An-Najah National University

Faculty of Graduate Studies

Effectiveness of Early Enteral Feeding Protocol on Clinical Outcomes in Critically Ill Patients in Surgical Intensive Care Unit

By
Rasha Shawahni

Supervisor
Dr. Eman Al shawish

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This Thesis was Defended Successfully on 20/4/2021and approved by:

Defense Committee Members:	**Signature**
1- Dr. Eman Al shawish / Supervisor	Dr. Eman Al shawish
2- Dr. Noureddine Al-Masry / External Examiner	.....
3- Dr.Wael Sadqa / Internal Examiner	.....

Dedication

إلى من علمني النجاح والصبر

إلى من حصد الأشواك عن دربي ليمهد لي طريق العلم

إلى القلب الكبير والدي العزيز

إلى نبع الحنان إلى صاحبة الصدر الرحيم إلى من تجرعت كأس الشقاء مرا

لتسقيني رحيق السعادة أمي الحبيبة

إلى القلوب الطاهرة الرقيقة والنفوس البريئة عائلتي

زوجي وأولادي

للنجاح أناس يقدرون معناه وللإبداع أناس يحصدونه شكرا لجهودك

المضنية ..فلك مني كل الثناء والتقدير الرائعة دكتورة إيمان الشاويش

إلى كل من ساندني ووقف بجانبي إليكم أهدي هذا العمل

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الإقرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

Effectiveness of Early Enteral Feeding Protocol on Clinical Outcomes in Critically Ill Patients in Surgical Intensive Care Unit

أقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وأن هذه الرسالة ككل، أو أي جزء منها لم يقدم لنيل أية درجة أو لقب علمي أو بحثي لدى أية مؤسسة تعليمية أو بحثية أخرى .

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name : اسم الطالب: رشا شواهنه

Signature : التوقيع: رشا شواهنه

Date: التاريخ: 20/4/2021

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List of Abbreviation

ICU	Intensive care unit
NPO	Nil per os (nothing by mouth)
NG	Nasogastric
LOS	Length of stay
PEG	Percutaneous endoscopic *gastrostomy*
NJ	Nasojejunal
GJ	Gastrojejunal
ND	Nasoduodenal
PPN	Peripheral parenteral nutrition
TPN	Total parenteral nutrition
Peep	Positive end-expiratory pressure
TV	Tidal volume
SPSS	Statistical package for the social science
RCT	Randomize control trial
GI	Gastrointestinal
APACHE	Acute physiology And Chronic Health Evaluation
GRV	Gastric residual volume
IRP	Institutional review board

Effectiveness of Early Enteral Feeding Protocol on Clinical Outcomes in Critically Ill Patients in Surgical Intensive Care Unit

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Abstract

To maintain sufficient nutritional therapy by enteral feeding is particularly important for the critically ill patients who require intubation and mechanical ventilators.

Aim of the study: To determine if there is a relationship between early feeding (within 24 to 48 h following ICU admission) for the critical ill patients and the clinical outcome and to provide evidence-based guidelines for early nutrition during critical illness.

Method: Quasi experimental design was adopted in this study All patients admitted to the surgical ICU will be enrolled unless enteral feeding was contraindicated the study obtain in intensive care unit at Rafidia surgical hospital ,data was collected through filling specific scale prepared with specific criteria regarding variables of the study comparing between two group of critical ill patient one started feeding early the second according to the department policy, the study population was an adult older than 18 year.

Result: there are no significant differences at 0.05 level between experimental group and control group in the distributions of gender ,age, BMI SBP, and marital status in other hand there are significant differences

at 0.05 level between Historical group and Protocol group in the Time of staying in ICU(Day) (P-value less than 0.05).

Also there are significant differences at 0.05 level between historical group and protocol group in:

In the Vital sign (SBP ,HR , TEMP and RR).

In the Lab tests (HGB, BUN, PLAT, CREA, NA, K, ALBUMIN, WBC, Ca and MG).

In the blood gas result (PCO2 ,PO2 and HCO3) .

In mechanical ventilator set up (TV and PEEP).

In GCS .

The percentage of complications is minimal in the control group .

Conclusion early feeding (first 24-48) hours is most benefit to the critical ill patients.

Key words: enteral feeding , intensive care unit , historical group .

Chapter 1
Introduction

1. Introduction

Nutrition support is an important part of care for the critical ill patients, however critically ill patients are commonly underfed, which lead to consequences such as increase length of hospital and intensive care unit stay , also number of day on the mechanical ventilator will increase and lead to infection , complication ,rate of mortality increase.

Critically ill patients requiring vital organ support in the ICU , most of the time they have anorexia and may be unable to feed by mouth sever skeletal muscle wasting and weakness occurring during the critical illness are associated with prolonged need for mechanical ventilator and rehabilitation Casaer et al .2014 So to prevent adverse outcomes related to nutritional deficit the research and articles recommended enteral nutrition as a first line therapy starting early at first 24-48 hours of Intensive care unit admission .

Nutritional therapy in ICU is a complex decision making which include the route of feeding ,dose of nutrients , and time to start feeding , so it's a multidisciplinary team decision .Enteral feeding is the most common method used in ICU to provide nutrition support to the critically ill patients, enteral feeding is recommended for critically ill patients who cannot consume oral diet to supply the energy to patients Enteral feeding leads to enhancement of intestinal mucosal integrity and nutrient absorption,

improvement of metabolic and immune response, also reduction of complication and costs (japer et al 2016).

1.1 Background

All Patients in intensive care units often have different degrees of inflammation that may result in reduced energy and protein intake, increased energy expenditure, and protein catabolism, which lead to malnutrition which lead to increase length of hospitalization, intensive care unit stay, time on ventilator, infectious complications, and mortality (Cahill et al, 2010). The critical ill patients need vital organ support in the intensive care unit, they may unable to feed spontaneously by mouth for many days.

Such patient is provided by other rout either enteral or parenteral route, if nutritional therapy delays the skeletal muscle - wasting and weakness occur during the critical illness period which lead to prolong staying in critical unit and prolong need of mechanical ventilator (Braunschweig et al, 2001).

Artificial nutritional therapy or support must be in the first therapeutic intervention to prevent metabolic deterioration and loss of body mass and energy.

Enteral type of feeding is the first desired route when possible, even if enteral route does not fulfill all energy requirements, gut still used for nutrition, Parenteral nutrition always be used as a way to feed if the gut is malfunctioning. Nutrition must be personalized for each patient according to the state of disease and patient nutritional status. Nutrition has impact on

wound healing, weaning, organ function, mobility and mortality. There are a few nutrition assessment tools and protocols. Studies show that better outcomes occurred when patient received nutrition within 24 to 48 hours of ICU admission if unable to eat (Blaser et al., 2017).

Therefore, it is essential that nurses know nutrition assessments, application, monitoring and management of severely ill patient's nutrition. The Nurses role is to identify, implement and to evaluate evidenced based nutrition practice. In nourishing critically, ill patients' nurses have an important role identifying risk-assessing adequacy of feeding and preventing complications (McClave et al., 2016; Dhaliwal, et al, 2014).

1.2 Definitions

Nutrition: nutrition therapy defines as an enteral or parental feed that provide of calories, protein, electrolytes, vitamins, minerals, trace elements, and fluids. Khalid **,** et al ,2010

Enteral nutrition: the provision of calories, protein, electrolyte vitamins, minerals, and fluid via the intestinal route when gastrointestinal tract function.

Parenteral nutrition: the provision of calories, protein, Electrolyte, vitamins, minerals, trace element and fluid by other route (such as peripheral parenteral nutrition and total parenteral nutrition) when gastrointestinal tract not function (Michael p et al 2014).

Peripheral parenteral nutrition (PPN): when the solution of nutrient is given into veins outside the Superior Vena Cava .

Total parenteral nutrition (TPN): administration of nutrition into the largest vein such as Superior Vena Cava that provide the majority of nutritional need.

1.3 Route of feeding

Enteral Feeding: when feeding given into stomach, duodenum, jejunum depend on the severity of illness and health state of gut it is classified to:

Gastric feeding: also define as stomach method which is the primary organ that help to start digestion.

Duodenal feeding: it is the very comfortable and safe method due to reduce risk of reflex and aspiration pneumonia.

Jejunely feeding: is the most common enteral method all over the world. It is helping to use of gut despite illus involving the stomach and large bowel

Parenteral feeding: classified into PPN (Periphral parenteral nutrient) and TPN (total parenteral nutrient) (Elke et al 2016) .

1.4 Indication of feeding in ICU

The main indication for early feeding is to prevent or to treat macronutriante and micronutriante deficancy, to provide nutrition need for

patients metabolism also to improve ptients outcome, and to promot wound healing (Gordon, et al, 2008).

Macronutrients define as: are proteins, fats, carbohydrate and water that's need in big amount for growing and good health and metabolism. (Esen et al 2017)

Micronutrients define as: items found in small quantity in diets such as vitamins, minerals and trace elements.(Esen, et al 2017).

1.5 Effect of malnutrition

Malnutrition affect all aspect of patients situation clasified into two effect: specific and non specific effect on the critical ill patients health stautus. Specific effects included: wound dehiscence, poor healing, failed surgical anastomosis and poor immune response to infection. While, non specific effect included: central nervouse system due to malnutritin the electrolyte will be disturbances that's will ffect central nervouse system, apathy, inability to clear secretion, drowsneses, loss of muscle mass which lead to increse work of breathing, lead to ventilator dependency, Sepsis: nutritional deprivation lead to multiorgan dysfunction syndrome (Gordon,et al 2008).

1.6 Objective of nutritional support

The main objective from nutritional support can be summarised into the following points: first, to prevent or to treat macronutrinate and micronutriante deficiencies. Second, to improve patiensts outcome. Finaly, to provide nutrition substinated patients metabolism.

1.7 Nutritional assessment

Nutritional assessment is very importante to prevent harm effect of over-feeding or under-feeding we must focus on many area such as clinical evaluation and laboratory finding. It should included the following:

- History and clinical examination: midical and surgical history for current and past history; evidence of anemia or vitamin deficancy or electrolyte disterbances.
- Anthropometric mesurement : include height and body weight; skin - fold mesurment.
- Biochemical data : hemoglobin level; serum albumin; albumin.

Assessment - Feeding Tube; daily assessment of correct placement of the feeding tube (according to the hospital standards or protocol). Assure oral/nasal hygene and care; the Nurse assures the accurate and adequate daily nutritional intake based on metabolic status; nutrition protocols should be used (Makic, et al 2011; Kreymann 2010). The Nurse should monitor the tolerance of Nutrition if the patients vomites or not absorbing,

(high residual, diminshed gastric motility). (Nguyen, et al 2014). The Nurse should prevent aspiration, and assess bowel movement constipation or diarrhea (Blaser et al., 2017).

The Nurse should minimize interruptions in Nutrition intake due to (e.g.) surgical procedures, imaging, medical interventions, scopes. The Nurse should explain and comunicate to patients and significant others regarding nutrition (Doenges, Moorhouse & Murr 2013).

1.8 Problem Statement, Significance and goals of the study

Early nutritional therapy is a challenging task that can have direct effect on patient's prognosis, Nutritional disorders such as malnutrition, overfeeding and negative energy balance are highly associated with increased morbidity and mortality, our mission is to optimize nutrition and energy status in critically ill patients because there is no guideline regarding feeding principle in current situation at our governmental hospitals.

The early nutritional support that provided at the first 24-48 hours, for the critical ill patients play vital role to decrease time of staying in critical care unit and improve the clinical outcome, so It is necessary to develop evidence-based feeding guideline in order to improve feeding practices and reduce mortality in ICU patients.

This study is important for several reasons. First, this research will be the first study that deal with this topic . Second, to increase awareness of health team in the intensive care unit that the multidisciplinary work is important

and encourage the nutritionist consultation in patient care. Third, to add evidence guideline for feeding because there is no guideline in our governmental hospital. Fourth to decrease the cost of treatment due to long stay in ICU.

The research question in current study, what is the relationship between early feeding and clinical outcome? The goals and objectives of the study:

1. To determine if there is a relationship between early feeding (within 24 to 48 h following ICU admission) for the critical ill patients and the clinical outcomes.

2. To provide evidence-based guidelines for early nutrition during critical illness.

Hypothesis of study

1. There is a relationship between early feeding and clinical outcome for critical ill patients at the level of P less than 0.05.

2. There is a relationship between early feeding and infection for critical ill patients at the level of P value less than 0.05.

3. There is a relationship between early feeding and length of stay in ICU for critical ill patients at the level of P value less than 0.05.

4. There is a relationship between early feeding and time on mechanical ventilator for critical ill patients at the level of P value less than 0.05.

Site and setting: The study will be conducted at Rafidia governmental Hospital, in the Intensive care unit for adult, Rafidia serves the most region of North West bank and had the highest surgical cases.

Chapter 2
Literature Review

Introduction

This chapter will review of the international studies and relevant documents with the support of electronic search on the studies related to type of feeding and indication. Literature review provides a framework for establishing the importance of the study. After using systematic approach 16 studies involved in literature review as shown in figure 1.

Nutritional management in critically ill-patients is a challenging task as malnutrition have a direct impact on the patient's prognosis, nutritional assessment has to be individualized according to patient's data. Nutritional disorders such as malnutrition, overfeeding and negative energy balance are highly associated with increased morbidity and mortality. A review of 16 studies worldwide since 2001 to 2018 found that the malnutrition in hospital lead to poor outcome in critically ill patients, critically ill patients often treated in Intensive care unit, consequences related to malnutrition include impaired immunological function, impaired ventilator drive and weakened respiratory muscles, leading to prolong ventilator dependence and increase infection and increase mortality and morbidity.

Nutrition therapy is most often provided as nutritional supplementation in the form of enteral (feeding via tube into the gut) or parenteral (intravenous feeding) nutrition. Several studies have shown better clinical outcome in

patients that start feeding early by using feeding guideline in the intensive care unit, in cluster randomized control trial by Gordon, et al , (2008).

The study aimed to improve feeding practices and reduce mortality in ICU patients, using Browman's Clinical Practice Guideline Development Cycle, A 27 community and tertiary hospitals in Australia and New Zealand. Between November 2003 and May 2004, (adult patients) Using Browman's Clinical Practice Guideline Development Cycle the title" Effect of Evidence-Based Feeding guideline Mortality of critically ill patients " by RCT, successful implementation the guideline result in significant practice change, result in reduced hospital mortality in critically ill patients.

In another prospective observation cohort study by Strack van Schijndel, et.al, (2009) about optimal nutrition during the period of mechanical ventilation decrease mortality rate, aimed to evaluate the effect of achieving optimal nutrition in ICU Patients during period of mechanical ventilation on mortality by calculating resting energy expenditure, the sample was mixed surgical –medical , 28 bed ICU in an academic hospital 243patients were enrolled in the study, the result optimal nutritional therapy improve, the patients how reach energy and protein goal has better outcome than how reach energy goal They underwent indirect calorimetry as part of routine care. Nutrition was guided by the result of indirect calorimetry and we aimed to provide at least 1.2 g of protein/kg/day. Cumulative balances were calculated for the period of mechanical ventilation. Outcome parameters were ICU, 28-dayand hospital mortality.

Alberda et. al, (2009) study about the relationship between nutritional intake and clinical outcomes in critically ill patients results of an international multicenter observational study, using body mass index (BMI, kg/m2) as a marker in a Critically ill adult (old than 18 years of age) patients that were mechanically ventilated within the first 48 h of admission to the ICU excluded non ventilated patients the results indicated that greater intakes of energy and protein were associated with better clinical outcomes of critically ill patients, particularly if their BMI is < 25 or >35.

-Another study by Khalid et al., (2010) " early enteral nutrition and outcome of critically ill patients treated with vasopresore mechanical ventilation, was aimed to determine the effect of early enteral feeding on the outcome of critically ill, by retrospective study, the patients were divided into 2 group: those who received enteral nutrition within 48 hours of the start of mechanical ventilation, termed the early nutrition group and who did not termed the late enteral nutrition group, population multi-institutional medical intensive care unit database were analyzed retrospectively 1174patients which intubated and need vasopresor using the Mortality Prediction Model at time zero (MPM-0) score, Simplified Acute Physiologic Score (SAPS) II, and Acute Physiologic and Chronic

Health Evaluation (APACHE) II, the intensive care unit and hospital mortality were lower in the early enteral nutrition group than in the late group A randomized control trial involving 130 patients those who were undergoing mechanical ventilation in an ICU and who received nutrition

the study done by Casaer et al ,2014 the aim to provide suggestion for feeding during the acute phase of critical illness ,by using the tool Tight calories control study ion (TICACOS)that was guided by indirect calorimetry to estimate the resting energy expenditure, the result that reduced hospital mortality but a significant decrease in infections and in the length of stay in the ICU.

A cross sectional study about the trend of enteral feeding among critically ill patients in adult ICU s in Malaysiausing SOFA Score. It aimed to determine the adequacy of caloric intake received by critically-ill patients in the general ICU in Malaysia. A 132 participants all participants were above 18 years old. The result Patients who received early enteral feeding and intermittent bolus within 48 hours of admission achieved adequate caloric intake compared to patients who started late and received continuous feeding (Salimah, et al., 2016).

In a review of evidence study about used PEP uP protocol, aimed to improve feeding adequacy among critically ill patients ,all ICU Admission (Mechanical ventilated, expected to stay in the ICU for > 72 hours, hemodynamically stable),the result improved nutrition adequacy during the first week in the intensive care unit (ICU) was associated with better survival and faster physical recovery at 3- and 6-month post-ICU admission (Lee, et al.,2016).

Another systemic review and meta-analysis of randomized controlled trials (Elke, et al., 2016) assess the Enteral versus parenteral nutrition in critically

ill patients , the number of patients 3347, aim to evaluate the effect of the route of nutrition (EN versus PN)on clinical outcomes of critically ill patients methodological quality of included trials scored independently by two reviewers, result In critically ill patients, the use of EN as compared to PN has no effect on overall mortality but decreases infectious complications and ICU LOS.

Other RCT Stehle et, al 2016, glutamine depeptide-supplemanted parenteral nutrition improve clinical outcome for critical ill patients, to test if early parenteral nutrition affect clinical outcome by using PRISMA guideline , A 842 critically ill patients not have renal or hepatic failure .The rate of infection decreased ,LOS decreased, stay on mechanical ventilator have been also decreased.

Other study Annika et, al , 2017." aim to provide evidence based guidelines for early enteral nutrition (EEN) during critical illness, used ESICM clinical practice guidelines, five meta analyses in unselected critically ill patients, and specifically in traumatic brain injury, severe acute pancreatitis, gastrointestinal (GI) surgery and abdominal trauma, the result EEN, initiated at a low rate, lead to decrease the infection rate in the majority of critically ill patients.

Other study by Shankar et.al, 2015 aim to evaluate the safety, tolerance, of very early EN within 6 hour of ICU admission prospectively collected data from 308 surgical and medical patients divided into 2 groups first start within 6 hour of admission and the second after 6 hour, the result that

Initiation of EN within 6 hours of ICU admission is feasible and safe and can be implemented routinely in all ICU patients.

Prospective observational cohort study by Compher et. al 2017 the objective of the study is to investigate whether clinical outcome vary by protein or energy intake , 2853 mechanically ventilated patients involved in the study the result that greater nutritional intake is associated with lower mortality and faster time of discharge .

By Elke et , al 2014, 13630 critical ill patients included in these study that aim was to evaluate the effect of energy and protein amount given by EN for the septic patients by using Regression models to examine the impact of calorie and protein intake on 60-day mortality and ventilator-free days, the result that a calorie and protein delivery closer to recommended amounts by EN in the early phase of ICU stay was associated with a more favorable outcomes Other study by Hegazi et, al,2017 about “Early jejunal feeding initiation and clinical outcomes in patients with severe pancreatitis “A retrospective chart review performed on all patients with SAP admitted to medical ICU during 1 year Collected data included demographic information, body mass index (BMI; kg/m2), Acute Physiology and Chronic Health Evaluation (APACHE) II scores at admission, time of onset of DJF, time to goal feeding, ICU length of stay, and mortality.

The result Early initiation by DJF in the ICU was associated with reduced mortality, and associated with a shorter ICU length of stay, irrespective of the severity of SAP.

SAP sever acute pancreatitis DJF :distal jejunal feeding Other study by Woo et.al, 2010 design was prospective observational study the patients classified as receiving EEN within 24hours of admission or delayed ,thirty six patients are candidates for EEN, Eighteen received EEN and 18 received delayed EN, Time on the ventilator was significantly shorter in the EEN group vs delayed .The incidence of new pneumonia was lower in the EEN group but no difference was found in the incidence of bacteremia. Hospital mortality was lower in the EEN group Summery From the previous study there is a strong relationship between early feeding and the clinical outcome for the critically ill patients .

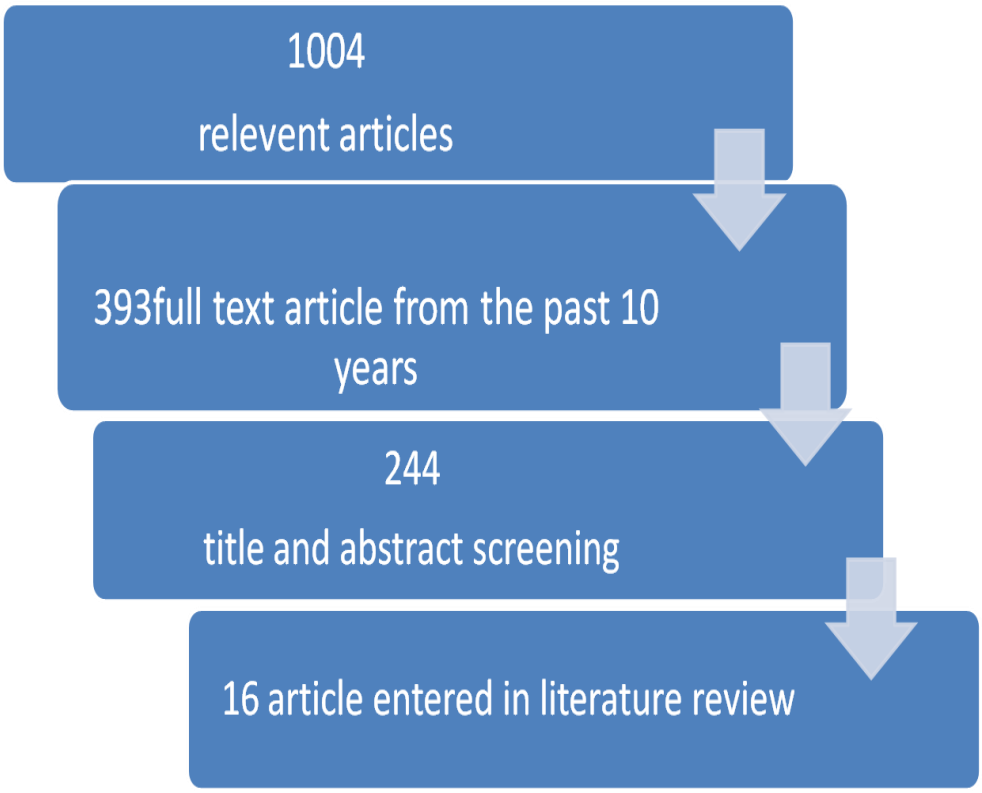

Figure.1: Systemic review approach

Chapter 3
Methodology

Introduction

This section presents research design, hypothesis, setting of the study, period of the study ,population and sampling, it presented the sampling techniques, exclusion and inclusion criteria this part is essential as it gives important understanding of the methodology used.

3.1 Study design

Quasi experimental design: research design involve the manipulation of independent variable to observe the effect on dependent variable (William M.K. Trochim et al, 2020)

Quazi experimental designs are generally used to establish the causality in situations where researchers are not able to randomly assign the subjects to group for various reasons.

It lacks at least one of the two other essential characteristics of the true experiment.

There are several type of design, the most important two type is:

1. Non randomize control group design.
2. Time series design(William M.K. Trochim et al, 2022)

Advantage:

The quasi experimental design more practical and feasible to conduct research also need.

Small sample size and more suitable for real natural world setting than true experimental design.

This design allows the researcher to evaluate the impact of quasi independent variable under naturally occurring conditions in some cases hypotheses are practically answered through the design.

Disadvantage:

In other hand There is no control over extraneous variable influencing the dependent variable the absence of a control group and absence of control over setting makes the result of this design less reliable and weak for establishment of causal relationship between independent and dependent variable.

3.2 Goals and objectives of the study

1. To determine if there is a relationship between early feeding (within 24 to 48 h following ICU admission) for the critical ill patients and the clinical outcome.
2. To provide evidence-based guidelines for early nutrition during critical illness.

3.3 Research question

What is the relationship between early feeding and clinical outcome?

3.4 Setting of the study

This study will be conducted in Nablus city in Rafidia Surgical Hospital, this hospital serves the most region of North West bank and had the highest surgical cases, particularly in ICU in the hospital.

3.5 Time of the study

Data collection was collected from March to October 2020 .

3.6 Study Population and sampling

The researcher was targeted all the patients in intensive care unit at Rafidia surgical hospital, data will be collected through filling specific scale prepared with specific criteria regarding variables of the study comparing between two group of critical ill patient one started feeding early the second according to the department policy, the study population will be an adult older than 18 year.

A Historical Control Group (Second Group)

This group includes patients who underwent ICU at the same hospital, with the same team, ICU staff, same number for example if first group contain20 patients the control group also 20 for historical. As part of the inclusion/exclusion criteria, this will be achieved by reviewing the hospital records of all patients who admitted to the same ICU

Sample Size Calculation

Pocock's sample size formula was used. This equation assumes that the comparison is to be made across two equally sized groups. However, comparisons in observational studies are mainly made across two unequally sized groups. In this case, the sample size should be adjusted according to the actual ratio of the two groups in order to reflect the inequality (Pocock, 1983). The error (a) is set to 0.05, which is the risk of making Type I errors, and (b) Power (1-type II error) is set to 0.85. Minimum standard error = 1. According to efficacy analysis, 39 patients in each group are recommended. We will take 45 patients in each group to cover any drop out from the study. Overall, we will recruit 90 patients in the current study.

A formula (i.e. Pocock's sample size formula) that can be directly applied for comparison of proportions P_1 and P_2 in two equally sized groups:

$$n = \frac{[P_1 (1-P_1) + P_2 (1-P_2)]}{(P_1-P_2)^2}(Z_{\alpha/2} + Z_{\beta})^2$$

Where:

n: required sample size

P_1: estimated proportion of study outcome in the exposed group (i.e. combination therapy) ($P_1 = 0.40$).

P_2: estimated proportion of study outcome in the unexposed group (placebo therapy) ($P_2 = 0.70$).

α: level of statistical significance

$Z_{\alpha/2:}$ Represents the desired level of statistical significance (typically 1.96 for $\alpha = 0.05$)

$Z_{\beta:}$ Represents the desired power (typically 0.84 for 80% power)

n for each group *2= total sample (i.e. for the 2 groups)

$$n = \frac{[0.40(1-0.40) + 0.70 (1-0.70)]}{(0.40-0.70)^2} (1.96+ 0.84)^2$$

$$n = \frac{[0.40 (0.60) + 0.70(0.30)]}{(0.30)^2} (2.8)^2$$

$$n = \frac{[0.24 + 0.21]}{0.09} (7.84)$$

$$n = \frac{[0.45]}{0.09} (7.84)$$

$n \approx 39$ patients

According to the analysis of power, 39 patients were recommended for experimental group.

3.7 Inclusion criteria

-All ICU adult patients more than 18 years ,both gender ,surgical .

-Critically ill patient.

-Patients stay more than 2-3days in ICU.

-Keep nil by mouth or on supplemental intravenous Infusion.

-Intubated patients and mechinically ventilted .

3.8 Exclusion criteria

-Pediatric patients.

- Multiple organ failure, septic shock or sepsis.

3 .9 Study variable

Dependent: clinical outcome (complication, day of stay in ICU, lap test (Albumin, Createnine), stay on mechanical ventilator, mortality rate).

Independent: early feeding, demographic data, route of feeding, type of surgery, BMI.

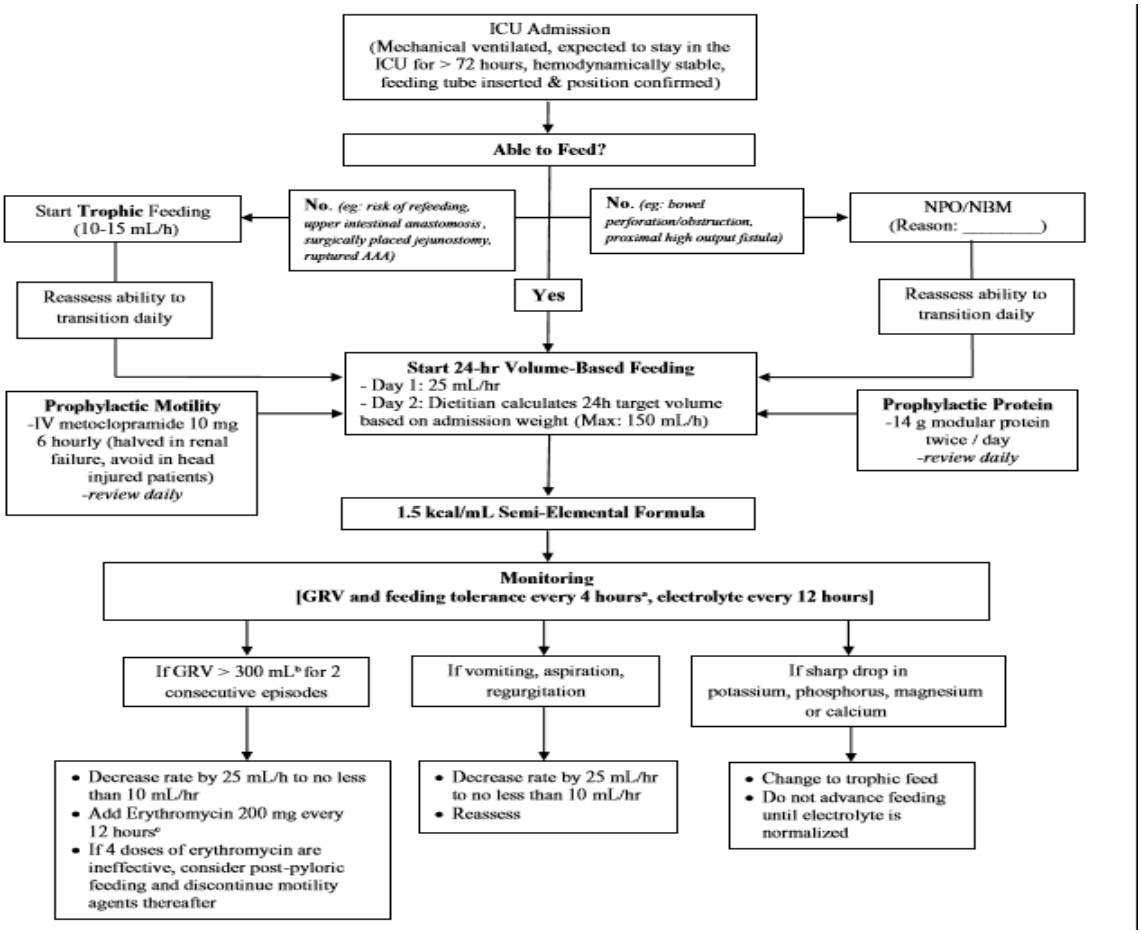

Figure.2: Protocol of the study PEP uP Protocol (Lee, et al 2016).

3.10 Data collection

After obtaining a formal approval from IRP and the ministry of health (MOH), secondary data

will be collected started through using especial protocol with specific criteria from clinical filled at the selected hospitals in a period of the time between from March to October 2020 .

Procedure All patients consecutively admitted to the surgical ICU will be enrolled unless enteral feeding was contraindicated.

Contraindication include: paralytic ileus, intestinal obstruction, intractable vomiting, persistent watery diarrhea, active GI bleeding, short bowel syndrome, or severe acute pancreatitis, during the study period were also excluded.

After admission patients were administered nasogastric feeding tube 12 Fr enteral feeding tube) tube placed by the anesthesiologist and with the help of ICU nurses, daily recommended energy and protein requirement ranged from 25-30 kcal /kg, all patients were fed with heads elevated 30-45 degree during feeding and for 1 hour after feeding, also residual was checked every 4 hour and feeding was hold for 1 hour if residual volume was over 300 ml, the nurse interrupted enteral feeding in case of:

1. Over regurgitation or aspiration.

2. Residual volume over 250-500ml with abdominal destination, nausea, vomiting, residual volume was rechecked before initiating feeding once the residual volume was lower 250ml and patients showed no abdominal distention ,nausea , vomiting tube feeding was restarted at a rate 20ml /hour and increase by 20 ml /hour every 4 hour until the calorie target was achieved patients were monitor for up to 7 days or observation were closed if patients discharge electrolytes must checked every12 hour if sharp drop in potassium, magnesium, calcium, change to trophic feed (10-15ml), don’t advance feed until electrolytes normalized About the tube of feeding :food is provided to intensive care patients according to the condition for example , low-sugar food

for diabetic patients, low salt for hypertensive patients ,and some time low fat diet.

For example: ensure, freekeh and cocktail and all this is under the supervision of a nutritionist.

3.11 Data analysis

After data collection, data was analyzed using frequencies and percentages, statistical package for social science (SPSS)), descriptive statistics to describe the study sample via mean, median, range, and. Cross tabulation that establishes an interdependent relationship between two tables of values, and Pearson Chi square used to study the relationship between early feeding and clinical outcome, significant relationship is determined when P-value<0.05.

3.12 Reliability and validity

Reliability is the consistency of the measurement, or the degree to which an instrument measure the same way each time it is used under the same condition with the same subjects. Validity refers to whether the questionnaire or survey measures what it intends to measure .The study protocol will be developed by the researcher; will be based on the information in the files used in the intensive care unit ward, and according to study variables. It will be reviewed by the supervisor, and experts, who suggested changes in some items.

3.13 Ethical considerations

As the research is involving human participants, it is necessary to follow strict ethical principles. The participants are asking to give their consent, and they are assured that participation or information provided would not be used against them. They are also assured of their right of confidentiality.

Confidentiality will be taken into consideration regarding data obtained from clinical files. And the cases will be kept anonymous without names and just with codes for data analysis. All participants will be informed about the purpose and design of the study and will talk that they will free to withdraw from the study any time if they are unconscious inform theier family. Also agreement must take from the MOH and medical director for the ICU also the nursing director this protocol was submitted with the approval by the committee on research was obtained from the institutional review board (IRP) at An-Najah national university

Summary&Conclusion

We were developed a evidence-based guideline for the provision of nutritional therapy due to the effect on critically ill patients.

Nutritional issue very important area which affect directly and indirectly the patients outcome, energy and nutrition assessment are very important to prevent over- feed or under-feeding critically ill pateints which has impact on morbidity and mortility.

Chapter 4
The Result

4.1 Overview

This chapter presents the study results, these results were obtained from analyzing the questionnaire, which contained five section:

Section one; Demographic data and history, section two; Vital sign, lab tests, mechanical ventilator section three; Glasgow coma scale, section four Feeding, section five ; Complication .

SPSS Version 20 used for data analysis .Descriptive statistics (frequencies, percentages, Means, Standard Deviations, and Medians) is used. The following Tests and Methods were used to analyze the results such that the P-Value < 0.05 is considered significant:

1. Chi-Square test: tests the differences between groups of patients for qualitative variables (Gender, Marital Status, and The Complications).
2. Mann-Whitney test (used as the main test because most of variables have Unequal variances according to study groups) and Two Independent Samples T test (Adjusted for Unequal variances): tests the differences between groups of patients for quantitative variables (Age, BMI, V/S, Lab test and mechanical ventilator, Glasgow coma scale , Feeding).

Characteristics of study participants

The results in the table below show that there are no significant differences at 0.05 level between Historical group and Protocol group in the distribution of Gender and Marital status(P-values are higher than 0.05).

Table (4-1): Descriptive statistics (Numbers and Frequencies) and the Chi Square test of differences between the Historical and the Protocol groups in the distribution of Gender and Marital status.

Variable	Category	Historical N(%)	Protocol N(%)	P_Value (Chi Square)
Gender	Male	29(72.5%)	28(70.0%)	0.805
	Female	11(27.5%)	12(30.0%)	
Marital status	Married	32(80.0%)	31(77.5%)	0.353
	Single	8(20.0%)	7(17.5%)	
	Other	0(0.0%)	2(5.0%)	

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in the Time of staying in ICU (Day) (P-value less than 0.05). The results exhibit that the patient stay in the ICU 6 days on the average for the Historical group which is significantly higher than the mean of staying days for Protocol group (5 days).

From the other hand, the results in the table below show that there are no significant differences at 0.05 level between Historical group and Protocol group in the Age and BMI (P-values are higher than 0.05).

Table (4-2): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Age, BMI, Time in ICU (Days).

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Age	40	51.1 ± 19	53	40	44.8 ± 17	43	0.104
BMI	40	26.1 ± 2.4	26.2	40	26.7 ± 2.4	26.3	0.345
Time in ICU(Days)	40	6 ± 1.4	6	40	5 ± 0.9	5	0.005

Section n two: V/S, Lab test and mechanical ventilator

The results in the table below show that there are no significant differences at 0.05 level between Historical group and Protocol group in SBP levels (All P-values are greater than 0.05).

Table (4-3): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in SBP levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
SBP1	40	131.18 ± 31.2	128	40	121.33 ± 29.96	120	0.084
SBP2	40	125.45 ± 25.58	127	40	119.4 ± 21.42	119	0.237
SBP3	40	128.03 ± 28.88	128	40	127.33 ± 16.94	122	0.501
SBP4	40	129.9 ± 35.71	125	40	124.18 ± 13.09	120	0.310
SBP5	36	129.06 ± 29.83	126	40	124.4 ± 9.97	124	0.259
SBP6	32	129.81 ± 27.1	130	36	124.58 ± 11.22	124	0.103
SBP7	27	128.04 ± 27.63	130	30	123.9 ± 11.65	120	0.141
Total-SBP	40	128.38 ± 24.01	127	40	123.45 ± 11.09	122	0.215

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in DBP levels at the first day and at the fourth day(P-values less than 0.05).

At the first day, the mean of DBP levels in Historical group (mean=76.73) is significantly higher than the mean of DBP levels in Protocol group (mean=68.43).

At the fourth day, the mean of DBP levels in Historical group (mean=69.9) is significantly higher than the mean of DBP levels in Protocol group (mean=66.2).

From the other hand, the results in the table below show that there are no significant differences at 0.05 level between Historical group and Protocol group in the Total _DBP levels and the levels at the other days(2,3,5,6,7) (P-values are higher than 0.05).

Table (4-4): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in DBP levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
DBP1	40	76.73 ± 19.92	74	40	68.43 ± 22.47	64	0.012
DBP2	40	66.65 ± 12.4	66	40	66.8 ± 10.03	66	0.735
DBP3	40	68.68 ± 16.64	73	40	68.98 ± 8.69	70	0.223
DBP4	40	69.9 ± 16.8	71	40	66.2 ± 7.8	65	0.038
DBP5	36	68.22 ± 15.81	70	40	67.93 ± 9.06	65	0.559
DBP6	32	66.69 ± 11.02	68	36	67.11 ± 7.69	69	0.871
DBP7	27	67.26 ± 14.89	65	30	66.3 ± 7.13	65	0.864
Total-DBP	40	69.5 ± 11.42	69	40	67.5 ± 6.02	66	0.165

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in HR levels at the sixth and seventh days(P-values less than 0.05).

At the sixth day, the mean of HR levels in Historical group (mean=90.13) is significantly higher than the mean of HR levels in Protocol group (mean=81.64).

At the seventh day, the mean of HR levels in Historical group (mean=92.26) is significantly higher than the mean of HR levels in Protocol group (mean=75.9).

From the other hand, the results in the table below show that there are no significant differences at 0.05 level between Historical group and Protocol group in the Total_ HR levels and the levels at the other days (from 1-5) (P-values are higher than 0.05).

Table (4-5): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in HR levels.

Group	Historical			Protocol			
Scale	N	Mean ± S	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
HR1	40	99.2 ± 23.74	101	40	100.4 ± 26.87	101	0.880
HR2	40	98.48 ± 23.6	95	40	93.85 ± 19.33	98	0.422
HR3	40	93.68 ± 17.98	88	40	92.15 ± 17.53	94	0.865
HR4	40	91.38 ± 19.62	88	40	88.93 ± 18.09	88	0.672
HR5	36	92.83 ± 20.67	88	40	85.2 ± 14.25	81	0.136
HR6	32	90.13 ± 20.31	92	36	81.64 ± 13.9	81	0.046*
HR7	27	92.26 ± 17.41	97	30	75.9 ± 13.57	71	0.000
Total HR	40	93.93 ± 13.46	95	40	89.13 ± 12.51	91	0.172

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in TEMP levels at the fifth and at the sixth days(P-values less than 0.05).

At the fifth day, the mean of TEMP levels in Historical group (mean=37.5) is significantly higher than the mean of TEMP levels in Protocol group (mean=36.85).

At the sixth day, the mean of TEMP levels in Historical group (mean=37.16) is significantly higher than the mean of TEMP levels in Protocol group (mean=36.81).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in the Total_ TEMP levels and the TEMP levels at the other days (1,2,3,4,7) (P-values are higher than 0.05).

Table (4-6): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in TEMP levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
TEMP1	40	36.58 ± 0.68	37	40	36.68 ± 0.76	37	0.856
TEMP2	40	37 ± 0.82	37	40	36.7 ± 0.76	37	0.101
TEMP3	40	36.73 ± 1.01	37	40	36.85 ± 0.7	37	0.793
TEMP4	40	37.2 ± 1.24	37	40	37.08 ± 0.69	37	0.857
TEMP5	36	37.5 ± 1.4	37	40	36.85 ± 0.77	37	0.022
TEMP6	32	37.16 ± 1.44	37	36	36.81 ± 0.71	37	0.031
TEMP7	27	36.93 ± 1.36	37	30	36.8 ± 0.66	37	0.808
Total TEMP	40	37.15 ± 0.92	37	40	36.98 ± 0.16	37	0.129

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in RR levels at the sixth and seventh days(P-values less than 0.05).

At the sixth day, the mean of RR levels in Historical group(mean=24.91) is significantly higher than the mean of RR levels in Protocol group(mean=21.56).

At the seventh day, the mean of RR levels in Historical group (mean=23.48) is significantly higher than the mean of RR levels in Protocol group (mean=20.37).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in the Total _RR levels and the levels at the other days(from 1-5) (P-values are higher than 0.05)

Table (4-7): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in RR level.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
RR1	40	22.48 ± 7.36	21	40	24.73 ± 5.43	25	0.059
RR2	40	24.38 ± 7.77	23	40	23.1 ± 5.37	22	0.732
RR3	40	22.4 ± 6.09	22	40	21.4 ± 4.5	22	0.786
RR4	40	23.48 ± 6.94	23	40	21.45 ± 5.14	21	0.212
RR5	36	24.69 ± 8.74	23	40	21.75 ± 3.43	22	0.348
RR6	32	24.91 ± 7.29	24	36	21.56 ± 4.46	21	0.034
RR7	27	23.48 ± 5.76	22	30	20.37 ± 3.76	22	0.018*
Total-RR	40	23.65 ± 5.37	25	40	22.18 ± 3.18	22	0.093

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in HGB levels at: the First, fifth, sixth and seventh days (P-values less than 0.05).

At the first day, the mean of HGB levels in Historical group (mean=11.95) is significantly **higher** than the mean of HGB levels in Protocol group (mean=10.55).

At the fifth day, the mean of HGB levels in Historical group (mean=10.32) is significantly **lower** than the mean of HGB levels in Protocol group (mean=11.9).

At the sixth day, the mean of HGB levels in Historical group (mean=10.13) is significantly **lower** than the mean of HGB levels in Protocol group (mean=12.03).

At the seventh day, the mean of HGB levels in Historical group (mean=9.93) is significantly **lower** than the mean of HGB levels in Protocol group (mean=12.15).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in the Total_ HGB levels and the levels at the other days(from 2-4) (P-values are higher than 0.05).

Table (4-8): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in HGB levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
HGB1	40	11.95 ± 2.77	12	40	10.55 ± 2	10	0.011
HGB2	40	11.58 ± 2.63	11	40	10.63 ± 1.58	10	0.116
HGB3	40	10.78 ± 2.25	10	40	10.9 ± 1.6	11	0.362
HGB4	40	10.68 ± 2.22	10	40	11.33 ± 1.73	11	0.064
HGB5	37	10.32 ± 1.55	10	40	11.9 ± 1.84	12	0.000
HGB6	32	10.13 ± 1.41	10	39	12.03 ± 1.61	12	0.000
HGB7	27	9.93 ± 1.86	10	33	12.15 ± 1.7	12	0.000
Total _HGB	40	10.95 ± 1.88	10	40	11.4 ± 1.43	11	0.079

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PLT levels at the last four days and in the Total _PLT levels(P-values less than 0.05). The results exhibit that the mean of Total _PLT levels in Historical group (mean=195.3) is significantly **lower** than the mean of Total _PLT levels in Protocol group (mean=233.25).

At the fourth day, the mean of PLT levels in Historical group (mean=180.15) is significantly **lower** than the mean of PLT levels in Protocol group (mean=239.48).

At the fifth day, the mean of PLT levels in Historical group (mean=179.05) is significantly **lower** than the mean of PLT levels in Protocol group (mean=257.3).

At the sixth day, the mean of PLT levels in Historical group (mean=154.38) is significantly **lower** than the mean of PLT levels in Protocol group (mean=247.26).

At the seventh day, the mean of PLT levels in Historical group (mean=163.81) is significantly **lower** than the mean of PLT levels in Protocol group (mean=274.85).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PLT levels at the first three days(from 1-3) (P-values are higher than 0.05).

Table (4-9): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PLT levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PLT1	40	242.7 ± 139.79	230	40	199.5 ± 106.82	163	0.088
PLT2	40	208.45 ± 120.37	177	40	213.13 ± 106.63	170	0.607
PLT3	40	183.78 ± 118.58	142	40	211.88 ± 97.79	189	0.054
PLT4	40	180.15 ± 126.68	159	40	239.48 ± 108.17	223	0.001
PLT5	37	179.05 ± 122.26	150	40	257.3 ± 98.42	240	0.000
PLT6	32	154.38 ± 84	132	39	247.26 ± 94.13	245	0.000
PLT7	27	163.81 ± 84.82	143	33	274.85 ± 109.24	268	0.000
Total-PLT	40	195.3 ± 116.19	164	40	233.25 ± 82.58	227	0.003

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in BUN levels at all days and in the Total BUN levels (P-values less than 0.05). The results exhibit that the mean of Total BUN levels in levels in Historical group (mean=31.95) is significantly **higher** than the mean of Total BUN levels in Protocol group (mean=17.45). The results also exhibit that the mean levels of BUN in Historical group are significantly **higher** than the mean levels of BUN in Protocol group at all days.

At the first day, the mean of BUN levels in Historical group(mean=29.23) is significantly **higher** than the mean of BUN levels in Protocol group(mean=19.45).

At the second day, the mean of BUN levels in Historical group (mean=30.08) is significantly **higher** than the mean of BUN levels in Protocol group (mean=20.45).

At the third day, the mean of BUN levels in Historical group (mean=28.3) is significantly **higher** than the mean of BUN levels in Protocol group (mean=17.48).

At the fourth day, the mean of BUN levels in Historical group (mean=31.3) is significantly **higher** than the mean of BUN levels in Protocol group (mean=16.78).

At the fifth day, the mean of BUN levels in Historical group (mean=34.19) is significantly **higher** than the mean of BUN levels in Protocol group (mean=15.53).

At the sixth day, the mean of BUN levels in Historical group (mean=35.5) is significantly **higher** than the mean of BUN levels in Protocol group (mean=15.82).

And at the seventh day, the mean of BUN levels in Historical group (mean=36.67) is significantly **higher** than the mean of BUN levels in Protocol group (mean=16.58).

Table (4-10): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in BUN levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
BUN1	40	29.23 ± 22.45	22	40	19.45 ± 8.74	21	0.012*
BUN2	40	30.08 ± 18.92	26	40	20.45 ± 10.29	19	0.028
BUN3	40	28.3 ± 18.32	23	40	17.48 ± 7.11	17	0.007
BUN4	40	31.3 ± 20.87	25	40	16.78 ± 4.6	17	0.001
BUN5	37	34.19 ± 25.36	24	40	15.53 ± 5.07	15	0.001
BUN6	32	35.5 ± 29.64	25	39	15.82 ± 7.89	15	0.003
BUN7	27	36.67 ± 33.01	24	33	16.58 ± 7.96	15	0.007
Total_ BUN	40	31.95 ± 21.03	24	40	17.45 ± 5.03	19	0.001

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Cr levels at all days and in the Total Cr levels (P-values less than 0.05). The results exhibit that the mean of Total Cr levels in Historical group (mean=1.31) is significantly **higher** than the mean of Total Cr levels in Protocol group (mean=0.76). The results also exhibit that the mean levels of Cr in Historical group are significantly **higher** than the mean levels of Cr in Protocol group at all days.

At the first day, the mean of Cr levels in Historical group (mean=1.16) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.81).

At the second day, the mean of Cr levels in Historical group (mean=1.11) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.8).

At the third day, the mean of Cr levels in Historical group (mean=1.22) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.77).

At the fourth day, the mean of Cr levels in Historical group (mean=1.15) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.76).

At the fifth day, the mean of Cr levels in Historical group (mean=1.42) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.7).

At the sixth day, the mean of Cr levels in Historical group (mean=1.68) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.69).

And at the seventh day, the mean of Cr levels in Historical group (mean=1.73) is significantly **higher** than the mean of Cr levels in Protocol group (mean=0.7).

Table (4-11): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Cr levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Cr1	40	1.16 ± 0.97	0.9	40	0.81 ± 0.32	0.9	0.032*
Cr2	40	1.11 ± 0.91	0.8	39	0.8 ± 0.32	0.8	0.048*
Cr3	40	1.22 ± 1.33	0.8	40	0.77 ± 0.26	0.8	0.038*
Cr4	40	1.15 ± 1.19	0.8	40	0.76 ± 0.23	0.8	0.043*
Cr5	37	1.42 ± 1.66	0.9	40	0.7 ± 0.17	0.7	0.011
Cr6	32	1.68 ± 2.08	1.0	39	0.69 ± 0.19	0.7	0.021
Cr7	27	1.73 ± 2.39	0.9	33	0.7 ± 0.2	0.7	0.017*
Total-Cr	40	1.31 ± 1.29	0.9	40	0.76 ± 0.18	0.8	0.017

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Na levels at the first, second, and the fourth days and in the Total Na levels(P-values less than 0.05). The results exhibit that the mean of Total Na levels in Historical group (mean=141.75) is significantly **higher** than the mean of Total Na levels in Protocol group (mean=138.55).

At the first day, the mean of Na levels in Historical group (mean=138.88) is significantly **higher** than the mean of Na levels in Protocol group(mean=135.43).

At the second day, the mean of Na levels in Historical group (mean=141) is significantly **higher** than the mean of Na levels in Protocol group (mean=138).

And at the fourth day, the mean of Na levels in Historical group (mean=143.13) is significantly **higher** than the mean of Na levels in Protocol group (mean=138.45).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Na levels at days (2,5,6,7) (P-values are higher than 0.05

Table (4-12): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Na levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Na1	40	138.88 ± 6.75	138	40	135.43 ± 5.06	134	0.002
Na2	39	141 ± 7.82	140	40	138 ± 6.9	136	0.020
Na3	40	141.5 ± 10.52	140	40	138.33 ± 6.15	136	0.137
Na4	40	143.13 ± 11.47	142	40	138.45 ± 5.02	137	0.021*
Na5	37	142.14 ± 10.92	141	40	139.6 ± 4.2	140	0.585
Na6	32	141.31 ± 11.49	140	39	139.59 ± 4.54	140	0.702
Na7	27	140.22 ± 12.58	139	33	140.85 ± 4.07	141	0.693
Total-Na	40	141.75 ± 9.03	140	40	138.55 ± 2.96	138	0.036*

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in K levels at the first and the second days only(P-values less than 0.05).

At the first day, the mean of K levels in Historical group (mean=4.25) is significantly **higher** than the mean of K levels in Protocol group (mean=3.18).

And at the second day, the mean of K levels in Historical group (mean=4.08) is significantly **higher** than the mean of K levels in Protocol group (mean=3.45).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in K levels at days(from 3-7) and in the Total K (P-values are higher than 0.05)

Table (4-13): Descriptive statistics (Numbers, Means ,Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in K levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
K1	40	4.25 ± 0.93	4	40	3.18 ± 0.64	3	0.000
K2	38	4.08 ± 0.94	4	40	3.45 ± 0.55	3	0.001
K3	40	3.9 ± 0.84	4	40	3.73 ± 0.51	4	0.231
K4	39	3.95 ± 0.92	4	40	4 ± 0.45	4	0.940
K5	37	3.81 ± 0.81	4	40	3.98 ± 0.48	4	0.236
K6	32	4.06 ± 0.98	4	39	4.08 ± 0.35	4	0.957
K7	27	3.89 ± 0.85	4	33	4.06 ± 0.35	4	0.062
Total-K	40	4 ± 0.64	4	40	3.9 ± 0.3	4	0.504

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in ALBUMINE levels atthe first, the second, the fifth, and the sixth days only(P-values less than 0.05).

At the first day, the mean of ALBUMINE levels in Historical group (mean=2.95) is significantly **higher** than the mean of ALBUMINE levels in Protocol group(mean=2.5).

And at the second day, the mean of ALBUMINE levels in Historical group (mean=2.33) is significantly **lower** than the mean of ALBUMINE levels in Protocol group (mean=2.74).

And at the fifth day, the mean of ALBUMINE levels in Historical group (mean=2.46) is significantly **lower** than the mean of ALBUMINE levels in Protocol group (mean=2.95)

And at the sixth day, the mean of ALBUMINE levels in Historical group (mean=2.37) is significantly **lower** than the mean of ALBUMINE levels in Protocol group (mean=2.97)

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in ALBUMINE levels at days (3,4,7) and in the Total-ALBUMINE (P-values are higher than 0.05).

Table (4-14): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in ALBUMINE levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
ALBUMINE1	21	2.95 ± 0.74	3	38	2.5 ± 1.03	2	0.026
ALBUMINE2	21	2.33 ± 0.8	2	34	2.74 ± 0.67	3	0.049
ALBUMINE3	27	2.43 ± 0.69	2.0	35	2.66 ± 0.68	3.0	0.217
ALBUMINE4	20	2.65 ± 0.75	3	35	2.86 ± 0.69	3	0.272
ALBUMINE5	24	2.46 ± 0.59	2	37	2.95 ± 0.66	3	0.005
ALBUMINE6	19	2.37 ± 0.6	2	33	2.97 ± 0.77	3	0.004
ALBUMINE7	16	2.63 ± 0.89	3	28	3 ± 0.72	3	0.148
Total-ALBUMINE	34	2.59 ± 0.56	3	40	2.8 ± 0.56	3	0.130

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in WBC levels at the first, the second, the sixth, and the seventh days only (P-values less than 0.05).

At the first day, the mean of WBC levels in Historical group (mean=14.75) is significantly **lower** than the mean of WBC levels in Protocol group (mean=21.23).

And at the second day, the mean of WBC levels in Historical group (mean=15.1) is significantly **lower** than the mean of WBC levels in Protocol group (mean=18.13).

And at the sixth day, the mean of WBC levels in Historical group (mean=16.16) is significantly **higher** than the mean of WBC levels in Protocol group (mean=11.28).

And at the seventh day, the mean of WBC levels in Historical group (mean=14.96) is significantly **higher** than the mean of WBC levels in Protocol group (mean=10.12).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in WBC levels at days(3,4,5) and in the Total WBC (P-values are higher than 0.05).

Table (4-15): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in WBC levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
WBC1	40	14.75 ± 8.95	12	40	21.23 ± 7.93	21	0.000
WBC2	39	15.1 ± 7.18	14	40	18.13 ± 6.1	17	0.027
WBC3	40	13.2 ± 5.76	13	40	15.28 ± 5.06	16	0.067
WBC4	40	14.73 ± 6.49	13	40	14.05 ± 5.3	13	0.681
WBC5	37	14.73 ± 7.74	13	40	12.63 ± 4.38	11	0.249
WBC6	32	16.16 ± 8.41	14	39	11.28 ± 4.53	10	0.012
WBC7	27	14.96 ± 7.05	13	33	10.12 ± 3.59	10	0.001
Total WBC	40	14.9 ± 5.14	14	40	14.75 ± 4.36	14	0.990

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Ca level sat all days and in the Total Ca levels except at the first day(P-values less than 0.05). The results exhibit that the mean of Total Ca levels in Historical group (mean=7.44) is significantly **lower** than the mean of Total Ca levels in Protocol group (mean=8.28). The results also exhibit that the mean levels of Ca in Historical group are significantly **lower** than the mean levels of Ca in Protocol group at all days.

At the second day, the mean of Ca levels in Historical group (mean=7.19) is significantly **lower** than the mean of Ca levels in Protocol group (mean=7.8).

At the third day, the mean of Ca levels in Historical group(mean=7.1) is significantly **lower** than the mean of Ca levels in Protocol group(mean=7.97).

At the fourth day, the mean of Ca levels in Historical group (mean=7.53) is significantly **lower** than the mean of Ca levels in Protocol group (mean=8.3).

At the fifth day, the mean of Ca levels in Historical group (mean=7.38) is significantly **lower** than the mean of Ca levels in Protocol group (mean=8.53).

At the sixth day, the mean of Ca levels in Historical group (mean=7.17) is significantly **lower** than the mean of Ca levels in Protocol group (mean=8.78).

And at the seventh day, the mean of Ca levels in Historical group (mean=6.78) is significantly **lower** than the mean of Ca levels in Protocol group (mean=8.48).

Table (4-16): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Ca levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Ca1	30	7.1 ± 2.19	8	38	7.68 ± 1.21	8	0.319
Ca2	31	7.19 ± 1.6	8	35	7.8 ± 0.63	8	0.043*
Ca3	31	7.1 ± 2.01	7	36	7.97 ± 0.74	8	0.014
Ca4	30	7.53 ± 1.78	8	37	8.3 ± 0.78	8	0.020
Ca5	26	7.38 ± 1.72	8	38	8.53 ± 0.65	9	0.000
Ca6	24	7.17 ± 1.74	8	36	8.78 ± 0.8	9	0.000
Ca7	18	6.78 ± 2.32	8	29	8.48 ± 1.7	9	0.001
Total-Ca	36	7.44 ± 1.5	8	40	8.28 ± 0.64	8	0.001

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Mg levels at the first, the second, the sixth, and the seventh days only(P-values less than 0.05).

At the first day, the mean of Mg levels in Historical group (mean=1.96) is significantly **higher** than the mean of Mg levels in Protocol group (mean=1.54).

And at the second day, the mean of Mg levels in Historical group (mean=2.07) is significantly **higher** than the mean of Mg levels in Protocol group (mean=1.68).

And at the sixth day, the mean of Mg levels in Historical group (mean=1.68) is significantly **lower** than the mean of Mg levels in Protocol group (mean=2.03).

And at the seventh day, the mean of Mg levels in Historical group (mean=1.63) is significantly **lower** than the mean of Mg levels in Protocol group (mean=2.07).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Mg levels at days(3,4,5) and in the Total Mg (P-values are higher than 0.05).

Table (4-17): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Mg levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Mg1	26	1.96 ± 0.6	2	39	1.54 ± 0.68	1	0.005
Mg2	27	2.07 ± 0.83	2	38	1.68 ± 0.53	2	0.024*
Mg3	28	1.89 ± 0.5	2	38	1.89 ± 0.31	2	0.786
Mg4	29	1.83 ± 0.54	2	37	1.97 ± 0.44	2	0.252
Mg5	26	1.88 ± 0.52	2	37	1.95 ± 0.4	2	0.611
Mg6	22	1.68 ± 0.57	2	34	2.03 ± 0.39	2	0.006
Mg7	19	1.63 ± 0.5	2	29	2.07 ± 0.37	2	0.001
Total-Mg	35	1.91 ± 0.45	2	40	1.95 ± 0.32	2	0.616

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Glucose levels at the first, the fifth, and the sixth days only(P-values less than 0.05).

At the first day, the mean of Glucose levels in Historical group (mean=169.13) is significantly **lower** than the mean of Glucose levels in Protocol group (mean=239.7).

And at the fifth day, the mean of Glucose levels in Historical group (mean=187.92) is significantly **higher** than the mean of Glucose levels in Protocol group (mean=148.88).

And at the sixth day, the mean of Glucose levels in Historical group (mean=167.72) is significantly **higher** than the mean of Glucose levels in Protocol group (mean=132.82).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Glucose levels at days (2,3,4,7) and in the Total Glucose (P-values are higher than 0.05).

Table (4-18): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Glucose levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Glucose1	39	169.13 ± 73.57	148	40	239.7 ± 96.63	240	0.002
Glucose2	38	195.26 ± 117.89	158	40	206.3 ± 76.44	199	0.136
Glucose3	38	175.21 ± 122.47	140	40	171.6 ± 63.2	170	0.519
Glucose4	40	169.63 ± 110.06	131	40	153.2 ± 47.1	139	0.395
Glucose5	36	187.92 ± 106.56	141	40	148.88 ± 51.62	140	0.042*
Glucose6	32	167.72 ± 77.52	162	39	132.82 ± 41.67	121	0.018*
Glucose7	26	155.35 ± 62.71	133	33	140.55 ± 40.4	135	0.635
Total-Glucose	40	182.38 ± 91.12	153	40	171.1 ± 49.25	171	0.686

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PH levels only at the sixth day only (P-value less than 0.05).The mean of PH levels in Historical group (mean=7.34) is significantly **lower** than the mean of PH levels in Protocol group (mean=7.39).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PH levels at days (1,2,3,4,5,7) and in the Total PH (P-values are higher than 0.05).

Table (4-19): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PH levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PH1	40	7.3 ± 0.13	7.30	40	7.3 ± 0.12	7.26	0.345
PH2	40	7.31 ± 0.11	7.30	40	7.32 ± 0.09	7.31	0.903
PH3	40	7.34 ± 0.09	7.33	40	7.35 ± 0.07	7.33	0.660
PH4	40	7.35 ± 0.11	7.33	40	7.36 ± 0.06	7.35	0.404
PH5	37	7.34 ± 0.14	7.35	38	7.39 ± 0.06	7.38	0.112
PH6	31	7.34 ± 0.09	7.33	26	7.39 ± 0.07	7.38	0.032
PH7	26	7.33 ± 0.12	7.32	11	7.35 ± 0.06	7.33	0.343
Total PH	40	7.33 ± 0.06	7.3315	40	7.35 ± 0.05	7.3451	0.166

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PCO2levels at the third, fourth, fifth, and the sixth days and in the Total_PCO2levels(P-values less than 0.05). The results exhibit that the mean of Total_PCO2levels in Historical group (mean=50.23) is significantly **higher** than the mean of Total_PCO2levels in Protocol group (mean=44.28).

At the third day, the mean of PCO2levels in Historical group (mean=48.13) is significantly **higher** than the mean of PCO2levels in Protocol group (mean=41.25).

At the fourth day, the mean of PCO2levels in Historical group (mean=46.78) is significantly **higher** than the mean of PCO2levels in Protocol group (mean=39.3).

At the fifth day, the mean of PCO2 levels in Historical group(mean=46.08) is significantly **higher** than the mean of PCO2 levels in Protocol group (mean=39.92).

And at the sixth day, the mean of PCO2levels in Historical group (mean=55.03) is significantly **higher** than the mean of PCO2levels in Protocol group (mean=39.88). From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PCO2levels at days(1,2,7) (P-values are higher than 0.05).

Table (4-20): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PCO2levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PCO2_1	40	54.03 ± 25.29	39	40	55.38 ± 17.83	59	0.376
PCO2_2	40	50.5 ± 22.29	41	40	48.53 ± 22.2	49	0.876
PCO2_3	40	48.13 ± 13.89	45	40	41.25 ± 7.69	43	0.045
PCO2_4	40	46.78 ± 15.99	42	40	39.3 ± 8.21	40	0.031
PCO2_5	37	46.08 ± 15.83	40	38	39.92 ± 7.88	41	0.036*
PCO2_6	31	55.03 ± 24.79	47	26	39.88 ± 9.98	37	0.004
PCO2_7	26	53.62 ± 25.1	43	11	44.27 ± 8.74	41	0.724
Total_PCO2	40	50.23 ± 12.07	48	40	44.28 ± 7.49	46	0.010*

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PO2levels at the second, third, fourth, fifth, and the seventh days and in the Total_PO2levels(P-values less than 0.05). The results exhibit that the mean of Total_PO2levels in Historical group (mean=105.45) is significantly **lower** than the mean of Total_PO2levels in Protocol group(mean=130.98).

At the second day, the mean of PO2 levels in Historical group (mean=103.68) is significantly **lower** than the mean of PO2 levels in Protocol group (mean=126.2).

At the third day, the mean of PO2levels in Historical group (mean=102.38) is significantly **lower** than the mean of PO2levels in Protocol group (mean=130.43).

At the fourth day, the mean of PO2levels in Historical group (mean=110.85) is significantly **lower** than the mean of PO2levels in Protocol group (mean=133.93).

At the fifth day, the mean of PO2levels in Historical group (mean=105.19) is significantly **lower** than the mean of PO2levels in Protocol group (mean=131.82).

And at the seventh day, the mean of PO2levels in Historical group (mean=95.62) is significantly **lower** than the mean of PO2levels in Protocol group (mean=115.09).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PO2levels at days(1,6) (P-values are higher than 0.05).

Table (4-21): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PO2levels.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PO2_1	40	101.73 ± 37.12	99	40	123.63 ± 78.51	97	0.344
PO2_2	40	103.68 ± 32.19	104	40	126.2 ± 46	115	0.022
PO2_3	40	102.38 ± 31.79	95	40	130.43 ± 59.45	123	0.005
PO2_4	40	110.85 ± 39.66	101	40	133.93 ± 50.14	123	0.003
PO2_5	37	105.19 ± 34.78	98	38	131.82 ± 34.72	130	0.000
PO2_6	31	121.29 ± 65.85	97	26	134.58 ± 37.53	125	0.067
PO2_7	26	95.62 ± 38.51	84	11	115.09 ± 23.61	115	0.031
Total_PO2	40	105.45 ± 21.73	102	40	130.98 ± 37.04	126	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in HCO3levels at the third, and the sixth days and in the Total_HCO3levels(P-values less than 0.05). The results exhibit that the mean of Total_HCO3levels in Historical group (mean=22.24) is significantly **higher** than the mean of Total_HCO3levels in Protocol group (mean=21.38).

At the third day, the mean of HCO3levels in Historical group (mean=22.72) is significantly **higher** than the mean of HCO3levels in Protocol group (mean=20.8).

And at the sixth day, the mean of HCO3levels in Historical group (mean=23.68) is significantly **higher** than the mean of HCO3levels in Protocol group (mean=20.93).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in HCO3levels at days(1,2,4,5,7) (P-values are higher than 0.05).

Table (4-22): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in HCO3level

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
HCO3_1	39	21.79 ± 5.14	22.1	40	21.63 ± 4.64	22.0	0.306
HCO3_2	39	22.09 ± 5.11	23.0	40	21.02 ± 3.95	21.0	0.152
HCO3_3	39	22.72 ± 3.76	23.1	40	20.8 ± 3.46	21.0	0.005
HCO3_4	39	21.82 ± 3.8	22.0	40	21.63 ± 1.83	22.0	0.464
HCO3_5	36	22.06 ± 4.17	22.1	38	21.92 ± 3.56	22.0	0.732
HCO3_6	31	23.68 ± 6.21	23.2	26	20.93 ± 3.09	21.0	0.029
HCO3_7	26	22.85 ± 5.39	23.0	11	22.81 ± 2.6	22.0	0.537
Total_HCO3	39	22.24 ± 2.86	22.6	40	21.38 ± 2.09	21.7	0.034

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Fio2_Alevels at the fourth, fifth, sixth, and the seventh days (P-values less than 0.05).

At the fourth day, the mean of Fio2_Alevels in Historical group (mean=61.71) is significantly **higher** than the mean of Fio2_Alevels in Protocol group (mean=50.51).

At the fifth day, the mean of Fio2_A levels in Historical group (mean=58.79) is significantly **higher** than the mean of Fio2_A levels in Protocol group (mean=43.43).

At the sixth day, the mean of Fio2_A levels in Historical group (mean=53.31) is significantly **higher** than the mean of Fio2_A levels in Protocol group (mean=39.07).

And at the seventh day, the mean of Fio2_Alevels in Historical group (mean=53.8) is significantly **higher** than the mean of Fio2_Alevels in Protocol group(mean=35).

From the other hand, the results in the table blow show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Fio2_Alevels at days(1,2,3) and the Total_Fio2_A(P-values are higher than 0.05).

Table (4-23): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Fio2 levels in shift A.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Fio2_A_1	19	86.32 ± 23.85	100	25	89.52 ± 16.67	100	0.882
Fio2_A_2	39	65.13 ± 24.32	70	40	69.63 ± 20.92	70	0.400
Fio2_A_3	39	61.41 ± 22.36	60	40	57.63 ± 14.94	60	0.681
Fio2_A_4	38	61.71 ± 21.73	60	39	50.51 ± 12.45	50	0.043
Fio2_A_5	33	58.79 ± 21.72	55	35	43.43 ± 7.65	40	0.001
Fio2_A_6	29	53.31 ± 21.21	50	15	39.07 ± 7.67	40	0.029
Fio2_A_7	20	53.8 ± 19.97	50	3	35 ± 5	35	0.036
Total_Fio2_A	40	62.53 ± 19.53	61	40	57.98 ± 10.24	58	0.492

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Fio2_B levels at the third, fourth, fifth, and the sixth days (P-values less than 0.05).

At the third day, the mean of Fio2_B levels in Historical group (mean=61.41) is significantly **higher** than the mean of Fio2_B levels in Protocol group (mean=53.25)

At the fourth day, the mean of Fio2_B levels in Historical group (mean=60) is significantly **higher** than the mean of Fio2_B levels in Protocol group (mean=48.46).

At the fifth day, the mean of Fio2_B levels in Historical group (mean=55.19) is significantly **higher** than the mean of Fio2_B levels in Protocol group (mean=42.14).

At the sixth day, the mean of Fio2_B levels in Historical group (mean=53.96) is significantly **higher** than the mean of Fio2_B levels in Protocol group (mean=41).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Fio2_B levels at days (1,2) and the Total_Fio2_B (P-values are higher than 0.05). And at the seventh day, there were no cases with Fio2_B values.

Table (4-24): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Fio2 levels in shift B.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Fio2_B_1	32	79.69 ± 23.99	100	35	85.43 ± 21.02	100	0.389
Fio2_B_2	39	63.59 ± 25.1	60	39	65 ± 18.71	70	0.735
Fio2_B_3	39	61.41 ± 21.58	60	40	53.25 ± 13.42	50	0.046*
Fio2_B_4	36	60 ± 21.78	58	39	48.46 ± 11.98	45	0.040
Fio2_B_5	31	55.19 ± 23.1	50	28	42.14 ± 5.68	40	0.030
Fio2_B_6	28	53.96 ± 20.68	50	10	41 ± 7.75	40	0.045
Fio2_B_7	18	56.72 ± 22.53	50	0	-------	------	------
Total_Fio2_B	40	62.35 ± 17.71	62	40	57.95 ± 9.81	58	0.288

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Fio2_C levels at the first ,third, fourth, fifth, and the sixth days(P-values less than 0.05).

At the first day, the mean of Fio2_C levels in Historical group (mean=69.21) is significantly **lower** than the mean of Fio2_C levels in Protocol group (mean=80.63).

At the third day, the mean of Fio2_C levels in Historical group (mean=61.15) is significantly **higher** than the mean of Fio2_C levels in Protocol group (mean=52.88).

At the fourth day, the mean of Fio2_C levels in Historical group (mean=62.29) is significantly **higher** than the mean of Fio2_C levels in Protocol group(mean=46.15).

At the fifth day, the mean of Fio2_C levels in Historical group (mean=53.03) is significantly **higher** than the mean of Fio2_C levels in Protocol group (mean=42.04).

At the sixth day, the mean of Fio2_C levels in Historical group (mean=52.44) is significantly **higher** than the mean of Fio2_C levels in Protocol group (mean=40.5).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Fio2_C levels at the second day and the Total_Fio2_C(P-values

are higher than 0.05). And at the seventh day, there were no cases with Fio2_C values.

Table (4-25): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Fio2 levels in shift C.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Fio2_C_1	38	69.21 ± 22.16	70	40	80.63 ± 22.74	93	0.020
Fio2_C_2	39	59.74 ± 23.95	50	39	61.67 ± 15.45	70	0.356
Fio2_C_3	39	61.15 ± 21.54	60	40	52.88 ± 12.24	50	0.038*
Fio2_C_4	35	62.29 ± 21.29	60	39	46.15 ± 9.7	45	0.001
Fio2_C_5	30	53.03 ± 21.23	50	27	42.04 ± 5.76	40	0.039
Fio2_C_6	25	52.44 ± 19.19	50	10	40.5 ± 7.98	40	0.027
Fio2_C_7	16	63.13 ± 23.44	60	0	------	------	------
Total_Fio2_C	40	60.55 ± 16.84	60	40	56.68 ± 9.64	58	0.522

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Fio2 levels at the first ,fourth, fifth, sixth and the seventh days (P-values less than 0.05).

At the first day, the mean of Fio2 levels in Historical group (mean=74.15) is significantly **lower** than the mean of Fio2 levels in Protocol group (mean=83.9).

At the fourth day, the mean of Fio2 levels in Historical group (mean=61.05) is significantly **higher** than the mean of Fio2 levels in Protocol group (mean=48.38).

At the fifth day, the mean of Fio2 levels in Historical group (mean=57.39) is significantly **higher** than the mean of Fio2 levels in Protocol group (mean=42.1).

At the sixth day, the mean of Fio2 levels in Historical group (mean=52.65) is significantly **higher** than the mean of Fio2 levels in Protocol group (mean=38.96).

At the seventh day, the mean of Fio2 levels in Historical group (mean=55.8) is significantly **higher** than the mean of Fio2 levels in Protocol group (mean=35).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Fio2 levels at the second and third days and in the Total_Fio2(P-values are higher than 0.05).

Table (4-26): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Fio2 levels at all shifts.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Fio2_1	40	74.15 ± 23.16	83.3	40	83.9 ± 20.15	95.0	0.031
Fio2_2	40	62.82 ± 23.16	60.0	40	65.04 ± 17.35	70.0	0.556
Fio2_3	40	61.32 ± 20.83	60.0	40	54.58 ± 12.45	51.7	0.183
Fio2_4	40	61.05 ± 19.5	60.0	40	48.38 ± 10.85	45.0	0.004
Fio2_5	40	57.39 ± 22.2	53.3	40	42.1 ± 5.72	40.0	0.002
Fio2_6	40	52.65 ± 19.04	50.0	40	38.96 ± 8.07	40.0	0.010
Fio2_7	40	55.8 ± 20.67	50.0	40	35 ± 5	35.0	0.035
Total_Fio2	40	61.81 ± 17.37	60.7	40	57.53 ± 9.44	57.2	0.344

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Set rate A levels at the fourth day only (P-value less than 0.05). The mean of Set rate A levels in Historical group (mean=14.58) is significantly **higher** than the mean of Set rate A levels in Protocol group (mean=13.33).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Set rate A levels at all the other days and the Total Set rate_ A(P-values are higher than 0.05).

Table (4-27): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Set rate levels in shift A.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Set_rate_A_1	19	15.53 ± 2.25	15	27	14.37 ± 2.2	14	0.086
Set_rate_A_2	39	13.79 ± 2.6	14	40	14.6 ± 2.04	14	0.097
Set_rate_A_3	39	13.15 ± 2.63	13	40	14.18 ± 2.14	14	0.078
Set_rate_A_4	38	14.58 ± 2.98	14	39	13.33 ± 1.9	13	0.031*
Set_rate_A_5	33	13.52 ± 2.53	14	34	12.74 ± 1.75	12	0.113
Set_rate_A_6	29	12.66 ± 2.36	12	14	12.57 ± 1.65	12	0.972
Set_rate_A_7	20	12.55 ± 2.52	12	3	12 ± 0	12	0.622
Total Set rate A	40	13.68 ± 1.86	14	40	13.78 ± 1.64	14	0.890

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Set rate B levels at the fourth day only (P-value less than 0.05). The mean of Set rate B levels in Historical group (mean=14.11) is significantly **higher** than the mean of Set rate B levels in Protocol group (mean=13.08).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Set rate B levels at all the other days and the Total Set rate B (P-values are higher than 0.05). And there were no cases with Set_rate_B_7 values at the seventh day.

Table (4-28): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Set rate levels in shift B.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Set_rate_B_1	32	14 ± 3.07	14	36	14.28 ± 2.24	14	0.868
Set_rate_B_2	39	13.49 ± 2.43	14	40	14.35 ± 2.28	14	0.115
Set_rate_B_3	39	13.85 ± 2.44	14	40	14.08 ± 1.99	14	0.557
Set_rate_B_4	36	14.11 ± 2.47	14	39	13.08 ± 1.75	13	0.039*
Set_rate_B_5	31	13.06 ± 2.32	13	28	12.86 ± 1.67	12	0.359
Set_rate_B_6	27	12.89 ± 2.42	12	9	12.33 ± 1	12	0.576
Set_rate_B_7	18	12.67 ± 2.54	12	0	------	------	------
Total Set rate B	40	13.45 ± 1.74	14	40	13.68 ± 1.61	14	0.746

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Set rate C levels at the fourth day only (P-value less than 0.05). The mean of Set rate C levels in Historical group (mean=14.4) is significantly **higher** than the mean of Set rate C levels in Protocol group (mean=12.85).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Set rate C levels at all the other days and the Total_Set_rate_C(P-values are higher than 0.05). And there were no cases with Set_rate_C_7 values at the seventh day

Table (4-29): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Set rate levels in shift C.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Set_rate_C_1	38	13.74 ± 2.81	14	39	14.38 ± 2.23	14	0.405
Set_rate_C_2	39	13.36 ± 2.5	13	40	14.18 ± 2.09	14	0.111
Set_rate_C_3	39	14.18 ± 2.94	14	40	13.68 ± 2.16	14	0.483
Set_rate_C_4	35	14.4 ± 2.44	14	39	12.85 ± 1.69	12	0.005
Set_rate_C_5	30	13.03 ± 2.28	14	26	12.65 ± 1.81	12	0.177
Set_rate_C_6	24	12.5 ± 2.32	12	9	12.33 ± 1	12	0.715
Set_rate_C_7	16	12.88 ± 2.33	12	0	------	------	------
Total Set rate C	40	13.78 ± 1.9	14	40	13.45 ± 1.54	14	0.398

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Set rate levels at the fourth day only(P-value less than 0.05). The mean of Set rate levels in Historical group (mean=14.52) is significantly **higher** than the mean of Set rate levels in Protocol group (mean=13.09).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Set rate levels at all the other days and the Total Set rate (P-values are higher than 0.05).

Table (4-30): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Set rate levels at all shifts.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Set_rate_1	40	13.82 ± 2.76	14.0	40	14.39 ± 2.12	14.0	0.471
Set_rate_2	40	13.55 ± 2.29	13.0	40	14.38 ± 2.01	14.0	0.089
Set_rate_3	40	13.73 ± 2.19	14.0	40	13.98 ± 2	14.0	0.570
Set_rate_4	40	14.52 ± 2.86	14.2	40	13.09 ± 1.71	13.0	0.011
Set_rate_5	40	13.45 ± 2.48	13.3	40	12.68 ± 1.65	12.0	0.072
Set_rate_6	40	12.63 ± 2.22	12.0	40	12.43 ± 1.16	12.0	0.757
Set_rate_7	40	12.73 ± 2.41	12.0	40	12 ± 0	12.0	0.527
Total Set rate	40	13.63 ± 1.71	13.8	40	13.63 ± 1.54	13.7	0.880

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in TV A levels at all days and in the Total TV A levels(P-values less than 0.05). The results exhibit that the mean of Total TV A levels in Historical group (mean=522.28) is significantly **higher** than the mean of Total TV A levels in Protocol group (mean=468.05). The results also exhibit that the mean levels of TV_A in Historical group are significantly **higher** than the mean levels of TV_A in Protocol group at all days.

At the first day, the mean of TV_A levels in Historical group (mean=547.37) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=474.07).

At the second day, the mean of TV_A levels in Historical group (mean=538.68) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=495).

At the third day, the mean of TV_A levels in Historical group (mean=529.47) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=481.25).

At the fourth day, the mean of TV_A levels in Historical group (mean=527.89) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=452.56).

At the fifth day, the mean of TV_A levels in Historical group (mean=515.76) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=436.76).

At the sixth day, the mean of TV_A levels in Historical group (mean=520.52) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=426.92).

And at the seventh day, the mean of TV_A levels in Historical group (mean=521.05) is significantly **higher** than the mean of TV_A levels in Protocol group (mean=400).

Table (4-31): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in TV levels in shift A.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
TV_A_1	19	547.37 ± 94.98	500	27	474.07 ± 50.71	450	0.003
TV_A_2	38	538.68 ± 72.79	510	40	495 ± 69.61	500	0.007
TV_A_3	38	529.47 ± 80.1	500	40	481.25 ± 62.72	500	0.006
TV_A_4	38	527.89 ± 70.41	500	39	452.56 ± 48.6	450	0.000
TV_A_5	33	515.76 ± 76.49	500	34	436.76 ± 44.91	400	0.000
TV_A_6	29	520.52 ± 67.83	500	13	426.92 ± 48.37	400	0.000
TV_A_7	19	521.05 ± 73.25	500	3	400 ± 0	400	0.008
Total TV A	40	522.28 ± 65.78	500	40	468.05 ± 46.21	465	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in TV B levels at all days and in the Total TV B levels except at the seventh day(P-values less than 0.05). The results exhibit that the mean of Total TV B levels in Historical group(mean=519.28) is significantly **higher** than the mean of Total TV B levels in Protocol group(mean=466.95). The results also exhibit that the mean levels of TV_B in Historical group are significantly **higher** than the mean levels of TV_B in Protocol group at all days.

At the first day, the mean of TV_B levels in Historical group(mean=532.26) is significantly **higher** than the mean of TV_B levels in Protocol group(mean=477.78).

At the second day, the mean of TV_B levels in Historical group(mean=542.63) is significantly **higher** than the mean of TV_B levels in Protocol group(mean=491.03).

At the third day, the mean of TV_B levels in Historical group (mean=525.53) is significantly **higher** than the mean of TV_B levels in Protocol group(mean=471.25).

At the fourth day, the mean of TV_B levels in Historical group (mean=522.78) is significantly **higher** than the mean of TV_B levels in Protocol group(mean=447.44).

At the fifth day, the mean of TV_B levels in Historical group (mean=516.77) is significantly **higher** than the mean of TV_B levels in Protocol group (mean=430.36).

At the sixth day, the mean of TV_B levels in Historical group(mean=517.41) is significantly **higher** than the mean of TV_B levels in Protocol group(mean=431.25).

And at the seventh day, there were no cases have TV B levels in Protocol group.

Table (4-32): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in TV levels in shift B.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
TV_B_1	31	532.26 ± 91.79	500	36	477.78 ± 49.92	450	0.010
TV_B_2	38	542.63 ± 72.85	535	39	491.03 ± 64.76	500	0.002
TV_B_3	38	525.53 ± 79.38	500	40	471.25 ± 58.71	475	0.003
TV_B_4	36	522.78 ± 78.69	500	39	447.44 ± 49.93	450	0.000
TV_B_5	31	516.77 ± 76.74	500	28	430.36 ± 41.59	400	0.000
TV_B_6	27	517.41 ± 71.98	500	8	431.25 ± 59.39	400	0.004
TV_B_7	17	523.53 ± 77.29	500	0	------	------	------
Total-TV-B	40	519.28 ± 67.04	500	40	466.95 ± 45.92	466	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in TV_C levels at all days and in the Total TV C levels except at the seventh day(P-values less than 0.05). The results exhibit that the mean of Total TV C levels in Historical group(mean=524.35) is significantly **higher** than the mean of Total TV C levels in Protocol group(mean=461.6). The results also exhibit that the mean levels of TV_C in Historical group are significantly **higher** than the mean levels of TV_C in Protocol group at all days.

At the first day, the mean of TV_C levels in Historical group (mean=535.56) is significantly **higher** than the mean of TV_C levels in Protocol group (mean=482.5).

At the second day, the mean of TV_C levels in Historical group (mean=543.95) is significantly **higher** than the mean of TV_C levels in Protocol group (mean=484.62).

At the third day, the mean of TV_C levels in Historical group (mean=528.16) is significantly **higher** than the mean of TV_C levels in Protocol group (mean=467.5).

At the fourth day, the mean of TV_C levels in Historical group (mean=514.86) is significantly **higher** than the mean of TV_C levels in Protocol group (mean=439.74).

At the fifth day, the mean of TV_C levels in Historical group(mean=524) is significantly **higher** than the mean of TV_C levels in Protocol group(mean=426.92).

At the sixth day, the mean of TV_C levels in Historical group (mean=522.61) is significantly **higher** than the mean of TV_C levels in Protocol group (mean=428.89).

And at the seventh day, there were no cases have TV_C levels in Protocol group.

Table (4-33): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in TV levels in shift C.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
TV_C_1	36	535.56 ± 84.16	500	40	482.5 ± 64.6	450	0.003
TV_C_2	38	543.95 ± 72.5	510	39	484.62 ± 64.02	500	0.001
TV_C_3	38	528.16 ± 75.83	500	40	467.5 ± 51.33	450	0.000
TV_C_4	35	514.86 ± 76.25	500	39	439.74 ± 44.69	450	0.000
TV_C_5	30	524 ± 75	500	26	426.92 ± 45.23	400	0.000
TV_C_6	23	522.61 ± 73.44	500	9	428.89 ± 56	400	0.002
TV_C_7	15	520 ± 70.2	500	0	------	------	------
Total TV C	40	524.35 ± 63.81	506	40	461.6 ± 38.39	461	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in TV level sat all days and in the Total TV levels(P-values less than 0.05). The results exhibit that the mean of Total TV levels in Historical group (mean=521.97) is significantly **higher** than the mean of Total TV levels in Protocol group (mean=465.53). The results also exhibit that the mean levels of TV in Historical group are significantly **higher** than the mean levels of TV in Protocol group at all days.

At the first day, the mean of TV levels in Historical group (mean=531.18) is significantly **higher** than the mean of TV levels in Protocol group (mean=480.21).

At the second day, the mean of TV levels in Historical group (mean=541.75) is significantly **higher** than the mean of TV levels in Protocol group (mean=489.58).

At the third day, the mean of TV levels in Historical group (mean=527.72) is significantly **higher** than the mean of TV levels in Protocol group (mean=473.33).

At the fourth day, the mean of TV levels in Historical group (mean=521.93) is significantly **higher** than the mean of TV levels in Protocol group (mean=446.58).

At the fifth day, the mean of TV levels in Historical group (mean=517.02) is significantly **higher** than the mean of TV levels in Protocol group (mean=433.82).

At the sixth day, the mean of TV levels in Historical group (mean=517.93) is significantly **higher** than the mean of TV levels in Protocol group (mean=427.18).

And at the seventh day, the mean of TV levels in Historical group (mean=518.42) is significantly **higher** than the mean of TV levels in Protocol group (mean=400).

Table (4-34): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in TV levels at all shifts.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
TV_1	40	531.18 ± 84.02	500.0	40	480.21 ± 60.61	450.0	0.002
TV_2	40	541.75 ± 70.44	533.3	40	489.58 ± 62.89	483.3	0.001
TV_3	40	527.72 ± 76.74	500.0	40	473.33 ± 53.22	475.0	0.002
TV_4	40	521.93 ± 71.68	500.0	40	446.58 ± 45.59	450.0	0.000
TV_5	40	517.02 ± 72.66	500.0	40	433.82 ± 42.14	400.0	0.000
TV_6	40	517.93 ± 67.65	500.0	40	427.18 ± 48.22	400.0	0.000
TV_7	40	518.42 ± 74.51	500.0	40	400 ± 0	400.0	0.008
Total TV	40	521.97 ± 65.06	500.0	40	465.53 ± 42.24	460.3	0.000

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PEEP_A levels at the third, fourth, fifth, sixth and the seventh days and in the Total PEEP_A levels(P-values less than 0.05). The results exhibit that the mean of Total PEEP A levels in Historical group (mean=6.35) is significantly **higher** than the mean of Total PEEP A levels in Protocol group (mean=5.25).

At the third day, the mean of PEEP_A levels in Historical group (mean=6.44) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5.49).

At the fourth day, the mean of PEEP_A levels in Historical group (mean=6.97) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5.03).

At the fifth day, the mean of PEEP_A levels in Historical group (mean=7.06) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=4.97).

At the sixth day, the mean of PEEP_A levels in Historical group (mean=6.5) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5.25).

And at the seventh day, the mean of PEEP_A levels in Historical group (mean=6.1) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PEEP_A levels at the first two days(P-values are higher than 0.05).

Table (4-35): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PEEP levels in shift A.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PEEP_A_1	19	4.68 ± 1.86	5	27	5.52 ± 1.31	5	0.125
PEEP_A_2	37	5.65 ± 2.54	5	39	5.38 ± 1.16	5	0.383
PEEP_A_3	39	6.44 ± 2.35	5	37	5.49 ± 1.82	5	0.038
PEEP_A_4	38	6.97 ± 2.16	7	38	5.03 ± 1.59	5	0.000
PEEP_A_5	32	7.06 ± 1.93	7	31	4.97 ± 1.6	5	0.000
PEEP_A_6	28	6.5 ± 1.93	5	12	5.25 ± 0.87	5	0.032
PEEP_A_7	20	6.1 ± 1.52	5	2	5 ± 0	5	0.004*
Total-PEEP-A	40	6.35 ± 1.59	6	40	5.25 ± 0.78	5	0.001

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PEEP_B levels at the fourth, fifth, and in the Total PEEP_B levels(P-values less than 0.05). The results exhibit that the mean of Total PEEP_B levels in Historical group (mean=6.03) is significantly **higher** than the mean of Total PEEP_B levels in Protocol group (mean=5.2).

At the fourth day, the mean of PEEP_B levels in Historical group (mean=6.8) is significantly **higher** than the mean of PEEP_B levels in Protocol group (mean=5.03).

At the fifth day, the mean of PEEP_B levels in Historical group (mean=6.52) is significantly **higher** than the mean of PEEP_B levels in Protocol group (mean=5).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PEEP_B levels at the days (1,2,3,6) (P-values are higher than 0.05). And at the seventh day, there were no cases have values of PEEP_B.

Table (4-36): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PEEP levels in shift B.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PEEP_B_1	32	5.5 ± 1.83	5	36	5.14 ± 1.1	5	0.494
PEEP_B_2	39	5.79 ± 2.31	5	38	5.34 ± 1.15	5	0.168
PEEP_B_3	39	6 ± 2.27	5	37	5.43 ± 1.71	5	0.287
PEEP_B_4	35	6.8 ± 2.04	7	38	5.03 ± 1.59	5	0.000
PEEP_B_5	29	6.52 ± 1.72	6	24	5 ± 0	5	0.000
PEEP_B_6	27	6.22 ± 1.74	5	8	5 ± 0	5	0.058
PEEP_B_7	18	5.5 ± 2.23	5	0	------	------	------
Total PEEP_B	40	6.03 ± 1.49	6	40	5.2 ± 0.61	5	0.010

*P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PEEP_C levels at the second, third, fourth, fifth, sixth and in the Total PEEP C levels(P-values less than 0.05). The results exhibit that the mean of Total PEEP C levels in Historical group (mean=6.15) is significantly **higher** than the mean of Total PEEP C levels in Protocol group (mean=5.23).

At the second day, the mean of PEEP_C levels in Historical group (mean=6.13) is significantly **higher** than the mean of PEEP_C levels in Protocol group (mean=5.34).

At the third day, the mean of PEEP_C levels in Historical group (mean=6.58) is significantly **higher** than the mean of PEEP_C levels in Protocol group (mean=5.21).

At the fourth day, the mean of PEEP_C levels in Historical group (mean=6.83) is significantly **higher** than the mean of PEEP_C levels in Protocol group (mean=5.11).

At the fifth day, the mean of PEEP_C levels in Historical group (mean=6.07) is significantly **higher** than the mean of PEEP_C levels in Protocol group (mean=5).

At the sixth day, the mean of PEEP_C levels in Historical group (mean=5.88) is significantly **higher** than the mean of PEEP_C levels in Protocol group (mean=5).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PEEP_C levels at the first day(P-value is higher than 0.05). And at the seventh day, there were no cases have values of PEEP_C.

Table (4-37): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PEEP levels in shift C.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PEEP_C_1	36	5.22 ± 2.21	5	40	5.35 ± 1.1	5	0.770
PEEP_C_2	39	6.13 ± 2.14	5	38	5.34 ± 1.15	5	0.020
PEEP_C_3	38	6.58 ± 2.37	5	38	5.21 ± 2.18	5	0.006
PEEP_C_4	35	6.83 ± 1.98	7	38	5.11 ± 1.66	5	0.000
PEEP_C_5	29	6.07 ± 2.07	5	21	5 ± 0	5	0.002
PEEP_C_6	24	5.88 ± 1.42	5	8	5 ± 0	5	0.006*
PEEP_C_7	15	5.8 ± 1.21	5	0	------	------	------
Total PEEP_C	40	6.15 ± 1.39	6	40	5.23 ± 0.83	5	0.002

* P-Value of the Two in dependent samples T test adjusted for unequal variances.

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in PEEP_A levels at the third, fourth, fifth, sixth and the seventh days and in the Total PEEP A levels(P-values less than 0.05). The results exhibit that the mean of Total PEEP A levels in Historical group (mean=6.18) is significantly **higher** than the mean of Total PEEP A levels in Protocol group (mean=5.23).

At the third day, the mean of PEEP_A levels in Historical group (mean=6.32) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5.37).

At the fourth day, the mean of PEEP_A levels in Historical group (mean=6.85) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5.05).

At the fifth day, the mean of PEEP_A levels in Historical group (mean=6.78) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=4.99).

At the sixth day, the mean of PEEP_A levels in Historical group(mean=6.23) is significantly **higher** than the mean of PEEP_A levels in Protocol group(mean=5.08).

And at the seventh day, the mean of PEEP_A levels in Historical group (mean=5.81) is significantly **higher** than the mean of PEEP_A levels in Protocol group (mean=5).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in PEEP_A levels at the first two days(P-values are higher than 0.05).

Table (4-38): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in PEEP levels at all shifts.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
PEEP_1	40	5.09 ± 1.91	5.0	40	5.28 ± 0.85	5.0	0.345
PEEP_2	40	5.85 ± 2.07	5.0	40	5.35 ± 0.88	5.0	0.201
PEEP_3	40	6.32 ± 2.11	5.3	40	5.37 ± 1.72	5.0	0.008
PEEP_4	40	6.85 ± 1.99	7.0	40	5.05 ± 1.57	5.0	0.000
PEEP_5	40	6.78 ± 1.88	6.5	40	4.99 ± 0.53	5.0	0.000
PEEP_6	40	6.23 ± 1.57	5.0	40	5.08 ± 0.29	5.0	0.012
PEEP_7	40	5.81 ± 1.4	5.0	40	5 ± 0	5.0	0.018*
Total PEEP	40	6.18 ± 1.4	5.8	40	5.23 ± 0.68	5.0	0.001

Section three: Glasgow coma scale

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale A levels at the sixth and at the seventh days and in the Total Glasgow_ coma scale A levels(P-values less than 0.05). The results exhibit that the mean of Total Glasgow coma scale A levels in Historical group (mean=5.88) is significantly **lower** than the mean of Total Glasgow coma scale A levels in Protocol group (mean=7.2).

At the sixth day, the mean of Glasgow coma scale A levels in Historical group (mean=6.13) is significantly **lower** than the mean of Glasgow coma scale A levels in Protocol group (mean=9.46).

And at the seventh day, the mean of Glasgow coma scale A levels in Historical group (mean=6.62) is significantly **lower** than the mean of Glasgow coma scale A levels in Protocol group (mean=12.03).

From the other hand, the results in the table above show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale A levels at the first five days(P-values are higher than 0.05).

Table (4-39): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Glasgow coma scale in shift A.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Glasgow_coma_scale_A_1	40	5.45 ± 0.85	5	40	5.35 ± 0.58	5	0.582
Glasgow_coma_scale_A_2	40	5.55 ± 1.28	5	40	5.65 ± 0.74	6	0.286
Glasgow_coma_scale_A_3	40	5.83 ± 1.2	6	40	5.78 ± 1.31	6	0.530
Glasgow_coma_scale_A_4	39	6.03 ± 1.66	6	40	5.73 ± 1.68	5	0.098
Glasgow_coma_scale_A_5	37	6.32 ± 2.63	6	40	6.85 ± 2.47	6	0.239
Glasgow_coma_scale_A_6	32	6.13 ± 2.69	5	39	9.46 ± 3.02	10	0.000
Glasgow_coma_scale_A_7	26	6.62 ± 3.45	5	35	12.03 ± 1.29	12	0.000
Total Glasgow coma scale A	40	5.88 ± 1.44	6	40	7.2 ± 1.07	7	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale B levels at the sixth and at the seventh days and in the Total Glasgow coma scale B levels (P-values less than 0.05). The results exhibit that the

mean of Total Glasgow coma scale B levels in Historical group(mean=5.9) is significantly **lower** than the mean of Total Glasgow coma scale B levels in Protocol group(mean=7.28).

At the sixth day, the mean of Glasgow coma scale B levels in Historical group (mean=6.31) is significantly **lower** than the mean of Glasgow coma scale B levels in Protocol group (mean=10.05).

And at the seventh day, the mean of Glasgow coma scale B levels in Historical group (mean=6.73) is significantly **lower** than the mean of Glasgow coma scale B levels in Protocol group (mean=12.03).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale B levels at the first five days (P-values are higher than 0.05).

Table (4-40): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Glasgow coma scale in shift B.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Glasgow_coma_scale_B_1	40	5.43 ± 0.84	5	40	5.28 ± 0.51	5	0.475
Glasgow_coma_scale_B_2	40	5.68 ± 1.37	5	40	5.28 ± 0.55	5	0.141
Glasgow_coma_scale_B_3	40	5.53 ± 1.34	5	40	5.73 ± 1.38	5	0.460
Glasgow_coma_scale_B_4	39	6 ± 1.79	6	40	5.88 ± 1.7	6	0.719
Glasgow_coma_scale_B_5	37	6.24 ± 2.39	6	40	6.95 ± 2.39	6	0.123
Glasgow_coma_scale_B_6	32	6.31 ± 2.8	6	39	10.05 ± 2.26	11	0.000
Glasgow_coma_scale_B_7	26	6.73 ± 3.44	6	35	12.03 ± 1.44	12	0.000
Total Glasgow coma scale B	40	5.9 ± 1.48	6	40	7.28 ± 1.01	7	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale C levels at the sixth and at the seventh days and in the Total Glasgow coma scale C levels (P-values less than 0.05). The results exhibit that the mean of Total Glasgow coma scale C levels in Historical group (mean=5.8) is significantly **lower** than the mean of Total Glasgow coma scale C levels in Protocol group (mean=7.23).

At the sixth day, the mean of Glasgow coma scale C levels in Historical group (mean=5.97) is significantly **lower** than the mean of Glasgow coma scale C levels in Protocol group (mean=10.21).

And at the seventh day, the mean of Glasgow coma scale C levels in Historical group (mean=6.65) is significantly **lower** than the mean of Glasgow coma scale C levels in Protocol group (mean=11.91).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale C levels at the first five days(P-values are higher than 0.05).

Table (4-41): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Glasgow coma scale in shift C.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Glasgow_coma_scale_C_1	40	5.38 ± 0.81	5	40	5.18 ± 0.55	5	0.124
Glasgow_coma_scale_C_2	40	5.48 ± 1.36	5	40	5.33 ± 0.62	5	0.751
Glasgow_coma_scale_C_3	40	5.48 ± 1.47	5	40	5.55 ± 1.36	5	0.868
Glasgow_coma_scale_C_4	39	5.87 ± 1.79	5	40	5.8 ± 1.38	6	0.838
Glasgow_coma_scale_C_5	37	6.24 ± 2.43	6	40	7 ± 2.3	7	0.076
Glasgow_coma_scale_C_6	32	5.97 ± 2.53	5	39	10.21 ± 2.43	11	0.000
Glasgow_coma_scale_C_7	26	6.65 ± 3.49	6	35	11.91 ± 1.62	12	0.000
Total Glasgow coma scale C	40	5.8 ± 1.49	5	40	7.23 ± 0.95	7	0.000

The results in the table below show that there are significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale AVERAGE levels at the sixth and at the seventh days and in the Total Glasgow coma scale AVERAGE levels(P-values less than 0.05). The results exhibit that the mean of Total Glasgow coma scale AVERAGE

levels in Historical group (mean=5.85) is significantly **lower** than the mean of Total Glasgow coma scale AVERAGE levels in Protocol group (mean=7.2).

At the sixth day, the mean of Glasgow coma scale AVERAGE levels in Historical group (mean=5.97) is significantly **lower** than the mean of Glasgow coma scale AVERAGE levels in Protocol group (mean=9.62).

And at the seventh day, the mean of Glasgow coma scale AVERAGE levels in Historical group (mean=6.65) is significantly **lower** than the mean of Glasgow coma scale AVERAGE levels in Protocol group (mean=12.06).

From the other hand, the results in the table below show that there are **no** significant differences at 0.05 level between Historical group and Protocol group in Glasgow coma scale AVERAGE levels at the first five days(P-values are higher than 0.05).

Table (4-42): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) and the test of differences between the Historical and the Protocol groups in Average Glasgow coma scale.

Group	Historical			Protocol			
Scale	N	Mean ± S.D	Median	N	Mean ± S.D	Median	Mann-Whitney P-value
Glasgow_coma_scale_AVERAGE_1	40	5.48 ± 0.72	5	40	5.3 ± 0.46	5	0.213
Glasgow_coma_scale_AVERAGE_2	40	5.55 ± 1.26	5	40	5.4 ± 0.59	5	0.777
Glasgow_coma_scale_AVERAGE_3	40	5.5 ± 1.26	5	40	5.7 ± 1.34	5	0.632
Glasgow_coma_scale_AVERAGE_4	39	5.97 ± 1.68	6	39	5.72 ± 1.5	5	0.268
Glasgow_coma_scale_AVERAGE_5	37	6.27 ± 2.42	6	40	6.93 ± 2.28	6	0.100
Glasgow_coma_scale_AVERAGE_6	32	5.97 ± 2.61	5	39	9.62 ± 2.55	10	0.000
Glasgow_coma_scale_AVERAGE_7	26	6.65 ± 3.41	5	35	12.06 ± 1.37	12	0.000
Total Glasgow coma scale AVERAGE	40	5.85 ± 1.48	5	40	7.2 ± 0.99	7	0.000

Section four: Feeding

The results in the table below show that the values of Total Intake for Protocol group are ranged between10200 and 21700 with average 14893.4, and the values of Total Output for Protocol group are ranged between 5700 and 18200 with average 13610.75 .

Table (4-43): Descriptive statistics (Numbers, Means, Standard Deviations, and Median) for Total Intake and Total Output scores in Protocol Group.

Descriptive Statistics						
	N	Minimum	Maximum	Mean	Std. Deviation	Median
Total Intake	40	10200	21700	14893.40	2467.127	14800
Total Output	40	5700	18200	13610.75	2637.950	14150

Section five: Complications

The results in the table below show that there are **no** cases in the Protocol group have the following Complications: Breakage and leakage of the tube, Bleeding from insertion site, Intestinal obstruction (illus), Hemorrhage, Infectious complications Infection at the tube insertion site, Aspiration pneumonia, Nasopharyngeal and ear infections, Peritonitis, Vitamin and trace element deficiency.

- The results also show that most of cases (95%) have not Displacement of the feeding tube and Metabolic complications Electrolyte disturbances (Hyper- and hypoglycemia).

- Regarding Tube obstruction, only 17.5% of the cases have this complication while 82.5% of the cases have not.

- Regarding Accidental tube removal, only 15% of the cases have this complication while 85% of the cases have not.

- Regarding Diarrhea, only 20% of the cases have this complication while 80% of the cases have not.

- And regarding (Edema / Ascites /Nausea /Vomiting/ Constipation Anorexia), only 27.5% of the cases have one or more of these complications while 72.5% of the cases have not.

- Finally, the results show that92.5% of the cases of Protocol group have Normal Residual Volume Amount (<300), and only 7.5% of the cases have Up-Normal Residual Volume Amount (>=300).

Table (4-44): Frequencies and Percentages for Complications in Protocol Group.

Complication	No	Yes
Normal Residual Volume Amount (<300)	3(7.5%)	37(92.5%)
Tube obstruction.	33(82.5%)	7(17.5%)
Displacement of the feeding tube.	38(95%)	2(5%)
Accidental tube removal.	34(85%)	6(15%)
Breakage and leakage of the tube.	40(100%)	0(0%)
Bleeding from insertion site.	40(100%)	0(0%)
Intestinal obstruction (illus).	40(100%)	0(0%)
Hemorrhage.	40(100%)	0(0%)
Infectious complications Infection at the tube insertion site.	40(100%)	0(0%)
Aspiration pneumonia.	40(100%)	0(0%)
Nasopharyngeal and ear infections.	40(100%)	0(0%)
Peritonitis.	40(100%)	0(0%)
diarrhea.	32(80%)	8(20%)
Metabolic complications Electrolyte disturbances (Hyper- and hypoglycemia).	38(95%)	2(5%)
Vitamin and trace element deficiency.	40(100%)	0(0%)
Edema / Ascites /Nausea /Vomiting/ Constipation Anorexia	29(72.5%)	11(27.5%)

Chapter 5
Discussion

5.1 Overview

The result of this study showed is there a relationship between early feeding for the critical ill patients and the clinical outcomes also. The patients data and the variable are introduced to put into action the recommendations that are based on the yielded findings our protocol is a novel EN feeding strategy when compared with other traditional feeding approach, it is needed a paradigm shift in practice, from a slow, conservative and reactionary approach to aggressive and protective one to minimize energy protein debt as well as the chances of intolerance. In addition, the strict monitoring of nutrition adequacy and comprehensive educational components also ensure that patients are fed safely and effectively.

In this current study all patients were divided into two groups critically ill patients in surgical ICU, 80 patients each group 40patients control and experimental the discuss will be build on answering hypothesis which presented earlier in this thesis:

5.1.1 hypothesis one

The first hypothesis the effect the early feeding for critical ill patients on the patients outcome which include :

1- Vital signs (blood pressure, heart rat, Temperature and respiratory rate).

2- Lab test result (HGB, PLT, BUN, Cr, Na, K, albumin, WBC, Ca, Mg, RBS, Bilirubin)

3- Glasgow coma scale

Our study found multiple significant difference in DBP at the first and fourth day also there are significant differences at 0.05 level between Historical group and Protocol group also in HR levels at the sixth and seventh days and there are significant differences at 0.05 level between Historical group and Protocol group in TEMP levels at the fifth and at the sixth days (P-values less than 0.05) , also there are significant differences at 0.05 level between Historical group and Protocol group in RR levels at the sixth and seventh days(P-values less than 0.05),and the study results similar to study done by Dalia Salah El-Deen El-Sedawyet al., (2019) both study approved that there is a significant result in vital sign especially temperature heart rate saturation when introducing the early feeding for critically ill patients .

Regarding the lap tests in this current study there are significant differences at 0.05 level between Historical group and Protocol group in HGB levels at: the First, fifth, sixth and seventh days(P-values less than 0.05) and that there are significant differences in PLT levels at the last four days and in the Total _PLT levels(P-values less than 0.05) also there are significant differences at 0.05 level between Historical group and Protocol group in BUN levels at all days and in the Total BUN levels(P-values less than 0.05) and there are significant differences in Cr levels at all days and in the Total Cr levels (P-values less than 0.05), there are significant differences at 0.05 level between Historical group and Protocol group in Na levels at the first, second, and the fourth days and in the Total Na levels (P-values less than 0.05) and there are significant differences in K levels at the first and the second days only (P-values less than 0.05) also there are significant differences at 0.05 level between Historical group and Protocol group in ALBUMINE levels at the first, the second, the fifth, and the sixth days only.

There are significant differences at 0.05 level between Historical group and Protocol group in WBC levels at the first, the second, the sixth, and the seventh days only are significant differences at 0.05 level between Historical group and Protocol group in Ca level sat all days and in the Total Ca, there are significant differences at 0.05 level between Historical group and Protocol group in Mg levels at the first, the second, the sixth, and the seventh days only there are significant differences at 0.05 level between Historical group and Protocol group in Glucose levels at the first, the fifth,

and the sixth days only these significant results was same to the study of A. Koontalay et. (2019) which compares between 2 group to determine the effects of a CNPG (clinical nursing practice guideline) of EN on the duration of a mechanical ventilator in critically ill patients and outcome this study was performed on 44 patients on ICU which divided into two group first group start feeding within the first 48hours and other called the control group, the result was that the ($p < .001$). and there is improve in the outcome in the lap test especially protein and albumin.

In other hand and regarding to GCS all patient in the control group having improving in the scale when compare with historical group and this coinciding with previous study by Salah El-Deen et al., (2019) according to this study more than half of the sample having Glasgow coma scale more than 11score which mean there is improve in the score and that is same to our significant result regarding GCS.

The second hypothesis discuss if there is a relationship between early feeding and infection for critical ill patients according to this study there are significant differences at 0.05 level between Historical group and Protocol group in temp levels at the fifth and at the sixth days(P-values less than 0.05) , also there are significant differences at 0.05 level between Historical group and Protocol group in WBC levels at the first, the second, the sixth, and the seventh days also this result proved by stehle, et .al (2016) by this RCT study comparing the patients start early parenteral feeding with patients were delayed feeding had lower total infectious

complication rate but it is opposite to our study regarding type of feeding our study discuss early enteral feeding , also another similar to our mission there is a study by elke, et. al (2016) in RCT study that comparing between enteral feeding and parenteral feeding for critically ill patients in enteral feeding there is significant reduction in the incidence of infection complication P = 0.004) in other study done by (Annika et , al ,2017)the study included 11RCT (597 patients) and the result that EEN reduced risk of infection compared to delayed EN (RR 0.64; 95% CI 0.46–0.90; P = 0.010; I 2 = 25%).

Third hypothesis in the study discuss if There is a relationship between early feeding and length of stay in ICU for critical ill patients at the level of P value less than 0.05 in this study there are significant differences at 0.05 level between Historical group and Protocol group in the Time of staying in ICU(Day) (P-value less than 0.05) (0.005) , The results exhibit that the patient stay in the ICU 6 days on the average for the Historical group which is significantly higher than the mean of staying days for Protocol group(5 days). these result similler to Elke, et al., (2016) study the result was enteral feeding was associated with significant reduction in ICU LOS (weighted mean difference [WMD] -0.80, 95 % CI −1.23, −0.37, P = 0.0003 also another study by (Stehl et.al,2016) and its result of the studies showed that the G ln dipeptide supplementation significantly reduced the LOS in the ICU by approximately 1.5 days (MD 1.61, 95% CI 3.17, 0.05, p ¼ 0.04, heterogeneity I2 ¼ 0%, p ¼ 0.78).

The fourth hypothesis discus if t there is a relationship between early feeding and time on mechanical ventilator for critical ill patients at the level of P value less than 0.05 there are significant differences at 0.05 level between Historical group and Protocol group in PH levels only at the sixth day only(P-value less than 0.05) also there are significant differences at 0.05 level between Historical group and Protocol group in PCO2 levels at the third, fourth, fifth, and the sixth days and in the Total_PCO2levels(P-values less than 0.05) there are significant differences at 0.05 level between Historical group and Protocol group in PO2levels at the second, third, fourth, fifth, and the seventh days and in the Total_PO2levels(P-values less than 0.05). There are significant differences at 0.05 level between Historical group and Protocol group in HCO3levels at the third, and the sixth days and in the Total_HCO3levels (P-values less than 0.05) in the other side according to MV mode there are significant differences at 0.05 level between Historical group and Protocol group in Fio2 levels at the first, fourth, fifth, sixth and the seventh days (P-values less than 0.05) . There are significant differences at 0.05 level between Historical group and Protocol group in TV level sat all days and in the Total TV levels (P-values less than 0.05)…. that there are significant differences at 0.05 level between Historical group and Protocol group in PEEP_A levels at the third, fourth, fifth, sixth and the seventh days and in the Total PEEP A levels (P-values less than 0.05) the same result by (Stehl et.al,2016) which showed, that the mechanical ventilation duration days was decrease (MD 1.56 days, 95% CI 2.88, 0.24, p ¼ 0.02)

5.1.2 Complication

The study showed that the most common complications for experimental (protocol group) were presented with low percentage.

The most common complications with the percentage:

Nausea and vomiting 27.5%, diarrhea 20%, tube obstruction 17.5%, and accidental tube remove 15%.

Abnormal residual volume 7.5%, Displacement of the feeding tube and Metabolic complications Electrolyte disturbances (Hyper- and hypoglycemia) same percentage 5% .

Even these figure or percentages the complications very low.

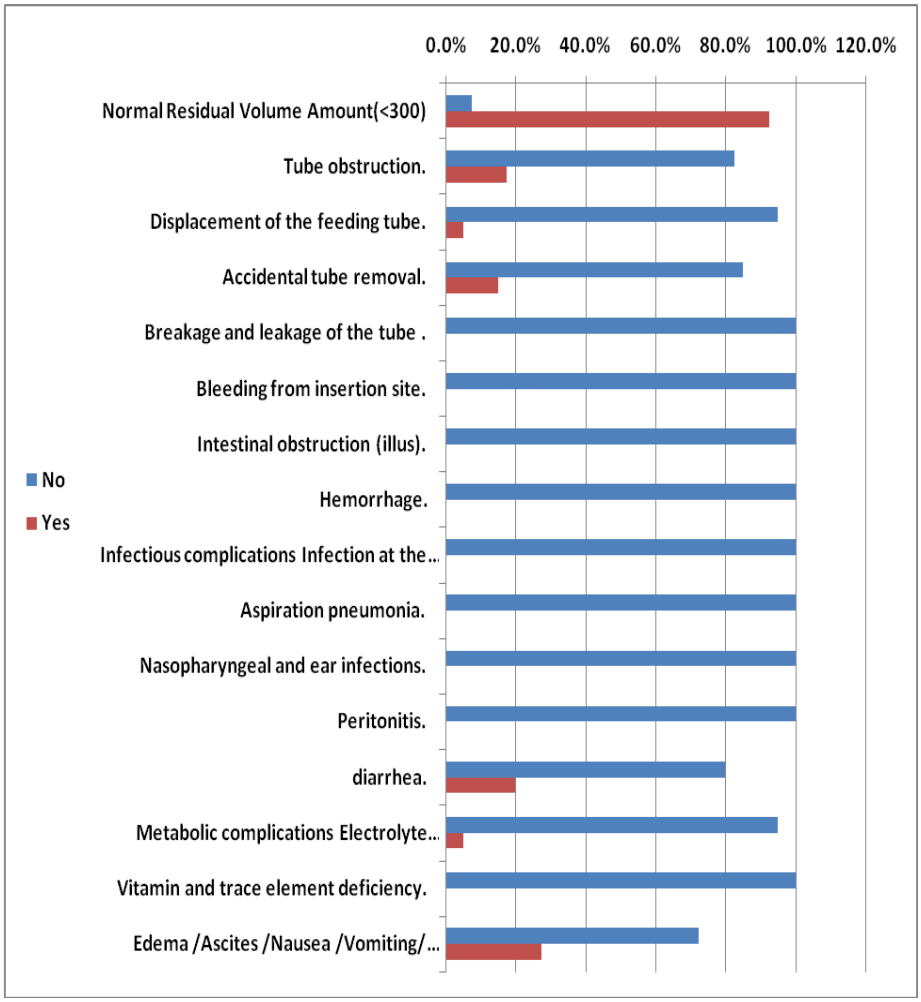

Figure. 3: Complication in Protocol Group.

Regarding the complication there is a study by Peter , et .al (2005) which compare outcome of early enteral feeding with early parenteral feeding for critical patients, by RCT the parenteral feeding was associated with increase in infective complication (7.9% p=.001) catheter related blood stream infection Enteral feeding was associated with diarrheal episodes (8.7%, p=.001).

5.1.3 Limitations of the study

1. Lacking of some information in the files regarding feeding type may be one of the obstacles.
2. lacking of previous study or research about feeding protocol.
3. Lacking of team work between (nurse, doctor, dietitian, respiratory therapist.

Chapter six

Recommendation and Conclusion

1. Future research should focus on strategies for improving the nutritional management of surgical ICU patients and focus on strategies for improving compliance with nutritional management protocols in an ICU setting.

2. We recommend nutrition prescriptions that tailor for pre-admission nutrition status, and severity and stage of illness. Particular attention should be paid to patients that are in (or likely to stay in) ICU for greater than a week, with ongoing monitoring of nutrition delivery and regular review of measured or estimated nutrition requirements.

3. A well-organized NST (nutrition support team) that include physician, nurse, nutritionist and pharmacist in order to provide high quality nutritional care in governmental hospital.

4. Proper training the staff on the correct use of nutritional support is crucial epically with regard the reduction of complications.

Conclusion

There are many problem resulting in underfeeding in ventilated and critically ill patients in this dissertation shown that early enhanced nutrition improves overall nutrition delivery without encountering gastrointestinal intolerance, Unfortunately, delivery of adequate nutrition is a complex issue without coordinated and complementary efforts of different health care professionals the results may be poor.

Adequacy of nutrition need not be compromised in ventilated, enterally fed patients. However, with the changes in practices in enhanced early nutrition, use of protocol emphasizing the strategies in maximizing the delivery of enteral nutrition and coordinated team effort would sustain the safety and quality of care in nutrition support.

The role of dietitian should continue to support adherence to the best evidence nutrition management to enhance timely nutrition support and safely advance enteral feeding to meet nutritional goals of critically ill patients. Ultimately, implementing appropriate feeding strategies and education of health care professionals aim at maximizing nutrition support for ventilated patients managed in general wards should also be the focus for future studies.

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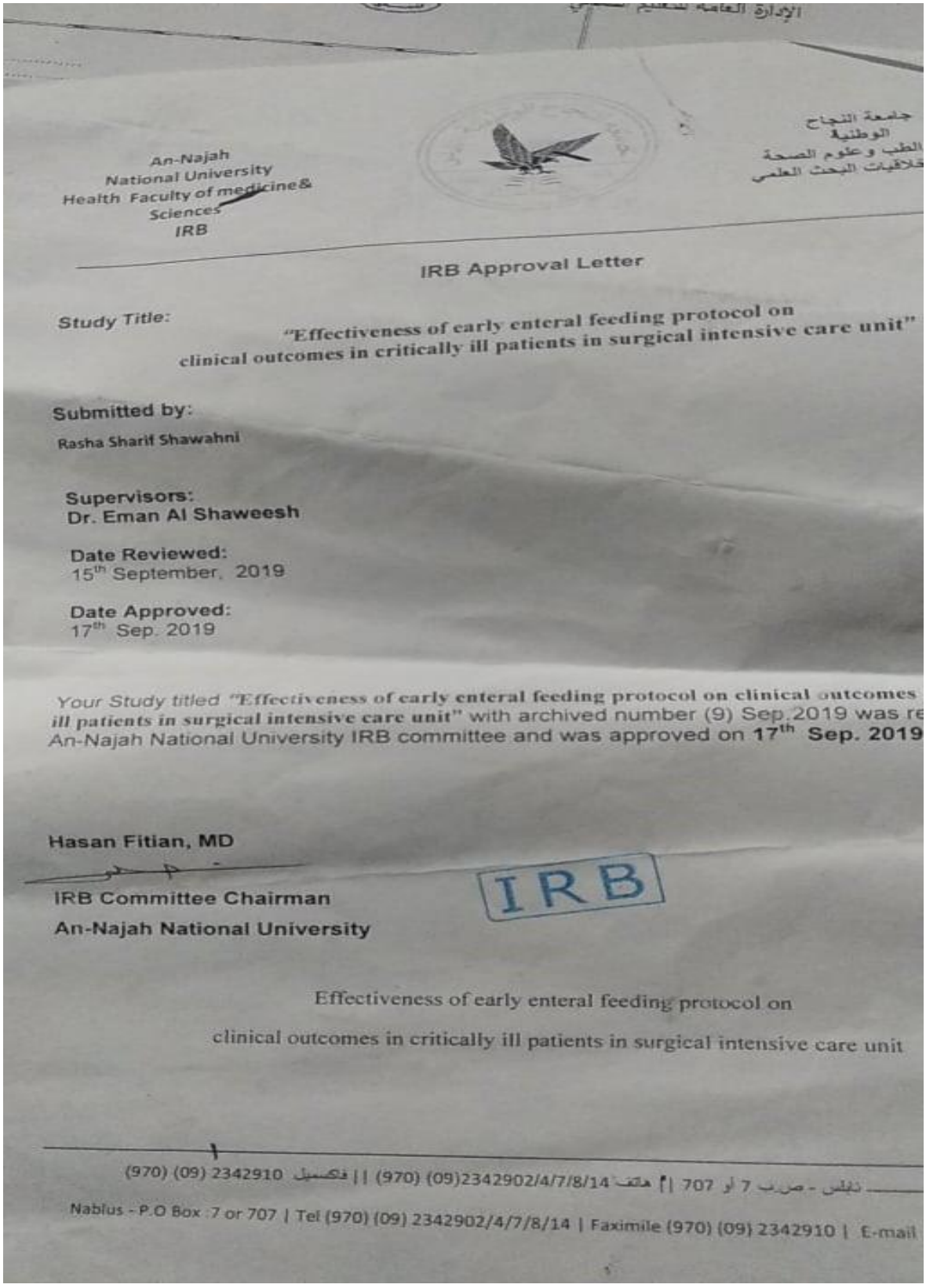
Appendices

Appendix 1

Table of literatures

Nu	Title-Author	Design	Aim	Tool	Population	Finding
1	(Gordenet.al., 2008) Effect of Evidence-Based Feeding guideline Mortality of critically ill patients "	cluster RCT	To improve feeding practices and reduce mortality in ICU patients.	Using Browman's Clinical Practice Guideline Development Cycle	A 27 community and tertiary hospitals in Australia and New Zealand. Between November 2003 and May2004adult patients),successful implementation the guideline result in significant practice change.	It helped in reduced hospital mortality in critically ill patients.
2	(Casaer& Van den Berghe, 2014) Nutrition in the Acute Phase of Critical Illness.	RCT	To provide suggestions for feeding during the acute phase of critical illness.	Tight Calorie Control Study (TICACOS) ion that was guided by indirect calorimetry to estimate the resting energy. expenditure.	involving 130 patients, those who were undergoing mechanical ventilation in an ICU and who received nutrition.	The intervention led to a trend toward reduced hospital mortality but a significant decrease in infections and in the length of stay in the ICU.
3	(Schijndel, et al.,2009) Optimal nutrition in ICU Patients during period of mechanical ventilation".	prospective observation cohort study.	to evaluate the effect of achieving optimal nutrition in ICU Patients during period of mechanical ventilation on mortality.	by calculating resting energy expenditure.	in a mixed medical-surgical, 28-bed ICU in an academic hospital. 243 sequential mixed medical-surgical patients were enrolled on day 3–5 after admission if they had an expected stay of at least another 5–7 days..	the result optimal nutritional therapy improves, the patients how reach energy and protein goal has better outcome than how reach energy goal.
4	(Lee, et al., 2016) Enhanced Protein-Energy Provision via the Enteral Route in Critically Ill Patients (PEP uP Protocol).	A Review of Evidence.	improve feeding adequacy among critically ill patients	PEP uP protocol	ICU Admission (Mechanical ventilated, expected to stay in the ICU for > 72 hours, hemodynamically stable).	improved nutrition adequacy in "high nutrition risk" patients during the first week in the intensive care unit (ICU) was associated with better survival and faster physical recovery at 3- and 6-month post-ICU admission
5	(Salimah, et al, 2016) The trend of enteral feeding among critically –ill patients in adult ICU Malysia.	cross sectional study	to determine the adequacy of caloric intake received by critically-ill patients in the general ICU in Malaysia.	SOFA score.	There were 132 participants, All participants were above 18 years old.	Patients who received early enteral feeding and intermittent bolus within 48 hours of admission achieved adequate caloric intake compared to patients who started late and receivedcontinuous feeding.

6	Elke, et al., 2016 Enteral versus parenteral nutrition in critically ill patients"	systematic review and meta-analysis of randomized controlled trials	to evaluate the effect of the route of nutrition (EN versus PN) on clinical outcomes of critically ill patients	methodological quality of included trials scored independently by two reviewers.	A total of 18 RCTs studying 3347 patients met inclusion criteria.	In critically ill patients, the use of EN as compared to PN has no effect on overall mortality but decreases infectious complications and ICU LOS.
7	Alberda, et al., 2009 The relationship between nutritional intake and clinical outcomes in critically ill patients".	Prospective observational study.	To find the relationship between nutritional intake and clinical outcomes in critically ill patients.	using body mass index (BMI, kg/m2) as a marker ACritically ill adult(old than 18 years of age) patient.	167 Critically ill adult(old than 18 years of age) patients that were mechanically ventilated within the first 48 h of admission to the ICU excluded non-ventilated patients.	The observed that greater intakes of energy and protein were associated with better clinical outcomes of critically ill patients, particularly if their BMI is more than 25 or less than 35
8	Stehl et.al, 2016 Glutamine depeptide-supplemanted parenteral nutrition improve clinical outcome for critical ill patients"	RCT	to test if early parenteral nutrition affect clinical outcome by using PRISMA guideline,	PRISMA guideline	A 842 critically ill patients not have renal or hepatic failure.	the rate of infection decrease,LOS decrease, stay on mechanical ventilator decrease.
9	Khalid et. al 2010. Early enteral nutrition and outcome of critically ill patients treated with vasopressor mechanical ventilation	retrospective study.	Aim to determine the effect of early enteral feeding on the outcome of critically ill	Mortality Prediction Model at time zero (MPM-0) score, Simplified Acute Physiologic Score (SAPS) II, and Acute Physiologic and Chronic Health Evaluation (APACHE) II score	2 group those who received enteral nutrition within 48 and who did not term the late enteral nutrition group, population multi-institutional medical intensive care unit, the patient no.1174	the intensive care unit and hospital mortality were lower in the early enteral nutrition group than in the late group.
10	Bear et, al, 2017. The role of nutritional support in the physical and functional support of critically ill patients	RCT	to assess the effect of early feeding in physical activity and quality of life.	American Society for Parenteral Nutrition (ASPEN) and Society of Critical Care Medicine (SCCM) guidelines	ICU patients who start early feeding 48-72hours	early feeding improves the physical and functional activity and quality of life
11	Reignier et.al, 2018 Optimal timing, dose and route of early nutrition therapy in critical illness and shock".	RCT	To improve that nutritional therapy is provided may have an impact on the outcome of critically.	venoarterial extracorporeal membrane oxygenation (VA-ECMO)	1769 patients who has circulatory problem.	The best timing for nutrition therapy is probably "early" in critically ill patients with severe circulatory failure.



جامعة النجاح
الوطنية
الطب و علوم الصحة
أخلاقيات البحث العلمي

An-Najah
National University
Health Faculty of medicine&
Sciences
IRB

IRB Approval Letter

Study Title:
"Effectiveness of early enteral feeding protocol on
clinical outcomes in critically ill patients in surgical intensive care unit"

Submitted by:
Rasha Sharif Shawahni

Supervisors:
Dr. Eman Al Shaweesh

Date Reviewed:
15th September, 2019

Date Approved:
17th Sep. 2019

Your Study titled "Effectiveness of early enteral feeding protocol on clinical outcomes
ill patients in surgical intensive care unit" with archived number (9) Sep.2019 was re
An-Najah National University IRB committee and was approved on 17th Sep. 2019

Hasan Fitian, MD

IRB Committee Chairman
An-Najah National University

IRB

Effectiveness of early enteral feeding protocol on
clinical outcomes in critically ill patients in surgical intensive care unit

نابلس - ص.ب 7 او 707 || هاتف (970) (09)2342902/4/7/8/14 || فاكسميل (970) (09) 2342910

Nablus - P.O Box :7 or 707 | Tel (970) (09) 2342902/4/7/8/14 | Faximile (970) (09) 2342910 | E-mail

Appendix 2

PERSONAL DATA SHEET

1- Section one: Demographic data and history

1- Participant no	
2- Gender	
3- Age	
4- Marital status	
5- Address	
6- Mobile	
7- Occupation	
8- File number	
9- Weight	
10- Height	
11- BMI	
12- Date of admission	
13-	
14- History	
15- Past medical history	
16- Past surgical history	
17- Present illness	

2- Section two: Check the following daily for 7 days or until discharge from ICU: V/S, Lab test and mechanical ventilator

Vital sign Day	BP	HR	TEMP	RR	CVP
Day 1					
Day 2					
Day 3					
Day 4					
Day 5					
Day 6					
Day 7					

d test Day	HGB	PLT	BUN	Cr	Na	K	ALBU-MINE	WBC	Ca	Mg	Glucose	BILIR UBIN
Day 1												
Day 2												
Day 3												
Day 4												
Day 5												
Day 6												
Day 7												

Blood gas / Day	PH	PCO2	PO2	HCO3
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Mechanical ventilator / Day	Mode			Fio2			Set rate			TV			PEEP		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Day1															
Day2															
Day3															
Day4															
Day5															
Day6															
Day7															

Section three: check Glasgow coma scale for 7 days

Glasgow coma scale / Day	Total score Shift A	Total score Shift B	Total score Shift C	Total score AVERAGE
Day1				
Day2				
Day3				
Day4				
Day5				
Day6				
Day7				

Feature	Scale response	Score notation	A Shift 1 2 3 4 5 6 7	B Shift 1 2 3 4 5 6 7	C Shift 1 2 3 4 5 6 7
Eye opening	Spontaneous To speech To pain None	4 3 2 1			
Best verbal response	Oriented confuse Inappropriate Words Incomprehensible sound None	5 4 3 2 1			
Best motor response	Obey commands Localize pain Withdrawal Flexion to pain Extension to pain None	6 5 4 3 2 1			

Section Four: Feeding

Intake		**Residual volume**		**Output**
Type	**Amount**	**Time**	**Amount**	
Total intake =				Total output =

Section Five: Check the present of the following complication daily for 7 days or until discharge from ICU

Complication	NO	If Yes (specify which day d1- d7)
1- Tube obstruction.		
2-Displacement of the feeding tube.		
3-Accidental tube removal.		
4-Breakage and leakage of the tube .		
5-Bleeding from insertion site.		
6-Intestinal obstruction (illus).		
7-Hemorrhage.		
8-Infectious complications Infection at the tube insertion site.		
9-Aspiration pneumonia.		
10-Nasopharyngeal and ear infections.		
11-Peritonitis.		
12-diarrhea.		
13-Metabolic complications Electrolyte disturbances(Hyper- and hypoglycemia).		
14-Vitamin and trace element deficiency.		
15-Edema /Ascites /Nausea /Vomiting/ Constipation Anorexia		

If other complication presented write them :……..

End

Appendix 3

جامعة النجاح الوطنية

كلية الدراسات العليا

موافقة للاشتراك بالبحث العلمي

الباحث: رشا شريف محمود شواهنة رقم الهاتف :0597944615

أخي /أختي الباحث/ة:

أنا الباحث الطالب رشا شواهنة تخصص تمريض عناية مكثفه ،جامعة النجاح الوطنية يسرني أن ادعوك/ي للمشاركة في بحثنا المتعلق بدراسة تأثير الغذاء ووقت البدء به على مريض العناية المكثفة .

لك/ي كامل الحرية والإرادة في المشاركة في هذا البحث وسؤال الباحث عما تراه مناسب، والتحدث لأي شخص عن هذا البحث.

كما يمكنك الاستفسار عن أي جزء الآن أو فيما بعد.

نؤكد بان كافة المعلومات التي سوف يتم جمعها منك/ي سوف تكون سرية ولإغراض البحث العلمي فقط، ولن يتم استخدامها لأغراض أخرى.

الموافقة على المشاركة في الدراسة:

لقد قرأت الوصف أعلاه من هذه الدراسة، وقد تمت الإجابة على جميع أسئلتي، وأنا اعلم انه يمكنني أن ارفض المشاركة في والانسحاب من الدراسة في أي وقت، وعلى ذلك أعطي موافقتي بحرية تامة.

اسم المريض/ه:

ولي الأمر في حال عدم وعي المريض : التاريخ:

Appendix 4

Please provide the following information to apply for research data collection permission at the Palestinian Ministry of Health institutions:

Research Title **اسم البحث**	Effectiveness of early enteral feeding protocol on clinical outcomes in critically ill patients in surgical intensive care unit
University Name **اسم الجامعة**	An –Najah National university
Principal Investigator/ Supervisor's name **اسم الباحث/ المشرف**	المشرف: د.ايمان الشاويش الباحث :رشا شريف شواهنه
Students participating in the research **أسماء الطلاب المشاركين في البحث**	
Specialty **التخصص**	Critical care nursing
Abstract **ملخص الدراسة**	**Introduction**: **Nutrition support is an important part of care for the critical ill patients, however critically ill patients are commonly underfed ,which lead to consequences such as increase length of hospital and intensive care unit stay , also number of day on the mechanical ventilator will increase and lead to infection , complication ,rate of mortality increase. Critically ill patients requiring vital organ support in the ICU , most of the time they have anorexia and may be unable to feed by mouth sever skeletal muscle wasting and weakness occurring during the critical illness are associated with prolonged need for mechanical ventilator and rehabilitation , So to prevent adverse outcomes related to nutritional deficit the research and articles recommended enteral nutrition as a first line therapy starting early at first 24-48 hours of ICU admission.** **Objective:** To determine if there is a relationship between early feeding (within 24 to 48 h following ICU admission) for the critical ill patients and the clinical outcome. To provide evidence-based guidelines for early nutrition during critical

	illness. **Method:** Quasi experimental design will be performed using sample from surgical adult ICU in Rafidia hospital (45 for each group experimental and historical). **Data:** Data will analyze using SPSS
Methodology **منهجية البحث**	Quasi experimental design , study will be performed using sample from surgical adult ICU in Rafidia hospital.
Data collection methods and tools **طرق جمع البيانات والأدوات**	
Dates and time of data collection **تواريخ ووقت جمع البيانات**	1/10/2019-1/3/2020
Sample size **حجم العينة**	45 patients for each group (experimental group and historical group)
Who will collect data or samples **من سيجمع البيانات أو العينات**	
Questionnaire or questions of the interview (copy) **استبيان أو أسئلة المقابلة (نسخة)**	
Ethical considerations **الاعتبارات الأخلاقية**	The filled forms or the questioners will not include any names (abbreviation will be used) . The filled questioners will be kept in supervisor office for 5 years and discarded after that based on university protocol.
Support the Ministry of Health with a copy of the final research **تزويد الوزارة بنسخة من نتائج البحث (في حال البحث للبكالوريوس يكتفى بنسخة الكترونية).**	
Contacts: Dr. Amal Abu Awad – Director General of Education in Health: **ibnsina99@yahoo.com** Mobile: 0562402187 Telefax: 09-2333901 Basima Joudeh : basimamoh@gmail.com mobile: 0562401397	

جامعة النجاح الوطنية
كلية الدراسات العليا

فاعلية استخدام بروتوكول التغذية المعوية المبكرة لتحسين الحالة السريرية لمرضى العناية المكثفة الجراحية

إعداد
رشا شواهنه

إشراف
د. إيمان الشاويش

قدمت هذه الاطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في برنامج تمريض العناية المكثفة، بكلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس–فلسطين.

2021

فاعلية استخدام بروتوكول التغذية المعوية المبكرة لتحسين الحالة السريرية لمرضى العناية المكثفة الجراحية

إعداد

رشا شواهنه

إشراف

د. إيمان الشاويش

الملخص

يعتبر الحفاظ على العلاج الغذائي الكافي عن طريق التغذية المعوية أمرًا مهمًا بشكل خاص للمرضى ذوي الحالات الحرجة الذين يحتاجون إلى التنبيب وأجهزة التنفس الصناعي.

الهدف من الدراسة: لتحديد ما إذا كانت هناك علاقة بين التغذية المبكرة (في غضون 24 إلى 48 ساعة بعد قبول وحدة العناية المركزة) للمرضى المصابين بأمراض خطيرة والنتائج السريرية وتقديم إرشادات قائمة على الأدلة للتغذية المبكرة أثناء المرض الخطير.

الطريقة: تم اعتماد تصميم شبه تجريبي في هذه الدراسة سيتم تسجيل جميع المرضى المقبولين في وحدة العناية المركزة الجراحية ما لم يكن هناك بطلان في التغذية المعوية، حيث تم الحصول على الدراسة في وحدة العناية المركزة في مستشفى رفيديا الجراحي، وتم جمع البيانات من خلال ملء مقياس محدد تم إعداده بمعايير محددة تتعلق بالمتغيرات من الدراسة التي قارنت بين مجموعتين من المرضى المصابين بأمراض خطيرة، بدأت واحدة في التغذية مبكرًا والمجموعة الثانية وفقًا لسياسة القسم، كان مجتمع الدراسة بالغًا أكبر من 18 عامًا.

النتيجة: لا توجد فروق ذات دلالة إحصائية عند مستوى 0.05 بين المجموعة التجريبية والمجموعة الضابطة في توزيعات الجنس والعمر ومؤشر كتلة الجسم ومؤشر كتلة الجسم والحالة الاجتماعية. البقاء في وحدة العناية المركزة (اليوم) (قيمة P أقل من 0.05).

كما توجد فروق ذات دلالة إحصائية عند مستوى 0.05 بين المجموعة التاريخية ومجموعة البروتوكول في:

في العلامة الحيوية (SBP، HR، TEMPوRR).

في الاختبارات المعملية (HGB وBUN وPLAT وCREA وNA وK وALBUMIN وWBC وCa وMG).

في نتيجة غازات الدم (PCO2 وPO2 وHCO3).

في تركيب جهاز التنفس الصناعي (TVوPEEP).

فيGCS.

نسبة المضاعفات ضئيلة في المجموعة الضابطة.

استنتاج التغذية المبكرة (24–48 ساعة الأولى) هي الأكثر فائدة للمرضى المصابين بأمراض خطيرة.

الكلمات المفتاحية: التغذية المعوية، وحدة العناية المركزة، المجموعة التاريخية.