10-2012

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Published in *Nutrition in Clinical Practice* 27:5 (October 2012), pp. 655–660;
doi: 10.1177/0884533612457179

Medical Nutrition Therapy Provided to Adult Hematopoietic Stem Cell Transplantation Patients

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Financial disclosure: None declared.

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Abstract

This study explored the current medical nutrition therapy (MNT) provided to adult patients undergoing hematopoietic stem cell transplantation (HSCT) and examined the current and desired role of registered dietitians (RDs) in providing MNT. A total of 60 RDs (57% response rate) responded to an electronic questionnaire. Descriptive statistics and χ^2 analyses (SPSS, version 18) were used. Results revealed the primary form of diet was oral, and for patients on nutrition support, parenteral nutrition (PN) was used more frequently (16%–31%) than enteral nutrition (EN) (5%–9%; $P \leq .05$). Nutrition support decisions were based on patients' individualized needs rather than established protocol or policies. Mucositis was the most common reason for implementing PN (31%), and intubation or being in the intensive care unit was the most common reason for implementing EN (28%). The RDs had varying degrees of autonomy in order writing and were most often recommending MNT to the physician or writing the MNT order with a physician cosignature. Many RDs reported desiring higher autonomy than what they were currently practicing ($P < .05$). Those who held a certified specialist in oncology (CSO) or certified nutrition support dietitian/clinician (CNCD/C) certification were significantly more likely to have and desire greater autonomy in order writing than those without specialty

credentials ($P \leq .05$). No difference was found in current practice or desired autonomy based on the years of experience or educational degree.

Keywords: nutrition therapy, stem cell transplantation, parenteral nutrition, enteral nutrition

Patients undergoing hematopoietic stem cell transplantation (HSCT) have increased metabolic demands and are at increased nutrition risk.[1] Complications that affect appetite and oral intake include nausea, vomiting, dysgeusia, diarrhea, mucositis, anorexia, and xerostomia.[2] Therefore, consuming adequate calories to prevent weight loss is challenging and may result in the use of nutrition support.[3]

Opinions vary on when to initiate nutrition support for HSCT recipients and whether the nutrition support provided should be parenteral nutrition (PN) or enteral nutrition (EN).[2] Traditionally, the use of PN has been the primary method of nutrition support for HSCT recipients. However, past studies[4–8] have suggested that PN use may be associated with increased incidence of hyperglycemia and infection, delayed engraftment, and increased length of hospitalization without positively affecting clinical outcomes. Conversely, EN has been associated with decreased development of acute-grade III/IV graft vs host disease (GVHD) and mortality from infection during the first 100 days after transplant.[4] Strong evidence to support standards for when to initiate nutrition support (PN or EN) is lacking.[9]

Registered dietitians (RDs) work closely with an interdisciplinary team to assist in making decisions on PN and EN feedings but experience varying degrees of autonomy in this process.[1,10] Most currently practicing RDs do not hold order-writing privileges but value independent and dependent prescriptive authority.[10]

Although published literature exists on advantages and disadvantages of PN and EN use in HSCT patients, there have been limited studies on the medical nutrition therapy (MNT) actually provided to this population. The purpose of this study was to determine the current MNT provided to adult patients undergoing HSCT and examine the current and desired role of dietitians in providing MNT to HSCT patients.

Methods

This study used a cross-sectional survey research design. An online questionnaire was provided through Survey Monkey (Chicago, Illinois). The study was approved by the Medical Center's institutional review board (IRB) prior to data collection.

Sample Selection

The target population for this study was RDs currently practicing in adult HSCT facilities in the United States. The research sample was obtained through contact information from the Blood and Marrow Transplant Information Network, listed by state on the website (www.bmtinfonet.org). The researcher called all US transplant centers (n = 155) and requested contact information for the RDs employed. Of the 155 contacted, contact information from 105 centers was obtained. An email requesting participation was sent to these RDs. In addition, RDs were asked to forward a link to a physician questionnaire to an

HSCT physician on their team. As only 11 physicians responded, only information from RDs will be discussed in this article.

Questionnaire Development

The questionnaire developed for the RDs had 5 main sections. In the first section, RDs were asked to indicate their current role and the role the RD should have in 9 different order-writing situations. The second section included questions on MNT practices (i.e., use of low bacterial content diets, methods used to assess nutrition intake). The third and fourth sections on PN and EN asked questions regarding the use of nutrition support on specific patient types (autologous or allogeneic), perceived barriers to initiating nutrition support, reasons for initiation and discontinuance of nutrition support, and duration of use. The final section asked questions regarding agreement on nutrition practices, preferred methods for providing nutrition to HSCT patients, and the perceived barriers to providing optimal nutrition. Depending on various screening questions, the total number of answers able to be provided by participants completing the questionnaire was 49, which was estimated to take approximately 30 minutes to complete, based on information from a pilot study. This included 13 open-ended and 36 close-ended questions.

Data Collection

Data collection followed recommendations by Dillman.[11] The cover letter and link to the electronic questionnaires were emailed to the RD sample in June 2011. The email explained the study's purpose, importance, voluntary nature of participation, and confidentiality of responses. A total of 3 follow-up emails were sent to the RDs thanking those who had completed the questionnaire for their participation and encouraging those who had not completed the questionnaire to do so. Participants were provided a summary of the findings from the research to facilitate benchmarking their practice with other HSCT facilities.

Data Analysis

Statistical software, Statistical Package for the Social Sciences (version 18.0, 2011, SPSS, Inc., an IBM Company, Chicago, Illinois), was used for all data analyses. To decrease bias, participants who left more than 50% of questions unanswered were excluded from the study. Descriptive statistics were completed for all variables. An independent t test was used to determine difference between mean PN and EN duration of use. χ^2 analyses were used to determine differences between the RD's current role and his or her perceived ideal role in order writing and to explore differences in current and desired autonomy in order-writing privileges based on specialty credentials, years of experience, and education level.

Results

A total of 60 RDs (57% response rate) completed the online questionnaire. A majority of RD respondents had a bachelor's degree (59%), 39% had a master's degree, and 2% had a doctorate degree. Most worked exclusively with adult HSCT patients (85%) and had been a RD for an average of 12 years. Many held no additional specialty certifications (45%), although 30% were certified nutrition support clinicians/dietitians (CNSC/D), and 22%

were certified specialists in oncology (CSO). Respondents had worked with HSCT patients for an average of 7 years.

Nutrition Practices

Almost all (88%) RDs responded that they used some type of low bacterial content diet (components of diet were not evaluated) that was most often (57%) initiated upon patient admission as opposed to a specific absolute neutrophil count (ANC). Approximately three-quarters (77%) of respondents reported that calorie counts were conducted on HSCT patients; however, only 11% reported that these were routinely done on HSCT patients and most (72%) were requested by the RD. The nurse or nurse assistant most often recorded the calorie counts (74%) while the RD analyzed the data (85%). The most commonly mentioned barrier to implementing calorie counts was labor and staffing (52%). When asked if RDs participate in daily rounds with other healthcare professionals, more than half (57%) responded that they did not, and the most common reason for not participating was a lack of time (47%). Finally, the majority of RDs (63%) did not meet with patients in an outpatient setting prior to transplantation.

PN Use

Almost all respondents (98%) had used PN at their facility, and the decision to initiate PN was almost exclusively individualized to the patient (97%) rather than under an established policy or protocol. Table 1 indicates the MNT practices of PN for HSCT patients with regard to percent and duration of nutrition support use by donor type, which was estimated by the RD. PN was used in approximately 16% of autologous patients, 29% of allogeneic-related donor patients, and 31% of allogeneic-unrelated donor patients. The RDs (61%) reported that the percentage of energy provided in PN was primarily dependent on oral intake, and approximately two-thirds (68%) discontinued PN when oral intake (or enteral tube feeding) was > 50% of needs. The top 3 components of policies, protocols, and/or individualized approaches for determining when to implement PN for HSCT patients included mucositis (31%), gastrointestinal toxicities such as nausea and vomiting (19%), and GVHD (17%).

Table 1. Medical Nutrition Therapy (MNT) Practices of Parenteral Nutrition (PN) and Enteral Nutrition (EN) for Hematopoietic Stem Cell Transplant (HSCT) Patients

Characteristics	PN	EN
Percent of autologous patients on nutrition support		
Mean[a]	16.5	5.0
Range	0.0–100.0	0.0–15.0
Percent of allogeneic patients on nutrition support		
Related donor		
Mean[a]	29.0	7.3
Range	0.0–90.0	0.0–30.0
Unrelated donor		
Mean[a]	30.8	9.1
Range	0.0–95.0	0.0–50.0
Days on nutrition support for autologous patients		
Mean	10.0	18.0
Range	0.0–56.0	0.0–112.0
Days on nutrition support for allogeneic patients		
Related donor		
Mean	13.5	14.3
Range	0.0–30.0	0.0–30.0
Unrelated donor		
Mean	16.1	17.5
Range	0.0–35.0	0.0–42.0

If a range was provided, the highest number in the range was used for calculation. Information provided is based on registered dietitian estimates of use.

a. $P \leq .05$, analysis of variance comparison of PN and EN use

EN Use

More than half of RDs used EN for HSCT patients (69%), and all (100%) stated that the decision to initiate EN was individualized to the patient rather than under policies or protocols. The majority of RDs did not continue EN if their patient had intractable diarrhea (75%), vomiting (93%), or nausea (60%). The percent of energy provided from EN was mostly dependent on oral intake (85%), and similar to PN, approximately two-thirds (68%) discontinued EN when oral intake was > 50% of needs. The top 3 components of the policies, protocols, and/or individualized approaches for determining when to implement EN for HSCT patients included if the patient was intubated or in the intensive care unit (28%), if oral intake was inadequate (23%), and if the physician had requested EN to be initiated (10%).

The RD's preferred methods of nutrition for HSCT autologous patients varied greatly and were fairly evenly distributed with oral intake only, no nutrition support (29%); oral intake with EN as needed (29%); and oral intake with PN as needed (27%; Table 2).

Table 2. Registered Dietitian (RD) and Physician Preferred Method of Nutrition for Hematopoietic Stem Cell Transplant (HSCT) Patients

Characteristics	No. (%)
Preferred nutrition for autologous patients	
Oral intake only, no nutrition support	16 (28.6)
Encourage oral intake, EN as needed	16 (28.6)
Encourage oral intake, PN as needed	15 (26.7)
Encourage oral intake, combination EN and PN	9 (16.1)
Preferred nutrition for allogeneic patients	
Oral intake only, no nutrition support	6 (11.3)
Encourage oral intake, EN as needed	15 (28.3)
Encourage oral intake, PN as needed	22 (41.5)
Encourage oral intake, combination EN and PN	10 (18.9)

Role of the RD in Order Writing

As indicated in Table 3, more than half of RDs write and modify under protocol with no physician cosignature for high-calorie and high-protein snacks (57%) and oral nutrition supplement drinks *(53%)*. With regard to oral diet changes, EN formula, EN rate and administration, macronutrients in PN, micronutrients in PN, and electrolytes in PN, the most common responses were that RDs are recommending to the physician (while the physician writes the order) or writing the order with a physician cosignature. Those who held a CSO or CNSD/C certification were significantly ($P \leq .05$) more likely to have greater autonomy in order writing than those without specialty credentials with regard to EN formula, EN rate and administration, micronutrients in PN, and electrolytes in PN. There were no differences in the RD's current role based on education (bachelor's vs. graduate) and years of experience (< 5 years vs. ≥ 6 years and < 10 years vs. ≥ 11 years).

RDs were asked to also rate what role they believed the RD should have in the order-writing process for the same 9 practice components listed in Table 3. The most common response for high-protein and high-calorie snacks (83%), oral nutrition supplement drinks (83%), and oral diet changes (72%) was that RDs should write and modify under protocol without a physician cosignature. However, more than half the RDs did not believe they should write or modify under protocol without a physician cosignature for the remaining practice components. A χ^2 analysis was used to determine differences between the RD's current and ideal role, shown in Table 3. Overall, with regard to high-protein and high-calorie snacks, oral nutrition supplement drinks, EN rate and administration, macronutrients in PN, micronutrients in PN, and electrolytes in PN, RDs reported desiring higher autonomy in those order-writing components than what they were currently doing ($P < .05$). A χ^2 analysis was performed to determine if there was a difference in desired autonomy based on credentials held (CSO or CNSD/C certification), education, and years of experience. RDs who held credentials desired higher autonomy with regard to the decision for oral diet changes and EN formula selection ($P \leq .05$). There were no significant differences in desired autonomy based on education and years of experience.

Table 3. Comparison of Registered Dietitian (RD) Current[a] and Ideal Role[b] with Hematopoietic Stem Cell Transplant (HSCT) Patients

Practice Components	RD Has No Role in Order Writing/ Recommending, No. (%)	RD Recommends/ Physician Writes Order, No. (%)	RD Writes/ Modifies with Physician Cosignature, No. (%)	RD Writes/ Modifies under Protocol/ No Physician Cosignature, No. (%)
High calorie/protein snacks*				
RD current practice response	1 (1.7)	11 (18.3)	14 (23.3)	34 (56.7)
RD ideal practice response	1 (1.7)	0	9 (15.0)	50 (83.3)
Oral nutrition supplement drinks*				
RD current practice response	1 (1.7)	10 (16.7)	17 (28.3)	32 (53.3)
RD ideal practice response	1 (1.7)	0	9 (15.0)	50 (83.3)
Oral diet changes				
RD current practice response	1 (1.7)	26 (43.3)	24 (40.0)	9 (15.0)
RD ideal practice response	1 (1.7)	1 (1.7)	15 (25.0)	43 (71.6)
Enteral nutrition (EN) formula				
RD current practice response	1 (1.7)	26 (43.4)	28 (46.7)	5 (8.3)
RD ideal practice response	1 (1.7)	5 (8.3)	28 (46.7)	26 (43.3)
EN rate/administration*				
RD current practice response	1 (1.7)	26 (43.3)	28 (46.7)	5 (8.3)
RD ideal practice response	1 (1.7)	6 (10.1)	26 (44.1)	36 (44.1)
Macronutrients in PN*				
RD current practice response	7 (11.7)	26 (43.3)	22 (36.7)	5 (8.3)
RD ideal practice response	3 (5.0)	10 (16.7)	26 (43.3)	21 (35.0)
Micronutrients in PN*				
RD current practice response	15 (25.0)	21 (35.0)	21 (35.0)	3 (5.0)
RD ideal practice response	4 (6.7)	14 (23.3)	26 (43.3)	16 (26.7)
Electrolytes in PN*				
RD current practice response	16 (26.7)	20 (33.3)	21 (35.0)	3 (5.0)
RD ideal practice response	4 (6.6)	16 (26.7)	24 (40.0)	16 (26.7)
Medications to manage nutrition-related side effects				
RD current practice response	14 (23.3)	42 (70.0)	4 (6.7)	0
RD ideal practice response	3 (5.0)	31 (51.7)	22 (36.7)	4 (6.6)

a. RD responses to question on the RD's current role.
b. RD response to question on the RD's ideal role.
*$P \leq .05$, χ^2 analysis differences between RD current and ideal role.

RD Beliefs about Barriers to Nutrition

The RDs were asked to list barriers to optimal nutrition for HSCT patients. The most common RD responses included gastrointestinal (GI) toxicities (38%), physician and medical staff agreement with care (30%), mucositis (13%), and having a lack of research data and protocols for practice (8%).

Discussion

Respondents in this study reported between 16% and 31% of autologous and allogeneic patients were placed on PN. In a study published in 1998, 32% of autologous patients and 92% of allogeneic patients were placed on PN,[12] and 53% of autologous patients and 65% of allogeneic patients were placed on PN from a study published in 2006.[13] Results from the current study suggest a possible decrease in PN use for HSCT patients over the past several years. Potential reasons for the decreased utilization of PN could be attributed to new chemotherapy regimens, supportive medications to control for side effects of treatment, or recent studies suggesting the negative consequences of PN use.[2,6]

RDs in the current study reported using PN most commonly if a patient had mucositis, GI toxicities, and GVHD. According to the American Society for Parenteral and Enteral Nutrition (ASPEN) practice guidelines,[14] PN should be discontinued when toxicities have resolved and stem cells have engrafted. Results from this study suggest that current practices are relying more on the patient's ability to consume an oral diet as opposed to whether or not engraftment occurred.

More studies have explored PN practices with adult HSCT patients than have explored EN use. In the current study, 98% of respondents reported they might use PN at their facility if nutrition support was warranted, whereas only 69% used EN if nutrition support was indicated for their adult HSCT patients. The use of PN and EN occurred in less than one-third of patients, regardless of the type of transplant, suggesting that the use of an oral diet was the most common route of nutrition provided to this patient population. PN was used significantly more as the nutrition support modality than EN ($P \leq .05$) (Table 1). A lack of literature exists on the benefits of EN for HSCT patients, which could be contributing to the greater use of PN, despite understood complications associated with this form of nutrition support in this population. Benefits of EN use over PN have been observed and include decreased incidence of GVHD and less mortality from infection within the first 100 days after transplantation.[4] The Academy of Nutrition and Dietetics Evidence Analysis Library guideline for HSCT patients states that PN use should occur only in select patients due to its increased risk of treatment complications, increased cost, and a significant lack of improvements in treatment outcomes.[15]

Consistent with findings from Weil et al,[10] RDs in this sample also experienced varying degrees of autonomy in order-writing privileges, and many RDs desired higher autonomy than what they were currently practicing. However, Weil et al.[10] evaluated RDs in multiple practice areas with general patients, whereas the current study assessed specific nutrition order-writing tasks to determine more in-depth autonomy with regard to HSCT patients.

Determining RDs' current and ideal practice with HSCT patients could provide insight into areas for the development of RD autonomy. Peterson et al.[16] studied the influence of the RD on order-writing privileges on PN use in a retrospective cohort at a tertiary care urban medical center to compare the use of PN on adult outcomes before and after RDs were granted order-writing privileges under protocol. After the RDs were granted order-writing privileges under protocol, overall PN use significantly decreased, including inappropriate PN use, despite an increase in hospital admission. The authors from this study

concluded that RDs with order-writing privileges have the potential to decrease inappropriate PN use and costs in hospital settings, and future studies should focus on the influence of the RD in advanced practice roles, specifically in nutrition support delivery. Therefore, RDs with higher autonomy in order writing could assist in decreasing inappropriate PN use and negative outcomes for adult HSCT patients.

Limitations

Several limitations should be considered when deriving conclusions from this study. A moderate response rate for RDs limits the generalizability of results. The response rate could be attributed to the length of the questionnaire, potential spam filters in emails, or a personal unwillingness to participate through email. Another limitation was allowing open-ended responses to some questions in the questionnaire, making categorization difficult. When the RDs were asked to provide the duration of nutrition support use within the past year, they were asked to estimate the duration and not collect actual data, to reduce the likelihood of participants discontinuing the survey due to time-consuming responses, which might have affected accuracy of the data. No question was asked if the RDs were currently working with other patient populations, which could provide insight into issues related to staffing. Also, no question to identify facility type was asked, which could determine regional discrepancies in both care and autonomy; facility questions were not asked to increase the response rate, as it was possible that participants might be less likely to complete the survey if their answers were associated with their facility.

Conclusions

Results from this study suggest that the use of an oral diet is the primary form of nutrition provided to HSCT patients; PN and EN are used when nutrition support is needed for all donor types, with PN being used significantly more than EN. However, PN use appears to be somewhat less compared with the frequency reported in previous studies. RDs are actively involved in the MNT provided to adult HSCT patients; however, they experience varying degrees of autonomy and believe the role of the RD should be to recommend (while the physician writes the order) or to write and modify with a physician cosignature for the majority of practice components.

In developing future questionnaires, questions regarding facility type should be asked to determine differences in nutrition practices and areas of autonomy based on facility type, size, and geographic location. In addition, future questionnaires could include interdisciplinary members, such as pharmacists and nurse practitioners, to determine similarities and differences in responses among disciplines. Finally, asking questions on the various conditioning regimens HSCT patients receive could be used to determine how GI toxicities and side effects of the regimens are associated with the increased utilization of nutrition support.

In future studies exploring MNT in HSCT patients, several areas of focus should be considered, such as exploring the rationale behind PN and EN use for adult patients undergoing HSCT since current practices have been proven somewhat inconsistent with evidence-based practice guidelines. Developing practice guidelines related to nutrition support should be developed to improve the level of evidence regarding optimal nutrition for adult HSCT

patients. There is also a need to encourage continued professional development of RDs working at HSCT facilities to prepare RDs to assume more responsibility for the MNT of HSCT patients.

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