Knowledge & Practice of selected critical care bundles among Residents at Tikur Anbessa Specialized Hospital Emergency Department, Addis Ababa, Ethiopia 2023

By: Abraham Tamirat (MD)

Advisors: Dr Yohannes (MD, Assistant Professor of ECCM, MPH)

Dr Sofia (MD, Assistant Professor of ECCM)

A research thesis submitted to Addis Ababa University, College of Health Sciences, School of Medicine, Department of Emergency Medicine. In Partial Fulfillment of the Requirements for Postgraduate Specialty Certificate in Emergency and Critical Care Medicine.

Addis Ababa, Ethiopia

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Acknowledgments

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Abbreviations

- AOR: - adjusted odds ratio
- CAUTI: - catheter-associated urinary tract infections
- CDC: - Centers for Disease Control and Prevention
- CI: – confidence interval
- CLABSI: - central line-associated bloodstream infections
- COR: – reported Crude odds ratios
- EBGs: - evidence-based guidelines
- ECCM: – Emergency & Critical Care Medicine
- ED: - Emergency Department
- HAIs: - Hospital acquired infections
- HCAI- Healthcare-associated infection
- ICU: - Intensive care unit
- INICC: - International Nosocomial Infection Control Consortium
- NEJM: - New England journal of medicine
- PGY: - Post Graduate Year
- SPSS: - Statistical Package for Social Sciences
- TASH: - Tikur Anbessa Specialized hospital
- VAP: - Ventilator-associated pneumonia
- WHO: - World Health Organization

Declaration

I, Dr. Abraham Tamirat, hereby declare that the material in this thesis is entirely original with full attribution to all sources.

Name: Abraham Tamirat, MD

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Signature: ……

Date of Submission: ……

Place: Addis Ababa, Ethiopia

As the advisor for the university, I have given my approval for this thesis to be submitted for review.

Name of Advisor: 1. Dr Sofia (MD, Assistant Professor of ECCM)

Signature: …….

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Signature: ……

Date: ……

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ABSTRACT

Background: A care bundle consists of three to five evidence-based therapies that work better when combined than when done alone. Utilizing care bundles can guarantee that the minimal level of care is provided. It has been demonstrated that implementing an evidence-based care bundle for critically sick patients improves outcomes.

Objective: To assess the knowledge and practice of selected critical care bundles among residents working in Tikur Anbessa Specialized Hospital Emergency Department, Addis Ababa, Ethiopia 2023.

Methods: Institutional-based cross-sectional study was conducted using a structured questionnaire and observational checklist. The method of census sampling was applied. After the collected data was cleaned, it was imported into Excel and subjected to binary logistic regression and descriptive analysis using SPSS.

Result: The study included 64 ECCM residents, with a 95.3% response rate. Of this 43 (70.5%) were males and 46 (75.4%) were between 25-30 years, with mean age of 29.9 (SD± 2.58) years. The mean of work experience was 3.27 (SD ± 1.68) years. Regarding knowledge of Critical care bundles, 42 (68.9%), 53 (86.9%), and 54 (88.5%) were aware of the VAP, sepsis, and urinary catheter care bundles, respectively. However, it was noted that 36 (59%), 51 (83.6%), and 51 (83.6%) had good daily practice of the VAP, sepsis, and urinary catheter care bundle components, respectively. Year of residency had a statistically significant association with knowledge & practice of Critical care bundles ($P<0.05$).

Conclusion: Most ECCM residents had a good knowledge of critical care bundles and were practicing them. However, the practice of daily oral care, sterile suction system, placement of urinary drainage, periurethral cleaning & blood culture before antibiotics administration were suboptimal.

Key Words: knowledge, practice, critical care bundles, residents, cross-sectional, Tikur Anbesa Specialized Hospital

1. Introduction

1.1 Background

A care bundle is a collection of three to five evidence-based therapies that, when used in combination, produce greater results than when used separately. The minimal required level of care can be delivered by using care bundles. It has been demonstrated that using an evidence-based care bundle can improve outcomes for critically ill patients. (1)

The Institute for Healthcare Improvement (IHI) established the idea of an Evidence-Based Bundle of Care, which typically consists of three to five structured interventions supported by scientific research that, when implemented, consistently improves patient outcomes. Numerous of these bundles have concentrated on reducing and preventing HAIs, such as sepsis, central line-associated bloodstream infections, and ventilator-associated pneumonia (VAP), which are thought to be preventable. (2)

To evaluate, follow and successfully respond to the demands of critically sick patients, a professional must have advanced knowledge, specialized skills, clinical experience, and problem-solving ability. The knowledge and application of evidence-based recommendations (EBGs) to avoid VAP by critical care nurses has also fallen short. There is still much to learn about the discrepancies between clinical knowledge and actual practice, and more research is necessary to enhance the standard of treatment and the outcomes for vulnerable patients.(3)

1.2 Statement of the Problem

Emergency medicine often treats patients who are critically ill and who need quick, aggressive treatment to achieve the best results. Providing professional treatment to seriously ill patients while balancing the requirements of other patients in the emergency department (ED) presents a challenge for emergency medicine (EM) doctors. A growing number of critically sick patients are arriving to the emergency department and, regrettably, being managed for prolonged periods of time there, even though they ought to be admitted to an intensive care unit (ICU).(4)

To evaluate, follow and successfully respond to the demands of critically sick patients, a professional must have advanced knowledge, specialized skills, clinical experience, and problem-solving ability. Additionally, there has been a lack of understanding among physicians and critical care nurses regarding the use of and practice towards evidence-based recommendations (EBGs) to prevent ICU infection. The utilization of ICU care bundles has not been properly researched, and further research is required to close these gaps. This will improve the standard of care and the outcome for seriously ill patients.(3)

Therefore, there is a need to evaluate the stage of knowledge, and practices regarding critical care bundles among the residents and identify areas of improvement to enhance patient care and outcomes.

1.3 Significance of The Study

The goal of this research is to have knowledge and practice toward selected Critical care bundles. The results of this research will be used by hospital management, health authorities, and policy makers as baseline or additional data to enhance the quality of critical care bundle follow-up at the emergency department. This research will be used as a resource for other studies on this subject.

1.4 Literature Review

Globally

A care bundle is a collection of interventions that have been proven to improve outcomes, are attainable, measurable, and have not yet been implemented in the majority of patients. The guiding principle is that the whole benefit of a patient's care is more than the sum of its parts.(5)

Bundled care to prevent hospital-acquired infections and complications does, in fact, improve treatment and prevent negative outcomes, even though many scientific researches lack the methodological consistency necessary to draw firm conclusions about the scientific data from which the bundles are generated.(6)

The rationale for the widespread adoption of care bundles in critical care medicine is compelling, according to research from around the world. Many studies have examined the effectiveness of critical care bundles; in cases where high levels of compliance have been attained, morbidity and mortality have decreased accordingly.(7)

Research demonstrates that VAP bundle procedures lower VAP rates. Reduced ventilator days, length of stay in the critical care unit, and mortality rates are the outcomes of bundling procedures. There was a clear correlation between lower VAP rates and higher clinician adherence to VAP bundle procedures.(8)

The Surviving Sepsis Campaign (SSC) Guideline, which represents current best practise, is intended to enhance patient outcomes by integrating efficient constituent treatments in the care of septic patients. Sepsis bundles have been linked to a notable rise in survivability, a reduction in antibiotic use time, and better drug selection. Early identification and treatment of septic patients are still necessary for this recommendation to be effective.(9)

The term "CAUTI" refers to a urinary tract infection in a patient who is now undergoing urinary tract catheterization or who has recently undergone catheterization and who has considerable bacteriuria as well as symptoms and/or indicators specifically due to the urinary tract with no other sources that can be identified. It is the most prevalent infection related to healthcare globally, leading to higher costs, longer hospital stays, and significant morbidity.(10)

Most cases are believed to be avoidable when infection prevention packages of care are used. There are numerous methods to avoid CAUTI both before and after urinary catheter

implantation, each with various degrees of evidence. These typically include of proper application, aseptic insertion and upkeep, prompt removal, and hand cleanliness.(11)

The results of the study conducted in Western India show that critical care professionals, such as resident physicians and ICU nurses, have a disparity in their knowledge and application of the VAP bundle (45% knowledge versus 40.7% practice).(12)

Elevating the head of the bed, taking daily vacations from sedation, determining whether the patient is ready for extubation, stress ulcer prophylaxis, DVT prophylaxis, and daily dental care with chlorhexidine are all common components of VAP bundles. (13)

A descriptive cross-sectional study conducted in Pakistan reveals that nurses had a poor understanding of the ventilator bundle, with a mean score of 37.5%. ICU nurses displayed a mean practice score of 60.8%, which is likewise insufficient per the criterion. (14)

A systematic study conducted on critical care nurses in the eastern Mediterranean region found that most of the nurses in the sample did not comply with recommended guidelines regarding VAP. The primary barriers mentioned in the research under consideration were a lack of time, regulations and protocols, a paucity of nursing staff, and a lack of education. (15)

An assessment of critical care nurses' awareness of and adherence to the ventilator care bundle in reducing ventilator-associated pneumonia (VAP) was carried out in India. The findings showed that 43.3% of staff nurses had good understanding of the ventilator care bundle and over half (56.7%) had outstanding knowledge. It illustrates the close correlation between staff nurses' knowledge of the ventilator care bundle and their adherence to it. (16)

Africa

A descriptive exploratory study was conducted in Egypt to examine nurses' understanding of the sepsis bundle and their clinical skills. Results: With a mean total knowledge score of (43.82 7.95), the study found that around 68% of the tested sample had low knowledge levels (75%). Additionally, the overall performance level of the entire sample under study (100%) was unsatisfactory (75%), with a mean score of (59.58 5.7). Between mean knowledge and mean practice scores, there were negative associations discovered (r = 0.1 at P = 0.5). Conclusion: According to study results, critical care nurses' awareness and practice levels about the sepsis bundle were unsatisfactory. (17)

Based on descriptive exploratory research carried out in Cairo, most nurses did not adhere to the VAP bundle practices (average mean = 8.62 + 7.9 out of 29) and there's no unique procedure to observe for VAP prevention. The results of a 20-item questionnaire showed inadequate knowledge scores (mean 7.46 + 2.37). The study's conclusions suggested that a policy for VAP prevention in ICUs should be created and put into place. Additionally, nurses must participate in training programs on infection control and VAP bundle preventive measures in order to lower the prevalence of VAP. (18)

Ethiopia

A cross-sectional descriptive study carried out in Addis Ababa reveals that a response rate of 96.2% was obtained from 101 medical professionals. The bulk of these, 55 (54.5%) were from TASH; 64.4% of the participants were men, and their mean age was 29.4 (SD 3.32) years. Of these, 53 (52.5%) were nurses and 48 (47.3%) were doctors. 53 (52.5%), 69 (68.3%), and 79 (78.2%) of those surveyed knew the ICU care packages for VAP, sepsis, and urinary catheters, respectively. However, it was found that 50 (49.5%), 64 (63.4%), and 68 (67.3%) had, respectively, good daily practice of the aspects of VAP, sepsis, and urinary catheter care bundles. Additionally, this study demonstrated a substantial correlation (p 0.001) between knowledge and practices. (3)

An Addis Ababa University cross-sectional study reveals that the participants as a whole mean knowledge score was 12.431 out of 16 (range: 5–16; SD: 2.10606). With only 155 (96.9%) of the research respondent scoring greater than 8 out of 16, only 51.9% had scores over the mean, While the remaining ones performed below average. The respondents' average practice score was

14.9625 out of 25 (range: 7–23; standard deviation: 3.48562). A mean practice score over the was achieved by 53.1% of the respondents, while the other respondents had bad practice. 25 responders (15.6%) received a total practice score of less than 12 out of 24 (i.e. < 50%). (19)

Based on cross-sectional descriptive research done in Addis Abeba on five selected government hospitals, 69 (57%) of the nurses had good practice in preventing VAP, compared to 42.5% who had poor practice, and 54.5% had a positive attitude towards preventing VAP as opposed to 44.6% who had a negative attitude. In terms of knowledge, there was a notable variation between respondents with and without work experience at ICU (P 0.015), but not between respondents with the same educational background. In terms of attitude and practice, there was a notable difference between age and practice (P0.044) and work experience and attitude (P0.043), respectively. (20)

1.5 Conceptual Framework

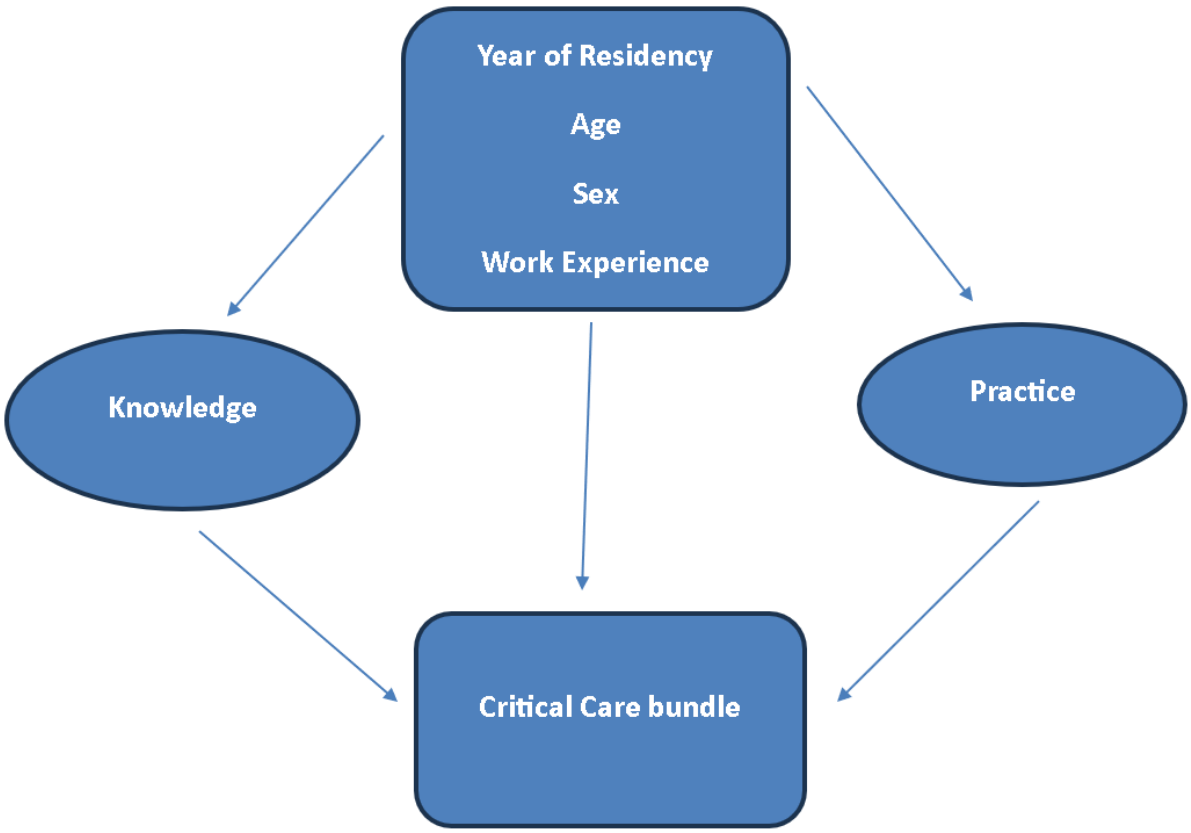

Figure: 1 Conceptual framework of knowledge & practice of Critical care bundles & its associated factors of ECCM residents at TASH ED, Addis Ababa Ethiopia, 2023. (3)

2. Objectives

2.1 General Objective

To assess the knowledge and practice of selected critical care bundle follow-up of residents at Tikur Anbessa Specialized Hospital Emergency Department 2023.

2.2 Specific Objectives

A: To assess the knowledge of selected critical care bundles of residents at Tikur Anbessa Specialized Hospital Emergency Department 2023.

B: To assess the practice of selected critical care bundles of residents at Tikur Anbessa Specialized Hospital Emergency Department 2023.

C: To assess the associated factors related to knowledge and practice of selected critical care bundles of residents at the TASH Emergency department 2023.

3. Methods and Materials

3.1 Study area and period

The study was carried out at TASH, one of Ethiopia's biggest referral hospitals, which is situated in Addis Ababa, the country's capital. The hospital is a tertiary teaching hospital affiliated with the College of Medicine and Health Science at Addis Ababa University. The hospital offers fellowship, graduate, and undergraduate training in many clinical medicine specialties. One of its specialty units is ECCM.

The research was done from August 1, 2023, to October 31, 2023.

3.2 Study design

An institutional-based cross-sectional study was conducted.

3.3 Source population

All residents who are working in the TASH Emergency department during the data collection period.

3.4 Study population

Emergency & critical care medicine residents who are working in the TASH Emergency department.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

ECCM residents who are working in the Emergency Department & who agreed to take part in this research were included.

3.5.2 Exclusion criteria

Non-ECCM resident who came for detachment & principal investigator

Residents who are not willing to participate in this study.

3.6 Sample Size Determination and Sampling Technique

3.6.1 Sample Size

This equation calculates the sample size.

$$n = \frac{Z_{\frac{\alpha}{2}}^{2} P (1 - P)}{d^{2}}$$

Where;

n =sample size for infinite population

Zα/2 = critical value for normal distribution at 95% confidence interval= 1.96 (α = 0.05).

P = Proportion =50%, d = margin of error= 5%

Because the populations under consideration are < 10,000, the above equation would be adjusted by the subsequent sample correction method;

NF =n/1+ (n/N)

NF = the ideal sample size for population < 10,000

n= the ideal sample size for population > 10,000 = 384

N = The population size estimate = 64

The sample size nf = 384/ {1+ (384/N)} = 55

10% was added for possible non-respondents = 6

Sample size = 61

3.6.2 Sampling Technique

All ECCM residents who work in the TASH Emergency Department were enrolled using the Census technique because there is no discernible difference between the study population and the computed sample size.

3.7 Variables

3.7.1 Dependent Variable

Knowledge

Practice

3.7.2 Independent Variables

Socio-demographic features: Age, Sex, Year of residency & Work experience

3.8 Data Collection Tools and Process

Utilizing an organized self-administered questionnaire and an observational checklist, the emergency department residents' knowledge and practice were evaluated.

Self-administered questionnaire data was collected by online Google form. Prior to the gathering of resident data, informed consent was obtained. From residents who refused to cooperate and grant their consent, no data were gathered.

Observational checklist data was collected by four pre-trained residents & the main investigator. Each bundle elements of critical care were assessed on the job over three months. ECCM residents have been assessed for the practice of critical care bundles while on their daily activities. Then, the completeness of the data was checked & entered into SPSS for analysis.

Both self-administered questionnaire and an observational checklist were adopted from previous published research. (3)

3.9 Data Quality Control

At every stage of the data gathering process, the lead investigator verified that the records were complete and that nothing was missing. The supervisor adopted the standard observational checklists guide for the assessment in order to guarantee the validity and correctness of the self-administered questionnaire; a pre-test was conducted to avoid confusion during the actual data collecting time. A week before the actual data collection, the lead investigator verified the resident's response. This let the investigator weed out questions that were too general and quickly change some of the question elements. Before analysis, additional data was verified during input into the computer, and any incomplete data was corrected.

3.10 Data Processing and Analysis

The study participants' collected data was coded, cleaned, and input into a computer. The analysis did not include any incomplete responses. For analytical and descriptive techniques like frequencies and proportions, the statistical package for social sciences (SPSS) version 26 was utilized. Bivariate analysis was used to evaluate the initial relationship between each independent variable and the dependent variable. Next, in order to compensate for confounders, those independent variables with a P-value less than 0.25 were moved to multivariate logistic regression. The model's fitness was assessed using the Hosmer-Lemeshow goodness-of-fit test, and a p-value of >0.05 was considered to be fit. A P-value of less than 0.05 was set as the threshold for a statistically significant correlation in the multivariate logistic regression. The presence and strength of the connection were ascertained by computing the adjusted odds ratio with 95% confidence interval.

3.11 Ethical Consideration

Ethical clearance was obtained from the Emergency Medicine Department research ethics committee. The pertinent bodies were made aware of the study's purpose. Furthermore, the researcher and research assistants upheld accountability and secrecy during the entire investigation. None of the respondents had to provide their identities or other forms of identification.

3.12 Operational Definitions

Knowledge: is defined as the subject's accurate degree of response to standardized questionnaires about ICU care bundles in infection control. Individuals were deemed competent if they answered a question correctly and received a score greater than 60%. (3)

Practice: describes what the participants have done in relation to the usage of critical care bundles for infection control. Individuals who scored above 60% and follow the recommended critical care bundle practices to avoid infection are said to have good practice. (3)

3.13 Dissemination and Utilization of The Result

After completion of the research, the findings were disseminated to Tikur Anbessa Specialized Hospital Department of Emergency Medicine & Critical Care. Hard copies will be submitted to the Tikur Anbessa Specialized Hospital provost office, the Addis Ababa health office, and federal ministry of Health.

4. Results

Out of the total 64 ECCM residents planned for the research, 61 of them engaged in the research with a response rate of 95.3%.

4.1 Socio-Demographic Characteristics

Of the 61 participant, 43 (70.5%) were men, and 46 (75.4%) had ages ranging from 25 to 30. Their mean age was 29.9 (SD± 2.58) years.

The mean of years of work experience was 3.27 (SD ± 1.68). Twenty-five (41%) of the total responses were second-year residents, 18 (29.5%) were third-year residents, and 18 (29.5%) were first-year residents.

Table 1: Socio-demographic features of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Variables		Frequency	Percent (%)
	Male	43	70.5%
Sex	Female	18	29.5%
	25-30 years	46	75.4%
Age	>30 years	15	24.6%
	PGY-1	18	29.5%
Year of Residency	PGY-2	25	41%
	PGY-3	18	29.5%
	<5 years	58	95.1%
Work of Experience	5-10 years	3	4.9%

4.2 Knowledge of Critical Care Bundle

Out of all respondents, the majority 37 (60.7%) mentioned 4 critical care bundles crucial for infection control and prevention.

4.2.1 Knowledge of VAP bundles

The majority of residents 42(68.9%) had knowledge about VAP bundle's crucial for infection control and prevention.

About the placement of patients who are intubated, 45 (73.8%) of participants were aware that a semi-recumbent position is advised unless it is contraindicated, and 53 (86.9%) of participants knew that head end elevation prevents ventilator associated pneumonia.

Only 32 (52.8%) of respondents were aware that a closed suction system and sterile procedure were suggested as standard.

Of the total respondents, only 22 (36.1%) were aware of the necessity of ventilator circuit adjustments for each new patient, and only 36 (59%) were aware of the significance of daily suction system changes.

Of the participants, 41 (67.2%) knew that chlorhexidine is advised as an oral decontaminant, and 33 (54.1%) said that oral care was advised for intubated patients at least once a day.

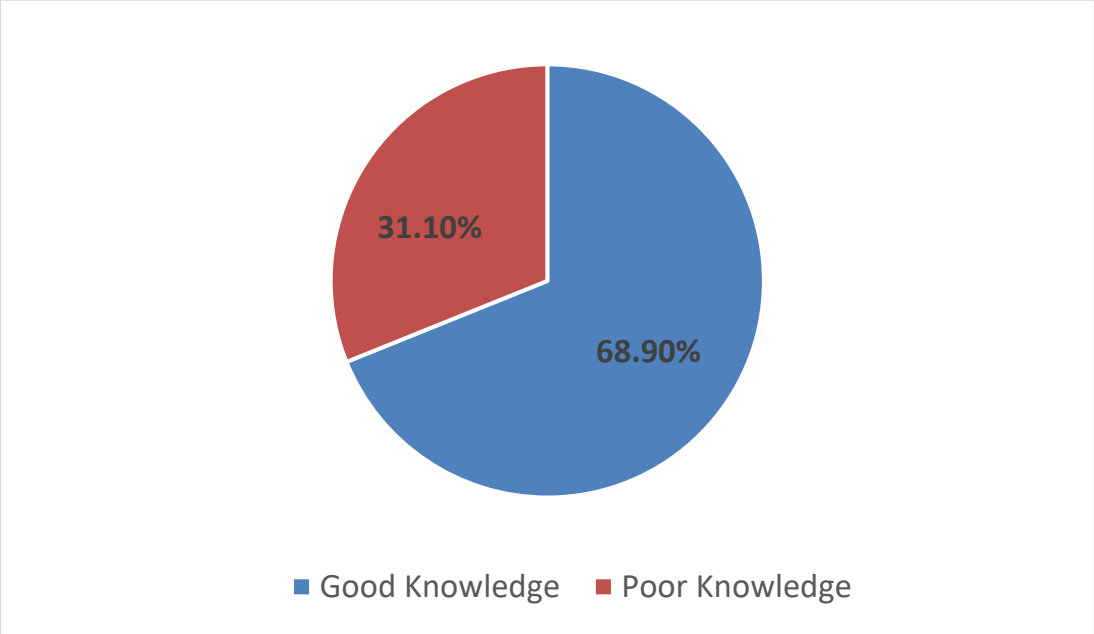

Figure 2: Knowledge of VAP bundle element among ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Table 2 Knowledge of VAP bundles of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023

Variables		Frequency	Percent (%)
Knowledgeable about elements incorporated into the VAP bundle	Yes	42	68.9%
	No	19	31.1%
Semi-recumbent positioning of patients	Yes	53	86.9%
	No	8	13.1%
The system recommended for suction is a closed suction system	Yes	32	52.4%
	No	29	47.6%
The endotracheal tube sectioning procedure is a sterile procedure	Yes	32	52.4%
	No	29	47.6%
Daily suction systems change	Yes	36	59%
	No	25	41%
The recommended ventilator circuit changes every new patient	Yes	22	36.1%
	No	39	63.9%
At least once daily oral care	Yes	33	54.1%
	No	28	45.9%
Use of Chlorhexidine as oral decontaminant	Yes	41	67.2%
	No	20	32.8%
Use of a swab moistened with Saline or water for oral care	Yes	18	29.5%
	No	43	70.5%

4.2.2 Knowledge of Sepsis bundles

Of the respondents, 53 (86.9%) were aware of the components that make up the sepsis bundle, and 61 (100%) indicated that antibiotics should be administered as soon as possible after the material is collected for culture and no later than one hour following the diagnosis of septic shock.

When it came to septic patient monitoring, 61 (100%), 30 (49.2%), 31 (50.8%), and 25 (41%) were knowledgeable that MAP ≥ 65, CVP ≥ 8, central venous saturation ≥ 70%, and all parameters were used to follow septic shock patients, respectively.

Table 3 Knowledge of Sepsis bundles of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Variable		Frequency	Percent %
Knowledgeable about elements incorporated into sepsis bundle	Yes	53	86.9%
	No	8	13.1%
Knowledgeable about activities to be completed within the first 1 h.	Yes	58	95.1%
	No	3	4.9%
Timing of antibiotics administration	After the specimen for culture	22	36.1%
	within 1 h of recognition of septic shock	39	63.9%
Targets used to monitor septic patients	MAP ≥ 65	61	100%
	CVP ≥ 8	30	49.2%
	Central venous saturation ≥ 70%	31	50.8%

4.2.3 Knowledge of Urinary catheter bundles

Of the total participants, 54 (88.5%) were aware of the components that make up the urinary catheter care bundle. Among the components that were highlighted were hand cleanliness, aseptic insertion, and insertion with indications.

Regarding bundles used for aseptic insertion of urinary catheter 51 (83.6%) of the respondents knew the use of sterile gloves, periurethral cleansing and lubricant jelly reduce CAUTI.

Of the responders, 55 (90.2%) knew when to insert a urinary catheter to prevent overuse.

Table 4 Knowledge of Urinary catheter bundles of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Variables		Frequency	Percent %
components of Urinary catheter care bundle	Yes	54	88.5%
	No	7	11.5%
Bundle used for aseptic insertion	Sterile gloves during insertion	60	98.4%
	Lubricant jelly for insertion	49	80.3%
	Sterile barrier (drape)	49	80.3%
	Cleaning periurethral area at least once daily	42	68.9%
Bundles used for maintenance of urinary catheter	Inflate the retention balloon with 15ml of water	41	67.2%
	Drainage bag below the level of the bladder not touch the floor	54	88.5%
Most mentioned Indications	Urinary retention	60	98.4%
	Incontinence	50	82%
	Bladder care	57	93.4%
	Therapeutic	48	78.7%
	Specimen collection	36	59%

4.2.4 Factors associated with knowledge of Critical care bundles

Among socio-demographic features and components of Critical care bundles on Binary logistic regression year of residency had a statistically significant association with knowledge of Critical care bundles components, while age, sex, and work experience had no significant association.

Using multivariate logistic regression, the study found that year 2 residents knew five times as much about VAP bundles as year 1 residents did (AOR=5.454, CI (1.265-23.513), P-value 0.023), and year 3 residents knew six times as much as year 1 residents (AOR= 6.93 CI (1.366-35.165), P value 0.019).

Table 5 Factors associated with knowledge of Critical care bundles of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Variables		**VAP bundles**					
Year of Residency		Knowledgeable	Not Knowledgeable	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
	PGY-1	8	10	1		1	
	PGY-2	20	5	5.0(1.295-19.30)	0.020*****	5.45(1.26-23.51)	**0.023****
	PGY-3	15	3	6.25(1.32-29.43)	0.020*****	6.93(1.36-35.16)	**0.019****
Work experience	<5 years	40	18	1		1	
	5-10 years	1	2	0.9(0.077-10.57)	0.933		
Age	25-30	33	13	1		1	
	>30	10	5	0.875(0.25-3.03)	0.833		
Sex	Male	31	12	1		1	
	Female	12	6	0.608(0.19-1.93)	0.400		
Variables		**Sepsis bundles**					
Year of Residency		Knowledgeable	Not Knowledgeable	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
	PGY-1	15	3	1			
	PGY-2	22	3	1.467(0.26-8.27)	0.664		
	PGY-3	17	1	3.4(0.319-36.27)	0.311		
Work experience	<5 years	52	6	1			
	5-10 years	2	1	4.33(0.34-55.21)	0.26		
Age	25-30	42	4	1			
	>30	12	3	2.62(0.51-13.37)	0.245		
Sex	Male	37	6	1			
	Female	17	1	0.363(0.04-3.25)	0.365		
Variables		**Urinary Catheter bundle**					
Year of Residency		Knowledgeable	Not Knowledgeable	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
	PGY-1	15	3	1			
	PGY-2	22	3	1.467(0.26-8.27)	0.664		
	PGY-3	17	1	3.4(0.319-36.27)	0.311		
Work experience	<5 years	52	6	1			
	5-10 years	2	1	0.23(0.018-2.94)	0.259		
Age	25-30	40	6	1			
	>30	14	1	2.10(0.23-19.00)	0.509		
Sex	Male	39	4	1			
	Female	15	3	0.513(0.102-2.5)	0.417		
***p-value<0.25; **p-value < 0.05**							

4.3 Practice of The Critical Care Bundles

Of the total responders, 36 (59%), 51 (83.6%), and 51(83.6%) were found to have good practice of components of VAP bundles, sepsis bundles and urinary catheter care bundles in their daily routines, respectively. Using checklists for observation, 61 persons were monitored.

4.3.1 VAP bundle practice

Only 22 (36%) of the participants in this study utilized alcohol or hand sanitizer for hand hygiene throughout their regular activities. Of these, 10 (16.4%) practiced both before and after patient interaction.

The minority of responders 16(26.2%) carried out daily oral care by rinsing mouth with a clean swab.

All participants were doing open suctions systems but in 22 (36%) procedures were aseptic.

Fifty-one (83.6%) and 49 (80.3%) participants, respectively, practiced daily sedation vacation and spontaneous breathing trial.

Table 6 Observational checklist used to evaluate practice of VAP bundles of ECCM residents at TASH Emergency Department, Addis Ababa, Ethiopia, 2023.

Critical Care bundles	Practice		Frequency	Percent (%)
VAP bundle	Hand hygiene	Washing with water	-	-
		Alcohol hand rub	22	36%
		Both	-	-
	Hand Washing or alcohol rub	Before patient contact	10	16.4%
		After patient contact	12	19.7%
		Before and After	10	16.4%
		Never	39	63.9%
	Oral care practice	Once daily	16	26.2%
		Daily rinse mouth with a clean swab	16	26.2%
		Daily oral care with chlorhexidine	-	-
		Daily oral care with H2O2	-	-
	SBT trial	Daily	49	80.3%
	Sedation vacations	Daily	51	83.6%
	Stress ulcer prophylaxis		50	82%
	DVT prophylaxis		50	82%
	Patient positioning	Supine position	11	18%
		Semi recumbent positioning	50	82%
		Prone positioning	-	-
	Suction systems for intubated patients	Open suction systems & use surgical glove	22	36%
		Closed suctions systems & clean glove	-	-
		Open suction systems & clean glove	39	64%
		Closed suctions systems & use surgical glove	-	-
	Frequency of change in suction systems	Daily changes	13	21.3%
		Every new patient	25	41%
	Frequency of the ventilator circuit changes	Every 48 hrs	-	-
		Every new patient	61	100%
		Every week	-	-

4.3.2 Sepsis bundles practice

The results of this research demonstrated that 52 (85.2%) of the participants give broad-spectrum antibiotics within one hour of the diagnosis of septic shocks.

Every participant uses MAP to follow patients with sepsis and septic shock and administers crystalloid up upon recognizing septic shocks. But just 23 (37.7%) of the participants had blood cultures taken prior to starting antibiotics, and none of them investigated lactate levels.

4.3.3 Urinary catheter care bundle practice

All participants were using sterile gloves & lubricant jelly for insertion. But 30 (49.1%) of participant positioned drainage bags below level of the bladder not touch the floor and 13 (21.3%) were exercising periurethral cleaning at least once daily. Merely 16.7% of responders regularly assess whether an indwelling urinary catheter is necessary.

Table 7 Observational checklist used to evaluate practice of sepsis bundles & Urinary catheter care bundle of ECCM residents at TASH ED, Addis Ababa, Ethiopia, 2023.

Critical Care bundles	Practice		Frequency	Percent (%)
Sepsis bundle	Measure lactate level		-	-
	Obtain blood culture before starting of antibiotics		23	37.7%
	Administer broad-spectrum antibiotics within 1 h of recognition		52	85.2%
	De-escalate antibiotic based on culture result		-	-
	Administer crystalloid for hypotension		61	100%
	Apply vasopressors for hypotension		61	100%
	Monitor MAP		61	100%
Urinary catheter bundles	Hand hygiene	Before each patient contact	17	27.8%
		After each patient contact	46	75.4%
	Use sterile gloves during insertion		61	100%
	Use lubricant jelly for insertion		61	100%
	Use of urinary catheters with indication		61	100%
	Inflate the retention balloon with 10 ml of water		61	100%
	Periurethral cleaning at least once daily		13	21.3%
	Drainage bag placed below the level of the bladder, not touch floor		30	49.1%
	Daily assessment of the presence and need for indwelling urinary catheters		46	75.4%

4.3.4 Factors associated with the practice of Critical care Bundles

Among socio-demographic features and components of Critical care bundles on Binary logistic regression Year of Residency had a statistically significant association with the practice of Critical care bundles while age, work experience, and gender had no significant association.

In multivariate logistic regression, the study showed that year 3 residents have higher practice than year 1 residents regarding VAP bundles (AOR=33.05 CI (4.416- 247.35), P value 0.001, also year 2 residents have higher practice than year 1 residents regarding VAP bundles (AOR=6.388, CI (1.361-29.994), P-value 0.019.

Table 8 Factors associated with practice of Critical care bundles of ECCM residents at TASH ED, Addis Ababa, Ethiopia, 2023.

Variables		**VAP bundles**					
		Good practice	Poor Practice	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
Year of Residency	PGY-1	5	13	1		1	
	PGY-2	15	10	3.90(1.057-14.388)	0.041*	6.38(1.36-29.994)	**0.019****
	PGY-3	16	2	20.8(3.453-125.29)	0.001*	33.05(4.41-247.3)	**0.001****
Work experience	<5 years	34	24	1		1	
	5-10 years	2	1	1.412(0.121-16.47)	0.783		
Age	25-30	27	19	1		1	
	>30	9	6	1.056(0.322-3.463)	0.929		
Sex	Male	24	19	1		1	
	Female	12	6	1.583(0.501-5.001)	0.434		
Variables		**Sepsis bundles**					
		Good practice	Poor Practice	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
Year of Residency	PGY-1	14	4	1			
	PGY-2	22	3	2.095(0.406-10.80)	0.377		
	PGY-3	15	3	1.429(0.27-7.549)	0.675		
Work experience	<5 years	49	9	1			
	5-10 years	2	1	0.367(0.03-4.491)	0.433		
Age	25-30	38	8	1			
	>30	13	2	1.368(0.257-7.288)	0.713		
Sex	Male	36	7	1			
	Female	15	3	0.972(0.221-4.273)	0.97		
Variables		**Urinary Catheter bundle**					
		Good practice	Poor Practice	COR, (95%CI)	P-value	AOR, (95%CI)	P-value
Year of Residency	PGY-1	15	3	1			
	PGY-2	23	2	2.30(0.343-15.436)	0.391		
	PGY-3	13	5	0.52(0.104-2.608)	0.427		
Work experience	<5 years	49	9	1			
	5-10 years	2	1	0.367(0.03-4.491)	0.433		
Age	25-30	38	8	1			
	>30	13	2	1.368(0.257-7.288)	0.713		
Sex	Male	37	6	1			
	Female	14	4	0.568(0.139-2.317)	0.430		
***p-value<0.25; **p-value < 0.05**							

5. Discussion

According to the study's findings, 42 participants (68.9%) were knowledgeable with the VAP bundle, 53 participants (86.9%) with the sepsis bundle, and 54 participants (88.5%) with the urinary catheter care bundle. However, it was noted that 36 (59%), 51 (83.6%), and 51 (83.6%) had good daily practice with the components of the VAP bundle, sepsis bundle, and urinary catheter care bundle, respectively.

The only factor that was shown to have a statistically significant association with critical care bundle knowledge and practice ($P<0.05$) was the year of residency.

The knowledge of VAP bundles was found to be higher in the current study than in the study conducted in the TASH ICU of Addis Ababa which shows 52.5% VAP bundle knowledge, 68.3% sepsis bundle knowledge & 78.2% urinary catheter care bundle knowledge. The difference may be due to study unit variability i.e. both nurses & physicians were involved in the Addis Ababa study. (3)

Regarding critical care bundle practice the study showed 59% VAP bundle practice, 83.6% sepsis & urinary catheter care bundle practices which were greater than that of a study carried out in TASH ICU showed 49.5% VAP bundle, 63.4% sepsis bundle & 67.3% urinary catheter care bundle practices, but Only 36% used alcohol/sanitizer for hand hygiene on their daily activity & 26% performed daily oral care in our study, whereas a study in TASH ICU showed 86.7% used alcohol/sanitizer for hand hygiene when they were on their daily activity & 72.2% performed daily oral care. The reason may be because of the easy accessibility of alcohol/sanitizer for hand hygiene at Addis Ababa TASH ICU. (3)

Regarding the practice of sepsis bundle the study showed 85.2% participants were administering broad spectrum antibiotics within one hour of detection of septic shocks, 100% of responders give crystalloid up on detection of septic shocks & 37.7% of participants were obtained blood culture before administration of antibiotics which was greater than that of a study carried out in Addis Ababa showed 77.8%, 77.8% & 14.4% of participant administering broad spectrum antibiotics within 1 hour, administer crystalloid up on recognition of septic shocks & obtained blood culture before administration of antibiotics respectively. (3)

The study revealed 68.9% knowledge and 59% practice of the VAP bundle, compared to 56.7% knowledge and 71.7% practice of the VAP bundle in India. (16)

The study found that, in contrast to the 51.9% knowledge and 53.1% practice of the VAP bundle in the Addis Ababa TASH ICU, there was 68.9% knowledge and 59% practice of the VAP bundle. This may be because they used different scoring methods. (19)

The study discovered that there was 68.9% knowledge and 59% practice of the VAP bundle, as opposed to 59.5% knowledge and 57% practice of the VAP bundle in five government hospitals of Addis Ababa that were examined. This may be because the study units have different educational levels. (20)

Concerning the VAP bundle, the study's results were superior, demonstrating 68.9% knowledge and 59% practice, compared to the findings of a study carried out in Western India, which reported 45% knowledge and 40.7% practice of the VAP bundle. The reason may be because the Indian data include both resident doctors & staff nurses & they used different scoring methods. (12)

Regarding the sepsis bundle the study revealed 86.9% knowledge & 83.6% practice as opposed to research done in Egypt on critical care nurses which showed 68% unsatisfactory knowledge & 100% unsatisfactory practice. This may be because the study units have different educational levels. (21)

The study discovered that there was 86.9% knowledge of sepsis bundle as opposed to a multicenter survey done on physicians showed suboptimal (59%) knowledge of sepsis bundle. (22)

The study found that 88.5% of participants knew about the use of urinary catheter bundles in preventing CAUTI, whereas 69.1% of participants in a Malaysian study had the same knowledge. (23)

The results of the study showed that 88.5% of participants were knowledgeable about the use of urinary catheter bundles to prevent CAUTI, compared to 57% of participants in an Indian study. This may be because the study unit has different educational levels & different scoring methods.(24)

6. Strength and Limitation of The Study

6.1 Strength

- ✓ All illegible subjects have been included in the study and has got 95.3% response rate.
- ✓ Structured questionnaires and an observational checklist adopted from a previous study were used to gather the data.

6.2 Limitation

- ✓ The study is limited to Emergency & critical care medicine residents working in the TASH Emergency Department
- ✓ The assessment of knowledge & practice for Central line care bundles dropped since the procedure is not regularly practiced in the TASH Emergency Department.
- ✓ Small sample size.
- ✓ Single-centered study
- ✓ Lack of adequate literature

7. Conclusion and Recommendation

7.1 Conclusion

Most ECCM residents had a good knowledge of critical care bundles and were practicing them. However, the practice of daily oral care, sterile suction system, placement of urinary drainage, Periurethral cleaning & blood culture before antibiotics administration were suboptimal.

Year of residency had statistically significant association with knowledge of Critical care bundles & practice of Critical care bundles($P<0.05$). while Age, Sex, and Work experience were found to have no statistically significant association.

7.2 Recommendation

All ECCM residents should incorporate the components of an evidence-based practice bundle. Critical care bundle training in the beginning of residency& continuous monitoring of adherence using a protocolized approach should be implemented.

Infection prevention practice was found to be low, so the institution should have the necessary infection prevention equipment and monitoring systems.

The practice of sending blood culture before antibiotic administration should be advocated.

A similar study is recommended to include a large sample size in other hospitals, & research on factors affecting the implementation of Critical care bundles.

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9.Annexes

9.1 Annexes 1 Consent Form

I am Dr. Abraham working as a data collector in the research of Assessment of Knowledge & practice of selected critical care bundles among residents working in TASH Emergency Department, Ethiopia, 2023 and the study undertaking is for a partial fulfillment of specialization in Emergency & Critical care Medicine which is fully supported and coordinated by the Department of Emergency Medicine & Critical care, and the designate principal investigator is Dr. Abraham Tamirat. The ethical clearance was obtained from Emergency Medicine department ethical committee.

The objective of this questionnaire is to collect data on Knowledge & practice of critical care bundles among residents working in the TASH Emergency Department and in this questionnaire names of individuals in the institution was not written and you have the right to permit or refuse for interview. However, your openness to this interview will enable us to better understand the critical care bundle knowledge and practice of the residents working in the TASH ED, which will enable us to create effective plans of action and address the issue going forward. Your genuine and active participation in the study's success would be much appreciated.

I have consented to engage in the research because I am aware of its benefits and the responsibilities, I will play in it.

A. Yes

B. No If the respondent agrees

Signature: …… Date: ……

Name of Data collector…… Sign: ……

Name of supervisor: ……...Sign: ……

Principal investigator's contact information: Phone no: - 0916784587

E-mail: abratam@gmail.com

9.2 Annexes Questionnaire

Part I: Socio-demographic characteristics of the respondent

1.1. Gender

A. Male B. Female

1.2. Age _____ in year

1.3. Year of Residency:

A. EMCC PGY 1
B. EMCC PGY 2
C. EMCC PGY 3

1.4. Work Experience …….

Part II- <u>Knowledge</u> of Critical care bundles important in the prevention of infection

2.1. Choose Critical care bundles crucial for preventing and reducing infection (>1 response is possible)

A. Ventilator-associated pneumonia (VAP) bundle
B. Central line bundle
C. Sepsis bundle
D. Urinary catheter bundle

2.2.VAP bundle ((>1 response is possible)

2.2.1. What are components included in the VAP bundle?

A. Elevation of the head of the bed at 30-40 degree
B. Daily oral care
C. Daily SBT trial
D. Stress ulcer prophylaxis,
E. DVT prophylaxis
F. Daily sedation vacations
G. Frequent of ETT suctioning and ventilator circuit change

2.2.2. Recommended type of positioning for ventilated Patient (If there is no C/I)

A. Supine positioning is recommended with the head of the bed elevated
B. Semi-recumbent positioning is recommended
C. Prone position
D. The position of the patient does not influence the risk for VAP
E. I do not know.

2.2.3. Recommended type of suction systems for intubated patients & the procedure?

A. Open suction systems and sterile procedure
B. Closed suctions systems and clean procedure
C. Open suction systems and clean procedure
D. Closed suctions systems and sterile procedure
E. Both systems
F. I do not know

2.2.4. Recommended frequency of change in suction systems

A. Daily changes are recommended (or when clinically indicated)
B. Weekly changes are recommended (or when clinically indicated)
C. It is to change systems for every new patient (or when clinically indicated)
D. I do not know

2.2.5. Recommended Frequency of Ventilator Circuit Changes

A. Every 48 hours (or when clinically indicated)
B. Every week (or when clinically indicated)
C. Every new patient (or when clinically indicated)
D. I do not know

2.2.6. Which of the following Oral decontaminants is preferable?

A. Povidone-iodine
B. Chlorhexidine
C. Daily rinse mouth with a clean swab

2.2.7. Frequency of oral care

A. Once daily
B. At least once per shift
C. Following suctioning
D. I don‘t know

2.3. Sepsis bundle (>1 response is possible)

2.3.1. What are components included into the Sepsis bundle?

A. Serial measurement lactate
B. Obtain blood culture
C. Administer broad-spectrum antibiotics
D. Administer crystalloid for hypotension
E. Apply vasopressors

2.3.2. Which of the following activities were completed within the first 1 hour?

A. Measure lactate level
B. Obtain blood culture
C. Administer broad-spectrum antibiotics
D. Administer crystalloid for hypotension

2.3.3. Timing of antibiotics administration:

A. After collecting specimens for blood culture
B. Within 1 h of recognition of septic shock
C. Any time

2.3.4. Which of the following is correct regarding targets of sepsis bundles?

A. Target mean arterial pressure (MAP) >/= 65 mmHg
B. Target central venous pressure (CVP) >/= 8 mmHg
C. Target central venous oxygen saturation >/= 70 %

2.4. Urinary catheter care bundle (>1 response is possible)

2.4.1. What are components included into urinary catheter bundle

A. Hand hygiene
B. Avoiding the unnecessary use of urinary catheters,
C. Aseptic insertion and maintenance
D. Consider early removal

2.4.2. Which of the following used for aseptic insertion & maintenance of urinary catheter

A. Use sterile gloves
B. Single-use packet of lubricant jelly for insertion
C. Sterile barrier (drape)
D. Antiseptic for periurethral cleaning least once daily
E. Inflate the retention ballon with 15ml of water
F. Drainage bag below level of the bladder not touch floor

2.4.3. What are indications of urinary catheter insertion to avoid unnecessary use?

A. Urinary retention
B. Urinary incontinence
C. Loss of consciousness (Bladder care)
D. Therapeutic
E. Specimen collection

Part III- <u>Practice</u> of Critical care bundles important in prevention of infection

3.1.VAP bundle (>1 response is possible)

3.1.1. Which components of VAP bundle you practicing in your daily activity?

A. Elevation of the head of the bed at 30-40 degree
B. Daily oral care
C. Daily SBT trial
D. Stress ulcer prophylaxis and DVT prophylaxis
F. Daily sedation vacations
G. Frequent of ETT suctioning and ventilator circuit change

3.1.2. Which type of positioning you practiced for ventilated Patient in your setup? A. Supine positioning with head of the bed elevated

B. Semi recumbent positioning

C. Prone positioning

3.1.3. Which type of suctioning systems used in intubated patients?

A. Open suction systems and use surgical glove
B. Closed suctions systems and clean glove
C. Open suction systems and clean glove
D. Closed suctions systems and use surgical glove

3.1.4. How frequent you change suction systems

A. Daily changes are recommended (or when clinically indicated)
B. Weekly changes are recommended (or when clinically indicated)
C. It is to change systems for every new patient (or when clinically indicated)

3.1.5. How frequent you change ventilator circuit?

A. Every 48 hours (or when clinically indicated)
B. Every week (or when clinically indicated)
C. Every new patient (or when clinically indicated)

3.1.6. Which of the following Oral decontaminant is used in your setup?

A. Povidone–iodine
B. Chlorhexidine
C. Daily Rinse mouth with a clean swab

3.1.7. How frequent you give oral care for your patient?

A. Once daily
B. At least once per shift
C. Following suctioning

3.2. Sepsis bundle (>1 response is possible)

3.2.1. Which components of Sepsis bundle you apply in your daily activity?

A. Serial measurement lactate
B. Administer broad spectrum antibiotics
C. Administer crystalloid for hypotension
D. Obtain blood culture
E. Apply vasopressors

3.2.2. At what time you initiate antibiotics for septic patient?

A. After collecting specimen for blood culture

B. Within 1 h of recognition of septic shock C. Any time

3.2.3. Which of the following parameters used to monitor septic patients?

A. Mean arterial pressure (MAP)

B. Central venous pressure, CVP C. Central venous oxygen saturation

3.3. Urinary catheter care bundle (>1 response is possible)

3.3.1. Which of the urinary catheter bundle you apply in while inserting urinary catheter?

A. Hand hygiene

B. Avoiding the unnecessary use of urinary catheters,

C. Aseptic insertion and maintenance

3.3.2. When do you wash your hand

A. Before each patient contact B. After each patient contact

C. Before and after each patient contact D. Not at all

3.3.3. Which of the following is/are applied for insertion and maintenance of urinary catheter?

A. Use sterile gloves during insertion

B. Use of lubricant jelly for insertion

C. Use of sterile barrier (drape)

D. Cleaning periurethral area least once daily

E. Inflate the retention ballon with 15ml of water

F. Drainage bag below level of the bladder not touch floor

3.3.4. To whom you insert urinary catheter in your hospital?

A. Those with urinary retention D. Those with Urinary incontinence

B. For bladder care E. For therapeutic

C. For specimen collection

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Part III: Observational check list: Assessment of Knowledge & practice of critical care bundles in infection control among residents at TASH Emergency department.

Profession: A. Resident PGY1 B. Resident PGY 2 C. Resident PGY 3 Age Sex

ICU Bundles	Practices		Yes	No	Remark
Ventilator associated pneumonia bundles	Hand hygiene	Washing with water			
		Use of alcohol hand rub			
	Washing or alcohol rub	Before patient contact			
		After patient contact			
	Oral care practice	Daily rinse mouth with a clean swab			
		Daily oral care with chlorhexidine			
		At least once per shift			
	SBT trial	Daily			
		Every other day			
	Daily Sedation vacations				
	Stress ulcer prophylaxis				
	DVT prophylaxis				
	Patient positioning	Semi recumbent positioning			
		Supine positioning			
	Suction systems for intubated patients	Open suction systems and sterile procedure			
		Closed suctions systems and sterile procedure			
	Frequency of change in suction systems	Daily changes			
		Weekly changes			
		Every new patient			
	Frequency of ventilator circuit changes	Every week			
		Every 48 hrs			
		Every new patient			
		When available			

Sepsis bundle	Measure lactate level	Within 1hr			
		Not measured			
	Obtain blood culture before administration of antibiotics				
	Administer broad spectrum antibiotics within 1 h of recognition				
	De-escalate of antibiotic based on culture result				
	Administer crystalloid for hypotension or lactate >/= 4 mmol/l)				
	Apply vasopressors for hypotension				
	Monitor MAP, CVP or SaO2 of sepsis patient				
Urinary catheter bundles	Hand hygiene	Before each patient contact			
		After each patient contact			
		Specify:			
	Use sterile gloves during insertion				
	Use lubricant jelly for insertion				
	Use of urinary catheters with indication				
	Inflate the retention balloon with 15ml of water				
	Periurethral cleaning at least once daily				
	Drainage bag placed below level of the bladder not touch floor				
	Daily assessment of the presence and need for indwelling urinary catheters				
	Regularly empty urinary drainage bags as separate procedures, each into a clean container.				

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Thank you for participation!!