Examining the Feasibility and Implementation of a New Dietary Intake Documentation Method in a Hospital Setting

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Major Project/ Report submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Online Master of Agricultural and Life Sciences
In
Applied Nutrition and Physical Activity

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Date of Submission: July 29, 2024

Key Words: Malnutrition, Dietary Intake, Point-of-Care Technology

ABSTRACT

Malnutrition affects one in three hospitalized patients in the United States (Sauer et al., 2019). One of the six diagnostic criteria for malnutrition is inadequate dietary intake, which can be tracked in several ways. In hospital settings, tracking and documenting dietary intake is primarily the responsibility of nursing staff or dietitians (Heighington-Wansbrough & Gemming, 2022). This project aimed to develop and present a staff training presentation on a new documentation method, utilizing the Welch Allyn Connex Spot Monitor, a point-of-care technology device. The training was presented to various clinical staff at Inova Alexandria Hospital at two meetings. The training presentation reviewed the importance of accurate meal documentation, the disadvantages of the current method, and instructions on how to follow the new method. Documentation frequency was collected from ten patient charts, with a length of stay greater than three days, from three hospital units before the training. Documentation frequency was measured again one week following the second training and four weeks following the second training. The baseline mean before the intervention was implemented was 4.33 meals per patient. The one-week post-intervention mean meals documented was 6.07 meals per patient and the four-week post-intervention mean was 4.1 meals per patient. The results indicated an increase in meal documentation frequency, across all units, one week following the second training session ($p = 0.02$). When assessing the maintenance of meal documentation four weeks after the training, the frequency was no longer significantly higher and returned close to the baseline value ($p = 0.74$). In conclusion, meal documentation frequency increased in the week following the training presentation. The adoption of the new method was not sustained over four weeks and highlighted the need for more regular training on the new documentation method.

ACKNOWLEDGMENTS

First, I would like to thank the staff at Inova Alexandria Hospital, specifically my clinical nutrition preceptor, Christa Guh, for their support and time in helping me complete this final project.

Dr. Valisa Hedrick, thank you for all your time, support, and expertise throughout this project. I sincerely appreciate all the guidance you gave me when deciding which statistical analyses to run.

Dr. Emily Myers, thank you for all your support and patience throughout this project. Your continuous assistance and attention to detail helped me succeed in the completion of this project. I am so grateful for your support.

Mrs. Amy LaFalce, thank you for your support and leadership throughout this year. Your constant encouragement is much appreciated.

Lastly, I'd like to thank my parents for their constant support throughout my endeavors. I am so thankful.

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INTRODUCTION

Background and Setting

Malnutrition develops when the body is deprived of the nutrients it needs to maintain healthy function (*Malnutrition*, 2024). Across the world, in 2022, 3.78 billion people were malnourished (World Health Organization, 2024). Malnutrition is a common problem in hospitalized patients. Bellanti et al. found that malnutrition in hospitalized patients ranges from 20 to 50 percent, while 60 to 65 percent of hospitalized patients have poorer nutritional statuses than healthy individuals (Bellanti et al., 2022 & Shahar et al., 2016). An estimated 90 percent of the older adult patient population is at an increased risk for developing malnutrition (England & Cheng, 2024). Kellet et al. found significant associations between malnutrition and decreasing body mass index, increasing age, and increasing lengths of stay (2016). Identifying and documenting malnutrition in the hospital setting is crucial for patients to receive appropriate care, as malnutrition is associated with adverse effects, including frequent readmissions, increased hospital costs, increased lengths of stay, and mortality (Shahar et al., 2016 & Agarwal et al., 2010). Accurate documentation of malnutrition also allows hospitals to receive greater financial reimbursement for the increased costs of care (Kellet et al., 2016).

Inadequate dietary intake is a major contributing factor to developing malnutrition and one of the six diagnostic criteria for malnutrition (White et al., 2012). However, accurate assessment of dietary intake is difficult, as the methods are subject to systematic and random measurement errors (Bailey, 2021). There are several methods for collecting dietary intake data, including self-report methods and methods conducted by trained personnel. While self-report dietary assessment methods are inexpensive and easier to administer, there are inherent measurement errors, such as underreporting and overreporting (Subar et al., 2015). Self-report dietary assessment methods also place a burden on patients, rely on their short-term memories

and communication skills, and require patients' compliance (Johnson, 2002). Dietary assessment methods that rely on healthcare personnel typically include visual estimations in inpatient settings and weighed food records in outpatient settings (Kawasaki et al., 2016 & Maunder et al., 2021). Weighed food records require ongoing training, can be time-intensive, and can lead to underestimation and overestimation (Palmet et al., 2015 & Maunder et al., 2021).

Many hospitals around the world use visual estimations. Nurses and nursing assistants, or equivalents, routinely visually estimate patients' intakes at the bedside while in patient rooms (Kawasaki et al., 2016). Typically, the healthcare personnel are taking vitals, administering medications, or helping the patient with activities of daily living, while making these visual estimations (Kawasaki et al., 2016 & Sengupta et al., 2010). Usually, visual estimations utilize a five-point scale ranging from zero percent to 100 percent, increasing in increments of 25. While visual estimations are time-efficient and require little training, especially with the five-point visual scale, healthcare personnel can underestimate or overestimate how much the patient consumes (Maunder et al., 2021). Additionally, visual estimations are often recorded in the electronic medical record sometime later after the estimation. Typically, healthcare personnel wait until they have adequate time to sit down and chart these estimations while documenting several other items (Yeung et al., 2012). Clinical staff must then rely on memory when documenting patient intakes (Castellanos & Andrews, 2002).

With the increasing use of point-of-care technology, there is an opportunity to optimize dietary intake documentation while still using the visual estimation method. The technology used close to the site of patient care, or point-of-care technology, allows clinicians to rapidly access diagnostic results (Larkins & Thombare, 2024 & Wang & Kritcka, 2018). When point-of-care technologies are paired with access to electronic medical records, patient care is improved.

Having access to the electronic medical record at the point of care improves the documentation workflow, by eliminating manual data transcription and reducing the time spent documenting (Pérez-Martí et al., 2022).

Inova Alexandria Hospital (IAH) is a 318-bed community hospital that has earned recognition from The Joint Commission for excellence in stroke care, joint replacement, and accountability measures (*Awards and Recognition for Inova Alexandria Hospital,* n.d.*).* Healthcare personnel at IAH, typically nurses and clinical technicians, visually estimate how much of a patient's tray was consumed using a five-point scale. However, many staff members delay recording the estimated dietary intake in the electronic medical record until it is more convenient since they must sit in the halls of the unit to manually input the data into the electronic medical record. It can be hours before the care provider records the estimation in the electronic medical record. Data can be inaccurate or left out due to delayed charting and the reliance on healthcare providers' memories (Yeung et al., 2012). A streamlined dietary intake documentation method would likely result in more accurate dietary intake documentation at IAH.

Statement of the Problem

Meal intake data is often inaccurate or missing across all units in inpatient hospital settings, including IAH, which makes it challenging for registered dietitians to track patients' estimated energy intakes and identify patients with malnutrition. In 2023, the malnutrition capture rate at IAH was just under 21%, meaning 21% of admitted patients were identified to have malnutrition. The current documentation method, five-point visual estimation with delayed charting is susceptible to documentation errors. Healthcare personnel have competing demands and often are at risk of forgetting data if they do not document at the point of care. A point-of-

care device that allows for bedside documentation would be more efficient and likely less prone to errors or omissions. There is a feature on the Welch Allyn Connex Spot Monitors, point-of-care devices used multiple times each day by nurses and technicians, that allows them to input meal intake data, which automatically flows to the electronic medical record. This method eliminates the need to manually document patient meal intake data in the electronic medical record.

Project Purpose

The purpose of this project was to evaluate the impact of training clinical staff at IAH on the feasibility and implementation of a new point-of-care method of meal intake documentation, utilizing the Welch Allyn Connex spot monitor, and measure changes in meal documentation frequency following the training. This method highlights bedside documentation, which allows healthcare personnel to spend more time with the patient and not rely on their short-term memory when documenting meal intake data (Castellanos & Andrews, 2002 & Graham et al., 2018).

Project Objectives

The objectives of this project were to:

- Create a training presentation focused on the importance of accurate meal intake documentation and the new meal intake documentation method.
- Conduct two training sessions, informing healthcare personnel how to implement the new documentation method
- Evaluate changes in meal documentation across three patient care units at IAH.

Definition of Terms

- Energy Intake: energy intake, typically measured in calories or kilocalories, is the amount of energy produced by an individual taken in from food consumption (Heaney, 2013)
- Malnutrition: malnutrition includes deficiencies, excesses, or imbalances in a person's nutrient intake, imbalance of nutrients, or impaired nutrient utilization (World Health Organization, n.d.)
- Charting: the process of documenting a patient's medical history and clinical data; the medical chart helps inform the decision-making of healthcare (Practice Fusion, 2015).

REVIEW OF LITERATURE

Dietary intake data are important in determining a patient's nutritional status in a clinical setting, in nutritional surveillance of certain populations, and in epidemiological research (Welch, 2005). Dietary intake data is helpful for nutrition care in healthcare settings, including acute care, long-term care, and outpatient facilities. Food and meal intake data are particularly useful when deriving practical recommendations from diet-disease relationships (Guan et al., 2019). Rollo et al. highlight the importance of refining dietary assessment tools for healthcare professionals to continuously build their understanding of the effect of diet on health and disease (2016). In a clinical setting, tracking patients' dietary intake allows healthcare personnel to track patient progress, identify patients at risk for malnutrition, and guide personnel in nutrition education and counseling (Maunder et al., 2021). There are significant consequences when poor dietary intake is not identified or managed, including malnutrition.

Malnutrition occurs in 20% to 50% of hospitalized patients around the world (Shahar et al., 2016). In the United States, one in every three hospitalized patients is at risk for malnutrition (Sauer et al., 2019). There are six diagnostic criteria for an adult malnutrition diagnosis including reduced energy intake, weight loss, loss of subcutaneous fat, loss of muscle mass, fluid

accumulation (edema), and reduced grip strength. Patients must meet at least two of the six criteria to be diagnosed with malnutrition (White et al., 2012). In a clinical setting, it is crucial to track dietary intake to determine if a patient meets the criteria for malnutrition. Early capture of malnutrition allows for earlier medical nutrition therapy. Malnutrition has associated complications including increased lengths of stay, pressure injuries, falls, higher morbidity and mortality, delayed recovery periods, and a significant financial burden (Maunder et al., 2021). When examining the food intake of hospitalized heart failure patients, Yoshida et al. found that inadequate food intake was associated with a higher incidence of death and readmission due to heart failure within one year (2020). Longer lengths of stay are associated with increased healthcare costs and increased economic burden on the patients. Hospital readmissions are associated with increased healthcare costs and poorer clinical outcomes, including decreased quality of life (MacFarling et al., 2023). Dietary intake data serves as an important tool in identifying and diagnosing malnutrition.

Self-Report Methods

Several tools are used to collect dietary intake from people. Common self-report collection methods include 24-hour dietary recalls, food records, and food frequency questionnaires (FFQ). 24-hour recalls and food records are open-ended and dependent on information provided by the subjects or patients (Guan et al., 2019 & Johnson, 2002). The 24-hour recall asks subjects to recount the type and amount of foods consumed in the past 24 hours. 24-hour recalls are generally more accessible for patients and do not require specific literacy skills (Bailey, 2021). Food records require patients to record everything they eat in a three to seven-day time frame. As more days are recorded, the quality of responses generally decreases. Food records also require the population to be motivated and have specific literacy skills (Bailey,

2021). Food frequency questionnaires are used to estimate dietary intake over some time, usually six months to one year. The questionnaire asks subjects to specify how often they have consumed particular foods in the given time frame. The food frequency questionnaire also asks subjects to identify how much of a given food they eat. Food frequency questionnaires are useful for estimating habitual intake but are less reliable for measuring recent intake (Subar et al., 2015).

There are several benefits and drawbacks to self-reported dietary intake data collection methods. Historically, self-reported data has been beneficial in several nutrition epidemiological studies and discoveries, such as the link between cigarette smoking and chronic disease risk or the association between low folic acid intake during pregnancy and neural tube defects (Subar et al., 2015 & Park et al., 2018).

Drawbacks to self-reported data collection methods include measurement errors, such as overreporting and underreporting. Subar et al., acknowledge and accept the measurement error associated with self-reported data collection methods. The authors state, “such [measurement] error is an inherent part of the measurement process” (2015). Self-report methods greatly burden the subjects as 24-hour recalls rely on their short-term memories, participants are reactive during food recalls, and food frequency questionnaires contain a limited list of foods. These methods also rely on participants’ communication skills and compliance (Johnson, 2002). In addition to simply forgetting which foods they ate, participants may reflect the social desirability bias in their responses. Reflecting this bias, participants can alter their responses on food recalls, food frequency questionnaires, and 24-hour recalls saying they consumed types and amounts of foods that they considered to be socially acceptable.

A New Zealand Adult Nutrition survey administered by Gemming et al. examined the ratio of reported energy intake (EI) to participants' estimated resting metabolic rates to identify participants who underreport. The proportion of participants who underreport was much higher than in previous surveys, suggesting increased influence of psychosocial and behavioral factors (2013). Even minor reporting errors can produce large discrepancies in energy intake calculations based on self-reported data collection methods (Subar et al., 2015 & Johnson, 2002). While self-reporting methods have inherent limitations, they are often the best option available for research studies because they are inexpensive and easy to administer.

Food Charts and Weighed Food Records

Other methods of collecting dietary intake information in a healthcare setting include food record charts and weighed food records. Food record charts require trained personnel to record which menu items the patient received and how much they ate of each. This method requires trained personnel as they must calculate the macronutrient composition of the meal using their record. Maunder et al. refer to weighed food records as the "gold standard for the collection of dietary intake data" (2021). This collection method requires all items on the meal tray to be weighed before delivery and after consumption to calculate intake.

Both food record charts and weighed food records have their drawbacks. Food record charts are not reliable as staff can easily misclassify items on meal trays, miss information, or not record information (Maunder et al., 2021). Weighed food records are labor and time-intensive, which is not feasible for a fast-paced healthcare setting, like a hospital (Maunder et al., 2021). Palmet et al. researched the nutritional intake of patients in a hospital by comparing weighed food records with food charts completed by healthcare personnel who have never received intake documentation training (2015). These findings suggested that the food record charts completed

by untrained staff may not accurately measure patient nutrient intake. To accurately measure patients' dietary intake, healthcare personnel may require regular training on dietary intake collection methods.

Visual Estimation Methods

Several researchers have examined other methods of dietary intake collection and the reliance on healthcare personnel estimations. The visual estimation method is used by healthcare personnel in hospitals worldwide. It requires staff to visually estimate how much of a patient tray was consumed by examining the waste on the plate (Heighington-Wansbrough & Gemming, 2022). Hospital staff, typically nurses and nursing assistants, routinely visually estimate patient intake at the bedside (Kawasaki et al., 2016). A variation of the visual estimation method is the five-point visual scale system, which is used in many healthcare settings (Maunder et al., 2021). The five-point visual scale system allows healthcare personnel to visually estimate how much of a meal tray was consumed using percentages (0%, 25%, 50%, 75%, or 100%). An 11-point visual scale (0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, or 100%) is also commonly used (Kawasaki et al., 2016). While the visual estimation methods are time efficient as clinical staff can quickly estimate patients' intake, there are several limitations to these methods including under and overreporting.

In skilled nursing facilities, recording dietary intake is usually the responsibility of certified nursing assistants (CNAs). In nursing homes, CNAs provide hands-on care and assist residents with completing activities of daily living (Sengupta et al., 2010). Simmons and Reuben compared different methods of dietary intake collection by CNAs in a nursing home (2015). The current practice, at the nursing home, requires CNAs to collect dietary intake information by visually estimating the amount of food that was eaten on residents' food trays. In this study, there

were several barriers to the visual estimation method's success. Simmons and Reuben state that high nursing home staff turnover rates and failed training interventions for behavior change in CNAs are responsible for inconsistent and inaccurate meal documentation (2015). In inpatient settings, including hospitals, visual estimations are the responsibility of nursing staff, nursing assistants, and dietitians (Heighington-Wansbrough & Gemming, 2022 & Kawasaki et al., 2016). Nursing staff and nursing assistants visually estimate patients' dietary intake as a routine part of patient care, while dietitians examine the detailed dietary intake of patients identified to be at nutrition risk (Kawasaki et al., 2016).

Overall, the validity and accuracy of visual estimation methods are difficult to assess. Using these methods, healthcare personnel can significantly overestimate or underestimate how much of the meal tray was consumed. Additionally, visual dietary intake estimations are often recorded in the electronic medical record at a later time and rely on memory. This lapse in time from measurement to charting can impact the validity of the method as it is reliant on the clinical staff's short-term memory (Castellanos & Andrews, 2002). Kawasaki et al. examined the criterion validity of the visual estimation method used when determining patient meal intake in a clinical setting. They compared weighed food records of 412 meal trays to the nursing assistant and dietitians' visual estimations of the trays. The researchers found that the weighed food records and visual estimations of the meal trays were highly correlated, however, the healthcare personnel were more likely to overestimate how much food was left on the trays (2016). The time delay between making the visual estimation and documenting it in the patient chart introduces issues with assessing validity.

Photography Methods

Simmons and Reuben also investigated a dietary intake assessment method that utilized photography. 'Before' and 'after' photos were taken of every meal tray and a trained evaluator estimated the amount the resident ate by comparing the two photos (2015). Rollo et al. also examined image-based data collection methods. Like Simmons and Reuben, they analyzed the 'before' and 'after' images. Rollo et al. also discussed how the analysis can either be automated, semi-automated, or manual (2016). Manual analysis, the method that was utilized in Simmons and Reuben's study (2015), is challenging due to the need for a trained analyst. The automated and semi-automated analysis techniques use computer vision techniques, sometimes with the assistance of a manual user. Image-based collection methods have the potential to reach large populations because of their accessibility. When combined with existing methods they may reduce misreporting because images capture foods commonly left out of intake records due to the social desirability bias and other factors (Rollo et al., 2016). However, more research is needed to evaluate the reliability and accuracy of these methods in estimating nutrient intake.

Validity and Reliability of Assessment Methods

Validity is the extent to which a measurement or assessment method can measure what it is supposed to. Reliability assesses the consistency of a measure (Heale & Twycross, 2015). Determining the validity and reliability of dietary intake assessment methods is challenging. The doubly labeled water technique is referred to as the "gold standard method to assess the validity of energy intake data post hoc" (Gemming et al., 2013). The doubly labeled water method is based on the theory that two isotopes are eliminated from the body differentially after a dose of doubly labeled water. The two isotopes, deuterium and oxygen-18, are eliminated from the body as water as carbon dioxide and water. Carbon dioxide production and resting energy expenditure can be calculated by subtracting deuterium from oxygen-18. Although effective in validating

energy intake, this method is often not feasible. The doubly labeled water technique is expensive, requires specialized equipment, and must be analyzed in a lab (Newberry & Costello, 1997).

Another approach to assessing the validity of dietary intake collection methods requires a reference method to compare the test method. The two methods must be independent of each other. Lombard et al. use the example of comparing a food frequency questionnaire that relies on the patient's memory and a weighed food record, which does not rely on memory (2015). There are limitations to this approach; poor validity of the test method may be related to errors in the reference method.

A third method, typically the doubly labeled water technique or biomarkers, can be compared to the test and reference methods to measure error. However, this is costly and not practical in a healthcare setting. When dietary intake data is produced using the test and reference methods, different statistical tests can be used to interpret the validity of the test methods. Statistical tests include Pearson correlation coefficients, Spearman rank correlated coefficients, and Bland-Altman analyses. There is currently no consensus on the best statistical method for measuring the validity of dietary intake methods as each statistical method measures a different facet of validity. Theoretically, multiple statistical tests that measure different facets of validity could be beneficial in assessing validity, however, it may be difficult to differentiate between the results of the different tests (Lombard et al., 2015 & Masson et al., 2003).

Foster et al. measured the reliability of an assessment tool titled, “Intake24”. Intake24 is an online dietary intake assessment tool, based on the multiple-pass 24-hour recall. The researchers compared Intake24 responses to interviewer-led recalls. Participants were asked to complete the Intake24 tool on four days across a 10-day span They assessed the “test-retest reliability of a single recall and reliability of a single-repeat recall” (2019). Intra-class

correlations and 95% confidence intervals were calculated for both methods. The intra-class correlation measures the association within a class of data (Liljequist et al., 2019). The reliability of the methods was classified based on the confidence intervals and intra-class correlations. The researchers also used the Bland & Altman method to assess the agreement between the different recalls.

The intra-class correlation demonstrated poor to moderate agreement in nutrient intakes. The researchers found that the intraclass correlation for the repeatability "of a single recall is lower than for two recalls", which illustrates large intra-individual variation (Foster et al., 2019). Foster et al. suggest that the results of multiple recalls be collapsed into pairs for reliability to be tested (2019). The Bland-Altman analysis demonstrated good agreements between paired recalls (1 and 2; 3 and 4) for kilocalories and macronutrients. Generally, assessing the reliability of dietary intake is very complicated due to the daily variation in eating patterns and food intake (Foster et al., 2019).

Feasibility and Implementation of Assessment Methods

The feasibility of various dietary intake assessment methods has been assessed in several studies. DeBiasse et al. evaluated the feasibility of 24-hour recalls and food frequency questionnaires among women with low socioeconomic status (2018). The participants in this study were recruited from the adult cohort of a parent trial. Participants were enrolled in this study after home visits by research staff. To assess the feasibility of the assessment methods, DeBiasse et al. noted if the participants were home and willing to complete the interviews, the number of contacts with the participant needed to complete each assessment, the participant's responses to the home visits, and the dates and times of each interview (2018). DeBiasse et al.

suggested that both the 24-hour recall and food frequency questionnaire could be feasible for participant contact and retention in research in a similar population (2018).

Subar et al. examined the feasibility of a web-based, automated self-administered 24-hour dietary assessment tool (ASA24) in large-scale research (2020). American Association of Retired Persons (AARP) members in Pittsburgh, Pennsylvania were invited to enroll in the study. 1,110 participants enrolled and were provided with login information to the study website, where they were prompted to complete the ASA24 and other dietary intake assessment methods. Subar et al. requested participants to complete six separate recalls and measured their response rates and the number of contacts to prompt the participants to complete the recalls (2020). The ASA24 was found to be highly feasible in large-scale nutrition research (Subar et al.., 2020).

Prinz et al. examined the feasibility and validity of a photo-based dietary assessment method compared to a weighed food record (2019). 66 participants were enrolled in the study and were taught how to use the Nutritional Tracking Information Smartphone (Nutris-Phone). Participants used the Nutris-Phones and weighed food records to document their meals and calculate energy intake. In this population, Prinz et al. found that the feasibility of the photo-based dietary record compared to the hand-written weighed record was positive (2019).

Bedside Documentation

Overall, there are opportunities for advancement in dietary intake collection methods in hospital settings. The research shows that the current methods have several benefits and limitations. The current methods require highly trained personnel for nutrient analysis, they are susceptible to underestimation and overestimation, and place a large burden on patients and healthcare personnel. The burden placed on patients and clinical staff arises from relying on short-term memory to recall dietary intake data. A study conducted by Castellanos and Andrews

demonstrated that dietary intake data immediately recorded in the electronic medical record are slightly more accurate than dietary intake data that were delayed in recording (2002). Castellanos and Andrews state that the delay in recording patient intake data from meal tray clearance “may be a substantial contributor to food intake estimation errors” (2002).

Additionally, Carlson et al., examined the effects of a workshop on wheels (WOW) on electronic medical record documentation timeliness (2010). The WOW is an example of point-of-care technology used at the bedside. The WOW was compared to the standard personal computer (PC) in hospital settings. The researchers found that the WOW yielded more timely data entry than the PCs. Using the WOW, vital signs data was entered into the electronic medical record within one hour 27% more often than when using the PC (Carlson et al., 2010). While this study examined the effects of point-of-care technology on vital signs documentation timeliness, it can be applied to other aspects of patient care, including meal documentation.

To minimize the burden placed on clinical staff when delaying the recording process of dietary intake data, the nurses could chart at the patient’s bedside. Bedside documentation, or point-of-care documentation, allows healthcare personnel to record patient data in the electronic medical record at the patient’s bedside. This documentation method allows staff to interact with patients while charting (Graham et al., 2018). Healthcare personnel will not have to rely on their memory when recording dietary intake if bedside charting. Technology has rapidly advanced and has greatly impacted healthcare settings, including the use of electronic medical records (Langley-Evans, 2023). Using new technology and bedside charting, healthcare personnel can increase dietary intake documentation.

Summary

Inaccurate dietary intake data can hinder healthcare professionals' recognition of malnutrition, which is associated with many negative health outcomes (Maunder et al., 2021). Hospital malnutrition is associated with longer lengths of stay, increased morbidity and mortality, and requires more aggressive nutrition care (Cass & Charlton, 2022). Evidence also suggests that malnourished patients incur greater hospitalization costs due to longer lengths of stay, hospital readmissions, and increased usage of hospital resources (Argwhal et al., 2013). Assessing and documenting dietary intake data is critical to identify patients at risk for malnutrition. This project will examine a new dietary intake documentation method in a hospital setting, utilizing a point-of-care technology device.

PROJECT METHODOLOGY AND DESIGN

Design and Methodology

This project is a feasibility study that aims to provide in-service training on a point-of-care meal intake documentation method at Inova Alexandria and measure its effects.

Intervention Design

The nursing manager of unit 25 suggested that the training for the new documentation method be presented at two separate staff meetings, the unit 25 monthly Unit Based Council (UBC) meeting and the monthly clinical technician council. Both meetings are typically held virtually, over Microsoft Teams, to maximize clinical staff participation. Most clinical technicians and nurses at IAH work three 12-hour shifts each week, with some staff working overnight. Holding the meetings over Microsoft Teams allows staff to participate if they are not physically at the hospital. The information presented at the staff meetings is delivered through a PowerPoint presentation created by the nursing manager. It was determined that the most effective way to deliver the documentation training information was through a PowerPoint

presentation so that the documentation training PowerPoint slides could be added to the end of the staff meeting PowerPoint slides.

Presentation slides were created that focused on the importance of accurate dietary intake documentation, evidence intaking the current method is ineffective, and evidence supporting that the proposed method of documentation is more effective. Also included in the presentation was a step-by-step tutorial on how to use the Welch Allyn Connex spot monitors to document meal intake data. Time was reserved for questions after the presentation.

Designing the presentation in this order allowed the presenter to explain why meal intake documentation is important, specifically in clinical settings where malnutrition is a common problem, before introducing the new method. Comparing the old method to the new method also highlighted the efficiency of the new method, since it utilizes a device that clinical technicians and nurses use multiple times each day. By ending the presentation with a step-by-step tutorial on how to use the Welch Allyn Connex spot monitor to document meal intake data, the clinical staff were able to learn exactly how to use input dietary intake data using the same device they are already using multiple times each day. The training slides can be referenced in Appendix A.

Intervention Implementation

The training slides were presented to clinical technicians and nursing staff at two separate meetings in May and June 2024. The slides were shared at the first meeting, the unit 25 monthly UBC meeting, on May 15, 2024. The nursing manager of unit 25 runs the monthly UBC meetings with various clinical staff who work on unit 25, including clinical technicians and registered nurses. Several topics are covered, and announcements are shared during the monthly UBC meetings. The training slides reviewing the new meal intake documentation method were

presented at the end of the May UBC meeting and subsequently shared in the Unit 25 Microsoft Teams channel.

The slides were also presented at the monthly clinical technician council meeting on June 3, 2024. The clinical technician council meetings are also run by the nursing manager and two clinical technicians from each unit in the hospital attend and serve as their unit's representatives. Different topics are covered in these meetings and the clinical technician representatives are expected to disperse the information to their respective units. The training slides were presented at the end of this meeting and shared in the clinical technician council Microsoft Teams channel. The clinical technician representatives were expected to relay the information covered in the training slides to their respective units.

Data Collection

Data were collected at three time points, using the same selection methods. Three units, 21, 23, and 25, were selected to collect meal intake documentation. Ten patients with a length of stay of at least three days were selected from each unit. The patients were excluded if the length of stay was less than three days, or if the patient had enteral or parenteral nutrition orders in the electronic medical record. Patients with nothing-by-mouth (NPO) diet orders and no enteral or parenteral nutrition orders were included. The clinical staff is expected to document "NPO" in the meal intake section of the electronic medical record, so patients with NPO diet orders were included in the data collection. The researcher recorded the number of meals documented in the electronic medical record over three days, for each patient.

Pre-intervention data was collected on May 9, 2024. During the pre-intervention data collection, the researcher recorded the frequency of documented meals from May 7 to May 9.

The frequencies were averaged on each unit and across all thirty patients. The first post-intervention data collection took place on June 10, 2024, one week after the presentation during the clinical technician council. The researcher recorded the frequency of documented meals from June 8 to June 10. The frequencies were averaged on each unit and across all patients, to be compared to the pre-intervention averages. The second post-intervention data collection was conducted on July 1, 2024, four weeks after the presentation at the clinical technician council. The researcher recorded the frequency of documented meals per patient from June 29 to July 1.

Data were entered into Microsoft Excel. Average meal documentation over three days was calculated for each unit and across all patients at each timepoint, pre-intervention, one-week post-intervention, and four weeks post-intervention. The pre-intervention mean across all patients was compared to both post-intervention means using an independent t-test. Six additional independent t-tests were run to compare the pre-intervention data set with both post-intervention data sets, within each unit. A single-factor analysis of variance (ANOVA) was run in Excel to compare differences between units at each timepoint (pre-intervention, first post-intervention, and second post-intervention). Post hoc analyses (pairwise comparisons between units) were run to determine where the difference between units occurred.

SUMMARY OF OUTCOMES, DISCUSSIONS, AND RECOMMENDATIONS

Project Outcomes and Results

Pre-intervention Data

Pre-intervention data from Saturday, May 7 to Monday, May 9, 2024, were collected on May 9. Each unit's average meal documentation frequency over three days was calculated

and broken down into average daily meals per patient. The pre-intervention data is presented below in Table 1.

Table 1. Average Meal Documentation Frequency at IAH Before Training Intervention: May 7 to May 9, 2024.

	Pre-Intervention	
Hospital Unit	**3-day average number of recorded meals per patient (maximum = 9)**	**3-day average number of recorded meals per patient per day (maximum = 3)**
Unit 21	4.2	1.4
Unit 23	6.5	2.17
Unit 25	2.3	0.76
All Units (21, 23, 25)	4.33	1.44

From May 7 to May 9, unit 21 averaged 4.2 meals documented per patient. This equates to 1.4 meals documented per patient, per day. Unit 23 averaged 6.5 meals documented per patient over these three days, equaling 2.17 melas documented per patient per day. Unit 25 averaged 2.3 meals documented per patient over these three days. This equals 0.76 meals documented per patient per day. Across all three units, the average meal documentation frequency was 4.33 meals documented per patient, between May 7 and May 9. This equals 1.44 meals documented per patient per day.

Post-intervention Data

The first post-intervention data collection was conducted one week after the training, on June 10, 2024, and included data from Saturday, June 8 to Monday, June 10. The one-week post-intervention average meals per patient and average per patient per day are presented in Table 2, below.

Table 2. Average Meal Documentation Frequency at IAH One Week After Training Intervention: June 8 to June 10, 2024.

	One-Week Post-Intervention	
Hospital Unit	**3-day average meals number of meals recorded per patient (maximum = 9)**	**3-day average number of recorded meals per patient per day (maximum = 3)**
Unit 21	5.44	1.81
Unit 23	7.78	2.59
Unit 25	5.1	1.7
All Units (21, 23, 25)	6.07	2.02

On June 10, units 21 and 23 only had nine patients that met the inclusion criteria (length of stay greater than or equal to three days and no enteral or parenteral nutrition orders). The meal documentation averages on units 21 and 23 reflect the nine patients included in the dataset. Unit 21 averaged 5.44 meals documented per patient from June 8, 2024, to June 10, 2024. This equals 1.81 meals documented per patient per day. Unit 23 averaged 7.78 meals documented per patient over these three days, which equates to 2.59 meals documented per patient per day. From June 8 to June 10, unit 25 averaged 5.1 meals documented per patient. This equals 1.7 meals documented per patient per day. Across all units, the average meal documentation frequency over the three days was 6.07 meals per patient, which equals 2.02 meals per patient per day.

The second post-intervention data collection was conducted on July 1, 2024, four weeks after the training presentation, and included meals documented between Saturday, June 29, and Monday, July 1. The second post-intervention data set is presented below in Table 3.

Table 3. Average Meal Documentation Frequency at IAH Four Weeks After Training Intervention: June 29 to July 1, 2024.

	Four-Week Post-Intervention	
Hospital Unit	**3-day average number of recorded meals per patient (maximum = 9)**	**3-day average number of recorded meals per patient per day (maximum = 3)**
Unit 21	2.8	0.93
Unit 23	6.4	2.13
Unit 25	3.1	1.03
All Units (21, 23, 25)	4.1	1.37

Unit 21 averaged 2.8 meals documented per patient over these three days, which equals 0.93 meals documented per patient per day. Unit 23 averaged 6.4 meals documented per patient from June 29 to July 1, equaling 2.13 meals documented per patient per day. Over three days, unit 25 averaged 3.1 meals documented per patient. This equals 1.03 meals documented per patient per day. Across all three units, the average meal documentation frequency over three days was 4.1 meals per patient, which equals 1.37 meals documented per patient per day.

Statistical Analyses

An independent t-test was run comparing the mean meals documented before the training to the mean meals documented one week after the training, across all units. Additional t-tests were run comparing the unit mean meals documented before the training to the mean meals documented one week after the training. Table 4, below, shows the independent t-test results comparing the pre-intervention data with the one-week post-intervention data.

Table 4. Independent Samples t-test Comparing Pre-Intervention Meal Documentation Frequency to One-Week Post-Intervention Meal Documentation Frequency at IAH Results.

Hospital Unit	Mean Number of Meals Documented Before Training Over 3 Days (±SD)[a]	Mean Number of Meals Documented 1-Week After Training Over 3 Days (±SD)[a]	Mean Difference[b] (post-pre)	P-Value
Unit 21	3.9 (±4.6)	5.1 (±9.6)	1.2	0.4
Unit 23	6.7 (±9.5)	7.3 (±2.2)	0.6	0.6
Unit 25	2.1 (±2.4)	5.0 (±6.0)	3.9	0.005
All Units	4.3 (±8.1)	6.1 (±7.3)	1.8	0.02

[a]Reported values are means ± standard deviation. [b]Mean differences according to an independent samples *t-test*, slight differences may be noted from the preceding columns due to rounding.

In unit 21, the mean number of meals documented before training was 3.9 (±4.6) and the mean number of meals documented after training was 5.1 (±9.6). The mean difference between the two time points was 1.2. The p-value was 0.4. In unit 23, the mean meals documented before training was 6.7 (±9.5) and the mean meals documented after training was 7.3 (±2.2). The mean difference between the two time points, on unit 23, was 0.6. The p-value was 0.6. In unit 25, the mean meals documented before training was 2.1 (±2.4). The mean number of meals documented after the training was 5.0 (±6.0). On unit 25, the mean difference between the time points was 3.9. The p-value was 0.005. Across all units, the mean number of meals documented before training was 4.3 (±8.1). The mean number of meals documented after the training was 6.1 (±7.3) and the mean difference between the time points was 1.8. The p-value was 0.02.

Additionally, independent t-tests were run to compare the mean number of meals documented before the training to those documented four weeks after the training, across all

patients. For each unit, additional independent t-tests were run to compare the mean meals documented before the training to those documented four weeks after the training. Table 5 summarizes the independent t-test results, comparing the pre-intervention data with the four-week post-intervention data.

Table 5. Independent Samples t-test Comparing Pre-Intervention Meal Documentation Frequency to Four-Week Post-Intervention Meal Documentation Frequency at IAH Results.

Hospital Unit	Mean Number of Meals Documented Before Training (±SD)[a]	Mean Number of Meals Documented 4 Weeks After Training (±SD)[a]	Mean Difference[b]	P-Value
Unit 21	3.9 (±4.6)	2.6 (±3.5)	-1.3	0.2
Unit 23	6.7 (±9.5)	6.4 (±2.0)	-0.3	0.8
Unit 25	2.1 (±2.4)	3.3 (±9.0)	1.2	0.3
All Units	4.3 (±8.1)	4.1 (±7.1)	0.2	0.7

[a]Reported values are means ± standard deviation. [b]Mean differences according to an independent samples *t-test*, slight differences may be noted from the preceding columns due to rounding.

The mean number of meals documented before the training, in unit 21, was 3.9 (±4.6). The mean number of meals documented four weeks after the training was 2.6 (±3.5). On unit 21, the mean difference between the two time points was -1.3. The p-value was 0.2. In unit 23, the mean meals documented before the training was 6.7 (±9.5) and the mean meals documented four weeks after the training was 6.4 (±2.0). The mean difference between the two time points was -0.3. The p-value was 0.8. In unit 25, the mean meals documented before the training was 2.1 (±2.4). The mean number of meals documented four weeks after the training was 3.3 (±9.0) and the mean difference between the time points was 1.2. The p-value was 0.3. Across all three units, the mean number of meals documented before the training was

4.3 (±8.1). The mean number of meals documented four weeks after the training was 4.1 (±7.1). The mean difference between the time points was 0.2 and the p-value was 0.7.

Single-factor ANOVAs examining the variance between units at each time point were also run in Excel. The summary table and ANOVA for the pre-intervention data are presented in Table 6, below.

Table 6. Pre-intervention One-Way Analysis of Variance (ANOVA) of Meal Documentation Frequency at IAH.

Source of Variation	df	F	P-Value
Between Groups	2	8.2	0.002**
Within Groups	27		

*p≤0.05, **p≤0.01, ***p≤0.001

$F(2,27) = 8.2$, $p = 0.002$. The p-value between groups was 0.002, indicating that a statistically significant difference was detected between groups. A pairwise comparison post hoc analysis demonstrated a significant difference between units 23 and 25 ($p = 0.001$).

The summary table and ANOVA examining the variance between units 21, 23, and 25 at the one-week post-intervention time point is presented below in Table 7.

Table 7. One-week post-intervention One-Way Analysis of Variance (ANOVA) of Meal Documentation Frequency at IAH.

Source of Variation	df	F	P-Value
Between Groups	2	2.5	0.1
Within Groups	25		

*p≤0.05, **p≤0.01, ***p≤0.001

F(2,25) = 2.5, p = 0.1. The p-value between groups was 0.1, which indicates the difference between groups is not statistically significant.

Below, is the four-week post-intervention ANOVA and summary table, Table 8.

Table 8. Four-week post-intervention One-Way Analysis of Variance (ANOVA) of Meal Documentation Frequency at IAH.

Source of Variation	df	F	P-Value
Between Groups	2	8.5	0.002**
Within Groups	27		

*p≤0.05, **p≤0.01, ***p≤0.001

F(2,7) = 8.5, p = 0.002. The p-value between groups was 0.002, indicating that a statistically significant difference was detected between groups. A pairwise comparison post hoc indicated a statistically significant difference between units 21 and 23 (p = 0.0001) and between units 23 and 25 (p = 0.006).

Participant Feedback

Following the training presentation, there was time for questions and comments from the participants. No participants had questions after the presentations at the Unit 25 UBC meeting and the clinical technician council meeting. At the end of the presentation at the clinical technician council, the nursing manager asked participants if they knew how to document meal intakes via the Welch Allyn Connex Spot Monitor. Two participants responded and said they did not know.

Project Outcomes and Results Analysis

The independent t-test comparing the pre-intervention mean to the one-week post-intervention mean showed a statistically significant increase in meal documentation (p =

0.02). This suggests that the training presentation was effective in the short term. The independent t-test comparing the pre-intervention mean to the four-week post-intervention mean did not show a statistically significant difference in meal documentation ($p = 0.74$). This suggests that adopting the new documentation method was not sustained over the four weeks that followed.

Following the second training session, there were no follow-up reminders about using the new documentation method. The presentation PowerPoint slides were shared in the respective Microsoft Teams channels. There was no way to determine if the healthcare professionals, who did not attend the meetings ever referenced the Teams channels to review the new documentation method instructions. Additionally, the second presentation was delivered at the clinical technician council meeting, where there were two representatives from each unit. The representatives are expected to share the information received at the council meeting with the rest of their respective units. In this project, there was no follow-up with the clinical technicians from each unit to confirm they received the information shared at the meeting.

Unit 25 showed the greatest increase in meal documentation one week after the training session ($p = 0.006$). The increase in documentation frequency, one week after the training session, in units 21 ($p = 0.33$) and 23 ($p = 0.29$) was not statistically significant. Comparing the pre-intervention documentation frequency with the four-week post-intervention frequency, there was an increase in documentation in unit 25, but it was not statistically significant ($p = 0.46$). The nursing manager of unit 25 was the only nursing manager involved in the training sessions, which could have impacted the adoption of the new documentation method by unit 25. Leadership support is crucial for organizational

improvement efforts in hospital settings (Thor et al., 2016). Unit 25 may have seen a significant increase in meal documentation frequency one week after the training session because a leader in unit 25 was involved in the improvement efforts. The training PowerPoint was also presented at the Unit 25 May UBC meeting before the clinical technician council. Nursing staff and clinical technicians in unit 25 received the information twice, compared to the other units, which received the information only once.

The short-term increases in meal documentation frequency, seen across all patients and in unit 25, were both statistically significant and practically significant. When developing this project with the nutrition team at Inova Alexandria, no expected increase in frequency was specified. The nutrition team commented that meal documentation frequency had been sparse between December 2023 and May 2024. The team was hopeful for any increase in meal documentation, which was observed one week following the intervention.

The ANOVAs showed differences in meal documentation frequency between the three units at the time of the pre-intervention data collection ($p = 0.0017$) and four weeks post-intervention ($p = 0.001$). Post hoc pairwise comparisons were conducted and revealed differences between unit 21 and unit 25 at the pre-intervention timepoint ($p = 0.001$). An additional post hoc pairwise comparison demonstrated differences between units 21 and 23 ($p = 0.0001$) and between units 23 and 25 ($p = 0.006$) at the four-week post-intervention time point. There was no difference in meal documentation frequency one week following the training session ($p = 0.106$). At Inova Alexandria Hospital, units 21 and 23 are low-acuity units. Unit 25 is the intermediate care unit (IMCU), which has a higher acuity than units 21 and 23. Intermediate care units are also referred to as step-down units and are for patients whose illness requires less staffing and monitoring equipment than that in an ICU (Wagner &

Hardin-Pierce, 2014). Patients who require more support than a standard unit, but less support than in an ICU are placed in the intermediate care unit. Nursing staff in high acuity units are expected to constantly monitor the patients and look for changes (Wagner & Hardin-Pierce, 2014). The difference in acuity levels could explain the differences in meal documentation frequency between units 21 and 25 before the training presentation was delivered.

Implications, Impacts, and Recommendations

Strengths and Limitations

There were several strengths of this project. First, this project enabled the development of training materials for the new documentation method. The information about the new documentation method reached a large group of clinical staff through the two training sessions. Fifteen participants from various units and five registered nurses from unit 25 received the new documentation method instructions. Presenting the training at the clinical technician council allowed the information about the new method to be shared across all hospital units, not just the units being evaluated through this project.

Additionally, there were a few limitations of this project. Data collection, at each time point, occurred on Mondays. The two days leading up to the date of collection and the date of the collection were examined when evaluating the number of meals documented. Because data was collected on Mondays, the two days leading up to the date of collection were weekend days. Although clinical staff are trained to document meal intake data regardless of the day, the weekend could have impacted the documentation frequency. Hospital staffing is generally lower over weekends compared to weekdays, which could create an increased workload for staff (Becker, 2007). Also, three days of data may not have been sufficient for examining the documentation frequency in the three patient care units.

Additionally, it was not feasible to follow the same group of healthcare personnel and patients throughout this project. It is unknown if the same group of healthcare personnel who attended the training presentations were working on the days leading up to the data collection dates. Finally, the information was presented at Unit 25's monthly UBC meeting, in addition to the clinical technician council meeting. The training PowerPoint was not presented at monthly meetings for units 21 or 23, which could have negatively impacted the adoption of the new method in these units.

Recommendations

The limitations of this project identified several factors to consider in the future. Following the training sessions, more frequent audits of medical charts would be beneficial to examine the weekly change in documentation habits. Chart audits should also be conducted on different days throughout the week. In this feasibility study, the audits were conducted only on Mondays. Audits should be performed on different days throughout the week and documentation frequency can be compared between different days of the week. The results of this project also highlight a need for ongoing training about the new documentation method. The results indicated a significant increase in meal documentation one week after the training materials were presented to the clinical technicians at the clinical technician council. No difference was seen between the pre-intervention and four-week post-intervention data. The short-term increase in meal documentation was not a sustainable change.

In the future, the training about the new documentation method should be presented at the monthly UBC and clinical technician council meetings. The training PowerPoint slides should be presented at other units' monthly meetings, in addition to the Unit 25 meetings. Nursing managers from each unit should also be informed and involved in the training, to

ensure their staff is following the new documentation method. The instructions for documenting meal intake data following the new method could be printed and posted in the nurses' station on every unit. By presenting the training in future monthly meetings and posting the instructions in the nurses' stations, the information will reach all healthcare personnel, not just those who attended the two meetings at the time of this project. As time goes on, the full training presentation may not be necessary, but a note about the new documentation during the monthly meetings would be a helpful reminder to healthcare personnel.

Dissemination Plan

The training materials were shared in both the Unit 25 and the Clinical Technician Council Microsoft Teams channels. The presentation slides will remain in the Microsoft Teams channels for the healthcare personnel to reference when needed. In the future, the training PowerPoint slides will be used in additional meetings. The results of this project were shared with the nutrition team at Inova Alexandria verbally and via a presentation. The results were also shared, via email, with the nursing director of unit 25.

Conclusion

Across all three units, short-term adoption of the new documentation method was seen one week after the second training session. No increase was seen when comparing the four-week post-intervention documentation frequency to the pre-intervention documentation frequency, across all units. There were differences between the units at the pre-intervention and four-week post-intervention time points, which could be explained by the differences in acuity between the units. Short-term adoption of the new method could be attributed to the fact that the information was presented one week before the first post-intervention data

collection. The adoption of the new method was not sustained over four weeks, which could be attributed to there being no reminders about the new documentation method, either in person or via Microsoft Teams. Although no increase in documentation frequency was seen at the four-week post-intervention time point, several recommendations for future work were identified. More frequent chart audits, training presentations, and reminders will be implemented in the future, to ensure healthcare personnel are following the new meal intake documentation method utilizing the Welch Allyn Connex Spot Monitor.

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APPENDIX

Appendix A. PowerPoint Presentation Training Slides

Using the Welch Allyn Connex Spot Monitor to Document I/O Data

Allison Gause, Virginia Tech Dietetic Intern

1

Importance of Meal Intake Documentation

- Estimated energy intake is one of the six criteria for malnutrition.[1]
- Accurate meal intake documentation allows dietitians to track patients' intake over the hospital course and diagnose patients with malnutrition.[2]
- Inadequate oral intake is a common problem in hospitalized patients.
  - Inadequate nutritional intake can lead to increased complications.[2, 3]

2

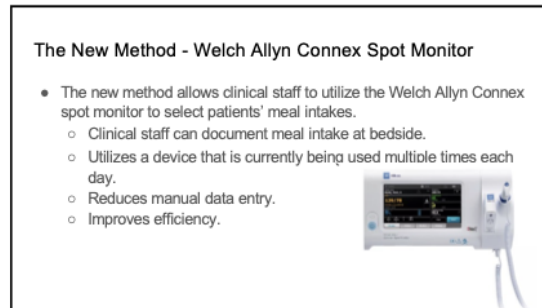
The Current Method

- Clinical technicians manually input meal intake data into the EMR while charting.
  - Can be charted at a later time.
  - Rely on memory.
  - Data can easily be left out.
- Malnutrition diagnoses can be missed without accurate nutritional intake data.

3

The New Method - Welch Allyn Connex Spot Monitor

- The new method allows clinical staff to utilize the Welch Allyn Connex spot monitor to select patients' meal intakes.
  - Clinical staff can document meal intake at bedside.
  - Utilizes a device that is currently being used multiple times each day.
  - Reduces manual data entry.
  - Improves efficiency.



4

Using the Welch Allyn Connex Spot Monitor

1. Clinician scan in.
2. Scan patient's wristband.
3. Select "spot".
4. On the "home" tab, click on IO.
5. Select the percent of meal consumed (0%, 25%, 50%, 75%, or 100%).
6. Hit next.
7. Hit save.

5

Thank you!

Questions?

6