HHS Public Access

Author manuscript

Chronic Illn. Author manuscript; available in PMC 2016 September 19.

Published in final edited form as:

Chronic Illn. 2016 March ; 12(1): 29–40. doi:10.1177/1742395315601415.

Informational needs of liver transplant recipients during a two-year post transplant period

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Abstract

Objectives—To describe the informational needs of liver transplant (LTx) recipients, examine potential differences in informational needs by socio-demographic and clinical variables, and examine informational needs at various time points post-transplant.

Methods—This study used a descriptive, cross-sectional design. Informational needs were assessed by the INQ-liver, a new questionnaire developed to include LTx recipients' perspective. In order to examine information needs at different post-transplant time points, participants were classified into four groups (0–1, 2–4, 5–9, and 10–24 months post-transplant).

Results—Participants (159) who were married, single, had higher levels of education, or higher monthly incomes had significantly greater informational needs. Informational needs related to disease and physical and emotional management remained high after transplant. Four subscales (medication, wound management, diet, and daily and social activities) indicated patients experience different informational needs across time. Participants who were 2–4 months post-transplant had higher informational needs related to wound management and daily and social activities. The highest informational needs related to medication and diet were reported by participants who were 5–9 months post-transplant.

Discussion—The findings indicated that informational needs vary among LTx recipients who are at different time points post-transplant. Marital status, education, and monthly income can influence informational needs.

Conclusion—Healthcare providers should tailor information given to LTx recipients to their needs at different time points. Longitudinal studies are needed to confirm the changing patterns of informational needs.

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Keywords

liver transplant; informational needs; self-management; transplant; recipients

Introduction

Liver transplantation (LTx) can be a life-saving option for people with acute/chronic liver failure. The number of liver transplants worldwide has increased from about 9,800[1] in 2000 to nearly 24,000 in 2012.[2] Also the clinical outcomes of LTx recipients have improved with the development of immunosuppression, advanced surgical techniques, effective donor organ management, and efficient organ distribution.[3,4] The 10 year survival rate of LTx recipients has risen to over 65%[5–8] and the graft survival rate has increased to 70%.[7,9] However, in spite of improved outcomes, some complications such as rejection persist.[10]

Recent practice and research strategies have targeted self-management. To maintain liver function and avoid complications, LTx recipients need to engage in a wide range of self-management behaviors including taking medications as prescribed, attending regular transplant clinic visits, avoiding infections, and monitoring for complications.[11] Proper education is essential for LTx recipients to enhance self-management, since education can improve health behaviors,[12–14] self-efficacy,[12,15,16] symptom management,[14,16,17] and control over disease.[13,17]

Identifying LTx recipients' informational needs is a key prerequisite to providing appropriate self-management education by healthcare providers.[18] An informational need is "a recognition that your knowledge is inadequate to satisfy a goal that you have, within the context/situation that you find yourself at a specific point in the time."[19] Time elapsed since LTx can influence informational needs. For example, Jones (2005)[20] noted that concerns of LTx recipients change across time. Participants immediate post-transplant reported several concerns including physical discomfort, limited activities of daily living, and personality changes. Six months after LTx, the focus changed to long-term concerns such as changed appearance, social isolation, and economic status. To help LTx recipients resolve their concerns, healthcare providers need to understand LTx recipients' time-specific informational needs.

The overall purpose of this study was to assess the informational needs of LTx recipients in South Korea. The specific aims were to 1) describe the informational needs of LTx recipients, 2) examine potential differences in informational needs by socio-demographic variables (gender, age, education, marital status, job status, and monthly income) and clinical variables (length of post-transplant hospital stay, post-transplant complications, rejection episodes, and re-hospitalization episodes), and 3) examine informational needs of LTx recipients at 0–1, 2–4, 5–9, and 10–24 months post transplant.

Method

Participants

A cross-sectional, descriptive design was used. Participants were recruited from a transplant outpatient clinic in Seoul, South Korea. Persons were eligible to participate if they 1) received a LTx in the last two years at the hospital where the study was conducted, 2) were over 18 years old, and 3) were able to give informed consent.

Measures

Socio-demographic and clinical questionnaire—The socio-demographic and clinical questionnaire contained 10 questions: gender, age, marital status, education, job status, monthly income, length of post-transplant hospital stay, post-transplant complications, rejection episodes, and re-hospitalization episodes.

Informational Needs Questionnaire – liver (INQ-liver)—As existing informational needs questionnaires lacked the LTx recipients' perspective, we developed an informational needs questionnaire. Preliminary items were generated by extracting questions posted by LTx recipients to self-help group websites from three major transplant hospitals in Seoul, South Korea. Each website that is organized and run by LTx recipients has a 'Question' section where LTx recipients can ask transplant-related questions.

We examined the 'Question' section from each hospital website and read every post. We then selected posts that were: 1) written by LTx recipients or caregivers and 2) related to LTx. For example, the post "I am a six-month LTx recipient. What should I do if I have a fever over 100.4°F?" was selected. A total of 115 posts met eligibility criteria and were further examined. The posts were categorized into fifty different questions. As the most frequently posted question was asked six times, we decided to include questions in the questionnaire that were posted at least three times. Therefore, seventeen questions from the self-help group websites were included in the questionnaire.

Next, we reviewed Yoo & Kim's (2005)[21] questionnaire and the book 'Liver Transplantation and New Life' published by The Korean Liver Transplantation Society (2005). These sources were used to verify the content included in the questionnaire from a health providers' perspective. Of the 17 questions selected from the self-help group websites, nine questions were similar to the information found in 'Liver Transplantation and New life'.[11] Based on this review, we included nine additional items considered to be critical information for self-management of LTx recipients. For example, we included two items about immunosuppressants, which all LTx recipients take.

Finally a panel of four clinical experts who worked with LTx recipients reviewed the questionnaire for content validity using Lynn's (1986) procedure.[22] The panel consisted of three nurses and one surgeon. As part of the process, the experts were asked to rate each item on a 4-point Likert scale from 1 (not relevant) to 4 (very relevant). The panel assessed whether the items were relevant, clear, and that there was no missing content. Content Validity Indices (CVI) were calculated based on the Lynn (1986).[22] The CVI is the proportion of items of a questionnaire that received a relevancy rating of 3 or 4.[22] The CVI

of the questionnaire was 1, which means every item was evaluated as relevant to informational needs of LTx recipients.[22]

The final version of the INQ-liver contained 26 items divided into six subscales: “disease-related” (two items), “medication” (four items), “wound management” (two items), “diet” (two items), “physical and emotional management” (seven items), and “daily and social activities” (nine items). For five of the subscales including disease-related, medication, diet, physical and emotional, and daily and social activities, participants rated their level of informational needs on a 4-point Likert scale: 1 for “not at all”, 2 for “not much”, 3 for “necessary”, and 4 for “very necessary”. For the wound management subscale, participants rated their level of informational needs on a 5-point Likert scale from 0 (no relevance) to 4 (very necessary). The 0 rating was added since it was assumed that LTx recipients who were at least one year post-transplant may not have any current problem with wound management. Higher scores indicated higher informational needs. Internal consistency reliability was assessed by Cronbach alpha of the overall questionnaire items and each subscale items.[23] The Cronbach alpha of the overall questionnaire from this sample was 0.95. The Cronbach alpha of each subscale ranged from 0.77 to 0.93 indicating high internal consistency among items in the questionnaire.[23]

Procedure

After approval from the institutional review board, all eligible LTx recipients were invited to participate. Those who gave written informed consent completed both the socio-demographic/clinical questionnaire and INQ-liver. The first author was available if participants had troubles completing the questionnaires.

Analysis

Data were analyzed using the Statistical Package for Social Sciences® version 18.0, SPSS Inc, Chicago, IL, USA. Descriptive statistics including frequency and mean were calculated to report demographics and informational needs of participants. Independent sample t-tests and one-way Analysis of Variance (ANOVA) tests were used to examine potential differences between informational needs by socio-demographic and clinical variables. Duncan post hoc tests were performed with one way ANOVAs to determine which group means were different.[24]

To examine informational needs at various post-operative time points, we categorized participants as 0–1, 2–4, 5–9, and 10–24 months post-transplant. We chose these time points because the informational needs of participants showed distinct differences at 2, 5, and 10 months. To determine if there were differences in informational needs by time points, we performed one-way ANOVA tests with Duncan post hoc analysis.

Results

Participants

One hundred and eighty-eight LTx recipients met eligibility criteria and were asked to participate. One hundred and fifty-nine recipients (85%) agreed to participate in the study.

Twenty-nine recipients (15%) declined to participate in the study due to a lack of time. Socio-demographic and clinical information of participants are described in Table 1.

The majority of participants had no rejection episodes (89.9%), re-hospitalization episodes (83.0%), or no post-transplant complications (66%). Among those who had complications, the most common was diabetes (49.2%). The age and gender of participants were consistent with the characteristics of the LTx recipient population of South Korea from 2008 to 2012.[25]

Overall Informational Needs

Table 2 describes the overall informational needs for each subscale. The two subscales with the highest mean score were disease-related (M = 3.1, SD = 0.7). In contrast, the wound management subscale had the lowest mean score (M = 1.9, SD = 1.4).

Informational needs by socio-demographic and clinical variables

Next, we explored whether informational needs differed by socio-demographic and clinical variables. Of the socio-demographic variables examined, marital status, education, and monthly income were significantly different (see Table 1). Participants who were married or single had significantly higher informational needs about daily and social activities than those who were divorced or widowed ($F = 3.150$; $p = 0.046$). A similar finding was reported for participants with higher monthly incomes. Participants with monthly incomes over $2,000 had higher disease-related informational needs than participants with monthly incomes below $2,000 ($t = -2.350$; $p = 0.020$). Finally, participants with higher levels of education had significantly higher informational needs regarding their medications ($F = 3.607$; $p = 0.015$) and physical and emotional management ($F = 3.016$; $p = 0.028$), than participants with lower levels of education. There were no significant differences by clinical variables.

Informational needs at different post-transplant time points

Informational needs were compared for LTx recipients at post-transplant time points of 0–1, 2–4, 5–9, and 10–24 months for each subscale on the INQ-liver (see Table 3). ANOVA revealed significant differences across time points on the medication ($F = 2.90$; $p = 0.037$), wound management ($F = 11.12$; $p < 0.001$), diet ($F = 3.44$; $p = 0.018$), and daily and social activities ($F = 4.20$; $p = 0.007$) subscales. Using the Duncan test, post hoc analyses were performed to determine the sources of group differences. Participants who were 2–4 months post-transplant had significantly higher informational needs on the wound management subscale than participants who were 10–24 months post-transplant. Participants who were 2–4 months post-transplant also had significantly higher informational needs on the daily and social activities subscale than participants in the other post-transplant time points. Participants who were 5–9 months post-transplant had significantly higher informational needs on the medication and diet subscales than participants in the other post-transplant time points.

Finally, each item of the INQ-liver was examined to determine if there were differences in information needs for participants who were 0–1, 2–4, 5–9, and 10–24 months post-transplant. ANOVA revealed that eight items had significant differences across time points.

Using the Duncan test, post hoc analyses were then performed. Participants who were 0–1 months post-transplant had significantly higher informational needs on the item, “how to manage tingling sensations in hands and feet induced by immunosuppressant” ($F = 4.59$; $p = 0.004$) than participants in the other post-transplant time points. Compared to other post-transplant time points, participants who were 2–4 months post-transplant had significantly higher informational needs on the items regarding blood sugar management ($F = 2.69$; $p = 0.048$), proper time to return to work ($F = 7.30$; $p<0.001$), proper time to participate in social activities ($F = 6.23$; $p<0.001$), and the advisability of receiving treatments from other clinics such as a dental clinic ($F = 5.02$; $p = 0.002$). Participants who were 5–9 months post-transplant reported significantly higher informational needs on the item “what kinds of food are helpful or not recommended after LTx” compared to participants in the other post-transplant time points ($F = 3.91$; $p = 0.010$). Participants who were 0–1, 2–4, and 5–9 months post-transplant had significantly higher informational needs on the items about post surgical wound management ($F = 9.72$; $p<0.001$) and wound pain care than participants who were 10–24 months post-transplant ($F = 10.79$; $p<0.001$).

Discussion

To maintain liver function, LTx recipients need to be able to self-manage various activities related to post-transplant care. To that end, LTx recipients must receive relevant information given at appropriate time points. Consistent with previous research,[21] LTx recipients in our study reported the highest need for disease-related information. Our study is the first to examine differences in the informational needs of LTx recipients at different post-operative time points. Expanding on the Jones (2005)[20] study, we found LTx recipients have different informational needs at various time points post-transplantation.

The highest need for information reported by participants in our study was related to disease, including which symptoms to monitor and when to report symptoms to healthcare providers. These findings are consistent with previous studies, which found that LTx recipients had high informational needs related to post-transplant complications and the treatment process.[21] Similar findings were also reported for kidney transplant recipients who had high informational needs about post-transplant complications such as rejection and infection.[26]

Our study demonstrated that marital status, education, and monthly income influenced informational needs. LTx recipients, who were married or single, reported greater informational needs. The findings were not supported by previous studies with LTx recipients.[21,27] Although the contexts between LTx and other transplant recipient populations are different, informational needs studies with other transplant populations partially support our findings. For example, married LTx recipients in our study had higher needs in daily and social activities. Ahn (2000)’s study of kidney transplant recipients documented that married recipients had lower informational needs related to diet compared to divorced or widowed recipients.[28] Both studies showed marital status can differ informational needs. Married people have influence over their partners’ health behaviors,[29] therefore they may impact partners’ informational needs. Findings from the current study may indicate that married LTx recipients want to participate in social activities with their partners.

LTx recipients with higher education or income had greater informational needs. Chronic disease patients with low socioeconomic status are less likely to engage in positive health behaviors because of low health literacy and limited health resource accessibility.[30–32] Health disparities may lead to informational needs differences,[33] which could explain the low informational needs of LTx recipients with low monthly income or education in this study. This finding indicates patients' health literacy need to be considered when developing educational material. Clinicians should consider resources available to LTx recipients (e.g. transportation, family support) when discussing self-management strategies.

In contrast to previous studies, we did not find differences in informational needs by re-hospitalization episode.[27] These inconsistencies may be due to the use of different informational needs questionnaires and the varying subject inclusion/exclusion criteria of each study. For example, unlike this study that only included patients who were ≤ two years post-transplant, Yoo & Kim's (2005)[21] study included LTx recipients who were at any time post-transplant. Further studies are needed to confirm which variables influence informational needs, using consistent instruments and consistent follow-up time periods.

This study found that LTx recipients' informational needs varied at different post-transplant time points. While our findings are cross-sectional, they are consistent with the work of Case (2007) who reported that informational needs changed across the disease trajectory.[34] For example, while a newly diagnosed cancer patient wants to know about the treatment process, a cancer patient who has completed treatment may need information regarding social and financial issues.[35] The contexts of LTx recipients are not the same across time and their concerns change over time.[20] It is not surprising that informational needs may not be the same across time.

In this study, participants who were less than 10 months post-transplant had high informational needs about diet and wound management. In terms of diet, LTx recipients in South Korea are instructed to eat a low bacterial diet including restricting raw vegetables for several months to prevent food borne infections. LTx recipients may not be confident in preparing a low bacterial diet, and may need more information. The finding that patients still needed information about wound management at seven to nine months was surprising. We had anticipated that LTx recipients would need wound management information and pain in the first six months post-transplant. This is an important finding for clinicians, as they may need to provide patients with information about wound management for a longer period post-transplant than previously anticipated.

While informational needs decreased in many areas for LTx recipients who were over 10 months post-transplant, the need for information regarding the treatment process and physical and emotional symptoms stayed high across all time periods. These findings imply that while LTx recipients at 10 months have adjusted to lifestyle changes such as low bacterial diet and complicated medication schedules, they might not be adjusted to symptoms like tingling in feet and hands or bodily pain. This finding is consistent with previous findings. Previous studies found that, although LTx recipients have difficulties in conducting self-management behaviors,[36,37] they adjust to changed lives by finding their own ways to self-manage.[37] However, other studies reported that LTx recipients experience

many physical and emotional symptoms after transplantation,[20,38,39] and are not confident in managing symptoms.[38] LTx recipients seem to need more time to adjust to physical and emotional symptoms than adjust to lifestyle changes such as following dietary or medication regimens.

This study suggests several practical implications. The findings indicate that LTx recipients may have difficulty in conducting proper self-management if they do not receive time-appropriate information. Healthcare providers should acknowledge that LTx recipients have different informational needs at different post-transplant time points and they need this information for a longer period than currently provided. Healthcare providers should develop time-specific education programs based on LTx recipients' informational needs, rather than presenting a single educational session.

There are implications for future research. Longitudinal studies are needed to further explore the changing patterns of informational needs across time and confirm the adjustment time point to changed lifestyle. Future research is needed to test the reliability and validity of the INQ-liver. Finally, researchers should develop time specific educational interventions to address the evolving needs of LTx recipients. Further, it is needed to examine which method is the most effective in delivering time specific information.

There are several limitations to the present study. This study used a cross-sectional design so we were unable to assess causality related to participants' informational needs across time. Second, this study used convenience sampling from a single center, potentially limiting the generalizability of the findings. However, the demographics of participants in this study were similar to the demographics of all LTx recipients in South Korea in terms of gender and age. Third, this study was conducted with a new survey developed with the help of LTx recipients in South Korea. Further testing should be done so that the survey can be validated with LTx recipients across other cultures.

In summary, the significance of this study was its evaluation of the informational needs of LTx recipients at different time points using the newly developed INQ-liver, a questionnaire developed to include LTx recipients' perspectives. LTx recipients needed information about the treatment process and about which symptoms to monitor after LTx. While informational needs for diet, medication, wound management, and daily and social activities were low among LTx recipients after 10 months, informational needs for disease and physical and emotional symptom management remained high across all time points. The findings emphasize the need for clinicians to understand not only what information their patients need in order to effectively self-manage but also that some of their informational needs may change over time.

Acknowledgments

We would like to thank the liver transplant recipients who participated in this study as well as the expert healthcare providers (transplant doctors and nurses) who helped us with the questionnaire development. The project described was supported by the Clinical and Translational Science Award (CTSA) program, through the NIH National Center for Advancing Translational Sciences (NCATS), grant UL1TR000427. The content presented in this article is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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Table 1

Informational Needs according to socio-demographic and clinical variables (N=159).

Variables (n)	Disease-Related			Medication			Wound management			Diet			Physical & emotional management			Daily & Social Activities		
	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p
Sex																		
Male(123)	3.1(0.7)	−.356	.722	2.7(0.9)	−.233	.816	1.9(1.3)	1.381	.169	2.8(0.7)	−.932	.353	2.8(0.7)	−.057	.954	2.5(0.6)	1.017	.310
Female(36)	3.2(0.8)			2.7(0.9)			1.6(1.5)			3.0(0.7)			2.8(0.7)			2.4(0.7)		
Age (year)																		
18–49(36)	3.3(0.7)	1.589	.207	2.5(1.0)	.772	.464	1.7(1.3)	2.981	.054	2.9(0.7)	.057	.945	2.7(0.8)	.681	.508	2.4(0.8)	1.178	.311
50–59(72)	3.1(0.8)			2.7(0.9)			2.1(1.3)			2.9(0.8)			2.9(0.7)			2.6(0.6)		
≥ 60(51)	3.0(0.7)			2.7(0.8)			1.5(1.5)			2.8(0.7)			2.8(0.6)			2.4(0.5)		
Marital status																		
Married(144)	3.1(0.7)	1.018	.364	2.7(0.9)	2.835	.062	1.9(1.4)	1.124	.328	2.9(0.7)	.034	.966	2.9(0.7)	1.499	.227	2.5(0.6)^{b}	3.150	.046
Single(8)	3.1(0.7)			2.9(1.0)			1.9(1.4)			2.9(0.7)			2.9(0.9)			2.5(0.8)^{b}		
Divorced/Widowed(7)	2.7(1.1)			1.9(0.8)			1.1(1.2)			2.9(1.1)			2.4(0.9)			1.9(0.7)^{a}		
Education																		
Graduate&Above(13)	3.1(0.8)	.116	.950	3.1(0.9)^{b}	3.607	.015	2.1(1.5)	1.120	.343	3.0(0.7)	2.098	.103	3.1(0.7)^{b}	3.106	.028	2.9(0.7)	2.643	.051
College(46)	3.1(0.8)			2.4(1.0)^{a}			1.6(1.5)			2.7(0.8)			2.7(0.8)^{a,b}			2.4(0.7)		
High/Middle(87)	3.1(0.7)			2.8(0.8)^{a,b}			2.0(1.3)			3.0(0.7)			2.9(0.7)^{b}			2.5(0.6)		
Below elementary(13)	3.0(0.9)			2.3(0.7)^{a}			1.6(1.2)			2.5(0.9)			2.4(0.8)^{a}			2.2(0.7)		
Job																		
Yes(71)	3.2(0.7)	.729	.467	2.7(1.0)	−.027	.978	2.0(1.4)	1.082	.281	2.8(0.8)	−.397	.692	2.8(0.8)	−.711	.478	2.5(0.7)	.055	.956
No(88)	3.1(0.8)			2.7(0.8)			1.7(1.3)			2.9(0.7)			2.9(0.7)			2.5(0.6)		
Income ($)																		
< 2,000(59)	2.9(0.8)	−2.350	.020	2.6(0.8)	−1.175	.242	1.7(1.2)	−1.214	.226	2.7(0.8)	−1.762	.080	2.7(0.7)	−1.591	.114	2.3(0.6)	−2.451	.015
≥ 2,000(100)	3.2(0.7)			2.7(0.9)			1.9(1.5)			3.0(0.7)			2.9(0.7)			2.6(0.6)		
Length of hospital stay (weeks)																		
1(6)	3.3(0.7)	2.000	.116	3.1(0.6)	1.383	.250	1.9(1.6)	.795	.498	2.8(0.7)	.387	.762	3.2(0.9)	1.367	.255	2.6(0.7)	1.742	.161
2(84)	3.1(0.7)			2.6(0.9)			2.0(1.3)			2.9(0.7)			2.8(0.7)			2.4(0.6)		

Variables (n)	Disease-Related			Medication			Wound management			Diet			Physical & emotional management			Daily & Social Activities		
	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p	M(SD)	t or F	p
3(36)	2.9(0.9)			2.5(1.0)			1.7(1.4)			2.8(0.8)			2.7(0.9)			2.3(0.7)		
≥ 4(33)	3.3(0.7)			2.9(0.8)			1.6(1.4)			3.0(0.8)			3.0(0.6)			2.6(0.6)		
Complication																		
Yes(54)	3.1(0.8)	.085	.932	2.5(1.0)	−1.410	.161	1.8(1.4)	−.121	.904	2.9(0.8)	.896	.372	2.9(0.8)	1.309	.193	2.5(0.8)	.963	.337
No(105)	3.1(0.8)			2.7(0.8)			1.8(1.4)			2.8(0.7)			2.8(0.7)			2.4(0.6)		
Rejection																		
No(143)	3.1(0.7)	1.199	.304	2.6(0.9)	.891	.412	1.8(1.4)	.001	.999	2.9(0.7)	.846	.431	2.8(0.7)	.947	.390	2.4(0.6)	3.015	.052
1(10)	3.3(0.9)			3.0(1.1)			1.9(1.7)			2.8(1.0)			2.9(0.9)			2.5(0.8)		
2(0)	0			0			0			0			0			0		
≥ 3(6)	3.5(0.8)			2.7(1.1)			1.8(1.6)			3.3(0.8)			3.2(0.8)			3.1(0.8)		
Re-hospitalization																		
Yes(27)	3.1(0.8)	.294	.769	2.6(0.9)	.256	.798	1.5(1.5)	1.307	.193	2.9(0.8)	−.564	.574	2.7(0.8)	.741	.460	2.5(0.6)	−.060	.952
No(132)	3.1(0.7)			2.7(0.9)			1.9(1.3)			2.9(0.7)			2.9(0.7)			2.5(0.6)		

*a,b*Duncan test(a<a,b<b).

Table 2

Overall Informational needs (N=159).

	Number of items	Score Range	Mean(SD)	Mean Score(SD)
Informational needs	26	24–104	68.3(16.3)	2.6(0.6)
Disease-related	2	2–8	6.2(1.5)	3.1(0.7)
Medication	4	1–16	10.6(3.6)	2.7(0.9)
Wound Management	2	0–8	3.7(2.8)	1.9(1.4)
Diet	2	2–8	5.7(1.5)	2.9(0.7)
Physical & Emotional Management	7	7–28	19.9(5.0)	2.8(0.7)
Daily & Social Activities	9	9–36	22.2(5.7)	2.5(0.6)

Table 3

Informational needs of each subscale at different time points (N=159).

Time (Months)	Disease-Related			Medication			Wound management			Diet			Physical & emotional management			Daily & Social Activities		
	M(SD)	F	p	M(SD)	F	p	M(SD)	F	p	M(SD)	F	p	M(SD)	F	p	M(SD)	F	p
0–1	3.0(0.7)	1.632	.184	2.7(0.9)^{a,b}	2.971	.034	2.3(0.8)^{b}	11.122	.000	3.0(0.8)^{a,b}	3.439	.018	3.0(0.7)	2.766	.044	2.4(0.5)^{a}	4.236	.007
2–4	3.0(0.7)			2.7(0.9)^{a,b}			2.5(1.2)^{b}			2.9(0.6)^{a,b}			3.0(0.8)			2.8(0.5)^{b}		
5–9	3.3(0.6)			3.0(0.8)^{b}			2.3(1.2)^{b}			3.1(0.6)^{b}			3.0(0.6)			2.6(0.6)^{a,b}		
10–24	3.0(0.8)			2.5(0.9)^{a}			1.2(1.4)^{a}			2.7(0.7)^{a}			2.7(0.8)			2.3(0.7)^{a}		

^{a,b}Duncan test(a<a,b<b).