Assessment of the Nutrition Care Process in U.S. Hospital using a Web-based Tool

Demonstrates the Need for Quality Improvement in Malnutrition Diagnosis and Discharge Care

Running title: Web-based data supports the need for quality improvement in malnutrition diagnosis and discharge care

Christina L. Sherry, Abby C. Sauer, Kathleen E. Thrush

Corresponding Author: Christina L. Sherry; email: christina.sherry@abbott.com

Footnotes

1Abbott Nutrition, Scientific and Medical Affairs, 2900 Easton Square Place, Columbus, OH 43219

2Financial support: This project was supported by Abbott Nutrition

3Conflict of Interest: Authors are employees of Abbott Nutrition

4Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>EHR</td>
<td>Electronic Health Record</td>
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<tr>
<td>QI</td>
<td>Quality Improvement</td>
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<td>RDN</td>
<td>Registered Dietitian Nutritionist</td>
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Abstract

Background Malnutrition in hospitalized patients is a pervasive problem in the U.S. Despite being acknowledged as a concern for over 40 years, it has not been well addressed with a systematic, process improvement approach.

Objective This project characterized the current nutrition care process in U.S. hospitals to establish a baseline for improvements. Additionally, it demonstrated the application of a web-based quality improvement tool as a simple approach to address hospital malnutrition.

Methods A web-based tool was established to measure and assess nutrition care practices from hospital electronic medical records. Individual institutions self-selected to participate and were assigned a unique ID to input data. Aggregated patient data was assessed from registered institutions. Data from all institutions was combined and presented as the totals for each variable.

Results Of the 243 registered users, 97 provided data and 150 reports were included in the analysis resulting in a total of 107,106 patients. Almost all (89.98%) patients were screened for malnutrition risk within 24 hours of admission and ~30% were found to be at-risk for malnutrition. Of those at-risk, ~65% received a RDN consult or order for an oral nutrition supplement. The rate of malnutrition diagnosis of those at-risk was ~14% and less than 10% of patients received a recommendation/prescription for an oral nutrition supplement at discharge.

Conclusions Malnutrition remains an issue for hospitalized patients; particularly the gap between those screened at-risk and diagnosed with malnutrition. Moreover, discharge recommendations for patients screened at-risk are also lacking. This data demonstrated that a web-based quality improvement tool could be used to capture the nutrition care practice at an
in institution level to provide directed approaches for addressing hospital malnutrition and improving care of patients at-risk of malnutrition

**Keywords** Malnutrition, quality improvement, nutrition care process, hospital patients
Introduction

Malnutrition continues to be a serious problem across healthcare settings, particularly in the hospital. At prevalence rates between 20-50% it remains a ‘skeleton in the hospital closet’ (1-3). Malnutrition contributes to a myriad of negative consequences, including increased morbidity and mortality, length of stay, complications, and readmission rates as well as decreased patient quality of life (3-8). This results in a significant economic burden on the healthcare system as hospital stays with malnutrition accounted for $42 billion in healthcare costs, patients with malnutrition had a 1.5-5 times higher proportion of in-hospital deaths, 2 times longer hospital stay and approximately 50-70% of patients did not have a routine discharge (9). Studies have shown that providing nutrition care through early and appropriate nutrition screening, assessment and intervention can improve outcomes in hospital patients, particularly high risk patient populations like older adults (10-13). One of the first noted studies in nutrition quality improvement (QI) was almost 20 years ago with Brugler’s comprehensive malnutrition study which found delays in identifying malnutrition and initiating a nutrition care plan for acutely ill patients. Therefore, a nutrition screening pilot was implemented, resulting in more high-risk patients receiving nutrition care (26% vs 37%) and the timeliness of intervention improved from 6.9 days to 3.4 days (14).

Recent studies have shown that nutrition QI initiatives can provide benefits to not only patient care but also financial outcomes for the institution by including early nutrition care into the nursing workflow (10), as well as using automation (11) and electronic health records (EHR) (15) to make improvements in nutrition supplement ordering. Meehan et al. employed an interdisciplinary QI team who developed a system utilizing nurses to screen patients’ nutritional status on admission and prescribe oral nutritional supplements for those at-risk for malnutrition.
(10). Improvements were seen in patients with ‘nutrition sensitive’ (as defined by the authors) diagnoses regarding length of stay, probability of readmissions and total hospital costs. A similar QI initiative from Sriram and colleagues included a basic and enhanced QI protocol to improve delivery of nutrition care to hospital patients. This QI protocol significantly reduced the relative risk of readmission and length of stay, which was more marked with the enhanced protocol that included discharge and post-discharge nutrition care (11). Finally, Citty et al. used a triangulated approach in their nutrition QI initiatives to evaluate both pre and post process changes utilizing medical record reviews, patient interview and assessment of formula room logs. Their goal was to redesign the ordering, administration and documentation of oral nutrition supplements resulting in significantly more patients being offered an oral nutrition supplement as well as the correct type, amount and frequency of nutritional products (15).

Although the research is limited, this data demonstrates the beneficial outcomes that can be seen from nutrition QI initiatives. Despite this, there has not been a wide scale assessment of U.S. hospital practices as it related to the nutrition care process outside of Patel’s 2012-13 survey data (16). This report used survey data collected from multidisciplinary health care professionals on current nutrition care practices in U.S. hospitals. They demonstrated there was good compliance with accreditation standards (at the time) in completing a nutrition screen within 24 hours of admission. However, challenges still existed in the use of validated screening tools, mechanisms for malnutrition coding and education for healthcare professionals around nutrition screening and assessment (16). U.S. hospitals are now utilizing EHR more broadly providing a systematic approach for the collection of nutrition data for QI initiatives. This report adds much needed U.S. based data on nutrition care processes, including screening, intervention, malnutrition diagnosis and discharge care for hospitalized patients to ultimately identify areas of
improvement for hospital processes and patient outcomes. The objective of this report was to assess the nutrition care in U.S. hospitals to determine what gaps may still exist while demonstrating the functionality of a web-based process to collect such data.

Methods

A web-based tool was developed in 2015 to measure and assess nutrition care practices in U.S. based hospitals. The tool was designed to collect aggregate process data and no patient level data was recorded in the system; therefore, Institutional Review Board approval was not required. The inclusion criteria for data were that patients were 18 years or older and admitted to the hospital, as well as access to EHR, and EHR data available on day one of admission. This tool was available to over 1,500 U.S. hospitals, 200 were targeted to be included in the program and 243 hospitals registered to participate. Therefore, the data collected are considered to be a convenience sample. In a non-probability sample, such as this, the tendency towards self-selection is high which introduces bias and violates the independence assumption of random sampling. For these reasons, the data presented in this paper are aggregated to a single measure per variable with descriptive analysis of the cohort data.

Registration was available to any U.S. hospital that had nutrition care incorporated into their EHR, and each hospital site was provided a unique registration code for the web-based system. After registration, aggregated hospital level data was abstracted from the EHR and entered into the web based tool (Table 1). Hospital sites were instructed to gather EHR data for each timeframe (monthly or quarterly) they chose to report data, and include the number of patients:

1. Admitted during this time frame
2. Who received a nutrition screening within 24 hours of admission or upon initial nurse screening

3. Identified not “at-risk” for malnutrition per screening tool

4. Identified as “at-risk” for malnutrition per screening tool

5. Who received an order for an oral nutrition supplement

6. Who received a registered dietitian nutritionist (RDN) consult

7. Who were diagnosed with malnutrition (as determined by each facility)

8. Who had a recommendation for an oral nutrition supplement in their discharge instructions

9. Who received a prescription of an oral nutrition supplement upon discharge

Hospital sites also had the option to provide data on the number of 30-day readmissions during this timeframe, as well as the number of patients with a documented fall and who developed a stage III or IV pressure ulcer; this optional data is not being reported in this manuscript.

Data was downloaded from the web-based tool in October 2015, March 2016 and July 2016. Data was electronically screened for exact duplicates. The remaining data was checked against the hospital site registration list to ensure all data to be analyzed was from registered hospital users and not test users. Next the data was reviewed independently by the authors (AS, CS, KT) for spurious, pseudo or mock data. Any data that did not reach independent consensus was reviewed and discussed for group consensus. After agreement, the data was reviewed to determine each entry was unique by eight characteristics of the data entries, including registration code, hospital name, hospital type, was a screening tool used, which tool used, was it the entire hospital or floor, which floor, was it the population and which sub-population. Data for each variable was combined across all reports and results are presented as totals for each
variable. In this manner, no measure of variability was obtained, due to the type of sampling scheme used.

**Results**

Over about 14 months (May 2015 to July 2016) 243 sites registered for the QI program with 97 unique sites inputting data which provided 150 reports that are included in the analysis (14 sites included more than one unique report) (Figure 1), contributing data from 107,106 patients. The overwhelming majority of the data is from community (58.8%) and teaching (38.1%) hospitals, with less than 5% from government (1.0%) and other (2.1%) institutions. The majority of these hospitals were located in the Northeast (37.6%) and South (33.1%).

Of those admitted during this data collection period, approximately 90% of patients received a nutrition screening within 24 hour of admission, and of those that were screened ~30% were found to be at-risk for malnutrition. For those patients screened at-risk, about two-thirds received a nutrition intervention in the form of a consultation with a RDN and/or an order for an oral nutritional supplement. Malnutrition diagnosis for those who were screened at-risk was 14%, which is over 4-times less than the nutrition intervention rate of ~65%. Upon discharge, less than 10% of patients who screened at-risk for malnutrition received a recommendation and/or prescription for an oral nutrition supplement (Table 2).

Over half of the hospitals were using a facility specific nutrition screening tool. All facility specific or other tools that were self-reported were considered to be non-validated. The remaining hospital sites reported using a validated screening tool, which in this data set include the mini-nutrition assessment (MNA), malnutrition screening tool (MST), malnutrition universal screening tool (MUST) and Nutrition Risk Screen (NRS)-2002; no sites reported using the NRS-
Figure 2). There were a similar number of patients screened within 24 hours between those using a validated vs non-validated tool (91.83% vs. 88.73%), and those using a validated tool had slightly more patients screen at-risk as compared to those using a non-validated tool (31.10% vs. 27.07%) (Figure 3A). Those using a non-validated tool had more consults for RDNs and more orders for oral nutrition supplements (73.34% vs 58.75% oral nutrition supplement order; 67.85% vs. 56.37% RDN consult) (Figure 3B). The malnutrition diagnosis of those screened at-risk with a validated tool was 3-times more than those screened with a non-validated tool (23.16% vs. 7.28%) (Figure 3B).

Discussion

Quality improvement is not new to health care, but it is not widely used in the nutrition. From the nutrition QI studies (10, 11, 14, 15, 17) conducted to date, it is clear that these types of initiatives improve patient care, reduce length of stay and hospital costs (11) and require an interdisciplinary approach and strong infrastructures (10, 11). This report focuses on gathering baseline data related to the current state of the nutrition care process in U.S. hospitals to help identify gaps in care and address areas of focus of nutrition QI initiatives. The strength of this data is in the number of patients, > 100,000 that contributed to the findings, as well as the national scope of the information. The primary limitations of this study were the restriction to discrete variables from the EHR and data collection from institutions who self-selected to contribute data. The latter may reflect the most optimal scenario as it can be hypothesized that these institutions are already “malnutrition aware” and working towards addressing malnutrition in their institutions.
This report demonstrates consistency with other studies (16) indicating that the prevalence of malnutrition risk is approximately 30%. Interestingly, data from Patel et al. and that reported here mirror each other in regards to nutrition screening rates in less than 24 hours (87.5% and 89.9%, respectively) and the use of a validated nutrition screening tool (38.5% and 41.2%, respectively) (16). The low adoption of a validated nutrition screening tool is surprising considering evidence from Skipper et al. supporting the use of validated tools and the wide availability of simple and easy to use validated tools (18). However, these data are similar to that examined by Eglseer et al. in Austrian hospitals which showed that in 53 hospitals with 5,255 patients only 21.2% (n=839) were assessed with a validated screening tool such as the MNA or MUST. Further, patients in departments using a validated screening tool received more interventions, including dietitian referrals, provision of energy-rich snacks between meals, and monitoring of nutritional intake (19). The data presented here highlights an area in the nutrition care process that can be explored further, particularly given the use of a validated screening tool was associated with a higher percentage of patients who were screened at-risk and diagnosed with malnutrition, but lower recommendations for RDN consult and orders for oral nutrition supplements. One could hypothesize that use of a validated screening tool more accurately identifies patients and provides interdisciplinary consensus (i.e. diagnosis of malnutrition) to stimulate appropriate action to improve outcomes through the duration of the hospital stay and through discharge planning. While nutrition screening within 24 hours of admission is no longer a requirement by the Joint Commission, it remains the best method for early identification and appropriate intervention. Two recent QI studies have been published emphasizing the importance of a validated nutrition screen related to adherence to meal intake (20) and better nutritional care and lower prevalence of malnutrition (19). Nutrition screening, assessment and
intervention during a patient’s stay and planning for their nutrition care after discharge are important components of the nutrition care process.

To our knowledge, this is the first report to ‘track’ the process for patients after screening to determine what nutrition care may have been provided and to understand discharge plans. Given the still ongoing adoption of EHR and integration of nutrition assessment and care plans into these EHR at the time of the tool development, data was limited to the collection to discreet variables and did not allow for collection of free-text data. Therefore, RDN consults, nutrition supplement orders, and recommendations and prescriptions served as a proxy for nutrition assessment and discharge plans, which is a limitation of this study. Additionally, many institutions are not integrated with out-patient records, making it very difficult to follow patients after discharge. Nonetheless, data presented here demonstrates a need for improved nutrition interventions and discharge planning for those patients screened at-risk. Measurement and documentation of nutrition screening, assessment, care and discharge plans are important priorities of a nutrition QI initiative as these align with the Malnutrition Quality Improvement Initiative, a project from a coalition of 60 organizations and stakeholders, including the Academy of Nutrition and Dietetics, working to defeat senior malnutrition (21).

Since 2010 there has been a slow increase in malnutrition diagnosis. Previous research from the 2010 Healthcare Costs and Utilization Project (HCUP) data indicated a very low percentage (3.2%) of patients in the hospital with a diagnosis of malnutrition at discharge (22). More recent data reports approximately 5%-7% of hospitals stays involved a malnutrition diagnosis (2, 9), and data in this report also demonstrates a higher rate of malnutrition diagnosis. This could indicate gaining adoption of coding for malnutrition since 2010; however, there still seems to be a significant gap between diagnosis of malnutrition and providers utilizing this
information for patient care, suggesting there is still room for improvement despite these small
increases. Another recent survey reflects that 79% of RDNs report diagnosing malnutrition;
however, providers omit the malnutrition diagnosis (45%), utilize an incorrect diagnosis (38%)
or disagree with the RDN diagnosis (35%) (23) thereby creating a gap in what the trained
nutrition professional assesses compared to the final coded diagnosis. Additionally, the higher
malnutrition diagnosis in the current study could also be attributed to over sampling of
‘malnutrition-aware’ institutions who self-selected to opt-in to the program and provide data as
compared to a survey of U.S. discharge records via the HCUP data.

Therefore, the data reported here highlight the greatest areas of QI need within the
nutrition care process which include the use of a validated tool, increased emphasis on
malnutrition diagnosis and discharge planning. It is a call to action for all in patient care, from
nurses and dietitians to administrators and coders, to include nutrition in their QI initiatives to
evaluate their own baseline process and determine where practices are working and where
improvements can be made.

Acknowledgements: A.C.S and K.E.T designed the web-based tool; C.L.S had primary
responsibility for the final content. All authors analyzed the data, wrote the paper, read and
approved the final manuscript. We thank all the participating institutions that provided their data
for this analysis.
References


Tables

Table 1: Hospital Level Data Variables

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<thead>
<tr>
<th>Hospital Level Variables</th>
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<tbody>
<tr>
<td>Hospital type (academic, community government)</td>
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<tr>
<td>Presence of a formal nutrition screening, intervention and discharge protocol</td>
</tr>
<tr>
<td>Nutrition screening tool currently being used (MST, MNA, NRS-2002, MUST, Facility Specific, Other)</td>
</tr>
<tr>
<td>Data collection on the entire hospital or a particular floor/unit If particular floor/unit, specify that floor/unit.</td>
</tr>
<tr>
<td>Data collection on the entire patient population or a particular sub-population. If particular sub-population, specify that sub-population.</td>
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Table 2: Nutrition Care Process

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<tr>
<th></th>
<th>N</th>
<th>(%)</th>
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<tbody>
<tr>
<td>Patients admitted</td>
<td>107,106</td>
<td>100</td>
</tr>
<tr>
<td>Patients screened of those admitted</td>
<td>96,377</td>
<td>89.98</td>
</tr>
<tr>
<td>Patients identified as at-risk for malnutrition of those screened</td>
<td>27,691</td>
<td>28.73</td>
</tr>
<tr>
<td>Of those identified as at-risk for malnutrition, those receiving oral nutrition supplement order</td>
<td>18,507</td>
<td>66.83</td>
</tr>
<tr>
<td>Of those identified as at-risk for malnutrition, those with a RDN consult</td>
<td>17,370</td>
<td>62.73</td>
</tr>
<tr>
<td>Of those identified as at-risk for malnutrition, those with a malnutrition diagnosis</td>
<td>3,977</td>
<td>14.36</td>
</tr>
<tr>
<td>Of those identified as at-risk for malnutrition, those with a discharge recommendation/prescription for oral nutrition supplement</td>
<td>2,467</td>
<td>8.91</td>
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**Figure Legends**

Figure 1: Program adoption. Of the 97 sites including data, 14 provided more than one unique report, resulting in 150 total unique reports for data analysis.

Figure 2: Site distribution by malnutrition screening tool reported to be used.

Figure 3: Cohort data (A) and subsequent nutrition care of those screened at-risk for malnutrition (B) by nutrition screening tool used. Discharge (D/C), Oral nutrition supplement (ONS), prescription (Rx).
Figure 1

Available for enrollment (N=1,592)

Target enrollment (N=200)

Enrolled sites (N=243)

Sites with data input (N=97)

Reports included for analysis (N=150)
Figure 2

- Facility Specific, 55.7%
- MST, 39.2%
- MNA, 1%
- MUST, 1%
- Other, 3.1%
Figure 3

A

Screened of admitted

At risk for malnutrition

of those screened

Validated tool

Non-validated tool

B

% of those screened

at risk for malnutrition

ONS order

RDN consult

Malnutrition diagnosis

D/C recommendation of Rx for ONS