The Effects of Surgical Tracheostomy Delays on Intensive Care Unit Patients in King Abdullah Medical City

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Abstract

Background-Tracheostomy is a surgical procedure that offers several benefits for patients in the intensive care unit (ICU), such as preventing damage to the mouth and larynx, reducing airway resistance, lowering the risk of ventilator-associated pneumonia (VAP), enhancing patient comfort, reducing the need for sedatives, and improving mobility and the ability to eat orally. The timing of tracheostomy in severely ill patients on mechanical ventilation (MV) is a subject of debate. Delays in performing tracheostomy can result in significant hospital costs and may negatively affect patient outcomes. While clinical conditions primarily influence these delays, administrative and interdisciplinary factors may also contribute.

Aim-To evaluate the impact of delaying surgical tracheostomy on ICU patients, particularly when bedside percutaneous tracheostomy is contentious, and to determine the benefits of early tracheostomy in improving patient outcomes and resource utilization in the ICU.

Methods-This retrospective study analyzed data from 48 ICU patients to evaluate various factors affecting the timing and outcomes of tracheostomy.

Results-Among the 48 ICU patients studied, 39.7% were aged 53-58 years, and gender distribution was equal. The APACHE II score indicated that 27.1% had a severity of illness score of 19, while the SOFA score showed that 52.1% had a score of seven for organ failure progression. There was an equal distribution of patients with and

without prior ventilation. Regarding the type of tracheostomy, 52.1% were percutaneous, with the remainder being surgical. Primary diagnoses included 27.1% with post-cardiac arrest and 4.2% with acute respiratory failure. Primary medical conditions necessitating ICU admission were 14.6% with hypertension and 8.3% with COPD. Among secondary comorbid conditions, 12.5% had heart failure and 6.3% had obesity. The data also revealed that 12.5% of patients were on mechanical ventilation for 19 days before tracheostomy, aligning with the typical period of 14-21 days for critically ill patients.

Conclusion-This research investigated the impact of delayed surgical tracheostomy on ICU patient outcomes, including length of stay, mortality, and complications. Despite study limitations, strong correlations were found, highlighting the importance of timely tracheostomy in critically ill patients. These findings and

Keywords- Surgical Tracheostomy, Intensive Care Unit

Introduction

Those who are unable to maintain the level of ventilation required to sustain gas exchange can benefit from mechanical ventilation (MV). It is recommended for a wide range of conditions, including respiratory distress syndrome, physiologic changes that cause the lung parenchyma to deteriorate, medical and/or surgical procedures, such as post-anesthesia recovery, and numerous other situations, such as head trauma or drug overdose that causes ventilatory failure (Khammas & Dawood, 2018).

Tracheostomy is a much of the time carried out surgery in sick patients, that is to say, patients confessed to the emergency unit and requiring delayed mechanical ventilation or aviation route security because of unconsciousness, asphyxia, respiratory solid loss of motion, and hypoxia. Compared to endotracheal intubation, tracheotomy has already been shown to have advantages such as a shorter stay in the intensive care unit or hospital, lower airway resistance, improved pulmonary hygiene , fewer lung infections, protection against direct laryngeal injury, facilitated nursing care, improved patient comfort, and advantages for oral feeding that are associated with the administration of smaller amounts of sedative. However, bleeding, wound infection, tracheal stenosis, and occasionally death is among the tracheotomy risks (Deng et al., 2021).

A tracheostomy is typically recommended for critically ill patients in the intensive care unit who require prolonged mechanical ventilation to facilitate the weaning process from the ventilator. It has many good effects, like better pulmonary mechanics, fewer nociceptive stimuli from the larynx or trachea, fewer sedatives and analgesics needed, easier oral hygiene and nutrition, and better communication. However, there may be some risks associated with its surgical approach (Khammas & Dawood, 2018).

A crucial question regarding the clinical outcomes is the timing of tracheotomy in critically ill patients receiving mechanical ventilation. When the duration of mechanical ventilation exceeds 14 days, a tracheotomy should be performed. The patient should also be endotracheally intubated within ten days, and if mechanical ventilation is expected to last longer than 21 days, a tracheotomy should be performed. However, it is still unknown when critically ill patients who are receiving mechanical ventilation should have their tracheotomy performed (Deng et al., 2021).

The effects of early versus late tracheotomy on critically ill patients receiving mechanical ventilation were the subject of several systematic reviews and meta-analyses. One of them indicates that critically ill patients do not benefit from an earlier tracheotomy. Early tracheotomy was found to be associated with a shorter stay in the intensive care unit, shorter duration of mechanical ventilation, and lower risk of mortality in two meta-analyses. However, early tracheotomy had no effect on hospital-acquired pneumonia, and the only improved outcome was short-term mortality in another meta-analysis (Meng et al., 2016).

In a recent multicenter cohort study, an independent association between increased in-hospital mortality and delayed tracheostomy (> 7 days after ICU admission) was found. Moreover, whether deferred tracheostomy would delay the term of MV (Tanaka et al., 2022).

Significance of the study

Delays of tracheostomy might result in substantial expenses for the hospital and may also have a negative impact on patient outcomes. While the

majority of delays are associated with the patient's clinical state, administrative and interdisciplinary variables may also be involved. To validate the effect of postponing surgical tracheostomy among ICU patients whose bedside percutaneous tracheostomy is disputed, more prospective study is required. Patients who have an early tracheostomy, particularly those who are intubated for fewer than 14 days, have higher survival chances. It may result in better patient outcomes and the use of fewer intensive care unit resources (Sindi, 2022).

Literature review

In order to make long-term airway care easier, tracheostomy is commonly required for severely sick ICU patients receiving extended mechanical ventilation (MV). This idea is still the same, but whether it should be used is still up for discussion and requires further research because it mostly relies on the doctor's judgment on whether a patient will require extended MV 18 rather than evidence-based treatment. The precise definition of early and late tracheostomy timing is a matter of disagreement among the authors of the research referenced in the literature, since they have conducted experiments with varying designs (Khammas & Dawood, 2018).

Types of Tracheostomies

Tracheostomy is frequently indicated in ICU patients either for long-term airway access or prolonged mechanical ventilation.

1-Percutaneous tracheostomy is a common procedure that is typically carried out by the ICU team. However, there are contraindications to performing this procedure at the bedside, and when these conditions are present, surgical tracheostomy is the approach that is most often chosen.

2-Surgical tracheostomy is routinely performed by the head and neck (H&N) team or by the ear, nose and throat (ENT) team in the operating theatre. This dependency on other teams outside of ICU is a factor that could lead to delays in discharge. Moreover, operating theatre booking is another critical factor (Mehta & Mehta, 2017).

Indications of Tracheostomy

One may categorize tracheostomy indications into two groups: elective tracheostomies and emergent tracheostomies.

Emergent tracheostomy indications include of:

1. Acute upper airway blockage (foreign body, angioedema, infection, allergy, etc.) with unsuccessful endotracheal intubation
2. Post-cricothyrotomy (if a cricothyrotomy has been performed, and an airway has been established, it should be promptly formalized into a tracheostomy).
3. Perforating injuries to the larynx

4-fracture of LeFort III (Alidad et al., 2019).

Acute airway obstruction, such as Ludwig's angina, aspiration of a foreign body into the upper airway, or penetrating trauma to the airway that is not amenable to endotracheal intubation, is the most common reason for emergency tracheostomy. When severe facial or cervical trauma occurs, an emergency tracheostomy may also be required, particularly in pan-facial fractures where nasal intubation is not an option due to craniofacial dislocation. With the exception of penetrating laryngeal trauma and LeFort III fractures, less invasive airway management strategies can be attempted prior to awake emergent tracheostomy in most cases. However, all instruments must be prepared and readily available prior to any airway manipulation (Alidad et al., 2019).

The impact of delayed tracheostomy on critically ill patients

In the past examinations, deferred tracheostomy was related with longer medical clinic and ICU stays, span of MV and sedation, which is predictable with ends from past examinations. The majority of patients in this multi-ethnic ICU were diagnosed with neurogenic injury (66.1%) or trauma (16.3%). When compared to other diagnoses, tracheostomy-dependent critically ill patients had a higher prevalence of neurogenic injury. Attending physicians would opt for a tracheostomy because they appear to have stable vital signs but are difficult to decannulate during treatment. Contrasting and blended populace, scientists tracked down comparable outcomes in patients with neurogenic injury, injury, and stomach related messes in a sub-populace examination in the wake of defining patients as per their fundamental finding. Be that as it may, for patients in a trance like state and cardiovascular, respiratory, and neuromuscular sicknesses, not all between bunch correlations showed tremendous contrasts (Zhao et al., 2024).

Hospitals face both logistical and financial challenges because of prolonged stays in intensive

care units (ICUs). Patients who require a longer stay in the intensive care unit (ICU) are more likely to require prolonged ventilation, which increases the likelihood of ventilator-associated pneumonia, acute respiratory distress syndrome, atelectasis, sepsis, and pulmonary oedema. When the length of stay is extended, even patients who do not require ventilation have higher mortality rates (Reardon et al., 2018).

Complications after tracheostomy

Intraoperative complication

-Bleeding is the most common intraoperative problem.

-The anterior jugular veins can usually be retracted laterally anatomically; however, there may be aberrant or bridging anterior jugular veins that need to be ligated.

-A last usable intricacy is that of pneumothorax or pneumomediastinum (Raimonde et al., 2023)**.**

Early Complications

-Infections that require antibiotics after a tracheostomy are extremely uncommon.

-Acute tracheostomy tube obstruction, which can be brought on by blood or mucus, is more likely to occur in the immediate postoperative period.

Late Complications

Pressure necrosis caused by over-inflating the tracheostomy tube's cuff is one of the most dreaded late complications. Due to advancements in low-pressure cuffs and awareness of cuff pressure as a risk factor, these are less common than in the past. To avoid this, the tracheostomy cuff pressure should be measured on a regular basis, ideally at a maximum of 20 cm H2O. Ischemia can cause the wall of the trachea to become necrotic as a result of high pressure there. Ensuing recuperating brings about filtering and stenosis (Raimonde et al., 2023).

Methodology

Introduction

The main objective of this research is to investigate the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of ICU stay, mortality, and complications.

Research design

The presents study has incorporated a quantitative cross-sectional design to investigate the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of ICU stay, mortality, and complications. With the incorporation of a quantitative cross-sectional design, the present study complies with the Retrospective Study as it aims to gather data and analyze the variables.

Statistical methods

Descriptive statistic

Data Collection

Data was collected through Intensive Care Unit Patients where the sample of the study consisted of (48) patients and the data were as the following

1. **Age**: To analyze the distribution of age among patients and its potential effect on outcomes.
2. **Gender**: To determine if gender differences affect outcomes related to tracheostomy delays.
3. **Primary Diagnosis**: To identify the primary medical condition requiring ICU admission and its influence on the timing and outcomes of tracheostomy.
4. **Comorbidity 1**: To evaluate the first major comorbid condition and its impact on patient outcomes.
5. **Comorbidity 2**: To assess the second major comorbid condition and its relationship with tracheostomy timing and outcomes.
6. **APACHE II Score**: To gauge the severity of illness and predict ICU outcomes, particularly in relation to tracheostomy timing.
7. **SOFA Score**: To monitor organ failure progression and its effect on the need for and timing of tracheostomy.
8. **History of Ventilation**: To understand the patient's ventilation history prior to tracheostomy.
9. **Duration of Ventilation (days)**: To measure how long patients were on mechanical ventilation before tracheostomy and analyze its impact on outcomes.
10. **Indication for Tracheostomy**: To document the reasons for tracheostomy and correlate them with timing and outcomes.
11. **Type of Tracheostomy**: To distinguish between surgical and percutaneous

tracheostomies and their respective outcomes.

12. **Length of ICU Stay AFTER Tracheostomy**: To determine how tracheostomy timing affects the length of ICU stay post-procedure.
13. **ICU Mortality**: To measure mortality rates and correlate them with tracheostomy timing.
14. **Tracheostomy Complications**: To record complications arising from tracheostomy and see if delays contribute to higher complication rates.
15. **Hospital Length of Stay:** To determine the length of stay the patient in the hospital.

Statistical Methods:

After the scanning process, questionnaires which are eligible to be included in the analysis and using a numerical coding system will be uploaded to the Statistical Package for Social Sciences (SPSS), version 23. Appropriate descriptive and analytical statistical techniques will be used to analyze the data and draw conclusions.

Results & Discussion:

This section will provide a detailed description of the data analysis and research findings. Also, it will convey all the study's findings and analysis using tables, text, and figures, emphasizing the most significant information.

Study personal information of the sample

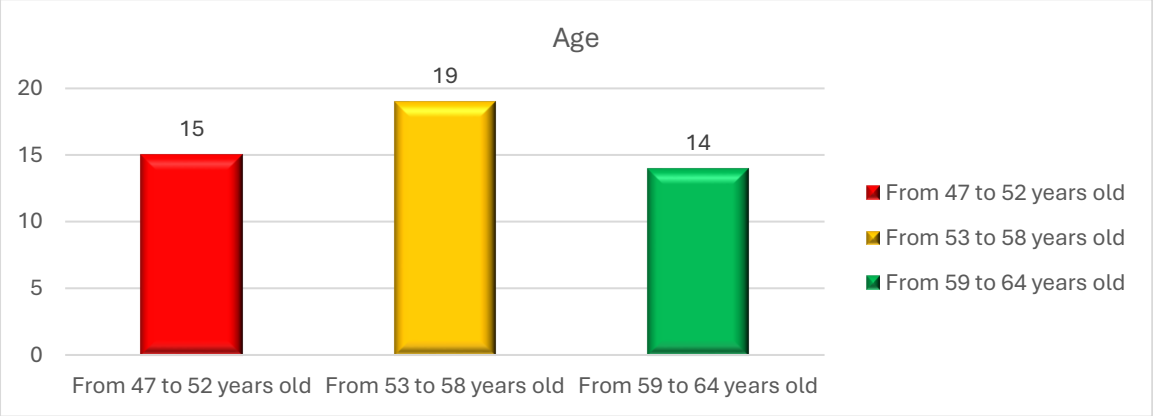
To study personal information Frequencies, and percentages was used as the following:

1-Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	48	47	64	55.00	5.235

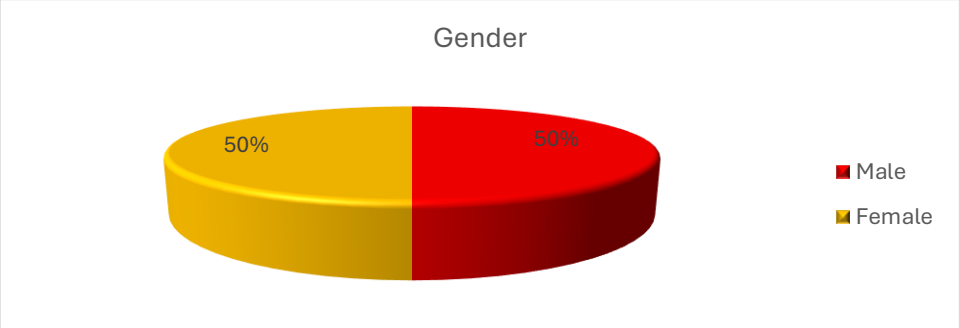
From the table we conclude that the age of sample study are ranged between 47 and 64 years old, mean of ages (55) years old and standard deviation (5.235) and the ages were as the following

we conclude that (39.7%) of patients their ages are from 53 to 58 years old, (31.3%) of patients their ages are from 47 to 52 years old, and (29 %) of patients their ages are from 59 to 64 years old



2-Gender

we conclude that (50%) of the patients are Males, and (50%) of the patients are Females.



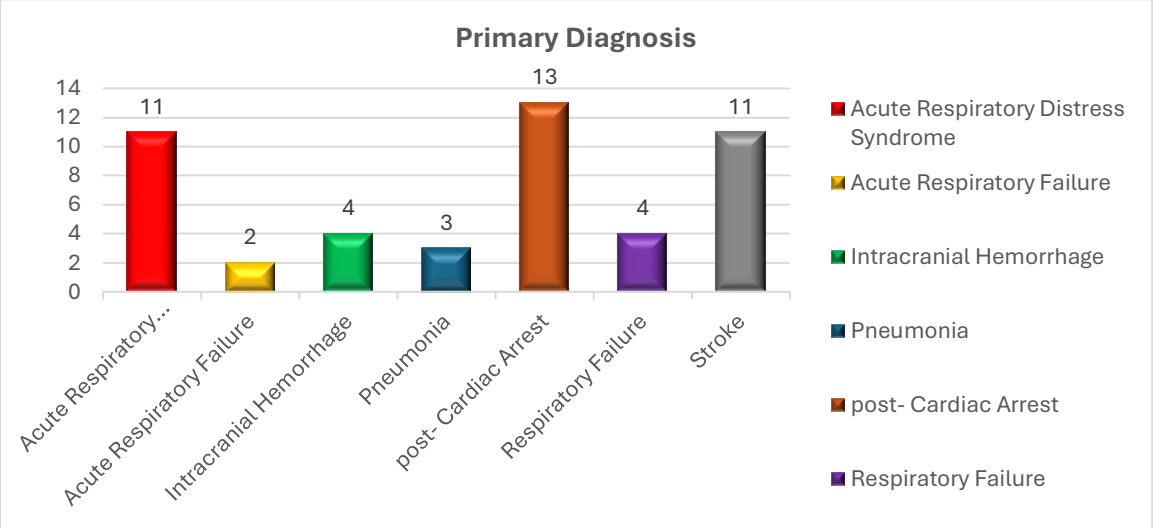
Answering the variables of the study

To study the variables of the study frequency and percentage were calculated to the items as the following

1- Primary Diagnosis

Primary Diagnosis	Frequency	Percent
Acute Respiratory Distress Syndrome	11	22.9
Acute Respiratory Failure	2	4.2
Intracranial Hemorrhage	4	8.3
Pneumonia	3	6.3
post- Cardiac Arrest	13	27.1
Respiratory Failure	4	8.3
Stroke	11	22.9
Total	**48**	**100.0**

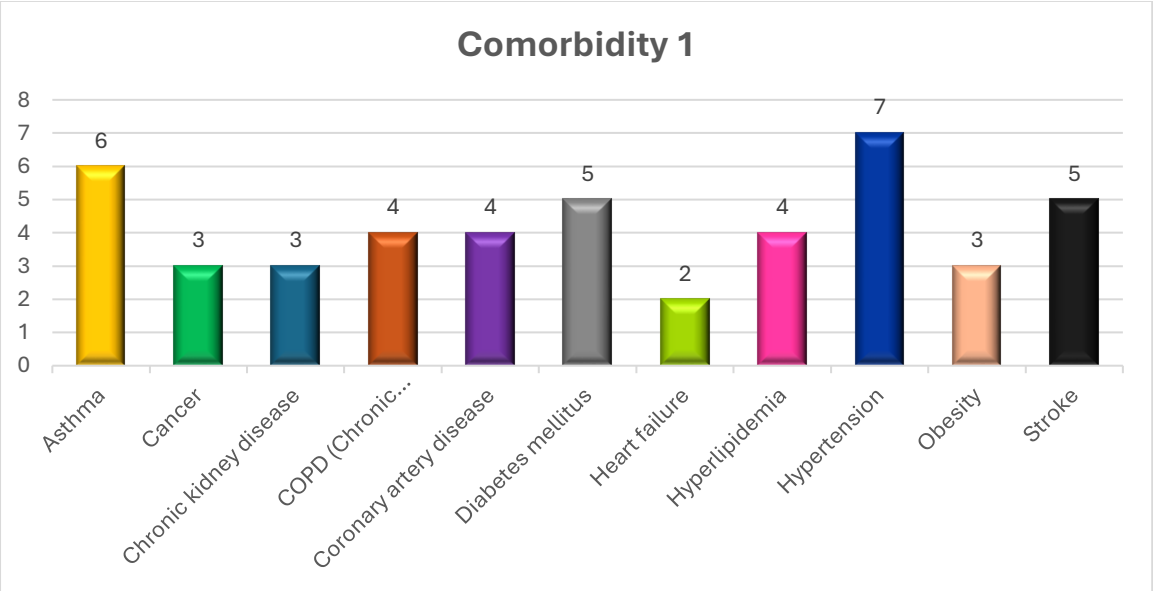
From the above table we conclude that (27.1 %) of the patients the Primary Diagnosis for them is post- Cardiac Arrest, (22.9 %) of the patients the Primary Diagnosis for them is acute respiratory distress syndrome, (22.9 %) of the patients the Primary Diagnosis for them is Stroke, (8.3%) of the patients the Primary Diagnosis for them is Intracranial Hemorrhage,(8.3%) of the patients the Primary Diagnosis for them is respiratory Failure ,(6.3%) of the patients the Primary Diagnosis for them is Pneumonia, and (4.2%) of the patients the Primary Diagnosis for them is Acute Respiratory Failure.



2- Comorbidity 1

Comorbidity 1	Frequency	Percent
(COPD)	2	4.2
Asthma	6	12.5
Cancer	3	6.3
Chronic kidney disease	3	6.3
COPD (Chronic Obstructive Pulmonary Disease)	4	8.3
Coronary artery disease	4	8.3
Diabetes mellitus	5	10.4
Heart failure	2	4.2
Hyperlipidemia	4	8.3
Hypertension	7	14.6
Obesity	3	6.3
Stroke	5	10.4
Total	48	100.0

From the above table we conclude that (14.6 %) of the patients the primary medical condition requiring ICU admission is Hypertension, (12.5 %) of the patients the primary medical condition requiring ICU admission is Asthma, (10.4 %) of the patients the primary medical condition requiring ICU admission is Stroke, (10.4 %) of the patients the primary medical condition requiring ICU admission is Diabetes mellitus ,(8.3%) of the patients the primary medical condition requiring ICU admission is Hyperlipidemia ,(8.3%) of the patients the primary medical condition requiring ICU admission is Coronary artery disease, and (8.3%) of the patients the primary medical condition requiring ICU admission is COPD (Chronic Obstructive Pulmonary Disease)



3- Comorbidity 2

Comorbidity 2	Frequency	Percent
Asthma	4	8.3
Cancer	4	8.3
Chronic kidney disease	5	10.4
COPD (Chronic Obstructive Pulmonary Disease)	4	8.3
Coronary artery disease	4	8.3

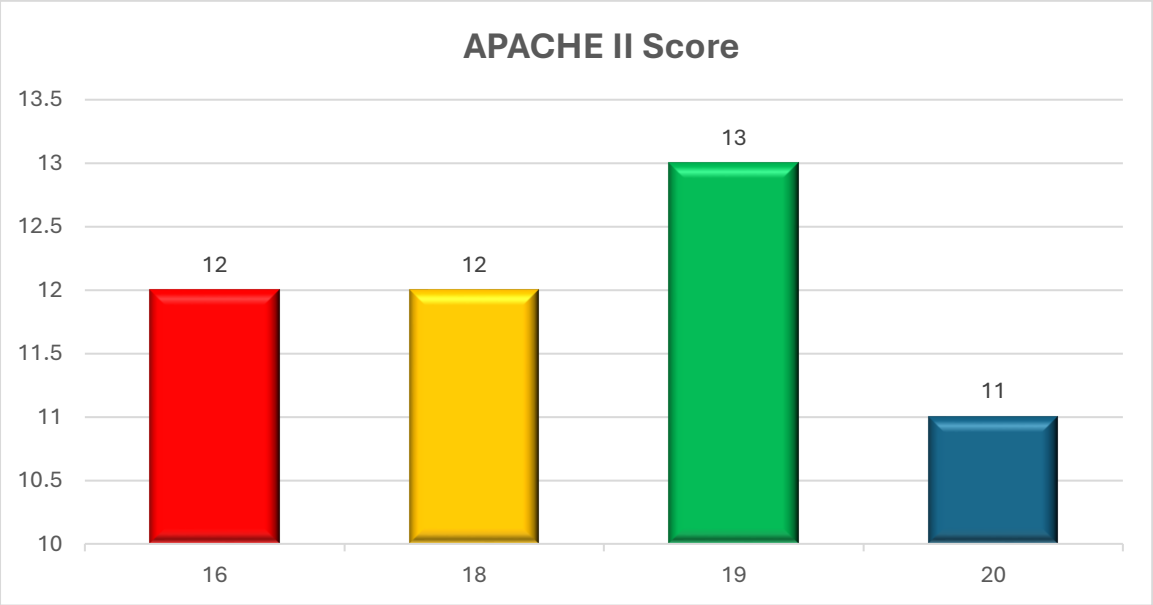
Diabetes mellitus	5	10.4
Heart failure	6	12.5
Hyperlipidemia	4	8.3
Hypertension	4	8.3
Obesity	3	6.3
Stroke	5	10.4
Total	**48**	**100.0**

From the above table we conclude that (12.5 %) of the patients the second major comorbid condition for them is Heart failure, (10.4 %) of the patients the second major comorbid condition for them is chronic kidney disease, (10.4 %) of the patients the second major comorbid condition for them is Diabetes mellitus, (10.4 %) of the patients the second major comorbid condition for them is Stroke, (8.3 %) of the patients the second major comorbid condition for them is Asthma, (8.3 %) of the patients the second major comorbid condition for them is Cancer, (8.3 %) of the patients the second major comorbid condition for them is COPD (Chronic Obstructive Pulmonary Disease), (8.3 %) of the patients the second major comorbid condition for them is Coronary artery disease, (8.3 %) of the patients the second major comorbid condition for them is Hyperlipidemia, (8.3 %) of the patients the second major comorbid condition for them is Hypertension, and (6.3 %) of the patients the second major comorbid condition for them is Obesity

4- APACHE II Score

APACHE II Score	Frequency	Percent
16.00	12	25.0
18.00	12	25.0
19.00	13	27.1
20.00	11	22.9
Total	**48**	**100.0**

From the above table we conclude that (27.1 %) of the patients the severity of illness to them is 19, (25 %) of the patients the severity of illness to them is 16, (25 %) of the patients the severity of illness to them is 18, (22.9 %) of the patients the severity of illness to them is 20



5- SOFA Score

SOFA Score	Frequency	Percent
6.00	12	25.0
7.00	25	52.1
8.00	11	22.9
Total	**48**	**100.0**

From the above table we conclude that (52.1 %) of the patients the monitor organ failure progression to them is 7.00, (25 %) of the patients the monitor organ failure progression to them is 6.00, and (22.9 %) of the patients the monitor organ failure progression to them is 8.00

6- History of Ventilation

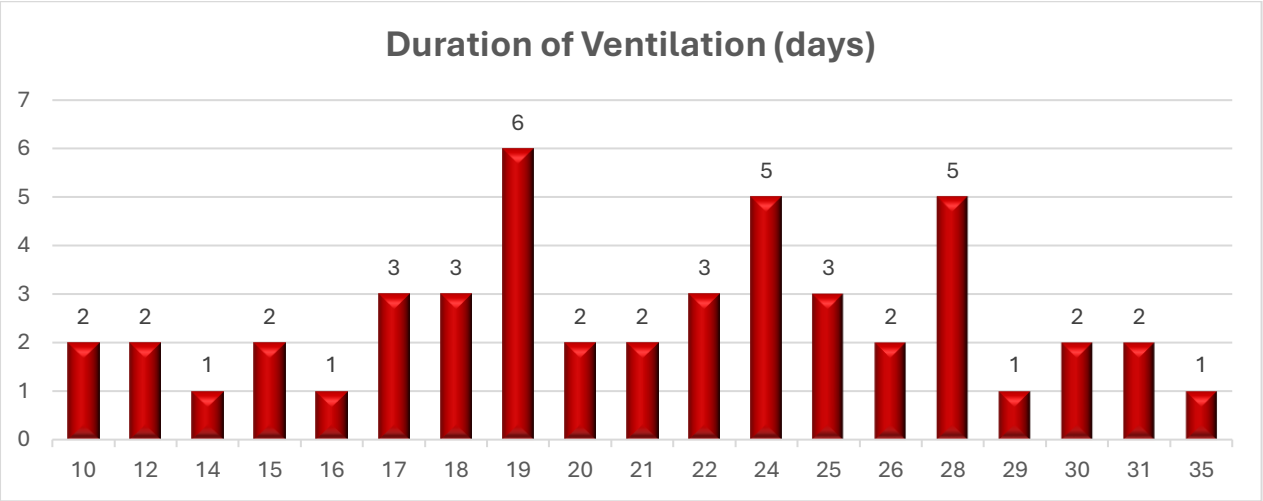
History of Ventilation	Frequency	Percent
Yes	24	50.0
No	24	50.0
Total	**48**	**100.0**

From the above table we conclude that (50 %) of the patients have ventilation history prior to tracheostomy, and (50 %) of the patients haven't ventilation history prior to tracheostomy

7- Duration of Ventilation (days)

Duration of Ventilation (days)	Frequency	Percent
10.00	2	4.2
12.00	2	4.2
14.00	1	2.1
15.00	2	4.2
16.00	1	2.1
17.00	3	6.3
18.00	3	6.3
19.00	6	12.5
20.00	2	4.2
21.00	2	4.2
22.00	3	6.3
24.00	5	10.4
25.00	3	6.3
26.00	2	4.2
28.00	5	10.4
29.00	1	2.1
30.00	2	4.2
31.00	2	4.2
35.00	1	2.1
Total	**48**	**100.0**

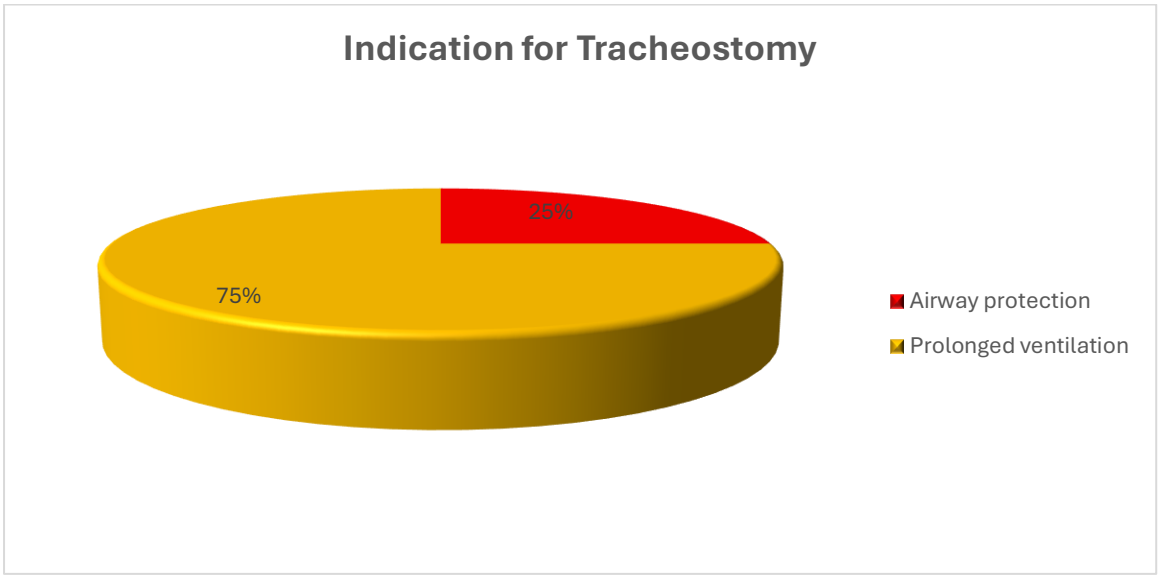
From the above table we conclude the period that (12.5%) of patients were on mechanical ventilation before tracheostomy is 19 days, the period that (12.5%) of patients were on mechanical ventilation before tracheostomy is 19 days, the period that (10.4%) of patients were on mechanical ventilation before tracheostomy is 28 days, the period that (10.4%) of patients were on mechanical ventilation before tracheostomy is 24 days , (6.3%) of patients were on mechanical ventilation before tracheostomy is 17 days, (6.3%) of patients were on mechanical ventilation before tracheostomy is 18 days, (6.3%) of patients were on mechanical ventilation before tracheostomy is 22 days, and (6.3%) of patients were on mechanical ventilation before tracheostomy is 25 days.



8- Indication for Tracheostomy

Indication for Tracheostomy	Frequency	Percent
Airway protection	12	25.0
Prolonged ventilation	36	75.0
Total	**48**	**100.0**

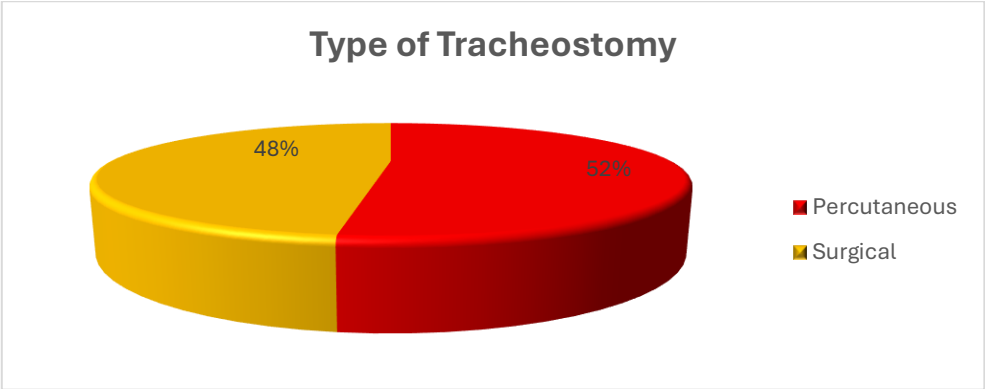
From the above table we conclude that (75 %) of the patients the reason for tracheostomy for them is Prolonged ventilation, and (25 %) of the patients the reason for tracheostomy for them is Airway protection



9- Type of Tracheostomy

Type of Tracheostomy	Frequency	Percent
Percutaneous	25	52.1
Surgical	23	47.9
Total	**48**	**100.0**

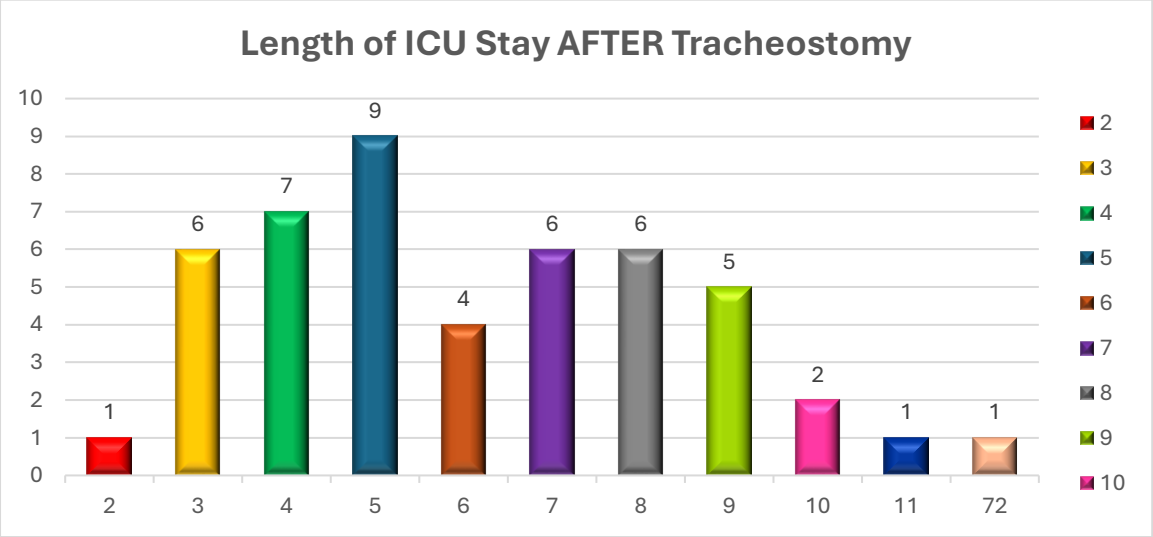
From the above table we conclude that (52.1 %) of the patients the tracheostomies to them were by Percutaneous, and (47.9 %) of the patients the tracheostomies to them were by Surgical.



10- Length of ICU Stay AFTER Tracheostomy

Length of ICU Stay AFTER Tracheostomy	Frequency	Percent
2.00	1	2.1
3.00	6	12.5
4.00	7	14.6
5.00	9	18.8
6.00	4	8.3
7.00	6	12.5
8.00	6	12.5
9.00	5	10.4
10.00	2	4.2
11.00	1	2.1
72.00	1	2.1
Total	**48**	**100.0**

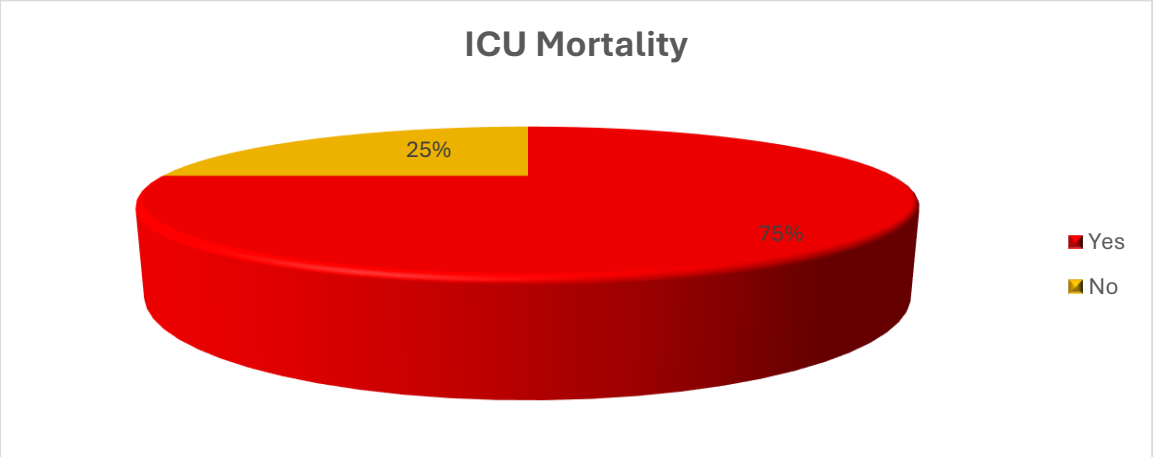
From the above table we conclude that (18.8 %) of the patients their length of ICU stay post-procedure tracheostomy is 5 days, (14.6 %) of the patients their length of ICU stay post-procedure tracheostomy is 4 days, (12.5 %) of the patients their length of ICU stay post-procedure tracheostomy is 3 days, (12.5 %) of the patients their length of ICU stay post-procedure tracheostomy is 7 days, (12.5 %) of the patients their length of ICU stay post-procedure tracheostomy is 8 days, and (10.4 %) of the patients their length of ICU stay post-procedure tracheostomy is 9 days



11- ICU Mortality

ICU Mortality	Frequency	Percent
Yes	36	75.0
No	12	25.0
Total	**48**	**100.0**

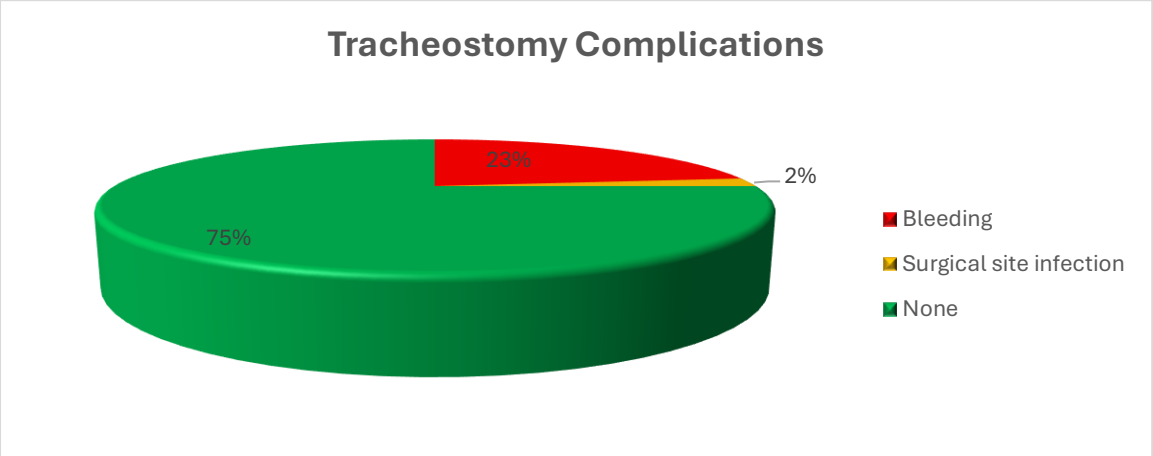
From the above table we conclude that (75 %) of the patients were ICU Mortality, and (25 %) of the patients weren't ICU Mortality.



12- Tracheostomy Complications

Tracheostomy Complications	Frequency	Percent
Bleeding	11	22.9
Surgical site infection	1	2.1
None	36	75.0
Total	**48**	**100.0**

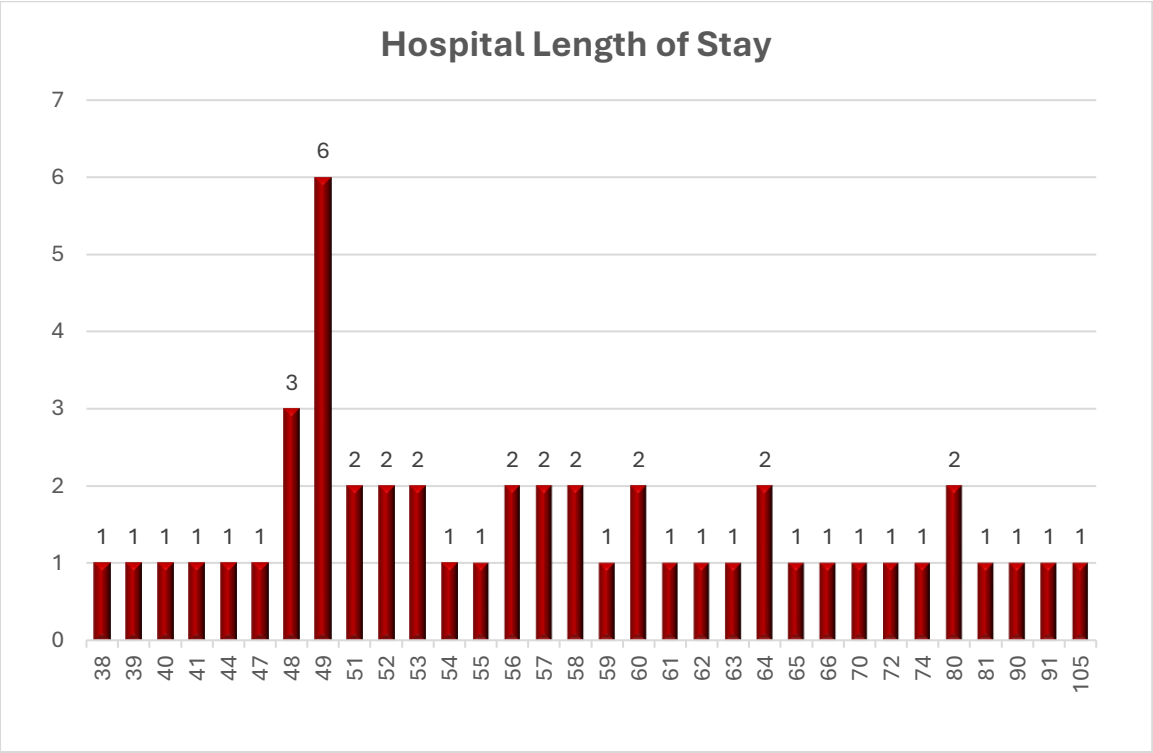
From the above table we conclude that (22.9 %) of the patients the Tracheostomy Complications for them is Bleeding, (2.1 %) of the patients the Tracheostomy Complications for them is Surgical site infection, and (75 %) of the patients haven't Tracheostomy Complications.



13- Hospital Length of Stay

Hospital Length of Stay	Frequency	Percent
38.00	1	2.1
39.00	1	2.1
40.00	1	2.1
41.00	1	2.1
44.00	1	2.1
47.00	1	2.1
48.00	3	6.3
49.00	6	12.5
51.00	2	4.2
52.00	2	4.2
53.00	2	4.2
54.00	1	2.1
55.00	1	2.1
56.00	2	4.2
57.00	2	4.2
58.00	2	4.2
59.00	1	2.1
60.00	2	4.2
61.00	1	2.1
62.00	1	2.1
63.00	1	2.1
64.00	2	4.2
65.00	1	2.1
66.00	1	2.1
70.00	1	2.1
72.00	1	2.1
74.00	1	2.1
80.00	2	4.2
81.00	1	2.1
90.00	1	2.1
91.00	1	2.1
105.00	1	2.1
Total	**48**	**100.0**

From the above table we conclude that (12.5 %) of the patients stayed 49 days in the hospital, (6.3 %) of the patients stayed 48 days in the hospital, (4.2 %) of the patients stayed 51 days in the hospital, (4.2 %) of the patients stayed 52 days in the hospital, (4.2 %) of the patients stayed 53 days in the hospital, (4.2 %) of the patients stayed 56 days in the hospital, (4.2 %) of the patients stayed 57 days in the hospital, (4.2 %) of the patients stayed 58 days in the hospital, (4.2 %) of the patients stayed 60 days in the hospital, (4.2 %) of the patients stayed 64 days in the hospital, and(4.2 %) of the patients stayed 80 days in the hospital.



Discussion

This study's main objective is to investigate the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of ICU stay, mortality, and complications which was significant and conducted by scanning process, questionnaires which are eligible to be included in the analysis and using a numerical coding system will be uploaded to the Statistical Package for Social Sciences (SPSS), version 23.

Appropriate descriptive and analytical statistical techniques will be used to analyze the data and draw conclusions. The present study complies with the Retrospective Study as it aims to gather data and analyze the variables. Data was collected through incorporation of a quantitative cross-sectional design in Intensive Care Unit Patients where the sample of the study consisted of (48) patients and the data were as the following:

Personal information, containing 2 parts.

Other variables of the study consisting of 110 items, grouped under 13 domains: Primary diagnosis 7 items, Comorbidity (1) 12 items, Comorbidity (2) 11 items, APACHE II Score 4 items, SOFA Score 3 items, History of Ventilation 2 items, Duration of Ventilation (days) 19 items, Indication for Tracheostomy 2 items, Type of Tracheostomy 2 items, Length of ICU Stay AFTER Tracheostomy 11 items, ICU Mortality 2 items, Tracheostomy Complications 3 items, Hospital Length of Stay 32 items.

Overall, the study results regarding the age, conclude that (39.7%) of patients their ages are from 53 to 58 years old, and the gender was equal. Regarding APACHE II Score (27.1 %) of the patients the severity of illness to them is 19, and SOFA Score (52.1 %) of the patients the monitor organ failure progression to them is 7.00. The patients have ventilation history prior to tracheostomy ate equal the patients don't have. (52.1 %) of the patients the tracheostomies to them were by Percutaneous, the others were by Surgical.

Relating to primary diagnosis, results show that (27.1 %) of the patients the primary diagnosis for them is post- Cardiac Arrest, and (4.2%) of the patients the primary diagnosis for them is Acute Respiratory Failure. The high percentage of post-Cardiac Arrest could be due to edema or other anatomical changes that make prolonged intubation difficult or risky. So, tracheostomy can provide a more stable and accessible airway for long-term management.

According to data, (14.6 %) of the patients the primary medical condition requiring ICU admission is Hypertension, and (8.3%) of the patients the

primary medical condition requiring ICU admission is COPD (Chronic Obstructive Pulmonary Disease). Hypertension alone is generally not a common primary indication for tracheostomy, it can play a significant role as a comorbid factor. For example: Uncontrolled hypertension increases the risk of stroke, which can result in neurological impairment and the need for tracheostomy to secure the airway and facilitate ventilation.
(12.5 %) of the patients the second major comorbid condition for them is Heart failure, and (6.3 %) of the patients the second major comorbid condition for them is Obesity. Obese patients often have anatomical changes, such as a short neck and increased soft tissue in the upper airway, which can make intubation and ventilation more difficult. The critical care team must carefully evaluate the risks and benefits of tracheostomy in obese patients, taking into account the patient's overall clinical status.
From the data we conclude the period that (12.5%) of patients were on mechanical ventilation before tracheostomy is 19 days. This correlate with that the typical period of mechanical ventilation before performing a tracheostomy in critically ill patients is generally around 14-21 days. Before performing a tracheostomy, the clinical team often aims to optimize the patient's overall medical status, ensuring they are stable enough to undergo the procedure.

Also, we found that (75 %) of the patients the reason for tracheostomy for them is Prolonged ventilation, and only (25 %) of the patients the reason for tracheostomy for them is Airway protection. The higher proportion of patients (75%) requiring tracheostomy for prolonged ventilation suggests that the underlying medical conditions in this patient population were primarily driving the need for long-term mechanical ventilation support. In contrast, only a quarter of the patients (25%) needed the tracheostomy specifically for airway protection purposes.

When it comes to length of ICU stay after tracheostomy, (18.8 %) of the patients their length of ICU stay post-procedure tracheostomy is 5 days, and (10.4 %) of the patients their length of ICU stay post-procedure tracheostomy is 9 days. Patients who undergo tracheostomy later during their ICU admission tend to have a longer overall ICU length of stay compared to those who receive a timely tracheostomy. The delay in tracheostomy can lead to extended mechanical ventilation requirements, which in turn can contribute to the prolonged ICU stay. The results show that (75 %) of the patients were ICU Mortality. Delayed tracheostomy has been linked to higher mortality rates in some studies, particularly in critically ill patients with respiratory failure or neurological impairment.
Regarding the tracheostomy complications (22.9 %) of the patients complicated with Bleeding, (2.1 %) of the patients complicated with Surgical site infection, the others have no complications. These results highlight the need for vigilant monitoring, early recognition, and prompt management of these complications to optimize patient outcomes. The results related to hospital length of stay showed that (12.5 %) of the patients stayed 49 days in the hospital, and (4.2 %) of the patients stayed 80 days in the hospital. Strategies to prevent and manage tracheostomy-related complications, as well as to facilitate timely weaning and rehabilitation, may help reduce the length of hospital stay in this patient population.
Finally, there is strong correlations between delayed surgical tracheostomy and patient outcomes in the ICU, including length of ICU stay, mortality, and complications. So, Timely tracheostomy, when indicated, can potentially improve patient outcomes by facilitating weaning from mechanical ventilation, reducing the risk of complications, and enabling earlier mobilization and rehabilitation, ultimately contributing to a shorter ICU stay and better overall outcomes.

Previous research on this topic was conducted mainly across a variety of countries, with different sample sizes and selection as well as various questionnaire selections. However, just like our findings, many of them found a significant association between delayed surgical tracheostomy and length of ICU stay, mortality, and complications as in:
(Khammas & Dawood, 2018) who found that early tracheostomy had a notable benefit in shortening the duration of the mechanical ventilation (MV), lessening the sedation time and minimizing the risks of weaning failure, but it had no significant impact on both the overall duration of ICU stay, namely through Timing of Tracheostomy in Intensive Care Unit Patients.

(Herritt et al., 2018) investigated a study about early vs. late tracheostomy in intensive care settings: Impact on ICU and hospital costs. Researchers found that This study shows that early tracheostomy can significantly reduce direct variable and likely total hospital costs in the intensive care unit based on length of stay alone. This is in addition to the already shown benefits of early tracheostomy in terms of ventilator dependent days, reduced length of stays, decreased pain, and improved communication.

(Lee et al., 2016) showed a study about Effect of early vs. late tracheostomy on clinical outcomes in critically ill pediatric patients, concluded that Tracheostomy performed within 14 days after the initiation of MV was associated with reduced duration of MV and length of ICU and hospital stay. Although there was no effect on mortality rate, children may benefit from early tracheostomy without severe complications.

(Sindi, 2022) confirmed that although most delays related to the clinical condition of the patient, administrative and multidisciplinary factors also play a role. Early tracheostomy (less than 14 days) from intubation increases the survival rates of patients and improves their clinical outcomes. Further prospective evaluation is needed to confirm the impact of delay in performing surgical tracheostomy among ICU patients whose bedside percutaneous tracheostomy is contraindicated. It was in a study named the impact of tracheostomy delay in intensive care unit patients: a two-year retrospective cohort study.

(Altman et al., 2020) found in a study named Tracheotomy Timing and Outcomes in the Critically Ill: Complexity and Opportunities for Progress that Early tracheotomy in ICU patients is associated with earlier ICU discharge, decreased length of overall hospital stay, and lower mortality when controlling for case mix index. Opportunities exist to optimize patient outcomes and O/E performance.

Our study has key strengths of ability to assess associations, help identify potential relationships and identify factors that may influence patient outcomes. It has comprehensive data collection can enable a thorough analysis of the impact of delayed tracheostomy on multiple important outcomes. It makes identification of potential risk factors, can inform clinical decision-making and guide the development of targeted interventions to improve patient care.

However, there are some limitations to our study. First, the study was conducted in one hospital which indicates that the results cannot be generalized to the rest of the population. Second, cross-sectional studies can only demonstrate associations between variables, and cannot definitively establish a causal relationship between delayed tracheostomy and patient outcomes. Third, the study's quality depends on the completeness and accuracy of the data collected from the ICU setting, which may be subject to limitations in documentation or data capture.

Future studies should consider longitudinal study designs to be able to detect changes over time, furthermore, future researchers should consider more large-scale studies including several hospitals to be able to generalize future results.

Conclusion

This research paper has investigated the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of ICU stay, mortality, and complications in the Intensive Care Unit and has found strong correlations between delayed surgical tracheostomy and patient outcomes. Despite the limitations of our study design and data of collection, our study shed light on the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of stay, mortality, and complications. The findings from such a study can contribute to the understanding of the importance of timely tracheostomy intervention in critically ill patients.

Recommendations

Our research finding proved the impact of delayed surgical tracheostomy on patient outcomes in the ICU, including length of ICU stay, mortality, and complications. Therefore, it’s recommended that the optimal timing for tracheostomy is very important, and the decision to perform tracheostomy should be made on a case-by-case basis, taking into account the patient's clinical status, underlying conditions, and the potential benefits and risks of the procedure.

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