle protocol is linked with reduced VAP incidents.	1	2	3	4	5
7.	It is important for me to understand the association between VAP and VAP bundle.	1	2	3	4	5

8.	As a respiratory therapist, I believe it is important to stay up to date with recent guidelines of VAP bundle released from the American Thoracic Society (ATS).	1	2	3	4	5
9.	As a respiratory therapist, it is my assignment to stay up to date with recent articles in VAP prevention.	1	2	3	4	5
10.	As a respiratory therapist, I read recent articles in regard of VAP prevention.	1	2	3	4	5
11.	Only RT educators should be familiar with the practices that are known to prevent VAP.	1	2	3	4	5
12.	I believe it is the respiratory therapy department's assignment to keep all RTs following the VAP bundle guidelines.	1	2	3	4	5
13.	I believe it is my call to apply the VAP preventive strategies without referring to my supervisor.	1	2	3	4	5
14.	VAP has a higher occurrence rate compared to other infections.	1	2	3	4	5
15.	Accumulation of secretion in the lower airways results in the development of VAP.	1	2	3	4	5

16.	Noninvasive ventilation (NIV) should be considered when possible over intubation for patients with respiratory failure.	1	2	3	4	5
17.	Re-intubation is increasing the risk of developing VAP.	1	2	3	4	5
18.	I believe endotracheal tubes with subglottic secretion drainage (SSD) can significantly reduce the risk of developing VAP.	1	2	3	4	5
19.	I believe maintaining endotracheal cuff pressure greater than 20 cm H ₂ O can reduce the risk of developing VAP.	1	2	3	4	5
20.	A passive humidifier or heat-moisture exchanger (HME) has no role in reducing the incidence of VAP.	1	2	3	4	5
21.	Heat- moisture exchanger (HME) is recommended for an intubated patient who is expected to remain on a mechanical ventilator for more than one day.	1	2	3	4	5
22.	In normal circumstances, changing the humidifier every week is reducing the risk of developing VAP.	1	2	3	4	5
23.	I believe that every ICU patient should be	1	2	3	4	5

evaluated daily for possible extubation.						
24.	A spontaneous breathing trial (SBT) is recommended to be performed daily more than once for every ICU patient when it is not contraindicated.	1	2	3	4	5
25.	Oral intubation is preferred over nasal intubation due to its role in decreasing the risk of developing VAP.	1	2	3	4	5
26.	In normal circumstances, I believe changing the ventilator circuit every week can reduce the developing of VAP.	1	2	3	4	5
27.	I believe a close-suction system is reducing the risk of VAP occurrence.	1	2	3	4	5
28.	In normal circumstances, changing the suction system every week is reducing the chance of developing VAP.	1	2	3	4	5

Section 2: Knowledge

Please answer each of the following questions by selecting one answer that describes your opinion.

29. common organisms associated with the early onset of VAP include *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*
- A. True
- B. False

30. common organisms present with late-onset of VAP are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Enterobacter*
- A. True
 - B. False
31. Early-onset of VAP can be seen on:
- A. 1st to 4th day post mechanical ventilation initiation
 - B. After the fifth day post mechanical ventilation initiation
 - C. I don't know
32. Late onset of VAP can be seen on:
- A. 1st to 4th day post mechanical ventilation initiation
 - B. After the fifth day post mechanical ventilation initiation
 - C. I don't know

Section 3: Demographic Data:

Please answer each of the following questions by selecting one answer that describes you:

33. Your gender:
- A. Male
 - B. Female
 - C. Other
34. What is your age in years?
.....years old.
35. Are you a respiratory therapist?
- A. Yes
 - B. No

36. How many years since your graduation from respiratory therapy school with bachelor's degree?

- A. Less than 5 years
- B. 5 years or more

37. How many years of experience do you have working in the ICU?

- A. Less than 2 years
- B. 2 years or more

38. What is your most recent awarded degree in respiratory therapy?

- A. Bachelor
- B. Master

39. In what country do you work currently as a respiratory therapist?

- A. USA
- B. KSA

40. How often have you treated VAP patients?

- A. Often
- B. Sometimes
- C. Rarely
- D. Never