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Deena Shewekah
University of Kentucky, dsh238@uky.edu

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Nurse Driven Enteral Nutrition Protocol for Mechanically Ventilated Patients

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing
Practice at the University of Kentucky

By

Deena Shewekah BSN, RN

Lexington, Kentucky

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Abstract

Introduction: Delayed enteral nutrition in critically ill patients increases the risk of complications and poor outcomes. Current evidence-based guidelines recommend initiation of enteral nutrition within 24-48 hours of intensive care unit (ICU) admission. The quality improvement (QI) project aim was to examine whether enteral nutrition was initiated within 24-48 hours of mechanical ventilation after implementation of QI intervention in order to determine practice change.

Methods: The QI protocol was introduced to the Cardiovascular ICU (CVICU) at UK Chandler Hospital (UKHC) nurses via an education session. A post-education electronic survey identified the nurse's understanding of the protocol. To identify nursing practice changes of enteral nutrition initiation in mechanically ventilated patients, a pre-post project design was conducted.

Results: Twenty two CVICU nurses anonymously completed surveys after receiving an educational session. All of the nurses reported an understanding of the contraindications for enteral nutrition. Twenty one of the 22 nurses (95.45%) understood when to discuss enteral nutrition initiation with a provider, and 19 (86.36%) reported an understanding of when to initiate enteral nutrition based on guideline recommendations. Of the 83 medical records analyzed that met inclusion criteria, five patients before the educational intervention and three patients after the educational intervention received enteral nutrition. There was no difference in the mean number of hours regarding enteral nutrition initiation time after mechanical ventilation for the pre-design intervention and the post-design intervention (M=61.6 vs M=50.0, p-value=0.66).

Conclusion: This QI project recognized there was a gap in the time it takes for enteral nutrition to be initiated after mechanical ventilation despite established guidelines. The practice gap identified in this QI project was not addressed with one educational session and did not have an impact in decreasing the time to initiate enteral nutrition after mechanical ventilation. Adherence to evidenced based practice guidelines and enhancement of nurse autonomy can potentially improve implementation of a nurse driven protocol for initiation of enteral nutrition in the mechanically ventilated patient population.

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TABLE OF CONTENTS

Background.....	6
Objective of this Project.....	7
Methods.....	10
Intervention	11
Results.....	12
Conclusion	13
References.....	16
Figures and Tables	18
Figure 1: Nurse Driven Early Enteral Nutrition Protocol for Mechanically Ventilated Patients	18
Figure 2: Patient Medical Records Analyzed	19
Table 1: Post Education Survey Analysis.....	20
Table 2: Pre-Post Comparisons of Patient Characteristics and Time to Enteral Nutrition.....	21

Background

Critically ill patients have a 41.7% risk of developing malnutrition due to being in a hyper-catabolic state[1]. Nutritional options include parental and enteral nutrition. Enteral nutrition has shown to be superior to parental nutrition due to the added benefit of having fewer associated complications[2]. Enteral nutrition in critically ill patients has gastrointestinal, immunologic, and survival advantages over parental nutrition[3]. Critically ill patients who are nothing by mouth (NPO) status due to illness or inability to receive enough nutrition are usually recommended enteral nutrition[4]. Malnutrition can affect patients' ability to respond to treatment and can therefore cause hyper-metabolism and inflammation which can cause infection, organ dysfunction, and mortality[5]. An increased risk for complications that occurs with malnutrition includes increased length of stay, poor wound healing, aspiration, organ dysfunction, and death[5]. Enteral nutrition can offset metabolic changes linked with illness and can decrease the risk for complications and poor outcomes [5].

The literature review was conducted using PUBMED and CINAHL with the inclusion criteria of articles being evidenced-based articles that are published between 2010-2019. Key search terms included "enteral nutrition protocol" and "nurse driven enteral nutrition protocol" and "nutrition protocols" and "enteral nutrition protocol for mechanical ventilation". Twelve evidenced based articles were analyzed. No exclusion for age of subjects were used in finding literature.

Guideline recommendations from the Society for Critical Care Medicine (SCCM) and American Society for Parental and Enteral Nutrition (ASPEN) include initiating enteral nutrition in critically ill patients no later than 24 to 48 hours of ICU admission [6]. SCCM and ASPEN guidelines also recommend implementing enteral feeding protocols with specific institutional

instructions including not using gastric residual volume as a part of routine care, increasing enteral nutrition goals within the ICU, reducing the risk of aspiration by elevating head of bed, using prokinetic agent, and using chlorhexidine mouthwash[5]. Despite guideline recommendations, inadequate enteral nutrition support and underfeeding continue in critically ill patients. In a study with 1059 critically ill mechanically ventilated patients, eighteen various ICUs had prescribed less than 50% of the caloric ratio even though enteral nutrition protocols were in place [5].

Within an ICU setting, current practice is that enteral nutrition is to be initiated in mechanically ventilated patients whenever the ICU physician places the order. Throughout personal nursing practice, a delay in patients receiving any type of nutrition within 48 hours of ICU admission was observed, anecdotally resulting in a noticed practice gap. An unidentified factor, in this institution, included whether the standard practice was following guideline recommendations in regards to timeliness in initiating enteral nutrition after mechanical ventilation. To address the unknown, data was collected pre and post QI implementation to determine whether there was a delay in enteral nutrition initiation per guideline recommendations and whether the QI project provided any impact to the timeliness of initiating enteral nutrition after mechanical ventilation.

Objective of Project

The Plan-Do-Study-Act (PDSA) cycle guided this QI project. The plan part of the PDSA cycle included conducting a literature review, analyzing guideline recommendations, and evaluating policies in place. The plan portion of the cycle began at University of Kentucky (UK) HealthCare Hospital analyzing the enteral nutrition and departmental policy for dieticians. The departmental policy for dieticians provides screening recommendations that allow dieticians to

automatically see patients without a medical doctor consult. Criteria for dieticians to automatically see patients with a consult includes a NPO status or clear liquids order for greater than three days, tube feeding ordered, low body mass index (BMI), stage two or greater pressure injury, or a length of stay greater than seven days. If the patient doesn't meet criteria, the dietician will have to wait for a consult order in order to manage the patient. Per policy titled Nutrition Support, intensive care unit (ICU) patients receiving enteral nutrition will receive a nutrition consult within 24 to 72 hours of ICU admission or within 24 hours of a nutrition consult being ordered. After analyzing these two policies, the gap that was identified is that mechanically ventilated ICU patients that are currently admitted may have delayed enteral nutrition up to three days because unless a dietician consult is ordered, a dietician will not be able to automatically see a patient until three days after the NPO status is placed per the dietician policy. Once this gap was identified, the plan of this QI project was to create a QI protocol that would allow enteral nutrition to be initiated within 24-48 hours of mechanical ventilation in the CVICU at UK Healthcare.

The "Do" part of the cycle includes the interventions that were done. This part of the cycle included creating the QI protocol with a multidisciplinary team. After creating the QI protocol, the CVICU nurses were provided information about the QI protocol and project. After information was provided to the CVICU nurses, a post-education survey was created. This survey consisted of four yes or no questions that determined understanding of the protocol. After creating the survey, through Survey Monkey, all the CVICU nurses were emailed a link to the survey along with a copy of the QI protocol.

The goal of the QI project was to evaluate whether the intervention was successful. During the "study" part of the cycle, includes evaluating and collecting data on the QI project.

Data collection was conducted through chart auditing by University of Kentucky Center for Clinical and Translation Science (CCTS), analyzed through SPSS, and reported to the University of Kentucky College of Nursing (UK CON). Data collection included analyzing the post-education survey and the pre-post design results. The pre-post design results were analyzed to determine whether there was a practice change in the amount of time it took to initiate enteral nutrition after mechanical ventilation while the post-education survey results determined whether nurses understood the QI protocol. Lastly, the “act” part of the cycle is based on the study portion of the protocol and helps individuals determine what can be improved or whether the study should be done implemented in a larger aspect.

There are four aims for this QI project that all had an outcome threshold of 90%. The overview for this project was to create and implement a Nurse Driven Enteral Nutrition Protocol for Mechanically Ventilated Patients (Figure 1). The goal of this QI project was to address a nursing practice change by having nurses advocate for enteral nutrition to be initiated 24-48 hours after mechanical ventilation. There were four specific aims to be evaluated after the implementation of this project.

1. Mechanically ventilated patients will have enteral nutrition initiated within 24-48 hours after mechanical ventilation after the implementation of the Nurse Driven Enteral Nutrition Protocol for Mechanically Ventilated Patients during the month of January 2020.
2. CVICU registered nursing staff will correctly understand, based on the QI protocol, when to discuss enteral nutrition initiation with a provider.
3. CVICU registered nursing staff will correctly understand, based on the QI protocol, what the contraindications of enteral nutrition in mechanically ventilated patients.

4. CVICU registered nursing staff will correctly understand, based on of the QI protocol, that enteral nutrition should be initiated within 24-48 hours of mechanical ventilation.

Methods

The pre and post QI project was conducted at UK Albert B. Chandler Hospital in Pavilion A located in Lexington, Kentucky. This clinical enterprise has approximately 9,000 individuals within a healthcare multidisciplinary field[7]. This QI project was be conducted within the hospital's thirty-one bed cardiovascular intensive care unit. Patients were mostly managed by critical care medicine (CCM), cardio-thoracic surgery team, heart and lung transplant team, and thoracic surgery team.

The sample consisted of CVICU nurses and CVICU patients who were mechanically ventilated in the months of November 2019 for the predesign and January 2020 for the post design. All patients whose medical records were included in this review were mechanically ventilated within the CVICU at UK Chandler Hospital. These patients were between the ages of 18 to 75 years old. Patients were excluded if they had any contraindications to receiving enteral nutrition (Figure 1). Inclusion criteria for the educational survey included all registered nurses who work in the CVICU at UK HealthCare. This included all new CVICU nurses who received education on the protocol or had a CVICU nurse preceptor who received education. Exclusion criteria included travel nurses and nurses who do not claim the CVICU to be their home unit.

Overall 83 patient records were analyzed within the two separate months that met inclusion criteria; five patients in November 2019 received enteral nutrition and three patients in January 2020 received enteral nutrition (Figure 2). The sample size of CVICU registered nurses' totaled 124 in December 2019. Of the 124 eligible nurses in CVICU, 22 registered nurses completed the post education survey.

This project analyzed practice changes that occurred during the QI project. IRB approval was obtained through University of Kentucky Institutional Review Board (IRB). A waiver of informed consent process was completed since the rights and welfare of subjects were not adversely affected. The electronic post-educational survey, sent through Survey Monkey, was completed anonymously by the CVICU registered nurses and the pre and post design medical record review was obtained by deidentified aggregate data obtained through electronic health records that did not include any patient identifiers with the assistance provided by UK CCTS.

Measures used to evaluate time to initiate enteral nutrition after mechanical ventilation was obtained through electronic health record (EHR) auditing. Variables that were abstracted from the medical record included age, gender, and diagnosis. EHR were analyzed during November 2019 and January 2020 and identified the time for enteral nutrition to be initiated after a patient received mechanical ventilation.

Interventions

Initially, the QI protocol was designed and distributed among a multidisciplinary team including CVICU nurses, providers from two separate service lines, CVICU clinical nurse specialist, and dietitians. The director of dietitians as well as the director of nursing professional practice and excellence provided their recommendations on the protocol. The ultimate goal was to gain feedback and recommendations in order to create a multidisciplinary QI protocol that benefited various disciplines. After collaborating with these multidisciplinary teams, the Nurse Driven Enteral Nutrition Protocol for Mechanically Ventilated Patients was created (Figure 1).

In December 2019, an education session was conducted where the Nurse Driven Enteral Nutrition Protocol for Mechanically Ventilated Patients was examined, and the QI protocol and project was discussed. The education session was conducted in the CVICU staff room, the first

week of December, for all CVICU staff who worked on the unit in the month of December 2019. Nurses were able to ask and receive immediate answers about the protocol. After completion of the education, all registered nurses received a post-education survey, through Survey Monkey, that was sent electronically to identify whether understanding of the protocol occurred. The post-education survey was sent out electronically two weeks after CVICU registered nurses received the education. With the electronic email, registered nurses were provided with a summary of the QI project and a copy of the QI protocol to reference. Within the email, a cover letter was included containing pertinent study information, knowledge that completion of the survey is considered implied consent to participate in the survey, and that completion of the survey was anonymous and voluntary with no coercion.

Data analysis was performed by using SPSS version 26.0 software. Independent *t* test and analysis of variance was the statistical test used to analyze age and time to initiate enteral nutrition after mechanical ventilation. A p -value ≤ 0.05 was considered statistically significant. The chi-square test for independence was the statistical test used to analyze gender and admitting diagnosis. Descriptive analysis was used for the post-education survey.

Results

Twenty two CVICU registered nurses completed the post-education survey that consisted of four yes or no questions to determine the understanding of the protocol. Descriptive characteristics of the sample of nurses who completed the survey is unknown as the survey was conducted anonymously. Aim two was met with a correct response rate of 21(95.45%). Aim three had two questions and was met with a correct response rate of 22(100%). Aim four did not meet outcome threshold and had a correct response rate of 19(86.36%) (Table One).

A total of 83 patients medical records were analyzed in total including 35 before the implementation and 48 after the implementation group. An independent-sample t-test was conducted to compare the time to initiate enteral nutrition after mechanical ventilation between the pre and post quality improvement intervention. There was no significant difference in scores for the pre-design intervention (M=50.0, SD=18.9) and the post-design intervention (M=61.6, SD=53.4; $p=0.66$, two-tailed). Another independent sample t-test was conducted to compare the mechanically ventilated CVICU patients' age within the pre and post QI intervention. There was no significant difference in age of the patients (M=57.6, SD= 12.15) reviewed compared to those in the post intervention (M=56.3, SD=6.66; $p = 0.876$, two-squared tailed) (Table 2). A chi-square test indicated no association between gender in the pre and post intervention ($n=8$) = $p >.95$ and no association between diagnosis in the pre and post intervention ($n=8$) = $p >.95$ (Table 2).

Conclusion

The new QI protocol did not have an impact in decreasing the time to initiate enteral nutrition after mechanical ventilation. Other researchers found that after implementation of an enteral nutrition protocol, enteral nutrition initiation increased within 24 hours from 25% to 64% [2, 8-11]. Our differing results could be due to the smaller sample size that was analyzed compared to what other researchers have found. Researchers had sample sizes ranging from 73 to 136 patients [8-11].

Hall (2017) reported that nursing staff training should be conducted to make sure the protocol is performed correctly while O'Leary-Kelley K. Bawel-Brinkley (2017) recommend that enteral nutrition protocols that are supported by evidenced-based research must be recognized as a standard of care in the intensive care unit. Other researchers have implemented a similar

educational intervention for enteral nutrition protocols to nursing staff as we did in this project [3, 8, 9, 12, 13].

Having only one educational session with the CVICU nursing staff would be considered a limitation as this could have resulted in the staff only hearing the information one time. This limitation was addressed by providing the QI protocol electronically in the email. Another limitation is that there was no reminder sent to the nurses to complete the survey. For future studies, a secondary email to remind staff to complete survey may be beneficial to improve response rates. Lastly, the one month length of time in the pre and post intervention group is a limitation as it attributed to a smaller sample size and didn't allow the study to analyze data results in a larger period of time.

This QI project is important in practice to recognize that current evidence-based guidelines are not always being followed. This QI project shows that there continues to be a gap in the time it takes for enteral nutrition to be initiated after mechanical ventilation despite established guidelines. For future implications, this QI project can be done on a larger institutional scale, rather than a single unit. Other recommendations include providing ICU nursing staff with multiple educational sessions rather than one session. Another recommendation would be to allowing ICU registered nurses to have autonomy, through an institutional policy and standard order set. This would allow ICU nurses to order enteral nutrition after mechanical ventilation through a standard order set as long as the inclusion criteria is met and there is no exclusion criteria being met. In future studies, including all stakeholders, such as provider, dieticians, and nursing staff, will allow all staff to receive the same information and follow the same protocol. For this institution, recommendations would include changing the

policies in place so dieticians are able to initiate enteral nutrition within guideline recommendations.

This QI project recognized that prior to the educational intervention, there was a gap in the time it takes for enteral nutrition to be initiated after mechanical ventilation despite established guidelines. The practice gap identified in this QI project was not addressed with one educational session and did not have an impact in decreasing the time to initiate enteral nutrition after mechanical ventilation. Working in healthcare, our goal should be to cause no harm to our patients so our goals should be to meet guideline recommendations to prevent harm.

Enhancement of nurse autonomy, through an institutional policy, through execution of a nurse driven protocol can augment evidenced based practice.

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Tables and Figures

Figure 1: Nurse Driven Early Enteral Nutrition Protocol for Mechanically Ventilated Patients

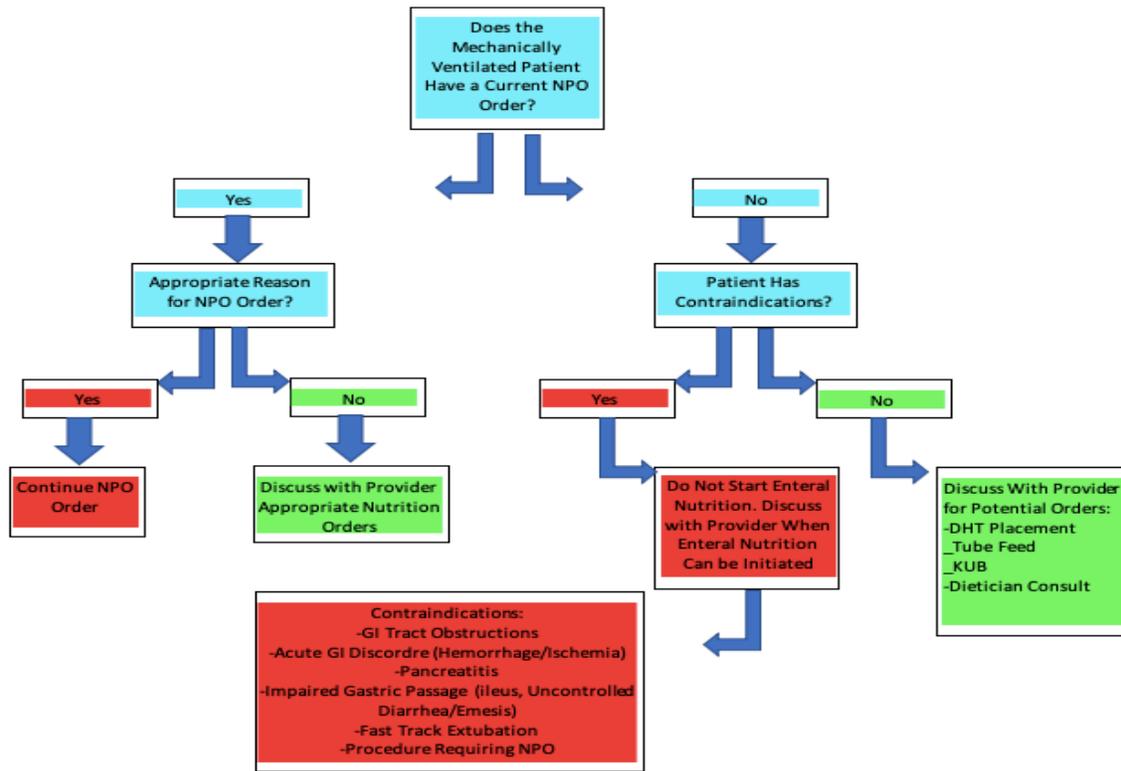


Figure 2: Patient Medical Records Analyzed

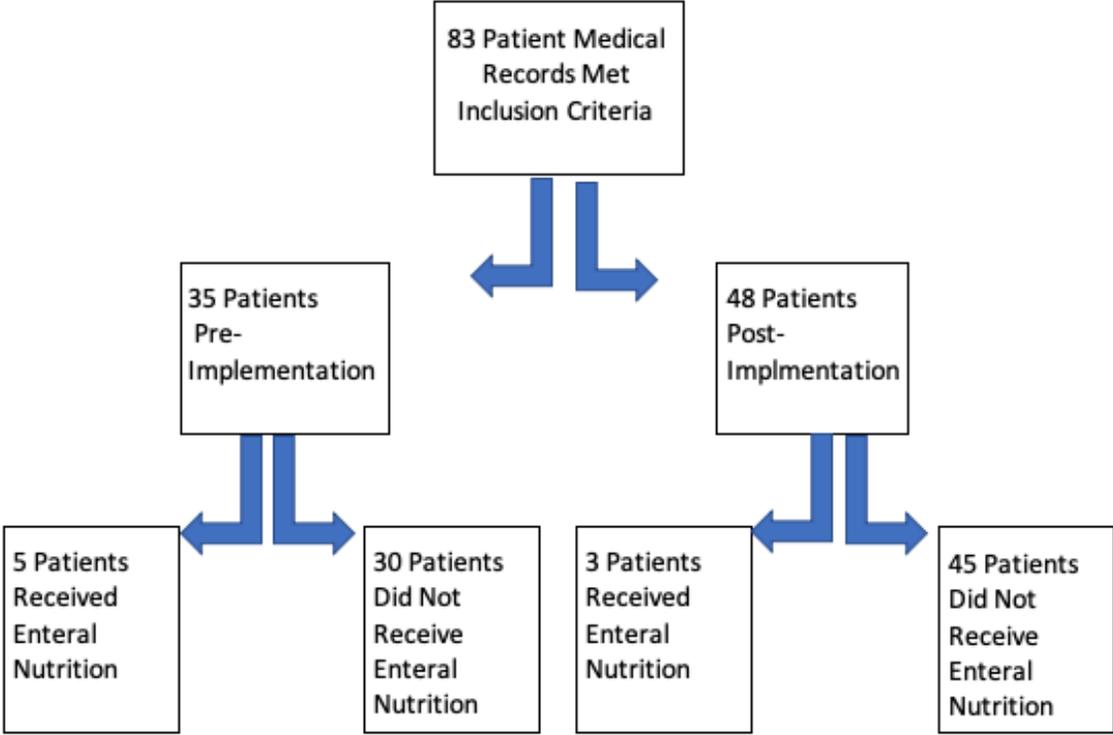


Table 1: Post Education Survey Analysis

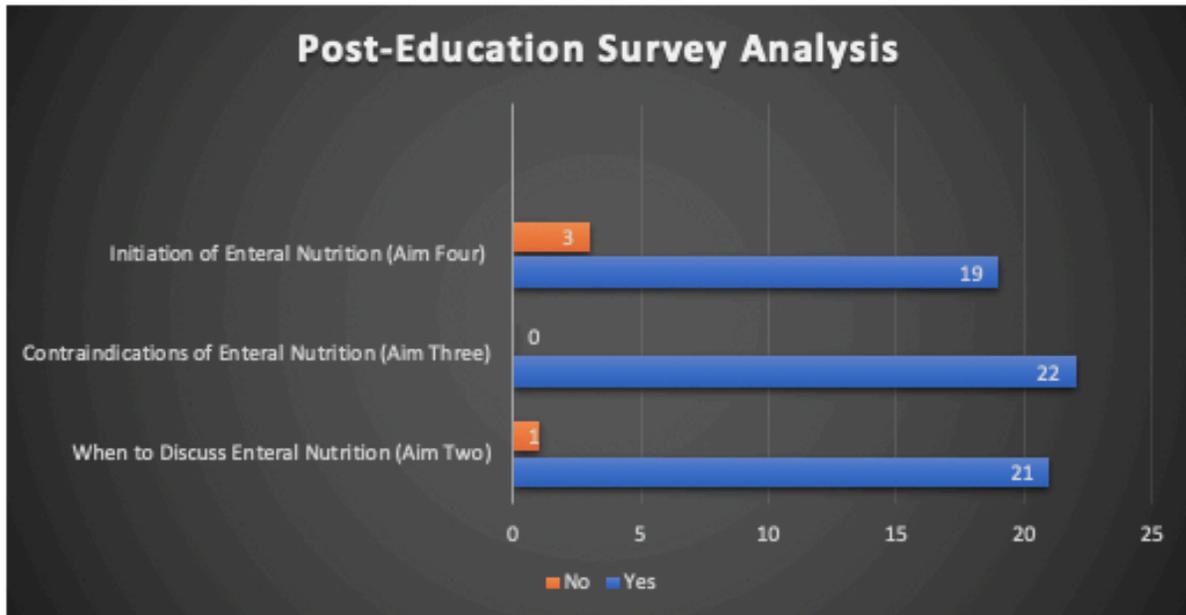


Table 2: Pre-Post Comparisons of Patient Characteristics and Time to Enteral Nutrition

Pre-Post Comparisons of Patient Characteristics and Time to Enteral Nutrition after Mechanical Ventilation (N=8)			
Variable	Pre-Intervention (n=5) Mean (SD) or n (%)	Post-Intervention (n=3) Mean (SD) or n (%)	P-Value
Age (Years)	57 +/- 12	56 +/- 6	P= 0.876
Gender			
Male	4 (80.0%)	2 (66.6%)	P= 1.00
Diagnosis			P= 1.00
Cardiac	4 (80.0%)	2 (66.6%)	
Respiratory	1 (20.0%)	1 (33.3%)	
Time to Initiate Enteral Nutrition after Mechanical Ventilation (Hours)	50.0 (18.9)	61.6 (53.4)	P= 0.66

*Two-Sample T-Tests for continuous variables and Fisher's Exact Test for Categorical Ones; There is no test Statistic for Fischer's Exact Test so only the p-value is shown.

SD=Standard Deviation