Journal of Health, Medicine and Nursing
ISSN 2422-8419 An International Peer-reviewed Journal
Vol.57, 2018

Effect of Modified Clinical Pathway Guidelines on Congestive Heart Failure Critically Ill Patient's Health Outcomes at Assuit University Hospital, Egypt

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Abstract
Literature review cited that, congestive heart failure critically ill patients are suffering from different health problems which might endanger their lives and safety, compromise their quality of life, and burden hospital resources. Critical care nurses play major role together with the other health care team members in integrating and delivering multidisciplinary health care for such group of patients. This care approach can positively been reflected upon patient's outcomes and other related variables. **Therefore, the aim** of this study is to investigate the effect of modified clinical pathway guidelines on congestive heart failure critically ill patients' health outcomes. **Research hypothesis;** critically ill congestive heart failure patients who are subjected to the modified clinical pathway guidelines in addition to the routine hospital care will Show; **1**- More hemodynamic stability,**2**- Lesser exposure to chest pain and dyspnea attacks, **3**- Fewer systemic complications, **4**- Lesser CCU stay / days and the numbers of re-hospitalizations, **5**- Lesser degree of dependent edema and grade of heart failure, and **6** - Report lesser numbers of negative variables than that of a matched control group of patients whom received the routine hospital care only. **Quasi-experimental research design** was used to conduct this study. **Setting;** the current study was conducted at the Coronary Care Unit of Assuit University Hospitals, Egypt. **Sample;** sixty adult male and female critically ill congestive heart failure patients were included in this study and assigned randomly into two equal and matched groups, (study and control of 30 patients each). **Tools**: Four tools were developed and tested by the investigators. These tools are; **I:** Congestive heart failure critically ill patient's assessment sheet, **II** Congestive heart failure critically ill complications monitoring sheet, **III:** Congestive heart failure critically ill Patient's health outcomes assessment sheet, and **IV:** Modified clinical pathway guidelines variances checklists Congestive heart failure critically ill Patient's health outcomes assessment sheet. **Setting:** Coronary Care Unit (CCU) of El-Or man Hospital, Assuit University Hospitals, Egypt. **Methods:** The researchers trained, participated in coordinating, and supporting the implementation of the clinical pathway guidelines, and then evaluated its effects on the selected congestive heart failure critically ill patients' health outcomes. **Results** of this study revealed that, patients in modified clinical pathway guidelines group got significantly lesser chest pain and dyspnea attacks, decreased weight gain, fewer systemic complications; shorter length of hospital stay / days, with lesser negative variables than that of the control group subjects. Thus the complex research hypothesis can be partially supported. **Conclusion:** Applying modified clinical pathway guidelines could significantly improve patient's health outcomes in congestive heart failure critically ill patients. **Recommendations:** Clinical pathway care approach needs to be supported and initiated in the CCU at Assuit University Hospitals with furthermore replications of this study and other related studies on a larger probability samples in relation to patient's health outcomes, safety, and hospital resources.
Keywords: Congestive Heart Failure Critically ill patients, Modified Clinical Pathway Guidelines, Clinical Pathway, and Patient's Health Outcomes.

1. Introduction

Congestive heart failure (CHF) a potentially life-threatening condition, requiring hospitalization in emergency care unit and it complicates the course of a significant proportion of patients in the ICU. CHF may present as a manifestation of newly diagnosed cardiac disease or as an exacerbation of underlying heart disease, because of fluid overload or stress accompanying acute illness. Emergency treatment is aimed predominantly at managing fluid overload and hemodynamic compromise [(1)]

Cardiac arrhythmias, whether symptomatic or not are common in all forms of heart failure. For example, in a patient with mitral valve regurgitation, the predominant arrhythmia may be atrial fibrillation, which may lead to the further progression of CHF. On the other hand, in a patient with ischemic cardiomyopathy, cardiac arrhythmia may manifest in the form of ventricular tachycardia or ventricular fibrillation, potentially leading to sudden cardiac death. Furthermore, both atrial and ventricular arrhythmias are often present in the same patient [(3)]

Complications on the right side are related to the inability of the right ventricle to pump properly, the most common cause of right-sided heart failure, and generally present as symptoms of systemic congestion, which are: peripheral edema, hepatic congestion and jugular distention. Recognizing the heart chambers affected is essential for the differential diagnosis [(4)]

Clinical Pathways are multidisciplinary care plans used to detail essential steps and timing in the care of patients with a specific clinical problem". Clinical Pathways are typically developed by providers using nationally recognized clinical practice guidelines (CPGs), which are modified as needed by advisory boards or committees. Some providers have created Clinical Pathways independently, often using clinical practice guidelines (CPGs) as a starting point and making modifications based on their own clinical experience. [(5)] Care pathways have become a popular tool to enhance the quality of care by improving patient outcomes, promoting patient safety, decreasing patient complications, and optimizing the use of resources. Also application care pathway in the hospital treatment of heart failure affect in reduce-hospital mortality rate, length of in-hospital stay, and readmission rate when compared with standard care [(6)]

2. Patients and methods

2. 1. Aim of this study:

The aim of this study is to investigate the effect of modified clinical pathway guidelines on congestive heart failure critically ill patients' health outcomes.

2.2. Operational Definitions:

- **Modified Clinical Pathway guidelines:** are group of health care timely settled clinical practices formulated from combination of two clinical health care pathways guidelines in the light of the unit routine care provided to such group of patients considering individual differences and patients 'conditions.
- **Congestive heart failure critically ill patients**: adult male and female critically ill patients admitted to the Coronary Care Unit of El-Or man Hospital, Assuit University Hospitals during the period of the study, willing to participate and able to communicate.
- **Patient's health outcomes, include:**
  - Hemodynamic status as indicated by (oxygenation, respiratory rate of less than 30 c/m, lung sounds, pulse rate, arrhythmias, temperature, and blood pressure).
  - Peripheral edema
  - Chest pain and dyspnea attacks.
  - Health conditions of different body systems.
  - Numbers of positive / negative variances
  - Frequencies of CCU readmissions.
  - Duration of CCU stay (per days).

2.3. Research hypotheses: -

To fulfill the aim of this study the following research hypotheses is formulated;

Critically ill congestive heart failure patients who are subjected to the modified clinical pathway guidelines in addition to the routine hospital care will Show; ; **(1)-** More hemodynamic stability, **(2)-** Lesser exposure to chest pain and dyspnea attacks, **(3)-** Fewer systemic complications, **(4)-** Lesser CCU stay / days and the numbers of re-hospitalizations, **(5)-** Lesser degree of dependent edema and grade of heart failure, and **(6)-** Report lesser numbers of negative variables than that of a matched control group of patients whom received the routine hospital care only.

2.4. Research design: A quasi-experimental research design was used in this study.

2.5. Setting: The study was conducted at the Coronary Care Unit (CCU) of El-Or-man Hospital, Cardiology at Assuit University Hospitals. Which it situated in the second floor of heart center, and it consists of three rooms with 16 beds; two of them consisted of 12 beds, six beds in every one and 4 beds in the third room. Health professionals affiliated to this unit are cooperative and working together as a multi-disciplinary team (the nursing staff, medical staff, pharmacist, dietitian, and physiotherapist). As well, this team was exposed to a lot of workshops, and education/ teaching sessions about updating patient's care and the recent trends of patients 'care through the services provided by the Continuous Education Center affiliated to this unit.

Subjects: a convenience sample of 60 adult male and female critically ill congestive heart failure patients (according to power analysis test). They were assigned randomly into two equal and matched groups; control and study (30 patients each).

2.6. Matching criteria:

- Age range of (1-3 years), Sex, Diagnosis, and Comorbidity diseases (e.g. diabetes mellitus and hypertension) & education.

2.7. Exclusion criteria were:

- Unconsciousness.
- Mechanical ventilation.
- Malignancy.

2.8. Study tools: Four tools were formulated to collect data pertinent to this study after reviewing the related literatures [8, 38]. These tools are:

I. Congestive heart failure critically ill patient's assessment sheet.
II. Congestive heart failure critically ill patients' complications monitoring sheet.
III. Congestive heart failure critically ill Patients' health outcomes assessment sheet.
IV. Modified clinical pathway guidelines variances checklists

2.8.1. Tool I: Congestive heart failure critically ill patient's assessment sheet:

This tool was developed by the researcher based on the related literature [7] to assess the critically ill patients with congestive heart failure; it included three main parts and covering the following:

Part 1: Patients' background data: This part covered 5 items.

This part covered background data as: age, sex, occupation, marital status and patient diagnosis.

Part 2: Cardiovascular assessment items: This part covered 7 items

- Hemodynamic status which included (pulse rate, temperature, respiration, and mean arterial blood pressure (which covered 4 items).
- **Peripheral edema:** using pitting edema scale, this scale adopted from [8] to assess severity of pitting edema, which it started from (+1 to +4). +1 represents no edema and end +4 represents severe edema with 8 mm depth of indentation and return to baseline after 2-5 min (it covered 1item).
- **Assessment of Chest pain**: by using Numerical Rating Scale (NRS) adopted from **Mann& Carr** [9] used to assess the intensity of pain levels on a scale of 0(no pain) to 10 (worst pain). This scale consists of 4 items includes (0→No pain, 1, 2, 3→mild pain, 4, 5, 6→moderate pain and 7, 8, 9, 10→sever pain) (it covered 1item).
- Assessment of congestive heart failure grade (it covered 1item).

Part 3: Respiratory assessment: This part covered 7 items.

- Monitoring oxygen saturation (%), Monitor Fraction of Inspired Oxygen (FiO2), Arterial blood gases (ABG), and abnormal lung sounds as (crackles and wheezing), (it covered 6 items).
- Assessment of dyspnea by using Medical Research Council (MRC) scale this scale adopted from **Best all, et al** [10] to assess difficulty of breathing. It is a simple categorical scale grading the effect of breathlessness of daily activities. It can be either self-reported or interviewer-administered with reported completion times of 30 seconds. It starts at number 1 where breathing is causing no difficulty at all and progresses through to number 5 where breathing is maximal difficulty (It covered 1 item).

2.8.2. Tool II: Congestive heart failure critically ill patients' complications monitoring sheet:

- **Complications related to different body systems**
  1) Cardiac (it covered 6 items).
  2) Respiratory (it covered 2 items).
  3) Musculoskeletal (it covered 2 items).
  4) Thrombi-embolism (it covered 2 items).
  5) Renal (it covered 2 items).
  6) Gastrointestinal (it covered 4 items).

2.8.3. Tool III: Congestive heart failure critically ill Patients' health outcomes assessment sheet.

This tool included designing sheet to study the expected patient's outcomes. It included five main sections:

Section I- Peripheral edema (it covered 1 item).
Section II- Congestive heart failure grade (it covered 1item).
Section III- Length of CCU stay / days (it covered 1 item).
Section IV- Frequencies of patients 'readmissions recorded during study period (it covered 1item)
Section V- Frequency of mortality (it covered 1 item)

2.8.4. Tool IV: Modified clinical pathway guidelines variances checklists: (It covered 3 main items)

This tool aimed to assess the deviation from the expected outcomes as proposed. An observational checklist established by the researchers based on reviewing the recent related literatures to elicit variances during study days It included three types of variance, Type one **(patient variance),** negative patient variance occurs when

patient doesn't comply with the prescribed treatment or there is a need for additional interventions previously unplanned. Positive patient variance occurs when patient is complying with the prescribed treatment. Second type (**clinician variance**); it is related to critical care team. This type of variance can be negative as delay in medical consultation and inadequate discharge planning or positive as accurate procedures practices. And the last type **(hospital variance**) this type of variance can be negative as delay in tests results, delay or cancellation of procedures and delay in discharge as result of routine hospital administration or positive as providing adequate supplies for patient care.

2.9. Methods:

- The study was conducted though out three main phases, which were preparatory, implementation, and evaluation phases.

2.9.1. Preparatory phase:-

Included the following:

- Preparation of the study tools and the clinical pathway guidelines practices.
- Content & face validity of the tools & the clinical path way guidelines practices were done by nine experts (3 medical, 3 nursing educators and 3nurse clinicians). The necessary modifications were done accordingly.
- Granting written approvals from the different administrative authorities to initiate and conduct the study
- Preparing the health care team members whom will be included to keep them oriented and ready.
- A pilot study was carried out on 10% of patients' sample (Six patients to check and ensure clarity, feasibility and applicability of the tools, little modifications were done, so the pilot study subjects were included in the actual study.
- The Reliability of assessment tools were tested using Cronbach's alpha.

Clinical pathway team:

Clinical pathway team consisted of (the nursing staff, medical staff, pharmacist, dietitian, physiotherapist, the cardiologist, professor of critical care nursing. The established pathway examined by experts in the field of services and education to test for content validity.

The clinical pathway team and the researchers observed and managed the pilot study patient in three stages; **admission stage**, it takes the first 24 hours and made patient assessment every 15 min in 1st hour q 30 min in 2nd hour then q 1hour after that, **the acute care stage** that targets two days, in this stage made patient assessment every 4 hours, and **the maintenance stage** that targets another three days, in this stage made patient assessment twice per day. The clinical outcomes of the patients assessed every day until six days.

2.9.3. Implementation & Evaluation phases:

Data of the current study were collected from August 2015 to July 2016, once an official permission was obtained from the director of the Coronary Care Unit (CCU) & the nursing unit manager as well as, from the other concerned health care team professionals. The nursing unit manager played a critical role in the recruitment of the study participant's as she was informing the researcher when a new congestive heart failure critically patient was admitted to the Coronary Care Unit. The researcher then contacted the eligible patients to seek their formal consents and to explain the aim and nature of the study, further, answer any questions they might have about the study and to gauge their interest in participating in the study. The participants got one day to think about their involvement and asking the physicians working in the Coronary Care Unit about the importance of the study.

For control group subjects;

- The control group patients received the routine hospital care only. Those patients were selected as a convenience sample off those whom were legible and willing to participate in the study. Written consents were granted from each patient after explaining the purpose and nature of the study. Data collected from the control group patients first before implementation of the clinical pathway procedures.
- Assessments of control group patients were done on admission and daily for six days using the four study tools.

For study group subjects;

The researchers conducted six meetings with the different CCU team members (nursing staff, medical staff, pharmacist, dietitian, physiotherapist) to explain the nature and purpose of the study as well as, revises the care path way approaches, while handing each of them a written copy of the assessments tools and the designed clinical pathway guidelines and discussed any unclear issue as well as, answered any question raised. Also seek their written consents to participate in the intervention process and their approval of the clinical pathway practice guidelines. For the nurse manager, the researcher interviewed and discussed the aim and nature of the study in a closed meeting and gave a written copy of the study and the designed modified clinical pathway guidelines to them. For CCU nursing staff the researcher presented and introduced the study through six educational

discussion sessions and assured their understanding and readiness to implementation.
A matched group of patients was selected as a study group subjects. Then,

- Data collection from the study group who were subjected to the clinical pathway implemented by researchers and health care providers in (CCU) was initiated.
- The researchers acted as a participant observer, care coordinator, trainer and supported the implementation all through the study period.

The established clinical pathways were implemented for six consecutive days to each of the study group patients. both study and control group subjects were assessed on admission to obtain baseline data using study tool 1, then assessment was done every 15 min during the 1st hour, then, q 30 min in 2nd hour and, q 1hour for the first six hours, then, every 4 hours during the 1st 72 hours, and every 6 hours according to patient's conditions. Then the mean of these readings was calculated. In addition to ECG monitoring in addition to;

- Pain assessment for pain intensity, using numerical scale performed from first day and daily for six days using tool I part 2.
- Peripheral edema daily for from first day and daily for five days from admission using peripheral edema scale using tool I part 2.
- Observing patients during exercise and recording dyspnea using dyspnea scale (MRC scale) from first day and daily for six days using tool I part 3.
- Complication monitoring utilizing Tool II.
- Patients' health outcomes using Tool III on daily bases
- Recording positive and negative variances using Tool IV and variance data collected, analyzed, & recorded, and then a plan developed / modified to correct them.

3. Ethical considerations:

- Research proposal was approved from Ethical Committee of in the Faculty of Nursing – Assuit University, Egypt.
- The study was following common ethical principles of the clinical researches.
- Written consent obtained from patients or guidance that is willing to participate in the study after explaining the nature and purpose of the study.
- Patient assured that the data of this research will not be reused without a second permission.
- Confidentiality and anonymity assured.
- Patients have the right to refuse to participate and \or withdraw from the study without any rationale at any time.

4. Statistical analysis

- After completion of the data collection for intervention group, statistical analysis was done by computer programmed SPSS (version 20.0) software. Data were presented using descriptive statistics in the form of frequencies and percentage (N, %), used for describing and summarizing qualitative variables. Mean and standard deviation used for describing and summarizing quantitative variables. Quantitative continuous data were compared using t- test for comparisons between two groups. Qualitative variables were compared using chi-square ($\chi 2$). In addition to One Way Anova tests used to determine significance for numerical variables.
- The critical value of tests "P" was considered statistically significant when P less than 0.05.

5. Results

The current study was aimed to investigate the effect of modified clinical pathway guidelines on congestive heart failure critically ill patients' health outcomes to achieve the aim of this study the following research hypothesis was formulated;

Critically ill Congestive heart failure patients who are subjected to the modified clinical pathway guidelines in addition to the routine hospital care will show; **(1)**- More hemodynamic stability, **(2)**- Lesser exposure to chest pain and dyspnea attacks, **(3)**- Fewer systemic complications, **(4)**- Lesser CCU stay / days and the numbers of re-hospitalizations, **(5)**- Lesser degree of dependent edema and grade of heart failure, and **(6)**- Report lesser numbers of negative variables than that of a matched control group of patients whom received the routine hospital care only.

Results of the current study are presented in two sections: -

- **Section one:** Describes the background data (Tables 1).
- **Section two:** Delineates hypotheses testing for being supported or not (Tables 2-14) and figures (1-4) are related to this section.

Section one: Described the background data

Table (1): Comparison between study and control groups in relation to patient's background data

Background data		Study group N=30		Control group N=30		P. value
		No.	%	No.	%	
Age	20 - 30 years	0	0.0	0	0.0	0.123
	31 - 40 years	4	13.3	6	20.0	
	41 - 50 years	8	26.7	6	20.0	
	51 - 60 years	18	60	18	60.0	
	Mean ±SD	51.7±8.7		50.3±9.6		0.559
Sex	Male	15	50.0	13	43.3	0.121
	Female	15	50.0	17	56.7	
Marital status	Married	26	86.7	26	86.7	0.721
	Single	2	6.7	1	3.3	
	Divorced	2	6.7	2	6.7	
	Widow	0	0.0	1	3.3	
Occupation	Not working	18	60.0	19	63.3	0.458
	Manual	5	16.7	2	6.7	
	Professional	7	23.3	9	30.0	
Diagnosis	Congestive heart failure (CHF)+ Diabetes Mellitus	8	26.7	10	33.3	0.843
	CHF+ Hypertension	7	23.3	6	20.0	
	CHF+ Ischemic Heart Diseases	10	33.3	12	40.0	
	CHF+ Others as (appendectomy & hysterectomy	5	30.0	2	30.0	

* Statistically significant difference ($p<0.05$)

5.1. Table 1: Showed that, (50%) of the study group were males as compared with (43.3%) of control group. The highest percentages of them (60.0%) of both groups were in the age group of 51 to 60 years old with a mean of (51.7±8.7) and (50.3±9.6) respectively. In relation to marital status majority of patients in both groups being married (86.7%). Regarding **occupation,** (60% - 63.3%) respectively of the study and control group patients was not working. As well, the highest percentage of both groups was diagnosed as congestive heart failure with ischemic heart disease with no significant statistical differences between them**.**

Section II: Hypothesis testing

In relation to hypothesis one, this states that s; critically ill congestive heart failure patients who are subjected to the modified clinical pathway guidelines in addition to the routine hospital care will Show More hemodynamic stability than that of a matched control group of patients whom received the routine hospital care only (tables 2-4 are related to this hypothesis)**.**

Table (2): Comparison between study and control groups as regards to hemodynamic state as indicated by temperature, respiration, pulse, and mean arterial pressure

Groups / Items	Days	Study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
Temperature	On admission	36.5±0.7	36.5±0.6	0.970
	2nd day	35.7±6.2	36.7±0.4	0.366
	3rd day	36.9±0.4	36.8±0.4	0.262
	4th day	36.9±0.3	36.9±0.4	0.738
	5th day	37±0.5	37.1±0.5	0.209
	6th day	35.5±6.7	37±0.7	0.264
	P1	0.024*	0.008**	
	P2	0.322	0.717	
Respiration	On admission	33.2±7.7	35.5±7.1	0.251
	2nd day	27.4±4.6	31.3±4.5	0.002**
	3rd day	24.4±4.1	28.3±5.1	0.002**
	4th day	22.6±4	27±6.1	0.002**
	5th day	22±3.8	26.7±5.6	0.001**
	6th day	21.2±3.8	25.3±6.4	0.009**
	P1	0.000**	0.000**	

Groups / Items	Days	Study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
	P2	0.083	0.350	
Pulse	On admission	93.8±29.1	96.3±30.7	0.749
	2nd day	91.7±27.6	91.5±24.1	0.980
	3rd day	86.5±21.6	89.7±18.4	0.535
	4th day	89.7±20.1	86±19.1	0.484
	5th day	89.4±21.5	84.1±17.8	0.321
	6th day	88.5±17.4	85.7±24.9	0.644
	P1	0.264	0.019*	
	P2	0.275	0.466	
Mean arterial pressure (MAP)	On admission	85.3+11.76	97.24+17.49	0.003**
	2nd day	85.8+12.02	89.86+14.12	0.236
	3rd day	82.36+7.95	85.74+16.78	0.324
	4th day	83.99+8.97	85.26+14.26	0.688
	5th day	84.17+8.74	84.73+15.98	0.872
	6th day	81.84+8.44	82.94+16.39	0.765
	P1	0.629	0.005**	
	P2	0.343	0.560	

* Statistically significant difference ($p<0.05$) ** statistically significant difference ($p<0.01$).
P_1 value: comparison between on admission day &4th day **P_2 value:** comparison between 4th day &6th day

5.2. Table 2: Demonstrates a statistically significant difference between study & control groups at 2nd day to 6th day ($P<0.009$) in relation to respiration, also, there was statistically significant difference in the first day only in relation to MAP and there was statistically significant difference in comparison between 1st and 4th day as regards to control group patients.

Table (3): Comparison between study and control groups as regards to hemodynamic state as indicated by arterial blood gases values

Arterial Blood Gases(ABGs)	Days	Study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
PH	On admission	7.42±0.10	7.42±0.05	0.353
	2nd day	7.43±0.1	7.42±0.1	0.855
	3rd day	7.42±0.1	7.41±0.1	0.524
	4th day	7.43±0.1	7,45±0.4	0.601
	5th day	7.5±0.1	7.5±0.1	0.395
	6th day	7.46± 0.2	7.47±0.4	0.502
	P1	0.417	0.523	
	P2	0.346	0.334	
Pao_2	On admission	72.9±27.7	70.8±41.8	0.837
	2nd day	71.3±26.5	82.6±37.4	0.354
	3rd day	94.9±32.1	86.4±48.3	0.612
	4th day	84.8±9.3	77.5±41.1	0.735
	5th day	89±26.3	65.2±22.1	0.101
	6th day	94.1±16.4	60.5±31.4	0.016*
	P1	0.020*	0.496	
	P2	0.640	0.335	
$PaCO_2$	On admission	35±12.5	38.2±15	0.432
	2nd day	35.7±10.2	36.2±12.1	0.913
	3rd day	31.7±8.5	36.1±9.9	0.237
	4th day	38.5±3.3	37±10.6	0.787
	5th day	35.8±12.5	35.7±1054.4	0.562
	6th day	28±6.1	35.8±13.3	0.160
	P1	0.767	0.336	
	P2	0.314	0.160	
	On admission	39.43±11.13	42.6±13.8	0.331

Arterial Blood Gases(ABGs)	Days	Study group N=30	Control group N=30	P. value
		Mean ±SD	Mean ±SD	
Fio_2	2nd day	34.43+11.13	43.6+13.8	0.006**
	3rd day	27.5±8.55	39.87±11.42	0.000**
	4th day	23.7±7.42	37.07±13.56	0.000**
	5th day	21.66±3.53	36.31±12.67	0.000**
	6th day	21.52±2.69	36.48±11.98	0.000**
	P1	<0.001**	0.407	
Sao_2	On admission	87.5±21.7	86.5±20.5	0.871
	2nd day	91±14.4	90.2±7.4	0.838
	3rd day	96.5±2.2	92.1±6.6	0.044*
	4th day	97±1.2	85.3±19.9	0.002**
	5th day	96.5±3.1	89.8±9.1	0.0003**
	6th day	98±1.2	77.6±26.4	0.0001**
	P1	0.019*	0.181	
	P2	0.002**	0.207	

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01)
P_1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.3. Table 3: Showed that there was statistically significant difference as regarding to Sao_2 and Fio2 from 3rd to 6th days between study and control groups, also there were statistically significant difference when compared between the first day and 3rd days in relation to (Pao2 and Sao2) for study group only. **Thus, hypothesis one was partially supported.**

Table (4): Comparison between study and control groups in relation to lung sound assessment

Variable	Days	Lung sound	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Lung sound assessment	On admission	Normal	9	30.0	3	10.0	0.151 NS
		Crackles	20	66.7	26	86.7	
		Wheezing	1	3.3	1	3.3	
	2nd day	Normal	15	50.0	4	13.3	0.009**
		Crackles	14	46.7	25	83.3	
		Wheezing	1	3.3	1	3.3	
	3rd day	Normal	18	60.0	6	20.0	0.005**
		Crackles	12	40.0	23	76.7	
		Wheezing	0	0.0	1	3.3	
	4th day	Normal	20	66.7	8	26.7	0.014*
		Crackles	10	33.3	21	70.0	
		Wheezing	0	0.0	1	3.3	
	5th day	Normal	25	83.3	11	26.7	0.001**
		Crackles	5	16.7	18	70.0	
		Wheezing	0	0.0	1	3.3	
	6th day	Normal	27	93.3	13	26.7	0.001**
		Crackles	3	10.0	16	70.0	
		Wheezing	0	0.0	1	3.3	
		P1	**0.049***		**0.553**		
		P2	0.0601		0.393		

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01).
P_1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.4. Table 4: Showed statistically significant difference at 2nd day to 6th days (P<0.05) in relation to lung sound between both groups (study and control); also there was statistically significant difference when comparison between 1st & 4th day for study group only. **Thus, hypothesis one was supported.**

In relation to hypothesis two, this states that: Critically ill Congestive heart failure patients who will be subjected to the modified clinical pathway guidelines will be Lesser exposure to chest pain and dyspnea attacks than patients who received the routine hospital care only (tables 5- 6 are related to this hypothesis).

Table 5: Distribution of the occurrence of chest pain intensity for study and control groups

Variable	Days	Items	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Chest Pain intensity	On admission	No pain	6	20.0	9	30.0	0.482
		Mild	2	6.7	1	3.4	
		Moderate	15	50.0	10	33.3	
		Sever	7	23.3	10	33.3	
	2nd day	No pain	17	56.6	12	40.0	0.010*
		Mild	11	36.7	5	16.7	
		Moderate	2	6.7	12	40.0	
		Sever	0	0.0	1	3.3	
	3rd day	No pain	28	93.4	16	53.4	0.002**
		Mild	1	3.3	7	23.3	
		Moderate	1	3.3	7	23.3	
		Sever	0	0.0	0	0.0	
	4th day	No pain	29	96.7	16	53.3	0.002**
		Mild	1	3.3	8	26.7	
		Moderate	0	0.0	5	16.7	
		Sever	0	0.0	1	3.3	
	5th day	No pain	30	100.0	17	56.6	– –
		Mild	0	0.0	8	26.7	
		Moderate	0	0.0	5	16.7	
		Sever	0	0.0	0	0.0	
	6th day	No pain	30	100.0	14	46.7	– –
		Mild	0	0.0	10	33.3	
		Moderate	0	0.0	6	20.0	
		Sever	0	0.0	0	0.0	
		P1	0.021*		0.001*		
		P2	--		0.553		

* Statistically significant difference ($p<0.05$) ** statistically significant difference ($p<0.01$).
P_1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.5. Table 5: Illustrated that there was statistically significant difference between both groups (study & control) at 2nd, 3rd &4th days with p. value = (0.010, 0.002, 0.002) respectively in relation to chest pain intensity. Also, there were statistically significant differences when comparison between admission and 4th days for both groups. **Thus, hypothesis two was supported.**

Table (6): Comparison between study and control groups as regards to scale for dyspnea assessment

Items	Days	Scale	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Assessment of dyspnea by Medical Research Council (MRC)	On admission	**0**	1	3.3	0	0.0	0.616
		1	0	0.0	0	0.0	
		2	2	6.7	4	13.3	
		3	16	53.3	13	43.3	
		4	11	36.7	13	43.3	
	2nd day	**0**	2	6.7	0	0.0	0.003**
		1	3	10.0	1	3.3	
		2	14	46.7	7	23.3	
		3	11	36.7	11	36.7	
		4	0	0.0	11	36.7	
	3rd day	**0**	7	23.3	0	0.0	0.002**
		1	6	20.0	2	6.7	
		2	13	43.3	12	40.0	
		3	4	13.3	13	43.3	
		4	0	0.0	3	10.0	

Items	Days	Scale	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
	4th day	0	9	30.0	2	6.7	0.001**
		1	14	46.7	5	16.7	
		2	7	23.3	9	30.0	
		3	0	0.0	11	36.7	
		4	0	0.0	3	10.0	
	5th day	0	21	70.0	3	10.0	0.001**
		1	9	30.0	4	13.3	
		2	0	0.0	9	30.0	
		3	0	0.0	10	33.3	
		4	0	0.0	4	13.3	
	6th day	0	27	90.0	1	3.3	0.001**
		1	3	10.0	2	6.7	
		2	0	0.0	14	46.7	
		3	0	0.0	9	30.0	
		4	0	0.0	4	13.3	
	P1		0.001**		0.004**		
	P2		0.002		0.294		

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

P_1 value: comparison between on admission & 4th day **P_2 value:** comparison between 4th day & 5th day

N.B Scale variables Score

- ☒ Get only breathless with strenuous exercise 0
- ☒ Get short of breath when hurrying on the level or walking up a slight hill. 1
- ☒ Walk slower than people of the same age on the level because of breathlessness or should stop for breath when walking at my own pace on the level. 2
- ☒ Stop breath after walking about 100 yards or after a few minutes on the level. 3
- ☒ Too breathless to leave the house" or breathless when dressing" 4

5.6. Table 6: Showed statistically significant difference between study and control groups in relation to dyspnea from 2nd to 6th days in addition there was statistically significant difference when comparison between (1st & 4th) days in relation both groups. **Thus, hypothesis two was supported**.

In relation to hypothesis three, this states that: Critically ill Congestive heart failure patients who will be subjected to the modified clinical pathway guidelines will be had fewer systemic complications related to different body systems than patients who received the routine hospital care only (Tables 7-12 figure one are related to this hypothesis)**.**

Table (7): Comparison between study and control groups as regards to cardiac complications

Items	Days	Type of complication	Study group N=30		Study group N=30		P. value
			No.	%	No.	%	
Cardiac complications	On admission	Tachycardia	5	16.7	6	20.0	0.879
		Atrial fibrillation	2	6.7	4	13.3	
		Ventricular arrhythmia	0	0.0	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	9	30.0	9	30.0	
		Hypotension	3	10.0	1	3.3	
		More than one complication	8	26.7	6	20.0	
		No complication	3	10.0	3	10.0	
	2nd day	Tachycardia	2	6.7	7	23.3	0.171
		Atrial fibrillation	1	3.3	4	13.3	
		Ventricular arrhythmia	2	6.7	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	8	26.7	11	36.7	
		Hypotension	4	13.3	1	3.3	
		More than one complication	9	30.0	4	13.3	
		No complication	4	13.3	2	6.7	
		Tachycardia	3	10.0	4	13.3	**0.049***

Items	Days	Type of complication	Study group N=30		Study group N=30		P. value
			No.	%	No.	%	
	3rd day	Atrial fibrillation	1	3.3	5	16.7	
		Ventricular arrhythmia	2	6.7	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	6	20.0	10	33.3	
		Hypotension	5	16.7	1	3.3	
		More than one complication	2	6.7	5	16.7	
		No complication	11	36.7	4	13.3	
	4th day	Tachycardia	3	10.0	3	10.0	
		Atrial fibrillation	1	3.3	5	16.7	
		Ventricular arrhythmia	1	3.3	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	2	6.7	9	30.0	**0.029***
		Hypotension	5	16.7	2	6.7	
		More than one complication	3	10.0	5	16.7	
		No complication	15	50.0	5	16.7	
	5th day	Tachycardia	0	0.0	4	13.3	
		Atrial fibrillation	1	3.3	5	16.7	
		Ventricular arrhythmia	1	3.3	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	2	6.7	9	30.0	**0.001****
		Hypotension	4	13.3	2	6.7	
		More than one complication	1	3.3	5	16.7	
		No complication	21	70.0	4	13.3	
	6th day	Tachycardia	0	0.0	4	13.3	
		Atrial fibrillation	1	3.3	5	16.7	
		Ventricular arrhythmia	1	3.3	1	3.3	
		Other conductive disturbance as (RBBB, LBBB…)	2	6.7	9	30.0	**0.001****
		Hypotension	4	13.3	2	6.7	
		More than one complication	1	3.3	4	13.3	
		No complication	21	70.0	5	16.7	
		P1	0.005**		0.017*		
		P2	0.530		1.000		

*Statistically significant difference ($p<0.05$) ** statistically significant difference ($p<0.01$)
P_1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day.
Note: RBBB (Right Bundle Branch Block) **LBBR** (Light Bundle Branch Block)

5.7. Table 7: Showed that no statistically significant difference between both groups subjects (study and control) as regards cardiac complications at the 1st day, while showed statistically significant difference between both group (study and control) from 3rd to 6th days. Also, there was statistically significant difference between comparison at 1st day and 3rd days regarding study group only. **Thus, hypothesis three was supported.**

Table (8) Comparison between study and control group subjects as regards to respiratory complications

Variable	Days	Type of complication	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Respiratory complications	On admission	Pulmonary edema	2	6.7	3	10.0	0.823
		Pulmonary congestion	14	46.7	12	40.0	
		No complication	14	46.7	15	50.0	
	2nd day	Pulmonary edema	2	6.7	1	3.3	0.779
		Pulmonary congestion	13	43.3	12	40.0	
		No complication	15	50.0	17	56.7	
	3rd day	Pulmonary edema	2	6.7	1	3.3	0.374
		Pulmonary congestion	8	26.7	13	43.3	
		No complication	20	66.7	16	53.3	
	4th day	Pulmonary edema	2	6.7	1	3.3	0.014*
		Pulmonary congestion	3	10.0	13	43.3	
		No complication	25	83.3	16	53.3	
		Pulmonary edema	2	6.7	2	6.7	<0.001**

Variable	Days	Type of complication	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
	5th day	Pulmonary congestion	1	3.3	12	40.0	
		No complication	27	90.0	16	53.7	
	6th day	Pulmonary edema	1	3.3	2	6.7	0.001**
		Pulmonary congestion	1	3.3	10	33.3	
		No complication	28	93.3	18	60.0	
		P1	**0.259**		**0.585**		
		P2					

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01).
P1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day.

5.8. Table 8: Revealed that (53.4%, 50%) respectively of study and control group had respiratory complications on admission. Also, there was reduction in respiratory complication from 2nd day of study with statistical significant difference between both groups at 4th ,5th & 6th day with p value at (0.014*, <0.001**, 0.001**) respectively. **Thus, hypothesis three was supported.**

Table (9): Comparison between study and control groups as regards to Musculoskeletal complications

Variables	Days	Types of complications	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Musculoskeletal Complications	On admission	Muscle wasting	0	0.0	0	0.0	1.00
		Respiratory muscle wasting	0	0.0	0	0.0	
		No complication	30	100.0	30	100.0	
	2nd day	Muscle wasting	0	0.0	0	0.0	0.313
		Respiratory muscle wasting	1	3.3	0	0.0	
		No complication	29	96.7	30	100.0	
	3rd day	Muscle wasting	0	0.0	0	0.0	0.313
		Respiratory muscle wasting	1	3.3	0	0.0	
		No complication	29	96.7	30	100.0	
	4th day	Muscle wasting	0	0.0	0	0.0	0.313
		Respiratory muscle wasting	1	3.3	0	0.0	
		No complication	29	96.7	30	100.0	
	5th day	Muscle wasting	0	0.0	1	3.3	0.368
		Respiratory muscle wasting	1	3.3	0	0.0	
		No complication	29	96.7	29	96.7	
	6th day	Muscle wasting	0	0.0	1	3.3	0.368
		Respiratory muscle wasting	1	3.3	0	0.0	
		No complication	29	96.7	29	96.7	
		P1	1.000		0.897		
		P2	0.472		1.000		

*Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01)
P1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.9. Table 9: Demonstrated that, no statistically significant difference between study and control group regarding musculoskeletal complications throughout the days of study and no statistically significant difference when compared 1st day with 4th days in two groups. **Thus, hypothesis three was not supported.**

Table (10): Comparison between study and control groups as regards to Thrombo-embolism complications

Variables	Days	Type of complication	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Thrombi-embolism complicati	On admission	Peripheral embolism	0	0.0	0	0.0	0.447
		Deep venous thrombosis	3	10.0	5	16.7	
		No complication	27	90.0	25	83.3	
	2nd day	Peripheral embolism	0	0.0	1	3.3	0.529
		Deep venous thrombosis	2	6.7	3	10.0	

Variables	Days	Type of complication	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
		No complication	28	93.3	26	86.7	
	3rd day	Peripheral embolism	0	0.0	1	3.3	0.399
		Deep venous thrombosis	2	6.7	4	13.3	
		No complication	28	93.3	25	83.3	
	4th day	Peripheral embolism	0	0.0	1	3.3	0.399
		Deep venous thrombosis	2	6.7	4	13.3	
		No complication	28	93.3	25	83.3	
	5th day	Peripheral embolism	0	0.0	1	3.3	0.065
		Deep venous thrombosis	0	0.0	4	13.3	
		No complication	30	100.0	25	83.3	
	6th day	Peripheral embolism	0	0.0	1	3.3	0.065
		Deep venous thrombosis	0	0.0	4	13.3	
		No complication	30	100.0	25	83.3	
		P_1	0.236		0.574		
		P_2	0.897		1.000		

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01).
P1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.10. Table 10: Demonstrated that, no statistically significant difference between study and control group regarding to thrombi-embolism complications throughout study days. **Thus, hypothesis three was not supported.**

Table (11) Comparison between study and control groups as regards to renal complications

Variables	Days	Types of complications	Study group N=30		Control group N=30		P. value
			No.	%	No.	%	
Renal complications	On admission	Renal impairment	8	26.7	13	43.3	0.376
		Acute renal failure	9	30.0	6	20.0	
		No complication	13	43.3	11	36.7	
	2nd day	Renal impairment	4	13.3	10	33.3	0.182
		Acute renal failure	10	33.3	7	23.3	
		No complication	16	53.3	13	43.3	
	3rd day	Renal impairment	7	23.3	11	36.7	0.491
		Acute renal failure	6	20.0	6	20.0	
		No complication	17	56.7	13	43.3	
	4th day	Renal impairment	8	26.7	11	36.7	0.138
		Acute renal failure	2	6.7	6	20.0	
		No complication	20	66.7	13	43.3	
	5th day	Renal impairment	10	33.3	10	33.3	0.046*
		Acute renal failure	2	6.7	9	30.0	
		No complication	18	60.0	11	36.7	
	6th day	Renal impairment	9	30.0	9	30.0	0.024*
		Acute renal failure	2	6.7	10	33.3	
		No complication	19	63.3	11	36.7	
		P1	0.051*		0.074		
		P2	0.959		0.505		

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01).
P1 value: comparison between on admission & 4th day **P_2 value:** comparison between 4th day &6th day

5.11. Table 11: Showed that about (56.7%, 33.4%, &36.7%) of the study group patients had renal complications throughout the study days as compared to (63.3%, 56.7%, & 63.3) of the control ones, with statistically significant difference with p value = (0.046, 0.024) respectively between both groups at 5th and 6th days and there was statistically significant difference when comparison between 1st and 4th days in relation to study group. **Thus, hypothesis three was supported.**

5.12. Figure 1: Showed that, about (50.0%, 13.3 &3.3%) of the study group patients had gastro-intestinal complication throughout the day of study as compared with (56.7%, 66.7%, &60.0%) of control ones, with a significantly statistical difference with p value at (0.40, < 0.001) respectively between them from 3rd and 6th day. **Thus, hypothesis three was supported.**

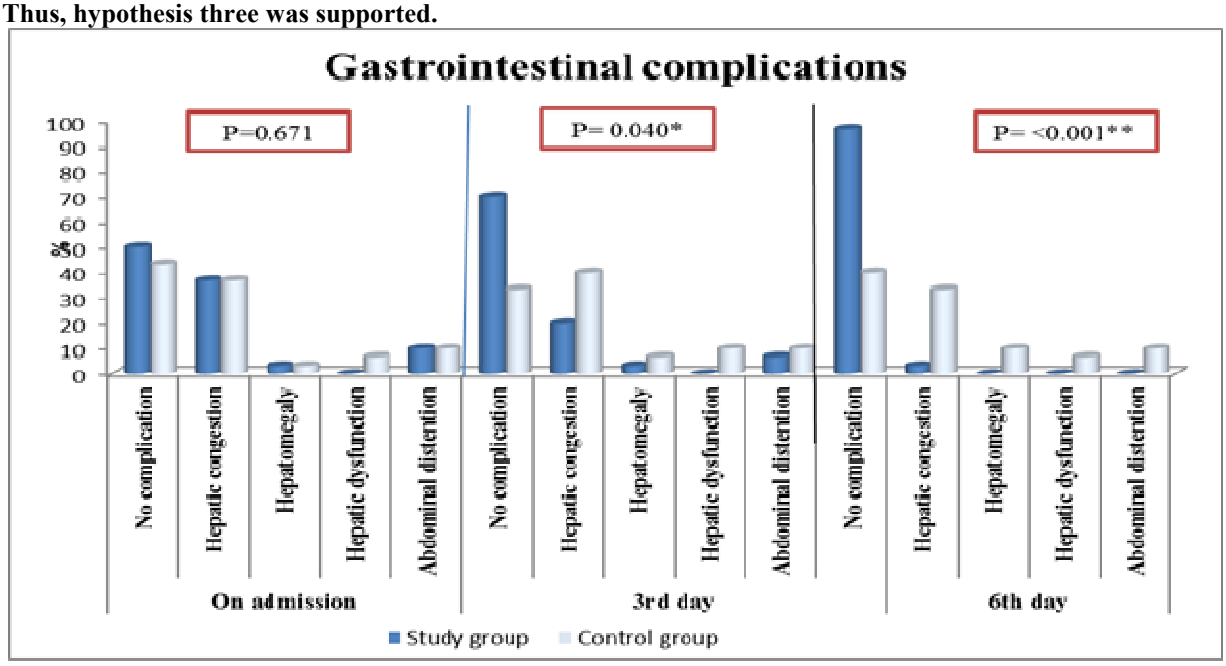

Figure (1) Comparison between study and control groups as regards to gastrointestinal complications

In relation to hypothesis four, this states that: Critically ill Congestive heart failure patients who will be subjected to the modified clinical pathway guidelines will be had Lesser CCU stay / days and the numbers of re-hospitalizations than patients who received the routine hospital care only (figures 2-4 are related to this hypothesis)**.**

5.13. Figure 2: Illustrated that majority (86.7%) of study group subjects stayed from five to six days as compared to more than half (53.4%) of control group subjects who stayed more than or equal seven days, with a statistically significant difference at p value = 0.019 between both groups. **Thus, hypothesis four was supported.**

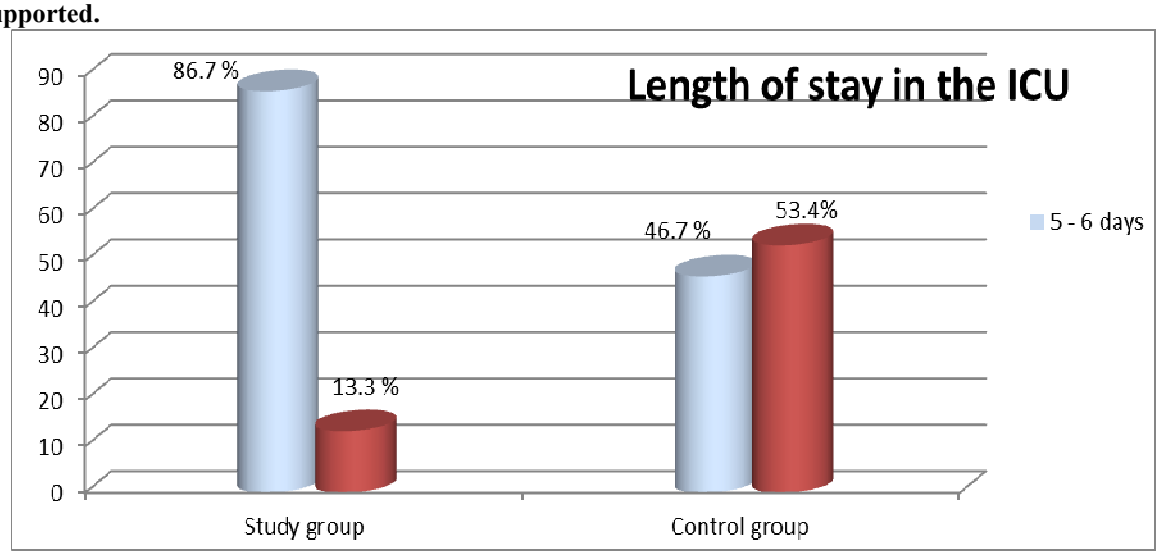

Figure (2): Comparison between study and control groups according to length of stay at ICU (n=60).

5.14. Figure 3: Described that 30% of control group as compared 3.3% of the study group patients were readmitted to CCU during study period with a statistically significant difference at p value =0.26 between both groups. **Thus, hypothesis four was supported.**

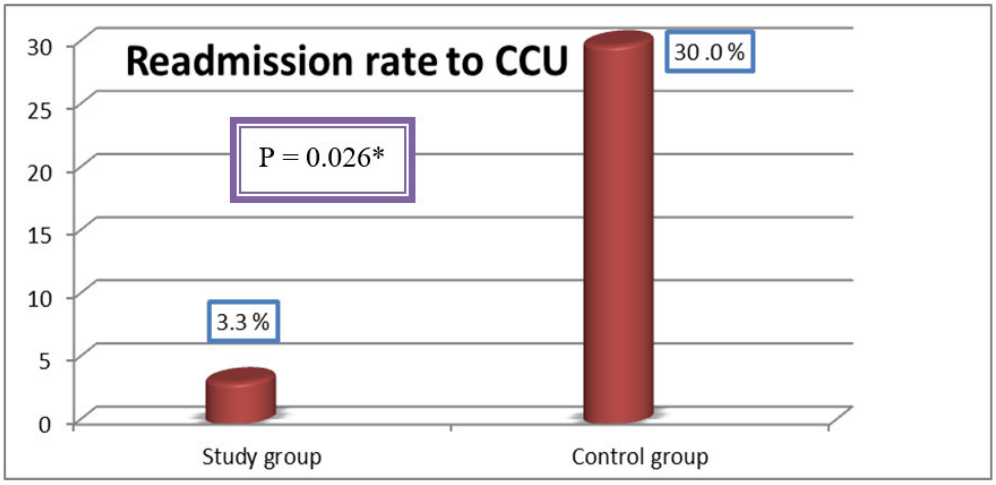

Figure (3): Comparison between study and control groups according to readmission rate to CCU through the study period

5.15. Figure 4: Showed that there were decreasing in mortality rate in study group as compared with control group, but there was no statistically significant difference regarding number of death between both groups. **Thus, hypothesis four was partially supported.**

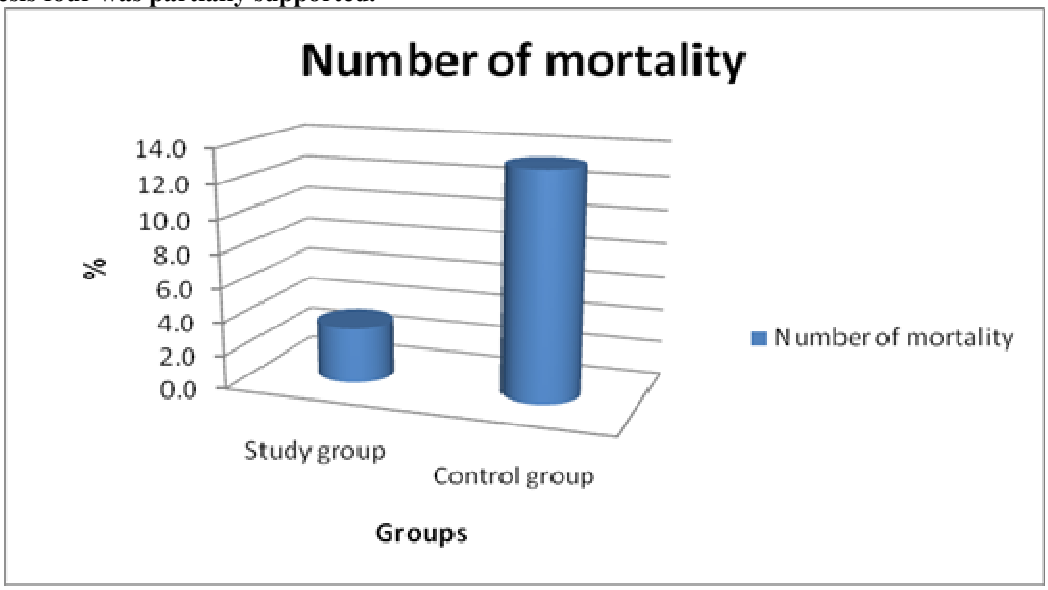

Figure (4): Comparison between study and control groups according to mortality rate (n=60).

In relation to hypothesis five, this states that: Critically ill Congestive heart failure patients who will be subjected to the modified clinical pathway guidelines will be had lesser degree of dependent edema and grades of heart failure than patients who received the routine hospital care only (Tables 12-13 are related to this hypothesis).

Table (12): Comparison between study and control groups as regards to peripheral edema scale

Items	Days	Scale	Study group N=30		Control group N=30		P. value
			No	%	No	%	
Peripheral	On admission	+1	4	13.3	2	6.7	0.407
		+2	6	20.0	3	10.0	
		+3	13	43.3	15	50.0	
		+4	7	23.3	10	33.3	
	2nd day	+1	7	23.3	3	10.0	0.001**
		+2	16	53.3	3	10.0	
		+3	7	23.3	17	56.7	
		+4	0	0.0	7	23.3	

Items	Days	Scale	Study group N=30		Control group N=30		P. value
			No	%	No	%	
edema assessment	3rd day	+1	12	40.0	4	13.3	0.001**
		+2	16	53.3	9	30.0	
		+3	2	6.7	14	46.7	
		+4	0	0.0	3	10.0	
	4th day	+1	25	83.3	6	20.0	<0.001**
		+2	5	16.7	10	33.3	
		+3	0	0.0	10	33.3	
		+4	0	0.0	4	13.3	
	5th day	+1	27	90.0	7	23.3	<0.001**
		+2	3	10.0	11	36.7	
		+3	0	0.0	8	26.7	
		+4	0	0.0	4	13.3	
	6th day	+1	28	93.3	8	26.7	<0.001**
		+2	2	6.7	12	40.0	
		+3	0	0.0	6	20.0	
		+4	0	0.0	4	13.3	
	P1		0.001**		0.025*		
	P2		0.022*		0.161		

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

P_1 value: comparison between on admission &4th day **P_1 value:** comparison between 4th day & 6th day

Scale variables **Score**

- 2mm or less: slight pitting, no visible distortion, disappears rapidly. +1
- 2-4mm indent: somewhat deeper pit, no readably detectable distortion, disappears in 10-25 seconds +2
- 4-6mm: pit is noticeably deep, may last more than a minute. extremity looks swollen and fuller. +3
- 6-8mm: pit is very deep, Lasts for 2-5 minutes. Dependent extremity is grossly distorted +4

5.16. Table 12: Showed that there was statistically significant difference at 2nd to 6th days between study and control as regards to peripheral edema. Also, there was statistically significant difference between comparison at 1st day and 3rd days regarding to study group only. **Thus, hypothesis five was supported.**

Table 13: Comparison between study and control group subjects as regards to congestive heart failure grades

Days	Grades	Study group N=30		Control group N=30		P. value
		No.	%	No.	%	
On admission	Grade I	0	0.0	0	0.0	0.670
	Grade II	2	6.7	1	3.3	
	Grade III	16	53.3	14	46.7	
	Grade IV	12	40.0	15	50.0	
2nd day	Grade I	0	0.0	0	0.0	0.475
	Grade II	5	16.7	2	6.7	
	Grade III	14	46.7	15	50.0	
	Grade IV	11	36.7	13	43.3	
3rd day	Grade I	0	0.0	0	0.0	0.417
	Grade II	10	33.3	8	26.7	
	Grade III	11	36.7	16	53.3	
	Grade IV	9	30.0	6	20.0	
4th day	Grade I	0	0.0	0	0.0	0.186
	Grade II	12	40.0	8	26.7	
	Grade III	9	30.0	16	53.3	
	Grade IV	9	30.0	6	20.0	
5th day	Grade I	0	0.0	0	0.0	0.400
	Grade II	14	46.7	9	30.0	
	Grade III	10	33.3	14	46.7	
	Grade IV	6	20.0	7	23.3	
	Grade I	0	0.0	0	0.0	0.186

Days	Grades	Study group N=30		Control group N=30		P. value
		No.	%	No.	%	
6th day	Grade II	16	53.3	9	30.0	
	Grade III	10	33.3	15	50.0	
	Grade IV	4	13.3	6	20.0	
	P1	0.035		0.008**		
	P2	0.279		0.194		

* Statistically significant difference ($p<0.05$) ** statistically significant difference ($p<0.01$).
P_1 value: comparison between on admission &4th day **P_2 value:** comparison between 4th day &6th day

5.17. Table 13: revealed that comparison between study and control groups as regards to congestive heart failure grades, there were no statistically significant difference between both group subjects during study days but, there were statistical significant difference when comparison between working of 1st day by 3rd day in relation to study group subjects **Thus, hypothesis five was partially supported.**
In relation to hypothesis six, this states that: Critically ill Congestive heart failure patients who will be subjected to the modified clinical pathway guidelines will be reported lesser numbers of negative variables than patients who received the routine hospital care only (table 14 is related to this hypothesis)**.**

Table (14): Comparison of variance deviations between the study and control groups during hospitalization

Variance type \ Groups	Study group N=30		Control group N=30		P. value
	No.	%	No.	%	
Positive patient variance	7	23.3	4	13.3	0.5465
Negative patient variance	4	13.3	16	53.3	**0.0139***
Positive clinician variance	6	20.0	4	13.3	0.7518
Negative clinician variance	5	16.7	10	33.3	0.1003
Positive hospital variance	5	16.7	2	6.7	0.4497
Negative hospital variance	3	10.0	13	43.3	**0.0244***

* Statistically significant difference ($p<0.05$)

Every subject might have one, more than one or variance

- **(-ve patient's variances)** means having infection or co-existing morbidities or non-compliance to prescribed treatment.
- **(+ve patient variances)** means compliance to the prescribed treatment.
- **(-ve clinician's variances)** means delay in medical consultation or providing inadequate discharge planning.
- **(+ve clinician's variances)** means accurate procedures practices by clinician.
- **(-ve hospital variances)** means delay in test results or delay in procedures or cancellation of procedure or delay in discharge because of routine hospital administration.
- **(+ve hospital variances)** means providing adequate supplies for patient care.

5.18. Table 14: The deviation related to patient and hospital found to be statistical significant difference with P value of (0.0139, 0.0244) respectively between study and control group patients. **Thus, hypothesis six was partially supported.**

6. Discussion

Complications of congestive Heart failure lead to a lower life expectancy that includes: cardiac arrhythmia may manifest in the form of ventricular tachycardia or ventricular fibrillation, potentially leading to sudden cardiac death, pulmonary complication such as (Pulmonary edema), thromboembolism (deep venous thrombosis, pulmonary embolism) gastrointestinal complications as hepatic congestion and hepatic dysfunction mal-absorption and musculoskeletal complication as muscle wasting [12].

Critical care nurses have witnessed an increased interest in improving outcomes for critically ill patients and there has been a flow of interest in the use of evidence based care pathways in clinical practice [13]. It is important that critical care nurses contribute to the development of such clinical pathway to actively shape their own practice.

Critical care nurses play a critical role in delivering care in both the independent and collaborative contexts of congestive heart failure intervention management. Nurses need to engage in developing evidence to support clinical pathway guidelines development. Developing consensus on nurse sensitive patient outcome indicators may enable benchmarking strategies and inform clinical trial design [14, 15].

Care pathways have become a popular tool to enhance the quality of care by improving patient outcomes, promoting patient safety, decreasing patient complications, and optimizing the use of resources. Also application care pathway in the hospital treatment of heart failure affect in reduce-hospital mortality rate, length of in-hospital stay, and readmission rate when compared with standard care [6]

So, the main aim of this research was to know effect of modified clinical pathway guidelines on congestive heart failure Health Outcomes at Coronary Care Unit. Where, the key result was to improve hemodynamic status, decrease chest pain, and decrease morbidity for example (arrhythmias) and decrease number of negative variances. The current study compared study group (pathway group), that followed modified clinical pathway guidelines checklist in addition to routine hospital care and the control group (non-pathway group), that undergo the routine hospital care only.

As regards to background data:

The study sample included sixty patients, 30 patients in each group. The mean age of study patients (study and control) was (51.7±8.7 & 50.3±9.6) respectively, with no significant difference between two groups. The present study was supported with [17] who reported that thirty-nine CHF patients were included in the study with average age of CHF patients was (45.51 ± 14.42) years**.** Also study by [16] told that sixty patients with congestive heart failure were enrolled in the study, thirty participants in study group and thirty participants in control group with mean age (50.70 ± 12.5 - 54.47 ± 14.6) respectively.

Regarding the Marital status, it was found that most the patients were married as compared to single patient of both groups. These results agree with [19] who reported that the most participants were married (76%) and had a spouse and 11% were single.

In relation to respiration, findings of the current study showed that majority of the both groups had tachypnea in the first day. After that there were improvement of respiration and decrease tachypnea in study group than control group from second to six day and there was significant improvement between both groups. This improvement could be due to applying of multidisciplinary evidenced base professional critical team intervention such as relaxation techniques, breathing and coughing exercises that make reduction in work of breathing. This agreed with [20] who showed that, the respiration may be fast to compensate for hypoxia, and it is shallow because of lack of energy in the body. Make careful assessment and continuous monitoring for patient during administering oxygen to ensure sufficient saturation.

As regards to Arterial Blood Gases (ABG):

Arterial blood gas analysis is a fundamental component of assessing critically ill patients. It allows rapid near-patient testing, giving vital information on oxygenation, ventilation, metabolic harmony, and an indication of tissue hypoxia [40].

As regarding Arterial Blood Gases (ABG); the current study demonstrated that the mean value of PaO2 was gradually improved among patients in the Clinical Pathway guidelines group from 3rd to 6th days when compared with control group. In relation to arterial oxygen saturation (SaO2), the present study reported that the mean values of (SaO2) for study group subjects significantly improved from second to six days than non-pathway group. This positive effect resulted from application of modified clinical pathway guidelines interventions as; Assist patient in a high Fowler's position during oxygen inhalation and encourage periods of rest in between exercise levels.

Study by [21] who mentioned that, the mean value of PaO2 was relatively improved among patients in the Clinical Pathway from admission to discharge. Also, the study was reported that the mean values of (SaO2) for the Clinical Pathway group were increased from admission to discharge. This can be effectively managed using a clinical pathway.

Concerning chest pain:

The present study revealed a significant improvements in chest pain attacks and at day of discharge in pathway group subjects when compared with control group ones. This progress resulted from nursing assessment pain using Numerical Rating Scale ranged from (0-10), continuous monitoring ECG and using pain control measures as (oxygenation, elevation of the bed, relaxation techniques and establish a quiet environment beside pain medication administration).

Also study by [42] who suggested that an accurate assessment of a patient's chest pain helps to identify the likely cause of the pain and leads to prompt and appropriate responses to alleviate the pain and treat the cause. Maintaining a calm and controlled environment is not only essential for the patient's comfort, but also for the nurses. Also performing and interpreting a 12-lead ECG is a vital assessment in the setting of chest pain. An ECG will help the medical team to determine if and when a patient requires reperfusion therapy to treat the cause of the chest pain.

Concerning to dyspnea score:

The current study findings revealed that high level of dyspnea score was recorded at the beginning of this study in both groups, and the level of dyspnea score in study groups who received modified clinical pathway guidelines, was highly significantly decreased compared with non-pathway group. This accelerated improvement

may be due to teaching patient relaxation techniques and how to use them, elevation head of bed, and providing oxygen with monitoring oxygen saturation via pulse oximetry.

The findings in this study are in line with study by [21] who explained that patients in the Clinical Pathway (CP) and non-pathway groups were almost equally distributed regarding dyspnea score and no significant differences were found between them on admission. Also, the study showed that there was a significant improvement of the dyspnea score among the patients in the CP as compared to the non- Clinical Pathway group patients.

Regarding to systemic complications:

Results of the current study revealed that pathway group has lower incidence of morbidity rate including (cardiac, respiratory, renal and gastrointestinal complications) and there were statistically significant differences between the studied groups. Based on these results, the hypothesis "Critically ill Congestive heart failure patients who will be exposed to the acute stage modified clinical pathway guidelines will be less exposed to complications than patients who receive the routine nursing care only" was partially supported.

In concerning to cardiac complications; it was noticed that majority of study group having lower cardiac complication as (hypotension, and arrhythmias) compared to control group after application of evidenced based multi-disciplinary critical team intervention, assessment for irregular heart rhythm by continues monitoring of ECG.

In relation to respiratory complication as pulmonary congestion and pulmonary edema; the present study findings reported that gradually improvement for study group from fourth to six day as compared to control group with statistical difference between both groups. Especially after assessment and multidisciplinary interventions for patient's problems, monitoring patient during oxygen taken and patients made breathing and coughing exercise.

As regard, gastrointestinal complications, it was observed that majority of non-pathway group subjects had GIT complications when compared to one patient of pathway group subjects with significant difference between both groups.

Moreover, the present study reported that the study group subjects had significant improvement in relation to renal complications than control group subjects. This could be due to careful assessment and appropriate monitoring by multidisciplinary critical care professional as (researcher, medical and nursing staff) to avoid potential complications. By detailed history taking, emphasis on physical examination and medication profile are all essential in planning, maintaining and providing the highest level of care, and comfort for congestive heart failure patients.

Our results go well with study by [25] who reported that monitoring and guidance program for patients with CHF significantly decreased complication signals such as edema, dyspnea, tachycardia, arrhythmia, pulmonary cognation, chest pain and gastrointestinal complications.

Also results in accordance with the study by [26] who demonstrated that complications during hospitalization period for patients managed by clinical pathway were less prevalent. Also, the study by [11], who examined the effect of implementation pathway in reducing hospital complications among 60 adult patients underwent clinical pathway. They found that, relatively fewer patients with complications related to hospitalization, among patients in the pathway (intervention) group when compared with patients in the control group.

Jurgens[27] demonstrated that, Comprehensive HF care begins with accurate identification of patients diagnosed with HF Provide guidance for management of HF and appropriate clinical assessment and intervention should not be delayed.to improve patient-health status and reduce morbidity.

Raman [28] demonstrated that, the care of cardiac failure patients complex and multidisciplinary in nature. It is best performed as part of a team effort which includes anesthetists, cardiologists, highly trained nursing staff along with ancillary support staff such as physical therapists and nutritionists. Attention to detail, frequent patient review, a high index of suspicion for complication and a systematic a logical approach to care are necessary to ensure excellent health status.

On other hand, studies by [29, 41], showed that no significant difference in the complications between control and clinical pathway groups. Disagreed with the present study by [30], who reported that the rate of patients who developed complications as (Confusion, Respiratory infection, Urinary Tract Infection, Pressure ulcer, Wound infection, and DVT) during their hospitalization was similar between the both groups, although the standard care group had a higher number of complications per patient than the pathway group. The cause of this difference was not clear and we believe that the finding warrants further investigation. There was one death in each group during the study period. However, both deaths were associated with pre-existing comorbidities.

Concerning to length of stay:

The current study revealed that the modified clinical pathway guidelines for congestive heart failure had a positive effect on the length of coronary care unit stay; with patient on the modified clinical pathway guidelines had shorter length of stay than control group patients. Those treated in the modified clinical pathway guidelines were discharged after 5.5 days rather than 7.7 days for the non-Clinical Pathway group subjects who were

managed according to the coronary care unit routine care only.

This shorter duration in the study group subjects may be attributed to guidelines of modified clinical pathway that allowed improving the quality of care while keeping hospital length of stay to an acceptable minimum time through early recognition and interventions of medical complications, nursing or social problems that necessitate prolonged hospitalization period. These factors may have contributed to a shorter Coronary Care Unit (CCU) length of stay (LOS).

The results of the current study agree with [32] who found that a significant reduction in length of stay (LOS) of the Clinical Pathway (CP) group as compared to the non-clinical pathway group. This shorter duration may be recognized to application of interventions according to multidisciplinary critical care team evidenced practice.

Also, the findings in the present study in accordance with the results of five studies were included in (five clinical studies). They are examining the effect of clinical pathways (CPs) on the length of stay; out of five studies by [31] three studies showed a significantly shorter length of stay (LOS) in the care pathway group. The overall results of these studies showed that care pathway provided a positive reduction in length of stay (LOS) when compared with the standard care.

Regarding to readmission rate:

The current study also revealed that there was significant difference between study and control group regarding re-admission rate with significant reduction in the study group. The findings in the present study are in line with five studies by [31] they studied the risk for readmission rate. One of these studies found that the risk of readmission significantly decreased in the care pathway group [33]**.** The overall result of meta-analysis was significant reduction of readmission rate.

In relation to mortality rate:

While our findings revealed that there was no significant difference between both study and control group related to number of death, but it found a decrease in mortality rate in the study group without significant difference between both groups.

The findings in the current study are in contrast with two studies done to estimate the mortality rate of the care pathway group compared to standard care group subjects. The use of clinical pathways had a significant positive effect in the two studies, including the mortality rate [33]. But the findings of current study are in line with the other three studies, the mortality rate decreased in the care pathway group, but not significantly [34]**.** The overall result of combining randomized controlled was not statistically significant. It is evident that Clinical Pathways can effectively improve the quality of care provided to patients suffering from congestive heart failure. Lower mortality rates and shorter hospital stays where observed among Clinical Pathway patients.

As regards to peripheral edema:

The current study revealed that there was a reduction of peripheral edema second to six days for the both groups. Peripheral edema decreased for modified clinical pathway guidelines group subjects more than non-CP group subjects. The improvement for the Clinical Pathway group may be due to the application of the modified clinical pathway guidelines which involved intervention aspects concerning with healthy low salt diet, low fat diet, fluid restriction and continuous weight monitoring and stop smoking besides diuretics medication dose in correct time.

These results agree with [22] who demonstrated that, majority of study group was having no edema compare to two third of control group was having 6mm deep pit 10-12 seconds to rebound edema; also study by [23] who reported that significant decrease of bilateral leg edema in patients with Congestive Heart Failure (CHF) which they were educated about value of monitoring fluid intake and weight gain.

Nursing role in recent decades has emphasized supporting and treating congestive heart failure disease because non-pharmacological treatment has been shown to be increasingly important, thus justifying the development of clinics and support programs for heart failure patients. Systematic care by nurses practicing evidence-based teaching and research reduces the negative impact of cardiovascular complications on patient outcomes [24].

In relation to grades of CHF, the present finding noted that one third of pathway group patients were grade III and other one third were grade IV at fourth day but there was improvement at six day and only four patient of study group were grade IV. The findings of study by [1] who found that majority of patients were hospitalized and had classified NYHA grade III and IV related to severity of them.

In relation to variances:

Variances are patient outcomes or staff actions that don't meet the expectation of the pathway or occur when patients did not follow the plan and sequence outlined in the modified clinical pathway guidelines. Variances can be positive or negative**.** Positive variance occurs when the patient progresses towards projected outcomes earlier than expected, when interventions such as patient education can successfully begin at an earlier stage. Negative variance occurs when the patient fails to meet projected outcomes, there is a delay in meeting the outcomes, or there is a need for additional interventions previously unplanned. Variance data collected, analyzed, recorded, and then a plan developed to correct them. There were four types of variances in this study. The first one is patient variance, clinician variance, and hospital variance.

Regarding the occurrence of variances in between both groups patients; the results of the current study demonstrated that patients of study group had lesser negative variance of patient care as compared to the control ones, which means that the study group patients had more compliance to prescribed care plan, As well patient of the study group had lesser hospital variance as compared to the control ones with statistical significant difference between both groups. This might be because multidisciplinary critical care teams apply modified clinical pathway guidelines as presented in the sheet.

The findings in the present study are in line with [37] who reported that there was significant difference in relation to negative system (hospital) variances and negative patient variances, also study by [35] mentioned that there was significant difference regards negative patient and negative clinician variances.

Finally, critically ill Patients with heart failure benefit from early diagnosis, close monitoring and management provided by skilled heart failure teams that include a heart failure nurse specialist and by cardiology nurses with sufficient education to support safe practice. As part of the team, the heart failure nurse specialist is well placed to also provide an outreach service to patients throughout the acute heart failure pathway and this requires close collaboration with nurses in non-cardiology specialist areas such as the emergency department. In contrast to the evidence base to support the heart failure nurse in long-term disease management, the nurse's role in the critically ill patient's heart failure pathway is less clearly defined. We now need to turn our attention to this in-patient period and strengthen the evidence that supports the role, number and skill set required of nurses to underpin effective heart failure treatment throughout the entire patient journey [36]

7. Conclusion:

By combining all possible results of implementation of modified clinical care pathway guideline it can be concluded that care pathway for congestive heart failure management showed a positive effect on patient's health outcomes such as; improved hemodynamic stability, lesser chest pain attacks, improvement of dependent edema, reduce dyspnea score, decreased number of systemic complications, reduced length of stay, increase number of positive variances and decrease number of negative variances in patient care.

8. Recommendation suggested:

- ☒ Clinical pathway care approach needs to be supported and initiated in CCU at Assuit university hospitals to improve the efficiency and quality of patients care.
- ☒ Conducting training program for health care providers on clinical pathway implementation for better quality of care.
- ☒ Comparison between the outcomes of clinical pathway implementation in different settings.
- ☒ Modified Clinical pathway guideline should be used to decrease negative variances and increase positive variances in patient care, improve guideline compliance, and potentially improving overall quality of care in patients with cardiac diseases.

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