

CONTINUING EDUCATION

Quantitative Measurement of Quality of Life in Adult Patients Undergoing Bone Marrow Transplant or Peripheral Blood Stem Cell Transplant: A Decade in Review

Eileen Danaher Hacker, PhD, RN, AOCN®

Purpose/Objectives: To critically evaluate a decade of quantitative quality-of-life (QOL) measurement in adult patients undergoing bone marrow transplant (BMT) or peripheral blood stem cell transplant (PBSCT).

Data Sources: Quantitative research articles published between January 1990 and January 2000 in the nursing and medical literature.

Data Synthesis: QOL measures reported in BMT and PBSCT literature support the multidimensional nature of the construct. The majority of studies used a single instrument to assess QOL. Variations in measurement included use of a single versus multiple instruments to assess QOL, theoretical underpinnings of instruments, and output (overall score, domain scores) provided by the instruments.

Conclusions: A study's purpose, conceptual approach, patient burden, and resources available to the researcher should guide decisions regarding QOL instrumentation. No gold standard exists for assessing QOL in research or clinical practice.

Implications for Nursing: Nurses can select from a variety of tools to measure QOL in the BMT and PBSCT patient populations. Clinicians must consider the clinical meaningfulness of changes in QOL before implementing changes in their practice.

Key Points . . .

- ▶ Quality-of-life (QOL) data, in addition to disease-free intervals and survival statistics, provide clinicians and patients undergoing bone marrow transplant (BMT) or peripheral blood stem cell transplant (PBSCT) with information to guide their treatment decisions.
- ▶ QOL measurements in the BMT and PBSCT literature support the multidimensional nature of the construct with items related to the physical, psychological, and social domains most often included in QOL instruments.
- ▶ No gold standard exists for measuring QOL in research or practice.
- ▶ Researchers and clinicians must consider a number of factors, including study purpose, conceptual approach, expected patient burden, and available resources, prior to selecting a QOL instrument for use in research and practice.

Goal for CE Enrollees:

To enhance nurses' knowledge regarding quality-of-life (QOL) measurements in adults undergoing bone marrow transplant (BMT) or peripheral blood stem cell transplant (PBSCT).

Objectives for CE Enrollees:

- On completion of this CE, the participant will be able to
1. Discuss a decade of quantitative QOL measurements in adult patients undergoing BMT or PBSCT.
 2. Describe the variations in the types of instruments available to measure QOL.
 3. Discuss the nursing implications of understanding the clinical meaningfulness of changes in QOL.

Eileen Danaher Hacker, PhD, RN, AOCN®, is a clinical assistant professor in the College of Nursing at the University of Illinois at Chicago. The development of this article was supported by doctoral scholarships from the Oncology Nursing Society and the American Cancer Society while the author was a doctoral student at the University of Illinois at Chicago. (Submitted February 2002. Accepted for publication October 25, 2002.)

Digital Object Identifier: 10.1188/03.ONF.613-631

Cancer and the treatment of cancer affect all aspects of patients' lives. Therefore, assessing patients' quality of life (QOL) throughout the cancer experience has become very meaningful. In addition to disease-free intervals and survival statistics, QOL data provide clinicians and patients with cancer with supplementary information to guide their treatment decisions. Cancer clinical trials increasingly contain a QOL component to delineate the length as well as the quality of survival. In fact, the Cancer Therapy Evaluation Program of the National Cancer Institute (NCI) (1988) has given research aimed at improving survival and QOL the highest priority.

How to best evaluate QOL remains a controversial topic among QOL researchers. One reason for this is the lack of agreement regarding the conceptual definition of QOL and the subsequent operational definition (Ferrans, 2000). Researchers may choose from a variety of instruments that reflect a variety of QOL conceptualizations. Differences in conceptualizing QOL, however, may lead to conflicting QOL outcomes. Furthermore, this lack of a gold standard for measuring QOL frequently translates into difficulty interpreting and synthesizing research findings within a particular field of interest.

Marrow ablative therapy followed by bone marrow transplantation (BMT) or peripheral blood stem cell transplantation (PBSCT) is one example of a cancer treatment that has the potential to affect all aspects of patients' lives. It is considered the definitive therapy for a variety of hematologic malignancies such as acute and chronic myeloid leukemia (Rowe et al., 1994; Weiss, 1999). Because of the significant morbidity and mortality associated with the treatment and ensuing long recovery period, QOL outcomes after BMT or PBSCT become particularly salient for oncology healthcare professionals and potential recipients of BMT or PBSCT. Several comprehensive reviews examining QOL in BMT recipients have been published (Andrykowski, 1994; Hjermstad & Kaasa, 1995; Neitzert et al., 1998; Whedon & Ferrell, 1994). None of the reviews, however, critically evaluated QOL measurement and the subsequent implications for the studies' results. The purpose of this integrative literature review is to provide a critical evaluation of quantitative QOL measurement in adult patients undergoing BMT or PBSCT and to identify potential measurement issues.

Background

QOL has been conceptualized in a variety of ways in the healthcare literature. Ferrans (1990) identified five major conceptualizations (see Table 1). The first conceptualization refers to a person's ability to lead a "normal life." The closer a

Table 1. Quality-of-Life Conceptualizations in the Healthcare Literature

Conceptualization	Description
Normalcy of life	Refers to a person's ability to lead a "normal" life. The closer a person gets to the standard of normal, the better the quality of life (QOL).
Social utility of life	Refers to a patient's ability to lead a socially useful life Focuses on the ability of a person to make contributions to society through gainful employment or fulfillment of commonly defined social roles, such as worker, mother, or teacher QOL is better when an individual is able to fulfill socially useful roles.
Achievement of life's goals	Focus is on achievement of personal goals. Relates to the congruence between desired and achieved goals A person feels satisfied or happy when personal goals that are important to him or her are achieved.
Happiness/affect	Focus is on the range of affective states from depression to euphoria Relates to the balance between positive and negative feeling states Those who are happier have better QOL than those who are unhappy.
Satisfaction with life	Refers to a cognitive assessment of life's experiences based on comparisons between desired and actual conditions of life Those who have a better QOL are those who are most satisfied with their lives.

Note. Based on information from Ferrans, 1990, 1996.

person gets to the standard of normal, the better the QOL. The second conceptualization refers to a person's ability to lead a socially useful life. This conceptualization most commonly focuses on the ability of a person to make contributions to society through gainful employment or fulfillment of commonly defined social roles (e.g., worker, mother, teacher). QOL is better when an individual is able to fulfill socially useful roles. Fulfillment of personal goals relates to the congruence between desired and achieved goals. A person feels satisfied or happy when personal goals that are important to him or her are achieved. A person feels dissatisfied or unhappy when he or she fails to achieve desired goals. When conceptualizing QOL from a happiness/affect perspective, the focus is on the range of affective states from depression to euphoria. In terms of QOL, the focus is on the balance between positive and negative feeling states. Those who are happier have better QOL than those who are unhappy. Satisfaction as a conceptualization of QOL is related closely to happiness, although they are not synonymous. Unlike happiness, which implies a transitory state, satisfaction suggests a personal, cognitive evaluation regarding life's conditions. Satisfaction is an assessment of life's experiences based on comparisons between desired and actual conditions of life. Those who have better QOL are the people who are most satisfied with their lives. Understanding how a researcher conceptualizes QOL is important when interpreting a study's results (Ferrans, 1996). Studies operationalizing QOL from different conceptualizations frequently result in different findings even for the same group of people.

Although no consensus has been reached regarding optimal QOL conceptualization, several areas of theoretical agreement exist (Donovan, Sanson-Fisher, & Redman, 1989; Gill & Feinstein, 1994; King et al., 1997). Most of the literature supports the use of the individual as the only suitable judge of his or her own QOL. Instruments that rely on self-report to measure QOL provide the most accurate information regarding QOL evaluation. Proxy measures have been found unreliable in several studies, illustrating discrepancies between the proxy's rating of QOL and the subject's self-report (Molzahn, Northcott, & Dossetor, 1997; Sprangers & Aaronson, 1992). Therefore, researchers believe that the most reliable source of information regarding QOL assessment is the individual's perspective.

Expert QOL researchers agree that the construct is multidimensional, consisting of at least physical, psychological, and social domains. This notion is supported by the multidimensional nature of several QOL conceptual frameworks (Ferrans, 1990, 1996; Ferrell et al., 1992). Researchers generally advocate measurement of at least the physical, psychological, and social domains to ensure a comprehensive approach to QOL measurement. Doing this allows the investigator to pinpoint problematic areas, as well as identify areas of strength.

Methods

Publications included in the integrative review were identified through literature searches of MEDLINE® and the CINAHL® database using the index terms "quality of life," "bone marrow transplantation," and "stem cell transplantation." The option "Restrict to Focus" was chosen for the literature search in an effort to limit the articles to only those that

were related primarily to QOL in patients undergoing BMT or PBSCT. In addition, the references of the studies obtained through computer indexing were examined to locate any additional articles not indexed in MEDLINE and CINAHL. Inclusion criteria for the review consisted of quantitative research articles published between January 1990 and January 2000 and studies involving adult patients undergoing BMT or PBSCT. Meeting abstracts and unpublished studies were not included in the review.

The integrative review of the literature was conducted in two phases. The purpose of phase one was to provide an overall sense of quantitative QOL measurement in patients undergoing BMT or PBSCT. The purpose of phase two was to provide a more in-depth evaluation of single instruments that measure QOL in this population. In phase one, all of the studies meeting the previous criteria were examined for definition of QOL published within the article, conceptualization of the QOL definition, and use of a single instrument or multiple instruments to measure QOL. Studies classified as using multiple instruments included those employing a battery of instruments to measure the various domains of QOL. In these studies, the authors did not designate a specific instrument to measure QOL. Single QOL instruments were determined via review of the methodology section of the research articles (e.g., "QOL was measured by..."). In phase two of the review, only studies using a single instrument to measure QOL were evaluated to determine (a) measurement of the various QOL domains, (b) scores provided by the tool (overall QOL score, domain scores, or both), and (c) categorization of the QOL tool according to the five major conceptualizations.

Results

Article Selection

A total of 67 articles were identified through computer searches of the literature, but 34 did not meet the inclusion criteria. The excluded articles consisted of several literature reviews focusing on various QOL topics. None of the reviews, however, specifically examined QOL measurement in patients undergoing BMT or PBSCT. Four studies employed qualitative methodologies. Three articles (two review articles and one research article) were not written in English. The research article written in a foreign language was excluded from further analysis because of the author's inability to translate it. Three studies examined QOL in pediatric patients, and four did not specifically examine QOL in patients undergoing BMT or PBSCT. In addition, multiple nonresearch articles and commentaries were excluded.

In all, 33 research articles met the criteria for inclusion in the review and are described in Table 2. One of the 33 studies was reported in two journals; therefore, only the most recent report was included in the analysis, although both are listed in Table 2 (Baker, Curbow, & Wingard, 1991; Baker et al., 1994). This resulted in 32 studies being included in the integrative review.

General Study Characteristics

In an effort to provide a brief overview of the research articles ($n = 32$), a number of methodologic characteristics were assessed (see Table 3). The majority of studies (88%) examined QOL with respect to BMT, but only three studies (9%) focused on QOL after PBSCT. One study included patients

undergoing both types of transplants. The sample sizes varied among the studies, with some enrolling as few as 9 subjects to as many as 388 subjects. The majority of studies (69%), however, enrolled fewer than 100 subjects.

In terms of design, 66% of studies measured QOL one time after BMT or PBSCT. QOL was assessed one to five years post-transplant for almost all patients in the cross-sectional, retrospective studies. Only two studies examined QOL in patients surviving longer than five years after BMT.

Thirty-four percent of the studies employed a prospective research design. In the prospective, longitudinal studies, measurement of QOL most frequently took place prior to BMT, 100 days after BMT, and again one year post-transplant. The number of times QOL was assessed post-transplant ranged from one to four.

Phase One

The majority of studies did not define QOL (81%). Of the six studies that specifically defined QOL, three of the definitions cited a cognitive evaluation of satisfaction with life's experience. The remaining three definitions reflected the normal life conceptualization by defining QOL in terms of deviations from normal functioning. A summary of these QOL definitions by author is presented in Table 4. Regarding instrumentation to measure QOL, only six (19%) of the studies used multiple instruments to measure QOL. The remaining studies operationalized QOL through use of a single instrument.

Phase Two

Eighty-one percent of the studies used a single instrument to measure QOL. General characteristics of the single instruments are listed in Table 5. Researchers used 14 separate instruments to measure QOL in the BMT and PBSCT populations (see Table 6 for complete names of each tool as well as reference information). Seven studies measured QOL with more than one instrument. For instance, Kopp et al. (1998) compared the FACT-BMT to the EORTC QLQ-C30. Hann et al. (1997) combined a multidimensional measure of QOL (MOS SF-36) with a unidimensional measure (ECOG Performance Rating Scale—Self-Report). A third study (Baker et al., 1991) used a multi-item tool and a single-item tool.

The 14 instruments were examined to determine measurement of QOL domains. The tools were classified as unidimensional versus multidimensional. The two unidimensional tools included the ECOG Performance Rating Scale, which measures functional status, and Cantril's Self-Anchoring Scale, which measures global life satisfaction. The remaining 12 instruments measured a variety of domains. All 12 of the multidimensional instruments contained items related to the physical/functional domain. Items representing the psychological/emotional domain were included in 11 instruments (EORTC QLQ C30, FACT-BMT, MOS SF-36, FLIC, CARES, SIP, COH QOL-BMT, SWED-QUAL, QLI, SLDS, and one of the investigator-developed questionnaires). In terms of the social/economic domain, 11 instruments included items capturing this domain (EORTC QLQ C-30, FACT-BMT, MOS SF-36, FLIC, CARES, SIP, COH QOL-BMT, SWED-QUAL, QLI, and both of the investigator-developed questionnaires). Examples of other domains incorporated into some of the instruments include the family and spirituality domains. These less commonly included domains are listed in Table 6 under the respective, multidimensional measures of QOL.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
Molassiotis & Morris, 1999 N = 28 Unrelated donor BMT	Retrospective, cross-sectional	\bar{X} = 41.2 months after BMT (SD = 24.4, range = 13–92 months)	Yes	EORTC QLQ-C30, supplementary BMT questionnaire, PAIS, HADS	Most patients reported good to excellent QOL after BMT. Female and older patients reported higher dysfunction. Fatigue was reported as the most troublesome symptom.
Marks et al., 1999 N = 20 Unrelated donor BMT	Retrospective	Median = 42 months after BMT (range = 23–95 months)	No	MOS-SF36, SLDS, SOS, employment questionnaire	Patients reported above-average satisfaction with life. They were dissatisfied with physical strength and appearance. 75% of survivors returned to some form of employment after BMT. Agreement exists between physicians' and patients' views of health except for mental health and fatigue.
Hann et al., 1999 N = 80 Autologous PBSCT, noncancer comparison group	Prospective, longitudinal	Baseline, on or about the day of stem cell reinfusion, and toward the end of treatment (a few days prior to discharge)	No	POMS-F, FSI, STAI, CES-D	Transplant recipients reported more frequent and severe fatigue. Fatigue had a greater impact on daily functioning and QOL in transplant recipients. Fatigue was related to time since transplant and psychosocial factors.
Winer et al., 1999 N = 82 Autologous BMT	Retrospective, cross-sectional	Median = 30.6 months after BMT (range = 13–64 months)	No	FLIC, SDS, sexual function questionnaire	QOL was lower in patients with recurrent disease. Insomnia, fatigue, and pain were reported as the most common symptoms after BMT. Sexual functioning was lower post-transplant. Many patients who worked pretransplant returned to work post-transplant.
Hjermstad et al., 1999 N = 177 Allogeneic PBSCT,	Prospective	Baseline and one year post-transplant	No	EORTC QLQ-C30	At baseline, patients undergoing allogeneic transplant reported better functioning and less symptoms than those undergoing autologous

(Continued on next page)

BDI—Becks Depression Inventory; BMT—bone marrow transplant; BSI—Brief Symptom Inventory; CARES—Cancer Rehabilitation Evaluation System; CES-D—Center for Epidemiologic Studies-Depression; COH QOL-BMT—City of Hope Quality of Life Scale for Bone Marrow Transplant; DBMT—Demands of Bone Marrow Transplant Recovery Inventory; ECOG—Eastern Cooperative Oncology Group; EORTC QLQ-C30—European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; FACT-BMT—Functional Assessment of Cancer Therapy Scale-Bone Marrow Transplant; FLIC—Functional Living Index; FRI—Family Relations Index; FSI—Fatigue Symptom Inventory; HADS—Hospital Anxiety and Depression Scale; MAC—Mental Adjustment to Cancer; MOS SF-36—Medical Outcomes Survey-Short Form 36; MOS-SSS—Medical Outcomes Social Support Survey; MRC/EORTC QLQ-LEU—MRC/European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Leukemia; MSAS—Memorial Symptom Assessment Scale; NSSQ—Norbeck Social Support Questionnaire; PAIS—Psychosocial Adjustment to Illness Scale; PANAS—Positive and Negative Affect Scale; PBSCT—peripheral blood stem cell transplant; PHQ—Perceived Health Questionnaire; PMH-SER—Princess Margaret Hospital-Symptom Experience Report; POMS—Profile of Mood States; POMS-F—Profile of Mood States Fatigue Scale; POMS-TMDS—Profile of Mood States Total Mood Disturbance Scale; PQOL—Perceived Quality of Life Questionnaire; PSFQ—Psychosexual Functioning Questionnaire; PSR—Performance Status Rating Scale; QLI—Quality of Life Index; QOL—quality of life; ROF—Recovery of Function Scale; RSCL—Rotterdam Symptom Checklist; RSE—Rosenberg Self-Esteem Scale; SDS—Symptom Distress Scale; SEAS—Sleep, Energy, and Appetite Scale; SER—Symptom Experience Report; SIP—Sickness Impact Profile; SLDS—Satisfaction With Life Domains Scale; SLDS-BMT—Satisfaction With Life Domains Scale-Bone Marrow Transplantation; SOS—Significant Other Scale; STAI—State-Trait Anxiety Inventory; SWED-QUAL—Swedish Health-Related Quality of Life Questionnaire; WCCL—Revised Ways of Coping Checklist; WHPQ—Ware Health Perceptions Questionnaire

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
autologous PBSCT, combination chemotherapy					transplant and combination chemotherapy. Autologous transplant recipients reported improvement in emotional and role functioning, fatigue, appetite, and constipation one year later. Allogeneic transplant recipients reported no significant changes one year later.
Zittoun et al., 1999 N = 178 Allogeneic BMT, autologous BMT	Prospective, longitudinal	One day after the end of the chemotherapy course or conditioning regimen, 10 days later, and 10 days after time two	No	Modified EORTC QOL core questionnaire, HADS, leukemia/BMT module	Patients frequently reported somatic symptoms, fatigue, anxiety, and depression after induction therapy that tended to improve closer to hospital discharge. Fatigue and emotional disorders were correlated with overall QOL.
McQuellon et al., 1998 N = 86 Autologous BMT, autologous PBSCT, allogeneic BMT	Prospective, longitudinal	Baseline, hospital discharge, 100 days post-transplant, one year post-transplant	No	FACT-BMT, POMS-TMDS, MOS-SSS, CES-D, PSR, and an interview questionnaire	Most patients (80%) reported that psychological distress improved over time. Overall QOL worsened at hospital discharge, then improved at 100 days and one year post-transplant. Patient concerns worsened over time.
Kopp et al., 1998 N = 56 Allogeneic BMT, autologous BMT	Cross-sectional	< one year after BMT: \bar{X} = 5.53 months (SD = 2.64, range = 1–11 months) > one year after BMT: \bar{X} = 59.2 months (SD = 35.4, range = 12–130 months)	No	FACT-BMT, EORTC QLQ-C30	Patients reported reduced QOL within the first year post-transplant in the areas of physical and emotional well-being, appetite loss, fatigue, pain, dyspnea, and nausea and vomiting. QOL improved with time.
Sutherland et al., 1997 N = 231 Allogeneic BMT	Cross-sectional	Median = 40 months after BMT (range = 1–253 months)	No	MOS SF-36, SLDS-BMT, PMH-SER	Compared to population norms, BMT recipients reported some diminished QOL. Time since transplant was an important factor with those more than three years afterward comparable to the general population norms in most domains. 81% of patients were satisfied with their QOL even though many reported experiencing symptoms.
McQuellon et al., 1997 N = 182 Allogeneic BMT, autologous BMT	Prospective, longitudinal	Before BMT, hospital discharge, 100 days after BMT	No	FACT-BMT	The BMT subscale demonstrated sensitivity to change in performance status over time. The entire FACT-BMT demonstrated adequate reliability and validity. The BMT subscale should be used in conjunction with the FACT-G and should not be used alone.
Hann et al., 1997 N = 86	Cross-sectional	\bar{X} = 20.3 months post-transplant (SD = 16.0, range = 3.5–62.5 months)	No	MOS SF-36, ECOG Performance Status Rating Scale - self report, MSAS	Transplant patients reported significantly diminished physical functioning, physical role func-

(Continued on next page)

Note. See key on page 616.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
Autologous BMT, noncancer comparison group					tioning, general health, vitality, social functioning, and emotional role functioning. Physical health as a measure of QOL associated with lower income, increased time to engraftment, and longer hospitalizations. Performance status associated with physical health and mental health. Physical health and mental health associated with greater symptom incidence, severity, and symptom-related distress.
Larsen et al., 1996 N = 9 Autologous PBSCT	Prospective, longitudinal	Admission to the transplant unit, discharge from the unit, and 7–15 weeks after stem cell reinfusion	No	SIP, SWED-QUAL	Patients reported physical health to be poorest at the time of hospital discharge whereas emotional health remained poor throughout the study.
McQuellon et al., 1996 N = 24 Autologous BMT	Prospective	Before BMT and a minimum of 100 days after BMT (\bar{X} = 279.5 days, SD = 129.5)	No	FACT-BMT, POMS-TMDS, MOS-SSS, CES-D, interview questionnaire, World Health Organization Performance Status Rating	Patients reported improved functional well-being, overall QOL, and mood post-transplant. 33% reported depressive symptoms post-transplant. Patients reported a variety of concerns related to employment, finances, appearance, insurance, personal or intimate physical relations, and planning for the future.
Molassiotis, 1996 N = 83 Allogeneic BMT, autologous BMT	Cross-sectional	\bar{X} = 38.7 months post-BMT (SD = 26.3, range 6–122 months)	No	PAIS, RSCL, PSFQ	Psychosocial adjustment was similar for patients receiving combination chemotherapy and those receiving chemotherapy and total body irradiation as a conditioning regimen. The combination chemotherapy groups reported more psychological and psychosomatic symptoms and greater impairment with daily activities.
Wellisch et al., 1996 N = 30 Allogeneic BMT, conventional chemotherapy	Retrospective	BMT group: \bar{X} = 59 months post-diagnosis (SD = 23) Conventional chemotherapy: \bar{X} = 79 months post-diagnosis (SD = 26)	No	CARES, CES-D, BSI, Current Health Status Questionnaire	The groups reported no differences in depression, psychiatric symptomatology, day-to-day problems, and rehabilitative needs. Patients in the two groups did not report significant differences in QOL measures.
Fromm et al., 1996 N = 90 Allogeneic BMT, autologous BMT	Cross-sectional, correlational	\bar{X} = 49.5 months after BMT (SD = 31.4)	No	FLIC, SIP (selected subscales), PAIS (selected subscales), POMS, PANAS, RSE, one-item global ratings of current perceived physical health and QOL	Patients reported positive psychosocial sequelae following BMT. Patients with poorer BMT prognostic factors reported more positive psychosocial sequelae. Time since BMT was negatively associated with

(Continued on next page)

Note. See key on page 616.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
Gaston-Johansson & Foxall, 1996 N = 24 Autologous BMT	Prospective, longitudinal	Two weeks and two days before BMT, five days and 20 days after BMT	Yes	QLI, BDI, STAI-State Anxiety Subscale	positive psychosocial sequelae. Negative psychosocial sequelae were associated with poorer psychosocial adjustment and QOL. Although not statistically significant, patients reported their QOL to be lowest two weeks before BMT and highest five days post-transplant. Patients reported more depression pretransplant than post-transplant. Reduced satisfaction with the health and functioning domain and the psychosocial and spiritual domain negatively affected QOL.
Watson et al., 1996 N = 388 Allogeneic BMT, autologous BMT, consolidation chemotherapy	Cross-sectional	Median = 720 days from complete remission to questionnaire completion (range = 265–2478 days)	No	MRC/EORTC QLQ-LEU	The supplementary leukemia module for patients in long-term complete remission provided useful information to evaluate chronic graft versus host disease and infection susceptibility. The supplement should be used with generic QOL measures such as the EORTC QLQ.
Molassiotis et al., 1996 N = 164 Allogeneic BMT, autologous BMT, maintenance chemotherapy	Retrospective, descriptive	6–122 months post-transplant (\bar{x} = 39.83, SD = 26.56)	Yes	PAIS, HADS, RSCL, NSSQ (functional support only), PSFQ	BMT recipients reported good to excellent QOL. 20% of patients had not returned to work an average of 40 months post-transplant. Allogeneic BMT recipients reported more physical symptom distress than autologous BMT recipients. Depressive symptoms, low affirmation, and impoverished social adjustment predicted a poorer QOL.
Molassiotis et al., 1995 N = 50 Allogeneic BMT, autologous BMT	Retrospective	\bar{x} = 42.4 months after BMT (range = 6–97 months)	No	PAIS, HADS, RSCL	No significant differences in psychological and physical functioning were reported between autologous and allogeneic BMT recipients, although autologous BMT recipients reported more psychological symptoms. Allogeneic BMT patients reported more physical symptoms. Most patients reported good to excellent QOL. 25% of patients did not return to work or school.
Whedon et al., 1995 N = 29 Autologous BMT	Descriptive, cross-sectional	\bar{x} = 37 months after BMT (SD = 19, range = 14–76 months)	No	COH QOL-BMT	Patients reported a high global QOL. Most patients reported minor disturbances in physical well-being.

(Continued on next page)

Note. See key on page 616.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
Andrykowski et al., 1995 N = 200 Allogeneic BMT, autologous BMT	Cross-sectional	\bar{X} = 41 months after BMT (SD = 28.3, range = 12–127 months)	Yes	POMS, PAIS (sexual relationship subscale), SIP (selected subscales), ROF, PHQ, PQOL, SER	Commonly reported difficulties included moderate to severe fatigue (50%), sexual dysfunction (30%), and visual disturbances (30%). Patients reported psychological distress related to the visual changes (25%) and reproductive concerns (43%). Patients reported moderate to severe distress related to family burden. Allogeneic transplant recipients reported poorer QOL than autologous recipients. Increased age, lower educational level, and advanced disease at the time of transplant were associated with poorer QOL. Time since transplant was associated with improved functioning. Poorer QOL was not associated with disease diagnosis, total body irradiation dose, presence or prophylaxis of chronic graft versus host disease, or extent of graft match.
Bush et al., 1995 N = 125 Allogeneic BMT, autologous BMT, syngeneic BMT	Descriptive, cross-sectional	\bar{X} = 10.1 years after BMT (SD = 2.5, range = 6–18.4 years)	Yes	EORTC QLQ-C30 (late complications of BMT module added), DBMT, POMS, WHYPQ, long-term BMT recovery questionnaire	Compared to pretransplant, most patients (74%) reported current QOL to be the same or better. 80% reported their QOL to be good to excellent. 80% reported their current health status as good to excellent. 88% reported that the benefits of transplantation eclipsed the side effects. Long-term complications of low severity continue to plague patients, such as emotional and sexual dysfunction, fatigue, visual problems, sleep disturbances, general pain, and cognitive dysfunction. Patients reported lack of social support to be the most frequently cited demand of recovery.
Andrykowski et al., 1994 N = 42 Allogeneic BMT	Prospective	Before BMT	No	FLIC, POMS, MAC	Survival after BMT was associated with extent of the graft match. Poorer post-BMT survival was independently predicted by poorer functional QOL and a tendency toward anxious preoccupation.
Baker et al., 1994 N = 135 Allogeneic BMT, autolo-	Retrospective	\bar{X} = 47.0 months after BMT (range = 6–149 months)	No	SLDS, POMS, Bradburn Positive and Negative Affect Scales	Patients reported an above-average level of satisfaction with major life domains.

*(Continued on next page)**Note.* See key on page 616.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
gous BMT, syngeneic BMT					<p>Patients reported less satisfaction with their physical strength, bodies, and ability to attain sexual satisfaction.</p> <p>Absence of graft versus host disease contributed to satisfaction with life.</p> <p>Patients who were transplanted at a later age reported greater dissatisfaction with life.</p> <p>QOL was predicted by self-esteem, age at transplantation, social support, and current physical functioning.</p>
Claisse et al., 1994 N = 49 BMT	Retrospective	After BMT (exact time not stated)	No	Investigator-developed questionnaire	<p>65% reported that they resumed a normal life.</p> <p>55% returned to work after a mean of 16 months post-transplant.</p> <p>94% of patients reported that they would choose to undergo a transplant again.</p>
Litwins et al., 1994 N = 54 Allogeneic BMT, autologous, BMT, conventional chemotherapy recipients	Retrospective	Minimum one year after BMT	No	SIP, Medical Coping Modes Questionnaire, Satisfaction Questionnaire	<p>BMT recipients and conventional chemotherapy patients reported good QOL.</p> <p>No significant differences in QOL were noted between the two groups.</p> <p>QOL was not significantly related to age, socioeconomic status, time since diagnosis, or time since most recent treatment.</p>
Syrjala et al., 1993 N = 67 Allogeneic BMT	Prospective, longitudinal	Before BMT and 90 days and one year after BMT	No	SIP, BSI, BDI, FRI, WCCL	<p>Patients reported that their greatest impairment of physical functioning occurred 90 days post-transplant.</p> <p>Physical functioning returned to pretransplant levels by one year.</p> <p>More severe chronic graft versus host disease, pretransplant physical impairment, and family conflict predicted impaired physical recovery at one year.</p> <p>Pretransplant marital conflict, nonmarried status, and less severe chronic graft versus host disease predicted emotional distress at one year.</p> <p>Depression (27%) and anxiety (41%) did not change pretransplant to a year post-transplant.</p>
Belec, 1992 N = 24 Allogeneic BMT, autologous BMT	Retrospective, cross-sectional	\bar{X} = 23 months after BMT (SD = 8.0, range = 12–38 months)	Yes	QLI	<p>The majority of BMT recipients reported an acceptable QOL.</p> <p>Patients reported living a more meaningful life post-transplant.</p>

(Continued on next page)

Note. See key on page 616.

Table 2. Quality of Life in Peripheral Blood Stem Cell Transplant and Bone Marrow Transplant Studies (Continued)

Study and Subjects	Design	Measurement Points	QOL Definition	Instruments	Major Findings
Grant et al., 1992 N = 179 Allogeneic BMT	Cross-sectional	Minimum 100 days after BMT	No	COH QOL-BMT	Families became more important and positively influenced overall QOL perception. Patients reported that their greatest concerns focused on health and employment. The majority of patients reported that they would undergo a transplant again. Adequate reliability and validity were established for the COH and QOL-BMT. Physical, psychological, social, and spiritual well-being comprise the four domains measured by the instrument.
Chao et al., 1992 N = 58 Autologous BMT	Prospective, longitudinal	Initial assessment 90+ days post-transplant, then every three months until one year after BMT	No	Investigator-developed tool	Patients reported an above-average to excellent QOL one year post-transplant. QOL was lowest 90 days post-transplant but improved by one year. 78% of patients returned to work. Physical concerns, such as inability to gain weight, poor appetite, sleep disturbances, and frequent colds, plagued patients 90 days post-transplant. All areas of concern improved by one year, except for frequent colds.
Baker et al., 1991 N = 135 Allogeneic BMT, autologous BMT, syngeneic BMT	Retrospective	\bar{X} = 47 months after BMT (range = 6–149 months)	No	The Role Checklist, SLDS, Cantril Self-Anchoring Ladders, POMS, Positive and Negative Affect Scales	Role retention was significantly correlated with higher QOL. Gender differences existed in terms of role retention patterns. Women were more likely to never have been employed. One-third of women who had been employed returned to work. Two-thirds of men who had worked returned to their jobs post-transplant.
Andrykowski et al., 1990 N = 58 Allogeneic BMT, renal transplant	Cross-sectional, retrospective	\bar{X} = 50.7 months after BMT, (SD = 26.5, range = 12–96 months) \bar{X} = 51.8 month after renal transplant (SD = 25.5, range = 17–97 months)	No	POMS, PAIS, SIP, FLIC, SEAS, SER, PHQ	No significant differences in a range of QOL domains were found between patients who received allogeneic BMT and those who received renal transplant. Poorer QOL post-transplant was associated with increased age, increased dosage of total body irradiation, and less education. BMT recipients reported their QOL to be significantly poorer than typical people of similar ages.

Note. See key on page 616.

Table 3. General Characteristics of Research Studies

Study Characteristics	n	%
Sample Population		
QOL in BMT	28	88
QOL in PBSCT	3	9
QOL in BMT and PBSCT	1	3
Sample Size		
> 100 subjects	22	69
< 100 subjects	10	31
Definition of QOL		
Defined	6	19
Did not define	26	81
Multiple versus single instruments		
Multiple instruments to measure various QOL domains	6	19
Single instrument to measure QOL	26	81

N = 32

BMT—bone marrow transplant; PBSCT—peripheral blood stem cell transplant; QOL—quality of life

Next, the single instruments for measuring QOL were examined to determine whether the tool provided an overall QOL score, domain scores, or both. The ECOG Performance Rating Scale-Self Report, Cantril's Self-Anchoring Scale, and SLDS produce an overall QOL score for the instrument. Scoring the EORTC QLQ C30, the MOS SF-36, and the SWED-QUAL produces specific domain scores that cannot be aggregated into an overall QOL score. The two investigator-developed questionnaires report frequencies of responses to the 4- and 14-item instruments. The six remaining instruments allow

Table 4. Quality-of-Life (QOL) Definitions in the Bone Marrow Transplant and Peripheral Blood Stem Cell Transplant Research Literature

Author	Definition
Molassiotis & Morris, 1999	"Conceptualized as the degree of adjustment in physical, psychological, and social domains of life together with the impact of the disease/treatment in everyday life" (p. 341)
Gaston-Johansson & Foxall, 1996	"Defined as the degree of satisfaction with present life circumstances as perceived by the individual. QOL is influenced by present as well as past and future experiences." (p.171)
Molassiotis et al., 1996	"Defined as a concept referring to the individual's own perceptions about the degree of satisfaction and ability to perform in life" (p. 249)
Andrykowski et al., 1995	"Typically viewed as a multidimensional construct, incorporating information regarding individuals' current physical symptoms and general health perceptions as well as information regarding physical, emotional, occupational and interpersonal functioning" (p. 1322)
Bush et al., 1995	"A composite of physical, emotional, and economic considerations which is frequently dominated by the physical sequelae of the disease" (p. 479)
Belec, 1992	"Defined as the degree of satisfaction with present life circumstances as perceived by the individual" (p. 32)

Table 5. Characteristics of Instruments Used as Single Instruments to Measure Quality of Life

Instrument Characteristics	n	%
Dimensionality		
Unidimensional	2	14
Multidimensional	12	86
Dimensions measured		
Physical domain	12	100
Psychological domain	11	92
Social/economic domain	11	92
Conceptualization		
Normal life	9	64
Satisfaction	3	21
Mixed	2	14
Scoring		
Domain scores only	3	21
Overall quality-of-life score	3	21
Domain and overall scores	6	43
Frequency of responses	2	14

N = 14

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

researchers to calculate both domain scores and an overall QOL score.

Finally, the tools were examined to determine categorization of QOL conceptualization. In the BMT and PBSCT populations, the majority of single instruments for measuring QOL reflected the normal life conceptualization. These include established QOL instruments such as the EORTC QLQ C-30, FACT-BMT, MOS SF-36, FLIC, CARES, ECOG Performance Rating Scale Self-Report, and SIP. In addition, two instruments developed for the studies by the investigators reflected the normal life conceptualization. Three tools represented the satisfaction conceptualization, including the QLI, SLDS, and Cantril's Self-Anchoring Scale. The COH QOL-BMT and SWED-QUAL contained items representing both the normal life conceptualization and the satisfaction conceptualization. None of the single measures of QOL used the social utility, achievement of personal goals, or happiness conceptualizations.

Discussion

General Study Characteristics

In terms of sample size, research design, and QOL measurement points, the studies included in this review shared the same general characteristics found in the other literature reviews (Andrykowski, 1994; Hjermstad & Kaasa, 1995; Neitzert et al., 1998; Whedon & Ferrell, 1994). The sample sizes of studies included in this integrative review generally were small, consisting of fewer than 100 subjects. Thus, the findings from studies with small samples may not be generalizable to other patients undergoing BMT or PBSCT. In addition, the small sample sizes potentially affected the ability to find statistical significance among findings that may have been clinically meaningful. In terms of research design, the majority of the studies included in this review used a cross-sectional design rather than longitudinal. Although more costly and difficult to implement, longitudinal designs offer the advantage of being able to examine overall QOL and specific QOL domains across

Table 6. Conceptualizations of Quality-of-Life (QOL) Instruments

Instrument	Frequency of Use	Domains Measured	Output Provided
Normal Life			
European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ C-30) (30 items) (Aaronson et al., 1993)	6	Five functional scales <ul style="list-style-type: none"> • Physical functioning • Role functioning • Emotional functioning • Cognitive functioning • Social functioning Multi-item symptom scales <ul style="list-style-type: none"> • Fatigue • Pain • Nausea and vomiting Global quality-of-life/health status scale Six single-item questions	Domain scores
Functional Assessment of Cancer Therapy-Bone Marrow Transplant (FACT-BMT) Functional Assessment of Cancer Therapy Scale-general (FACT-G): (28 items) (Cella et al., 1993) BMT subscale: (12 items) (McQuellon et al., 1997)	4	Physical well-being Function well-being Social/family well-being Emotional well-being Satisfaction with doctor-patient relationship BMT subscale	Total score Domain scores
Medical Outcomes Survey-Short Form 36 (MOS SF-36) (36 items) (Ware & Sherbourne, 1992)	3	Physical functioning Bodily pain Role limitations Emotional well-being Social functioning Energy/fatigue General health perceptions Perceived change in health	Domain scores
Functional Living Index (FLIC) (22 items) (Schipper et al., 1984)	3	Current health Role Sociability Emotional Pain Nausea Hardship because of cancer	Total score Domain scores
Cancer Rehabilitation Evaluation System (CARES) (91–132 items) (Schag & Heinrich, 1988)	1	Global health-related quality-of-life scale Five summary scales <ul style="list-style-type: none"> • Physical • Psychosocial • Marital • Medical interaction • Sexual 31 subscales measuring everyday functioning	Total score Domain scores
Eastern Cooperative Oncology Group Performance Rating Scale-Self Report (one item) (Zubrod et al., 1960)	1	Functional status	Total score
Sickness Impact Profile (SIP) (136 items) (Bergner et al., 1981)	3	Physical dimension <ul style="list-style-type: none"> • Psychosocial dimension • Sleep and rest • Taking nutrition • Usual daily work • Household management • Leisure • Recreation 	Total score Domain scores
Investigator-developed questionnaire (14 items)	1	14 items regarding weight, appetite, sleep, colds, medication, employment, sexual activity, appearance, adjustment, concern and difficulty with BMT, and global QOL	Answers to items

(Continued on next page)

N = 32 studies

Table 6. Conceptualizations of Quality-of-Life (QOL) Instruments (Continued)

Instrument	Frequency of Use	Domains Measured	Output Provided
Investigator-developed questionnaire (four items)	1	Four items related to normalcy of life, body image, sexual life, and professional activity	Answers to items
Satisfaction			
Quality of Life Index (QLI) (35 items related to satisfaction) (35 corresponding items related to importance) (Ferrans & Powers, 1985)	2	Health and functioning Psychological/spiritual Social and economic Family	Total score Domain scores
Satisfaction with Life Domain Scale (18 items) (Baker et al., 1992)	2	18 items related to relationships, health, appearance, leisure time, ability to eat, physical strength, and BMT	Total score
Cantril's Self-Anchoring Scale (one item) (Cantril, 1965)	1	Global	Total score
Mixed			
City of Hope Quality of Life Scale for Bone Marrow Transplant (COH QOL-BMT) (28–30 items; different versions) (Grant et al., 1992)	2	Physical well-being and symptoms Psychological well-being Social well-being Spiritual well-being Single-item global measure of QOL	Total score Domain scores
Swedish Health-Related Quality of Life Questionnaire (SWED-QUAL) (61 items) (Brorsson et al., 1993)	1	Physical functioning Mobility Satisfaction with physical health Role limitations because of physical health Pain Positive effect Negative effect Role limitations because of emotional health Sleep problems Satisfaction with family life Marital functioning Sexual functioning General health perceptions	Domain scores

N = 32 studies

an extended period of time in the same patients. This strengthens the design of the study and improves the confidence in study findings. In the PBSCT and BMT populations, this is particularly helpful for examining changes in QOL that may vary with time, such as before and after transplantation.

The types of patients included in this review are different when compared to the other published reviews. In this review, more studies included patients undergoing PBSCT as opposed to only BMT. This reflects the increasing use of peripheral blood versus bone marrow as the source of stem cells, particularly in autologous transplantation. Whether differences exist in QOL outcomes between patients undergoing PBSCT and BMT remains to be seen because none of the studies in this review examined this question.

Phase One

The fact that few authors conceptually defined QOL in their studies also is consistent with the current literature in that a lack of consensus remains regarding the definition of QOL (King et al., 1997). Because the definition was not stated explicitly does not necessarily mean that the researchers failed to define QOL. Some researchers have developed research programs examining QOL in BMT recipients. Their definitions of QOL simply may not be published in every article. On the other hand, lack of clarity regarding conceptualization of a concept such as QOL

creates a number of difficulties for readers. One such difficulty lies in assessing the consistency between the theoretical definition of QOL and the operationalization of the concept.

Controversy exists regarding whether a single instrument or multiple instruments should be used to measure QOL (Dean, 1997). Advocates for the use of a battery of instruments stress the multidimensionality of the concept and the lack of consensus in terms of defining QOL (Jalowiec, 1990). Proponents of using a single QOL measure cite the disadvantages of using multiple instruments, such as researcher and patient burden, data management, data analysis, and interpretation of findings, particularly when the various instruments produce conflicting results (Frank-Stromborg, 1984; Guyatt & Jaeschke, 1990). In this review, the majority of studies used a single measure of QOL. Decisions to use a single instrument or multiple instruments to measure QOL in patients undergoing BMT or PBSCT should be guided by the purpose of the study, conceptual framework, patient burden, and resources available to the researcher.

Phase Two

The multidimensional nature of QOL now is well established in the cancer literature. This integrative review of QOL in the BMT and PBSCT literature supported this notion. With the exception of the two studies using only investigator-developed questionnaires, all studies in this review used either a tool that

measured multiple dimensions of QOL or several instruments to measure the various domains. Although researchers agree on the multidimensional nature of QOL, no consensus exists concerning specific QOL domains to be included in each instrument. The single QOL instruments identified in this review reveal a host of QOL domains that may be assessed depending on the instrument. Although no agreement exists regarding specific domains to be included in QOL research, understanding that various aspects of life impact QOL perception represents significant progress in QOL research.

Of the established instruments reviewed, the EORTC QLQ C-30, MOS SF-36, and SWED-QUAL provide only domain scores for a variety of QOL dimensions. The exclusive use of domain scores allows researchers to identify deficits in various QOL domains and specifically target problem areas. On the other hand, using only domain scores does not explicate the interactive nature among various domains. In addition, data management and analysis can become complicated if an instrument produces a number of subscale scores rather than or in addition to an overall QOL score.

For instance, the EORTC QLQ C30 is a single QOL instrument that provides only domain scores. This instrument is a 30-item tool that produces five functional scales, a global QOL/health status scale, three multi-item symptom scales, and six single-item questions. Although these very specific subscales allow researchers to identify changes in a particular QOL domain, dealing with a multitude of subscales that cannot be aggregated into one score complicates data analysis, particularly when a sample size is small.

Tools that provide only an overall QOL score produce the opposite advantages and disadvantages. The ECOG Performance Rating Scale-Self Report, SLDS, and Cantril's Self-Anchoring Scale are instruments that result in one overall QOL score. When using an instrument that only provides a single QOL score, researchers cannot determine which QOL domains stay the same, improve, or deteriorate after BMT or PBSCT.

Instruments that provide domain scores and an aggregate score confer the most flexibility when measuring QOL. A number of measures evaluated in this review provide both types (FACT-BMT, FLIC, CARES, SIP, COH QOL-BMT, and QLI). The question remains, however, whether a summative score is the same as an integrated assessment of QOL.

The decision regarding instrumentation and, in particular, type of scoring depends on the purpose of the study. Despite the drawbacks, descriptive, exploratory studies evaluating QOL in patients undergoing BMT might benefit from using instruments that provide only domain scores. Likewise, studies only interested in global measures of QOL in the BMT population might benefit from using a tool that furnishes only one QOL score. This may be more economical in terms of researcher and patient burden.

Understanding the theoretical underpinnings of an instrument is essential for interpreting study results. In this integrative review, only two conceptualizations of QOL were represented when evaluating the instruments: normal life and satisfaction. The majority of instruments viewed QOL from a normal life perspective. These instruments focus on measuring deviations from normal. Standards of normalcy may include perfect health, a comparable reference group, or an individual's pre-illness level of functioning. According to Ferrans (1996), the

major difficulty with this conceptualization is deciding whose definition of normal to use. In addition, the patient's perspective of QOL is not taken into consideration. A patient undergoing BMT may experience significant deviations from normal in all dimensions of QOL yet be satisfied that his or her life is worth living. Nevertheless, information provided by these tools contributes to understanding the impact of BMT on a patient's ability to lead a normal life, which is important.

Instruments reflecting the satisfaction conceptualization also were represented in this review, although not as frequently as the instruments measuring deviations from normal. Scores from satisfaction instruments reflect a patient's cognitive appraisal of life's conditions. Measurement of QOL from this perspective is consistent with an individualist perspective (Ferrans, 1996) and the literature regarding measurement of QOL in patients with cancer (Donovan et al., 1989; Osoba, 1994). In addition, the satisfaction conceptualization is compatible with the dynamic nature of QOL. Scores reflect changes in a patient's values over time, particularly if the satisfaction scores are weighted according to the level of importance assigned by the individual, as with the QLI (Ferrans & Powers, 1985, 1992).

The two instruments with items reflecting the normal life and satisfaction conceptualizations combine both theoretical underpinnings. With these instruments, however, an individual is not asked to supply information regarding satisfaction with functional status for all the various QOL domains.

The importance of determining the conceptualization of QOL espoused by a tool prior to interpreting a study's results cannot be underestimated. As this review illustrated, authors primarily used two QOL conceptualizations to guide their studies and to select the appropriate instruments. Although tools using the normal life and satisfaction conceptualizations provide useful and essential information regarding QOL in patients undergoing BMT or PBSCT, significant differences exist between the two. Findings from a normal life tool might not be similar and might even conflict with findings from a tool using a satisfaction conceptualization, even in the same group of patients. For example, one study in this review assessed QOL using instruments reflecting both the normal life (MOS SF-36) and the satisfaction (SLDS) conceptualizations (Sutherland et al., 1997). In that study, patients scored significantly lower than the population norms for the MOS SF-36 on physical functioning, role functioning-physical, role functioning-emotional, social functioning, and general health; yet 81% of the patients stated that they were satisfied with their QOL. As the study illustrates, readers must be aware of differences between tools prior to interpreting and comparing results regarding QOL in BMT and PBSCT literature.

Implications for Nursing in Research and Practice

Unfortunately, a gold standard for measuring QOL in research or clinical practice does not exist. Meanwhile, the list of available QOL measures has grown tremendously (Garratt, Schmidt, Mackintosh, & Fitzpatrick, 2002). The majority of QOL instruments, including the tools highlighted in this integrative review, were developed for use in research studies. Because of the plethora of instruments, selecting an instrument to examine QOL in the BMT and PBSCT populations requires a great deal of consideration.

Figure 1 lists examples of questions that researchers may consider prior to selecting an instrument. Most importantly, the QOL instrument to be used must be reliable, valid, and able to provide the information that the investigator needs to address the research question. No single QOL instrument can adequately address all research questions across all patients. For instance, a tool that is appropriate for use when studying the long-term consequences of BMT or PBSCT may not be appropriate when examining the short-term consequences. On the other hand, using the same instrument across all assessment points may be helpful and even necessary when conducting a longitudinal study to describe QOL trends post-transplant.

Conducting QOL assessments for use in the clinical arena still is a relatively uncommon procedure. Therefore, the selection criteria for choosing an instrument are not as clear. In clinical practice, a gold standard for assessing QOL in patients undergoing BMT or PBSCT does not exist. As in the research environment, a tool must be able to provide a transplant clinician with the information that he or she needs to adequately assess a patient's QOL. Furthermore, the clinician also must determine when changes in QOL ratings among patients reflect clinically

meaningful changes in QOL perception. No QOL instrument will satisfactorily capture all the necessary QOL information to address all clinical practice needs. For instance, a tool that can be readily administered, scored, and interpreted by a clinician interested in assessing QOL in long-term transplant survivors may be too burdensome for the staff nurse on the BMT unit to administer. Different situations call for different QOL tools.

Even though transplant clinicians rarely incorporate standardized QOL assessments into their daily clinical practice, clinicians need to understand the QOL research findings to integrate these findings into patient care. One of the difficulties associated with translating research findings into clinical practice stems from understanding and distinguishing the difference between statistical significance versus clinical significance or clinically meaningful findings (Guyatt et al., 2002). Findings that are statistically significant might not be large enough to have clinical ramifications for patient care. For instance, small numerical changes in QOL scores may be statistically significant, especially in large samples, but small changes are not necessarily meaningful to a patient (Osoba, 1999). In this example, the evidence for incorporating research findings into patient care might not be warranted. Thus, BMT and PBSCT clinicians must understand the magnitude of QOL changes before implementing changes in practice.

Recently, attention has focused on assessing clinical significance when measuring QOL as a means to bridge the gap between QOL researchers and oncology clinicians. This represents an important and exciting area for future growth. Delineation of research findings that are clinically meaningful to patients will enhance the foundation for evidence-based practice and ultimately improve the care of transplant patients. A thorough discussion regarding clinical significance versus statistical significance in patients is beyond the scope of this article. Readers are referred to a series of six articles published by a consensus group of QOL experts for further discussion of this important topic (Cella, Bullinger, Scott, Barofsky, & Clinical Significance Consensus Meeting Group, 2002; Frost et al., 2002; Guyatt et al., 2002; Sloan et al., 2002; Sprangers et al., 2002; Symonds, Berzon, Marquis, Rummans, & Clinical Significance Consensus Meeting Group, 2002).

Conclusion

The BMT and PBSCT procedures and marrow ablative regimen result in significant toxicities, including graft versus host disease, serious infections, and other associated problems. The addition of QOL measures to the traditional measures of survival rates and length of disease-free intervals provides a more complete evaluation of treatment outcomes. Decisions regarding QOL instrumentation in the BMT and PBSCT populations are influenced by a number of factors, including study purpose, QOL conceptualization, concerns regarding patient burden, and human and financial resources available to the researcher.

The majority of single measures of QOL used in BMT and PBSCT literature support the multidimensional nature of QOL. Items reflecting the physical, psychological, and social/economic domains were included in most of these tools. QOL instrumentation differences include use of a single versus multiple instruments, theoretical underpinnings of instruments, and output provided by the instruments (overall QOL score, domain scores, or both). An understanding of QOL instrumentation is essential to interpreting a study's results

Research

- Is the tool reliable and valid?
- Will the tool provide the information that is needed to address the research questions?
- Is the conceptualization of the tool consistent with the research question?
- Should a generic or a cancer-specific tool be used?
- What aspects of life does the tool address?
- Does the tool provide domain scores, an overall or aggregate quality-of-life (QOL) score, or both?
- What type of scale is used?
- How many items are included in the instrument?
- How long does completing the instrument take?
- Is the instrument patient-administered or investigator-administered?
- Given the patient's expected health status, will he or she be able to complete the instrument in a timely manner?
- How frequently will the instrument need to be administered?
- Is the tool responsive to changes in the patient's condition?
- Is the tool sensitive enough to reflect true changes in the patient's condition?
- Can clinicians easily interpret the research findings obtained from the instrument?

Clinical Practice

- Is the tool reliable and valid?
- Will the tool be able to provide the information that is needed to assess the impact of transplantation on QOL?
- What specific aspects of QOL does the tool address? Functional status? Symptoms? Global QOL? Satisfaction?
- Can the tool be administered easily in a clinical setting?
- Is the instrument patient-administered or investigator-administered?
- How many items are included in the tool?
- How long does completing the instrument take?
- How frequently will the instrument be administered? Daily? Weekly? At pre-set times? At each office visit?
- Given the patient's expected health status, will he or she be able to complete the instrument in a timely manner?
- Are guidelines available for determining clinically meaningful changes in QOL?
- How are the tools scored?
- Are the findings obtained from the tool easily interpreted?
- Will administration of the QOL instrument impact the patient and healthcare professional's relationship?

Figure 1. Selection Questions for Quality-of-Life Instruments

because no gold standard exists for measuring QOL in research or clinical practice. As the movement for evidence-based practice continues to grow, clinicians need to know whether statistically significant findings result in clinically meaningful changes in patients' perceptions of QOL. The findings from this integrative review suggest that further study is warranted, including a review of QOL in BMT and PBSCT research findings within the context of the normal life and satisfaction conceptualizations. In addition, examining the

clinical meaningfulness of statistically significant findings of QOL research in patients undergoing BMT or PBSCT would enhance the foundation for evidence-based practice.

The author wishes to thank Carol Estwing Ferrans, PhD, RN, FAAN, for her continued mentorship and assistance with this manuscript.

Author Contact: Eileen Danaher Hacker, PhD, RN, AOCN[®], can be reached at ehacker@uic.edu, with copy to editor at rose_mary@earthlink.net.

References

- Aaronson, N.K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N.J., et al. (1993). The European Organization for Research and Treatment of Cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute*, *85*, 365–376.
- Andrykowski, M.A. (1994). Psychosocial factors in bone marrow transplantation: A review and recommendations for research. *Bone Marrow Transplantation*, *13*, 357–375.
- Andrykowski, M.A., Altmayer, E.M., Barnett, R.L., Otis, M.L., Gingrich, R., & Henslee-Downey, P.J. (1990). The quality of life in adult survivors of allogeneic bone marrow transplantation: Correlates and comparison with matched renal transplant recipients. *Transplantation*, *50*, 399–406.
- Andrykowski, M.A., Brady, M.J., & Henslee-Downey, P.J. (1994). Psychosocial factors predictive of survival after allogeneic bone marrow transplantation for leukemia. *Psychosomatic Medicine*, *56*, 432–439.
- Andrykowski, M.A., Greiner, C.B., Altmayer, E.M., Burish, T.G., Antin, J.H., Gingrich, R., et al. (1995). Quality of life following bone marrow transplantation: Findings from a multicentre study. *British Journal of Cancer*, *71*, 1322–1329.
- Baker, F., Curbow, B., & Wingard, J.R. (1991). Role retention and quality of life of bone marrow transplant survivors. *Social Science and Medicine*, *32*, 697–704.
- Baker, F., Curbow, B., & Wingard, J.R. (1992). Development of the Satisfaction With Life Domains Scale for cancer. *Journal of Psychosocial Oncology*, *10*(3), 75–90.
- Baker, F., Wingard, J.R., Curbow, B., Zabora, J., Jodrey, D., Fogarty, L., et al. (1994). Quality of life of bone marrow transplant long-term survivors. *Bone Marrow Transplantation*, *13*, 589–596.
- Belec, R.H. (1992). Quality of life: Perceptions of long-term survivors of bone marrow transplantation. *Oncology Nursing Forum*, *19*, 31–37.
- Bergner, M., Bobbitt, R.A., Carter, W.B., & Gilson, B.S. (1981). The Sickness Impact Profile: Development and final revision of a health status measure. *Medical Care*, *19*, 787–805.
- Bronsson, B., Ifver, J., & Hays, R.D. (1993). The Swedish Health-Related Quality of Life Survey (SWED-QUAL). *Quality of Life Research*, *2*, 33–45.
- Bush, N.E., Haberman, M., Donaldson, G., & Sullivan, K.M. (1995). Quality of life of 125 adults surviving 6–18 years after bone marrow transplantation. *Social Science and Medicine*, *40*, 479–490.
- Cantril, H. (1965). *The patterns of human concern*. New Brunswick, NJ: Rutgers University Press.
- Cella, D., Bullinger, M., Scott, C., Barofsky, I., & Clinical Significance Consensus Meeting Group. (2002). Group vs. individual approaches to understanding the clinical significance of differences or changes in quality of life. *Mayo Clinic Proceedings*, *77*, 384–392.
- Cella, D.F., Tulsky, D.S., Gray, G., Sarafian, B., Linn, E., Bonomi, A., et al. (1993). The Functional Assessment of Cancer Therapy Scale: Development and validation of the general measure. *Journal of Clinical Oncology*, *11*, 570–579.
- Chao, N.J., Tierney, K., Bloom, J.R., Long, G.D., Barr, T.A., Stallbaum, B.A., et al. (1992). Dynamic assessment of quality of life after autologous bone marrow transplantation. *Blood*, *80*, 825–830.
- Claisse, J.P., Hirsch, I., & Gluckman, E. (1994). Quality of life after an allogeneic bone marrow transplantation: The patient's point of view. *Nouvelle Revue Francaise d'Hematologie*, *36*(Suppl. 1), S83–S84.
- Dean, H. (1997). Multiple instruments for measuring quality of life. In M. Frank-Stromborg & S.J. Olsen (Eds.), *Instruments for clinical health-care research* (2nd ed., pp. 135–148). Boston: Jones and Bartlett.
- Donovan, K., Sanson-Fisher, R.W., & Redman, S. (1989). Measuring quality of life in cancer patients. *Journal of Clinical Oncology*, *7*, 959–968.
- Ferrans, C.E. (1990). Quality of life: Conceptual issues. *Seminars in Oncology Nursing*, *6*, 248–254.
- Ferrans, C.E. (1996). Development of a conceptual model of quality of life. *Scholarly Inquiry for Nursing Practice*, *10*, 293–304.
- Ferrans, C.E. (2000). Quality of life as an outcome of cancer care. In C. Yarbrough, M. Frogge, & M. Goodman (Eds.), *Cancer nursing: Principles and practice* (5th ed., pp. 243–258). Boston, MA: Jones and Bartlett.
- Ferrans, C.E., & Powers, M.J. (1985). Quality of Life Index: Development and psychometric properties. *Advances in Nursing Science*, *8*(1), 15–24.
- Ferrans, C.E., & Powers, M.J. (1992). Psychometric assessment of the Quality of Life Index. *Research in Nursing and Health*, *15*, 111–119.
- Ferrell, B., Grant, M., Schmidt, G.M., Rhiner, M., Whitehead, C., Fonbuena, P., et al. (1992). The meaning of quality of life for bone marrow transplant survivors. Part 1. The impact of bone marrow transplant on quality of life. *Cancer Nursing*, *15*, 153–160.
- Frank-Stromborg, M. (1984). Selecting an instrument to measure quality of life. *Oncology Nursing Forum*, *11*(5), 88–91.
- Fromm, K., Andrykowski, M.A., & Hunt, J. (1996). Positive and negative psychosocial sequelae of bone marrow transplantation: Implications for quality of life assessment. *Journal of Behavioral Medicine*, *19*, 221–240.
- Frost, M.H., Bonomi, A.E., Ferrans, C.E., Wong, G.Y., Hays, R.D., & Clinical Significance Consensus Meeting Group. (2002). Patient, clinician, and population perspectives on determining the clinical significance of quality-of-life scores. *Mayo Clinic Proceedings*, *77*, 488–494.
- Garratt, A., Schmidt, L., Mackintosh, A., & Fitzpatrick, R. (2002). Quality of life measurement: Bibliographic study of patient assessed health outcome measures. *BMJ*, *324*, 1417–1421.
- Gaston-Johansson, F., & Foxall, M. (1996). Psychological correlates of quality of life across the autologous bone marrow transplant experience. *Cancer Nursing*, *19*, 170–176.
- Gill, T.M., & Feinstein, A.R. (1994). A critical appraisal of quality-of-life measurements. *JAMA*, *272*, 619–626.
- Grant, M., Ferrell, B., Schmidt, G.M., Fonbuena, P., Niland, J.C., & Forman, S.J. (1992). Measurement of quality of life in bone marrow transplantation survivors. *Quality of Life Research*, *1*, 375–384.
- Guyatt, G.H., & Jaeschke, R. (1990). Measurements in clinical trials: Choosing the appropriate approach. In B. Spilker (Ed.), *Quality of life assessments in clinical trials* (pp. 37–46). New York: Raven.
- Guyatt, G.H., Osoba, D., Wu, A.W., Wyrwich, K.W., Norman, G.R., & Clinical Significance Consensus Meeting Group. (2002). Methods to explain the clinical significance of health status measures. *Mayo Clinic Proceedings*, *77*, 371–383.
- Hann, D.M., Garovoy, N., Finkelstein, B., Jacobsen, P.B., Azzarello, L.M., & Fields, K.K. (1999). Fatigue and quality of life in breast cancer patients undergoing autologous stem cell transplantation: A longitudinal comparative study. *Journal of Pain and Symptom Management*, *17*, 311–319.
- Hann, D.M., Jacobsen, P.B., Martin, S.C., Kronish, L.E., Azzarello, L.M., & Fields, K.K. (1997). Quality of life following bone marrow transplantation for breast cancer: A comparative study. *Bone Marrow Transplantation*, *19*, 257–264.
- Hjermstad, M.J., Evensen, S.A., Kvaloy, S.O., Fayers, P.M., & Kaasa, S. (1999). Health-related quality of life 1 year after allogeneic or autologous

- stem-cell transplantation: A prospective study. *Journal of Clinical Oncology*, 17, 706–718.
- Hjermstad, M.J., & Kaasa, S. (1995). Quality of life in adult cancer patients treated with bone marrow transplantation—A review of the literature. *European Journal of Cancer*, 31A(2), 163–173.
- Jalowiec, A. (1990). Issues in using multiple measures of quality of life. *Seminars in Oncology Nursing*, 6, 271–277.
- King, C.R., Haberman, M., Berry, D.L., Bush, N., Butler, L., Dow, K.H., et al. (1997). Quality of life and the cancer experience: The state-of-the-knowledge. *Oncology Nursing Forum*, 24, 27–41.
- Kopp, M., Schweigkofler, H., Holzner, B., Nachbaur, D., Niederwieser, D., Fleischhacker, W.W., et al. (1998). Time after bone marrow transplantation as an important variable for quality of life: Results of a cross-sectional investigation using two different instruments for quality-of-life assessment. *Annals of Hematology*, 77, 27–32.
- Larsen, J., Gardulf, A., Nordstrom, G., Bjorkstrand, B., & Ljungman, P. (1996). Health-related quality of life in women with breast cancer undergoing autologous stem-cell transplantation. *Cancer Nursing*, 19, 368–375.
- Litwins, N.M., Rodrigue, J.R., & Weiner, R.S. (1994). Quality of life in adult recipients of bone marrow transplantation. *Psychological Reports*, 75(1 Pt. 1), 323–328.
- Marks, D.I., Gale, D.J., Vedhara, K., & Bird, J.M. (1999). A quality of life study in 20 adult long-term survivors of unrelated donor bone marrow transplantation. *Bone Marrow Transplantation*, 24, 191–195.
- McQuellon, R.P., Craven, B., Russell, G.B., Hoffman, S., Cruz, J.M., Perry, J.J., et al. (1996). Quality of life in breast cancer patients before and after autologous bone marrow transplantation. *Bone Marrow Transplantation*, 18, 579–584.
- McQuellon, R.P., Russell, G.B., Cella, D.F., Craven, B.L., Brady, M., Bonomi, A., et al. (1997). Quality of life measurement in bone marrow transplantation: Development of the Functional Assessment of Cancer Therapy-Bone Marrow Transplant (FACT-BMT) scale. *Bone Marrow Transplantation*, 19, 357–368.
- McQuellon, R.P., Russell, G.B., Rambo, T.D., Craven, B.L., Radford, J., Perry, J.J., et al. (1998). Quality of life and psychological distress of bone marrow transplant recipients: The ‘time trajectory’ to recovery over the first year. *Bone Marrow Transplantation*, 21, 477–486.
- Molassiotis, A. (1996). Late psychosocial effects of conditioning for BMT. *British Journal of Nursing*, 5, 1296–1302.
- Molassiotis, A., Boughton, B.J., Burgoyne, T., & van den Akker, O.B. (1995). Comparison of the overall quality of life in 50 long-term survivors of autologous and allogeneic bone marrow transplantation. *Journal of Advanced Nursing*, 22, 509–516.
- Molassiotis, A., & Morris, P.J. (1999). Quality of life in patients with chronic myeloid leukemia after unrelated donor bone marrow transplantation. *Cancer Nursing*, 22, 340–349.
- Molassiotis, A., van den Akker, O.B., Milligan, D.W., Goldman, J.M., Boughton, B.J., Holmes, J.A., et al. (1996). Quality of life in long-term survivors of marrow transplantation: Comparison with a matched group receiving maintenance chemotherapy. *Bone Marrow Transplantation*, 17, 249–258.
- Molzahn, A.E., Northcott, H.C., & Dossetor, J.B. (1997). Quality of life of individuals with end stage renal disease: Perceptions of patients, nurses, and physicians. *ANNA Journal*, 24, 325–333.
- National Cancer Institute. (1988). *Cancer Therapy Evaluation Program*. Bethesda, MD: Author.
- Neitzert, C.S., Ritvo, P., Dancy, J., Weiser, K., Murray, C., & Avery, J. (1998). The psychosocial impact of bone marrow transplantation: A review of the literature. *Bone Marrow Transplantation*, 22, 409–422.
- Osoba, D. (1994). Lessons learned from measuring health-related quality of life in oncology. *Journal of Clinical Oncology*, 12, 608–616.
- Osoba, D. (1999). What has been learned from measuring health-related quality of life in clinical oncology. *European Journal of Cancer*, 35, 1565–1570.
- Rowe, J.M., Ciobanu, N., Ascensao, J., Stadtmauer, E.A., Weiner, R.S., Schenkein, D.P., et al. (1994). Recommended guidelines for the management of autologous and allogeneic bone marrow transplantation. *Annals of Internal Medicine*, 120, 143–158.
- Schag, C.A.C., & Heinrich, R.L. (1988). *Cancer rehabilitation evaluation system (CARES) manual*. Santa Monica, CA: CARES Consultants.
- Schipper, H., Clinch, J., McMurray, A., & Levitt, M. (1984). Measuring the quality of life of cancer patients: The Functional Living Index-Cancer: Development and validation. *Journal of Clinical Oncology*, 2, 472–483.
- Sloan, J.A., Cella, D., Frost, M., Guyatt, G.H., Sprangers, M., Symonds, T., et al. (2002). Assessing clinical significance in measuring oncology patient quality of life: Introduction to the symposium, content overview, and definition of terms. *Mayo Clinic Proceedings*, 77, 367–370.
- Sprangers, M.A., & Aaronson, N.K. (1992). Role of health care providers and significant others in evaluating the quality of life of patients with chronic disease: A review. *Journal of Clinical Epidemiology*, 45, 743–760.
- Sprangers, M.A., Moynihan, C.M., Moynihan, T.J., Patrick, D.L., Revicki, D.A., & Clinical Significance Consensus Meeting Group. (2002). Assessing meaningful change over time in quality of life: A users’ guide for clinicians. *Mayo Clinic Proceedings*, 77, 561–571.
- Sutherland, H.J., Fyles, G.M., Adams, G., Hao, Y., Lipton, J.H., Minden, M.D., et al. (1997). Quality of life following bone marrow transplantation: A comparison of patient reports with population norms. *Bone Marrow Transplantation*, 19, 1129–1136.
- Symonds, T., Berzon, R., Marquis, P., Rummans, T.A., & Clinical Significance Consensus Meeting Group. (2002). The clinical significance of quality-of-life results: Practical considerations for specific audiences. *Mayo Clinic Proceedings*, 77, 572–583.
- Syrjala, K.L., Chapko, M.K., Vitaliano, P.P., Cummings, C., & Sullivan, K.M. (1993). Recovery after allogeneic marrow transplantation: Prospective study of predictors of long-term physical and psychosocial functioning. *Bone Marrow Transplantation*, 11, 319–327.
- Ware, J.E., Jr., & Sherbourne, C.D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*, 30, 473–483.
- Watson, M., Zittoun, R., Hall, E., Solbu, G., & Wheatley, K. (1996). A modular questionnaire for the assessment of longterm quality of life in leukaemia patients: The MRC/EORTC QLQ-LEU. *Quality of Life Research*, 5(1), 15–19.
- Weiss, R.B. (1999). Introduction: Dose-intensive therapy for adult malignancies. *Seminars in Oncology*, 26, 1–5.
- Wellisch, D.K., Centeno, J., Guzman, J., Belin, T., & Schiller, G.J. (1996). Bone marrow transplantation vs. high-dose cytarabine-based consolidation chemotherapy for acute myelogenous leukemia: A long-term follow-up study of quality-of-life measures of survivors. *Psychosomatics*, 37, 144–154.
- Whedon, M., & Ferrell, B.R. (1994). Quality of life in adult bone marrow transplant patients: Beyond the first year. *Seminars in Oncology Nursing*, 10, 42–57.
- Whedon, M., Stearns, D., & Mills, L.E. (1995). Quality of life of long-term adult survivors of autologous bone marrow transplantation. *Oncology Nursing Forum*, 22, 1527–1537.
- Winer, E.P., Lindley, C., Hardee, M., Sawyer, W.T., Brunatti, C., Borstelmann, N.A., et al. (1999). Quality of life in patients surviving at least 12 months following high dose chemotherapy with autologous bone marrow support. *Psycho-Oncology*, 8, 167–176.
- Zittoun, R., Achard, S., & Ruzsiewicz, M. (1999). Assessment of quality of life during intensive chemotherapy or bone marrow transplantation. *Psycho-Oncology*, 8, 64–73.
- Zubrod, C.G., Schneiderman, M., Frei, E., Brindley, C., Gold, G.L., Shnider, B., et al. (1960). Appraisal of methods for the study of chemotherapy of cancer in man: Comparative therapeutic trial of nitrogen mustard and triethylene thiophosphoramide. *Journal of Chronic Disease*, 11, 7–33. 

The continuing education examination and test form for the preceding article appear on the following pages.