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Enteral Nutrition Protocol for Pediatric Burn Patients: A Quality Improvement Initiative

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Conflicts of Interest:
None to declare.

Disclaimer or Disclosure Information:
None to declare.

Abstract

Objective: This quality improvement project was conducted to determine the efficacy of an enteral feeding protocol to improve nutrition supplementation in pediatric burn patients.

Methods: Non-ICU patients with >10% total burn surface area requiring enteral nutrition supplementation were fed within 12 hours of admission or with the first sedated dressing change, whichever took place first. Pre (n = 3) and post (n = 5) implementation of the enteral feeding protocol data were obtained. Data were collected via chart audit and survey.

Results: Patients and nurses had similar characteristics; and nurses had similar nutrition practices. Total intake of calories (93.8%) and protein (109.1%) increased. Nurse perception of the protocol use increased (a mean survey of 3.25, neutral, to 4.57, somewhat agree).

Conclusion: Implementation of a standardized enteral feeding protocol for pediatric burn patients improved feeding delivery and increased receipt of nutrition.

Keywords: Enteral feeding; enteral nutrition; burns; clinical protocols; nutrition support; pediatric

Introduction

Patients admitted to the hospital for a burn require adequate nutritional support to improve healing (1). Severe burns initiate the body's stress response which increases metabolic rates (1). In the event of a burn injury, the body is at risk for severe protein and caloric malnutrition which requires individualized nutritional assessments and a plan to meet a patient's hypermetabolic demands (2). Enteral nutrition is often delivered via a nasogastric, gastric, or intestinal tube to improve gastrointestinal function and reduce intestinal permeability after burn injury (2).

Inadequate nutrition increases a patient's risk for infection, delayed wound healing, impaired immune response, and mortality (3). A high protein and carbohydrate diet can reduce muscle-protein degradation and promotes wound healing for burn patients (3). Pediatric patients are more vulnerable to the metabolic effects of injury due to an increased basal metabolic requirement to maintain growth and activity and because of their limited energy reserves compared to adult patients (2). Due to the intestinal mucosal damage that occurs with burn injury, which results in decreased absorption of nutrients, the timing of enteral feeding is crucial (1).

Chart audits of pediatric burn patients from 2018 through 2020 showed inadequate daily caloric, (mean 78% (standard deviation [SD] 10.9, and range 70-90) and protein (mean 101.2% (SD 10.1, and range 92.5-112.3) intake prior to the implementation of the enteral feeding protocol (see Figure 1 and Table 1). On average, it took 4.21 (SD 2.9, range 1.7-7.3) days to place an NG tube (see Figure 2 and Table 2).

The enteral feeding protocol was implemented at a Midwestern Children's Hospital to improve nutrition for pediatric burn patients in July 2020. Confusion about the overnight feeding rate calculation and use of the protocol followed the first quality improvement cycle which led to modifying the protocol orders to make the order set more user friendly. A second quality improvement effort was initiated in November 2020 to ensure adherence to the protocol, assess registered nurse (RN) perception, and reduce nighttime feeding rate calculation errors by including the calculation in the nutrition order on the patient EHR summary page. The ultimate goal was to improve nutrition and overall health in pediatric burn patients.

Organizational Assessment

The Burke and Litwin Model of Organizational Performance and Change Framework (4) was used to assess the organization's performance. Inadequate nutrition supplementation for pediatric burn patients was identified by the organization through retrospective chart reviews. Data provided key stakeholders the means to formulate an enteral feeding protocol to improve receipt of nutrition for pediatric patients meeting inclusion criteria. Feedback from RNs, physicians, and registered dieticians (RDs) utilizing the protocol indicated the need to improve adherence and understanding to the protocol that an order set change and additional education was needed. A SWOT (5) analysis found the most important strengths in the organization were a clearly defined vision, mission, and strategic plan to take on quality improvement measures. The organization had clear and concise goals when approaching any new plan and employs committed staff who strive to help pediatric patients of all backgrounds. The opportunities that could be achieved through this project included maintaining adherence to a protocol and increasing the number of patients that receive 100% of their daily enteral nutrition requirement; and eventually to encourage a system wide enteral feeding protocol be implemented.

Literature Review

A literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (6) guideline to identify methods to improve nutritional support in burn patients and the efficacy of early enteral nutrition protocols in burn patients. A comprehensive electronic search was conducted in the CINAHL Complete, PubMed, ProQuest, and MEDLINE databases. Key words were "enteral feeding or enteral nutrition", "early enteral nutrition or early enteral feeding", "enteral resuscitation", "burns or burn injury or major burns", "protocols or guidelines or procedures or policy". Similar search terms were listed by using Boolean operators (OR, AND) to broaden the search to include all relevant articles. The searches were limited to the English language during the years 2010 to 2020 with no restrictions to geographic areas. A total of 471 articles were identified, 468 were removed, leaving 3 articles which met the inclusion criteria (see Figure 3). This included one retrospective review with a prospective clinical trial, one randomized comparison clinical trial, and one randomized control trial were included. Implementing a standardized early enteral feeding protocol with proper adherence has the potential to improve patient outcomes (7, 8, 9). The review demonstrated the benefits of initiating EEN as soon as possible after injury to maintain gut function, improve wound healing, and reduce the risk for infection, complications, and mortality (7, 8, 9). This literature was utilized to guide the quality improvement project.

Quality Improvement Methods

The design for this project included program evaluation and quality improvement. Evaluation of the patients without the enteral feeding protocol and when the first round of protocol was used provided an idea where improvements could be made. Protocol were new to staff and few RNs were familiar with utilizing the protocol firsthand. Modification to the protocol regarding confusion about the nurse guided nightly feeding rates was needed. Adjustments to the wording of the nutritional order set were implemented to reduce confusion among RNs. The second round of the PDSA cycle (10) implemented for this project was to ensure better understanding and use of the protocol be maintained for each patient. Continuous process improvement addresses and eliminates the root causes of identified problems while taking RN feedback into consideration through PDSA cycle changes (10). Finally, a sustainability plan was created to support future performance.

Setting

The setting was an urban Midwestern Children's Hospital that has maintained Magnet® status since 2009, the highest international distinction for nursing excellence and outstanding patient care (11). The hospital is also ranked in pediatric specialties of cancer, cardiology and heart surgery, diabetes and endocrinology, nephrology, neurology and neurosurgery, orthopedics, pulmonology and lung surgery, and urology (12). The project was implemented on a pediatric unit that specializes in burn treatments with a thorough enteral feeding protocol. The unit receives pediatric patients with burn injuries locally and from hospitals across the state.

Participants

The participants were part of a multidisciplinary team. RDs are required to assess the patient's nutritional needs and develop a daily nutrition goal that is then prescribed by the physician team caring for the patient. If patients are scheduled for procedures that require nothing by mouth status, the bedside RNs titrate overnight feeding rates to adjust for the time the patient must be nothing by mouth. Patient care technicians are trained to assist with tube feedings and feeding pumps and are essential to help RNs maintain these nutritional goals. Nursing educators and managers help to facilitate educational needs for staff, as this patient population is highly specific with irregular admissions. Patients who can eat by mouth with the assistance of their guardians or caregiver(s), are responsible to track daily caloric intake to accurately determine nighttime enteral feeding rates.

Intervention

Maintaining adequate nutritional requirements for patients requiring enteral feeding is crucial for optimal recovery (7, 8, 9, 13). Ensuring each patient receives 100% of their prescribed nutrition each day is the goal of this project. The overall project objectives were to identify early adopters and develop a team of stakeholders, assess organization readiness with barriers and facilitators, utilize various experts to assist with project design and evaluation, develop a cognitive aid and educate RNs on the new order set, evaluate use of the enteral feeding protocol with patient data and RN surveys, address issues identified throughout the evaluation process, and design and implement a sustainability plan (14).

Implementation included the nighttime feeding rate calculation to the nutritional order set in the patients EHR. This allowed RNs to view the calculation used for the nighttime feeding rate in the same area of the EHR where total caloric needs and maximum rate volume are located for each patient. Including this calculation in the nutritional order set aimed to reduce miscommunication between RNs and prevent delays in nighttime feeding start times.

Implementation

Measures

Demographic data collected included patient gender and age as well as the RN shift on surveys since the protocol nutrition calculations occur on night shift (15). Measures collected were patient length of stay, total caloric and protein intake, the time it took to place the patient's NG tube, and correct use of enteral feeding calculation. Patient outcome measures focused on the total daily nutritional intake received. RN perception measures on the survey will evaluate knowledge of the protocol process, attendance of the educational sessions, and use of the protocol given the smaller patient volumes. RN measures included RN satisfaction of the protocol usage. Implementation measures were the number of RNs educated on the protocol, the number of surveys completed, and the number of implementation errors throughout the implementation phase. System measures are the number of patients included in the protocol, the number of hours to place the NG tube from admission, the daily intake of the total caloric requirement, the daily intake of the total protein requirement, and use of the protocol in any other patient populations.

Analysis

Data analysis consisted of descriptive statistics and two comparison groups for patients that fit the protocol inclusion criteria during the implementation phase (15). The comparison groups were: no enteral feeding protocol or the control group, and combined PSDA Cycle 1 initiated feeding protocol and PDSA Cycle 2 project implementation with the feeding protocol. The focus was a within each group analysis with target outcomes including receipt of 100% of daily nutritional intake and adherence to the enteral feeding protocol.

Fisher's Exact tests and Mann-Whitney U tests were used to analyze survey data due to low counts. Answers to RN surveys were analyzed in two groups: pre- and post-implementation. The final analysis focused on patient length of stay, total caloric and protein intake, the time it took to place the patient's NG tube, and correct use of enteral feeding calculation. The mean percentage of nutrition, length of stay, and days to nasogastric tube placement for burn patients each calendar year of the retrospective chart review was treated as one participant in the analysis. Comments and concerns about the use of the protocol primarily focused on the limited number of patient admissions, which reduced familiarity with direct use of the protocol.

Ethical Considerations

The internal review board reviewed the project and it was determined to be quality improvement. Patient and RN confidentiality were maintained, surveys were anonymous, and all data were deidentified.

Results

Pre-implementation patient retrospective chart review (n=24, 2018 to 2020) found an average 78% (SD 10.9, range 70-90) total calories and 101.2% (SD 10.1, range 92.5-112.3) total protein required throughout their hospital stay, as shown in Table 3. Burn patients admitted post-implementation (n = 5) received an average of 93.8% (SD 26.3, range 63-130) total calories and 109.1% (SD 10.2, range 95.7-121.5) total protein throughout their hospital stay. A comparison of pre-/post-implementation found a mean difference length of stay 13.8 to 9.8, days to nasogastric tube placement 4.2 to 1.2, and a mean of 4.8 days to protocol initiation (see Table 3). The sample size was not large enough to detect a statistically significant effect between each group, however the data showed a positive trend towards improvement after the second cycle.

Pre-/post-implementation RN surveys showed improved understanding of the protocol after attending an in-person educational session ($p = 0.05$), the nutrition orders for each patient ($p = 0.03$), and ease of nutrition rate calculations for nighttime feeds ($p = 0.01$). Pre- and post-implementation differed in mean scores (4.5 to 2.43) when asked about the in-person education session improving understanding of the protocol. Fewer RNs attended the in-person education session in post-implementation than pre-implementation (n = 6 to n = 3). Pre- and post-implementation differed in mean scores (3.25 to 4.57) when asked about the ease of understanding patient nutrition orders. Pre- and post-implementation differed in mean scores (2.75 to 4.57) when asked about the ease in calculating the nighttime feeding rate for patients. Remaining survey questions were not significant (>0.05). Another concern was that the protocol was written for older children who are typically eating normal diets so the feeding algorithm must be adjusted for infant and toddler patients who are mostly drinking formula. Chart reviews indicated RDs appropriately adjusted the feeding orders for every patient to reflect an infant's normal feeding schedule while maintaining the overall goal of the enteral feeding protocol.

Discussion

The enteral feeding protocol had a great impact on patients receiving a nasogastric tube within the first 24 hours of injury or admission to the hospital. One complication discovered for ordering the enteral feeding protocol to begin in patients was their ability to tolerate the maximum goal rate for 24 hours prior to protocol implementation. Some patients would take several days before the protocol was ordered for their inability to maintain their goal feeding rate without emesis. Practice variations of the enteral feeding protocol were implemented for infants to keep them on a regular three-hour feeding schedule rather than daily bolus feeds and an overnight drip feed. This allowed RNs to bolus remaining formula requirements for each feed throughout the entire day.

Utilizing a PDSA cycle (10) approach for this project provided a data-driven examination of the enteral feeding protocol and outcomes to develop further quality improvements. The project plan consisted of editing the nutrition order set to include the nighttime feeding calculation and educating RNs on the change made. Data collection began with the pre-implementation RN surveys and patient admissions in November 2020 and ended in March 2021. Findings of RNs survey educational session suggest the in-person educational session was helpful when the protocol was first implemented, however information is forgotten between sporadic patient admissions. The post-

implementation data shows that RNs understanding of the nutrition orders and overnight feeding calculations improved from pre-implementation survey data. Positive outcomes related to the enteral feeding protocol include increased receipt of total caloric and protein requirements, increased placement of a nasogastric tubes within 24 hours of admission, and reduced length of stay.

Limitations

Weaknesses to this project include delayed feeding tube orders due to miscommunication between treatment teams or patient feeding intolerance. The most important threat in this organization is a failure to maintain long-term adherence to the nurse guided titrations with this feeding protocol. COVID-19 had a large impact on the project by reducing number of pediatric patients coming into the hospital overall and reducing RN participation in pre- and post-implementation surveys. The volume of data collected was also limited given the highly specific patient population for this project and trends for lower pediatric burn patient admissions in the fall and winter months.

Conclusion

Adequate nutritional support improves clinical outcomes for pediatric burn patients. Initiation of early enteral nutrition (EEN) within the first 24 hours has been shown to preserve intestinal mucosa, gut motility, and blood flow (1). Ideally, enteral nutrition is delivered via a nasogastric, gastric, or intestinal tube to improve gastrointestinal function and reduce intestinal permeability after burn injury (2). Use of The Nutrition Care Process Model is important to enhance nutritional support in patients (16). This model was chosen for this project because it is designed to have nutritional requirements continually evolve with the patient as the treatment team makes regular assessments and adjustments to the nutritional diagnosis and intervention (16).

Implementation of a nurse guided enteral feeding protocol improved the total caloric and protein intake of pediatric burn patients. The protocol is now a standard of care for all pediatric burn patients meeting inclusion criteria in this Midwestern Children's Hospital. Tracking compliance to the enteral feeding protocol is essential to maintain proper adherence. RN unit champions have been established on the unit to provide education to RNs and analyze patient charts to verify the protocol is being used correctly (14). As data collection continues to show efficacy of the enteral

feeding protocol in pediatric burn patients, it may be used in other pediatric units throughout the state and for adult burn patients requiring enteral nutrition support.

Implications for Practice and Further Study in the Field

Future use of this protocol may be generalized to other patient populations with serious illness. Studies stress the importance of adequate nutritional intake for improved clinical outcomes for all critically ill patients (17). As efficacy for this feeding protocol is established in the specific burn population, additional PDSA cycles can be done to make the protocol more generalizable.

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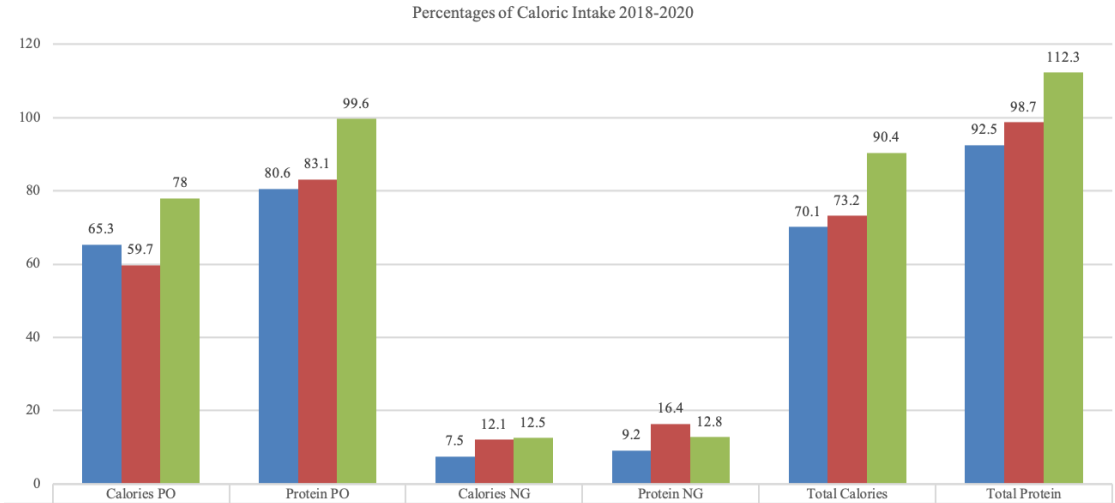
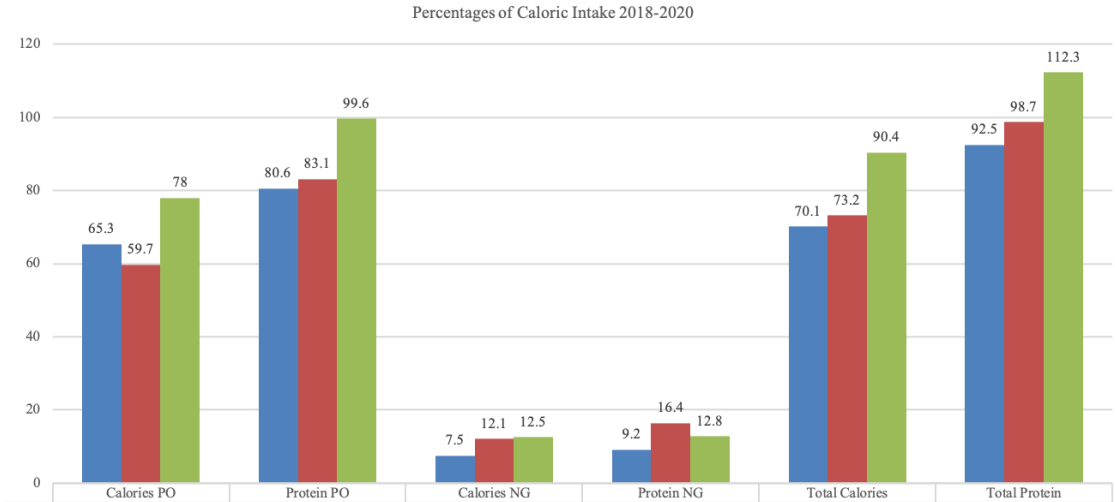
Figures

Figure 1: Pediatric burn patient caloric intake 2018, 2019, and 2020.



	Calories PO	Protein PO	Calories NG	Protein NG	Total Calories	Total Protein
2018	65.3	80.6	7.5	9.2	70.1	92.5
2019	59.7	83.1	12.1	16.4	73.2	98.7
2020	78	99.6	12.5	12.8	90.4	112.3

Figure 2: Pediatric burn patient caloric intake 2018, 2019, and 2020.



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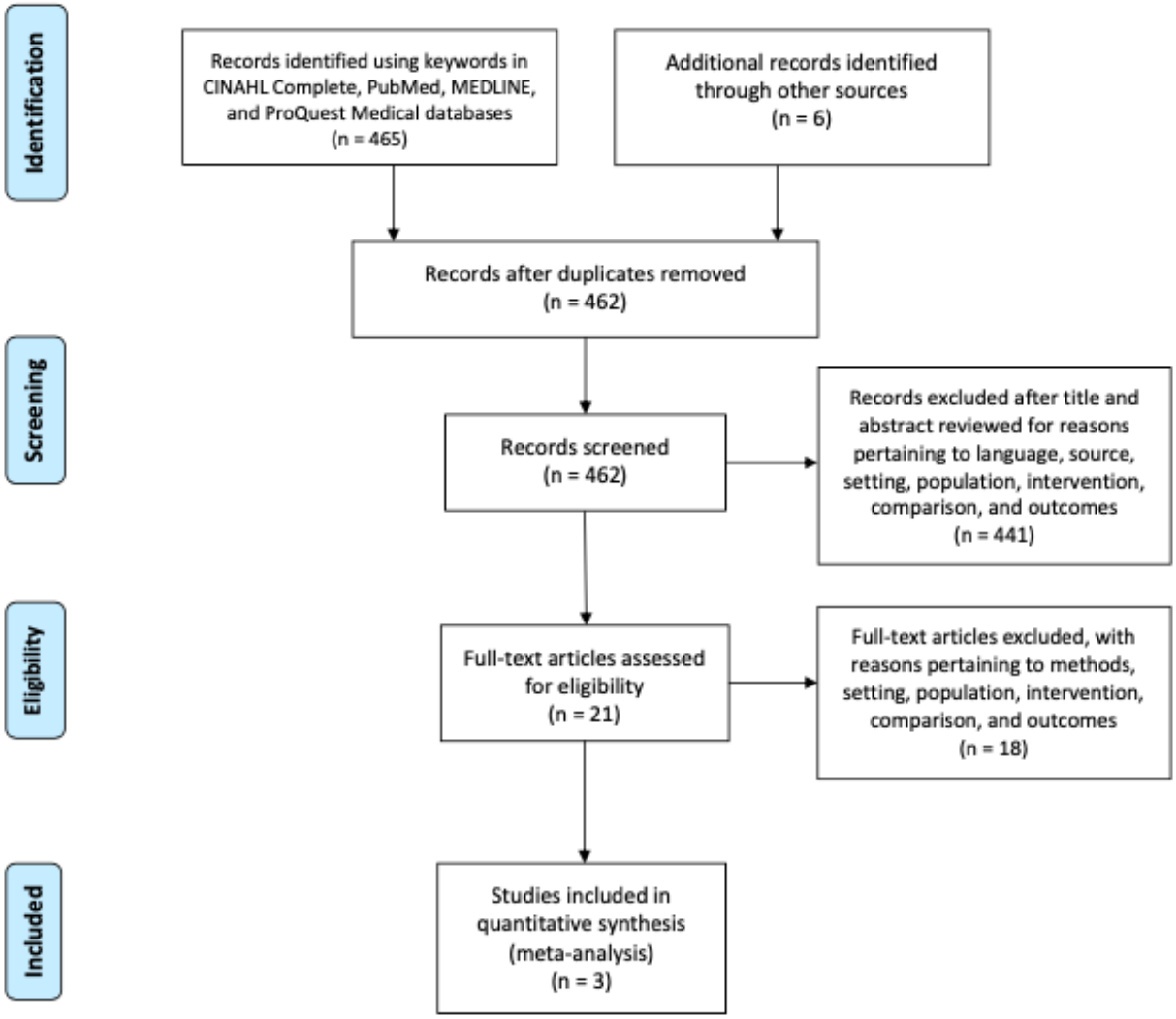
2020	78	99.6	12.5	12.8	90.4	112.3

Figure 3: PRISMA Figure.



Tables

Table 1: Pediatric burn patient caloric intake 2018, 2019, and 2020.

Year	Number of Patients	Average LOS	% PO Calories	% PO Protein	% NG Calories	% NG Protein	% Total Calories	% Total Protein
2018	9	14.44	65.32	80.58	7.54	9.23	70.11	92.51
2019	10	17.5	59.73	83.11	16.39	16.39	73.38	98.65
2020	5	9.5	78	99.55	12.75	12.75	90.37	112.3
Total	24	13.81	67.68	87.75	12.79	12.79	77.95	101.15

Table 2: Pediatric burn patient nasogastric tube placement orders 2018, 2019, and 2020.

Year	Number of Patients	Nasogastric Tube Placed	% NG Tubes Placed	Days to Placement
2018	9	3	33	7.3
2019	10	3	30	1.67
2020	5	1	30	3.65
Total	24	7	27.67	4.21

Table 3. Comparison of all burn patients before and after implementation of nurse guided enteral feeding protocol

Variable	Group 1 (n = 3) No Protocol	Group 2 (n = 5) Nurse Guided Feeding Protocol
Mean length of stay	13.813	9.8
Median length of stay	14.44	11
Mean days to NG placement	4.207	1.2
Median days to NG placement	3.65	1
Mean total calorie intake	77.97	93.82
Median total calorie intake	73.4	99.9
Mean total protein intake	101.17	109.12
Median total protein intake	98.7	108

Enteral Nutrition Protocol for Pediatric Burn Patients: A Quality Improvement Initiative

Maggie Tepe

DNP Project Defense

April 13, 2021

Acknowledgements

- Advisory Team:
  - Advisor: Sandra L. Spoelstra PhD, RN, FGSA, FAAN
  - Team Member: Christina Quick DNP, APRN, CPNP-ACPC
  - Site Mentor: Caryn Steenland MSN, RN, CCRN, ACCNS-P

Objectives for Presentation

1. Describe background of phenomenon.
2. Discuss results of Organizational assessment and Literature Review.
3. Review the project plan.
4. Discuss project results, practice implications, and sustainability plan.
5. Review application of DNP Essentials to the project.

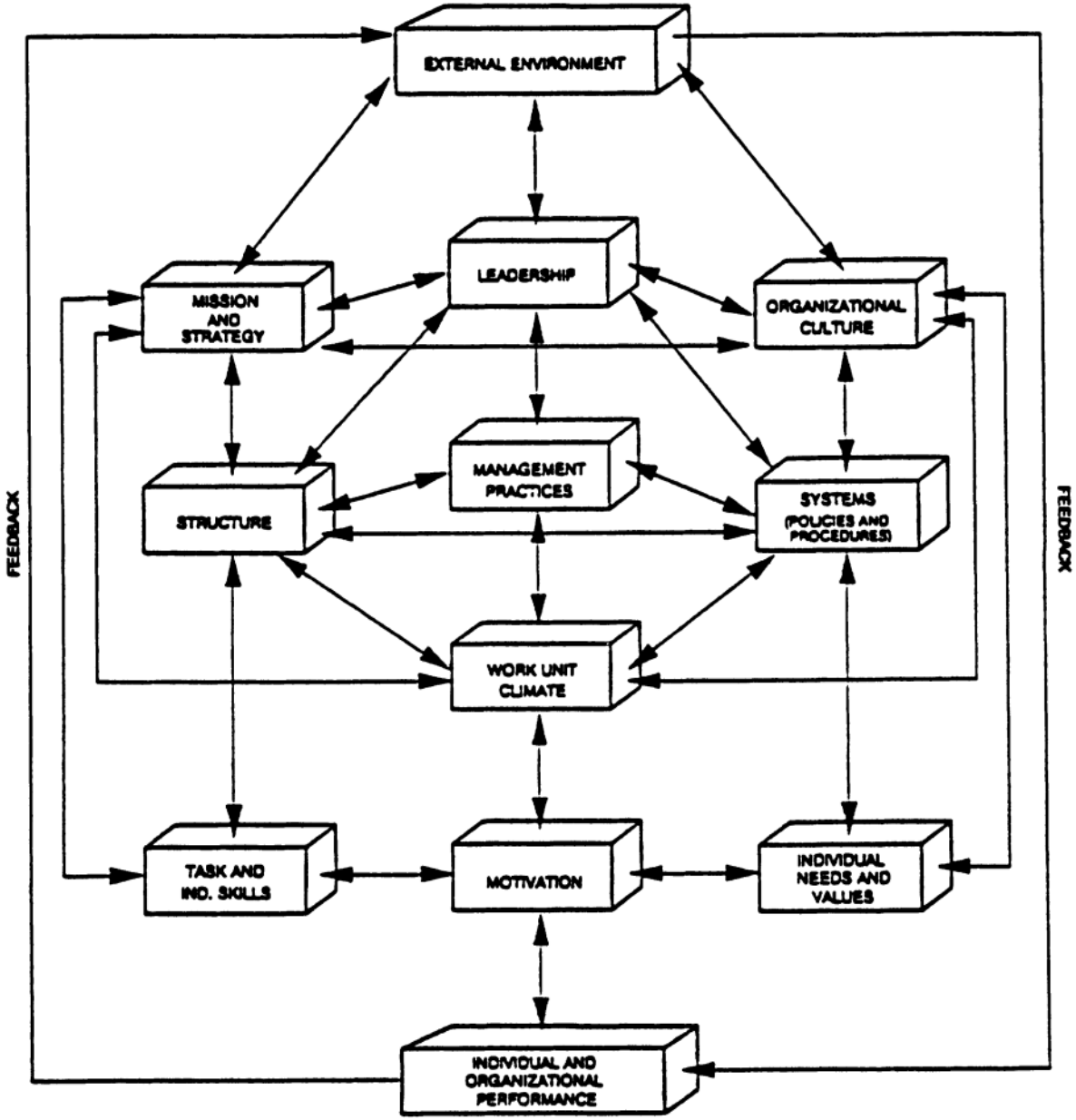
Introduction

- Severe burns initiate hypermetabolic state (Clark, Imran, Madni, & Wolf, 2017).
- Increased risk for protein and caloric malnutrition
  - Leads to delayed wound healing, risk for infection, impaired immune response, and mortality (Stodter et al., 2018).
- Early enteral nutrition preserves intestinal mucosa, gut motility, and blood flow (Clark, Imran, Madni, & Wolf, 2017).

Organizational Assessment

Burke and Litwin Model of Organizational Performance and Change

- External environment and organizational performance create a feedback loop that impact internal variables.



Nasogastric Tube Placement

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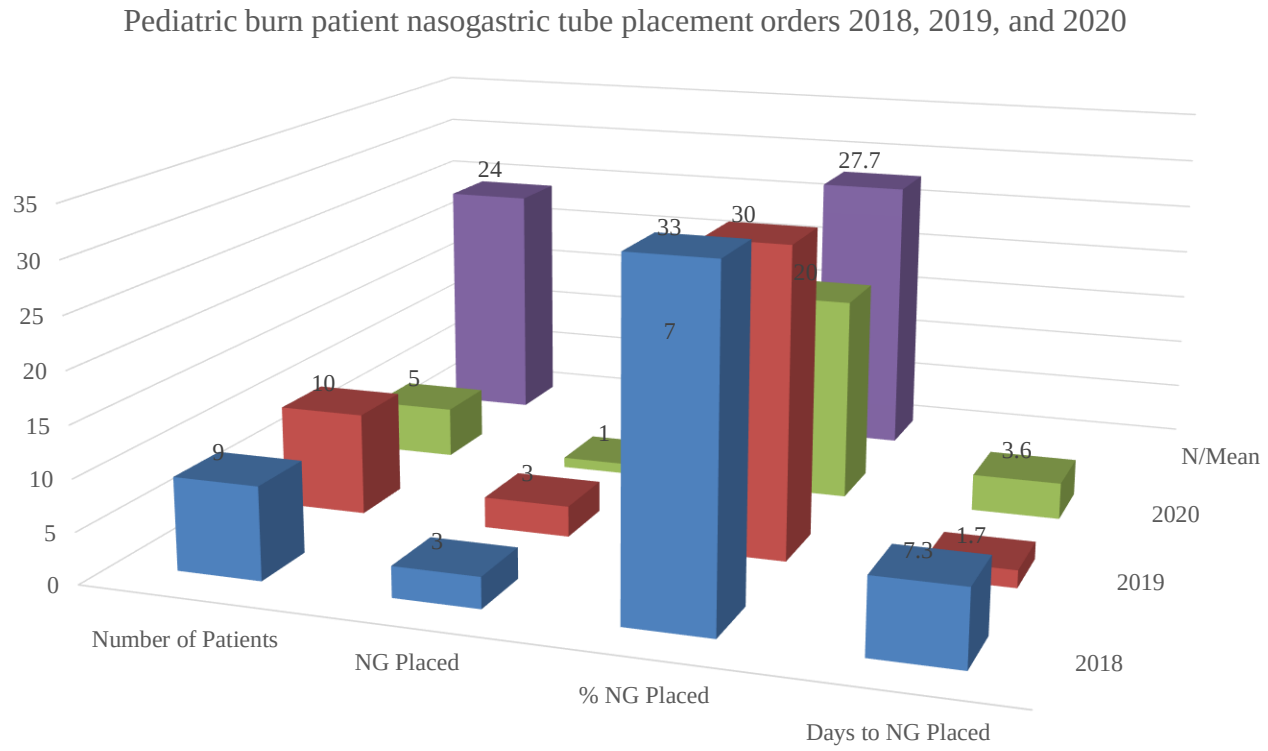
Nasogastric Tube Placement



	Number of Patients	NG Placed	% NG Placed	Days to NG Placed
2018	9	3	33	7.3
2019	10	3	30	1.7
2020	5	1	20	3.6
N/Mean	24	7	27.7	4.21

Figure 1: Pediatric burn patient nasogastric tube placement orders 2018, 2019, and 2020.

Nutritional Intake

Year	Number of Patients	Average LOS	% PO Calories	% PO Protein	% NG Calories	% NG Protein	% Total Calories	% Total Protein
2018	9	14.44	65.32%	80.58%	7.54%	9.23%	70.11%	92.51%
2019	10	17.50	59.73%	83.11%	12.10%	16.39%	73.38%	98.65%
2020	5	9.50	78%	99.55%	12.50%	12.75%	90.37%	112.30 %
Total:	24	13.81	67.68%	87.75%	10.71%	12.79%	77.95%	101.15 %

Table 3: Pediatric burn patient caloric intake 2018, 2019, and 2020

Nutritional Intake

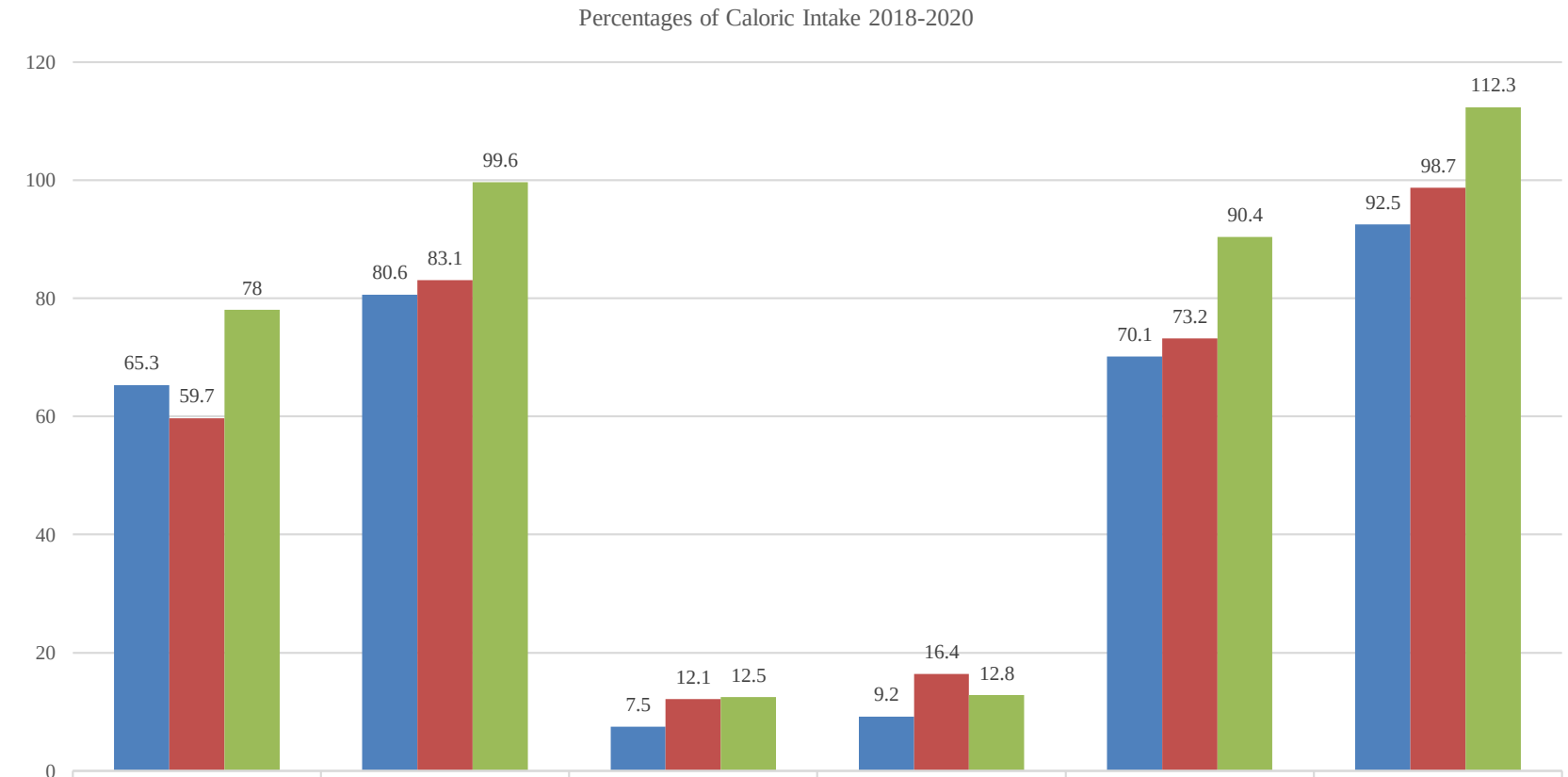


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Figure 2: Pediatric burn patient caloric intake 2018, 2019, and 2020.

SWOT Analysis

Strengths

- Part of a large healthcare system in the Midwest
- Magnet® status (XXX Health, 2016)
- Nationally ranked in several pediatric specialties (U.S. News, 2020)
- **Clearly defined vision, mission, and strategic plan**
- **Clear and concise goals**
- **Committed employees who strive to help pediatric patients of all backgrounds**

Weaknesses

- Lack of staff knowledge on enteral feeding protocol
- **Delayed feeding tube orders due to miscommunication between treatment teams**
- Lack of maintaining adequate nutritional support in acutely ill patients
- Patient intolerance to enteral feedings could prevent use of protocol in certain cases
- **Miscommunication with supporting staff could affect maintenance of daily nutritional requirements**

Opportunities

- Improving health outcomes of specific patients on the enteral feeding protocol
- **Increase number of patients receiving 100% of daily enteral nutrition requirements**
- **Successful adherence to protocol could encourage system wide enteral feeding protocol to be implemented**
- Increased staff knowledge on nutritional support to be used with other patient diagnoses

Threats

- Patient transfers and stabilization procedures (i.e. pain management, IV fluid resuscitation, wound care) from outside hospitals delay timely implementation of early enteral feeding protocol
- Lack of staff attendance to protocol educational sessions
- **Failure to maintain long-term adherence to nurse guided titrations with feeding protocol**
- Lack of regulation to maintain timely feedings

Knowledge Gained from Assessment

- Pediatric patients have higher basal metabolic requirements.
- Increased risk for nutritional deficits during acute illness or injury.

Clinical Practice Question

- Will including the daily formula rate calculation to the nutrition order set improve nurse directed titration adherence for nighttime feeds at a Midwestern children's hospital?

Literature Review

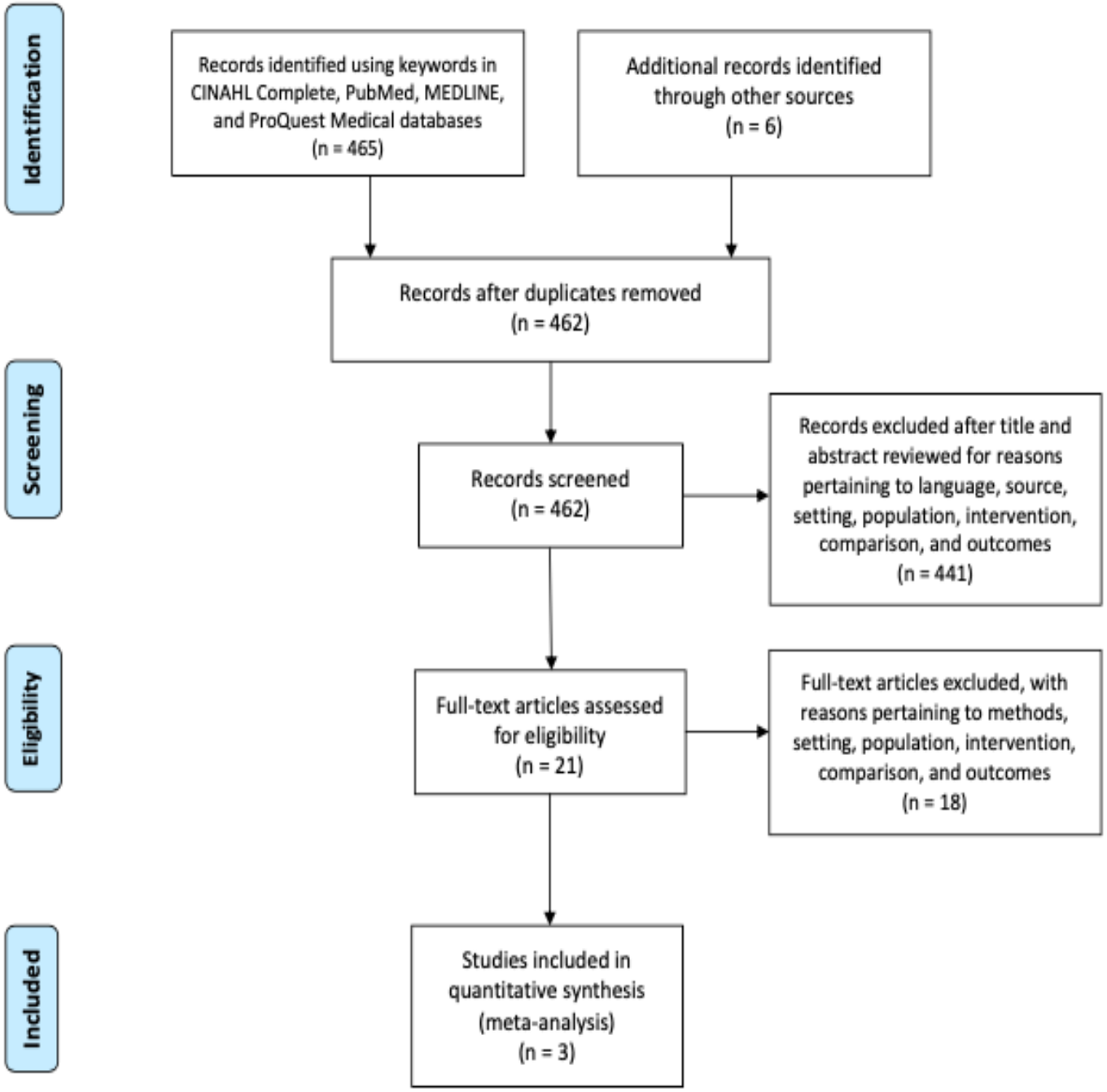
Purpose of Review

1. Identify methods to improve nutritional support in burn patients.
2. Identify the efficacy of early enteral nutrition protocols in burn patients.

Review question:

- In patients with burn injuries, does the use of an early enteral nutrition protocol improve nutritional outcomes?

PRISMA Figure



Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009).

Author	DOI	Purpose	Design	Results	Conclusion
Conrad (2017).	10.1097/BCR.0000000000000554	To improve nutritional support in burn patients with a prescribed enteral feeding protocol.	Retrospective review, prospective clinical trial	All patients pre-implementation received 100% of their nutritional requirements 59.9% of the days vs 76.5% in patients post-implementation. Pre-implementation patients received 100% of feeds 61.6% of the days vs 85.4% post-implementation.	The use of a prescribed, nurse directed enteral feeding protocol improves nutrition delivery in all patients and specifically in burn patients.
Khorasani (2010).	10.1016/j.burns.2009.12.005	Assess the effectiveness of early enteral nutrition in pediatric burn patients.	RCT	Mean duration of hospitalization was 16.4 +/- 3.7 days for late enteral nutrition group and 12.6 +/- 1.3 days for early enteral nutrition group. Mortality was 40 patients (12%) for late enteral nutrition group and 31 patients (8.5%) for early enteral nutrition group.	Early enteral nutrition reduces length of hospitalization and mortality in pediatric patients.
Vicic (2013).	10.6133/apjcn.2013.22.4.13	To compare benefits and safety of early enteral nutrition in burn patients compared to a normal diet.	RCT	Control group lost 2.27 +/- 0.56 kg/m^2 BMI while intervention group lost 1.77 +/- 0.38 kg/m^2 BMI.	Early enteral nutrition group had lower complications, infection rates, and BMI loss compared to control group.

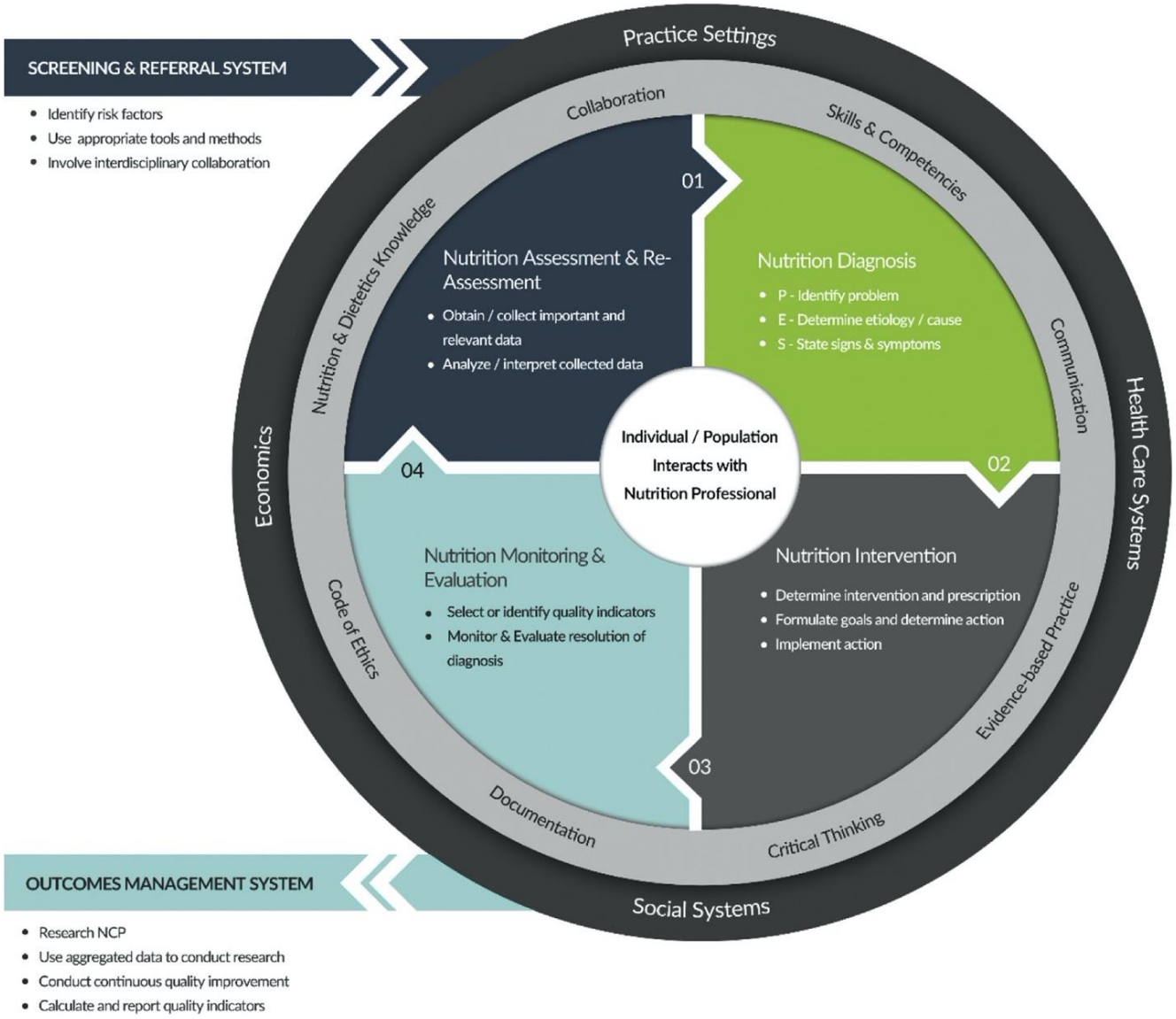
Summary of Evidence for Use in Plan

- Nurse directed enteral feeding protocol increases nutrition received.
- Early enteral nutrition provides better patient outcomes than late enteral nutrition or normal diets by mouth.

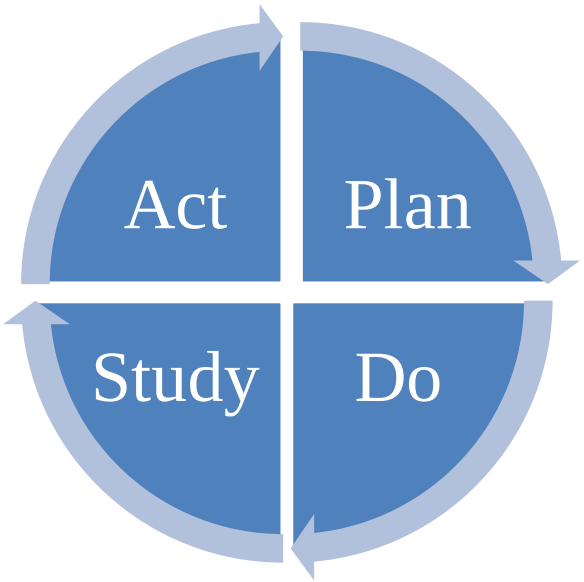
PROJECT PLAN

Conceptual Model for Phenomenon

- Enhances nutritional support by integrating behavioral and biological aspects of nutrition (Hammond, Myers, & Trostler, 2014).



Project Design



- Project Design: Quality Improvement/Program Evaluation.
  - Evaluation of current use of the protocol with quality improvements.
  - Use of the Plan, Do, Study, Act Model (PDSA).
  - (Institute for Healthcare Improvement, 2017).

Setting & Participants

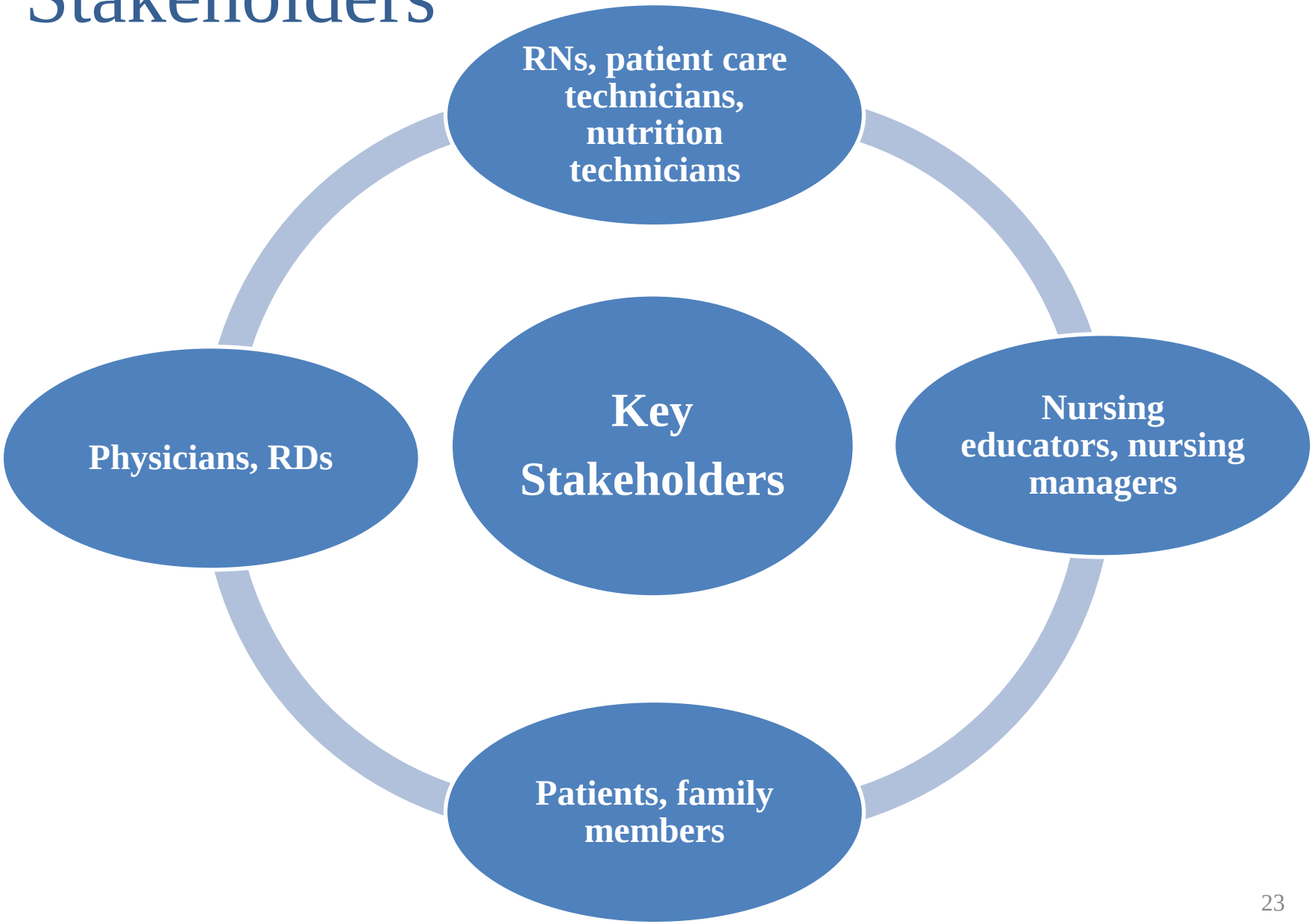
Setting:

- Urban Midwestern Children's Hospital with Magnet® status (XXX Health, 2016).
  - Ranked in several pediatric specialties (U.S. News & World Report, 2020).
- 24 bed unit with 6 beds set up as a Pediatric Cardiac Intensive Care Unit (PCICU).
  - Pediatric unit specializes in burn treatment.
  - Patients are local and from hospitals across the state.

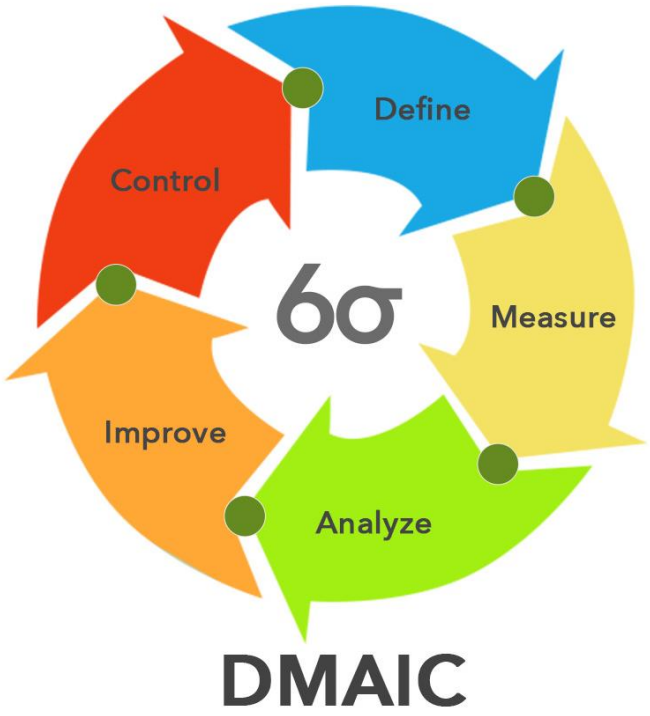
Participants:

- Physicians, RDs.
- RNs, patient care technicians, nutrition technicians.
- Nursing educators, nursing managers.
- Patients, family members.

Stakeholders



Implementation Framework



(ASQ, 2020).

Define	• Problem is defined • Goals are set
Measure	• Data collection for the problem • Define performance to achieve an outcome
Analyze	• Determine efficacy and efficiency of process • Quantify goals
Improve	• Identify areas of improvement • Establish process tolerance
Control	• Establish process capability • Implement the process

Purpose, Objectives, and Project Type

Purpose: To evaluate and improve adherence to an existing enteral feeding protocol for pediatric burn patients.

Objectives:

1. Identify early adopters and develop a team of stakeholders.
2. Assess organization readiness with barriers and facilitators.
3. Utilize various experts to assist with project design and evaluation.
4. Develop a cognitive aid and educate staff on the new order set.
5. Evaluate use of the enteral feeding protocol with patient data and staff surveys.
6. Address issues identified throughout the evaluation process.
7. Design and implement a sustainability plan.

Project Type: Program Evaluation of existing protocol and Quality Improvement (Moran, Burson, & Conrad, 2014).

Implementation Strategy #1

- Organizational Assessment:
  1. Assessment of readiness.
  2. Identified barriers and facilitators.
  3. Identified early adopters.

(Powell et al., 2015)

Implementation Strategy #2

- Expert Involvement:
    4. Expert advisor.
    5. Use data experts.
    6. Development of a coalition.
    7. Identify champions.
    8. Organize clinician implementation meetings.

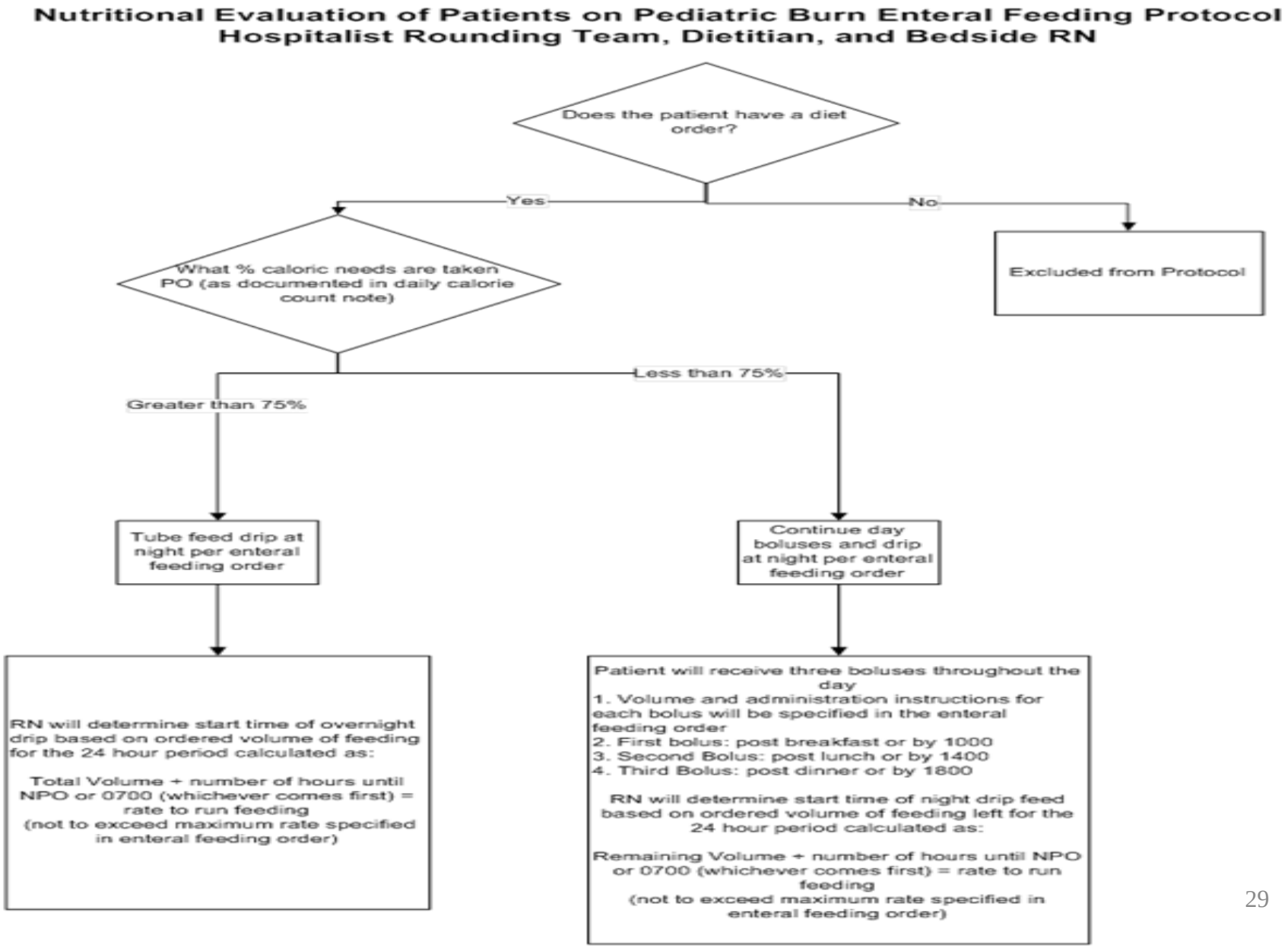
(Powell et al., 2015)

Implementation Strategy #3

- Cognitive Aid:
  9. Developed and implement the aid/tool to prompt data collection.
  10. Developed and organized a system for quality monitoring.
  11. Tailor strategies.
  12. Promote adaptability.

(Powell et al., 2015)

Cognitive Aid



Order Set

- To include the calculation below for RNs to initiate nighttime enteral feeds.

Total volume remaining/max rate =

# of hours before NPO time or 0700 to begin feed

Implementation Strategy #4

- Quality Improvement and Change Model:
  13. Conduct cyclical small tests of change.
  14. Purposely reexamine the implementation.
  15. Audit and provide feedback.
  16. Stage implementation scale up.

(Powell et al., 2015)

Patient Nutrition Audit Tool

Patient + Day of hospital stay	Hours to place NG from admission	Total Caloric Requirement	Total Caloric Intake %	Total Protein Requirement	Total Protein Intake %	Feeding Rate Calculation Errors

Daily Rounding Tool

Current Tube Feeds: Day Boluses Night Drip

PO Caloric Intake Over Last 24 Hours: _____

Continue Tube Feedings? Yes No

>75% PO Intake

Tube Feed Drip Night

NPO Time (if applicable):

_____

Total Volume/max rate =

# of hours before NPO time or 0700 to begin feed

< 75% PO Intake

Day Boluses:

Bolus #1: post breakfast or by 1000

Bolus #2: post lunch or by 1400

Bolus #3: post dinner or by 1800

Night Drip:

Time NPO (if applicable):

_____

Total volume remaining/max rate =

# of hours before NPO time or 0700 to begin feed

Pre-/Post-Implementation Survey

1. What shift do you work?
    a. 0700-1500
    b. 1500-2300
    c. 1900-0700
    d. Other
2. Have you read the enteral feeding protocol?
    a. Yes
    b. No
3. Did you attend the in-person education for the enteral feeding protocol?
    a. Yes
    b. No
4. If you answered yes to the previous question: I believe the educational training session enhanced my knowledge and practice for the enteral feeding protocol.
    a. Strongly agree
    b. Somewhat agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
5. I have used the enteral feeding protocol with a patient:
    a. Never
    b. 1-2 times
    c. 3+ times
6. I would be interested in a short educational session to learn about the goals of the protocol.
    a. Yes
    b. No
7. I find the daily nutrition orders easy to understand.
    a. Strongly agree
    b. Somewhat agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
8. I find the nighttime feeding rate easy to calculate.
    a. Strongly agree
    b. Somewhat agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
9. I feel the enteral feeding protocol has improved patient receipt of daily nutrition.
    a. Strongly agree
    b. Somewhat agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
10. What additional comments or concerns do you have about the protocol?

Evaluation and Measures

- Demographic data
  - Patient gender, age
  - Staff member shift
- Patient outcome measures
  - Total daily nutrition intake
- Perception measures
  - Knowledge of process
  - Education attendance
  - Use of protocol
- Satisfaction measures
  - RN
- System measures
  - Number of cases
  - Hours to place NG tube
  - Daily intake of total caloric requirement
  - Daily intake of total protein requirement
  - Protocol use with other patient populations
- Implementation measure
  - Number of RNs educated
  - Number of surveys completed
  - Implementation errors

(Moran, Burson, & Conrad, 2014)

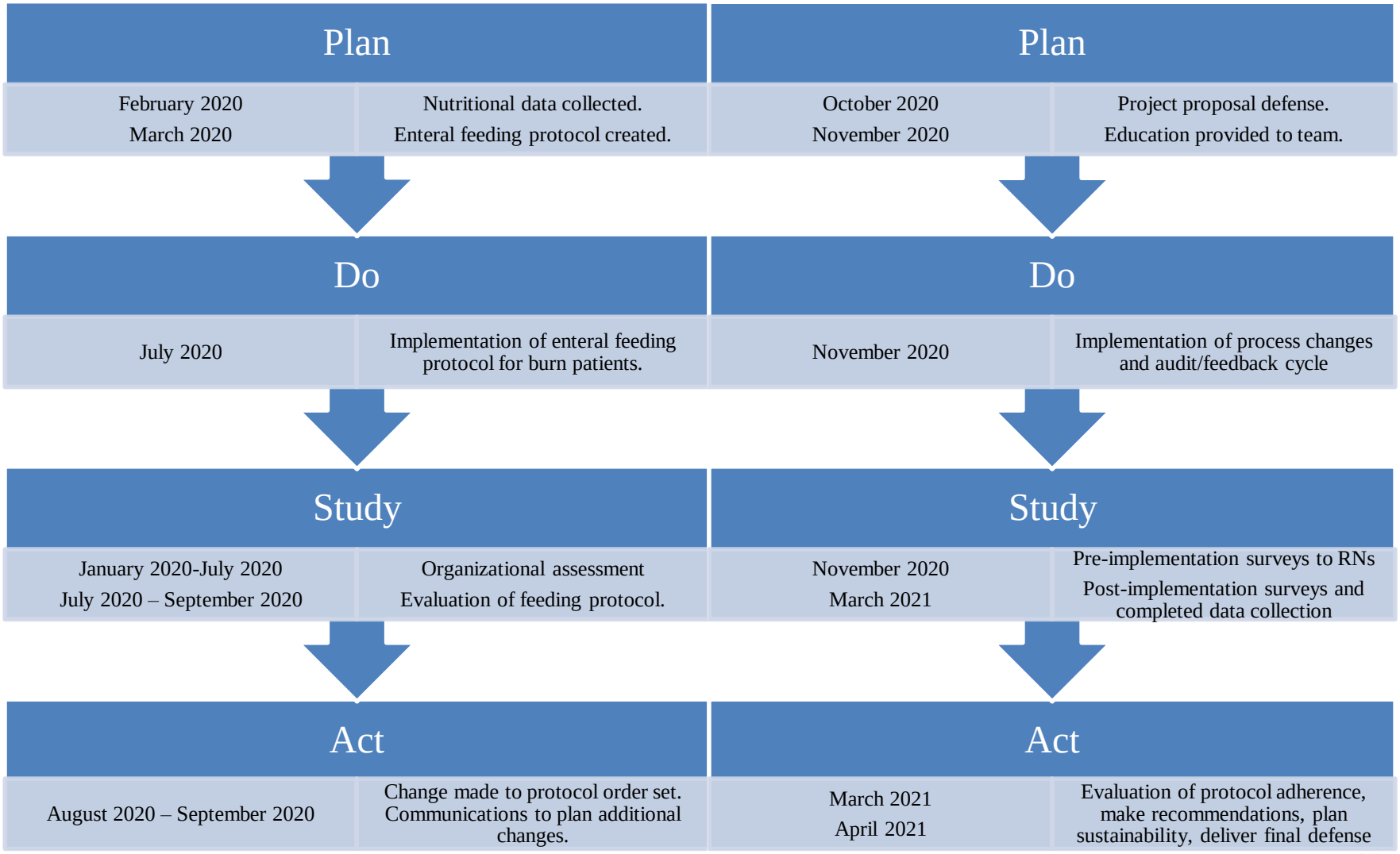
Analysis Plan

- Quantitative:
  - Descriptive Statistics.
  - Chi-square test.
    - Analyze relationship between categorical data.
    - Significance will be classified as a p-value ≤ 0.05.
- Qualitative: group comments in themes.
- Target Outcomes.
  - Receipt of 100% of daily nutritional intake.
  - Adherence to feeding protocol.

Ethical Considerations

- Deidentified patient and staff data.
- Secured M drive folders on health system computers for collected data.
- Formal ethics review through health system IRB.
  - IRB Determination letter available upon request.

Timeline


Plan
February 2020
March 2020
Nutritional data collected.
Enteral feeding protocol created.
Do
July 2020
Implementation of enteral feeding protocol for burn patients.
Study
January 2020-July 2020
July 2020 – September 2020
Organizational assessment
Evaluation of feeding protocol.
Act
August 2020 – September 2020
Change made to protocol order set. Communications to plan additional changes.
Plan
October 2020
November 2020
Project proposal defense.
Education provided to team.
Do
November 2020
Implementation of process changes and audit/feedback cycle
Study
November 2020
March 2021
Pre-implementation surveys to RNs
Post-implementation surveys and completed data collection
Act
March 2021
April 2021
Evaluation of protocol adherence, make recommendations, plan sustainability, deliver final defense

Results

Results: Participant Characteristics

	Pre-implementation	Post-implementation
Burn Patients	3	5
RN Survey Participants	8	7

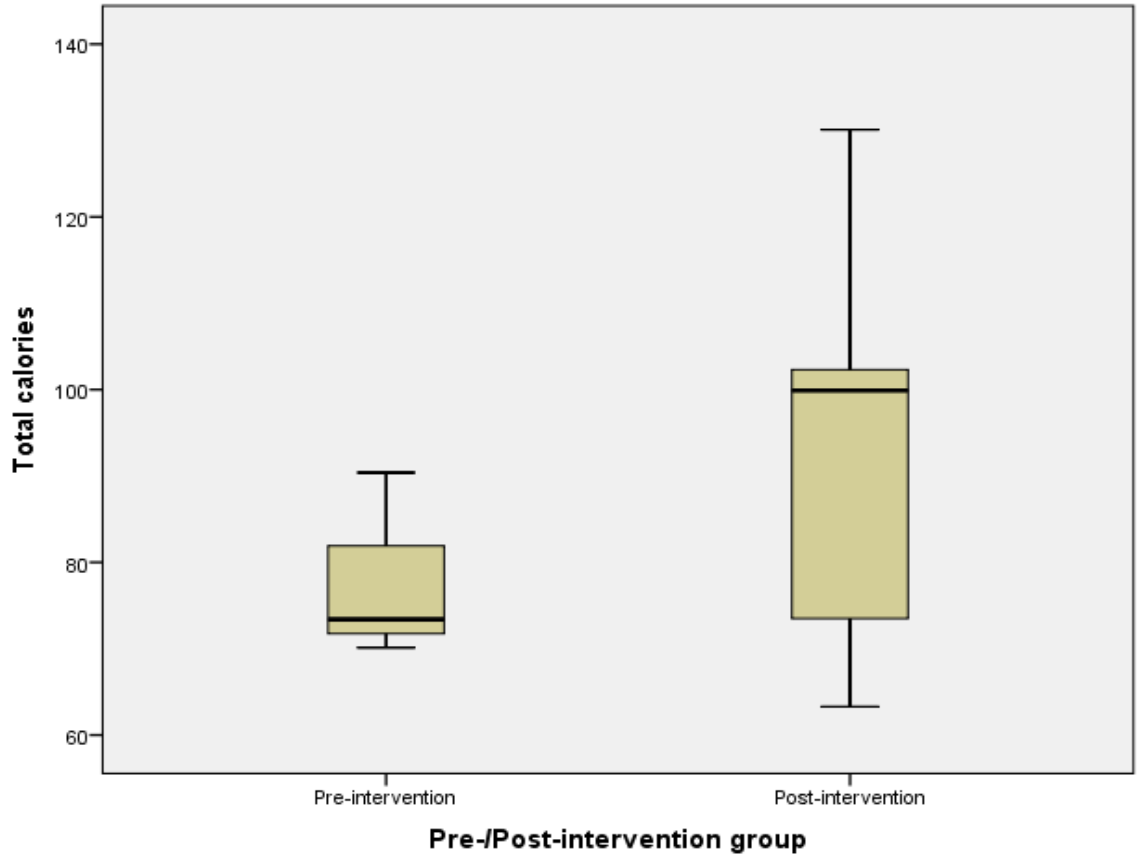
Results: Pre/Post Implementation RN Survey

	Mean (SD)			p-Value
Factor	Before (8)	After (7)	Difference	
Did RN attend in-person education session?	1.25 (0.46)	1.57 (0.54)	0.32	0.31
Did RN use protocol with a patient?	1.5 (0.54)	1.29 (0.49)	-0.21	0.61
Interest in another learning session	1.63 (0.58)	1.71 (0.49)	0.08	1
Did in-person session improve understanding of protocol?	4.5 (2.20)	2.43 (1.81)	-2.07	**0.045**
Nutrition order understanding	3.25 (1.17)	4.57 (0.54)	1.32	**0.03**
Nighttime rate calculation understanding	2.75 (1.17)	4.57 (0.54)	1.82	**0.01**
RN perception of nutrition received	4.13 (0.99)	4 (1.16)	-0.13	0.90

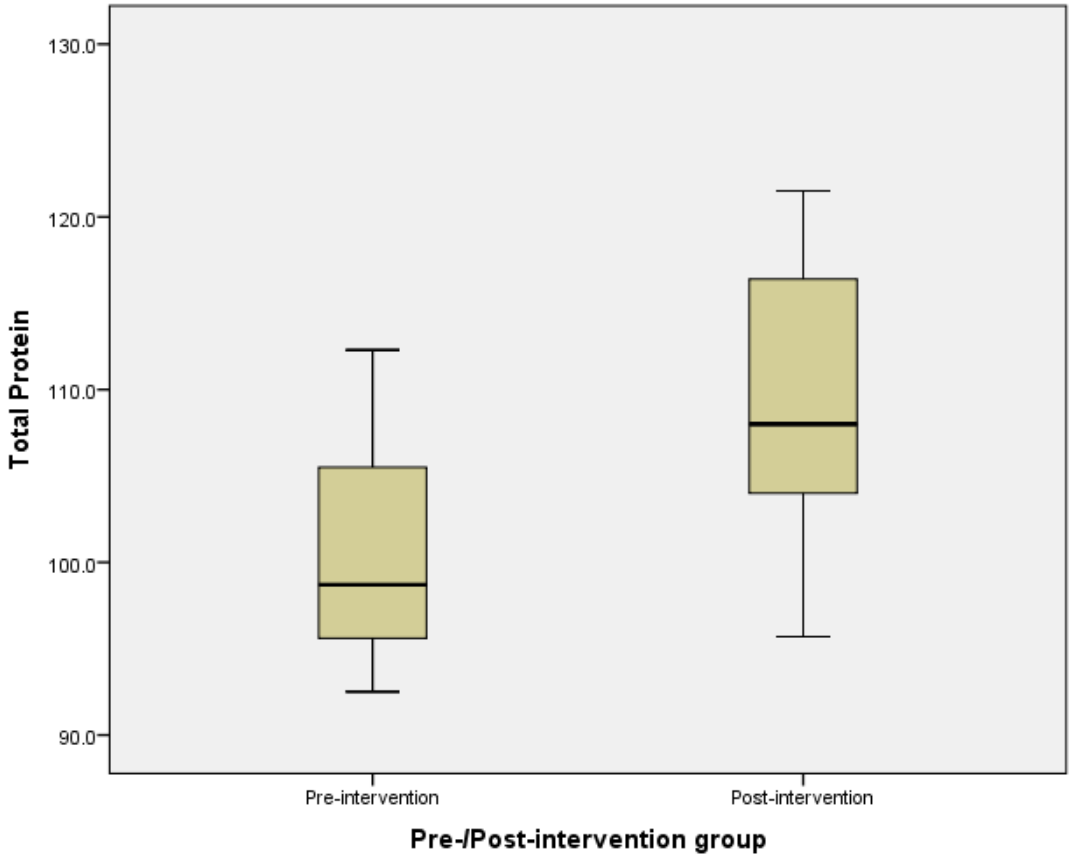
Results: Patient Outcomes

Variable	Pre-implementation: No Protocol Retrospective Review (n = 3) Mean (Median)	Post-implementation: Nurse Guided Feeding Protocol (n = 5) Mean (Median)
Length of stay	13.81 (14.44)	9.8 (11)
Days to NG placement	4.21 (3.65)	1.2 (1)
Total calorie intake	77.97 (73.4)	93.82 (99.9)
Total protein intake	101.17 (98.7)	109.12 (108)

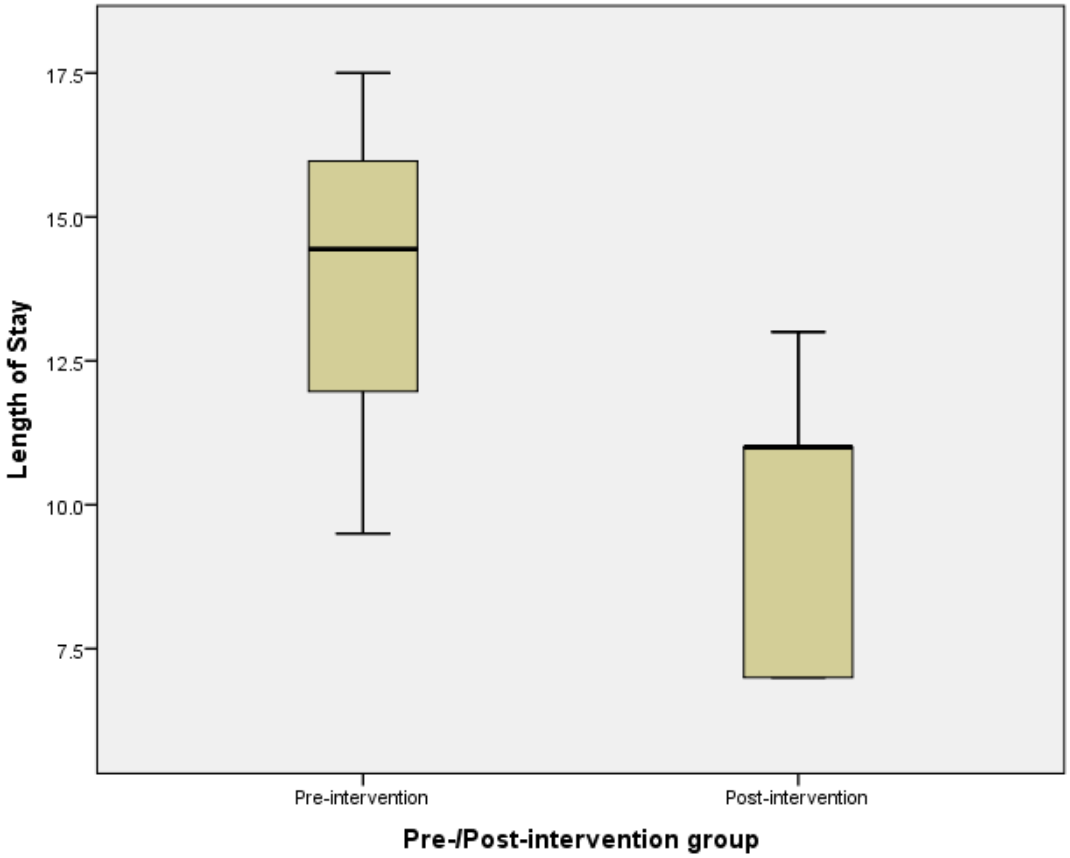
Results: Total Caloric Intake



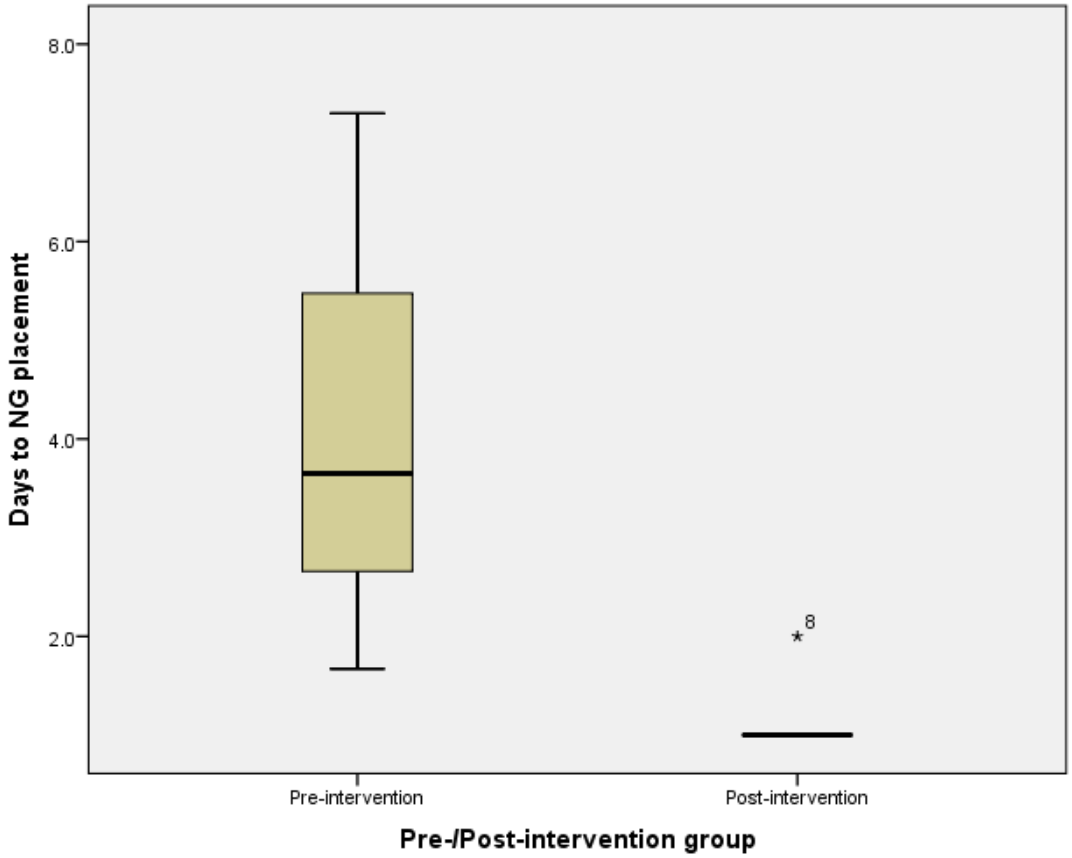
Results: Total Protein Intake



Results: Length of Stay



Results: Days to NG Placement



Budget & Resources

Cost Mitigation if Protocol Reduces Hospital Stay by One Day	
1 pediatric admission per day	$4,300
1% per TBSA cost per day (at least 10%)	$4,260

Expenses for Implementation of Project	
Project Manager time (in-kind)	$5,000
Site Mentor meetings	$1,040
Staff RN surveys and education	$1,312
RD education	$27.11
Total Expenses	$7,379.11

Cost Mitigation per patient	**$1,180.89**
Cost Mitigation for 10 patients	$11,808.90

Discussion and Conclusions

Discussion

- Standard enteral feeding protocol improves clinical outcomes.
- PDSA cycle approach allows for continued process improvements.
- Nutrition order adjustments for individual needs.
- Infrequent patient admissions limits familiarity with the protocol.

Limitations

- Limited statistical analysis available.
  - Small sample size.
- Measurement imprecision.
  - Adjustment for small sample size.
  - Surveys.
- COVID-19 pandemic:
  - Reduced patient admissions.
  - Limited staff participation.

Implications for Practice

- Spread to other patient populations.
  - Generalizability to adult burn, cardiac, and traumatic brain injury patients.
  - Adapt protocol and cognitive aids to other diagnoses.
- Further evaluation needed.
  - Long-term understanding of protocol with limited patient contacts.
  - Evaluation of enteral feeding protocol in other diagnoses requiring nutrition supplementation.

Conclusions

- Implementation strategies
  - Audit and provide feedback
  - Conduct cyclical small tests of change
  - Purposely reexamine the implementation
- PDSA model (Institute for Healthcare Improvement, 2017)
  - Allows flexibility with protocol
  - Opportunity for continuous quality improvements

Sustainability Plan

- Track compliance:
  - RN champions established for analyzing data.
  - Monitor use in other patient populations.
- Continue improvements:
  - Additional PDSA cycles.
  - Generalize protocol to different patient populations.

Dissemination

- Stakeholder meeting with project members.
  - Discuss results, survey comments, and sustainability plan.
- Public defense.
- Submission to ScholarWorks.

Reflection on DNP Essentials

DNP Essentials

Essential I: Scientific Underpinnings for Practice

- Framework utilization to increase understanding of the project phenomenon
- Completion of a literature review using the PRISMA framework
- Selection of evidence-based interventions to address an identified problem

Essential II: Organizational and Systems Leadership

- Establish a sustainability plan based on feasibility within the organization
- Use of evidenced-based implementation strategies

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

- Use of analytic techniques within a literature review and organizational assessment
- Evaluation and analysis of several patient and staff measures in the project
- Findings were disseminated publicly and within the organization

Essential IV: Information Systems and Technology

- Use of technology to evaluate the enteral feeding protocol
- Use of technology to create a budget for the project, create staff surveys and educational materials, and to distribute surveys and materials to staff

(AACN, 2006).

DNP Essentials

Essential V: Advocacy for Health Care Policy

- Critically analyzing enteral feeding policies within the organization
- Advocating for patients to receive optimal nutrition supplementation
- Advocating for RNs to have optimal nutrition order communications

Essential VI: Interprofessional Collaboration

- Collaborating and communicating with site mentor, statisticians, RNs, nurse manager, and registered dieticians
- Lead the quality improvement project and collect patient data with each admission

Essential VII: Clinical Prevention and Population Health

- Evaluation of a current enteral feeding policy and determining appropriate interventions
- Project addressed the population of interest: acutely-ill hospitalized pediatric patients

Essential VIII: Advanced Nursing Practice

- Used clinical and leadership judgement in complex health situations
- Developed and sustained relationships with all professionals involved in the project
- Outcomes were analyzed and disseminated to encourage optimal care and future quality improvements

(AACN, 2006).

Summary

- Adequate nutritional support improves clinical outcomes for burn patients.
- The Nutrition Care Process (NCP) Model is the conceptual model for this phenomenon. The Plan, Do, Study, Act model is utilized to direct change.
- Implementation strategies to promote practice change.
- Address issues identified throughout the evaluation process.
- Standardized enteral feeding protocols improve receipt of nutrition requirements for patients.
- Design and implement a sustainability plan.

Handouts

- Organizational Assessment Data
- Literature Review
- Project Evaluation Measures
- Staff Education
- Staff Survey
- Cognitive Aid
- IRB Determination
- Proposed Budget & Resources

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