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Brief Communications

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Noninterruptive tool to support provider malnutrition documentation and minimize documentation queries

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Abstract

Objectives: Determine if an electronic documentation tool can reduce documentation queries for malnutrition without impacting diagnostic coding.

Materials and Methods: Malnutrition documentation queries and diagnosis coding proportions were compared between 2 groups of 600 malnourished adults discharged from internal medicine services before and after this electronic malnutrition documentation tool was promoted.

Results: Documentation queries for malnutrition were observed in 300 (50%) of the preintervention discharges and 112 (19%) of the postintervention discharges ($P < .001$). A diagnosis code for malnutrition was observed in 99% of both groups. In a logistic regression accounting for clustering by provider, the odds ratio of a query postdeployment vs predeployment was 0.21 (95% CI, 0.16-0.29). In 88 of 112 (79%) of the postintervention discharges queried for malnutrition, the tool was not used as recommended.

Conclusions: We have demonstrated that introducing and promoting this electronic documentation tool can reduce querying for malnutrition while preserving diagnostic coding.

Lay Summary

Malnutrition is commonly addressed in hospitalized adults, and diagnostic coding of malnutrition has important implications for hospital billing and quality of care assessment. Yet, health-care providers may find it challenging to document malnutrition in detail sufficient for accurate diagnostic code assignment. Clinical documentation queries generated by clinical documentation specialists help to support health-care provider documentation by requesting such details but come at the cost of additional documentation work. At our institution, clinical documentation specialists review all charts with dietitian-identified malnutrition and query when health-care provider documentation lacks sufficient detail for diagnostic code assignment. Recognizing that documentation work and interruptive decision support systems are associated with health-care provider job dissatisfaction, we designed a noninterruptive malnutrition documentation support tool. This tool leverages data from clinician assessments, interventions, and orders to generate noninterruptive documentation support. Introducing and promoting this tool to a group of internal medicine providers led to a 63% relative reduction in clinical documentation queries for malnutrition without negatively impacting the diagnostic coding of malnutrition in a group of patients with dietitian-identified malnutrition.

Key words: electronic health records; health information systems; documentation; clinical decision support; malnutrition.

Introduction

Malnutrition is commonly identified and treated in hospitalized adults.[1–7] Yet, several studies have shown that it may be underreported in hospital discharge diagnosis coding sets.[8,9] Accurate documentation of primary and secondary discharge diagnoses is critical to ensure that important clinical conditions are reflected in the medical record, for hospital billing, and for claims-based hospital quality assessment programs.[10–14] For example, malnutrition is used in the Elixhauser Comorbidity Index, which is used by US News and World Report to rate hospitals.[15] Clinical Documentation Integrity (CDI) programs have arisen to improve documentation.[16,17] Clinical documentation specialists

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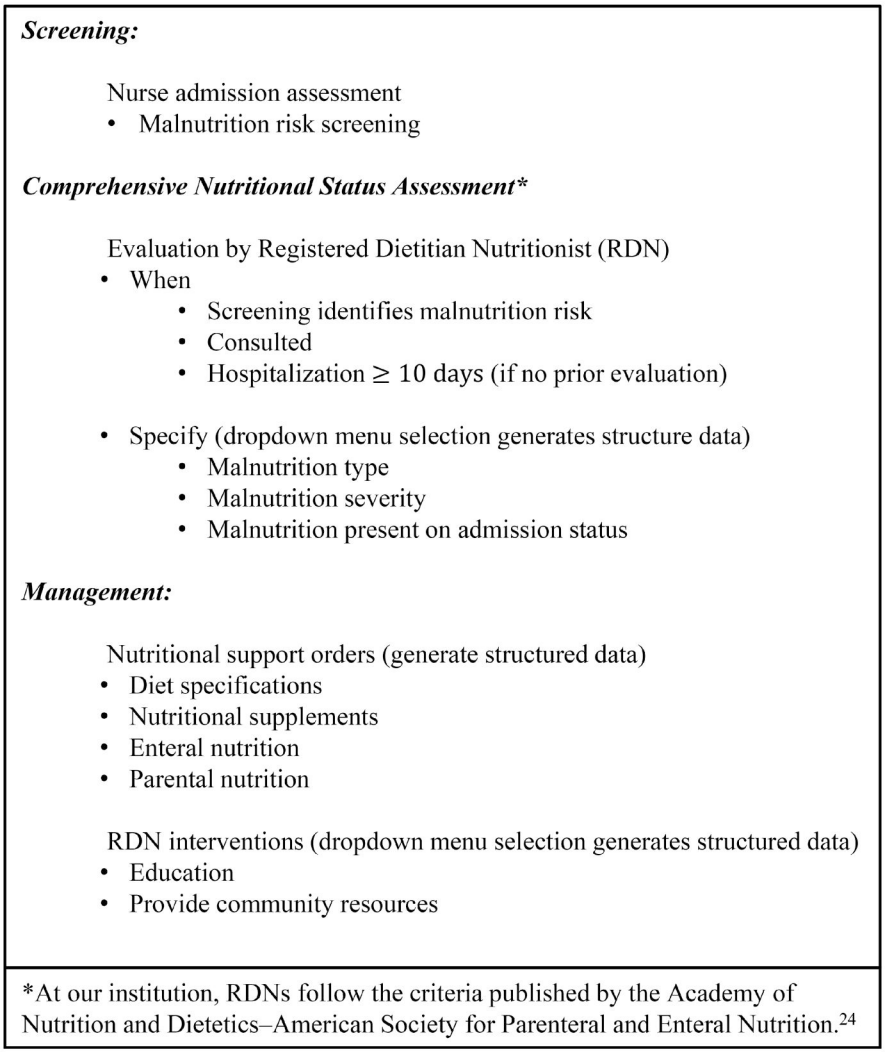

Figure 1. Malnutrition identification and management. *At our institution, RDNs follow the criteria published by the Academy of Nutrition and Dietetics–American Society for Parenteral and Enteral Nutrition.[24]

(CDSs) review the chart and provider documentation to ensure that conditions that are evaluated, treated, and/or monitored during the admission are documented by a health-care provider with sufficient detail to allow a diagnosis code to be assigned. When provider documentation is unclear or lacks specificity, a documentation query may be sent to the provider for clarification. When malnutrition is identified (Figure 1), our hospital protocol is for a CDS to query if the provider documentation lacks sufficient detail. Recognizing that documentation work, such as answering queries, is linked to provider job dissatisfaction, interventions that reduce queries and support accurate diagnostic coding are needed.[18–21] To decrease queries for malnutrition without adversely impacting malnutrition diagnostic code assignment, we created an electronic tool to support provider documentation. We hypothesized that introducing and promoting the tool would reduce malnutrition queries by at least 50%.

Methods

Our tool uses clinician-verified structured data (Figure 1) to provide noninterruptive malnutrition documentation support in provider progress notes. It is conditional, meaning text appears only after specified requirements are met, for example, after a Registered Dietitian Nutritionist (RDN) selects malnutrition type from a dropdown list in the RDN's assessment note (Figure 2). It is refreshable in that when a note is opened, refreshed, or copied-forward, content updates with the most recently entered structured data.[22] It displays concise terms in a simple structure for ease of review by the provider. After reviewing, the provider may confirm by signing the note with the suggested text. If the provider disagrees, they may delete or edit the tool output, which prevents the terms from updating when that note is refreshed or copied-forward.

Using a serial cross-sectional (pre/post) design, we compared 2 groups of adult patients (age 18 years and above) with RDN-identified malnutrition who were discharged consecutively from internal medicine acute care services at our urban academic hospital. The inclusion criteria were (1) RDN-identified malnutrition and (2) discharge from an acute care internal medicine service. There were no exclusion criteria.

The first group consisted of patients from before the first version of the tool was released (November 4, 2021, through

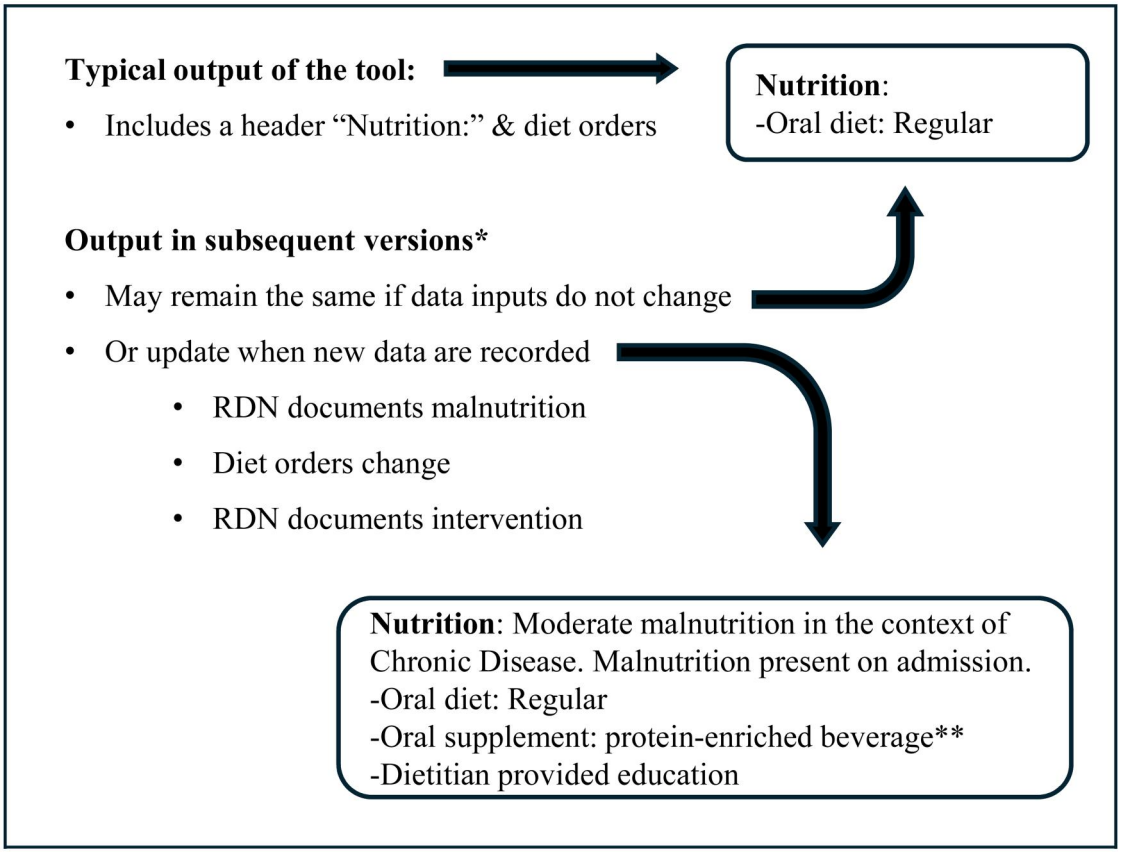

Figure 2. Examples of tool output in provider progress notes. Abbreviation: RDN, Registered Dietitian Nutritionist. *When a note is started, refreshed, or copied-forward into a new note. **A generic term used in place of a branded order name.

February 28, 2022). From March to July 2022, the tool was piloted and refined with input from CDSs, RDNs, and 7 hospitalist attendings. In August 2022, the finalized tool was promoted to approximately 190 total internal medicine providers (residents, advanced practice providers, and hospitalist attendings). Adoption of the tool was voluntary. Residency program and hospitalist leaders asked their groups to add it to their progress note templates. The tool was promoted at staff meetings and through an informational flier and through a video showing how to add it the assessment and plan section of note templates (a process that should take less than a minute). After tool promotion, our CDSs adjusted their protocol to delay querying by 2 days from the RDN assessment. This was to allow time for the tool to update in a subsequent provider progress note. The second group consisted of patients consecutively discharged from the same services after tool promotion (August 1 through November 9, 2022).

Data were extracted from the electronic medical record (Epic Care Systems, Madison, Wisconsin, United States). Data included baseline patient characteristics (age, sex, race, ethnicity), hospital length of stay, death during hospitalization, body mass index, principal discharge diagnosis code assigned to the admission, the severity of malnutrition, and its status on admission (both by RDN assessment).

Prior experience by investigators indicated that approximately 60% of discharges from the study site with RDN-identified malnutrition receive a query for malnutrition. We estimated, a priori, that introducing and promoting the malnutrition documentation tool would conservatively result in a 50% relative reduction in queries for malnutrition. For the power analysis, we estimated that we could measure 500 hospital discharges before and 500 hospital discharges after the intervention, with as many as 100 repeated patient measurements (due to repeat hospitalizations), among 190 providers. We considered that provider behavior might vary in their documentation practices and adoption of the tool. For example, some providers might consistently document malnutrition, while others might not, and some providers might adopt the tool into their progress note templates, while others might not. We sought to estimate the minimum detectable effect (MDE) size of the difference in query proportions between the preintervention and postintervention groups. We assumed 80% power and 5% alpha error. We considered 2 extreme simplifications for this calculation, with the true estimate lying within this range. In one instance, we assumed that only patients who were not repeated would be informative in the analysis and that there would be no within-provider correlation pre-to-postintervention. In this instance, the MDE would be a decrease in the absolute percent of discharges receiving a query from 60% preintervention to 51.2% postintervention (a relative reduction of approximately 15%). In the alternate extreme instance, we assumed an all-or-none behavior by providers and only included providers who required a query in the preintervention period. In this instance, using Laplace smoothing proportions for a small sample size and binomial exact CIs, the minimum detectable improvement would be a change from 60% preintervention to 58.2% postintervention, or a relative decrease of 3%. Thus, we estimated the MDE to lie between a 3% and 15% relative reduction in

queried discharges. In the study, we were able to achieve a slightly larger sample size than was initially estimated (600 discharges preintervention and 600 discharges postintervention); thus, the actual minimal detectable effect size would be smaller than our initial estimate and far smaller than the prespecified 50% relative reduction.

For the primary outcome, we applied a comparison of proportions test to the percentage of charts with a malnutrition query before vs after the intervention. To account for the differing behavior toward malnutrition documentation and adoption of the tool, such as an overpopulation of providers who naturally document malnutrition in specific terms (and therefore do not receive queries) in either group, we performed a mixed effects logistic regression analysis to account for clustering by the discharging provider. For the secondary outcome, we compared the proportion of malnutrition diagnostic code assignment between groups.

The author (K.O.) reviewed all queried charts in the postintervention period to assess factors contributing to the query. During this review, the tool was identified by its characteristic appearance (Figure 1). Accurate structured data showing its presence in note templates was unavailable during the study period.

The Johns Hopkins University Institutional Review Board reviewed this research protocol and approved it as a secondary research project (IRB00293239).

Results

Among the 1200 inpatient discharges, the median age was 61 (interquartile range 47-72), and 54% were male (Table 1). Of the reported racial identities, 50% were African American and 41% White with slight variation between groups. The median length of stay was 8 days in each group. Principal diagnoses were categorized by chapter of the 10th edition of the International Classification of Diseases (ICD-10) with slight variation between periods.[23] The 3 most common principal diagnosis categories were those of the digestive system (17%), infectious diseases (14%), and diseases of the circulatory system (12%). Death occurred during hospitalization in 54 patients (4%). Malnutrition was moderate in 687 (57%), severe in 513 (44%), and present on admission in 1162 (97%).

Preintervention, 300 of the 600 discharges (50%) received a malnutrition query, and 593 (99%) received a malnutrition diagnosis code. Postintervention, 112 of the 600 discharges (19%, a 63% relative reduction, $P < .01$ vs preintervention) received a malnutrition query and 594 discharges (99%, $P > .99$ vs preintervention) received a malnutrition diagnosis code. The mixed effects logistic regression analysis accounting for clustering by provider found that the odds of receiving a query in the postintervention period were lower than in the preintervention period (odds ratio 0.21, 95% CI, 0.16-0.29, $P < .001$). Of the 112 postintervention discharges receiving a query, in 88 (79%) there was no observed use of the tool in a provider progress note within 2 days of the RDN assessment (Table 2).

Discussion

The promotion of this noninterruptive documentation tool was associated with a 63% relative reduction in the proportion of charts queried for malnutrition without impacting the proportion of charts receiving a malnutrition diagnostic code. The reduction remained significant after accounting for repeated measurements of providers who may have had differing baseline malnutrition documentation practices and variable adoption of the tool.

There is considerable interest in developing electronic tools to support provider documentation. Through a quality improvement project Parkash et al. illustrate how such tools can support the documentation of malnutrition diagnostic terms.[26] Cerasale et al. demonstrated an exciting reduction in queries for several conditions with their tool. Cerasale's tool did not reduce queries for malnutrition which was potentially due to a small sample size of malnourished patients in their study.[27]

Our tool leverages structured data to offer noninterruptive malnutrition documentation support. Recognizing that documentation work and interruptive decision support systems are associated with provider job dissatisfaction, we avoided strategies that would force the writer to make a selection from a list or enter free text.[18–21,28,29] Instead, this tool uses clinician-verified data to suggest draft text for the provider to confirm, delete, or modify as they choose.

This is not a diagnostic or management tool. The standard of care for malnutrition evaluation and management should always be followed. At the time of writing, this includes having a trained operator, such as an RDN, perform a nutritional status assessment with a validated tool to detect malnutrition.[11,24,30] Unless contraindicated, interventions shown to improve patient outcomes should be provided.[6,7,30]

The tool's limitations include the need for team members to adhere to protocols and account for the slight delay in updating when data inputs change. For example, when the RDN assessment occurred after that day's daily progress note was opened, and hospital discharge occurred that same day without the provider refreshing their note, there was no opportunity for it to update (6% of postintervention queries). Similarly, it relies on structured data entry by the RDN. When an RDN deviated from protocol, the assessment was not recorded as structured data, and the tool did not suggest terms generated from this assessment (one postintervention query). In other instances, it is unclear why a query was sent despite the use of the tool with appropriate documentation (13% of postintervention queries). The CDS may have deviated from their protocol or sent a query to resolve conflicting documentation elsewhere.

Limitations of the study include its nonrandomized, retrospective, and single-center design. Unmeasured confounding variables and the importance of following similar protocols to those we describe may limit generalizability (eg, at our institution, all charts with RDN-identified malnutrition are reviewed by a CDS). A challenge of our study environment was that many providers use individually customized note templates. Nonadoption was associated with 79% of postintervention queries. A larger query reduction might be expected in settings where providers use a single (or a few) shared templates. Factors contributing to provider adoption of this or similar tools are a potential future line of inquiry. Due to the lack of reliable structured data tracking provider adoption, these data were obtained by chart review. Development of an analytic strategy to track adoption of this or similar tools would support future investigations. Despite these limitations, it is unlikely that factors other than the

Table 1. Study population characteristics in preintervention vs postintervention groups.

	Total ($N = 1200$)	Preintervention ($N = 600$)	Postintervention ($N = 600$)
Age			
Mean (SD)	59.2 (17)	59.6 (17)	58.8 (17)
Median (Min, Max)	61	62.0 (20.0, 95.0)	60.0 (18.0, 99.0)
Interquartile range	47-71	49-71	46-72
Sex			
Female	553 (46%)	268 (45%)	285 (47%)
Male	647 (54%)	332 (55%)	315 (53%)
Race			
Asian	29 (2%)	16 (3%)	13 (2%)
Black or African American	605 (50%)	322 (54%)	283 (47%)
White	493 (41%)	230 (38%)	263 (44%)
American Indian or Alaska native	2 (<1%)	2 (<1%)	0 (0%)
Hawaiian or Pacific Islander	1 (<1%)	1 (<1%)	0 (0%)
Multiracial	24 (2%)	3 (<1%)	21 (3%)
Other	45 (4%)	26 (4%)	19 (3%)
Declined to answer	1 (<1%)	0 (0%)	1 (<1%)
Ethnicity			
Not Hispanic or Latino	1142 (95%)	575 (95%)	567 (94%)
Hispanic or Latino	39 (3%)	19 (3%)	20 (3%)
Choose not to disclose	12 (1%)	5 (1%)	7 (1%)
Two or more ethnicities	5 (<1%)	1 (<1%)	4 (1%)
Not defined	2 (<1%)	0 (0%)	2 (<1%)
LOS in days			
Mean (SD)	11.9 (13)	11.9 (13)	12.0 (13)
Median (Min, Max)	8 (1, 136)	8 (1, 112)	8 (1, 136)
Principal diagnoses by ICD-10 chapter[a]			
I. Certain infectious and parasitic diseases	166 (14%)	85 (14%)	81 (13%)
II. Neoplasms	60 (5%)	22 (4%)	38 (6%)
III. Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	31 (3%)	12 (2%)	19 (3%)
IV. Endocrine, nutritional, and metabolic diseases	97 (8%)	44 (7%)	53 (9%)
V. Mental and behavioral disorders	47 (4%)	20 (3%)	27 (4%)
VI. Diseases of the nervous system	33 (3%)	17 (3%)	16 (3%)
VII. Diseases of the eye and adnexa	7 (<1%)	4 (<1%)	3 (<1%)
VIII. Diseases of the ear and mastoid process	3 (<1%)	2 (<1%)	1 (<1%)
IX. Diseases of the circulatory system	150 (12%)	72 (12%)	78 (13%)
X. Diseases of the respiratory system	74 (6%)	40 (7%)	34 (6%)
XI. Diseases of the digestive system	209 (17%)	104 (17%)	105 (17%)
XII. Diseases of the skin and subcutaneous tissue	42 (3%)	21 (3%)	21 (3%)
XIII. Diseases of the musculoskeletal system and connective tissue	37 (3%)	18 (3%)	19 (3%)
XIV. Diseases of the genitourinary system	37 (3%)	18 (3%)	19 (3%)
XVII. Congenital malformations, deformations, and chromosomal abnormalities	0 (<1%)	0 (0%)	1 (<1%)
XVIII. Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	39 (3%)	22 (4%)	17 (3%)
XIX. Injury, poisoning, and certain other consequences of external causes	103 (9%)	50 (8%)	53 (9%)
XXII. Codes for special purposes	64 (5%)	49 (8%)	15 (2%)
Death			
No	1146 (95%)	575 (96%)	571 (95%)
Yes	54 (4%)	25 (4%)	29 (5%)
Malnutrition severity[b]			
Moderate	687 (57%)	355 (60%)	332 (55%)
Severe	513 (43%)	245 (41%)	268 (45%)
Present on admission			
No	18 (1%)	8 (1%)	10 (2%)
Yes	1162 (97%)	582 (97%)	580 (97%)
Unable to determine	7 (<1%)	3 (<1%)	4 (<1%)
Missing	13 (1%)	7 (1%)	6 (1%)
BMI in kg/m^2			
Mean (SD)	22.5 (5.43)	22.4 (5.61)	22.5 (5.26)
Median (Min, Max)	21.6 (12.3, 54.6)	21.6 (12.3, 51.7)	21.6 (12.4, 54.6)
Missing, *n* (%)	18 (1%)	10 (2%)	8 (1%)

Abbreviation: BMI, body mass index.

[a] Grouped by chapter of the International Classification of Diseases 10th revision (ICD-10).[23] No patient within the study had a principal diagnosis from ICD-10 chapters XV, XVI, XX, or XXI.

[b] For adult patients, current malnutrition diagnostic guidelines define moderate and severe malnutrition,[24] whereas pediatric guidelines define mild, moderate, and severe malnutrition.[25]

Table 2. Queried postintervention discharges ($n = 112$).

Provider behavior cases (%)	Subgroup category cases (%)	Subgroup descriptive assessment
Nonadherent[a] 88 (79%)	Never used: 78 of 112 (70%)	*There was no observed use of the tool in a provider note during this hospitalization*
	Used too late: 10 of 112 (9%)	*The first observed use of the tool was after 2 full business days from the Registered Dietitian Nutritionist (RDN) assessment*
Adherent[b] 24 (21%)	Queried: 15 of 112 (13%):	*The tool was observed in a provider note and displayed malnutrition terms, but a malnutrition query was also sent*
	Short time-to-discharge: 7 of 112 (6%)	*The tool was observed in provider progress notes but did not suggest malnutrition to the provider to review because the RDN assessment and hospital discharge both occurred before it could be refreshed, or a new note was written*
	Dietitian deviation: First 1 of 112 (<1%):	*The RDN deviated from their documentation protocol which prevented their assessment from linking the tool*
	Long admission: 1 of 112 (<1%)	*Due to a prolonged hospitalization, this patient had already received a query before the postintervention period*

[a] No provider progress note was observed to contain the tool within 2 days of the RDN assessment.
[b] One or more provider progress notes containing the tool were observed within 2 business days from the RDN assessment.

intervention were responsible for the large reduction in queries observed.

In sum, this malnutrition documentation tool leverages structured data to offer noninterruptive documentation support that illustrates both the malnutrition diagnosis and core elements of the treatment plan. Introducing and promoting the tool led to a 63% relative reduction in the proportion of charts receiving a malnutrition query without impacting diagnostic coding.

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Author contributions

Kevin O'Malley (Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Writing Original Draft), Patricia Dasch (Conceptualization, Resources, Writing Review Editing), Sarah C. Bauer (Conceptualization, Writing Review Editing), Dhananjay Vaidya (Formal Analysis, Methodology, Validation, Writing Review Editing), Matthew Severson (Conceptualization, Methodology, Validation, Writing Review Editing), Sam Sokolinsky (Data Curation, Methodology, Writing Review Editing), Patricia Kaehne (Conceptualization, Validation, Writing Review Editing), Peter M. Hill (Conceptualization, Resources, Writing Review Editing), Daniel J. Brotman (Validation, Writing Review Editing), Benjamin Erwin Bodnar (Validation, Writing Review Editing), Stephen Lichtenstein (Conceptualization, Writing Review Editing), Renee Demski (Conceptualization, Writing Review Editing), and Stephen A. Berry (Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Supervision, Writing Review Editing)

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Conflicts of interest

The authors and contributors confirm that they do not have any relevant conflicts of interest with respect to this work.

Data availability

The data underlying this article cannot be shared publicly due to the presence of protected health information. The data will be shared on reasonable request to the corresponding author pending approval by the Johns Hopkins Health Plans Data Sharing Committee.

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