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Evidence Based Protocol: Improving Nutrition Monitoring in Hospitalized Adults

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Abstract

Malnutrition affects a large number of adult inpatients. For these patients, the implications of the high rate of malnutrition include impaired wound healing, higher rates of infection, and an increased risk of death. These complications contribute to increased healthcare costs and longer lengths of stay. The level of monitoring and documentation of patients' meal consumption was acknowledged to be below expectations in an acuity-adaptable neurosciences unit situated in a downtown hospital located in the Midwestern United States. The define-measure-analyze-improve-control (DMAIC) quality improvement framework guided the quality improvement team to develop a standard process for meal related activities. The rate of meal intake documentation improved after adoption of the standard process.

Keywords: monitoring nutritional intake, meal tray delivery, DMAIC, electronic health record, documentation standards, malnutrition

Chapter 1: Introduction to the Clinical Microsystem

Nutrition status is frequently compromised in the acute inpatient adult population. Patients who are admitted with existing nutrition issues can experience significant decline during their hospital stay (Sura, Madhavan, Carnaby, & Crary, 2012). Additionally, patients who initially present with adequate protein-energy nutrition may regress to a malnourished state during an acute hospitalization (Corrigan, Escuro, Celestin, & Kirby, 2011; Deuz et al., 2016). Chronic illness and malnutrition frequently coincide (Corrigan et al., 2011). Malnutrition intensifies the morbidity and mortality of hospitalized adults, leading to reduced functional capacity and an increased hospital cost and length of stay (Wirth et al., 2013). In hospitalized patients, 30% – 70% are malnourished and up to half do not have their malnutrition detected by their health care providers (Somanchi, Tau, & Mullin, 2011). Older adults above the age of 65 are the most vulnerable to malnutrition (Deuz et al., 2016). Known risk factors for malnutrition include having surgery, unintentional weight loss, wounds or pressure ulcers, and infection (Somanchi et al., 2011). Despite the documented deleterious effects of malnutrition on patients' well-being, malnutrition remains a significant problem in hospitalized adults.

Gap in Target Microsystem

For the purposes of this project the Master of Science in Nursing (MSN) student is based on a clinical microsystem. Nelson, Batalden, Godfrey & Lazar (2011) define a microsystem as a "group of people who work together in a defined setting on a regular basis to create care for discrete subpopulations of patients" (p. 3-4). The MSN student identified that the process used by the microsystem to monitor nutritional intake is problematic. Upon admission patients are screened for malnutrition by registered nurses (RNs) using the malnutrition screening tool

(MST). The MST is a valid and evidence-based tool to screen for malnutrition (Tappenden, et al., 2013). Affirmative responses to certain questions or a score of 2 or higher on the MST will trigger an automatic referral to the registered dietitian (RD), who then performs a formal nutrition assessment and develops a nutrition plan of care. Patients who "pass" the MST are not referred to the RD. However, institutional policies require RDs to evaluate patients who "pass" the MST 7 to 10-days after admission for their nutritional needs. Patients can be referred to the nutrition department sooner than 7 to 10-days if health care providers suspect the patient is not meeting his or her nutritional needs. On the targeted microsystem, the referral typically occurs during multi-disciplinary rounds, where the RN notifies the RD of a nutrition concern. However, given the state of poor meal intake documentation and the relatively low priority of nutrition, the RN may lack the evidence that a patient has had several consecutive days of inadequate meal intake. Therefore, a nutrition referral may not occur due to deficient monitoring and documentation.

The meal tray delivery process is another exemplar of how breakdowns in nutrition care processes lead to gaps in practice. Many aspects of the nutrition department's processes, including the coordination of meal tray delivery, are aided by specialized software, called CBORD. The meal tray delivery process uses a room service model. During mealtimes patients call operators in the nutrition department to place their meal orders, which are entered into the CBORD application. A printed meal ticket listing all the food items is included on the meal tray. The software notifies nutrition technicians, "tray runners", once meal trays are assembled and ready for delivery. Tray runners (TRs) pick meal trays up in the kitchen and deliver them to patient's rooms. The software tracks the location of each meal tray and alerts tray runners to

collect the tray 60-minutes after it was delivered. During mealtimes RNs and patient care assistants (PCAs) may be occupied with many other tasks. For example, nurses are admitting or discharging patients, performing focused neurological assessments, preparing patients for tests and procedures, and communicating with other providers. PCAs are assisting patients who need help with feedings, getting vital signs and point of care blood sugar checks, toileting patients, helping patients reposition, and performing hygiene tasks. Clinicians state that these activities are time sensitive and take priority over assessing meal intake. Moreover, the limited window of time after a patient is done eating and before the tray is cleared by the tray runner makes documenting meal intake very difficult. The unit is not adequately following the hospital's policies on documentation. Due to numerous complicating factors, the rate of meal intake documentation falls short of the requirement, which states that monitoring of all patients' nutritional intake is required. The gap between the current state and the desired state diminishes the ability for clinicians to track a patient's progress ward meeting the goals of their nutritional care.

Description of Protocol

A protocol will be described that is designed to improve monitoring and documentation of meal intake by ameliorating the problems that exist in the current process. The protocol must satisfy the following criteria: uses a reliable method for assessing patients' meal intake, does not require significant investment of resources (i.e., time, money, training) to implement, and does not add significant burden to the workload of bedside clinicians. Desired outcomes of the protocol will be to have increased documentation of patient meal intake.

The Clinical Microsystem

The microsystem of interest is a 34-bed acuity-adaptable neurosciences unit situated within a downtown hospital. The hospital, located in the Midwestern United States, has 344 inpatient beds and is part of a much larger hospital organization. The microsystem is designed for the care of patients with neurological disorders. The most common reasons for admission include cerebrovascular accident (CVA), transient ischemic attack (TIA), seizure, subdural hematoma, spinal stenosis (requiring surgery), brain tumor, neuralgia, and alcohol withdrawal. The unit often admits general medical/surgical patients as well.

To care for the patients the microsystem employs 46 Registered Nurses (RNs) and 37 patient care assistants (PCAs). The unit leadership consists of one clinical nurse leader (CNL), one nurse manager, one clinical nurse specialist (CNS), one nurse educator, a night shift nurse supervisor, and one director. There are four neuro-hospitalists, seven neurologists, three neuro-psychologists are available for consult, and a variable number of internal medicine and family medicine residents. Other clinicians, who are vital to the functioning of this unit, serve designated geographic areas in the hospital and they are often spread between several microsystems. The neurosciences unit has one full time equivalent (FTE) social worker, two RN case managers, three transitions coordinators, one stroke program coordinator, one FTE pharmacist, one FTE dietician, and a 0.5 FTE Chaplin.

Need for Change

Monitoring patients' nutritional status and documenting his or her intake is a basic nursing function (Blair & Smith, 2012; Kalisch, 2006). It is an expectation of the organization that RNs and PCAs will document intake and output for all patients including the proportion of

meals consumed. The process for assessing and documenting on meal intake is part of the orientation and onboarding process of new employees. However, the current state is that documentation of meal intake occurs on approximately half of all meals.

Rationale

The population being served by the target microsystem experiences increased prevalence and severity of malnutrition (Corrigan et al., 2011; Deuz et al., 2016). Moreover, patients often need therapy services after discharge from the microsystem. According to Wirth et al. (2013) malnourished stroke patients are discharged to a higher acuity setting and/or have less functional capacity than stroke patients who are not malnourished. Prevalence of swallowing difficulties and the need for a modified consistency diet also predispose stroke patients for malnutrition (Wirth et al., 2013). On the target microsystem, due to neurological and functional impairment, many patients have a limited ability to self-feed, lack motivation to eat meals, and have difficulty communicating food choice preferences. The CNL has identified that this is a major problem in the unit, causing a delay in referrals to the RD and a delay in meeting patients' nutritional needs. Therefore, a valid screening tool is not enough; there also needs to be an evidence-based protocol in place to closely monitor patients' meal intake to mitigate the likelihood of patients becoming malnourished while hospitalized.

Key Stakeholders

The major stakeholders of the project include the patient care assistants, registered nurses, registered dietitians, tray runners, patients, and providers. RNs and PCAs do most of the documentation of patients' consumption of nutritional supplements and meal intake. RNs and PCAs are also responsible for a considerable amount of patient education and they provide

support to patients with regards to maintaining adequate nutritional intake. The RDs contribute by providing the initial patient education and closely monitoring patients who have been identified as malnourished or at-risk for malnutrition. Registered dietitians play an important role because they diagnose and treat malnourished patients. However, their impact on the nutritional wellbeing of the patients admitted to the target microsystem may be limited if there is a high rate of undiagnosed malnutrition. Their role on the microsystem is also to support a culture which places a high value on maintaining and improving patients' nutritional status. Part of the problem stems from the view that nutrition is not a priority. RDs encourage a positive nutrition culture by prompting nurses to discuss any nutritional concerns they may have during multi-disciplinary rounds. The tray runners are another major stakeholder in reforming nutrition related processes because they will have a different perspective on how hospital processes affect patients' ability to access nutrition. Patients are the primary drivers for the quality improvement process. A significant driver of the healthcare system is to improve the quality of care while reducing the cost incurred to maintain the system (White et al., 2012). The patient perspective is crucial to create a system that meets their needs. Improving patient outcomes will be impossible without mutual cooperation from all stakeholders.

Feasibility

The proposed intervention is a realistic request to make of bedside clinicians. The current rate of nutrition documentation and statements made by unit staff suggest that extensive tutorials about how to use the electronic health record (EHR) or where to document intake is unnecessary. However, education about the importance of nutrition monitoring is likely needed. The intervention does not require any capital investment or a change to the EHR.

Anticipated Barriers

The provision and documentation of nutrition care is not regarded as an essential unit process. I anticipate struggling against a unit culture that does not highly prioritize nutrition. The heavy workload and competing priorities will continue to be challenging. Moreover, if the intervention is excessively burdensome and gains in patient wellbeing cannot be shown, then the staff will no longer be engaged in more rigorous monitoring of meal intake. Furthermore, changes to the meal tray delivery process highly depend upon the willingness of the tray runners to be flexible and participate as team members.

Nature of the Project

The goal of the intervention is to improve the percentage of time that patients' meal consumption is documented in the electronic health record (EHR) from the current rate of 54% to a target of 80%. To improve the meal documentation rate, the MSN student will lead a quality improvement team to modify the workflow with respect to the meal tray delivery and removal process. The intention behind changing the meal tray process is to reduce the hurdle that prevents unit personnel from assessing and documenting meal intake. Consequently, producing a more thorough electronic health record will result in greater monitoring of patients' nutritional status. Involvement from microsystem staff is crucial to the success of the project. Opportunities exist for collaboration during the measurement, analysis, improvement, and control phases of the project.

Chapter 2: Literature Review

The goal of this project is to increase the rate of meal intake documentation thereby improving the capacity for nurses to monitor patients' nutritional status while they are in the hospital. To implement an evidenced based project, a literature review was undertaken to determine how to best monitor food intake. Hospitalized adults frequently have an altered nutritional status (Bounoure et al., 2016). Patients who are malnourished at the time they are admitted can suffer from substantial decline during their inpatient stay (Sura et al., 2012). Additionally, patients who initially present to the hospital with adequate protein-energy nutrition may regress to a malnourished state (Corrigan et al., 2011; Deuz et al., 2016). Chronic illness and malnutrition frequently coincide (Corrigan et al., 2011). Malnutrition intensifies the morbidity and mortality of hospitalized patients, causing a reduced functional capacity and increasing the cost and length of stay (Wirth et al., 2013). Up to half of malnourished patients are undetected by clinicians (Somanchi et al., 2011). With regards to poor nutrition status, older adults above the age of 65 are among the most vulnerable populations (Deuz et al., 2016). The purpose of this literature review is to highlight the impact of malnutrition on patient outcomes and determine evidence-based interventions to help nurses monitor and identify patients at risk of and suffering from malnutrition. The research question used to guide the literature search is; "What is the most appropriate method to assess meal consumption to detect early signs of malnutrition in hospitalized adult patients with neurological disorders."

Method

The literature review was conducted via electronically searching CINAHL, the Cochrane Library, Michigan eLibrary's Nursing Resource Center, AHRQ's National Guideline

Clearinghouse, PubMed, ProQuest, and Sage Complete with the following search terms: nutrition, malnutrition, calorie count, inpatient, hospitalized, acute care, adult patients, altered nutrition, nutritional status, meal delivery process, nutrition protocol, meal preparation, nurse's role, neurological, stroke, CVA, TIA, encephalopathy, TBI, seizure, epilepsy, spinal surgery, neurosurgery, lumbar laminectomy, craniotomy, nutritional supplement, nutrition support, mealtime environment, dietary intake, mealtime assistance, models of care, energy intake, food intake, meal consumption, food service, visual estimate, plate waste, validity, food intake chart. Preference was given to articles published within the past decade (i.e., 2007 – 2017). However, earlier articles were included if they appeared to be especially pertinent to the clinical problem or the population of the microsystem. The results of the literature search yielded many studies that were written about patients with disease related malnutrition, such as, gastrointestinal surgery, care of the elderly, oncology, orthopedic trauma, cardiothoracic, renal, long-term care, the community dwelling elderly, and obstetric patients. The majority of these articles were related to specific dietary recommendations rather than the ongoing assessment of nutritional status; thus, they did not pertain to the current project. The paucity of relevant research about altered nutrition in patients with neurological disorders necessitated expanding the search to the general adult inpatient population.

Impact of Malnutrition

The prevalence of malnutrition in hospitalized adults is between 11% and 70% (Baldwin, Kimber, Gibbs, & Weekes, 2016; Bounoure et al., 2016; Hafsteinsdóttir et al., 2010; Kruizenga et al. 2003). According to Dupertius et al. (2003), 69% of hospitalized patients failed to consume the necessary amount of energy and nutrients even when provided with ample food. Moreover,

poor meal intake increases the risk of malnutrition (Berrut et. al., 2002). Kruizenga et al. (2003) found that only half of malnourished inpatient adults received a thorough evaluation by a dietitian. However, according to a systematic review and meta-analysis of hospitalized, medical patients, malnutrition is associated with higher morbidity and mortality, an increased rate of complications and poorer outcomes (Bally et al., 2016). Complications related to malnutrition include muscle wasting, longer length of stay (LOS), increased risk of infections, development of pressure ulcers, and worse functional capacity (Bally et al., 2016; Tappenden, et al., 2013). The risks associated with developing a pressure sore are four times greater in patients who are malnourished (Tappenden et al., 2013).

A study by Somanchi et al. (2010) demonstrates that an early intervention to treat malnutrition reduced the average LOS by 3.2 days. Treating malnutrition has a significant economic impact, in 2003, the annual cost for treating moderate to severe malnutrition was estimated to be over $11 billion (Russell, 2007). According to Agarwal et. al. (2013) hospitalized patients who consumed less than 25% of the provided food had a two-fold increased risk of 90-day in-hospital mortality (p.737). There is strong evidence that hospitalized older adults are at high risk for malnutrition; and that the consequences of malnutrition are dire.

Monitoring Patients' Intake

Monitoring food intake is an important task that can improve the identification and treatment of patients who are at risk for malnutrition (Bjornsdottir et al., 2013; Budiningsari, Shahar, Manaf, & Susetyowati, 2016). However, documentation of food intake is often of poor quality and inaccurate (Bjornsdottir et al., 2013). Barriers to an accurate record of intake are the perceived importance of recording meal intake, competing priorities at mealtimes, meal trays

being removed prior to documentation of intake, and the accuracy of the measurement method (Bjornsdottir et al., 2013; Tappenden, et al., 2013). Monitoring nutrition intake is an essential nursing task; however, nutrition related tasks are often overlooked partially due to the lack of established institutional processes for the provision of nutrition care (Perry, Hamilton, Williams, & Jones, 2013; Wang et al., 2016). Therefore, any intervention to promote the monitoring and documenting of nutrition intake must be easily adopted into institutional processes, provide accurate measurements, and able to be performed quickly (Bjornsdottir et al., 2013). Monitoring of patients' meal intake is achieved through several methods, such as, the weighted food method, food intake charts and plate diagrams, and by direct visualization (Berrut et. al., 2002; Bjornsdottir et al., 2013; Budiningsari et al., 2016; Førli, Oppedal, Skjelle, & Vatn, 1998; Husted, Fournaise, Matzen, & Scheller, 2017; Kawasaki et al., 2016; Palmer, Miller, & Noble, 2015).

Weighted food method. The weighted food method is considered the gold standard for accurately calculating meal consumption; however, it is highly labor intensive (Agarwal, et al., 2013; Kawasaki et al., 2016). In the weighted food method, each item of leftover food is weighed individually (Budiningsari et al., 2016). The weight of each food item is subtracted from the weight of a standard reference meal (Palmer et al., 2015). The weight of the leftover food is converted into nutrients using information provided by the food manufacturer or by using nutritional databases (Palmer et al., 2015). The weighted food method is the most accurate dietary assessment method available, hence researchers use the weighted food method to the test validity novel nutrient assessment scales (Agarwal, et al., 2013; Budiningsari et al., 2016; Kawasaki et. al., 2016; Palmer et al, 2015).

Food intake charts and plate diagrams. Food intake charts are written logs of meal intake (Førli et al., 1998; Palmer et al, 2015). Food intake charts use the meal portions method, where the proportion of each food item that is consumed is recorded independently and aggregated to quantify the intake for each meal (Førli et al., 1998; Palmer et al., 2015; Perry et al., 2013). Plate diagrams use pictorial representations of meal portions to improve the accuracy of quantifying meal intake (Bjornsdottir et al., 2013; Budiningsari et al., 2016). Plate diagrams use partially shaded meal portions that correspond to the scale for documentation (Budiningsari et al., 2016). Shaded diagrams are used as a reference to aid in estimating the remaining food proportions (Budiningsari et al., 2016). When calculating energy and nutrient consumption, food intake charts and plate diagrams are more accurate than using the plate method (Berrut et. al., 2002; Bjornsdottir et al., 2013; Budiningsari et al., 2016; Førli et al., 1998). Some studies have shown significant agreement comparing food intake charts with the weighed food method (Berrut et. al., 2002; Budiningsari et al., 2016; Husted et al., 2017). However, other studies using these methods to estimate calorie counts failed to achieve significant agreement, when compared to the weighted food method (Bjornsdottir et al., 2013; Palmer et al., 2015). When using food intake charts and plate diagrams, a possible rationale for inaccurate calorie count estimations is due to clerical errors, like omitting entire meal portions (Budiningsari et al., 2016; Palmer et al., 2015). Thus, the literature is inconclusive regarding the accuracy of food intake charts and plate diagrams as methods to assess patients' meal consumption when compared to the weighted food method.

Direct visualization. In direct visualization, clinicians estimate the proportion of the meal that is consumed by looking at the plate before and after the meal was consumed (Berrut et.

al., 2002; Husted et al., 2017; Kandiah, Stinnett, & Lutton, 2006). The direct visualization method has two weaknesses. A drawback with the method's reliability is that all groups tasked to evaluate meal intake tend to overestimate the amount of food the patient consumed (Berrut et al., 2002; Kawasaki et al., 2016). Moreover, in direct visualization clinicians only document one measurement for the meal, rather than documenting each food group separately (Husted et al., 2017). Because the direct visualization method takes an aggregate measurement of the meal, instead of distinguishing between each food portion, it is difficult for dietitians to know the amount of protein a patient consumes. Accurate measurement of protein intake for patients who are at-risk for malnutrition is highly important because adequate protein consumption mitigates the loss of lean body mass and can improve patients' outcomes (Tappenden et al., 2013). Therefore, direct visualization is not nearly as accurate as the weighted food method in terms of calculating caloric intake (Husted et al., 2017; Kawasaki et al., 2016).

Despite the disadvantages of the method, many studies find direct visualization to be a fairly accurate method to estimate meal intake and considered it to be a valid measurement to detect inadequate meal consumption in hospitalized patients (Berrut et al., 2002; Husted et al., 2017; Kawasaki et. al., 2016). Berrut et al. (2002) and Husted et al. (2017) find that direct visualization is useful for tracking meal intake over the course of a patients stay and will help to identify insufficient meal intake at an early stage. Moreover, when comparing interrater reliability among clinicians of different job categories using direct visualization to estimate meal intake, there is significant agreement in terms of correlation (Berrut et al., 2002; Kawasaki et al., 2016). That is, meal intake estimates made by patient care assistants, dietitians, and physicians have a small amount of variability from each other using this method.

Summary of Evidence

Using the meal portions method, with either food intake charts or plate diagrams, is more accurate than the plate method (Bjornsdottir et al., 2013; Budiningsari et al., 2016; Kawasaki et al., 2016). However, few studies show significant agreement between the meal portions method and the weighted food method (Berrut et al., 2002, Budiningsari et al., 2016; Palmer et al., 2015). Several studies suggest that food intake charts, meal plate diagrams, and direct visualization are all appropriate methods for monitoring patient intake (Berrut et al., 2002, Budiningsari et al., 2016; Husted et al., 2017; Kawasaki et al., 2016). However, short of the weighted food method, which is the gold standard, there is a lack of consensus about which method is superior.

In the context of this project, the method selected must promote the goal of increasing the rate of meal documentation among the unit personnel and be adequately sensitive to detect patients who may be at-risk for developing malnutrition. Using the EHR to calculate a patient's exact energy intake isn't necessary, however, it is important for RNs and RDs to monitor the EHR and quickly be able to identify which patients need additional nutritional resources (e.g., nutritional evaluation, oral supplements, calorie count). In support of the direct visualization method, the method is straightforward and has a high degree of interrater reliability (Kawasaki et al., 2016). Moreover, it is appropriately sensitive for nurses and dietitians to monitor meal intake over the duration of several days, such as a hospital admission (Berrut et al., 2002; Husted et al., 2017; Kawasaki et al., 2016). The goal of this project is to increase documentation and monitoring of meal consumption; therefore, the protocol that is developed will have clinicians use direct visualization as the method for meal intake assessment and documentation.

Literature Critique

There are few studies of nutritional interventions in the neurological patient population. Therefore, studies across the adult acute care populations were included, with an emphasis on patients 65 and older. Additionally, there is a paucity of published literature about the accuracy of measuring meal intake. The quality of the evidence is further diminished because studies used different scales to quantify meal intake, for example some studies used quartiles or deciles, yet others used scales with unusual spacing, such as, 0%, 25%, 50%, 75%, 80%, and 100% or "all", "half", or "nothing" (Berrut et al., 2002, Budiningsari et al., 2016; Kawasaki et al., 2016). Absent from the literature were methods to help clinical personnel be more consistent in documenting nutritional intake. However, the literature search provided evidence that the direct visualization method that is currently used is an adequate method for evaluating nutritional intake in hospitalized adult patients.

Chapter 3: Conceptual Model

Detection, prevention and treatment of malnutrition in the acute inpatient adult population is a complex process which requires coordination of hospital resources (Tappenden et al., 2013). In the target microsystem, there are opportunities to optimize the processes involved with meal tray delivery, and assessment of meal intake, as well as documentation and monitoring of patients' nutritional status. The current method is entirely dependent on the actions of individual nurses and lacks the necessary systemic structure. This creates staff frustration and the potential for poor nutrition related outcomes due to under identification of patients at risk for malnutrition and omission of the necessary treatment. The CNL on the microsystem has identified that the poor documentation of food intake is problematic and leads to inadequate recognition of those who require a referral to registered dietitians. An evidence-based project will be undertaken to implement a standardized process for meal documentation, uniform placement of meal trays, and scheduled rounding times for removal of used trays.

To successfully administer this evidence-based project, it will be necessary to include quality improvement models as a benchmark for comparison. The define-measure-analyze-improve-control (DMAIC) method of quality improvement is a conceptual model which will be used to study the clinical problem and determine possible solutions. Once the intervention is identified the MSN student and relevant stakeholders will guide the implementation of the process changes with the goal of reducing patients' nutritional risk by increasing meal intake documentation. In this chapter, the components of the conceptual model will be discussed and there will be an explanation of how the conceptual model will be applied to the clinical problem.

Historical Perspective of Conceptual Models

Process improvement theories originate from the manufacturing sector out of the necessity to manage quality control, minimize product defects, streamline the supply chain and reduce variations in manufacturing (De Mast & Lokkerbol, 2012). Six Sigma is a process improvement approach that uses statistical methods to identify the causes of variation and reduce manufacturing defects (Linderman et al., 2003; Schroeder, Linderman, Liedtke, & Choo, 2008). Organizations across numerous and diverse industries are compelled to perpetually improve processes by adapting and applying process improvement theories to their organization (Shankar, 2009). The trend toward process improvement has also occurred in the healthcare sector. According to Vest and Gramm (2009), the theoretical foundation of Six Sigma has been successfully appropriated to hospital settings and several studies have reported positive outcomes while implementing this model.

Six Sigma is effectuated by using a conceptual model that facilitates the implementation of the theory in a step-by-step approach (Shankar, 2009). The conceptual model that guides the Six Sigma theory is called DMAIC, which stands for define-measure-analyze-improve-control (Shankar, 2009). Though DMAIC has its roots in Six Sigma, it is frequently thought of as a generalizable problem-solving model (De Mast & Lokkerbol, 2012). The benefit of using DMAIC as a framework to design this evidence-based project is that the logical progression of the phases of DMAIC guide the project from beginning to end (Schroeder et al., 2008). Moreover, problem solving tools specific to each phase of DMAIC have been developed to facilitate the progression of the process (Schroeder et al., 2008).

In this evidence-based project, the stages of DMAIC will be applied independently of Six Sigma as a logical step-by-step problem-solving process. This will help identify the root causes contributing to poor documentation of meal intake, as well as provide possible solutions to ameliorate the problem (De Mast & Lokkerbol, 2012). For a visual diagram of the DMAIC framework in the context of this project, refer to Appendix A. Applying DMAIC to the phenomenon of interest is appropriate because, "the DMAIC methodology takes a problem that has been identified by the organization and utilizes a set of tools and techniques in a logical fashion to arrive at a sustainable solution. The resultant solution will minimize or eliminate the problem" (Shankar, 2009, p. xvi). DMAIC will be used as the theoretical underpinning to this project as the step-by-step structure will provide guidance for correcting the clinical problem and because it has been used effectively in healthcare settings (Vest & Gamm, 2009).

Define

Defining the purpose of the project and the extent of the problem is the initial step in the DMAIC model (Schroeder et al., 2008). Clearly identifying the problem and the limits of the proposed intervention is important, as the problem being addressed should be aligned with the goals of the organization (Langley, 2009). The problem on the target microsystem is the gap that exists between the organizational policy for monitoring patients' meal intake and the existing practice. The expectation is that RNs and PCAs are accountable to monitor and document the nutrition and meal intake of their patients. In the existing practice, monitoring of patients' nutritional status is hindered by poor documentation of meal intake. Having support from leadership will be useful when attempting to obtain the resources necessary to achieve the mission (Warner et al., 2013). This project is supported by the nurse manager, the CNL, and the

nutrition services manager. Setting project boundaries ensures that the team is comprised of the right stakeholders and will prevent the team from expanding the scope beyond the primary objectives (Warner et al., 2013). The scope of this project is limited to the documentation of meal intake, because a process currently exists for initial assessment of nutrition status upon admission.

Measure

After the problem has been detected it must be quantified (Schroeder et al., 2008). This step in the DMAIC model serves two purposes. The first objective of measurement is to scrutinize the entire process under examination (i.e., consider the interaction that occurs across microsystems) (Schroeder et al., 2008). Being knowledgeable of the whole process will be useful in the subsequent steps of DMAIC (De Mast & Lokkerbol, 2012). The point at which the problem appears may be distant from the point at which the problem is generated and knowing how the system works may provide valuable insight (Langley, 2009). To measure the entire nutrition process, the MSN student will conduct structured interviews with staff members who take part in the meal tray delivery, meal tray removal, and meal documentation process. This will include RNs, PCAs, the registered dietitian, and tray runners. The MSN student will also visualize the flow of the meal tray from the beginning of the process, which starts in the kitchen, up to the patients' room, and then how the meal tray is removed from the room and returned to the kitchen.

Secondly, measuring the problem involves the collection of baseline data, which will be used to evaluate the effectiveness of the intervention (Schroeder et al., 2008). It is crucial to establish baseline data because the effectiveness of the intervention is gauged on the comparison

between the pre- and post-data (Schroeder et al., 2008). Pre- and post-intervention data will be collected by auditing the electronic health record (EHR) for meal documentation. A pre-intervention audit of the EHR for meal documentation of inpatient rooms on the clinical microsystem illustrates the range of meal documentation is between 42%-54%. See Appendix B for the line chart detailing the rate of meal intake documentation.

Analyze

In the analysis phase of DMAIC, variables are examined to determine antecedents to the problem (Langley, 2009). To improve the nutrition process the information gathered from chart audits and staff interviews will be examined to identify precipitating factors of the clinical problem. Two problem solving techniques of DMAIC will be applied to analyze the problem. The two techniques that will be used are (a) process flowcharting and (b) root cause analysis (see Appendix C for the flowchart of the pre-intervention meal tray delivery process and Appendix D for the root cause analysis). According to Warner et al. (2013) each step of a process can be analyzed by mapping out the sequence of events in a process flowchart. Variations in the process will be visualized on a flowchart and will be categorized for further examination. To identify the sources of variation seen within the flowchart, the process improvement team will also conduct a root cause analysis (RCA). Root cause analysis is a type of structured brainstorming activity (Harris, Roussel, Thomas, 2014; Langley, 2009). RCAs typically have five main categories: technology, policies, people, procedures, and environment (Toussaint, & Berry, 2013). Causes for variation are attributed to one of the five categories. RCAs are useful for clarifying and prioritizing the root causes of error (Harris et al., 2014; Langley, 2009).

Collaboration with key stakeholders will drive this stage of DMAIC. The variations in the pre-intervention process identified in the process flowchart will be analyzed using an RCA. Several "root causes" will be identified by the team and original ideas will be sought to address the findings from the RCA. Subsequently, the quality improvement team will develop interventions targeted at ameliorating the root cause or the group of root causes that contribute to the clinical problem. Then the team will determine which interventions to include in the process change.

Improve

The overarching theme of process improvement theory is to standardize or eliminate activities that are unorganized or that may lead to errors (Schroeder et al., 2008). In DMAIC, the goal of the improve stage is to evaluate and implement interventions which will enhance the functioning of the process (Linderman et al., 2003). On the target microsystem, there is no standard process for meal tray delivery, meal tray removal, or documentation of intake. Standardizing the workflow will be central to the process improvement activities.

Potential solutions that were proposed in the analysis phase will be considered for inclusion into the new standard process. During the improvement phase stakeholders will trial the proposed interventions and report back to the team on how the changes impacted their workflow. The provisional activities that improved compliance with documentation standards will be included in the intervention. Activities that caused work to be duplicated or tasks to be omitted altogether will be eliminated. The resulting series of steps will be aggregated to formulate the new standard process (see Appendix E for post-intervention meal tray delivery process flowchart). The MSN student will formalize the set of interventions by creating a

standard process document (see Appendix F for the standard process document). The standard process document will include the project overview, as well as, step-by-step instructions for each group of employees who will be affected by the change in workflow. The materials will be presented to micro- and meso-system leadership to attain approval for implementing the process changes, they will also be used to educate staff members about the impending changes. The standard process document will be sent to unit staff members electronically with their weekly staff email, which is how information is normally promulgated. The document will also be posted on the unit for reference. After receiving the approval to implement the process change and the staff education has taken place, the standard process will go into effect.

Control

The control phase of DMAIC consists of the period immediately following implementation of the process change and continues over time (Shankar, 2009). In the final stage of DMAIC, the goal is to control and sustain the improvements to avoid lapsing back to the former process (Warner et al., 2013). A sustainability plan is an essential part of the clinical protocol and will be developed for the target microsystem (Harris et al., 2014). To fully integrate the standard work into the microsystem's processes, the sustainability plan will have three parts; staff member education, modification to the physical environment, and automation of processes.

Leading up to the implementation start date, the process change will be presented to unit personnel using several communication media. Staff members will have access to the standard process document which will be sent to them in the weekly email, copies of the document will be posted on the unit. Following the email, the MSN student will speak individually with RNs and PCAs on both day- and night- shift to educate them about the process change. Starting two-

weeks before the standard process takes effect, the MSN student will perform brief presentations regarding the process change during the daily pre-shift huddle. The student will be available throughout their shift to address staff questions and concerns. Those who wish to give anonymous feedback about the intervention can submit comment cards to an envelope posted on the unit and their concerns will be addressed in during the pre-shift huddle. After familiarizing themselves with the new workflow, staff members will be expected to certify their competence by signing their name on a unit roster. Individuals who have not signed their names on the competency sheet will be followed-up with to address any remaining concerns. According to Langley (2009), ingraining the standard process into the microsystem's new employee orientation program would benefit the sustainability of the project.

Shankar (2009) suggests that modifying the physical environment and automating operations, whenever feasible, also supports the project's sustainability. Therefore, small signs will be added to all patient rooms to designate the standard location of tray placement and remind staff of the change in workflow. Furthermore, and automated EHR auditing report will be designed to improve the CNL's ability to audit for compliance with meal intake documentation. The CNL can use the results of the audit to motivate employees by providing feedback about their performance and fostering ownership of outcomes.

Conclusion

It is expedient to apply the DMAIC model to address this clinical problem. Using the define-measure-analyze-improve-control sequence will result in a greater understanding of the nature of the phenomenon (Langley, 2009). Patients on the target microsystem are at an increased risk for adverse nutrition related outcomes, because the level of monitoring and

documentation of meal intake falls short of the expectation. At the core of this phenomenon is a defective process that makes it difficult for clinicians to assess, monitor, and document each patient's meal intake. DMAIC is a quality improvement framework designed to isolate and eliminate the root causes of variation (Schroeder et al., 2008). Eliminating the variation that occurs on this microsystem will create a more reliable process and will result in better monitoring of patient intake and potentially better patient outcomes.

Chapter 4: Clinical Protocol

The project design will flow in accordance with the DMAIC framework, each phase of the project will correspond with the phases of DMAIC. By fulfilling each phase of the framework, the desired outcome of the project will be accomplished (Shankar, 2009). The grand objective is to improve monitoring of patients' nutritional status while they are hospitalized. The objective will be achieved by implementing the intervention. The purpose of the intervention is to increase the rate of meal documentation by defining and streamlining the processes involved in meal tray delivery and removal, and meal documentation. The procedures of the intervention will be a result of following the DMAIC framework. Tools specific to each phase of DMAIC will be used to study the clinical problem and formulate an intervention.

Purpose of the Project with Objectives

The overall purpose of the project is to improve detection of patients who develop nutrition deficits after being admitted to an acute care setting by implementing a standardized process for meal tray delivery, documentation of nutrition intake, and meal tray removal. The rationale for undertaking this clinical problem is because malnutrition affects over half of hospitalized adults, though most patients are never diagnosed or treated (White et al., 2012). Moreover, seven in ten adult patients experience a decline in their nutritional status during hospitalization (Somanchi et al., 2011). On the microsystem of interest patients who have existing malnutrition are identified because unit personnel screen everyone upon admission with an evidence-based assessment called the malnutrition screening tool (MST). Therefore, an opportunity exists to improve nutrition monitoring of the patients who are not initially at-risk for malnutrition but who eventually develop malnutrition during their acute hospitalization. The

objectives will be to improve nutrition monitoring and standardize the meal tray delivery and removal process. The desired outcome is to more easily identify patients who develop malnutrition by increasing the rate of meal intake documentation which promotes more vigilant monitoring. Each phase of DMAIC has a subordinate objective that serves to advance the development of the protocol. See Appendix G for a Gantt chart of the project timeline.

Define. In the define phase, the goal is to determine what the clinical problem is and the scope of the planned intervention. This phase will be complete when a clear problem statement can be articulated. Approval to conduct the quality improvement activity will need to be obtained from the hospital leadership.

Measure. In the measure phase, the goal is to define the variables of interest, specify the parameters of the variables, and collect baseline data. An electronic monitoring tool will need to be developed to reduce the burden of collecting data.

Analyze. In the analyze phase, the goal is to establish which antecedent factors lead to the clinical problem and to develop potential solutions to counteract the antecedents. Once the group of measures is decided upon the goal will be to design and synchronize each aspect of the intervention.

Improve. In the improve phase, the goal is to implement the intervention on the clinical microsystem. This will include developing and disseminating the materials that specify the intervention. Staff members will be educated about how the intervention affects their workflow.

Control. In the control phase, the goal will be to compare pre- and post- intervention measurements to evaluate the impact of the intervention. A mechanism to ensure sustainability of the process change will also need to be developed.

Needed Resources

It was evident from the microsystem assessment that there would be minimal capital and technological resources available to address the clinical problem. This challenge shaped the decision to pursue a clinical problem that would be susceptible to an intervention principally focused on modifying the workflow of unit personnel. Therefore, staff members from the relevant microsystems are the central resource for this project. Employees would not be permitted to meet outside of their assigned schedule to work on this project. Instead of establishing a regular meeting time, the MSN student plans to meet with staff, one on one, during their work hours to solicit ideas and ask for feedback.

The quality improvement team incorporates personnel from three job categories present on the microsystem: registered nurses, patient care assistants, and tray runners. RNs are responsible for the wellbeing of their patients and an essential nursing responsibility is to monitor patients' nutritional status. The intervention needs to be supportive of the nursing duty to adequately monitor patients, so the RN perspective is important when creating the intervention. RNs often delegate meal related tasks to the PCAs. Therefore, PCAs do the majority of meal intake documentation and will experience the most significant change to their workflow as a result of the intervention. As key stakeholders, a great effort will be made to design the intervention according to the responses of PCAs. Another core constituent of the process change is the nutrition tray runner who delivers meal trays to patients on the target microsystem. Representatives of the three key stakeholder groups will comprise the quality improvement team. The preferences of the quality improvement team will be synthesized to generate a consensus design for the project intervention. Although, the viewpoints of all staff

members will be considered. Input from all key stakeholder groups will be crucial in the improvement phase of the project. Once the standard process is established, the success of the intervention ultimately relies on participation of the unit personnel.

Another challenge that needs to be addressed is how to quantify the rate of meal documentation. To establish the existence of this clinical problem, the MSN student initially audited the EHR for meal intake documentation. However, manually auditing patient charts became an insurmountable burden and it would not be an appropriate method to evaluate the results of the intervention. An electronic measurement tool will need to be created to consistently capture the data and eliminate the labor involved in calculating the documentation rate of meal intake. Due to lack of resources, it is not feasible to introduce novel technology to solve the problem. Thus, the MSN student will use underlying features in the existing EHR to achieve the same results. The MSN student will attempt to create an automated report that displays only the desired information about patients' meal intake. The implications of the report, if it can successfully be created, will be that the microsystem could reliably track day-to-day compliance of documentation, which supports the project's sustainability.

Cost Benefit Analysis

Since the primary resource needed to complete this project is the contribution from microsystem personnel who will not be paid to spend additional time participating in the project and there are no other quantifiable financial or technological expenditures required, there is no cost associated to implement the project. Several studies have associated more aggressive nutrition management policies with favorable cost outcomes, in terms of cost avoidance or increased reimbursement rates (Kruizenga et al 2003; Ockenga, Freudenreich, Zakonsky,

Norman, Pirlich, & Lochs, 2005; Meehan, Loose, Bell, Partridge, Nelson, & Goates, 2016; Somanchi et al., 2010; White et al., 2012). However, extrapolating the results from other studies to perform a cost benefit analysis on the intervention proposed in this project may be misleading. This is primarily due to the difference between the nature of the interventions and desired outcomes described in other studies and the proposed scope of this project. Many of the interventions described in other studies go beyond the scope of this project. Several studies have examined the effectiveness of protocols targeted at early detection and treatment of malnutrition. The MSN student is unaware of any studies with the objective to improve the detection of malnutrition by improving staff compliance with documentation and standardize the meal tray delivery and removal process. However, better documentation of meal intake may lead to an increase in malnutrition diagnoses on the microsystem. Additionally, higher rates of diagnosed malnutrition can increase the hospital's reimbursement.

Documentation of poor nutritional intake, among other criteria, can help support the diagnoses of malnutrition (White et al., 2012). According to White et al., (2012) the actual prevalence of malnutrition in hospitalized adults is between 15%-60%, yet its diagnosed merely 3% of the time. The diagnoses of malnutrition is important because the diagnoses is linked to the payment system established by the Centers for Medicare and Medicaid Services (CMS) (White et al., 2012). The Medicare Severity-Diagnostic-Related Groups (MS-DRGs) are used to assign the amount of money a hospital receives for treating patients who meet certain criteria, however, in the absence of documented criteria, the hospital will receive no payment (White et al., 2012). Hence, inadequate documentation of meal intake may preclude a patient from being diagnosed with malnutrition. Absent the diagnoses of malnutrition, the hospital will not receive payment for

services rendered to improve that patients' nutrition status. According to Ockenga et al. (2005), after improving a hospital's malnutrition screening protocol, the rate of diagnosed cases of malnutrition increased by 15% and that resulted in $455 more per patient in reimbursement money.

The evidence supporting better nutrition management is overwhelming. Studies show that early treatment of malnutrition reduces the likelihood that patients develop complications (Kruizenga et al., 2003; Meehan et al., 2016). Fewer complications reduces the average LOS and results in a net cost savings for hospitals (Kruizenga et al., 2003; Meehan et al., 2016). After implementing a nutrition related quality improvement protocol, Meehan et al. (2016) demonstrates a reduction in the LOS by 0.77 days, 17% reduction in readmission probability, 50% reduction in HAPUs, and an average cost reduction of $969 for nutrition sensitive patients. Kruizenga et al. (2005) finds that early screening and treatment of malnutrition results in a cost savings of $91 per patient per day.

Measurement: Sources of Data and Tools

Structured interviews will be conducted with participation from the RNs and PCAs who are core microsystem staff members. The MSN student will also interview members from the nutrition microsystem, that is, the RD and the tray runners. The purpose of the structured interviews is to gain an appreciation of how different members impact the current nutrition related processes on the target microsystem.

After interviewing microsystem staff, the student plans to shadow a tray runner from the nutrition department so that the entirety of the meal tray delivery process for the microsystem of interest is observed. The MSN student will observe the movement of meal trays from their

inception in the kitchen, to delivery on bedside tables in patients' rooms, and back down to the kitchen. With regards to the clinical project, the process measure is the meal tray delivery process, and it will be operationalized by developing a meal tray process flowchart. The MSN student will quantify the current process by creating the process flowchart (see Appendix C for the pre-intervention meal tray delivery process flowchart). Essentially, the proposed intervention will be the adoption of a new meal tray delivery process that facilitates improved documentation of meal intake and monitoring of nutrition status. A new process flowchart of the intervention will be created to detail the process change (see Appendix E for the post-intervention meal tray delivery process flowchart). After implementation of the intervention, the MSN student plans to shadow the tray runner and make observations of the new process during meal times. By using the flowcharts and observing the workflow, the MSN student will compare the pre-intervention meal tray process to the post-intervention meal tray process and evaluate whether the project resulted in an observable change in workflow.

The final and most important source of information for this project will come from auditing the EHR for the presence of meal documentation. The rate of meal documentation is the primary outcome indicator. The EHR was initially audited by hand, though an automated EHR report will be created to support data collection. Both data collection methods will apply the same criteria to determine what qualifies as a valid entry for purposes of quantifying meal intake documentation. See the "Meal Documentation" section of Appendix F for the full description of valid documentation criteria. In a brief description of the criteria, its assumed that each patient would be receiving three meals per day. The rate of meal documentation would be diminished by a third for each instance that the EHR doesn't reflect documentation during an assumed meal

time. The patient doesn't necessarily have to eat a certain amount of food during each meal, the EHR merely has to reflect information about a patient's nutritional situation. Examples of acceptable documentation include, a patient who refuses to eat, a patient who is prohibited from eating for medical reasons, and a patient who eats 75% of their meal. The purpose of this project is to increase the rate of meal intake documentation so that the EHR provides a more accurate representation of a patients' nutritional status. The MSN student will track the rate of meal documentation and compare the results before and after the project is implemented. To determine if the project was successful, the post-intervention rate of meal documentation needs to be higher than the pre-intervention rate of meal documentation. Additionally, the stated objective of the project is to increase rates of meal documentation from 54% to 80%.

Chapter 5: Project Evaluation

Project Overview, Strengths, and Weaknesses

A new process for delivering, removing, and documenting meal trays was developed and implemented on the microsystem with the purpose of increasing monitoring of patients' nutritional status. The results of the intervention will be discussed in this chapter, as well as an evaluation of the execution of the project plan (see Appendix G for a Gantt chart detailing the project timeline). Barriers presented opportunities to change and improve upon the planned intervention, though in other instances, the challenge was too great to overcome and resulted in changes that undermine the effectiveness of the intervention.

Define. It was believed that patients on the clinical microsystem were not achieving optimal nutritional outcomes, though it was initially difficult to establish and clearly articulate the clinical problem and the scope of what would be the proposed intervention. After reviewing the published literature, the organizational policies and procedures, assessing the microsystem, and speaking with stakeholders, it became clear the problem was that organizational documentation standards were not being upheld which degrades nurses' ability to monitor their patients.

Originally, the key stakeholders desired a more comprehensive intervention, though there were several limitations that restrained the scope of the clinical project. Ideally the desired protocol would include detecting and correcting malnutrition in hospitalized patients who experience a decline in their nutritional status. The desired outcomes of this ideal version of the protocol would be to show that it resulted in a lower prevalence of nutrition related complications (e.g., decreased average LOS and fewer pressure injuries). However, an

intervention of that scale would have required a hospital-wide policy shift regarding the delivery of nutritional supplements and changes to the composition of patient meals. Additionally, the more basic problem of identifying the patients who develop a risk for malnutrition while they are hospitalized had to be addressed first. Consequently, the problem is defined as a lack of adequate meal intake documentation which violates organizational standards and negatively affects the monitoring of patients' nutritional status. Therefore, the scope of the protocol would be to improve meal intake documentation which would theoretically increase nurses' monitoring of patients' nutritional status.

Measure. The established focus of the protocol is related to meal intake; hence the plan was to measure all aspects of the meal delivery process. To understand the current process, structured interviews with all parties involved with the meal tray delivery process were conducted. The MSN student was successful in establishing relationships with individuals in the nutrition department microsystem. These relationships were beneficial because they lead to opportunities for the MSN student to shadow the nutrition tray runners and visualize each phase of the meal tray delivery process.

The other goal of the measure stage, which was to quantify the percentage of patients' meals that were being documented was also successfully completed. At first, the MSN student manually audited the EHR to calculate the percentage of meals that were being documented, this was an arduous task, and it was clear that an automated process was necessary. To overcome this burden, the assistance of a technology specialist was sought to create an automated report that uses data from the EHR. However, creating the report was not an effortless process and it took many attempts to develop the most useful version. A simplified explanation of the challenge

presented by creating an automated report is that quantifying the rate of omitted data entries is impossible. Therefore, the report had to gather enough contextual variables that when considered together would present a meaningful data point, yet it had to limit the amount of unnecessary information so that using the report did not become as arduous as auditing the original EHR by hand. A set of standards was developed to analyze the information presented in the automated report. The standards uniformly applied to make use of the report and was able to quantify the rate of meal intake documentation for each patient.

Analyze. Every objective for the analysis phase of the project was successfully completed. The MSN student conducted several hours of observation of the meal tray delivery process including shadowing the nutrition tray runners. From the observations, a process flowchart was created and analyzed to determine at which point in the process variations occurred. The variations identified in the pre-intervention process flowchart were inputs for the root cause analysis (RCA). Stakeholders also made significant contributions to the RCA. Several root causes were identified as contributory factors precluding accurate nutritional care, namely the documentation of meal intake. The RCA uncovered that markedly rapid removal of used meal trays was the principal antecedent factor that resulted in poor documentation of meal intake. An opinion shared among the PCAs was that the TRs removed used meal trays so quickly that they were not able to come back after the patient was done eating and visualize how much of the meal was consumed. Conversely part of the TR workflow expectation was to remove meal trays from patients' rooms 60-minutes after they were delivered. The MSN student worked closely with the key stakeholders (i.e., day-shift PCAs, the nutrition tray runners, and the

manager of the nutrition department) to find alternative steps that maintain the priorities of each constituent yet avoids the circumstances that perpetuate the clinical problem.

Improve. The purpose of the improve phase is to establish the new standard work related to meal tray delivery, removal, and documentation. The analysis phase yielded several possible interventions. After much discussion, the stakeholders settled upon a set of small changes to the workflow. The two key innovations of the process change were: (a) establishing the uniform location for meal tray placement; and (b) standardizing the rounding times for used meal tray removal. The new process involves an expectation that used meal trays will now be placed on a specific shelf in the patient's room. Placement of used meal trays in that location signifies that meal intake documentation is complete and the used tray is ready to be cleared from the room. Instead of TRs removing used meal trays 60-minutes after they are delivered, in the new standard process TRs will only remove trays that are placed in the standard location. The remaining meal trays will be removed during standard rounding times at 1000, 1400, and 2000. The change resulted in a simplified and more predictable workflow for RNs, PCAs, and TRs.

The MSN student successfully introduced the intervention to the microsystem by presenting the project to unit personnel during pre-shift huddles, posting information on a centrally located bulletin board, and creating the standard process document which was distributed to staff. The standard process document provided rationale for the process change and defined the standard workflow for RNs, PCAs, and TRs. The plan for the intervention, the content of the bulletin board, and the standard process document were approved by the appropriate nutrition department and nursing unit leadership prior to implementation.

Establishing the standard rounding times to remove used meal trays is a strength of the project and in many regards, it is the most elegant accomplishment of the project. There are several reasons to highlight this aspect of the intervention. First, this is a practical change and it addresses the dominant root cause of the clinical problem. According to the RCA, the primary reason that meal intake was not being documented in the EHR was because used meal trays were being removed from patients' rooms too quickly for the PCAs to visualize the amount of food that the patient had consumed. Other root causes were identified; however, the clearance rate of used meal trays was the most significant factor contributing to the problem. Additionally, the change to implement standardized rounding times was the product of collaboration between individuals from separate microsystems, who have disparate priorities, and it is supported by each constituent stakeholder group. One of the benefits of using the DMAIC framework is to involve microsystems personnel in the process of problem solving. An intentional design of this project was to empower individuals to suggest their own solutions to the clinical problem. According to Nelson et al. (2011), staff members are more likely to support an intervention if they have been involved in developing the final product. Representatives from multiple microsystems took part in developing the protocol, which gives additional credence that the process change will be sustained. Moreover, standardizing meal tray rounding times lessens variation in the process and eases the pressure of the workload. Another reason that staff members are likely to sustain the intervention, is that it diminishes the time pressure they have to complete tasks. The same amount of work is being done, yet, because unit personnel are able to predict their workflow they have an increased capacity to complete assigned tasks.

Control. The objective of the control phase is to sustain the process change. This phase of the project is ongoing. There are three facets to the sustainability plan; they are staff member education, modification to the physical environment, and auditing the EHR for documentation compliance.

Part of the sustainability strategy is to ensure that unit personnel are sufficiently educated. To this end, the standard process document was distributed to staff as part of the weekly email update. Another intention of the standard process document was that it would be included in the orientation materials for new staff members. Beginning two weeks before the process change went into effect, the MSN student presented the intervention during the pre-shift huddle each morning. Moreover, the MSN student individually approached staff members from both shifts to educate them about how the change impacts their workflow. If staff members had questions or suggestions they were encouraged to ask the MSN student directly. Unit personnel could also anonymously submit questions to a folder attached to the bulletin board. To ensure accountability, staff were expected to certify their understanding of the intervention by initialing next to their name on a unit roster, which was also posted on the bulletin board.

Originally the plan was to modify the physical environment on the microsystem by adding small signs to designate the standardized location for used meal trays. The signs were supposed to be located on a closet door in the patients' room or on the shelf inside of the closet. However, this part of the sustainability plan was unsuccessful. Signs and decorations posted inside patient care areas are governed by strict criteria and any changes to the microsystem appearance had to be approved by a committee. To maintain the timeline and implement the

intervention prior to the end of the MSN students clinical experience, this aspect of the plan was jettisoned.

The final aspect of the sustainability plan includes establishing an automated mechanism to audit the electronic health record for meal intake documentation (See Appendix F for a visual representation of the EHR). With the assistance of a technology expert, an automatic report was created and runs each morning. The report encompasses all of the patients on the microsystem. The report gathers information from the EHR according to specified location instructions. For example, the report gathers all the information located in the "ADL Nutrition" column. Then, the information gathered from the EHR is deposited onto an electronic spreadsheet and emailed to the MSN student and CNL. The most useful information that the report provides is from the "meal intake" cell. The "meal intake" cell contains options to document 0%, 25%, 50%, 75%, 100%, bites, ice chips, sips, and refused. However, other contextual variables are necessary to provide a holistic picture of a patient's nutritional status, therefore, other cells are included in the report.

The MSN student demonstrated technological proficiency by working with exerts to create the automated EHR auditing report. However, the report is also a significant weakness of the project. The purpose of making an automated report is that it should provide a relatively easy and more reliable method for auditing the EHR. However, the report in its current state does not provide the CNL with a quick method to gauge the documentation performance of the microsystem personnel. The flaw in the report is that it too heavily relies upon the contextual information to provide the most accurate representation of a patient's documented meal intake. By including the contextual data, the report is truer to the clinical picture but is also too

overwhelming to be very useful. For example, a patient who is NPO would not necessarily have anything documented in the "meal intake" cell of the EHR. Examining the EHR by hand would show the NPO diet order, which would also imply that they had 0% meal intake. Therefore, only accounting for information documented in the "meal intake" cell provides a skewed illustration of how well staff members are documenting and monitoring that patient's nutritional status. The lack of a simplified auditing mechanism – one that doesn't require extensive analysis – may negatively impact the sustainability of the project.

Project Outcomes

The primary outcome of interest is the rate of meal documentation. The project was implemented at the end of the MSN student's clinical time on the microsystem, consequently, the post-intervention data is not as extensive as the pre-intervention data. However, a fair evaluation of the project can be made by comparing the first two weeks of pre-intervention data with the first two weeks of post-intervention data. The first two weeks of pre-intervention measurement have the rate of meal tray documentation at 54% and 42%, respectively. The week of implementation and the week following have the rate of meal tray documentation at 72% and 80%, respectively. This would signify that the project was a success. However, the improvement exhibited by the meal rate of documentation occurs throughout the duration of data collection, and does not necessarily begin the week that the process change was implemented. It is possible that merely studying patients' nutritional status amplified the cognizance of the clinical problem among staff members, which resulted in an ever-increasing consistency of meal intake documentation. Nevertheless, the stated outcome of this project was to improve the rate of meal documentation from the previous rate of roughly 50% to 80%. Given the initial results that 80%

of meals are being documented in the EHR, the intervention can be considered a success. For the project to endure, the CNL must continue to enact the sustainability plan and continue to audit the rate of meal documentation.

Implications for Practice

Though the post-intervention data is somewhat limited with regards to prolonged sustainability, the preliminary post-intervention outcome suggests that this project successfully improved the rate of meal documentation on the microsystem of interest. It should be noted that the results of quality improvement projects cannot be generalized to other settings in the way that the findings of a research study can be. Nonetheless, there may be implications for nursing practice, patient outcomes, and the cost of delivering care. For instance, monitoring patients' intake and providing care that maintains or improves a patient's nutritional status is a basic nursing skill, yet it is given lower priority than other aspects of patient care (Somanchi et al., 2010). Consumers and payers of healthcare services have an expectation that patients will not suffer from preventable complications related to insufficient nutrient and energy intake, yet, the literature shows that maintaining the status quo yields insufficient results (White et al., 2012). The consequence of failing to address patients' nutritional status is associated with increased rates of morbidity, mortality, length of stay, and infections (Meehan et al. 2016). Not only does inadequate nutritional care result in needless patient suffering, complications that are associated with malnutrition increase the cost of care. Tappenden et al. (2013) shows that treating malnourished patients with oral supplements resulted in a cost savings of $4734 and reduces the LOS by 20%.

The protocol developed in this project addresses a phenomenon that is not unique to the microsystem of interest and given the strong upside potential it may be appropriate to apply this protocol to other microsystems in the organization. The literature suggests that half of all patients are malnourished and 69% of patients experience a decline in their nutritional status during their hospital stay (Somanchi et al., 2010). The goal of this project is to improve nurses' ability to monitor their patients' nutritional intake by encouraging more thorough documentation of meal consumption. More effective monitoring of patients' nutritional status may diminish the rate of or the severity of nutritional deterioration that patients experience.

Project Limitations

There are limitations to the project that merit a discussion. The two prominent shortcomings of the project involve failing to meet expectations. At the outset, the MSN student believed the scope of the project was that the intervention would incorporate a novel way to treat malnourished patients, beyond the current mechanism of providing food. That is to say, the intervention would not merely be to enhance detection and monitoring of nutrition but do more to intervene, once the at-risk patients were identified. However, the evidence suggests that simply identifying patients who are malnourished is a fairly ambitious task and is the starting point for addressing nutritional issues in this population. Additionally, supporting an essential nursing role of monitoring patients' meal intake is a necessary first step to implementing more intensive interventions.

The other limitation of the project is the method of data collection. The final version of the automated EHR auditing report still does not adequately perform its intended function. The intent behind creating an automated method for evaluating the EHR was to reduce the time and

labor involved in auditing the EHR for compliance with meal documentation. However, sorting out the irrelevant data that accompanies the valuable information is still burdensome. The nature of how the EHR is built and the way it functions bears responsibility.

Enactment of MSN Essentials

Besides improving the operations of the microsystem of interest, this project provided an opportunity for the MSN student to enact several of the MSN Essentials. Demonstrating proficiency in the nine MSN Essentials is a critical part of the curriculum (American Association of Colleges of Nursing, 2013). The MSN student demonstrated competency in Essential II (Organizational and Systems Leadership for Quality Improvement and Systems Thinking). The MSN student used systems theory to evaluate the delivery of care in a complex organization by assessing the delivery of nutritional care on the microsystem and determined how multiple components of the system interact to affect patient outcomes.

Essential III (Clinical Scholarship and Analytical methods for Evidence-Based Practice) was enacted by the MSN student by first performing a microsystem assessment to identify clinical problems. Using the DMAIC framework, the student applied problem solving techniques, such as root cause analysis (RCA), to identify the cause of the clinical problem. Results from the RCA and evidence from the literature informed the design of an intervention. Performance measures were created to evaluate the effectiveness of the protocol. After the protocol was implemented, the outcomes were compared to the pre-implementation data to demonstrate that the intervention lead to higher quality care.

Aspects of Essential IV (Translating and Integrating Scholarship into Practice) were realized throughout the project. For example, during the analysis and improve phases of the

project the MSN student diligently reviewed the available literature related to the clinical problem and incorporated the best evidence in the protocol development. Furthermore, the MSN student performed a gap analysis to interpret the discrepancy between the desired state of nutritional monitoring and the current practices observed on the microsystem. The organization's policies and procedures were reviewed to determine the expectations of the desired state. The protocol was influenced by the evidence provided in the literature and by the standards determined by the institution.

The MSN student proficiently used technology in the clinical setting thereby satisfying Essential V (Informatics and Healthcare Technologies). The student studied the electronic health record (EHR) system in great detail and became familiar with the capabilities and restrictions of the system. Though there were many frustrating limitations of the system, an automated report was created with the help of a technology specialist. Since the report is integrated with the EHR it is used to audit compliance with the documentation requirement of the protocol.

The entire project depended on fostering participation from the various stakeholder groups. The MSN student actualized Essential VII (Interprofessional Collaboration for Improving Patient and Population Health Outcomes) by developing leadership skills which were necessary to facilitate the development of the intervention by willing participants. Relationships were developed with individuals who represent different microsystems and who have diverse objectives. As the leader of the team, the student was responsible for creating an interprofessional coalition of stakeholders who supported the project by analyzing the root causes of the clinical problem, brain storming solutions, and providing feedback to improve the intervention.

Ultimately the MSN student enacted Essential IX (Masters Level Nursing Practice). Patients on the microsystem were assessed to determine their actual and potential health risks. With the participation of many others, the MSN student designed an intervention targeted at improving patient health outcomes by modifying the delivery of nursing care on the microsystem. The intervention developed in this project may bolster RNs' resolve to continue providing the best nutrition related care to all patients.

Conclusion

The results of a microsystem assessment indicated that even routine microsystem processes have the potential to be optimized. Additionally, it demonstrated that the monitoring of fundamental patient needs, such as nutritional intake, can be overlooked. Subsequently, a team of key stakeholders was assembled to perform a more in-depth analysis of the situation and brainstorm potential solutions. The provision of nutrition related care is a complex process spanning multiple microsystems, hence, multiple groups of stakeholders were invited to participate. DMAIC, a valid quality improvement framework, was used to guide the project plan. The team's efforts resulted in the recommendation to implement a series of coordinated steps, that were designed to improve the rate of meal documentation and streamline workflow. The new standard process, developed by the quality improvement team, was successful. Meal intake documentation rates increased from 54%, prior to implementation, to 80%. The new process is popular among staff members because it makes their workflow more predictable. However, the long-term sustainability of the project relies on continued staff engagement and regularly auditing the EHR using the automated report.

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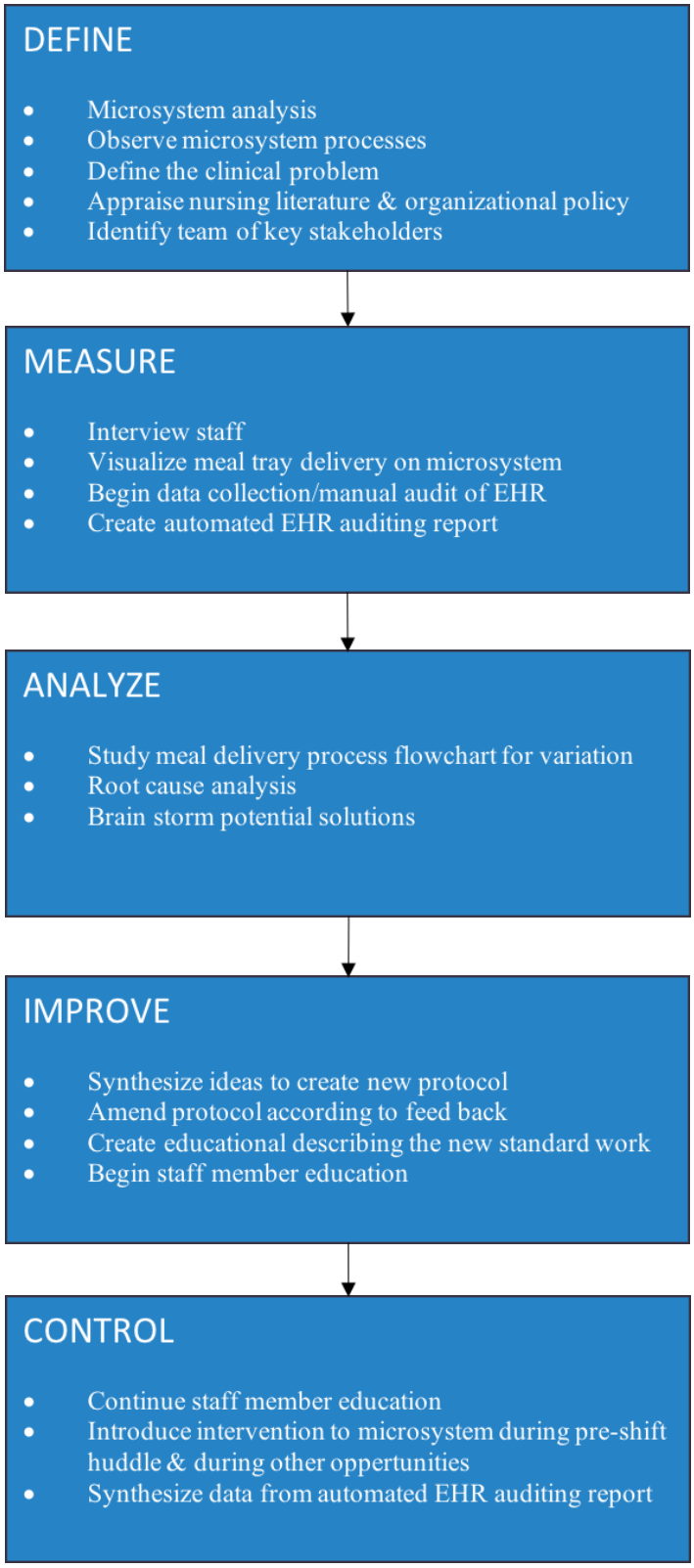
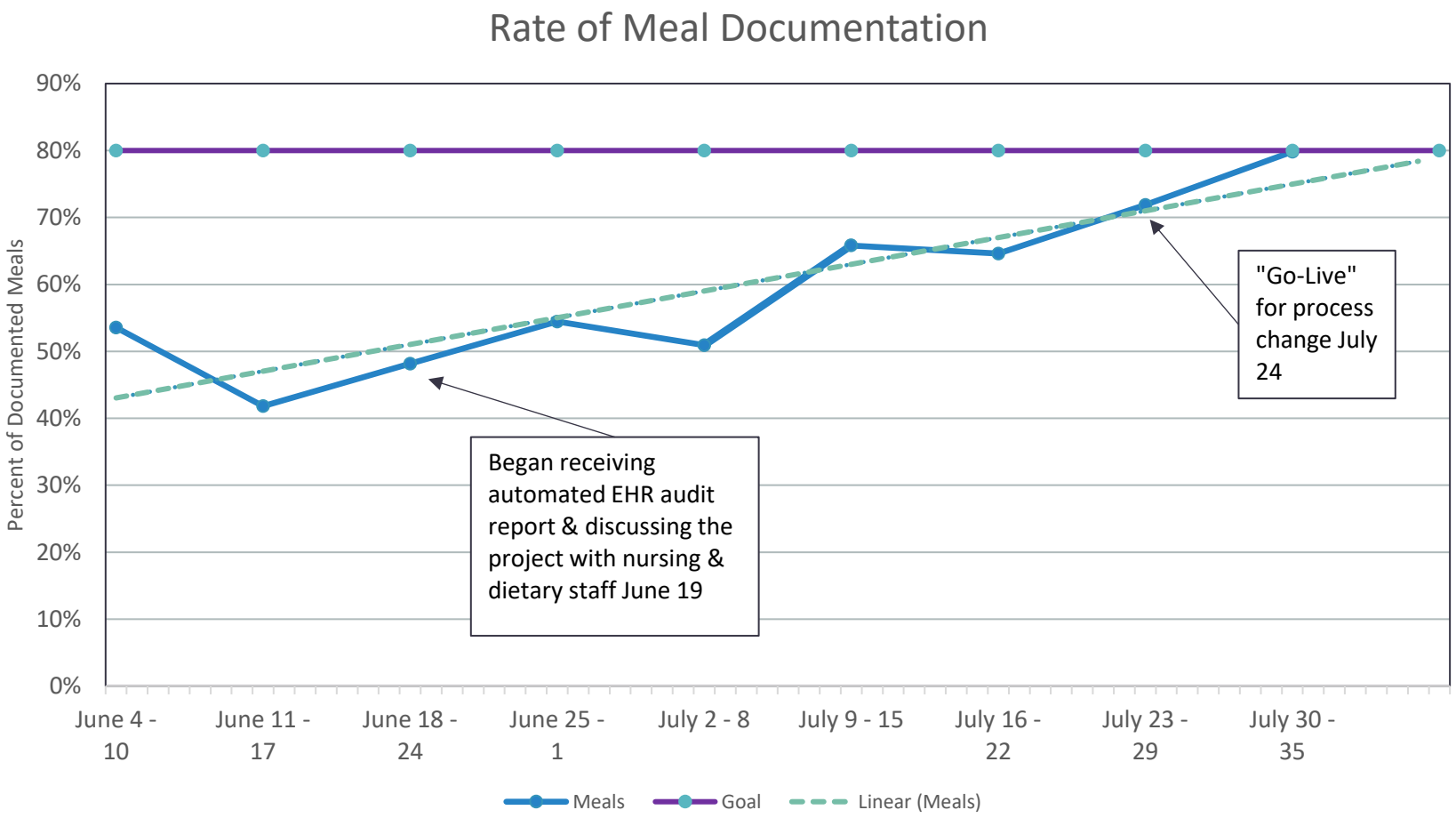
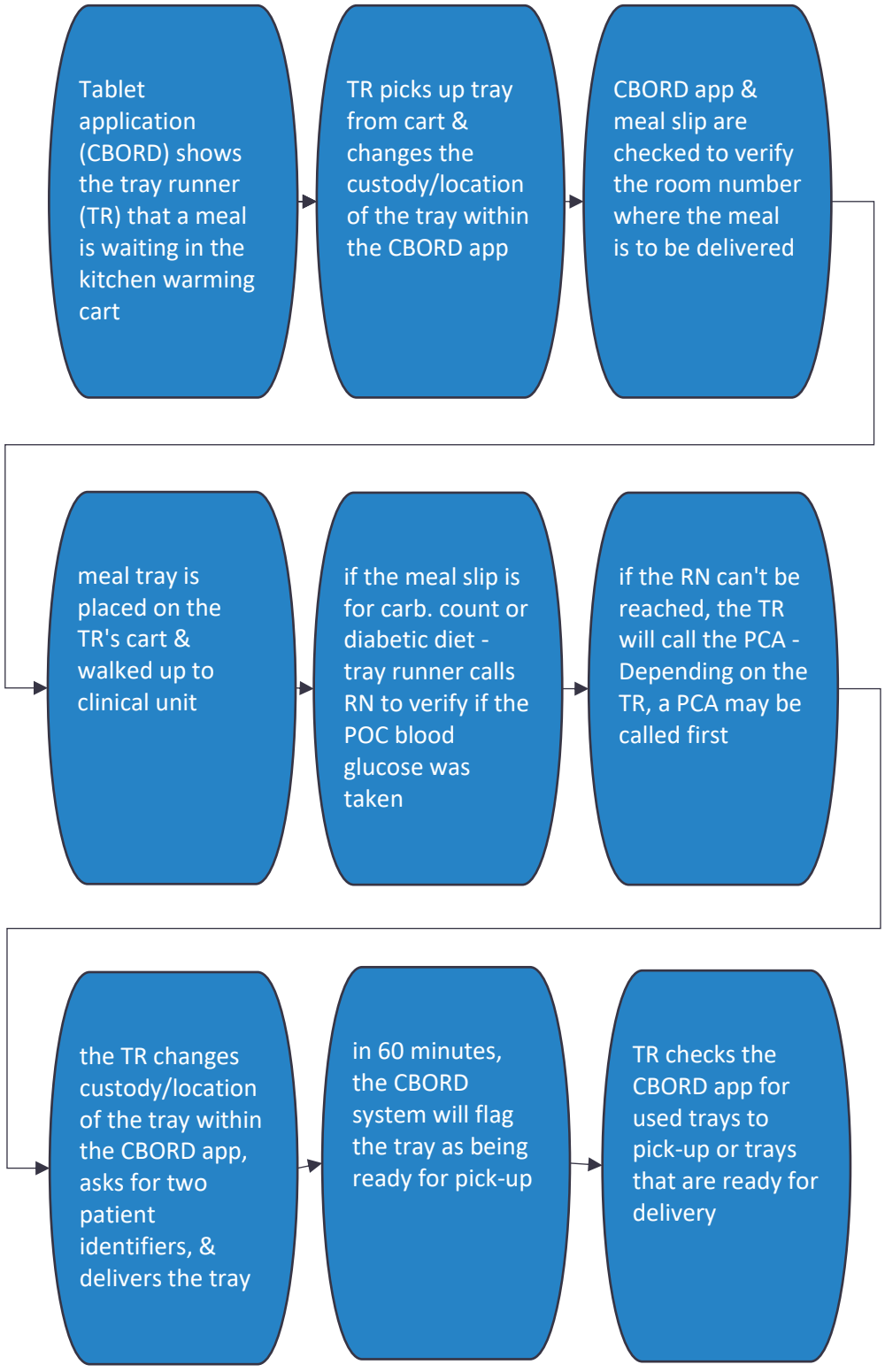
Appendix A: Diagram of DMAIC Framework



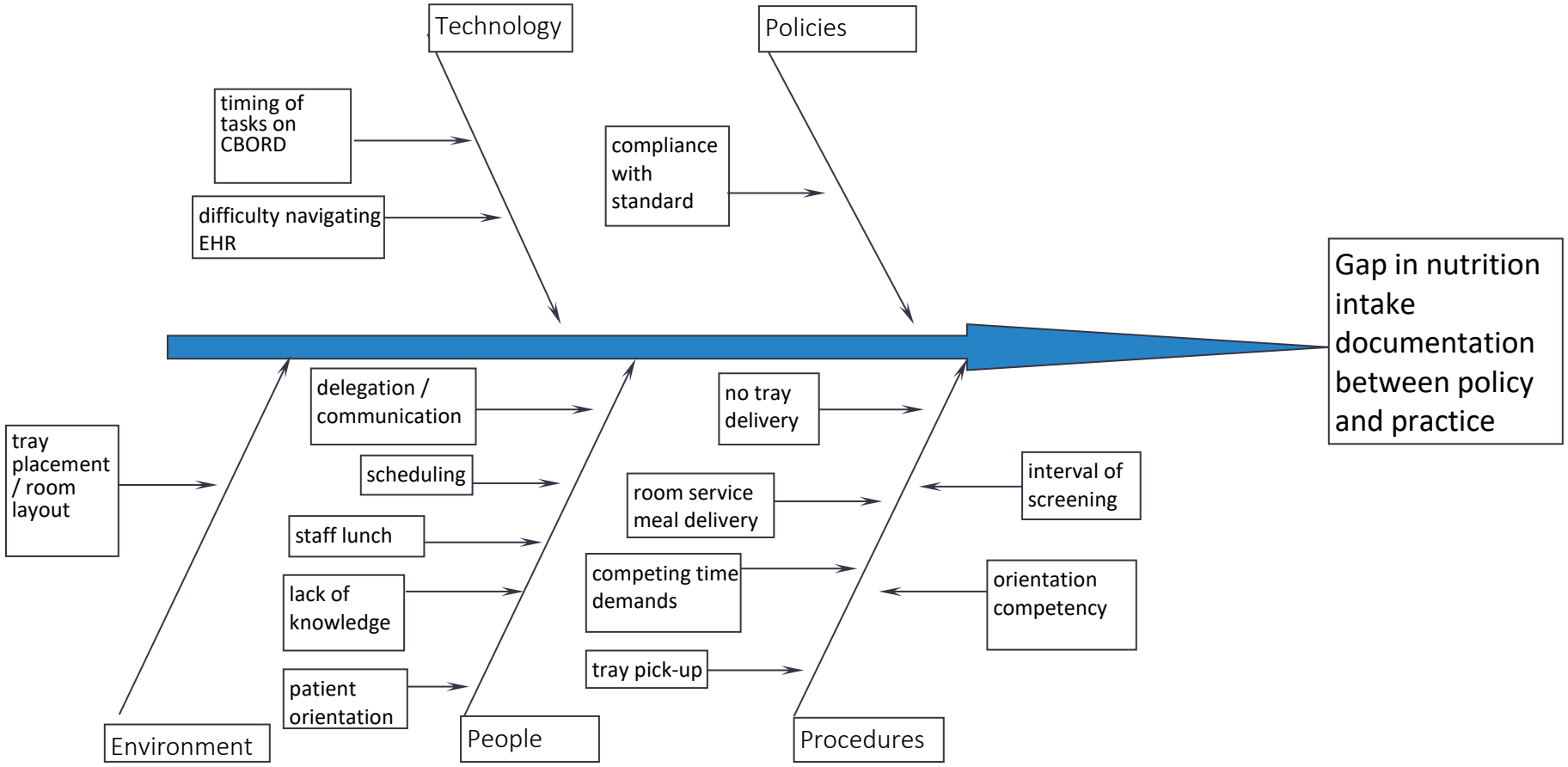
Appendix B: Line Chart of Meal Documentation Rate



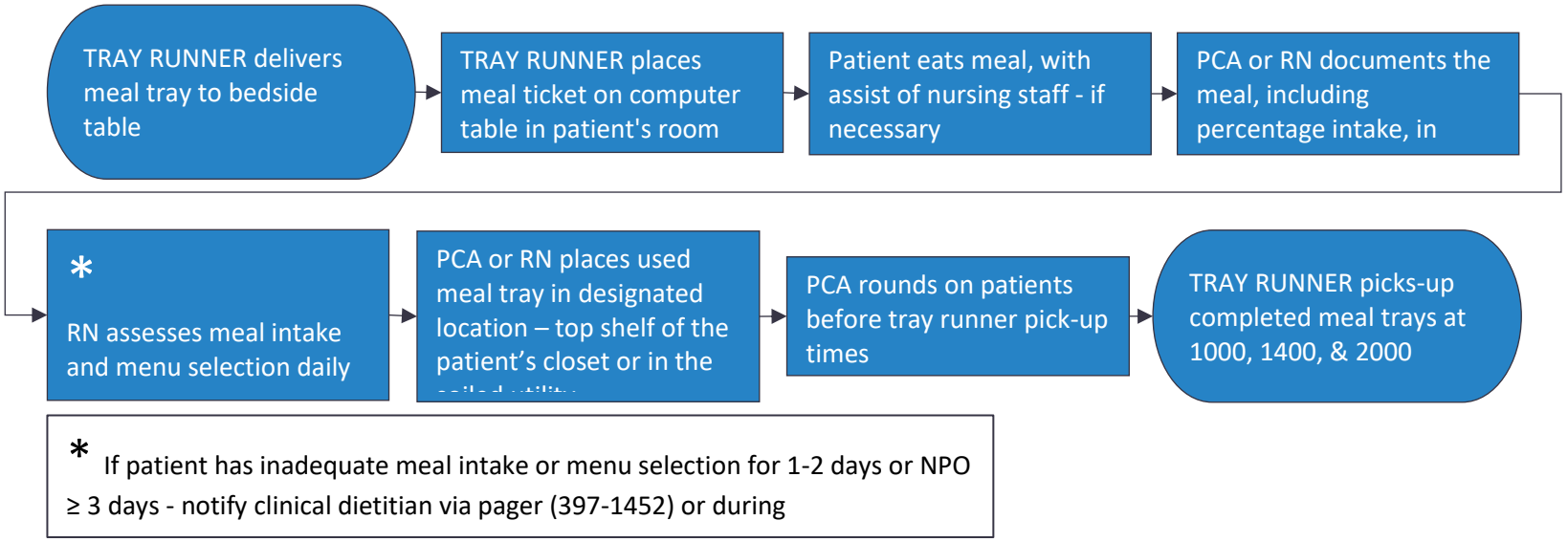
Appendix C: Pre-intervention Meal Tray Delivery Process Flowchart



Appendix D: Root Cause Analysis



Appendix E: Post-intervention Meal Tray Delivery Process Flowchart



Appendix F: Standard Process Document

Standard Process for Meal Tray Delivery, Removal, & Nutrition Documentation

STANDARD WORK FOR- RN, PCA, TR

This document outlines the process for nutrition delivery, documentation and monitoring.

Request:

☐ Requesting to implement a process change that is designed to improve nutrition monitoring & documentation.

☐ Similar to the current process, though it adds more structure to the workflow and assigns responsibilities to employees in different job categories (i.e., RN, PCA, TR).

☐ Please **validate that you've received the education** (self-validation check sheet is posted on bulletin board near time clock).

☐ **Start date is July 24.**

Tray Delivery:

☐ Meals delivered to bedside table by tray runner.

☐ Meal ticket placed on computer table.

- Meal ticket is used to provide information about carb. counts, calorie counts, and to aide in documentation.



Tray Removal:




☐ After documenting in IView, RN or PCA will place the used meal tray in the designated location – **the top shelf of the closet** or **in the soiled utility**

- When meal trays are placed in the closet or soiled utility, that signifies to the tray runner that the meal has been documented.

☐ If meal trays are accumulating, please check to see if they have been documented and placed in the proper location.

- All trays not placed in the designated area will not be cleared from the floor.

RN role:

☐ Delegation of meal/nutrition documentation.

☐ RN notifies the clinical dietitian if the menu selection or patient intake is inadequate for 1-2 days or if the patient is NPO ≥ 3 days. Notification may be via pager or during multidisciplinary rounds (according to policy & procedure Index Code: 521/019).

☐ Placement of used tray in top shelf of the closet or in the soiled utility.

PCA role:

- ☐ Documentation of patients' meal/nutrition intake in IView.
- ☐ Placement of used tray in top shelf of the closet or in the soiled utility.
- ☐ Round on patients before the tray runner pick-up times (prior to 1000, 1400, & 2000).
- ☐ Document supplement and snack consumption in-between meals.

Tray Runner role:

- ☐ Meal trays are delivered to bedside table and meal tickets are placed on computer cart.
- ☐ Round for used meal trays and only remove trays that are placed in the designated locations.
- ☐ At **1000, 1400, & 2000** all of remaining used meal trays will be cleared from patient rooms, regardless of where they are placed – this is to maintain cleanliness and patient satisfaction.

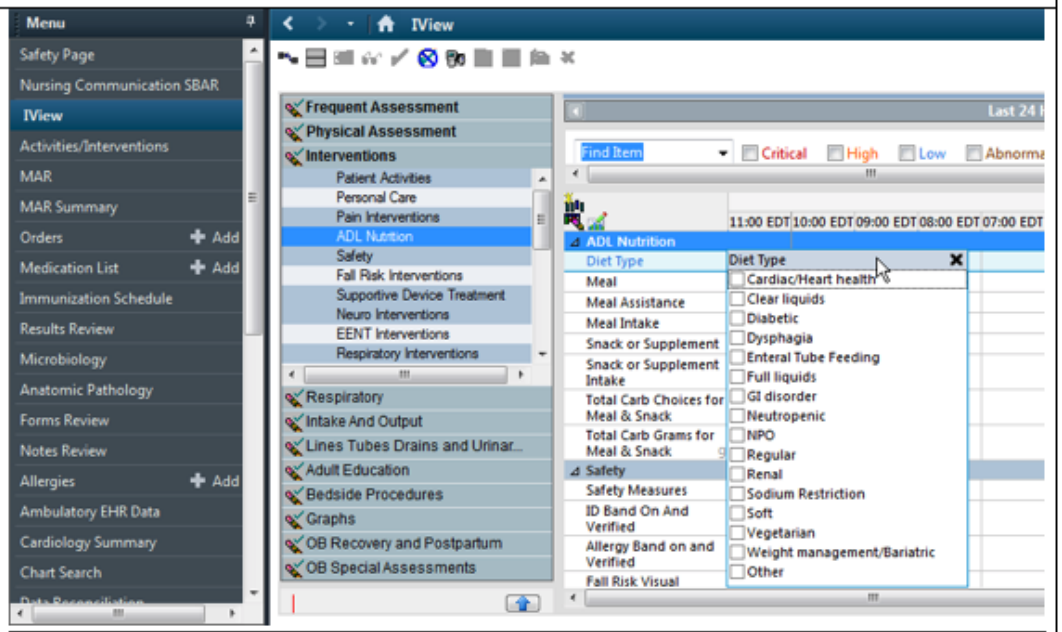
Meal Documentation:

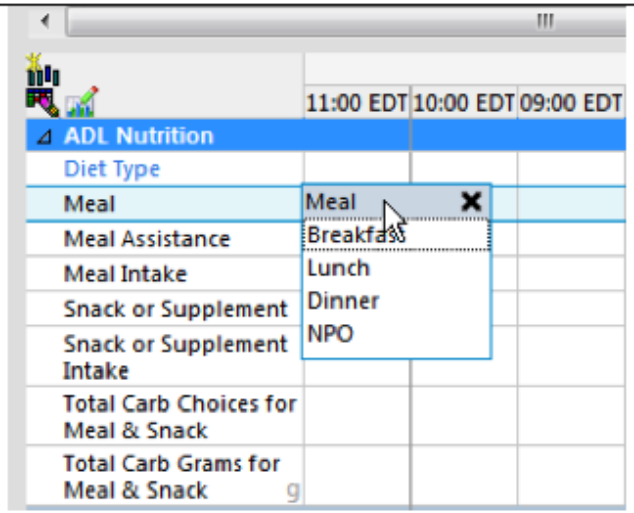
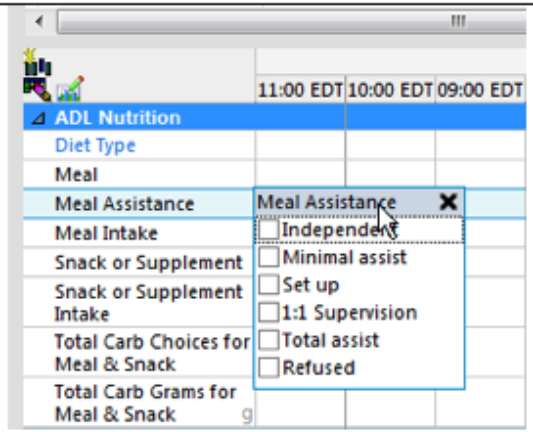
- ☐ RN or PCA will document the meal, including **meal intake percentage/amount,** in the relevant fields in IView.
- ☐ For the purpose of auditing the EHR the following criteria will be applied:
  - It will be assumed that patients have a standard of three meals per day.
  - Meal intake documentation data will be gathered from each patient present on the clinical microsystem with an "inpatient" status order, patients with an "observation" status order, which includes all patients who are being monitored in the Epilepsy Monitoring Unit, will not be considered. If a patient's status changes from "observation" to "inpatient", all meal intake data will be eligible for inclusion retroactively.
  - Only meals actually consumed on the clinical microsystem apply. For example, if a patient reports consuming a meal earlier in the day, prior to being transferred to the microsystem of interest, or if a patient eats meals in the hospital cafeteria with family – the meal will not will not be included in the tally for meal documentation.
  - This microsystem uses a "room service delivery model" for meal tray delivery. This means that patients are provided with access to a telephone and the appropriate menu, according to their diet. From their rooms, patients call-in their meal orders to the kitchen and their meal is delivered via tray runner, usually arrives within 45 minutes. The kitchen is open to receive orders from 0700 to 1900. As a result of the room service delivery model, there are no standard meal times.
    - To standardize the measurement of meal intake data, meal times were divided into 4-hour blocks of time. The time blocks will determine the denominator value of a day's possible meal intake when an event such as admission, discharge, transfer, patient off floor for procedure, or change in "NPO" diet order occurs. Block A is 0800 (and earlier) to 1159, Block B is 1200 to 1559, and Block C is 1600 to 2000 (and later).

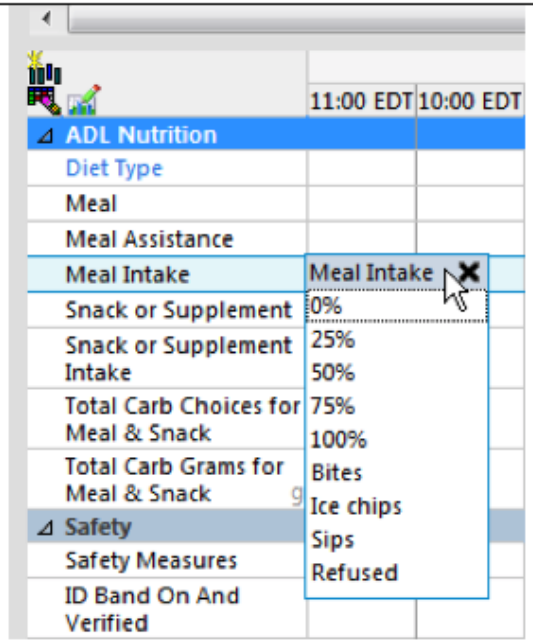
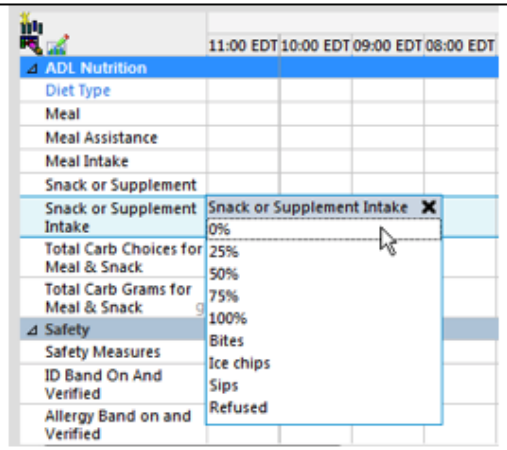
- If an event occurs before Block A, the patient will be assumed to have all three out of the three standard meals.
- If an event occurs during Block A, the patient will be assumed to have two out of the three standard meals.
- If an event occurs during Block B, the patient will be assumed to have one out of the three standard meals.
- If an event occurs during or after Block C, the patient will be assumed to have zero out of the three standard meals.

- Valid meal documentation responses that will be considered in the numerator include:
  - 0%, 25%, 50%, 75%, 100%
  - Refused
  - Bites
  - NPO
- Any value that is entered into the EHR that provides information about a patients' amount of meal intake will be considered as a valid entry for the numerator. Whether the documentation reflects that a patient is NPO, refuses to eat, eats bites, 0%, 25%, 50%, 75%, or 100% of their meal, all data entries would be considered valid. However, the absence of any such documentation is considered as a missed opportunity for meal intake.

IView Charting Field Options

Bands	***Sections***	***Field***	
Interventions	ADL Nutrition	Diet Type Valid for meal documentation: NPO	

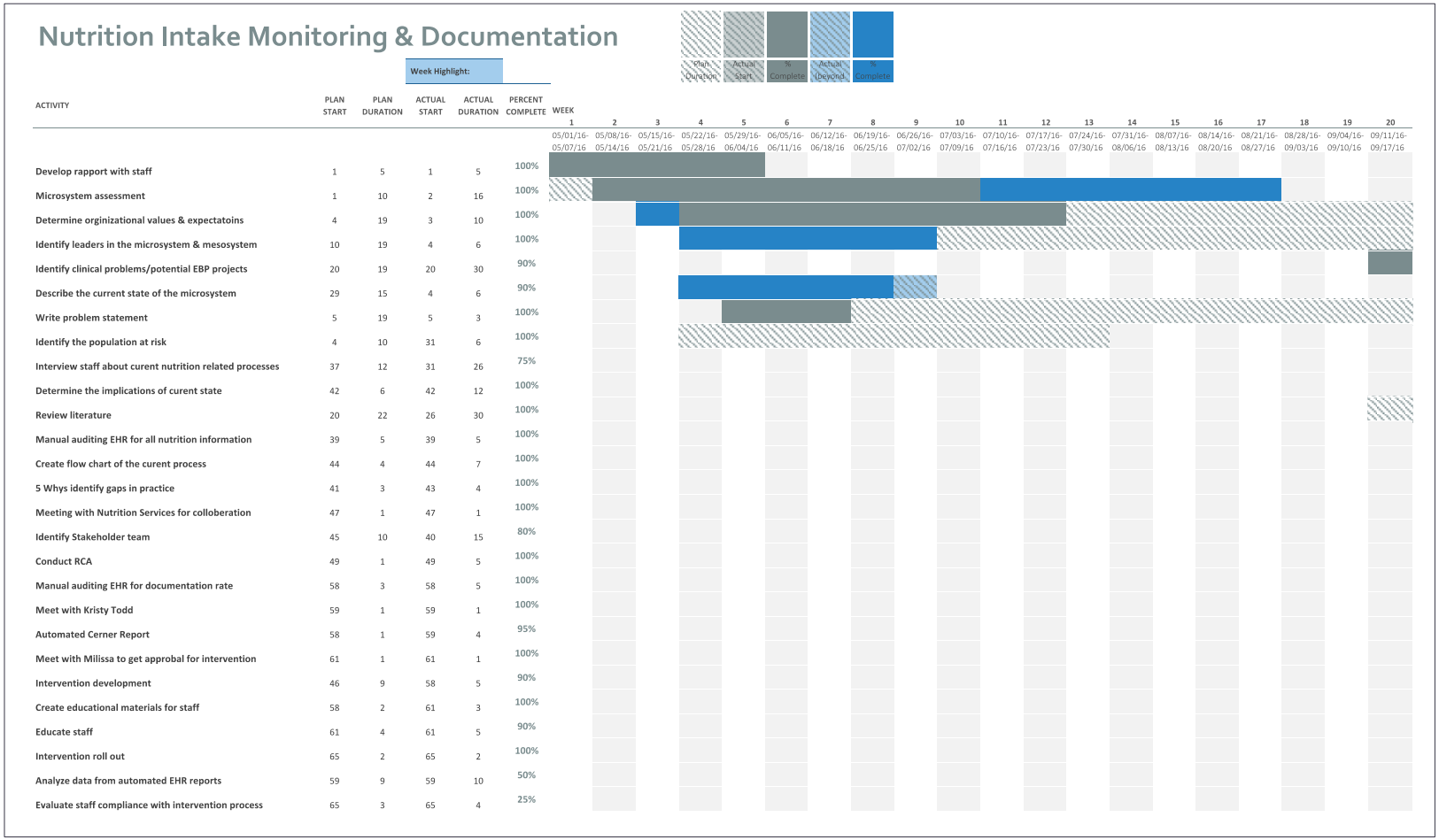
Interventions	ADL Nutrition	Meal Valid for meal documentation: NPO	
Interventions	ADL Nutrition	Meal Assistance	

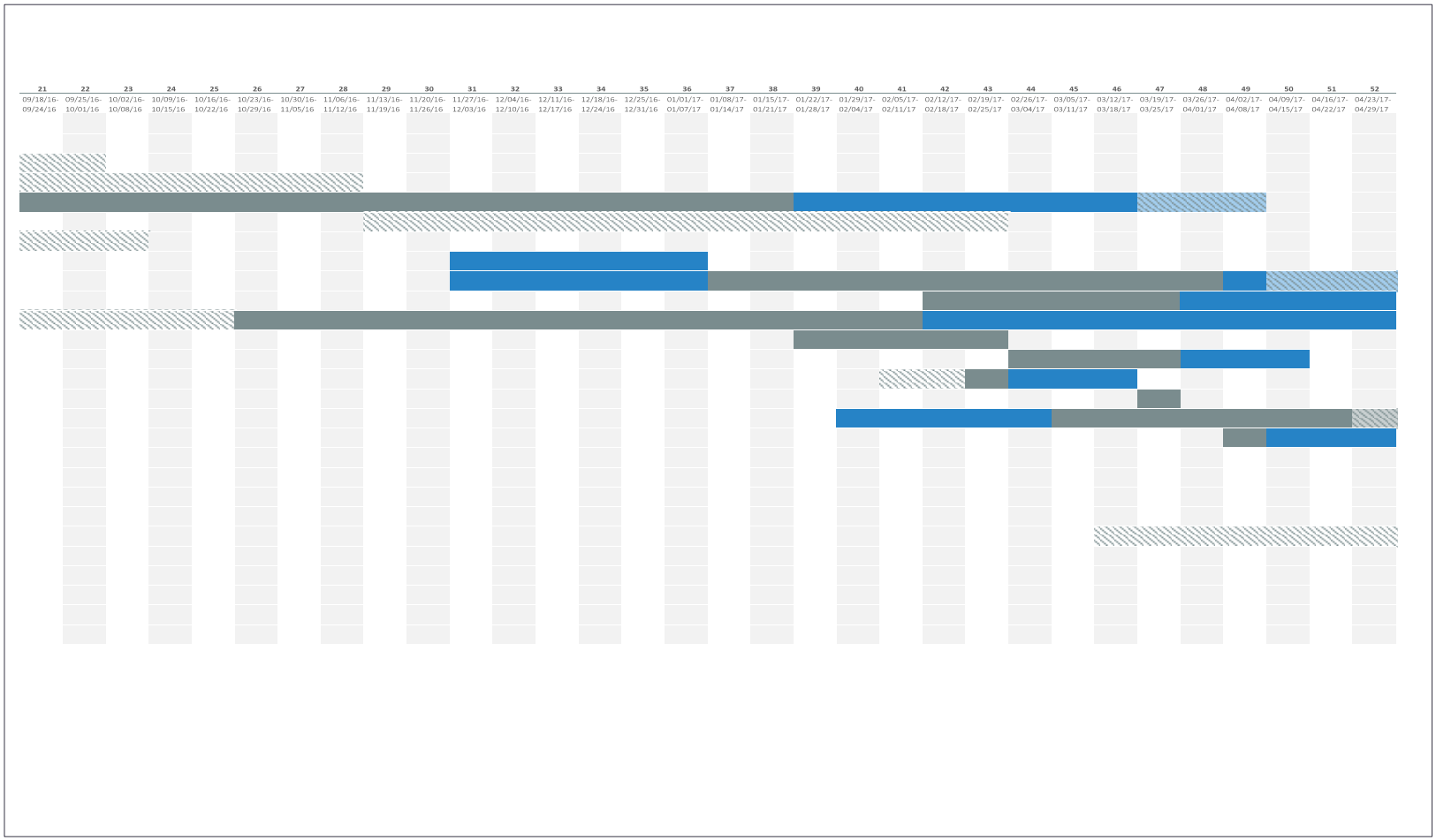
Interventions	ADL Nutrition	Meal Intake Valid for meal documentation: 0% 25% 50% 75% 100% Bites Ice chips Sips Refused	
Interventions	ADL Nutrition	Snack or Supplement Intake	

Feedback:

- ☐ Email suggestions/concerns/questions to MSN student or microsystem CNL.
- ☐ After initial trial period, we will use suggestions to reform the process, as necessary, to accommodate workflow & improve compliance.
- ☐ Written comments can be submitted to the folder attached to the bulletin board located near the time clock.

Appendix G: Gantt Chart of the Project Timeline

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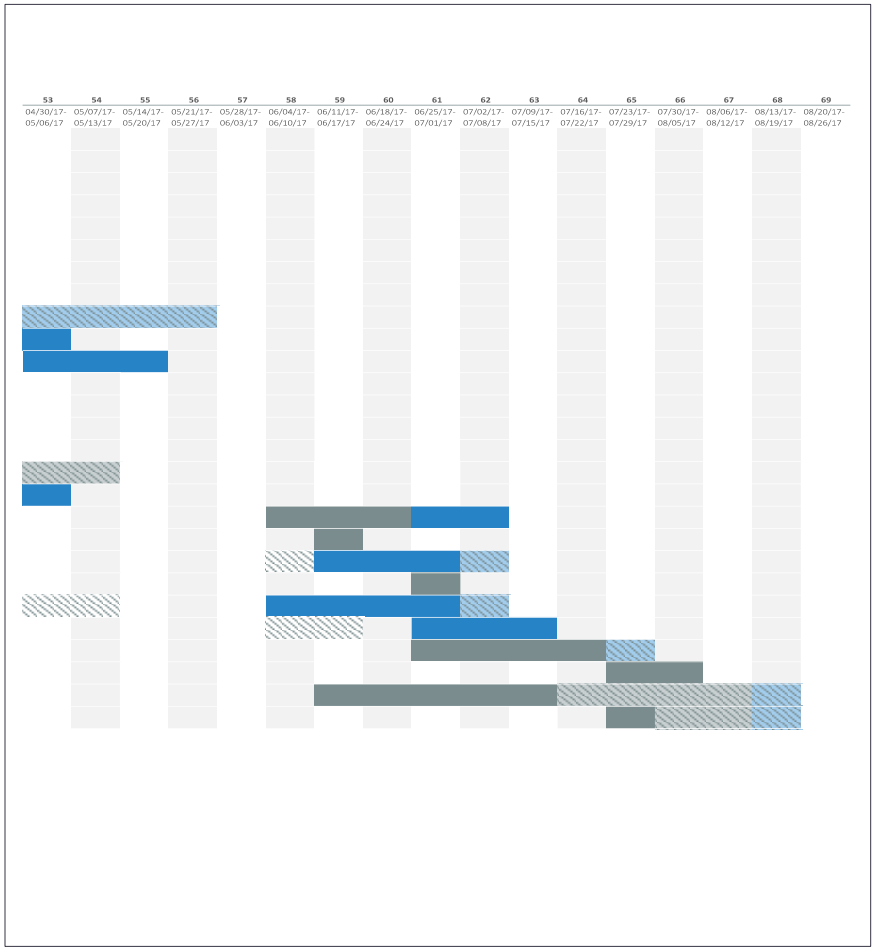
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