Improving Malnutrition in Hospitalized Older Adults: The Development, Optimization, and Use of a Supportive Toolkit

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ABSTRACT
Malnutrition is a leading cause of morbidity and mortality, especially among older adults. However, diagnosis and treatment of malnutrition in the hospital setting are often overlooked. In recent years, quality improvement (QI) initiatives to increase the assessment and treatment of malnutrition in hospital settings have been implemented and shown to improve both patient health and economic outcomes. The Malnutrition Quality Improvement Initiative (MQii) Toolkit was designed in an effort to support hospitals seeking to implement malnutrition QI initiatives. The Toolkit has been implemented, studied, and updated for optimization of content, adaptability, and usability over several cycles of improvement from 2016-2017 at more than 50 hospital centers in the United States. The result is an open access, customizable, and user-friendly MQii Toolkit that can facilitate the implementation of malnutrition QI initiatives in individual facilities. This article introduces the MQii Toolkit, describes the process by which it was designed and improved, and orients clinical care teams to its use.

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Keywords: Malnutrition; Quality improvement; Plan-do-study-act cycles; Toolkit

Malnutrition, which has been defined through an etiology-based approach and can include individuals who are underweight or overweight, is a leading cause of morbidity and mortality, especially among older adults. As many as half of all patients are malnourished or are at risk of becoming malnourished at the time of hospital admission, with older adults especially at risk, often because of the health, physiologic, and functional changes associated with aging that can influence their nutritional status. Early identification and treatment of these patients is the most effective way to reduce malnutrition-associated safety and health outcome issues. However, the diagnosis and treatment of malnutrition are often overlooked when other care needs are given higher priority.

In recent years, screening practices designed to detect patients at risk of malnutrition have become more widespread, and studies of their effectiveness have demonstrated that both patient health outcomes and hospital economic outcomes are improved when malnutrition is more effectively identified and treated. Such malnutrition quality improvement (QI) efforts have ranged from taking basic steps for improving patient nutrition to implementing wide-sweeping overhauls of the entire process, including medical record reviews, tracking of nutrition supplement administration, and provision of enteral and parenteral nutrition support. In an effort to support hospitals seeking to implement malnutrition QI initiatives, the Malnutrition Quality Improvement Initiative (MQii) partners (Academy of Nutrition and Dietetics and Avalere Health) designed a toolkit (MQii Toolkit Team). The MQii Toolkit has been implemented, studied, and updated for optimization of content and usability in the clinical setting. This article introduces the MQii Toolkit, describes the systematic rapid-cycle process by which it was designed and improved, and encourages clinical care teams to tackle a malnutrition QI initiative using the MQii Toolkit as a guide.

THE MQii TOOLKIT: AN OVERVIEW
In 2015, the MQii was established by the Academy of Nutrition and Dietetics (Academy), Avalere Health, and other expert stakeholders as a program to advance the quality of malnutrition care for patients. One of several major outcomes of the MQii in 2016-2017 was to create a learning collaborative of hospitals across the country to develop and test a malnutrition QI-focused toolkit for clinicians, the MQii Toolkit.

The MQii Toolkit is an evidence-based guide that directs hospital providers through the process of supporting malnutrition QI for older hospitalized patients. Although the MQii Toolkit is designed to facilitate the care of patients ages 65 and older, the best practices and core concepts it reflects are relevant to all adult patients (ages 18+) in the hospital setting. The MQii Toolkit helps clinicians identify and...
treat malnutrition in hospitalized patients by providing recommendations drawn from best-practice research, available literature, clinical practice guidelines developed by the Academy and the American Society for Parenteral and Enteral Nutrition, and the Academy’s Nutrition Care Process workflow elements.

Providing start-to-finish guidance for optimal malnutrition care, the MQii Toolkit was built to be easily implemented and customizable to fit the unique needs of the implementing hospital. The MQii Toolkit provides interdisciplinary care teams (including registered dietitian nutritionists, nurses, physicians, pharmacists, patient advocates, and quality leaders) guidance for malnutrition screening, nutrition assessment, malnutrition diagnosis, care plan development, monitoring and evaluation, and discharge planning. These resources enable clinicians to identify care gaps and lead QI efforts at their hospitals, regardless of prior experience with QI processes. Information in the MQii Toolkit includes:

- What “quality improvement” means and how to implement it
- How to identify malnutrition care gaps
- How to begin a hospital-based malnutrition QI project
- Best practice recommendations for each step of the malnutrition clinical workflow
- Implementation recommendations to address identified gaps
- Tools and resources for clinicians
- Other information such as key QI concepts, how to collect and monitor data for the evaluation of QI efforts, and more

**HOW HAS THE MQii TOOLKIT BEEN OPTIMIZED?**

The MQii Toolkit was initially built following the model of successful QI tools from other initiatives focused on myocardial infarction, bloodstream infections, and asthma. Following the MQii Toolkit’s initial development, a systematic QI process was undertaken to optimize the MQii Toolkit for clinical use.

A number of QI frameworks can be implemented within a hospital to assess and improve clinical processes. One of the most widely used models is the plan-do-study-act (PDSA) cycle approach (Figure 1A). Through systematic, rapid cycles of change and improvement, QI teams evaluate the impact of improvement at regular intervals, determine whether initiatives have successfully resulted in change, and refine the process as necessary.

Three PDSA improvement cycles to rapidly test, evaluate, and revise the MQii Toolkit were implemented over an 18-month period (February 2016 through September 2017) across 55 participating hospitals. Each PDSA cycle comprised of implementing the MQii Toolkit, collecting and analyzing feedback from the hospitals, and revising the Toolkit to address limitations identified in the findings. Given that the adoption of innovative care processes into clinical practice can take up to 17 years, one goal of this undertaking was to produce a toolkit that could spur innovation by its ability to be rapidly customized to the unique needs, demographics, and resources of individual hospitals across the United States.

Between each of the three PDSA cycles, qualitative data were collected to assess the utility of the MQii Toolkit across four domains: content, adaptability, usability, and functionality (Figure 1B). Recommendations within the MQii Toolkit were developed to be clinically relevant and comprehensive to address the needs of patients and clinicians. Modifications and revisions to the MQii Toolkit related to the four domains were made after every cycle, in accordance with the principles of PDSA rapid-cycle improvement. The short turnaround time of the PDSA model allowed the MQii Toolkit Team to efficiently adapt and refine the Toolkit.

**PDSA Cycle 1**

PDSA cycle 1 consisted of an initial assessment of a paper-based toolkit by a single demonstration site during a preimplementation period. Initial feedback on the content, usability, functionality, and adaptability to the demonstration site’s unique circumstances was collected (Figure 2).

Feedback indicated that this first iteration of the MQii Toolkit was very difficult to navigate, that it was not always clear how the different sections should be used, and that it appeared to have limited adaptability to the unique implementation needs of the

![Figure 1](image-url)
demonstration site. Thus, it was unclear whether the MQii Toolkit would be suitable for widespread uptake at other facilities.

Modifications were made to the MQii Toolkit accordingly, in advance of the second PDSA cycle. Specifically, the document was reformatted to more clearly highlight the user learning objectives, clarifying to users how each section should be implemented, and helping users identify the sections most relevant to their unique QI project. These revisions were intended to enhance the usability and adaptability of the MQii Toolkit.

**PDSA Cycle 2**
The second PDSA assessment cycle occurred at the demonstration site and five additional hospitals, which received limited directions for their use of the MQii Toolkit to best approximate “real-world” circumstances. During the “plan” phase of the second PDSA cycle, sites identified opportunities for improvement in their malnutrition clinical workflow and modified available tools and resources (e.g., educational training materials) within the MQii Toolkit to suit their hospitals' needs. The “do” phase consisted of implementation of a QI project using these tools and resources. During the “study” phase of the cycle, the MQii Toolkit Team routinely collected insights from the sites.

The MQii Toolkit had been improved after PDSA cycle 1, with users noting that it helped institutions identify and implement QI projects that uniquely addressed their specific nutrition challenges (Figure 2). However, feedback from PDSA cycle 2 suggested that resources supporting MQii Toolkit internal buy-in and adoption were lacking, and aspects of the MQii Toolkit’s usability and functionality still needed additional improvement. In response, several updates were made in advance of PDSA cycle 3 (Figure 2).

Finally, the critical weakness of the MQii Toolkit was found to be its paper-based format. Therefore, an open access, web-based version of the MQii Toolkit incorporating cycle 2 modifications and stand-alone sections to increase navigability was developed.

**PDSA Cycle 3**
The third PDSA cycle comprised evaluations by 50 hospitals across 12 states. Facility registered dietitian nutritionists were interviewed by the MQii Toolkit Team to gather feedback about use of the Toolkit (Figure 2). Additional areas for improvement identified included difficulty regarding the recruitment of an interdisciplinary team and confusion about what was required vs recommended for team composition. The electronic medium produced mixed feedback: some

<table>
<thead>
<tr>
<th>PLAN</th>
<th>DO</th>
<th>STUDY</th>
<th>ACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this version</td>
<td>Needing improvement for next cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cycle 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Basic usability and adaptability</td>
<td>✓ Guidelines for the engagement of an interdisciplinary team</td>
<td>✓ Guidelines for nutrition best practices</td>
<td>✓ Very difficult to navigate</td>
</tr>
<tr>
<td><strong>Cycle 2</strong></td>
<td></td>
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<td></td>
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<tr>
<td>✓ Increased usability and adaptability</td>
<td>✓ Clinical workflow mapping materials, including a single-page, easy-to-reference diagram</td>
<td>✓ Guidelines for the identification of priority area(s) in need of QI</td>
<td>✓ The critical weakness of the Toolkit in Cycle 2 remains its paper-based format</td>
</tr>
<tr>
<td>✓ New tools to help interdisciplinary teams identify malnutrition</td>
<td>✓ Easy day-to-day implementation</td>
<td>✓ New content to be developed:</td>
<td>✓ Insufficient information to support malnutrition-focused discharge planning</td>
</tr>
<tr>
<td><strong>Cycle 3</strong></td>
<td></td>
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<tr>
<td>✓ The Toolkit was translated into a publicly available, web-based version</td>
<td>✓ New modifications and navigable stand-alone sections were included</td>
<td>✓ Newly developed content was found to be impactful</td>
<td>✓ Overwhelming volume of information</td>
</tr>
<tr>
<td>✓ Some sections of the Toolkit were reported to be easier to use in this electronic version</td>
<td>✓ Project leaders were able to implement only those components needed to improve quality of care at their individual site</td>
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Figure 2. Malnutrition Quality Improvement Initiative (MQii) Toolkit improvement cycles. QI = quality improvement.
Figure 3. Navigating the Malnutrition Quality Improvement Initiative (MQii) Toolkit. Accessible online at malnutritionquality.org, the MQii Toolkit (A) is presented with background information for specific members of the quality improvement (QI) team (B), a link to engage with the MQii Learning Collaborative (C), a QI primer (D), readiness assessment tools (E), and links to short or long versions of the MQii Toolkit document in PDF format (F).
portions of the MQii Toolkit were easier to use electronically, but the volume of information was found to be overwhelming, and it was not readily apparent how best to use the document when planning their intervention or communicating with specific frontline staff. Despite modifications and clear improvements following PDSA cycle 2, navigability of the MQii Toolkit remained the primary weakness (Figure 2).

The use of the PDSA cycle approach to develop the MQii Toolkit allowed for rapid evaluation and improvement of the Toolkit to support its implementation. Although findings from the quantitative and qualitative research indicated that the navigability of the MQii Toolkit continues to be an area for improvement, users generally felt that the content of the Toolkit was clinically appropriate and that progress had been made in enhancing the usability and adaptability of the document.

Next Generation
A next generation of the MQii Toolkit has been developed and features

Figure 4. The recommended malnutrition clinical workflow. Guidelines for each step of the malnutrition assessment and treatment process are available on page 22 of the complete Malnutrition Quality Improvement Initiative Toolkit, found at malnutritionquality.org.
streamlined content intended to reduce its overall size, reorganization of certain components to better align with recommended project steps, and consolidation of the resources deemed most beneficial to a site as it kicks off its QI initiative. These improvements were launched in 2018 by the MQii Toolkit Team, at which point the MQii had enrolled over 250 hospitals nationwide in the Learning Collaborative to implement malnutrition QI projects using the MQii Toolkit and, at some of the hospitals, a set of malnutrition-focused electronic clinical quality measures.

Below this electronic workflow are orange buttons for downloading both the complete (78-page) and abbreviated (58-page) Toolkit documents in PDF format (Figure 3F). While navigating the Toolkit’s supporting materials and preparing to implement the Toolkit at a facility, it may help to refer to the recommended malnutrition clinical workflow (Figure 4). This clinical workflow template delineates the steps that should be taken to assess and address malnutrition in patients, along with timeframes for implementing each step. The MQii Toolkit is designed to assist in the execution and improvement of this clinical workflow process.

References


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STATEMENT OF POTENTIAL CONFLICT OF INTEREST
The Malnutrition Quality Improvement Initiative (MQii) is a project of the Academy of Nutrition and Dietetics, Avalere Health, and other stakeholders who participated in and provided guidance and expertise in this collaborative partnership. S. M. McCauley is an employee of the Academy of Nutrition and Dietetics. K. J. Pratt and K. Mitchell are employees of Avalere Health. G. Astrauskas and T. Heck are employees of Spring Valley Hospital Medical Center. B. Hernandez is an employee of Tampa General Hospital. J. Johnston is an employee of J. W. Ruby Memorial Hospital, Morgantown, WV. H. J. Silver is research associate professor of medicine, and director, Vanderbilt Diet, Body Composition and Human Metabolism Core, and director, Vanderbilt Metabolic Kitchen Core, Vanderbilt University Medical Center, Nashville, TN.

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AUTHOR CONTRIBUTIONS
While affiliated with Avalere Health, E. Fitall led development and optimization of the toolkit and the writing of the manuscript. K. J. Pratt, S. M. McCauley, and K. Mitchell contributed to the toolkit design and testing and practice application section of the manuscript. G. Astrauskas, T. Heck, B. Hernandez, J. Johnston, and H. J. Silver led toolkit testing in their facilities and provided insights into its further development and clinical use. All authors reviewed and commented on subsequent drafts of the manuscript.