Abstract
In collaboration with medical and surgical initiatives for quality improvement, the nutrition support service must identify relevant quality objectives to advance performance improvement. The success of these initiatives is largely dependent on the ability of the nutrition service to “hardwire” the process into the nutrition care plan. Inpatient registered dietitians (RDs) should align their quality indicators to meet the needs of their patient population or specialty service. Developing safety initiatives with quality care components such as computerized order entry for prescribing nutrition provides consistent care delivery. Partnering with physician champions allows for the implementation of hospital-wide policies, procedures, protocols, privileges, and computerized order entry pathways. Improving outcomes and achieving defined metrics creates essential staffing productivity requirements within each service line, providing justification for staffing levels and resulting in overall quality improvements.

Introduction
Quality improvement has become an integral component of health care. Commercial insurers and the Centers for Medicare & Medicaid Services offer incentives and superior reimbursement to hospitals that exceed best practice benchmarks (1–9). The American Hospital Association (AHA) Quality Center™ provides access to resources and tools that support hospital initiatives for quality improvement (10). In 2001, the Institute of Medicine (IOM) described six quality aims that provide a foundation for the implementation of the AHA quality and patient safety agenda (11). These include: patient safety, patient-centeredness, efficiency, effectiveness, timeliness, and equity (Fig. 1). This article examines quality initiatives that have been established by the nutrition support service of one teaching hospital. Specific initiatives and their effects on clinical operations, staff performance, and patient outcomes are reviewed.

Quality Initiatives in Nutrition Support
There are numerous opportunities for the pursuit of quality initiatives related to nutrition therapy based on the IOM quality aims (Table). In our teaching hospital, the nutrition service partners with each area of surgical and medical specialty (service lines) and the RDs participate on various service-line collaborative practice teams. In addition, an RD represents nutrition issues on various hospital committees such as Pharmacy Medication Use, Medication Safety, Formulary Committees, Research Task Forces, and Medical Staff Quality Groups. Each RD is required to define metric objectives during the performance appraisal process that are determined in collaboration with the service-line goals. A few examples include appropriate use of therapy, complications associated with nutrition treatment, patient satisfaction, compliance with protocols, and glycemic control. Individual performance assessment involves defining how the metric meets, exceeds, or does not meet expectations, with corresponding monetary compensation to pay for performance. All nutrition orders are entered electronically within nutrition care sets, which allows the service to devise safe pathways for ordering enteral (EN) and parenteral nutrition (PN) support. Both National Safety Goals and Joint Commission standards can be incorporated into the pathways. Compliance with complete quality documents by the RD is maximized when the initiative is hardwired into the process.

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For example, the RD specializing in glycemic control for patients receiving nutrition support collaborates with the diabetes section and collaborative practice team to implement insulin-dosing strategies for patients receiving nutrition support therapy. The RD works within defined structures of the hospital for gathering data, including the Institutional Review Board (IRB) and the Quality Institute. The data are analyzed, and protocols are developed, implemented, and monitored for success by the nutrition team via their participation on collaborative practice teams as data relates to each practice area.

The metric of improvement is quantified and examined in the individual RD performance appraisal. Through this process, the RD becomes committed to the objective and develops a sense of ownership in relation to the outcome. For the original glycemic control initiative, the original individual performance appraisal objective positively affects hospital-wide patient care by improving glycemic control when the metrics are reached. As each staff member commits to meaningful performance objectives, departmental commitment to quality increases. Best practices have been achieved at our hospital when the objectives are included in the collaborative service-line quality plans. Further, aligning RD performance improvement opportunities within specialties improves employee engagement and job satisfaction (12–16), thereby improving resource utilization and decreasing staff turnover.

Each employee is held accountable for quality improvement outcomes related to his or her skill set (17–19), and the clinical nutrition manager or pharmacy director is held accountable for knowing individual strengths and aligning quality initiatives to support the individual. Clear competency measures form the basis for objective skill assessments that are crucial to quality care (20,21), and advanced-level practice is achieved as clinical skills are enhanced (22–25). Such practice is defined by RD job descriptions and pay grades associated with advanced-level practice. Finally, opportunities resulting from quality initiatives include invitations to conduct research, teach, publish, and present.

Many nutrition services struggle with the areas identified at our hospital. For example, the literature provides limited guidelines for managing patients receiving nutrition support therapy while achieving tight glycemic control. As more patients are managed with a basal/bolus insulin regimen while receiving enteral support, the RD must identify or anticipate potential safety concerns. If the patient receives long-acting insulin in the morning and is scheduled for a test off the floor later in the day, the tube feeding is put on hold, and a plan must be devised to protect the patient from hypoglycemia if the test takes longer than anticipated. One of the steps within the ordering of the enteral feeding is to provide intravenous replacement fluids when tube feedings are interrupted beyond 2 hours without the requirement for a separate order or call to the physician.

Institutional protocols not only address quality initiatives, but also provide opportunities for RDs to expand their clinical responsibilities. The Joint Commission requires all patients to be screened for nutrition risk within 24 hours of admission (26). Patients identified at nutrition risk must be assessed by nutrition services. Patients with complicated hospitalizations routinely are identified at risk using nutrition screening criteria (27,28). Our patients are screened by nursing upon admission to the hospital via a functional assessment that addresses predetermined questions. If a patient fails any part of the assessment, a consult to our service is generated. When the consult is completed, the nutrition professional can activate physician-approved institutional protocols. Examples of protocols include ordering supplements,

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**Table. Nutrition Indicators Related to the Six Institute of Medicine Quality Aims**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Sample Quality Monitor</th>
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<tbody>
<tr>
<td><strong>Patient Safety</strong></td>
<td>- Correct permanent feeding tube selection&lt;br&gt;- Avoidance of central line placement if therapy duration is less than 7 to 10 days&lt;br&gt;- Tight glycemic control (serum glucose: 90 to 140 mg/dL)&lt;br&gt;- Criteria for therapy use</td>
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<td><strong>Patient-Centeredness</strong></td>
<td>- Home enteral nutrition patient satisfaction survey&lt;br&gt;- Consideration of patient wishes and ethical issues prior to permanent tube feeding placement&lt;br&gt;- Creation of patient-friendly schedules for specialized nutrition support delivery</td>
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<tr>
<td><strong>Effectiveness</strong></td>
<td>- Evidenced-based practice&lt;br&gt;- Glycemic protocols&lt;br&gt;- Criteria for enteral nutrition specialty formula use</td>
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<tr>
<td><strong>Efficiency</strong></td>
<td>- Protocol pathways for providing specialized nutrition support&lt;br&gt;- Order sets for multivitamin and trace element therapy&lt;br&gt;- Wound care protocols</td>
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<tr>
<td><strong>Timeliness</strong></td>
<td>- Consult response time within 48 hours&lt;br&gt;- Early enteral feeding to prevent malnutrition&lt;br&gt;- Preoperative oral supplementation when poor nutritional status identified by physician</td>
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<tr>
<td><strong>Equity</strong></td>
<td>- Consistent care to all patients&lt;br&gt;- Age-specific competencies defined and measured</td>
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vitamins, and minerals; managing tube feedings; and instituting PN. Obtaining clinical privileges from physician leadership that empower the RD to exceed job expectations by implementing care immediately and efficiently results in improved outcomes (29). The RD can focus all clinical interventions on the patient, and no time is spent contacting physicians to implement orders. Job expectations change with clinical privileges as the nutrition service realizes their greatest impact in patient care and outcomes. Examples of institutional protocols include processes that improve utilization of therapy, timeliness of interventions, and execution of specific service-line initiatives. One interesting example includes the ordering of permanent feeding tubes. Educating physicians plus implementing a standardized enteral tube formulary with supporting computerized order entry screens that contain clear enteral access algorithms allows the physician to choose the proper tube.

Enteral Nutrition

Safety of therapy is the first priority for hospitalized patients requiring nutrition support therapy. The RD is an integral part of a safe EN program that encompasses a comprehensive multidisciplinary approach addressing many variables. EN quality indicators designed to yield data regarding safety, efficacy, and patient-centeredness provide crucial information for improvement. Examples of quality indicators in our institution follow.

Enteral Tubes on Formulary

It is helpful to assess the number of feeding tubes available by each service that places tubes, such as surgery, gastroenterology, and interventional radiology. When each tube is identified as being on formulary, with care directions and pictures provided on the hospital infonet to which all caregivers have access, sentinel events can be avoided. The RD is responsible for managing the entire enteral process at our institution, which includes understanding how to care for all enteral tubes on formulary. This also is necessary for educating patients receiving home enteral regimens. The RD is uniquely poised to collect outcome data on permanent feeding tube complications because he or she is involved in all enteral consults. Additionally, this allows RDs to focus on procedures related to enteral tube care to improve the incidence of patient complications. It also has been helpful for our hospital to identify special scheduling requirements for the services placing tubes, such as weekend availability, outpatient tube placements, or short-stay admissions, to manage patient expectations with discharge planning. Simply put, the enteral tube formulary includes which specific feeding and/or decompression tube will be placed by which service. The RD can provide expert guidance in establishing the system-wide enteral tube formulary and educating all users about specific tube indications, placement requirements, and care of the tube. Such education must be easily accessible to all members of the healthcare team responsible for patients who have enteral feeding tubes.

Many complications have been reported due to the placement of non-formulary tubes at our facility. The presence of an enteral tube formulary eliminates industry sample tubes from the institution and allows for systematic evaluation of new products through a committee process. One example of a positive benefit from implementation of an enteral tube formulary and accompanying enteral algorithms for tube selection is decreasing the likelihood of a physician ordering a jejunal tube without an indication for small bowel feedings. The patient receiving this tube requires administration of the feeding via pump, which increases the time to deliver therapy compared with syringe gastric feedings. This may affect a patient's quality of life if the amount of time to deliver therapy is unnecessarily increased. Insurance coverage related to tube feeding formula, pump, and supplies must be verified prior to tube placement to manage patient expectations.

Clear Delineation of Services Placing Tubes

To simplify the decision tree for permanent feeding tube placement in our institution, the gastroenterology service places percutaneous endoscopic gastrostomy (PEG) tubes and the radiology service places percutaneous gastrojejunostomy tubes (PG/J). Exceptions are defined by all services involved. For example, if a patient is unable to tolerate an endoscope being passed through the esophagus because of an esophageal tumor or varices, the gastroenterologist defers placement to radiology, where an endoscope is not needed for placement. For surgical patients requiring permanent enteral access and undergoing laparotomy, the surgical service places gastric and jejunal tubes. Quality outcome data for every percutaneous permanent feeding tube placed is assessed by each RD and summarized quarterly to identify areas for improvement. Data analysis for minor and major complications associated with permanent feeding tubes for each service placing tubes has allowed us to benchmark our complications with complications reported in the literature. Each service (gastroenterology, radiology, and surgery) approved the definitions for minor and major complications associated with permanent feeding tube placements (Fig. 2). These data are collected by the RD and reviewed for improvement opportunities. For example, radiologic tube dislodgement in obese patients appeared common. To address this problem, the interventional radiologists reviewed the data and changed placement procedures to increase the number of stays placed during feeding tube placement in obese patients.

Change in placement practices have resulted from identifying certain trends with permanent decompression tubes. For example, many trauma patients in our facility require acute decompression and receive permanent tubes. After careful study, it was determined that many of the patients needed only short-term decompression and could have been managed adequately with a nasogastric (NG) tube. The NG tube now is used for decompression until a decision regarding long-term nutrition support needs can be made. Surgically placed feeding tubes also are considered during the time of operation.

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Ethical issues related to tube placement were identified as part of the permanent feeding tube data collection. Numerous surveys revealed that sufficient time was not taken to explain the option of deferring feeding tube placement to provide nutrition support therapy because physicians perceived this as a lengthy and difficult conversation. As part of a teaching initiative with the palliative care team, resources were developed to assist physicians with the language used to explain nutrition and hydration options to patients and family members. Automatic referrals for tracheotomy and PEG feeding tube placements in combination no longer are initiated. Careful consideration for each therapy is discussed.

**Competency and Procedure for Bedside Nasoenteric Tubes Placement**

Outcome data are assessed for every bedside nasoenteric tube placement to assess the success of the placement. Data analysis revealed the need for a different feeding tube for small bowel placement and clear indications for gastric versus small bowel nasoenteric tube placement. In addition, the requirement for competent staff to use established methodology for tube placement and confirmation has resulted in improved proper tube selection and tip location as well as early initiation of feeding. A successful bedside program has decreased the number of fluoroscopy visits for tube placement, resulting in significant cost savings at our institution.

**Early Enteral Access and Feeding**

Early enteral feeding parameters, which may vary by patient population, are compared with national benchmarks at our institution. For example, the number of days until goal enteral feedings are reached is monitored in the neonatal population and compared with a national database from Vermont-Oxford Network, a nonprofit voluntary collaboration of health-care professionals who care for newborn infants (http://www.vtoxford.org/). In addition, the concomitant use of PN is assessed when enteral access is not successful. All of our intensive care units strive for...
early enteral access when indicated and measure the success of their bedside placement algorithms.

**Enteral Tubing, Pump, and Formulary Selections**

All RDs at our institution contribute to EN formulary decisions. The clinical nutrition manager must navigate corporate group purchasing organization contracts and establish essential requirements for the EN formulary. Defining criteria for use of specialty formulas is essential for both patient safety (proper use) and the budget process due to their expense compared with standard formula. The RD also collaborates with nursing and bio-electronics on enteral tube feeding delivery pump selections. Once the products are selected, the quality initiatives constantly provide data elements for re-evaluation.

**Order Set Safety**

An electronic EN order set provides effective guidance for safe enteral orders. For example, generic formula selection screens on the computer that provide indications and descriptions with appropriate progressions for continuous, bolus, syringe, gravity, or cycled feedings aid in safe energy, nutrient, and fluid delivery, thereby preventing potential complications such as the refeeding syndrome and hyperglycemia. Indications and restrictions for specialty formula use can be built into the computer-ordering pathway for enteral feedings. Furthermore, proper care of each feeding tube selected from the formulary can be built into the order set. For example, flushing requirements for specific tubes can be addressed, and normal saline or free water can be provided as flushing options if medically indicated. Directions for residual checks, if needed, can be customized to specific tube types. Controversy regarding gastrointestinal tolerance to EN programs due to “high-volume residuals” is attenuated at our institution by providing instructions within the pathway not to hold tube feedings if residuals resemble the appearance of tube feeding. Guidelines for physician notification criteria also can be included.

We have incorporated other components into the ordering pathway, including directions to nursing for monitoring parameters such as scheduled laboratory tests, fluid balance, weight, directions for head of bed elevation requirements, schedule changes due to percussion and postural drainage, and/or drug/nutrient interactions with the tube feeding as well as replacement fluid guidelines for interruptions in formula delivery. These components were built into the pathway to reduce delays in care and alleviate potential problems that could occur if specific care guidelines were not readily available as part of the tube feeding order.

**Glycemic Control With Tube Feeding**

An additional medication order set specific to dose and type of insulin needed for patients receiving EN assists with safe glycemic management. EN often is interrupted or held, and internal data from the hospital suggest that patients receiving long-acting insulin or insulin drip infusions when EN is interrupted are at risk for hypoglycemia. Replacement guidelines that are hard-wired into the order set, as described previously, allow immediate action by nursing to administer intravenous dextrose to prevent complications. Computerized order entry yields safe and efficient EN delivery and optimal glycemic control by initiating enteral feedings gradually and progressing according to tolerance and glycemic control.

**Parenteral Nutrition**

As with EN, a safe PN program includes a comprehensive multidisciplinary approach that addresses inpatient management and guidelines for PN in the home. PN management and survey/data collection variables yielding valuable information from our institution follow. The RD manages both inpatient and home nutrition support patients to provide continuity of service.

**PN Use**

Understanding utilization trends and the duration of therapy within an institution provides information for improvement. PN survey information may include: indication for therapy; service initiating therapy; information regarding EN trial, if appropriate; duration of therapy; and type of line placed for therapy.

Our PN utilization data revealed frequent placement of peripherally inserted central catheters only for PN therapy and often for short duration. Requiring the RD to determine if PN meets established criteria prior to initiation of therapy eliminates inappropriate PN orders because the RD discusses the questionable indication with the ordering physician. Physicians at our teaching hospital have the privilege to order PN, but the RD is consulted automatically per protocol and determines if therapy is indicated based on standards of care. The RD contacts the physician when therapy is not indicated to discontinue the order. The nutrition support service physician advisor rarely needs to intervene because the RDs have established an excellent rapport and competency at the institution. Figure 3 provides a sample PN quality survey that is completed by the RD with each new PN start. This information is collated quarterly and reviewed by the Medical Staff Quality Committee. The number of patients who do not meet our standards for PN therapy is less than 3%.

**PN Order Set Safety**

As with EN, computerized physician order entry for PN allows for safe solution selection and administration according to policy. Specifically, pathways can be designed for neonates, infants, children, and adults. Macronutrients and micronutrients are selected from age-appropriate safe ranges that are defined by the Medication Safety Committee. For example, we have reduced the incidence of hyperglycemia and the refeeding syndrome with slow macronutrient PN progressions. Other compatible additives such as insulin can be managed with embedded guidelines within the PN computer order. For example, RDs coordinate the amount of regular insulin in the PN bag with the entire daily insulin regimen to account for all sources of

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Peripheral osmolarity restrictions can be addressed with standard macronutrient and micronutrient guidelines that have been predetermined to be acceptable for peripheral infusion. Volume options can be built into the pathway, allowing for cyclic regimens for home PN patients. In collaboration with the patient, the RDs provide cycled infusion times for home PN patients to reduce the amount of infusion time.

**Glycemic Control With PN**

The optimal management of patients with hyperglycemia while receiving PN is challenging. Improving outcome variables for this population remains a priority at our institution. Using IRB data analysis for this population, our efforts continue to focus on the development of order sets and protocols. RDs are crucial to the success of an insulin program designed for EN and PN at our institution because they assist in the management of therapy.

### Additional Nutrition Quality Indicators

The nutrition support team can affect quality indicators within each service line in addition to nutrition support monitors. A few examples include:

- Compliance with nutrition risk screening and consult to nutrition support service to expedite nutrition therapy
- Consult completion time and productivity measurements to justify staffing needs
- Percent of new mothers breastfeeding upon discharge
- Neonatal weight gain velocities compared to birth size
- Incidence of necrotizing enterocolitis in the neonatal population
- Wound care protocol implementation to improve wound healing and decrease length of stay
- Success with ketogenic diet in refractory seizure control to decrease the incidence of seizures
- Oral supplement protocols for specific diagnosis to provide adequate oral intake
- Education for defined drug/nutrient interactions to prevent complications
- Preoperative nutrition supplements in patients identified at nutrition risk to improve postoperative healing
- Specialized renal protocols for nutrition and medication management to expedite care

### Summary

When the nutrition support service aligns quality initiatives within each service line, quality care is delivered and nutrition therapy is maximized. The six IOM quality aims provide a foundation for the implementation of specific indicators. Each RD must be held accountable for clinical competency and contributions to patient care. This can be accomplished by participation in hospital quality structures, research programs, and specific service-line committees. Physician-approved policies, protocols, and order sets provide opportunities to implement consistent quality nutrition care. Finally, each quality objective provides an opportunity for the RD to publish and present, which ultimately increases employee engagement and job satisfaction.

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### References


Guest Editor’s Perspective

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their thoughts, expertise, professional goals and experiences, and the subsequent outcomes of those experiences.

Lisa McDowell describes hospital-based quality initiatives in nutrition support services that resulted in positive effects not only in patient outcomes, but also in clinical operations and staff performance. Carol Rees Parrish and Joe Krenitsky share the dedication, determination, and steps taken to grow adult nutrition support services at a university-based medical center from an inpatient consult service to an enormous program encompassing inpatient, outpatient, and home care nutrition support services as well as multidisciplinary educational programs and clinical nutrition support research. Pamela Charney deftly integrates the Nutrition Care Process (NCP) into nutrition support practice, skillfully leading the nutrition support dietitian into the murky world of NCP implementation in this specialized arena. Last, but by no means least, Annalynn Skipper elucidates the emerging vision and concepts of advanced-level dietetics practice in nutrition support, including the rationale for its creation and the construct of its practitioners.

To repeat Dr. Einstein’s (or my dentist’s) words, “Only a fool would expect different results from doing the same thing.” The need to alter dietetics education and practice has been identified, and changes are occurring. Visionaries and leaders in the dietetics profession are grappling continuously with the whats, hows, whens, and whys of this professional makeover. A common theme appears to be spurring change: Doing the same thing results in the same outcome, and that outcome is losing its value for both the practitioner and the public. This is an exciting, albeit confusing, time in the dietetics profession. I’m game for a change. How about you?