Discharge and Unscheduled Readmissions of Adult Patients Undergoing Hematopoietic Stem Cell Transplantation: Implications for Developing Nursing Interventions

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Purpose/Objectives: To describe discharge and unscheduled readmission patterns of adult patients undergoing hematopoietic stem cell transplantation (HSCT). To identify implications for nursing practice from survey results and the literature that may improve patient outcomes during and following initial hospital discharge.

Design: Retrospective chart review and literature review.

Setting: National Cancer Institute-designated Comprehensive Cancer Center.

Sample: 100 adult patients undergoing HSCT in the first six months of 2000.

Methods: Investigator-created retrospective chart-review tool collected data in three areas: demographic, clinical, and readmissions in the first six months after discharge.

Main Research Variables: Demographic variables: gender, marital status, age, and diagnosis; clinical variables: remission status at transplant, type of transplant, presence of comorbid or concurrent conditions, number of infections, number of catheter-related infections, number of bacteremic episodes, and psychosocial support; readmission variables: reason for admission, discharge or death data, number of days of each admission, and length of time between discharge to the next admission.

Findings: Fifty-one percent had at least one unscheduled readmission, and 80% developed an infection after HSCT. Further analysis comparing autologous to allogeneic transplant recipients indicated that the allogeneic group had a higher number of readmissions, unscheduled readmissions, and infections. Patients who reported an infection within a month prior to HSCT had a 50% mortality rate after transplantation.

Conclusions: Findings indicate that allogeneic transplant recipients are a more vulnerable population in regard to infections and readmissions. Developing and testing nursing interventions surrounding the discharge period are needed next steps in improving care.

Implications for Nursing: Knowledge of trends in this vulnerable population will guide nursing to plan targeted interventions.

Key Points . . .

- The retrospective chart review of 100 adult patients undergoing hematopoietic stem cell transplantation in the first six months of 2000 indicated infection, gastrointestinal problems, failure to thrive, and graft-versus-host disease as primary reasons for unscheduled readmissions in the first six months following initial discharge.
- Allogeneic transplant recipients have a higher infection risk and unscheduled readmission rate.
- Allogeneic transplant recipients are a vulnerable population with needs for significant nursing interventions at and after initial discharge.

Thousands of hematopoietic stem cell transplants (HSCTs) are performed each year, with the number of transplants increasing for treatment of malignant diseases (Andrykowski et al., 1999; King, 1996). With this increase, greater expertise has developed in the four decades of transplant experience surrounding the care of these patients. Some of these advances have occurred in the area of HSCT outpatient management (Horowitz, 1999). Traditionally, transplantation involved an inpatient admission to complete the process of conditioning therapy (ablative chemotherapy or radiation therapy) followed by bone marrow or stem cell reinfusion, and about 30–40 days of inpatient care after

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transplantation. Today, as a result of changes in the care of patients undergoing HSCT and pressure regarding healthcare costs, transplants or parts of the transplant process such as the conditioning phase or follow-up post-transplant may be performed in the outpatient setting (Horowitz).

Along with the increase in the number of transplants and the refinement of medical treatment, survival rates after HSCT have improved steadily since the late 1960s. Current descriptions of survival rates reveal variations depending on the underlying disease, the stage of disease at transplant, and the type of transplant. Mortality rates at 100 days post-transplant vary from 5%–42% (Loberiza, 2003). With increases in the survival rate, physical and psychosocial issues that transplant survivors face after discharge have been identified. Several studies have described a population struggling with major quality-of-life (QOL) issues in the first year after transplantation. These issues include physical symptoms such as fatigue, pain, dyspnea, insomnia, poor concentration, appearance, concern about body image, and physical restrictions; psychological symptoms such as fear of the future, loss of control, anxiety, and depression; social issues such as reintegration into the family, workforce, social roles, sexuality, and finances; and existential and religious issues (Altmaier, Gingrich, & Fyfe, 1991; Andrykowski, 1994; Andrykowski et al., 1999; Baker, 1994; Baker, Zabora, Polland, & Wingard, 1999; Ferrell et al., 1992a, 1992b; Grant et al., 1992; Johnson Vickberg et al., 2001; Kopp et al., 1998; Molassiotis, van den Akker, & Boughton, 1997; Schmidt et al., 1993; Wettergren, Langius, Bjorkholm, & Bjorvell, 1997).

The complex survivorship issues in the immediate post-transplant phase present significant challenges for patients and families, including physical complications and psychosocial and emotional sequelae for both patients and families (Blume & Amylon, 1999; Fife et al., 2000; Grant, 1999; King, 1996). Transplantation continues to be associated with a substantial risk of mortality and morbidity, increasing the burden on families and healthcare providers (Blume & Amylon). Infection and organ damage and failure continue to be significant issues after transplantation. With the current healthcare reimbursement system and changes in the care of patients undergoing transplants, such as the use of peripheral blood stem cells and growth factors, patients frequently are discharged with complicated care needs (Whedon & Fliedner, 1999). This population of patients often is readmitted within six months to manage a variety of clinical issues, accompanied by psychological issues that are too complex or difficult for patients and families to deal with at home.

Education and management of patients regarding these symptoms represent significant challenges to nurses in the field of transplantation (Whedon & Fliedner, 1999). Common issues in the first 100 days after transplantation are infection, medication management, graft-versus-host disease (GVHD), nutritional issues, nausea, fatigue, family role shifting, family distress, coping, slowly returning to a "new normal," and existential issues (Andrykowski & McQuellon, 1999; Whedon & Fliedner). Families and patients are dependent on healthcare professionals for their very survival and need to learn ways to gain more control over their lives during recovery (Fife et al., 2000). Education, including patients' involvement in decision making, and choices enable patients and families to feel more in control (Fife et al.). Findings from a qualitative study reported that patients and families experiencing the process of HSCT acknowledged that receiving information allayed anxiety stemming from uncertainty (Cooper & Powell, 1998).

Comparisons between patients undergoing allogeneic transplants and those undergoing autologous transplants reveal that allogeneic transplant recipients experience more physical problems, such as dry mouth, tiredness, lack of energy, tension, headaches, decreased sexual interest, irritability, low back pain, sore mouth, and shortness of breath (Molassiotis, Boughton, Burgoyne, & van den Akker, 1995). Also, increased acute complications generally occur during the first 100 days after transplantation. A patient's health status may change repeatedly during this phase and for as long as a year. For example, organ toxicities such as pulmonary complications, infections, veno-occlusive disease, and GVHD may occur (Jackson et al., 1998; King, 1996). These complications may result in unplanned readmissions and frequent use of healthcare services.

Discharge from the hospital to the home setting is recognized as a stressful time for patients and families and has been pinpointed as a time when patients experience decreased QOL (Andrykowski & McQuellon, 1999; McQuellon et al., 1998; Thain & Gibbon, 1996). The move toward earlier discharge of these complicated patients has had a tremendous impact on nursing responsibilities during this high-risk period (Wagner & Quinones, 1998). The demands include tracking and coaching patients and families regarding plans for follow-up care and emergency plans to address various clinical issues. Examples of major topics for discharge teaching include right atrial catheter care, fluid and nutrition management, signs and symptoms of infection and infection prevention, GVHD, organ toxicities, nausea, vomiting, diarrhea, dehydration, and psychological issues such as adjustment after isolation, role disruption, and coping.

This literature review supports the increasing need for discharge teaching and follow-up for patients after transplantation. Information on what postdischarge problems occur in which patients, when readmissions are needed, and reasons for readmissions could provide valuable information for creating patient-specific postdischarge teaching approaches. To fill this gap, a retrospective study was proposed to illustrate patients' status at discharge and readmission patterns. Data on patient characteristics, disease, and treatment characteristics also were needed to explore which groups in the population appear to be at highest risk for complications and readmissions.

The aim of this study was to combine information obtained from a literature review and a chart review to identify implications for nursing practice priorities that may affect patient outcomes following HSCT in the discharge and follow-up process.

Methods

Design

A retrospective chart review was conducted on 100 adult patients undergoing HSCT during the first half of 2000 to assess demographic variables, clinical variables, and discharge and readmission patterns. The cancer center was located in southern California and has had a bone marrow transplantation unit since 1976. Sample size was influenced by resources available, which provided for a part-time nurse who identified eligible patients and conducted the chart review.

Instrument

The retrospective chart-review tool consists of 36 items created to gather data according to three main areas: demographic variables, clinical variables, and discharge and readmission patterns. The questions were developed from demographic and disease and treatment instruments used in previous studies of various cancer populations. Demographic information included gender, age, ethnicity, and marital status. The clinical questions included diagnosis, remission status at the time of HSCT, type of HSCT, presence of comorbid disease, presence of concurrent disease, history of infection prior to HSCT, date of diagnosis, history of previous transplant, tandem transplant questions, number of infections, number of catheter-related infections, number of bacteremic episodes, number of psychological support visits, disease status at days 30 and 100 and at six months, and death, relapse, or persistent disease questions. The readmission questions provided data on the number of readmissions and evaluated each readmission for reason, location, discharge data, length of stay, and time to next readmission. The first draft of the instrument was reviewed by the coinvestigators, and recommendations were incorporated into the instrument. A pilot test of 10 patient charts was conducted and verified. The values for variables such as diagnosis, conditioning regimen, and infections were developed in collaboration with a physician who was formulating the long-term follow-up chart abstraction for a grant. Comorbid conditions were defined as any additional medical diagnoses. Concurrent conditions were defined as additional medical issues a patient experienced as a part of the cancer diagnosis or treatment. Deaths were identified up to 18 months after transplantation, and information collected included date and cause of death.

Psychosocial support was defined as a consultation from the psychology department. Although psychological support is provided by many members of the care team (physicians, nurses, social workers, and others), psychological support by a psychologist requires a physician order and usually represents referral from a physician, nurse, or social worker who oversees a complex psychological problem exceeding those usually seen in transplant recipients. The revised version of the tool was verified by the investigators, definitions clarified, and formatting finalized.

Usual Care

Usual care for transplant recipients during the time period used for the retrospective chart review consisted of hospitalization for autologous and allogeneic transplants. For tandem patients, discharge between the two transplants was usual. All patients had indwelling central venous access catheters and were discharged with them still in place. Criteria for discharge included the ability to ingest 2 liters of fluid per day by mouth, ability to take medications orally, being afebrile, ability to care for the indwelling central venous access catheter, availability of a caregiver in the home during night hours at a minimum, and availability of transportation to the clinic. Discharge teaching generally is performed no earlier than 48 hours prior to discharge because patients are too ill before then to learn any new procedures or demonstrate self-care. A three-ring binder for transplant recipients is distributed prior to the transplant in the ambulatory clinic. The binder contains information on a wide variety of topics, including self-care, complications, and eating hints. During discharge teaching, the staff nurse goes over the binder with the patient. During that time, the dietician visits the patient, providing information on the low-bacteria diet. The pharmacist reviews the prescribed medications with the patient. Either the physical therapist or the occupational therapist goes over the prescribed exercise program. Once the patient leaves the hospital, no further contact is initiated by the staff. If patients call in, referral is made to the appropriate person depending on the problem identified (e.g., medical questions referred to a physician, medication questions referred to a pharmacist).

Procedure

Following review and approval by the institutional review board, a retrospective chart review was performed on 100 patients undergoing HSCT. Patients were identified from a list of sequential patients transplanted in 2000. The list was generated by the Biostatistics Department. Patients on the list were screened for eligibility as follows: adult hematology patients undergoing HSCT for hematologic malignancies and followed at the City of Hope National Medical Center in Duarte, CA, for at least six months. Records from each eligible patient were obtained from computer medical record documentation and chart data. During the first six months of 2000, 157 adults were transplanted, with the first 100 eligible patients identified between January 1 and June 15. Thus, the sample represented 64% of the total group. The most common reason for noninclusion was when patients were part of a contracted health maintenance organization whose patients were followed in that system after discharge. Chart abstraction was performed by one of the investigators and validated by the primary author. Differences were discussed and resolved.

Statistical Analysis

Data analysis consisted of frequency analysis of all variables followed by comparisons among populations regarding infection characteristics and readmission characteristics by analysis of variance (ANOVA). SPSS® (SPSS Inc., Chicago, IL) Version 8.0 was used for analysis. Because this was a convenience sample with resources for analyzing only 100 charts, statistical differences are not reported. Differences can be viewed as trends that provide direction for future care planning.

Results

Table 1 reflects the demographic and clinical data for the sample. The majority of patients were male (59%) and married (59%), and the mean age was 45 (SD = 13.42). The predominant diagnoses were non-Hodgkin lymphoma (24%), chronic myeloid leukemia (18%), multiple myeloma (15%), and acute myeloid leukemia (14%). The most common type of transplant was autologous (34%), followed by sibling myeloablative allogeneic (28%). Some patients (12%) received two transplants—a tandem transplant. Comorbid conditions are found in Table 2. Of the 100 patients, 34 had comorbid diseases and 16 experienced concurrent conditions. Referrals for psychological support occurred in 12 (12%) of the patients (5 autologous, 7 allogeneic). Length of stay for initial hospitalization for autologous transplant recipients ranged from 25–30 days, and for allogeneic transplant recipients ranged from 30–35 days.

Table 1. Demographic and Clinical Variables

Variable	n	%
Age (years)		
$\bar{X}$ = 45	–	–
Range = 19–73	–	–
Gender		
Male	59	59
Female	41	41
Marital status		
Married	59	59
Single	24	24
Divorced	10	10
Widowed	4	4
Separated	3	3
Diagnosis		
Non-Hodgkin lymphoma	24	24
Chronic myeloid leukemia	18	18
Multiple myeloma	15	15
Acute myeloid leukemia	14	14
Hodgkin disease	9	9
Acute lymphocytic leukemia	9	9
Myelodysplastic syndrome	7	7
Other	2	2
Aplastic anemia	1	1
Chronic myelomonocytic leukemia	1	1
Type of transplant		
Autologous	34	34
Sibling myeloablative allogeneic	28	28
Unrelated myeloablative allogeneic	17	17
Sibling nonmyeloablative allogeneic	6	6
Unrelated nonmyeloablative allogeneic	2	2
Myeloablative syngeneic	1	1
Combined allogeneic and autologous	12	12
Remission status at transplant		
Relapse	26	26
Partial relapse	26	26
First remission	15	15
Chronic phase	12	12
Second remission	9	9
Accelerated phase	5	5
Static disease	2	2
Third remission	1	1
Complete response	1	1
Pathology status unclear	3	3
History of infection prior to transplant		
No	92	92
Yes	8	8

N = 100

Eight patients had infections within one month prior to HSCT. They were infections in a cut finger, facial abscess, genital herpes, fungal infection of the nails, sinusitis, upper respiratory infection, and staphylococcus epidermis bacteremia. Of the 100 patients, 80% became infected with bacterial, viral, or fungal infections post-HSCT, with one to three infectious episodes being the most common frequency. Of the patients who had infectious episodes, 34 (34%) did not require readmission to the hospital but were treated in the ambulatory clinic. Eleven percent of the infections were catheter-related, with one individual having three episodes of a catheter-related infection. Thirty-two percent of the individuals had one or two bacteremic episodes (see Table 3).

Overall death rates were collected up to 18 months post-transplant and revealed that 30% died of recurrent disease, followed by organ failure and fungal infection. Death rate during HSCT hospitalization was 11%, during the first readmission it was 3%, during the second readmission 2%, and during the third readmission 1%. Patients who had comorbid diseases before transplantation did not have a higher rate of death. However, the eight patients who had an infection within one month prior to HSCT had a 50% mortality rate.

Readmission Data

Within a six-month period subsequent to discharge after transplantation, 51% of the 100 patients had at least one unscheduled readmission, 14% were readmitted twice, 4% three times, and 3% four times. Reasons for unscheduled readmissions are described in Figure 1. Examples of infection-related reasons included sepsis, catheter-related infections, cellulitis, disseminated zoster, and pneumonia. Examples for readmissions for gastrointestinal problems, dehydration, and failure to thrive involved patients who had difficulty with fluid intake, nausea, vomiting, diarrhea, and severe nutritional issues. Readmissions for GVHD consisted of management of skin, intestinal, or liver GVHD. The "other" category consisted of a variety of reasons, including abdominal pain, shunt bleeding, neurologic symptoms, hyperglycemia, and mental status changes.

Of the 100 patients, 12 were scheduled for two (tandem) transplants, with 5 patients scheduled for two autologous transplants and 7 patients scheduled for an autologous transplant followed by an allogeneic transplant (see Figure 2). Eleven patients completed both transplants, with seven patients (58%) able to stay out of the hospital between transplants. Of those readmitted between phases, three were readmitted for infection or fever, and two were admitted for

Table 2. Comorbid and Concurrent Diseases

Disease	n	%
Comorbid (N = 34)		
Multiple	15	44
Hypertension	4	12
Inflammatory bowel disease	3	9
Hypercholesterolemia	2	6
Previous cancer history	2	6
Hepatitis	2	6
Spondylitis	2	6
Diabetes	1	3
Graves disease	1	3
Asthma	1	3
History of syncopal episodes	1	3
Concurrent (N = 16)		
Renal insufficiency	5	31
Multiple	4	25
Deep vein thrombosis	2	13
Hypogammaglobulinemia	1	6
Pleural effusion	1	6
Erythema	1	6
Tuberculosis	1	6
Vancomycin-resistant enterococcus	1	6

Note. Because of rounding, percentages may not total 100.

Table 3. Infections Post-Transplant

Type and Number of Infections	n	%
Number of infections		
0	19	19
1	32	32
2	23	23
3	17	17
4	1	1
5	4	4
6	2	2
7	1	1
Missing	1	1
Catheter-related infections		
0	89	89
1	10	10
3	1	1
Bacteremic episodes		
0	68	68
1	29	29
2	3	3

dehydration or gastrointestinal problems. When readmitted, patients stayed an average of eight days.

Further analysis involved comparing allogeneic (n = 54) to autologous transplant recipients (n = 34) for unscheduled readmissions, number of infections, and length of stay. The tandem patients (n = 12) were not included in this comparison. Allogeneic transplant recipients included sibling myeloablative, sibling myeloablative allogeneic, unrelated nonmyeloablative allogeneic, and myeloablative syngeneic. The last individual, a twin transplant, was classified as allogeneic according to the usual classification of allogeneic versus autologous (Oudshoorn, Lie, Bakker, Van der Zanden, & Claas, 2004). Comparisons also were made in the allogeneic group, between myeloablative and nonmyeloablative. Nonmyeloablative approaches to transplantation included reduced intensity conditioning in an effort to decrease treatment-induced toxicities (Hinds & Minor, 2000). Unscheduled admissions occurred for treatment of sepsis, GVHD, and other complications.

The average number of total unscheduled readmissions was fewer for autologous transplant recipients ($\bar{X}$ = 0.59) versus allogeneic transplant recipients ($\bar{X}$ = 1.04) (see Figure 3a). Further breakdown of the allogeneic transplant recipients into nonmyeloablative and myeloablative subgroups revealed a larger difference, with increased unscheduled readmissions for the nonmyeloablative group (see Figure 3b).

The number of infections for the six-month period postdischarge was analyzed comparing autologous and all allogeneic transplant recipients (see Figure 4a). Allogeneic transplant recipients had a higher number of infections than autologous transplant recipients. When the allogeneic transplant recipients were analyzed by myeloablative and nonmyeloablative subgroups, no differences were evident (see Figure 4b).

Analysis of length of stay for all first unscheduled readmissions revealed longer stays for the allogeneic transplant recipients versus the autologous transplant recipients (see Figure 5a). This difference was not seen when comparing the allogeneic subgroups of myeloablative versus nonmyeloablative patients (see Figure 5b).

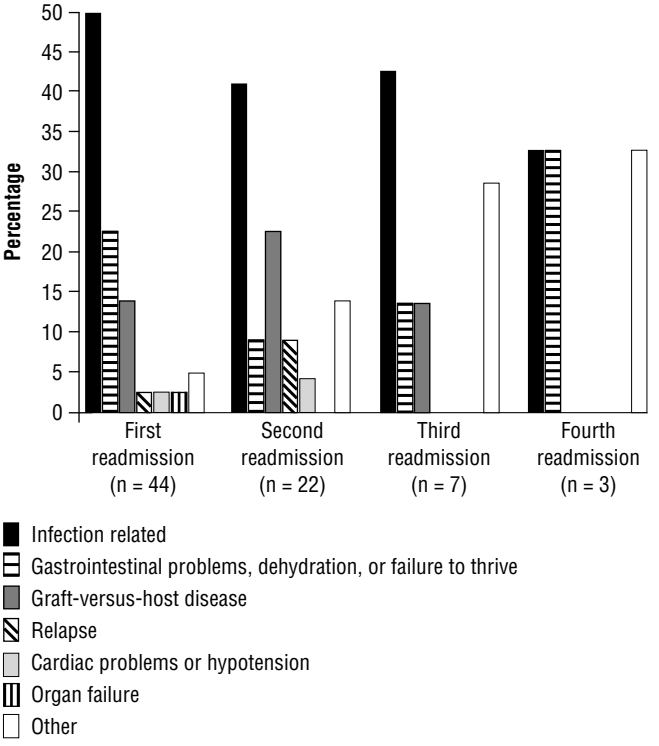

Figure 1. Reasons for Unscheduled Readmission: Nontandem Transplants

Discussion and Implications for Nursing Interventions

These results reveal trends for the increased risk of complications that allogeneic HSCT patients experience that lead to unscheduled readmissions. In addition, for these readmissions, the length of stay was longer for allogeneic transplant recipients. When examining which subgroup of allogeneic transplant recipients was most likely to be readmitted, the nonmyeloablative patients were at the highest risk. Infections occurred in 80% of the patients but were highest in the allogeneic transplant recipients. All allogeneic transplant recipients appeared to be at higher risk for infection, with no difference in the allogeneic subgroups of myeloablative and nonmyeloablative.

Completed both transplants
Yes = 11 (92%)
No = 1 (8%)
Readmitted between transplants
Yes = 5 (42%)
No = 7 (58%)
Reasons for readmission
Infection or fever = 3
Dehydration or gastrointestinal problems = 2
Length of stay for readmission
$\bar{X}$ = 8 days
Range = 6–14 days

Figure 2. Tandem Transplants (N = 12)

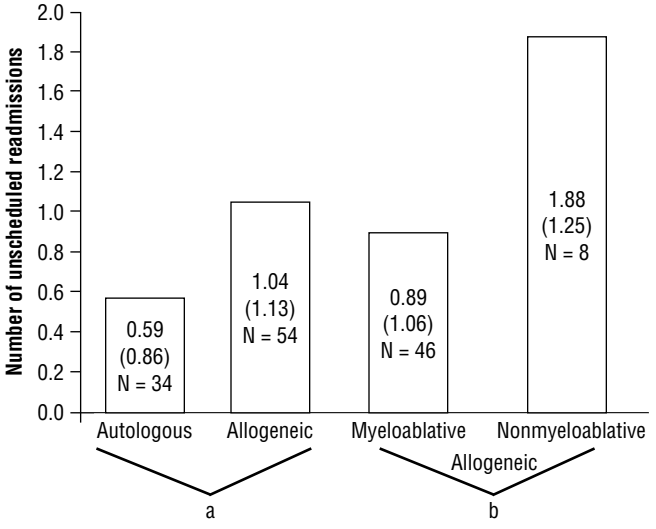

Figure 3. Mean Number (and Standard Deviations) of Unscheduled Readmissions

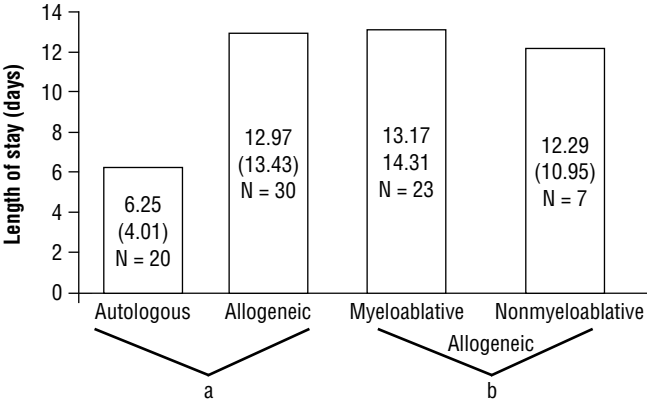

Figure 5. Mean Length of Stay (and Standard Deviations) in Days for First Readmission

Primary cause of death for the autologous group was persistent or recurrent disease (87%). For the allogeneic group, the primary causes of death included recurrent disease (41%), infection (23%), organ failure (18%), GVHD (6%), and other (12%).

Information from the literature on transplant survivors (Baker et al., 1999) combined with information from this chart review provides the background for identifying implications for nursing interventions. Demographic distribution of the population whose charts were reviewed identified several areas of interest. The age range included a number of patients older than 65, but this transplant population represented a young cancer population, with a mean age of 45. More than half were married and male. Social roles included completing educational goals, beginning and carrying out career goals, marriage, raising a family, and building a financial future. For this group of survivors to carry out these social roles and responsibilities, healthcare professionals need to assist them in maintaining an optimal level of independence. Discharge teaching and coaching of adult patients with cancer should include short-term needs and long-term goals.

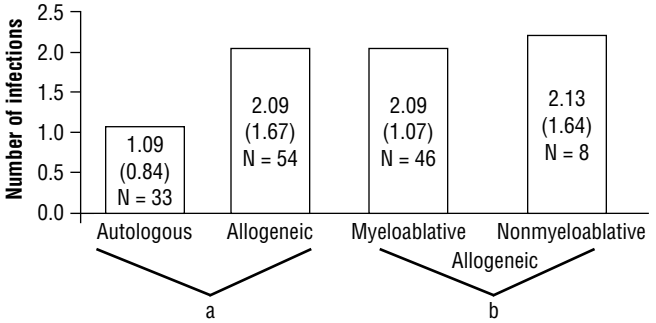

Figure 4. Mean Number (and Standard Deviations) of Infections Over Six Months

Physical, psychological, social, and spiritual problems and challenges of transplant survivors have been identified and can be used to describe interventions to be explored and tested (Broers, Kaptein, Le Cassie, Fibbe, & Hengeveld, 2000; Fife et al., 2000; Keogh, Riordan, McNamara, Duggan, & McCann, 1998). In this population, infection is the most common complication postdischarge and a reason for readmission. Infection is followed closely by gastrointestinal, dehydration, and failure to thrive issues and GVHD. Important aspects of each of these problems need to be part of the teaching and monitoring content taught at discharge to patients and family caregivers (Smith, Burcat, & Walker, 1999). Such teaching should include specific goals for patients and practical approaches useful in the home setting. For example, a goal of an oral intake of 2 liters of fluid daily is overwhelming to the average patient and needs to be defined in terms of size and number of glasses and ways to increase intake creatively (e.g., ice cubes, carrying a liter bottle at all times, graphing input).

Teaching content also should include specific symptoms for patients to monitor and clear reporting mechanisms should symptoms occur. This content should be focused especially toward the allogeneic population because comparison of the allogeneic and autologous groups revealed trends for increased readmissions and infections for the allogeneic transplant recipients. Teaching content has a potential to affect the number of readmissions and length of stay for each readmission. For example, if healthcare professionals target education on infection prevention and early detection, readmissions may be avoided, or conditions may be diagnosed early enough to make treatment shorter and more effective. Changes in patterns of readmissions ultimately may affect the outcomes and cost of the entire transplantation process.

Psychological problems and challenges are important as well. The discharge time is one when patients and families are vulnerable to increased anxiety, depression, and stress. Psychoeducational interventions have the potential to decrease these symptoms; however, few intervention studies have been performed on transplant recipients. Studies in the nursing, medical, and psychological literature covering psychological issues are primarily descriptive (Ferrell et al., 1992a, 1992b; Fife et al., 2000; Grant et al., 1992; Keogh et al., 1998; McQuellon et al., 1998). Referral for counseling, support groups,

and literature may assist patients during this transition. Sexual counseling may be needed to address fertility and intimacy problems. In addition, if patients and caregivers feel competent in newly learned physical aspects of care (e.g., central venous catheter care, medication orders), some stress can be alleviated.

Social problems include designation of a family caregiver to assist with physical care, meals, medication administration, and ambulation. This may mean that someone from the family has to take time off from work or stop working altogether, which can have a major impact on family finances. Counseling from a social worker is necessary to ensure that the processes needed to obtain resources such as disability support are understood. The need for assistance from religious or spiritual advisors cannot be underestimated. Spiritual problems include the persistence of uncertainty about the future, worthlessness, and hopelessness. Referral for pastoral support is important and may be provided by an institution or involve contacting a church, synagogue, or temple.

Limitations

This study has limitations. The first is that the retrospective study used data available from patient medical records. Thus, the data are subject to usual errors, primarily omissions that occur in medical records. In addition, all patients came from one institution, reflecting the treatment at that institution.

Conclusions

In summary, data from this retrospective chart review identified populations with potential discharge problems and higher readmission risk, specific variables surrounding discharge and readmission, and post-transplant outcomes potentially amenable to nursing interventions. These findings parallel those reported in other studies and clinical papers. This information can assist in planning nursing strategies to improve the discharge process, prevent and detect complications early, decrease readmission rates, and assist patients with information to physically, psychologically, socially, and spiritually cope with issues surrounding transplantation. Findings have prompted the authors to explore ways to improve the discharge process and follow-up support at their institution. An appropriate intervention to test would be to explore patient and caregiver education surrounding the discharge time, prioritizing content, testing patient and caregiver learning, and providing resources to patients after discharge. In fact, as a further step from this retrospective study, the authors have started a pilot nurse educational intervention study to test ways to improve education and patient outcomes in the home after discharge.

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