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Effect Of Implementing Clinical Pathway on Hemodynamic Status, Arterial Blood Gases and PIC Score for Chest Trauma Patients

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Abstract

Background: Clinical Pathway is designed to streamline patient care and ensure adherence to evidence-based practices, which may have a positive impact on patient outcomes **Aim:** the study aimed to evaluate effect of implementing the clinical pathway on chest trauma patients' Hemodynamic status. **Design:** A quasi-experimental research design useful in this study. **Subject**: contained 60 adult patients with chest trauma, equally, divided into study and control group. **Setting**: The study directed at the trauma intensive care unit at Assiut University Hospital. **Tools**: three tools were used: **Tool 1**: Chest trauma assessment sheet, **Tool 2**: patient's clinical pathway variances checklist, and **Tool 3**: PIC Score (pain, inspiration, and cough). **Result**: the current study findings showed that regards score and standard division of study group related to PH, PaO2, Paco2, and SO2 in the last day with statistically significant difference (P=0.000 &p=0.003 respectively between control and study group. **Conclusions**: According to the findings of this study, the concluded high positive correlation between study and control group related to hemodynamic status.

Recommendation: Continuous training for healthcare providers involved in chest traumas are essential for consistent adherence to the pathway. **Keywords**: Chest Trauma Patient, Clinical Pathway, Patient hemodynamic status.**introduction**

Chest trauma represents a significant clinical challenge due to its potential to compromise respiratory function and hemodynamic stability, posing a threat to patient survival. Common injuries, such as large chest wall hematomas and air collections within the pleural cavity, often disrupt gas exchange and arterial blood gas (ABG) levels, necessitating immediate and precise management **(Ketai & Primack, 2019)**.

Large chest wall hematomas or collections of air inside the chest wall that can connect with the intrathoracic space are linked to severe injuries to the chest wall. While chest radiography might not be able to differentiate between parenchymal or mediastinal injuries and chest walls, CT scanning can

do so with ease. **(Chaudhry R, Bordoni B. 2022)** Furthermore, complications like pneumothorax may require the placement of surgical chest drains, which should only be performed by qualified clinicians in high-dependency or intensive care units **(Williams et al., 2020).**

Role of Clinical Pathways in Improving Outcomes: Clinical pathways are structured frameworks designed to standardize patient care based on evidence-based practices, ensuring consistent and high-quality treatment. For chest trauma patients, these pathways emphasize interventions aimed at improving hemodynamic stability, optimizing ABG levels, and reducing complications such as prolonged mechanical ventilation and ICU stays. Studies suggest that clinical pathways streamline care delivery and improve outcomes by enhancing adherence to standardized protocols **(Rotter et al., 2019)**.

Significance of Hemodynamic Monitoring and ABG Analysis: Maintaining stable hemodynamic parameters is essential for chest trauma patients, as disruptions can indicate worsening respiratory or circulatory function. Arterial blood gas analysis provides critical insights into oxygenation, ventilation, and acid-base balance, serving as a reliable marker for the effectiveness of therapeutic interventions **(Du, 2017). (Williams, A. and et al 2020)**

Multidisciplinary Approach to Chest Trauma Care: Effective management of chest trauma requires a multidisciplinary team comprising physicians, nurses, and healthcare support staff. Their coordinated efforts ensure timely assessment, intervention, and monitoring of patients. Clinical pathways provide a structured approach to integrating these roles, facilitating seamless collaboration and optimizing patient outcomes **(Bass et al., 2015).**

It might take up to eight weeks for a cracked rib to heal on its own. To keep the air sacs in the lung open and avoid pneumonia, a kind of chest infection, you might be instructed to cough and breathe deeply on a frequent basis if you have a cracked rib. Take painkillers if you're in discomfort. To cough more comfortably, take deep breaths, and perform any breathing exercises that are prescribed to you, it is vital to relieve your pain. **(Schwend, R. and et al 2022)**

PIC scores are commonly used in the management of thoracic trauma. A patient should have this used as an assessment tool in the Emergency Department and by therapists throughout their admission. Nursing staff on the wards will assess patients at rest and on movement using a verbal descriptor scale and assess how much pain is interfering with their ability to function using the functional pain assessment tool as per comfort charts. **(Zubrzycki, M.2018).**

Without a doubt, having the appropriate personnel in the right location at the right time, with the right abilities, is the best way to treat someone who has experienced significant trauma or possibly fatal injuries. The theme of "skills to be present in the multidisciplinary team" was therefore included in the scope. Each of the trauma-related guidelines—non-complex fractures, complex fractures, major trauma, and spinal injury assessment—was expected to represent the competencies of the multidisciplinary team needed to provide the recommendations in the specialized guideline. **(Bass, C. and et al 2015) (Rotter T. and et al 2019)**

Significant study

Globally, trauma is the biggest cause of death. Less than 10% of patients need any form of surgery after suffering a chest trauma of some severity, ranging from a simple rib fracture to a piercing damage of the heart. The necessity of early care is highlighted by the fact that mortality is second only to head injuries. Early diagnosis and treatment can help avert many of these fatalities.

Aim of study

- To evaluate effect of implementing the clinical pathway on chest trauma patients' hemodynamic status and arterial blood gases.

Tool and methods

Tools: three tools have been utilized for data collection for clinical pathway guidelines after reviewing literature include the following: -

Tool 1: - Chest trauma assessment sheet: - This tool has been developed by the researcher after reviewing the related literature's **(Awad, and et al 2022)**. To assess critically ill patients with chest trauma, it comprised three parts.

Part I: **Demographic data and medical data**: it includes age, sex, occupation, level of education, and marital status.

Part II: hemodynamics assessment sheet as: -

- Hemodynamic status monitoring such as (pulse rate b/m, temperature, blood pressure (BP) mm hg (systolic BP, diastolic BP and mean arterial blood pressure), Monitoring Central venous pressure.

Part III: Respiratory assessment and mechanical ventilation sheet which Included: -

- Oxygen saturation monitoring
- Method of ventilation (invasive or non-invasive).
- Parameter of mechanical ventilation.

Tool II: patient's clinical pathway variances checklist:

This tool evaluates the deviation from the clinical pathway's suggested expected results. Based on a review of recent related literature, the researcher has created an observational checklist.

Scoring system: Each item on the checklist was given a score between 0 and 1, with one degree awarded for each completed step and zero for those that were not.

Tool III: (pain, inspiration, and cough) (PIC) score scale: - This tool adopted by **(Witt & Bulger 2017)** the pathway usages a PIC scoring tool to assess 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).**

Methods: - The study has been conducted throughout three main phases, which are preparatory phase, implementation phase and evaluation phase.

1) **preparatory phase**
   Methods: Preparation, implementation, and assessment are the three primary stages that the study was carried out.

• After describing the purpose and scope of the study, the hospital's relevant authorities in the emergency medical unit granted official approval to perform it.

• The administrative authority of the hospital has granted written consent to gather the required data.

• The researcher developed the methods utilized in this investigation after examining pertinent literature.

• Pilot research was carried out on six patients, or 10% of the sample, to verify the tools' applicability, clarity, and viability. The necessary changes have been made.

• Cronbach's alpha has been used to measure the reliability of assessment instruments.

- Face validity: the tools have been tested the validity by jury of 5 Experts in the field of critical care nursing, nursing administration. and critical care medicine from Assiut university hospital and the necessary modification have been done.

2- Implementation phase: -

• data collect from the control group before moving on to the research group to prevent sample contamination. While the research group underwent formulated clinical route guidelines, the control group received standard hospital treatment.

• Patients and caregivers have received training about the goal and procedure of putting the route into practice.

• After evaluating recent literature and existing procedures, the researcher has been serving as a coordinator and has divided the therapeutic pathway into timed assignments.

• Under the researcher's supervision, the trained care providers have used the developed clinical route to the study group from the time of admission to the patient's release.

Phase one: "Assessment phase": - Patients in both control and study group have been assessed daily Such as respiratory assessment continues monitoring, hemodynamic monitoring, methods of patient ventilation, and arterial blood gases monitoring.

- Patient's socio-demographic data, baseline characteristics and medical data is complete for all patients on admission to obtain patients of both study and control group as baseline data.

Phase two: "Establishing the clinical pathway (CP)" This phase has been accomplished by the following steps:

Step 1: 'Selection of an expert panel' Expert panel have been involved in each step of pathway development.

Step 2: 'Literature review' an extensive literature review have been conducted by the researchers to identify all available evidence and studies of pathways used for management of patients with chest trauma.

Step 3: Formulation of clinical pathway: - The established CP consists of four parts:

Part I: assessment and preparation.

This part includes (1) patient assessment (such as patient health history and physical examination).

Part II: daily interventions; this part includes the daily nursing and collaborative interventions.

Part III: Expected daily outcomes.

Phase Three: "Implementing the clinical pathway" patient care has been implemented the established pathway on the CP group from admission till discharge under researcher's

supervision and the CP group assessment, meanwhile, have been taken and documented as described in phase one.

3-Evaluation phase: -

Assess the management of patients with chest trauma, using patient outcomes to gauge how well the clinical route worked. The following outcomes have been measured by comparing the results of the study and control groups using Stabilize hemodynamic conditions, improvement of oxygenation, improvement of crackles in lungs, and absence of chest pain.

Results

Table 1: Demographic characteristics of patients studied: -

Demographic Data		Study group N=30		Control group N=30		p. value
		No.	%	No.	%	
Age	18:30	11	36.7	6	20.0	
	31:40	7	23.3	7	23.3	
	41:50	6	20.0	10	33.3	
	51:60	6	20.0	7	23.3	0.499
Mean ± SD		36.77± 11.726		41.17 ± 12.239		0.16
Sex	Male	21	70.0	24	80.0	
	Female	9	30.0	6	20.0	0.371
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)

Table (2): comparison between study and control group subjects regarding methods of ventilation and Fio_2 percentage

Days	**Mode**	**Study group N=30**		**Control group N=30**		**p. value**	**Fio_2 percentage**		**p. value**
		No.	**%**	**No.**	**%**		**Study N=30**	**Control N=30**	
							Mean ±SD	**Mean ±SD**	
1st day	bi-level mode	0	0.0	11	36.7	**.003 ****			
	SIMV mode	21	70.0	13	43.3				
	PCV-VG mode	3	10.0	1	6.7				
	HI-FLOW	3	10.0	0	0.0		**57 ± 4.7**	**63.3±14.2**	**.024***
	CPAP MODE	0	0.0	1	3.3				
	PCV	3	10.0	2	6.7				
	Non-invasive mask	0	0.0	2	6.7				
2nd day	Bi-level mode	12	40.0	12	40.0	**.019 ***			
	SIMV mode	9	30.0	15	50.0				
	PCV-VG mode	0	0.0	2	6.7				
	HI-FLOW	3	10.0	0	0.0		**52 ± 6.1**	**57 ± 4.66**	**.001 ****
	CPAP MODE	6	20.0	0	0.0				
	PCV	0	0.0	1	3.3				
3rd day	bi-level mode	3	10.0	7	23.3	**.000 ****			
	SIMV mode	0	0.0	14	46.7				
	PCV-VG mode	0	0.0	2	6.7				
	HI-FLOW	0	0.0	0	0.0		**45 ± 6.8**	**58.3 ± 12.9**	**.000 ****
	CPAP MODE	27	90.0	4	13.3				
	PCV	3	10.0	3	10.0				
Last day	bi-level mode	0	0.0	7	23.3	**0.000 ****			
	SIMV mode	0	0.0	4	13.3				

	PCV-VG mode	0	0.0	1	3.3				
	HI-FLOW	9	30.0	0	0.0		**43.5 ± 7.2**	**55.1 ± 18.5**	**.002 ****
	CPAP MODE	9	30.0	18	60.0				
	Non-invasive mask	12	40.0	0	0.0				

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

Table 3: comparison between study and control group subjects regarding hemodynamics monitoring.

Hemodynamics	Days	study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
Temperature	1st day	38.17 ± 0.64	38.11 ±0 .63	.731
	3rd day	37.94 ± .84	39.1 ± 0.62	.089
	5th day	37.38 ± 0.88	39.65 ± 0.73	.000**
	Last day	37.1 ± 0.94	39.6 ± 0.66	.004**
Pulse	1st day	98.6 ± 14.63	102.23 ± 11.98	0.301
	3rd day	96.33 ± 13.45	98.2 ± 13.68	0.596
	5th day	86.1 ± 10	100.1 ± 15.48	0.000**
	Last day	85.06 ± 9.13	99.93 ± 14.79	0.000**
MAP	1st day	76.83 ± 11.14	72.56 ± 10.97	0.568
	3rd day	72.67 ± 9.55	71.67 ± 11.01	0.217
	5th day	64.11 ±11.27	76.89 ± 21.08	0.005**
	Last day	80.61 ± 9.23	70.67 ± 16.75	0.005**

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

Table 4: comparison between study and control group subject regarding arterial blood gases.

Arterial Blood Gases	Days	study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
PH	1st day	7.44 ±.069	7.44 ±0.095	**.103**
	3rd	7.45 ± 0.057	7.46 ± 0.09	**.034****
	5th day	7.42 ± .033	7.47 ± .07	**.025****
	Last day	7.42 ± .02	7.47± 0.067	**.000****
PAO2	1st day	140.93 ± 33.04	122.73 ± 31.14	**.653**
	3rd	161 ± 24.15	114.2 ± 29	**.247**
	5th day	152.6 ± 25.6	84.9 ± 20.6	**.114**
	Last day	136.93 ± 27.4	74.7 ± 15.6	**.002****
PACO2	1st day	38.17 ± 8	37.93 ± 12.06	**.194**
	3rd day	38.15 ± 7.53	39.3 ± 9.32	**.265**
	5th day	37.40 ± 7.33	38.8 ± 9.09	**.013****
	Last day	39.1 ± 4.22	39.18 ± 7.23	**.044****
HCO3	1st day	25.94 ± 6.15	25.88 ± 6.4	**.96**
	3rd day	26.25 ± 4.36	26.73± 7.21	**.76**
	5th day	24.6 ± 4.81	28.05 ± 6.24	**.113**
	Last day	25 ± 2.81	27.41± 3.85	**.008****
Spo2	1st day	98.36 ±1.63	93.4 ± 3.5	**.000****
	3rd day	98.5 ±1.53	93.9 ± 2.26	**.000****
	5th day	99.05 ± .89	93.81 ± 2.08	**.000****
	Last day	99.4 ±.67	93.1 ± 2.43	**.000****

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

Table 5: comparison between study and control group subjects regards CVP, intake, output and balance.

Items	Days	study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
CVP	1st day	6.97 ± 2.4	9.97 ± 3.996	0.001**
	3rd day	8.1 ± 2.8	10.63 ± 4.2	0.020*
	5th day	9.5 ± 2.52	10.97 ± 3.83	0.016*
	Last day	9.63 ± 2.57	11.03 ± 3.86	0.009**
Intake (24 hrs.)	1st day	2998 ±773	4615 ± 972	0.096
	3rd day	2950 ± 709	4566 ± 749	0.383

	5th day	2977 ± 702	4761 ± 486	0.017*
	Last day	2882 ± 611	4655 ± 832	0.076
Output (24 hrs.)	1st day	2620 ± 678	3358 ± 992	0.588
	3rd day	2590 ± 621	3519 ± 1133	.054
	5th day	2590 ± 655	3328 ± 579.5	.961
	Last day	2487 ± 480	3106 ± 731	.203
Balance	1st day	387 ± 337	1433 ± 481	.234
	3rd day	360 ± 445	1046.7 ± 928	.005**
	5th day	378 ± 408	1257 ± 674	.002**
	Last day	395 ± 323	1549.7 ± 719	.005**

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

Table 6:

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

Pain		Study group		Control group		p. value
		No.	%	No.	%	
Base line (day of admission)	Severe (score=1)	13	43.3	16	53.3	.438
	Moderate (score=2)	17	56.7	14	46.7	
	Controlled (score=3)	0		0		
At discharge	Severe (score=1)	0		4	13.3	.000
	Moderate (score=2)	7	23.3	22	73.3	
	Controlled (score=3)	23	76.7	4	13.3	

Table 7:

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

Inspiration using spirometry		Study group		Control group		p. value
		No.	%	No.	%	
Base line (day of admission)	above goal alert Count (score=4)	0	0.0	0	0.0	.000
	goal to alert volume (score=3)	0	0.0	0	0.0	
	below alert volume (score=2)	19	63.3	4	13.3	
	unable to perform incentive spirometry (score=1)	11	36.7	26	86.7	
At discharge	above goal alert Count (score=4)	7	23.3	0	0.0	
	goal to alert volume (score=3)	18	60.0	4	13.3	
	below alert volume (score=2)	5	16.7	7	23.3	.000
	unable to perform incentive spirometry (score=1)	0	0.0	19	63.3	

Table 8:

Comparison between study and control group subject regards PIC Score related to (cough). (n=60)

Cough		Study group		Control group		p. value
		No.	%	No.	%	
Base line (day of admission)	Absent (Score=1)	3	10.0	10	33.3	.003
	Weak (Score=2)	13	43.3	17	56.7	
	Strong (Score=3)	14	46.7	3	10.0	
At discharge	Absent (Score=1)	0	0.0	8	26.7	.000
	Weak (Score=2)	6	20.0	17	56.7	
	Strong (Score=3)	24	80.0	5	16.7	

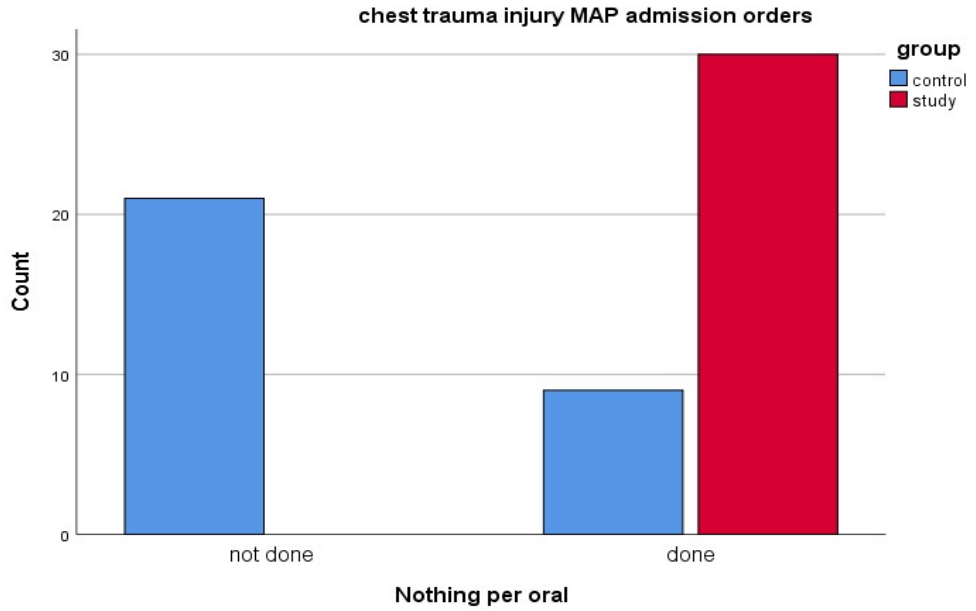

Figure (1) comparison between study and control group subject regards to Chest trauma injury map admission orders related to nothing per mouth

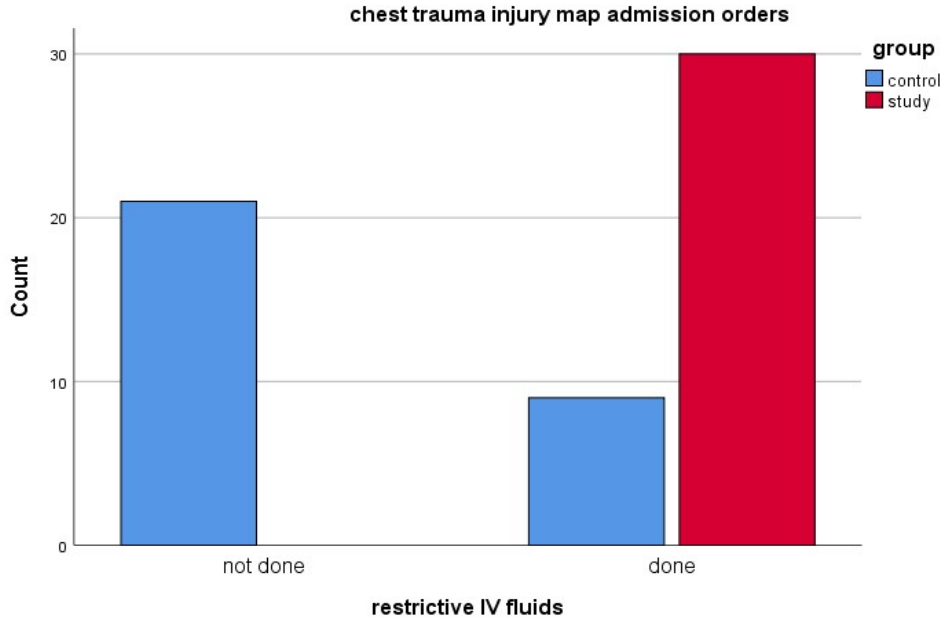

Figure (2) comparison between study and control group subject regards to Chest trauma injury map admission orders related to restrictive IV fluids

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.

Table (2) shows comparison between study and control groups as regards methods of ventilation and Fio2. There were highest percentages of patients in both groups (study &control) (70.0%- 90.0% respectively) were used different mode of mechanical ventilation on admission. With (p=.003**) statistically significant difference between both groups from 1st day to last day. In addition, there was note statistically significant difference when comparison between (1st to last) days and in relation to FiO2 there was statistically significant difference throughout study days. So, hypothesis one was supported.

Table (3) shows comparison study and control group subjects regards hemodynamics monitoring with no statistically significant difference related to (Temperature, Pulse and MAP) in (1^{st}, 3^{rd}) days of study but there were statistically significant differences between both groups (P > 0.05) throughout (5^{th} and last) days of study.

Table (4) shows comparison between study and control groups in relation to arterial blood gases. The table shows the mean score, and the standard deviations of study group related to PH was (7.44 ±.069) and mean score and standard division of control group was (7.44 ±0.095) at admission as (base data) with no statistically significant difference. However, other days the mean score and standard division of study group was (7.42 ± .02) and mean score and standard division of control group was (7.47± 0.067) with statistically significant difference throughout study days (P=0.000 respectively).

Regarding the mean score and standard division of study group related to PaO2 was (138.4 ± 34.5) and mean score and SD of control group was (81.1 ± 15.1) at the 6 days of study, and last day with statistically significant difference (P=0.000 &p=0.003 respectively),

The Paco2, mean score and SD of study group (39.1 ± 4.22) and mean score and SD of control group were (39.18 ± 7.23) at the last day of study, with statistically significant difference (P=0.044 respectively).

The table also shows mean score, and standard division of study group related to HCO3 was (25 ± 2.81) and mean score and standard division of control group was (27.41± 3.85) at the last day of study. With statistically significant difference (P=0.008 respectively).

The SO2 mean score and SD of study group (98.36 ±1.63), and mean score and SD of control group was (93.4 ± 3.5) at the first day of study, but at last day mean score and SD of study group was (99.4 ±.67) and mean score and SD of control group was (93.1 ± 2.43) with statistically significant difference. Also, there was a statistically significant difference at 1st to last day with p value less than (0.05). Moreover, there was a statistically significant difference. So, hypothesis one was partially supported

Table (5) shows a comparison between study and control group subjects regards CVP, intake, output and balance. with no statistically significant difference related to intake, but there was statistically significant difference at (5th day in intake (P < 0.05). As well in relation to CVP there were statistically significant differences between both groups (study& control) (P < 0.05). As regards Balance in all days there were statistically significant differences between both groups (P < 0.05).

Table 6: 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 1^{st} day related to pain assessment but last day with statistically significant difference (P=.000 respectively).

Table (7&8) 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 (1) comparison between study and control group subjects regarding Chest trauma injury map admission orders (nothing per oral) are illustrated in Figure 1. Differences between groups were statistically significant (P=0.000 respectively).

Figure (2) comparison between study and control group subject regards to Chest trauma injury map admission orders (restrictive IV fluids) are illustrated in Figure 2. Differences between groups were statistically significant (P=0.000 respectively).

Discussion

Descriptions of the sample studied:

Demographic characteristics of patients studied: -

The result of current study show that no statistically significant differences found between groups in relation to age, sex, marital status, and level of education. Across both groups, most participants were young, male, married and educated, with no statistically significant difference in mean age between the two groups. This can be explained by that males are more expire to trauma than female during driving and working in high places that most susceptible to falling from high.

In the same line **(Patel, P. et al 2021)** who reported that (41%) were from 25 to 35 years, majority of patient were male. Vehicular accident was the commonest (60%) cause of injury followed by assault (20%).

The current study supported with **(Mohamed, W. et al 2018)** who reported that Sixty participants of head trauma completed the study (30 in each arm). Apart from age, there were no significant differences between groups in baseline characteristics.

The current study not supported by **(Park, C.,et al 2021)** who reported that of the 859 eligible patients, 712 patients were included in the analysis (442 [62.1%] in the baseline group; 270 [37.9%] in the postimplementation group; mean [SD] age: 81.4 [9.1] years; 394 [55.3%] were female).

Related to methods of ventilation and Fio2. There were highest percentages of patients in both groups (study &control) (70.0%- 90.0% respectively) were used different modes of mechanical ventilation on admission. With statistically significant difference between both groups from 1st day to last day. In addition, there was note statistically significant difference when comparison between (1st to last) days and in relation to FiO2 there was statistically significant difference throughout study days.

The current study comes in the same line with **(Mahran, M.,et al 2021)** who reported that 88 adult patients with blunt chest injuries. Patients were enrolled in this study aged ≥18 years old classified into two equal groups: Group I (Non-Invasive Mechanical Ventilation group) = 44 patients: Patients in this group received BIPAP. Group II (Control group=44 patient: Patients in this group have received high flow O2 by mask O2 without use of non-invasive mechanical ventilation. As same line **(Siebens, K., et al 2010)** who reported that the median LOS of intervention subjects was almost shorter than that of control subjects.

Related to the difference in diagnostic procedures performed within the first 24 hours of the study. However, there were statistically significant differences between groups in the number of patients receiving other diagnostic tests, with significantly fewer patients in the control group receiving, nothing per oral (NPO), a chest x-ray, Elevation the head of the bed at 30 degrees until spines is cleared, Complete drug chart, Restrictive IV fluids, Add Troponin to blood screen and start accurate fluid balance. Differences between groups were significant.

In the same line **(Eghbalzadeh, K., et al 2017)** said that on admission to emergency departments

symptoms might be missing or may not be clearly associated with the injury. Accurate diagnostics and early management to prevent serious complications and death are essential for patients suffering a BCT. Optimal initial diagnostics include echocardiography or CT, Holter-monitor recordings, serial 12-lead electrocardiography and measurements of cardiac enzymes. Immediate diagnostics leading to the appropriate therapy are essential for saving a patient's life.

Data of **(Traub, M.,et al 2007)** reported that the study identifies the clinical features associated with further diagnostic information obtained on a CT chest scan compared with a standard chest X-ray in patients sustaining blunt trauma to the chest. CT chest scan is significantly more likely to provide further diagnostic information for the management of blunt trauma compared to a chest X-ray in patients with chest wall tenderness. CT scan was significantly more effective than routine chest X-ray in detecting lung confusions, pneumothoraxes, mediastinal hematomas, as well as fractured ribs, scapula, sternums, and vertebrae.

The current study supported by **(Mohamed, W. et al 2018)** who reported to the using of standardized diagnostic order sheet on admission for all pathway groups result in decreased number of variances among the intervention group in the diagnostic studies in the first 48 hours compared to the control group.

regarding arterial blood gases.

shows comparison between study and control groups in relation to arterial blood gases. The table shows the mean score, and standard division of study group related to PH (7.44 ±.069) and mean score, and standard division of control group was (7.44 ±0.095) at admission as (base data) with no statistically significant difference. However, other days the mean score and standard division of study group was (7.42 ± .02) and mean score and standard division of control group was (7.47± 0.067) with statistically significant difference throughout study days (P=0.000 respectively).

As same line **(Duymaz, T. et al 2019)** who reported that oxygen saturation, vital capacity, tidal volume, PEF, pulmonary arterial pressure, and quality of life were significantly higher in patients who underwent CP compared with the control group. There was a significant improvement in all the parameters of the patients who underwent chest physiotherapy when compared with the intragroup comparisons.

Also, the Current study supported by **(Ju, T. 2015)** who reported that Two groups had no significant improvement in PO2 and oxygenation index at the time point of 24 h and 48 h without significant difference between the two groups. At the time point of 72 h,96h and 120 h, significant differences were observed between the two groups in PO2 and Pa O2/ FIO2(control group: 105. 8 ±28. 4/221. 5 ±28. 7,108. 4 ±30. 7/239. 4 ±25. 3,142. 8 ± 34. 3 /318. 5 ± 35. 7; analgesia group: 131. 8 ± 27. 5/285. 5 ± 32. 7,153. 4 ± 32. 4 /328. 1 ± 30. 6,170. 8 ± 20. 7/350. 2 ± 34. 9), while PH value, PCO2 and SpO2 had no significant difference.

Many studies agree that clinical pathways provide a standardized approach to patient management, leading to improved outcomes. Standardization helps in ensuring that all healthcare providers follow evidence-based practices. **(McDonald, K. M., & Sundararajan, V 2023).** Several researchers emphasize that clinical pathways enhance hemodynamic monitoring and management, particularly in critical care settings. They argue that consistent protocols lead to better management of fluids, medications, and interventions. **(Smith, J. A., et al.2023)**

Clinical pathways improve communication among healthcare providers, which is essential for maintaining optimal patient care and ensuring that interventions are timely and effective. **(Brown, L. T., & Green, R.2024).** Some authors argue that while clinical pathways can standardize care, their effectiveness can vary significantly based on local implementation and adherence levels. This

variability can lead to inconsistent outcomes. **(Johnson, R. C., et al.2023)**
There is debate about whether clinical pathways might limit individualized patient care. Critics suggest that strict adherence to pathways can overlook unique patient needs and nuances, potentially compromising care quality. **(Davis, M. K., & Lee, S. Y. 2023).** Some studies show mixed results regarding the impact of clinical pathways on specific outcomes such as arterial blood gases and daily intake/output balance. This inconsistency suggests that further research is needed to determine the pathways' effectiveness across different patient populations. **(Taylor, P. J., & Nguyen, H. T. 2024)**
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 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 on-admission day related to pain assessment but at discharge 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. 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.
Current study supported by **(Ong, C.,2021)** who reported that 39% of patients were found to have inadequate pain control based on the local chest trauma pathway. 33% of chest trauma patients developed a hospital acquired pneumonia (HAP) and 44% of pts with inadequate pain control developed a HAP. The admission length of patients with HAP secondary to chest trauma was on average three times longer relative to uncomplicated patients (15 days vs 5 days). Chest trauma patients often receive inadequate pain control and delayed specialist team input.
In continence **(Aslan, G., etal., 2014)** who report that that respiratory muscle strength improved by inspiratory and expiratory muscle training in patients with slowly progressive neuromuscular disease.

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