BRIEF COMMUNICATION

Implementation of malnutrition quality improvement reveals opportunities for better nutrition care delivery for hospitalized patients

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Abstract

Background: Gaps in hospital-based nutrition care practices and opportunities to improve care of patients at risk of malnutrition or malnourished have been demonstrated by several US hospitals implementing quality improvement (QI) projects. This study examined the impact of nutrition care process improvements focused on better documentation of identification and diagnosis of malnutrition in 5 hospital services and differences between nutritionally targeted vs nontargeted services.

Methods: Data on malnutrition risk screening, nutrition assessment, malnutrition diagnosis, and nutrition care plan delivery were collected from 32,723 hospital encounters for patients admitted to the intensive care unit, pulmonology, oncology, urology, and general medicine services (targeted) as well as the rest of the nontargeted hospital services between 2017 and 2019.

Results: Higher rates of morbidity in targeted service patients compared with those in the patient population admitted in the nontargeted services were observed, including higher rates of malnutrition risk (37.43% vs 19.16%, $P < .001$), higher rates of moderate and severe malnutrition first identified by a registered dietitian nutritionist (20.27% vs 9.67%, $P < .001$), and malnutrition diagnosis confirmed by an admitting physician (16.72% vs 6.74%, $P < .001$).

Conclusions: The findings suggest sustained improvements in confirmed rates of malnutrition identification and diagnosis are achievable. Targeting malnutrition QI efforts to hospital services with higher patient morbidity is an effective method for improving malnutrition diagnosis, in particular in hospitals with limited resources, which in turn can result in improved nutrition care delivery.

KEYWORDS
malnutrition diagnosis, outcomes research/quality, quality improvement programs

CLINICAL RELEVANCY STATEMENT

Malnutrition is a common and costly challenge in medical inpatients. This study analyzed a quality improvement initiative to improve diagnosis of malnutrition. Improvements in the rate of diagnosis were achieved in targeted hospital services. The quality improvement initiative also improved communication as measured by agreement between physician diagnosis and dietitian assessment and improved the rate of nutrition care plan implementation.

BACKGROUND

Implementation of effective nutrition care processes for medical inpatients who are at risk of malnutrition or malnourished have been found to be cost-effective,[1] but such processes are often overlooked and underutilized. Gaps in nutrition care practice result in poor patient outcomes and increased costs.[2,3]

A number of US hospitals have demonstrated that nutrition-focused quality improvement (QI) programs or initiatives can be effectively implemented to improve patient care while improving the health and economic outcomes of at-risk/malnourished patients.[4–6] Effective implementation of standardized metrics is key to measuring progress and assessing the impact of initiatives on both processes and patient outcomes.[5–7] Most reported data have focused on the impact of hospital- or subpopulation-level changes on practice and outcomes, with fewer studies examining QI projects targeted to certain services or subpopulations that may receive the greatest benefit from improved nutrition care.

The Malnutrition Quality Improvement Initiative (MQii) was developed to help hospitals in the US improve nutrition care for patients with malnutrition or at malnutrition risk.[8,9] MQii resources include (1) a toolkit to help hospitals implement best-practice malnutrition care[10] and (2) four malnutrition-focused electronic clinical quality measures (eCQMs).[6] The MQii Toolkit and eCQMs are being used by over 290 hospitals to implement best nutrition care practices as part of QI projects.[6] MQii hospitals collect, analyze, and share data on patient nutrition care and implementation of nutrition-focused QI projects.

UNC Medical Center (UNCMC) is a public, academic teaching hospital with >950 beds, noted for specialties in cardiology, trauma, gastroenterology, nephrology, pulmonology, cancer, neurology, and burn care.[7] As an MQii participant, UNCMC implemented a QI project from 2017 to 2019 focused on completion of nutrition-focused physical assessment of patients at malnutrition risk, improving physician alignment with registered dietitian nutritionist (RDN) assessment, and confirmation with malnutrition diagnosis. Emphasis on implementation of the QI project varied across services. This study evaluated how assessment and diagnosis of malnutrition varied across services.

METHODS

The UNCMC Clinical Nutrition Department partnered with clinical documentation specialists, nurses, and physician champions from across the hospital to assess nutrition care gaps. The team identified improving coordination between RDNs and physicians regarding the confirmation of malnutrition diagnosis when identified by RDNs as an opportunity to improve patient care.

The UNCMC QI team implemented a malnutrition diagnosis education intervention with resident physicians of 5 participating services (intensive care unit [ICU], pulmonology, oncology, urology, and general medicine). The remaining 48 nonparticipating services were categorized as nontargeted services (eg, cardiology, endocrinology).

Malnutrition documentation in the electronic health record (EHR) was modified to include RDN and physician documentation of nutrition status to facilitate better coordination between RDNs and physicians. Staff resources were reorganized and greater effort was made to communicate nutrition assessment results with physicians. No changes were made to UNCMC's process of screening patients by the admitting nurse or the manual nutrition consult request process. Data on malnutrition screening rate, assessment rate of patients at malnutrition risk, confirmation rate of malnutrition diagnosis by physicians, and overall malnutrition diagnosis rate in targeted services were collected via electronic extraction using a data query of the EHR to monitor progress.

The team also addressed nutrition assessment policies for clarity and efficient use of human resources. In 2018, the medical center reviewed best practices, obtained clinician feedback on intervention priorities, and prioritized screening consultations to best allocate staffing resources. Internal guidelines on the practice of nutrition assessment were also adjusted. The QI project was reviewed by the facility's Institutional Review Board (IRB) and an exemption obtained (IRB number: 17-0992).

Data on 32,723 hospital encounters from both baseline (May to August 2017) and 2 follow-up periods (July to October 2018 and February to May 2019) were extracted from the EHR system. The distribution of encounters across services and pre-post QI are outlined in Table 1. The follow-up periods reflect time frames after the hospital's period of initial engagement in the MQii (2018) and after more thorough clinician education and engagement had taken effect and additional staff were onboarded to support continuity of QI efforts (2019).

Analysis

Descriptive statistics are reported on all variables of interest. Differences across groups were evaluated using χ^2 tests. Results were considered statistically significant if $P \leq .05$. All analyses were performed using SAS 9.4.

TABLE 1 Study population by targeted service and QI project implementation

Study population by period		
Indicator	Pre-QI baseline (May to August 2017)	Post-QI period (July to October 2018 and February to May 2019)
Targeted services	1964	3882
Nontargeted services	8728	18,080

Abbreviation: QI, quality improvement.

RESULTS

Table 2 compares malnutrition screening and diagnosis rates in targeted and nontargeted services. Although malnutrition screening rates were similar in targeted and nontargeted services (>98% in both), a significantly higher percentage of patients in targeted services were at malnutrition risk (37.4% vs 19.2%, $P < .0001$), had nutrition assessment findings of moderate to severe malnutrition (20.3% vs 9.7%, $P < .0001$), and had a malnutrition diagnosis (16.7% vs 6.7%; P-values $< .0001$). Patients admitted to targeted services were also more likely to see an RDN (35.6% vs 22.4%, $P < .0001$). Less than 40% of patients who were identified as being at malnutrition risk at screening received a completed nutrition assessment by an RDN. Finally, there was a significant increase in malnutrition diagnosis from the pre-QI to post-QI period in targeted (13.5% vs 18.4%; $P < .0001$) and nontargeted (6% vs 7.1%; $P = .0003$) services.

Key nutrition indicators were also examined at the individual service level (Table 3). Oncology and ICU patients showed the highest nutrition risk before and after the QI project; pulmonology also had a high percentage of patients at risk. The percentage of patients diagnosed as malnourished increased in each service post QI project. The largest increases were in pulmonology (7.2% absolute increase) and ICU (6.6% absolute increase). General medicine and urology reported the largest relative increases in malnutrition diagnosis (49.9% and 62.1%, respectively) but had low pre-QI rates of malnutrition diagnosis compared with those of the other targeted services. The increase in malnutrition diagnosis was greater in targeted than nontargeted services in both absolute and relative terms.

The difference between the percentage of patients identified as malnourished by RDNs and physicians decreased post QI. Pre-QI, RDNs identified a higher percentage of patients as malnourished in all services compared with physicians, and the average difference between the percent of patients identified as malnourished was 6.9%. Post QI, the average absolute difference in the percentage of patients identified as malnourished decreased to 3.3%. This suggests a greater level of agreement between RDNs and physicians on patient malnutrition status. Post QI, there was a significant increase in the percent of patients in the general medicine and urology services receiving an RDN nutrition care plan after being diagnosed with malnutrition.

Table 4 examines RDN and physician agreement and disagreement on patient malnutrition status. RDN and physician agreement increased in all targeted services post QI, whereas agreement was effectively unchanged in nontargeted services. The increase in agreement was statistically significant in the oncology, pulmonology, and urology services ($P < .05$).

DISCUSSION

This nutrition-focused QI project was successful in several aspects. First, the rate of malnutrition diagnosis increased in the targeted service areas as physicians focused on identifying malnourished patients. Second, the level of agreement between RDNs and physicians in identification of malnourished patients increased, suggesting improved communication and coordination between practitioners. Third, the percentage of patients with diagnosed malnutrition receiving an RDN-developed nutrition care plan increased in 2 (urology and general medicine) of 5 targeted services, indicating that patients who needed nutrition care were more likely to receive it. This contributes to a growing body of evidence on nutrition-focused QI projects being effective in addressing patient nutrition care.[3–6,8,11] Fourth, the high percentage of oncology patients identified as being at malnutrition risk or malnourished supports previous work demonstrating that oncology patient populations have important nutrition care needs.[12,13]

RDN and physician agreement on malnutrition identification is key in several aspects of patient care. Agreement between care providers leads to communication of similar messages to patients, reduced patient confusion, and improved patient satisfaction and treatment compliance.[14] Diagnostic agreement also facilitates earlier discussions between treatment providers on appropriate nutrition interventions. Previous studies have linked early nutrition intervention to shorter hospital stays, reduced infection rates, and reduced unplanned readmission rates.[3,4,15]

Effective care coordination between RDNs and physicians is only possible when medical teams have sufficient knowledge and training in nutrition care, a common understanding of the definition of malnutrition, and a mutually defined workflow and EHR functionality.[16] General nutrition education may be lacking among physicians, as studies have found that only 25% of US medical schools provide a dedicated nutrition course.[17] However, physician education in real-world clinical practice settings has been recognized as a feasible approach to improving patient nutrition care.[15,18,19] Therefore, improved nutrition-focused training and education would facilitate better communication and coordination of efforts between physicians and RDNs in patient nutrition care.

Despite meaningful gains in nutrition care, there remains room for improvement. Automating the nutrition consult request, as was done in previous QI studies,[3,15] through the EHR removes the barrier of manual entry and improves timeliness to assessment, identification, and intervention. Effective use of telemedicine may expand the reach of RDNs, allowing them to consult patients remotely during the weekend

TABLE 2 Key nutrition indicators for targeted and nontargeted services

Indicator	Target vs nontarget services			Target services			Nontarget services		
	Target services (N = 5915)	Nontarget services (N = 26,808)	P	Pre-QI (N = 1976)	Post-QI (N = 3939)	P	Pre-QI (N = 8728)	Post-QI (N = 18,080)	P
Nutrition screen completion, %	98.8	99.1	.1034	99.4*	98.6*	.0046*	99.7*	98.7*	<.0001*
Patients screened positive for nutrition risk, %	37.4*	19.2*	<.0001*	36.5	37.9	.3011	19.8	18.9	.0760
RDN nutrition assessment completion, %	35.6*	22.4*	<.0001*	40.3*	33.2*	<.0001*	24.6*	21.3*	<.0001*
RDN nutrition assessment finding of severe/moderate malnutrition, %	20.3*	9.7*	<.0001*	19.9*	20.4*	<.0001*	8.9*	10.0*	<.0001*
MD malnutrition diagnosis, %	16.7*	6.7*	<.0001*	13.5*	18.4*	<.0001*	6.0*	7.1*	.0003*
RDN care plan for malnutrition diagnosis, %	95.8	94.0	.0519	93.6	95.6*	.0425*	93.6	94.2	.6668

Abbreviations: MD, medical doctor; QI, quality improvement; RDN, registered dietitian nutritionist.
*Statistically significant.

TABLE 3 Nutrition indicators pre-QI and post-QI by service

Service	Identified as at risk by screening (percentage of all patients)			RDN identification of malnutrition (percentage of all patients)			MD diagnosis of malnutrition (percentage of all patients)			Care plan by MD malnutrition diagnosis (percentage of all patients)		
	Pre-QI	Post-QI	P	Pre-QI	Post-QI	P	Pre-QI	Post-QI	P	Pre-QI	Post-QI	P
General medicine	30.9*	35.6*	.0275*	13.6*	18.2*	<.0001*	10.8*	16.3*	.0005*	85.0*	95.8*	.0007*
Intensive care unit	40.6	39.0	.7496	26.9*	22.2*	<.0001*	17.5	24.1	.1085	92.3	94.7	.6495
Oncology	50.7	49.1	.5053	28.9*	27.8*	<.0001*	18.1	22.0	.0554	99.1	96.2	.1163
Pulmonology	37.3	37.1	.9511	23.5*	19.4*	.0107*	16.8	24.0	.0327	100	100	-
Urology	11.8	13.1	.6481	7.9	7.1	.7274	3.1	5.0	.2584	71.4*	100*	.0153*
Nontargeted services	19.8	18.9	.0760	8.9*	10.0*	<.0001*	6.0*	7.1*	.0003*	93.6	94.2	.6668

Abbreviations: MD, medical doctor; QI, quality improvement; RDN, registered dietitian nutritionist.
*Statistically significant.

TABLE 4 Physician and RDN agreement on patient malnutrition status, by service

Service	Number of patients		RDN and MD agree on malnutrition status, %		RDN and MD disagree on malnutrition status, %		P
	Pre-QI	Post-QI	Pre-QI	Post-QI	Pre-QI	Post-QI	
Hospital service	242	479	83.47	87.68	16.53	12.32	.1208
Intensive care unit	85	114	74.12	82.46	25.88	17.54	.1539
Oncology	319	485	75.24*	81.03*	24.76*	18.97*	.0494*
Pulmonology	123	183	70.73*	92.35*	29.27*	7.65*	<.0001*
Urology	27	47	55.55*	82.98*	45.45*	17.02*	.0106*
Nontargeted services	2151	3849	79.87	79.97	20.13	20.03	.9268

Abbreviations: MD, medical doctor; QI, quality improvement; RDN, registered dietitian nutritionist.

*Statistically significant.

or evenings or at locations that do not have a full-time dietitian.[20] Existing evidence from full census assessment audits has found that a larger proportion of the hospital population was malnourished than was originally diagnosed.[21]

Limitations

This study has several limitations primarily associated with the use of observational study design, which prevents the identification of causal relationships. Thus, observed associations in this study should be investigated further with experimental or quasi-experimental methods. This project relied on a convenience sample of encounters with available data, and no matching analysis was performed; thus, the baseline and control groups are not of similar size. Patients in the baseline and QI groups were seen at different times of the year, leaving open the possibility of causes unrelated to the QI such as seasonal differences and secular trends in terms of patient characteristics, needs, and care delivered. Staffing shortages acknowledged by the hospital could impact the true extent to which malnutrition was identified. Ultimately, this could mean that even more patients needed nutrition care and intervention than were identified. This study did not examine how the nutrition care improvements in this study translated to patient outcomes. Future work should explore the connection between nutrition care improvements and patient outcomes.

CONCLUSION

Targeting efforts to address the quality of nutrition care to patient groups that are at higher clinical risk may help hospitals with limited staffing resources attend to highest-risk patients. Implementing standardized measurements for malnutrition indicators stratified by services in the hospital may help hospitals identify services with the greatest need for nutrition care improvement and facilitate targeted QI efforts. Such targeted efforts assist healthcare systems in continuing their QI processes while adjusting to meet unanticipated public health demands. Targeted efforts may also benefit hospital systems with severely limited resources. Coordinating nutrition care processes across disciplines, automating referral for RDN consults, and continued improvements in EHR documentation within compliance standards may help hospitals to identify malnutrition in a timely fashion and result in more malnourished or at-risk patients receiving optimized nutrition care.

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REFERENCES

1. Schuetz P, Sulo S, Walzer S, et al. EFFORT trial collaborators. Economic evaluation of individualized nutritional support in medical inpatients: secondary analysis of the EFFORT trial. *Clin Nutr*. 2020;39(11):3361-3368.
2. Snider JT, Linthicum MT, Wu Y, et al. Economic burden of community-based disease-associated malnutrition in the United States. *JPEN J Parenter Enteral Nutr*. 2014;38(2 Suppl):S77-S85.
3. Sriram K, Sulo S, VanDerBosch G, et al. A comprehensive nutrition-focused quality improvement program reduces 30-day readmissions and length of stay in hospitalized patients. *JPEN J Parenter Enteral Nutr*. 2017;41(3):384-391.
4. Pratt KJ, Hernandez B, Blancato R, Blankenship J, Mitchell K. Impact of an interdisciplinary malnutrition quality improvement project at a large metropolitan hospital. *BMJ Open Qual*. 2020;9(1):e000735.
5. Nepple K, Tobert C, Valladares A, Mitchell K, Yadrick M. Enhancing identification and management of hospitalized patients who are malnourished: a pilot evaluation of electronic quality improvement measures. *J Acad Nutr Diet*. 2019;119(9 Suppl 2):S32-S39.
6. Valladares AF, Kilgore KM, Partridge J, Sulo S, Kerr KW, McCauley S. How a malnutrition quality improvement initiative furthers malnutrition measurement and care: results from a hospital learning collaborative. *JPEN J Parenter Enteral Nutr*. 2021;45(2):336-371.
7. Danis K, Kline M, Munson M, et al. Identifying and managing malnourished hospitalized patients utilizing the malnutrition quality improvement initiative: the UPMC experience. *J Acad Nutr Diet*. 2019;119(9S2):S40-S43.
8. UNC Medical Center About Us. UNC Medical Center, UNC Health Care. Accessed October 12, 2020. https://www.uncmedicalcenter.org/uncmc/about/
9. McCauley SM, Barrocas A, Malone A. Hospital nutrition care betters patient clinical outcomes and reduces costs: the Malnutrition Quality Improvement Initiative story. *J Acad Nutr Diet*. 2019;119(9 Suppl 2):S11-S14.
10. Academy of Nutrition and Dietetics. Malnutrition Quality Improvement Initiative. Accessed April 17, 2020. http://malnutritionquality.org/
11. Fitall E, Pratt KJ, McCauley SM, et al. Improving malnutrition in hospitalized older adults: the development, optimization, and use of a supportive toolkit. *J Acad Nutr Diet*. 2019;119(9 Suppl 2):S25-S31.
12. Arensberg MB, Richards J, Benjamin J, Kerr KW, Hegazi R. Opportunities for Quality Improvement Programs (QIPs) in the nutrition support of patients with cancer. *Healthcare*. 2020;8(3):227.
13. Trujillo EB, Claghorn K, Dixon SW, et al. Inadequate nutrition coverage in outpatient cancer centers: results off a National Survey. *J Oncol*. 2019;2019:7462940.
14. Silver HJ, Pratt KJ, Bruno M, et al. Effectiveness of the malnutrition quality improvement initiative on practitioner malnutrition knowledge and screening, diagnosis, and timeliness of malnutrition-related care provided to older adults admitted to a tertiary care facility: a Pilot Study. *J Acad Nutr Diet*. 2018;118(1):101-109.
15. Mullin GE, Fann L, Sulo S, Partridge J. The association between oral nutritional supplements and 30-day hospital readmissions of malnourished patients at a US academic medical center. *J Acad Nutr Diet*. 2019;119(7):1168-1175.
16. Marshall AP, Takefala T, Williams LT, Spencer A, Grealish L, Roberts S. Health practitioner practices and their influence on nutritional intake of hospitalised patients. *Int J Nurs Sci*. 2019;6(2):162-168.
17. Adams KM, Kohlmeier M, Zeisel SH. Nutrition education in U.S. medical schools: latest update of a national survey. *Acad Med*. 2010;85(9):1537-1542.
18. Jensen GL, Compher C, Sullivan DH, Mullin GE. Recognizing malnutrition in adults: definitions and characteristics, screening, assessment, and team approach. *JPEN J Parenter Enteral Nutr*. 2013;37(6):802-807.
19. Laur C, Valaitis R, Bell J, Keller H. Changing nutrition care practices in hospital: a thematic analysis of hospital staff perspectives. *BMC Health Services Res*. 2017;17(1):498.
20. Mehta, P. Stahl, MG, Shull M, et al. Telehealth and nutrition support during the COVID-19 Pandemic. *J Acad Nutr Diet*. 2020;120(12):1953-1957.
21. Keller HH, Valaitis R, Laur CV, et al. Multi-site implementation of nutrition screening and diagnosis in medical care units: Success of the More-2-Eat project. *Clin Nutr*. 2019;38(2):897-905.