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"Effect of Clinical Pathway Implementation on Sequential Organ Failure Assessment Score and (Pain, Inspiration, and Cough) Score for Chest Trauma Patients"

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Abstract
Background: Clinical Pathways aim to advance the quality, co-ordination, and continuousness of care for the patient with chest trauma across changed areas. **Aim:** The study aimed to evaluate effect of implementing of the clinical pathway on chest trauma patients out comes. **Design:** A quasi-experimental research design applied in this study. **Subject:** Contained 60 adult patients with chest trauma, similarly, divided into study and control group. **Setting**: The study conducted at the trauma intensive care unit at Assiut University Hospital. **Tools:** Four tools were used: **Tool 1:** Chest trauma assessment sheet, **Tool 2:** Patient's clinical pathway variances checklist, **Tool 3:** (pain, inspiration, and cough) score scale and **Tool 4**: Chest trauma patients' outcomes assessment sheet. **Result:** the current study findings showed that regards sequential organ failure assessment score. with more patients in the study group have low score of mortality rate (96.7 %), and a larger section of patients in the control group moderate score of mortality rate (40.0%)**.** So that, differences in this Score between groups were statistically significant. Also, PIC score between control and study group were statistically significant difference. **Conclusions:** Implementation of clinical pathway impact positively on patients' outcomes. That reflected by high positive correlation among study and control group related to prolonged duration of intensive care unit stay and duration of mechanical ventilation. **Recommendation:** Further research is needed to confirm these findings across multiple centers and patient populations. Continuous training for healthcare providers involved in chest trauma care are essential for consistent adherence to the pathway.

Keywords: Chest Trauma Patient, Clinical Pathway, Patient Outcomes, PIC Score & SOFA Score.

Introduction
Chest trauma grades tertiary after extremities and head injury in main accident, motor vehicle accidents are the communal reason of injury. The chest wall is hurt utmost. Several of injuries are of modest sternness and infrequently necessitate invasive interference. **(Gidion, et al., 2021)**. Chest injuries variety from comparatively minor to mortal flail chest or massive faults. Significant chest injury is existing in about one 3rd of patients admit afterward severe trauma. In organization, the main areas to be well-thought-out are, pneumothorax, exposed wounds, pain control, pulmonary contusion, and flail chest. **(Chegini, et al., 2021)**
Pulmonary aspiration remainders weighty risk to the ICU patient, and death rate stay elevated. A vital to enhancement is preventing. If aspirating happens however, initial recognizing plus violent treatment will yield the greatest outcomes. Fast intubating, remove particulate matter, ventilation, institution of antibiotics, prevention of atelectasis, and nutritious support are ideals for care. **(Ashford et al., 2021)**
Clinical pathway is a group of evidence-based practices targeting specific clinical problems aimed at improving the quality of patient care when used together. the tools necessary to standardize care across patient populations thereby improving health outcomes, introduces an evidence-based protocol for a specific clinical problem resulting in an increase inpatient care efficiency and effectiveness, increased communication, documentation and more effective use of hospital resources resulting in fewer medical complications which decreases patients Extent of stay and overall hospital cost. **(Andres et al., 2017),**
The usage of Clinical Pathways in Patient with chest trauma is the second most unintentional injury associated with significant morbidity and mortality. Rib fractures are indicators of severe bodily injury and can be a sign of underlying organ injury. **(Abo El-Ella, et al., 2018)** Common pulmonary complications of thoracic injury can include pulmonary effusion, acute respiratory distress syndrome (ARDS), aspiration, pneumonia, and atelectasis or lobar collapse. Uncontrolled pain, poor inspiratory effort, and inadequate cough can contribute to pulmonary complications if treatment is not optimized early. **(Kim & Moore 2020)**.
Some studies indicate early, aggressive intervention with multidisciplinary clinical pathways, chest physiotherapy, and appropriate analgesia contribute to

an overall decrease in complications and healthcare costs. **(Altawalbeh et al., 2019) (Kaier et al., 2019).** The use of inpatient clinical pathways allows the care team to identify complications early, decrease Intensive Care Unit readmissions, and decrease length of staying in hospital. Clinical pathways provide a critical link between the best available evidence, clinical practice, and quality of care. **(Siddique, et al., (2021).**

The PIC Score highlights repeated assessment of pain, incentive spirometry, and cough capability. It is a simple, cost-effective instrument for guiding the care for patients with chest wall injuries. The primary goal is to use the PIC Score to reduce unnecessary ICU admissions for patients with chest wall injuries. Additional results included days spent on an intensive care unit ventilator, duration of stay, hospital death, and place of discharge. To improve the treatment of patients with non-intubated chest wall injuries or those who have weaned. **(Terry, et al., 2021)**

Significance of study

Globally, trauma is the leading cause of death. Less than 10% of patients require any form of surgical intervention, even though all of them suffer chest injuries of varying degrees, ranging from a straightforward rib fracture to a stab wound to the heart. After head injuries, mortality is second highest, highlighting the significance of primary care. Fast detection and treatment can prevent a number of these deaths. According to **(Assiut university hospitals records from 2021)**, there were seventy-eight cases of patients with chest trauma admitted to the trauma ICU, accounting for 312 of all ICU admissions, or 25% of all admissions overall. According to this study, appropriately implemented clinical pathways may shorten hospital stays and restrict the amount that care can be changed.

Aim of the study

- To evaluate effect of implementing of the clinical pathway on chest trauma patients out comes
- To evaluate effect of implementing of the clinical pathway on chest trauma patients' PIC score and SOFA score

Hypothesis:

- Patients with chest trauma to whom clinical pathway is applied will have less complication than who will receive routine hospital care (control).
- Patients with chest trauma to whom clinical pathway is applied will have less stay hospital and less readmission than who will receive routine hospital care (control).
- Patients with chest trauma to whom clinical pathway is applied will have a significantly PIC score improved than those receiving usual care (control).

Patients and Methods:

Research design:

A quasi-experimental research design was used in this study. This design is used to explain relationships, clarify certain events that happened or both. This type of experimental design in which the researcher has limited control over the selection of study participants. In clinical nursing studies, subjects are frequently not randomly selected but the samples are convenient. Thus, nurse researchers conduct more quasi-experimental studies.

Setting:

The study was conducted in the trauma intensive care unit at Assiut university main hospital.

Study sample:

A purpose-designed sample of sixty adult patients with chest trauma comprised the study subjects. 60 critically ill adult patients were selected using a two-tailed alpha threshold of 0.05 in an epi info power analysis. The sample was divided into two groups, each with thirty patients: the control group and the study group. The control group began first, followed mostly by the study group.

The patients' Inclusion criteria:

- Both sex with age from 18- 60 years.
- Chest trauma patients.
- Patients connected to mechanical ventilation or high flow.
- Recent trauma admission

Exclusion criteria: -

- Patients with head trauma or spinal cord injury.
- Patients with COPD.
- Pregnant woman.
- Burn patients.

Tools:

Tool 1: Chest trauma assessment sheet: - This tool has been advanced by the researcher after reviewing the related literature's **(Dogrul etal., 2020)**. To assess critically ill patients with chest trauma, it comprised five parts.

Part I: Demographic data and medical data

Part II: Cardiovascular assessment sheet

Part III: Respiratory assessment and mechanical ventilation sheet

Part IV: Neurological assessment by using Glasgow coma scale.

Part IIV: Diagnostic studies and laboratory investigation

Tool II: patient's clinical pathway variances checklist:

This tool assesses the variation from the anticipated results as suggested by the clinical pathway. (**Kim & Moore, 2020)**. Three phases of the patient intervention were divided into this tool: **stage I** was **admittance to the ICU** (the first 24 hours). **Stage II**: **the acute care** (the first five days) involved a patient improvement variance checklist that concealed the

assessment and intervention during the acute stage. **Stage III: movement and weaning** (the final five study days) included multidisciplinary interference during the weaning stage. The standardized order sheet was used to assess the patient's state and provide management throughout the first day.

Scoring system:

The score ranges from 0 to 1, each item in checklist was scored as follow: one degree for each step done and zero for step that not done.

Tool III: (pain, inspiration, and cough) (PIC) score scale: This tool adopted by **(Witt & Bulger 2017)** the pathway usages a PIC scoring tool to in order assess and screen patients, mentioning to pain, Inspiratory capability, and Coughing.

Scoring system:

The score may range from 3 to 10 where 10 is the goal score. Pain is scored on a scale of 1–3, representing patient-reported pain score on the subjective 0–10 scale: 3 points if controlled (subjective numeric scale 0–4), 2 points if moderately controlled (subjective numeric scale 5–7), or 1 point if severe (subjective numeric scale 8–10). Inspiratory capacity is scored on a scale of 1–4, relating to 'goal' and 'alert' levels for inspiratory spirometry based on sex-specific predictive nomograms for age and height as available in the spirometer product inserts (goal is set at 80% of expected inspiratory capacity, alert level is 15 mL/kg or a maximum of 1500 mL). Patients receive four points if able to achieve at least goal inspiratory spirometry volume, three if between goal and alert levels, two if less than alert volume, and one point if unable to perform inspiratory spirometry. Finally, cough is subjectively assessed by the bedside nurse and assigned three points if strong, two points if weak, and one point if absent.

PIC Score

3	4	5	6	7	8	9	10

Pain	Inspiration	Cough
Patient-reported, 0-10 scale	Inspiratory spirometry; goal and alert thresholds set by respiratory therapist	Assessment by bedside nurse
3 – Controlled (Pain intensity scale 0-4)	4- Above goal volume	3 – Strong
2 – Moderate (Pain intensity scale 5-7)	3 – Goal to alert volume	2 – Weak
1 – Severe (Pain intensity scale 8-10)	2- Below alert volume	1 - Absent
	1 – Unable to perform incentive spirometry	

Figure (1): (Pain, Inspiratory capacity, and Cough) PIC score. (Bulger 2017).

Tool IV: Chest trauma patients' outcomes assessment sheet:

Patients' outcomes included length of stay, costs, ventilator requirements, readmission rate, SOFA scores and complications. This tool has been advanced by a researcher after revising related literature's **(Siddique, et al., 2021).**

Scoring system for SOFA Score: The SOFA score basically evaluates the six different organ systems separately reflecting the function of an organ system (respiratory, cardiovascular, renal, neurological, hepatic and hematological) and allocates a score of 0–4 for each item. Also, Different variables and parameters are included in each of the organ system, and a definite score is given to that state varying from 0 to 4, all of which is later added to calculate the SOFA score (maximum of 24). The score increases as the organ system functioning worsens; thus, the assessment of individual organ dysfunction or failure can be done along with evaluation of patient.

Pilot study:

Six patients, or 10% of the sample, participated in pilot research to ensure the tools' feasibility, clarity, and application. The required adjustments have been made.

Validity and reliability

- The internal consistency of reliability was carried out to the study tool (first, second) which were, 90%, 82% which were acceptable Using Cronbach's alpha, the reliability of evaluation instruments has been examined.
- Face and content validity: Five experts in the fields of critical care medicine, nursing administration, and critical care nursing from Assiut University Hospital evaluated the instruments' validity and made the required adjustments.

Fieldwork

Study group:

- Care providers received instruction regarding the goal and process of executing the pathway designed after collect data from the control group one week later. The clinical pathway handouts, slides, videos, and discussions were used for the training. In addition, staff members were encouraged to ask questions in a small group environment.
- All patients admitted to the trauma unit within the seven-month period beginning on February 1 and concluding on August 31, 2023, were measured and managed as a study group following the completion of recruiting and screening. Thirty patients participated in the trial and met the desired criteria.

Control group:

- From the beginning of September 2022 to the end of January 2023, an overall of patients were admitted to the trauma unit. Data was gathered from the study group after the control group to prevent

sample contamination. While the study group followed established clinical pathway standards, the control group received standard hospital treatment.

Ethical consideration:

The ethics committee of the college of nursing has approved the research proposal; the study adhered to established ethical guidelines for clinical research and did not pose any harm to the study subjects. After outlining the nature and goal of the study, consent was obtained from patients or supervisors who are willing to take part in it. Data anonymity and confidentiality had been guaranteed. The study subjects were free to decline participation or to leave the study at any moment, for any reason. Data collecting has taken study subject privacy into account.

Statistical analysis:

SPSS (ver.25) was used to analyze the data using computer programming. Descriptive statistics were used to acquire data in the form of means ± standard deviations for qualitative variables and frequencies and percentages for qualitative variables. The independent samples t-test was utilized to compare quantitative continuous data between two groups. A chi-square test was used to compare qualitative variables to assess significance. When P was less than 0.05, the test's "P" crucial value was determined to be statistically significant.

Results

Table (1): Demographic characteristics of studied patients: (n=60)

Demographic Data		Study group N=30		Control group N=30		p. value
		No.	%	No.	%	
Age	18:30	11	36.7	6	20.0	0.499
	31:40	7	23.3	7	23.3	
	41:50	6	20.0	10	33.3	
	51:60	6	20.0	7	23.3	
Mean ± SD		36.77± 11.726		41.17 ± 12.239		0.16
Sex	Male	21	70.0	24	80.0	0.371
	Female	9	30.0	6	20.0	
Marital status	Single	6	20.0	7	23.3	0.329
	Married	24	80.0	20	66.7	
	Divorce	0	0.0	1	3.3	
	Widow	0	0.0	2	6.7	
Level of education	Educated	24	80.0	25	83.3	0.739
	Illiterate	6	20.0	5	16.7	

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01)*

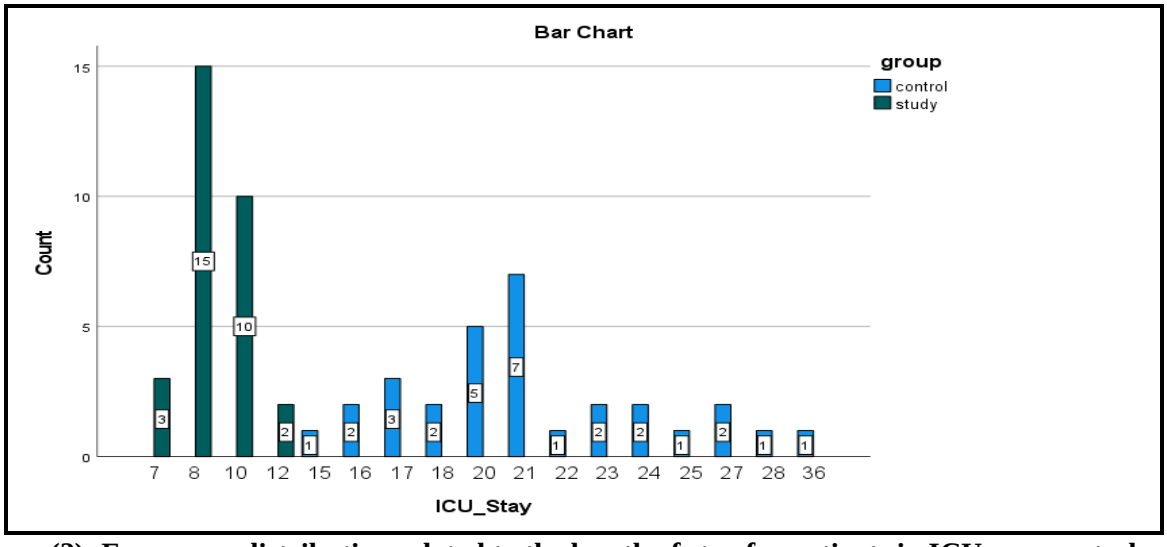

Figure (2): Frequency distribution related to the length of stay for patients in ICU among study and control group (n=60)

Table (2): Distribution of patients regarding to procedures performed within admission (the first 24 hours) of study, by study group (n=60)

Chest trauma injury map admission orders (first 24 hours)	Study group N=30				Control groupN=30				p. value
	Done		Not done		Done		Not Done		
	No.	%	No.	%	No.	%	No.	%	
Nothing per oral (NPO).	30	100.0	0	0.0	9	30.0	21	70.0	.000**
Chest x-ray in AM.	30	100.0	0	0.0	12	40.0	18	60.0	.000**
Elevation the head of the bed at 30 degrees until spines is cleared	30	100.0	0	0.0	13	43.3	17	56.7	.000**
Start an accurate fluid balance chart	30	100.0	0	0.0	11	36.7	19	63.3	.000**
Complete drug chart	30	100.0	0	0.0	9	30.0	21	70.0	.000**
Restrictive IV fluids	30	100.0			9	30.0	21	70.0	.000**
Add Troponin to blood screen.	30	100.0	0	0.0	10	33.3	20	66.7	.000**
Start accurate fluid balance	30	100.0	0	0.0	19	63.3	11	36.7	.001**

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01).*

Table (3): Comparison between study and control group subject regards PIC Score related to pain. (n=60)

Pain		Study group N=30		Control group N=30		p. value
		No.	%	No.	%	
1ST day	Severe (score=1)	24	80.0	25	83.3	.739
	Moderate (score=2)	6	20.0	5	16.7	
	Controlled (score=3)	0	0.0	0	0.0	
Last day	Severe (score=1)	0	0.0	4	13.3	.000**
	Moderate (score=2)	3	10.0	18	60.0	
	Controlled (score=3)	27	90.0	8	26.7	

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01)*

Table (4): Comparison between study and control group subject regards PIC Score related to (Inspiration using spirometry and cough). (n=60)

Inspiration using spirometry		Study group N=30		Control group N=30		p. value
		No.	%	No.	%	
1st day	above goal alert Count (score=4)	0	0.0	0	0.0	.038*
	goal to alert volume (score=3)	0	0.0	0	0.0	
	below alert volume (score=2)	8	26.7	2	6.7	
	unable to perform incentive spirometry (score=1)	22	73.3	28	93.3	
Last day	above goal alert Count (score=4)	18	60.0	3	10.0	.000**
	goal to alert volume (score=3)	12	40.0	3	10.0	
	below alert volume (score=2)	0	0.0	7	23.3	
	unable to perform incentive spirometry (score=1)	0	0.0	17	56.7	
Cough		**Study group N=30**		**Control group N=30**		**p. value**
		No.	**%**	**No.**	**%**	
1ST day	Absent (Score=1)	12	40.0	25	83.3	.001**
	Weak (Score=2)	18	60.0	5	16.7	
	Strong (Score=3)	0	0.0	0	0.0	
Last day	Absent (Score=1)	0	0.0	7	23.3	.000**
	Weak (Score=2)	6	20.0	15	50.0	
	Strong (Score=3)	24	80.0	8	26.7	

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01)*

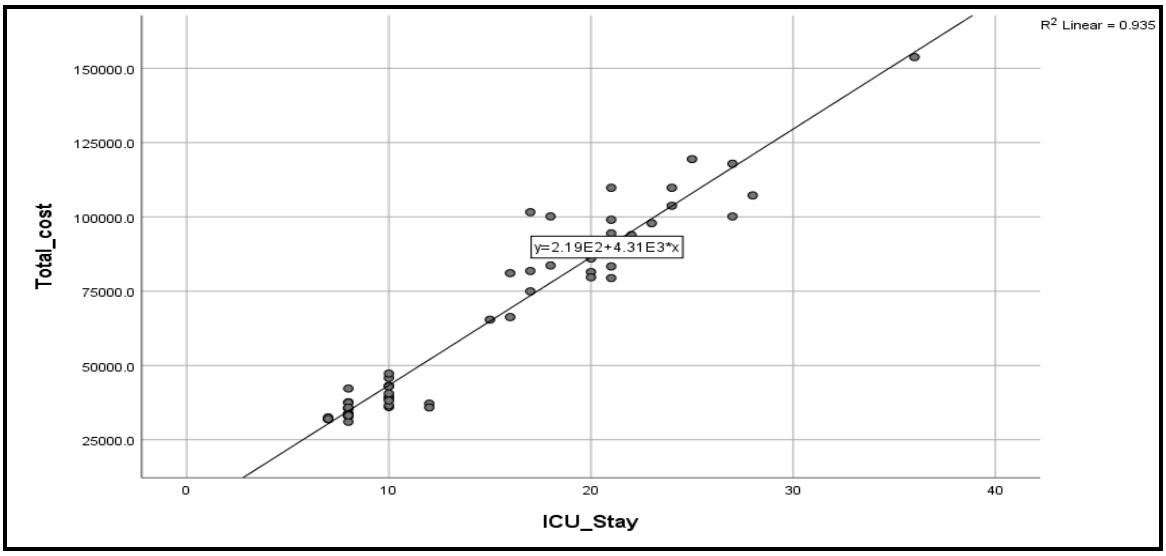

Figure (3): Correlation between length of stay and total cost in ICU

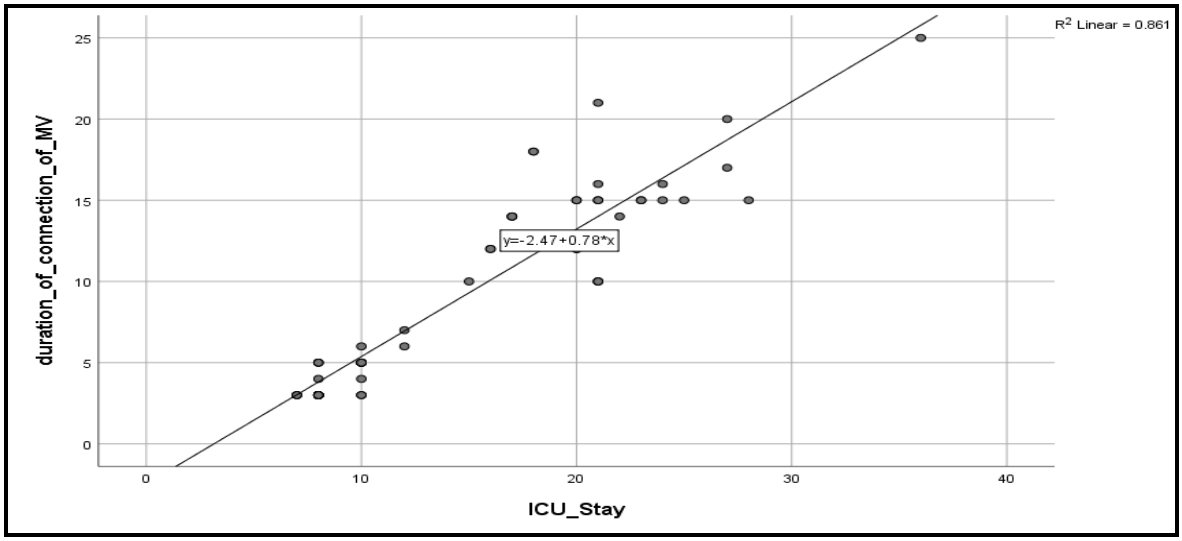

Figure (4): Correlation between length of stay in ICU and duration of connection to mechanical ventilation.

Table (5): Distribution of patients regarding to procedures performed within acute care stage (the first 5 days) of study, by study group (n=60)

Acute care stage (the first 5 days)	Study group N=30				Control group N=30				p. value[1]	p. value[2]
	Done		Not done		Done		Not Done			
	No.	%	No.	%	No.	%	No.	%		
Initial ABG	30	100.0	0	0.0	30	100.0	0	0.0	1.000	1.000
CT- Chest	30	100.0	0	0.0	30	100.0	0	0.0	1.000	.688
Keep PEEP with minimum level	30	100.0	0	0.0	6	20.0	26	80.0	.000**	.000**
Monitor blood gases 15-20 min after all changes	30	100.0	0	0.0	21	70.0	9	30.0	.001**	.001**
Maintain MAP at 60-90 mmHg	30	100.0	0	0.0	10	33.3	20	66.7	.000**	.000**

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01)*
p. value[1], p. value[2]*: comparison between study and control group done and not done 1st and 2nd day.*
ABG: *arterial blood gases,* ***CT- Scan:*** *Computerized Tomography.*

Table (6): Comparison between study and control group subject regards SOFA Score. (n=60)

Mortality rate prediction	SOFA SCORE	Study group N=30		Control group N=30		p. value
		NO.	%	NO.	%	
<2%	< 6	29	96.7	0	0.0	0.000**
0-10%	7:9	1	3.3	4	13.3	
10-30%	10:12	0	0.0	12	40.0	
40-60%	13:14	0	0.0	9	30.0	
75-90%	15	0	0.0	0	0.0	
>90%	>15	0	0.0	5	16.7	

**Statistically significance difference (p<0.05)* ***statistically significant difference (p<0.01)*

Table (1): Shows the demographic characteristics of the patients assigned to the study and control groups. The mean age of the study group was about 36.8 years, while the control group was about 41.2, with the difference in mean age between the two groups that was not statistically significant. There was also a difference in the marital status of the participants in each group, with more patients in the study group being married (70 %), and a greater proportion of patients in the control group being married (66.7%). So that, differences in marital status between groups were not statistically significant. Across both groups, most participants were male and educated, with no statistically significant differences found between groups in relation to sex or level of education.

Figure (2): Frequency distribution between the two groups (study and control) related to the length of stay of patients in ICU. Length of stay in the intensive care unit (ICU) Differences between groups in the mean of the length of ICU stay were statistically significant (P=0.000 &p=0.002 respectively)

Table (2): Describes the variations in the diagnostic techniques used during the study's first 24 hours. Although there were statistically significant differences between the groups in the number of patients undergoing additional diagnostic tests, the control group had significantly fewer patients receiving a chest x-ray, elevation of the head of the bed at 30 degrees until the spine is cleared, a complete medication chart, and nothing per oral (NPO). Limiting IV fluids, start an accurate fluid balance by adding troponin to the blood screen (p=0.000). Significant differences existed between the groups.

Table (3): Shows comparison between study and control as regard PIC score after weaning that contain (pain assessment score, Inspiration using spirometry, and Cough assessment) with not statistically significance difference in the 1st day related to pain assessment but last day with statistically significant difference (P=.000 respectively).

Table (4): Shows comparison between study and control as regard to other items (Inspiration using spirometry and Cough assessment), of PIC score through days of study with statistically significant difference (P=.006& p=0.000 respectively).

Figure (3): Correlation between length of stay on ICU and total cost in ICU. Shows High positive Correlation between study and control group related to length of stay and total cost of stay in ICU as R=0.935

Figure (4): Correlation between length of stay in ICU and duration of connection to mechanical ventilation. Figure 4 shows High positive Correlation among study and control group related to prolonged duration of ICU stay and duration of mechanical ventilation as R=0.961

Table (5): Outlines distribution of patients regarding to procedures performed within acute care stage (the first 5 days) of study, by study group the difference in acute care performed within the clinical pathway appliance of the study. Though, there were no statistically significant differences between groups in ABG test and CT- chest scan. With Statistically significance difference related to (Keep PEEP with minimum level, monitor blood gases 15-20 min after all changes, Maintain MAP at 60-90 mmHg) with (P=0.000&P=0.001 respectively).

Table (6): Shows the comparison between study and control group subject regards SOFA Score. with more patients in the study group have low score of mortality rate (96.7 %), and a larger section of patients in the control group moderate score of mortality rate (40.0%). **(p=0.000).** So that, differences in SOFA Score between groups were statistically significant.

Discussion

Several studies have investigated the effects of clinical pathways on patient outcomes in the context of chest trauma. For example, a study by **Hajjar, et al., (2021)** compared outcomes between chest trauma patients managed with a clinical pathway and those managed without a pathway. The study found that patients in the clinical pathway group had significantly lower mortality rates and shorter stays in the ICU compared to the control group. These findings recommend that the application of a clinical pathway for chest trauma patients might contribute to

improved patient outcomes. The study reflected adequately power-driven for measuring most of the outcomes (length of stay, SOFA score and PIC score.

Related to Descriptions of the studied sample:

Demographic characteristics of studied patients:

According to the findings of a recent study, there are no statistically significant differences between the groups about age, sex, marital status, or educational attainment. Most participants in both groups were young, male, married, and educated. The study group's mean age was approximately 36.8, while the control group's mean age was approximately 41.2. There was no statistically significant difference in the mean age of the two groups. This can be explained by the fact that men are more prone to trauma than women are when driving and working in high-risk environments where they are more likely to fall. The current study supported by **Mohamed, et al., 2018)** who reported that Sixty participants of head trauma complete the study (30 in each arm). Related to age, there were no significant differences between groups in baseline characteristics. In the same line **(Patel, et al., 2021)** who reported that two fifth were from 25 to 35 years, majority of patient were male. Vehicular accident was the commonest two third cause of injury followed by assault one fifth.

Related to the variations in diagnostic techniques used throughout the study's first twenty-four hours. Nonetheless, there were statistically significant variations between the groups in the number of patients undergoing additional diagnostic procedures; notably, a notably smaller number of patients in the control group underwent a chest x-ray, nothing per oral (NPO), Complete the medication chart, raise the head of the bed by 30 degrees until the spine is clear. Limiting IV fluids start an accurate fluid balance by adding troponin to the blood screen. Significant differences existed between the groups.

In the same line **(Eghbalzadeh, et al., 2017)**, signs may disappear or may not be directly connected to the injury at the time of admission to emergency rooms. For patients, precise diagnosis and early management are essential to preventing major complications and death. The best main diagnostic procedures include cardiac enzyme tests, serial 12-lead electrocardiography, Holter-monitor recordings, and echocardiography or CT scans. Rapid diagnoses that result in the right treatment are crucial to a patient's survival. Also **(Wu, et al., 2019)** reported that Cardiac trauma conveys high mortality rates and should be reflected in all patients presenting with chest trauma. These patients can have a varied range of clinical presentations, from being symptomless to being in hemodynamic downfall. Presently, multidetector calculated tomography is the golden-standard diagnostic imaging modality for wholly patients with abnormal electrocardiogram or Troponin I level follow-on chest trauma. In the same stripe **(Abouzeid, et al., (2018) (Gálvez, et al., 2020)** also report assess the trauma mechanism and noninvasive tomography techniques available in the emergency department. Chest X-ray and bedside ultrasound are the primary tests for unstable patients, high-energy mechanism of accident, or higher clinical suspicion. chest computed tomography (CT) is the keystone test for evaluating the existence of intrathoracic abrasions subordinate to penetrating trauma, that can possibly threaten patient's life. Short and initial finding can be lifesaving and determine the consequences.

Related to SOFA Score. with more patients in the study group have low score of mortality rate, and a more proportion of patients in the control group moderate score of mortality rate more than one third. So that, differences in SOFA Score between groups were statistically significant. That may explain as Prolonged stays in the ICU may be associated with delayed recovery, especially in patients with severe illness. The slower improvement or resolution of organ dysfunction can contribute to a higher SOFA score over time. It's significant to note that the SOFA score is just one tool used by healthcare professionals to evaluate the strictness of illness and guide clinical decision-making. Monitoring trends in the SOFA score over time helps healthcare providers evaluate the patient's response to treatment in addition adjust the care plan accordingly. The score is not only used for initial assessment but also for ongoing evaluation throughout the patient's stay in the ICU. **(Kumar, & 2018)** who reported according to studies, there were independent risk indicators for death in the SOFA scores for respiratory, neurological, renal, cardiovascular, hematological, and hepatic dysfunctions. From the first to the last day, the SOFA score was generally studied. On the first day, there was a statistically significant difference in the SOFA scores between survivors and non-survivors. Similarly, the SOFA score showed a notable trend of increase during the first week, especially during the first three days, indicating a steady decline in organ function among those who did not survive.

(McCarthy, 2022) Who reported that to appraise global accurateness of SOFA score for infection calculation, about two third were recognized with an infection that categorized with (one third with blood circulation infection, two third with skin and soft tissue infection, and two fifth with pulmonary infection).

Several studies have investigated the effectiveness of clinical pathways for chest trauma patients and their effect on patient consequences and healthcare costs. A systematic review conducted by **(Baker, et al., 2020)** analyzed the outcomes of fifteen studies exploring the

application of clinical pathways for trauma patients. The review found that clinical pathways resulted in improved outcomes, containing reduced death rates, diminished complications, shorter hospital stays, and improved functional status upon discharge. the implementation of clinical pathways for chest trauma patients has been found to significantly decrease the costs associated with ICU stays. One study by (**Hajjar, et al., 2021)** examined the financial implications of utilizing clinical pathways for chest trauma patients admitted to the ICU. The study found that the implementation of clinical pathways resulted in substantial cost savings, primarily through the reduction of ICU length of stay, decreased resource utilization, and enhanced continuity of care. These findings suggest that clinical pathways can serve as an effective tool for improving patient outcomes while simultaneously reducing the financial burden on healthcare systems.

Related to PIC score.

The PIC score likely refers to an assessment tool used to evaluate pain, inspiration (breathing efforts), and coughing during the weaning process from mechanical ventilation. Current study shows contrast among study and control as regarding to PIC score after weaning that contain (pain assessment score, Inspiration using spirometry, and Cough assessment) with not statistically significance difference in the 1st day related to pain assessment but last day with statistically significant difference. Nevertheless, related to other items of PIC score between control and study group throughout days of study with statistically significant difference. This score helps clinicians monitor and manage patients' readiness for extubating. We can interpretation of findings as on the first day of the weaning process, there was no statistically significant difference in the pain assessment scores between the study and control groups. This suggests that, initially, both groups experienced a similar level of pain during the weaning process. By the last day, this change became statistically significant. This may indicate that certain interventions that apply in the study group influenced PIC scores during the weaning process.

As same line **(Terry, et al., 2021)** who reported that the PIC Score is a cost-saving tool for patients with chest wall injuries to guide their care. In the PIC group and were indicated by a sharply declining PIC Score, which denoted pulmonary deterioration, three points earlier in the prior eight-hour shift. Current study supported by **(Ong, 2021)** who stated that more than one third of patients had inadequate pain management included into their local chest trauma pathway at the time of diagnosis. Hospital acquired pneumonia (HAP) was progressed in 33% of patients with chest injuries and in less than half of patients with inadequate pain management. Patients with HAP due to chest trauma had an average hospitalization duration of three times longer than that of patients without complications (15 days vs. 5 days). Patients with chest injuries frequently experience insufficient pain management and delayed specialized team participation.

Also supported by **(Émond, 2020)** It revealed that the patients without atelectasis had a 0.53 nurse-patient correlation, a 0.37 physician-patient correlation, and a 0.51 nurse-physician correlation ($p<=0.05$). Therefore, in patients with atelectasis, the association between the perception of cough capability and patient-physician was 0.62; 0.40; and 0.51 ($p<=0.05$). Also **(Rose, & Presneill, 2011).** Reported that Typical ventilatory performance prophets containing respiratory rate and effective cough were stated to be of larger clinical usefulness than other more lately anticipated measures. In continence **(Aslan, et al., 2014)** who report that respiratory muscle strength enhanced by inspiratory and expiratory muscle exercise in patients with slowly progressive neuromuscular illness.

Also **(Su, et al., 2010) who** find that indication of cough reflex has the potential to predict successful extubating in patients who pass SBT.

Currently, most respondents rely on practice tactics. The biggest factors impacting practice variation, according to clinicians, are variations in clinician style and experience. The two factors most likely to contribute to practice standardization were patient decision aids and time to adopt standards. Although they believe that practice differences should be minimized, clinicians are less certain that this can be done. Guidelines' convenience isn't a major obstacle to practice standardization, although having more time to implement standards is thought to be beneficial. **(Cook, et al., 2018)**

Limitations

The brief period of the study may also be supposed as a study restraint. Ten days might reflect a short time for managing of chest trauma patient as it may not offer adequate time to notice clinical and statistically significant among groups for wholly related outcomes, comprising long-term outcomes. To elaborate, patients with chest trauma injury frequently have other traumatic injuries to limbs and require a long period of time for treatment.

Conclusion

According to the finding of this study concluded high positive correlation between study and control group related to length of stay and total cost of stay in ICU also high positive correlation among study and control group related to prolonged duration of ICU stay and duration of connection to mechanical ventilation.

Recommendations:

- The limitation of the current study highlights the need for future clinical pathway studies to monitor clinical practice more closely in control groups to determine the extent to which clinical pathways may impact the delivery of best practice care.
- Regular training and education for healthcare providers involved in chest trauma care are essential for consistent adherence to the pathway.

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