



Published in final edited form as:

Biol Blood Marrow Transplant. 2017 January ; 23(1): 165–171. doi:10.1016/j.bbmt.2016.10.008.

HRQoL among Older Related HSC Donors (>60 yrs.) is Equivalent to that of Younger Related Donors (18–60 yrs.): An RDSafe Study

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Conflict of Interest Disclosures: There are no conflicts to disclose.

“The contents do not reflect the views of the Department of Veterans Affairs or the United States Government.”

Authorship Contributions

All authors participated in the design of the research, selection of the analytic strategy, and manuscript preparation. JB collected and managed data at the University of Pittsburgh, assisted with data analysis and contributed to the conceptual organization of the manuscript. DMK, HK, RD, RMB, DLC, MMH, RJK and BES facilitated and managed sampling and participant recruitment and data management at the NMDP. MAP recruited and monitored participating transplant centers. All authors interpreted data and reviewed and approved the final manuscript.

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Abstract

The increasing number of older adults with blood-related disorders and the introduction of reduced intensity conditioning regimens has led to increases in hematopoietic stem cell (HSC) transplantation among older adults and a corresponding increase in the age of siblings who donate HSCs to these patients. Data regarding the donation-related experiences of older donors is lacking. The Related Donor Safety Study (RDSafe) aimed to examine/compare health-related quality of life (HRQoL) of older versus younger HSC donors. 60 peripheral blood stem cell (PBSC) donors ages 18–60 and 104 PBSC donors age >60 completed validated questionnaires at pre-donation, 4 weeks and 1 year post-donation. Prior to donation, older donors had poorer general physical health ($t=-3.27$; $p=.001$) but better mental health ($t=2.11$; $p<.05$). There were no age differences in multiple other donation-related factors. At 4 weeks post-donation, there were no group differences in general physical/mental health, but older donors were less likely to report donation-related pain ($t=-2.26$; $p<.05$) and concerns ($t=-3.38$; $p=.001$). At both 4 weeks and 1 year post-donation, there were no significant differences in the percentage of each age group feeling physically back to normal or in the number of days it took donors to feel completely well. There was no evidence that increasing age within the older donor group was associated with poorer donation-related HRQoL. Taken together, these data support the current practice of HSC donation by sibling donors above age 60, providing no evidence of worsening HRQoL up to one year after donation in individuals up to age 76.

Keywords

HSC donation; related donation; HSC donor HRQoL

INTRODUCTION

Hematopoietic stem cell (HSC) transplantation is increasingly used to treat leukemia and other blood-related diseases for which other forms of therapy are ineffective or would be less effective. Several factors, including the increasing number of older adults as a proportion of the population, the introduction of reduced intensity conditioning regimens and improved supportive care have made HSC transplantation an increasingly utilized therapy for older adults.^{1–3} In the decade from 2000–2011, the number of HSC transplants for patients >60 years of age quadrupled and continues to increase.¹ The increasing age of transplant patients has led to a parallel increase in the average age of sibling HSC donors enlisted to help these patients.¹ This has raised questions about whether grafts from older donors are equally effective for patients as those from younger donors and whether the donation process is safe for this group of donors.

In terms of the effectiveness of HSCs from older donors, there is mounting evidence that older donors can produce high quality grafts, and several studies have found that advanced donor age does not produce poorer outcomes for patients.⁴⁻⁷ Rezvani found (a) no difference between donors <60 and those ≥60 in terms of HSC engraftment, the pace of neutrophil and platelet recovery and donor chimerism, and (b) no increased risk of donor-derived clonal disorders from stem cells of older donors.³

Studies focused on the safety and donation-related experiences of older sibling donors are less common.¹ Some evidence that older donor age may be associated with an increased number of adverse events has led most international registries to set upper age limits for unrelated donors of 60 years or younger.^{8,9} Many of these registries have also recently revised the upper age limit for joining a registry downward to 40—although this is primarily due to better patient outcomes when younger donors are used rather than donor safety concerns.¹⁰⁻¹² No such guidelines exist for related donors, and an aging population, the increasing use of haploidentical transplantation, and improvements in transplant-related regimens make it likely that the use of older sibling donors will continue to increase. Despite this, there are no existing large systematic investigations of health-related quality of life (HRQoL) in the context of older related HSC donation.

The goal of the current investigation was to examine and compare the donation-related experiences and health-related quality of life (HRQoL) of older versus younger sibling HSC donors. This investigation was part of a larger study (NHLBI-funded Related Donor Safety Study, RDSafe) focused on the medical safety and HRQoL of related HSC donation. The specific aims of the sub-study focused on HRQoL of older donors were to (a) longitudinally examine HRQoL among HSC donors >60 years of age from pre-donation through one year post-donation, (b) compare HRQoL of older donors with those of their younger counterparts aged 18–60, and (c) to examine whether increasing age within the group of donors >60 was associated with poorer donation-related HRQoL.

MATERIALS AND METHODS

Human subjects research protection

This investigation was approved by the Institutional Review Boards at the University of Pittsburgh, the National Marrow Donor Program (NMDP), and individual transplant centers when required. All participants signed informed consent before completing the study interviews.

Participants and study design

This prospective, longitudinal investigation included adult related HSC donors ages 18–76, enrolled in the parent RDSafe investigation who donated PBSC at one of 41, geographically diverse, US transplant centers between 03/2010 and 04/2013 (see supplement table for a list of contributing centers). The number of donors contributed by center ranged from 1–20 with a median of 3 donors per center.

To be eligible, potential participants were required to meet the requirements for donation at each transplant center and consent to participate in both the parent RDSafe study and the

donor HRQoL sub-study. Potential participants were excluded from the study if they did not read, write, and speak English, were unable to complete a telephone interview due to cognitive or linguistic difficulties, or if they did not have access to a telephone.

Individual transplant centers consented participants for the study and passed contact information of enrolled donors to University of Pittsburgh staff. Interviewers from the University of Pittsburgh contacted participants by telephone to complete data collection. Within four weeks prior to initiation of G-CSF administration for PBSC donors, participants completed a baseline interview. All donors were interviewed again 4 weeks and 1 year after donation. The interviews required approximately 20 minutes to complete and participants received a \$25 honorarium after completing each interview. A Computer Assisted Telephone Interview (CATI) system was used to collect and enter interview data. Data were stored on a secure server in an encrypted data file.

Study measures

Three categories of participant characteristics were assessed: (1) socio-demographic, (2) general physical and psychological status, and (3) donation-related. Measures were previously validated scales/items with established measurement properties either created for, or used in, other donation-related settings. Recipient status at 1 year following donation was collected directly from transplant center records.

Socio-demographic characteristics: sex, age, race/ethnicity, education level, employment status, income, marital status, whether the donor had children, and whether he/she had ever donated blood or apheresis. For the analysis examining HRQoL by age groupings within the older donor group, age was trichotomized 61–64, 65–69, and 70.

General physical and psychological status—*Overall/generic physical and psychological status* were assessed with the physical and mental health summary scales of the SF12v2.¹³ Scores range from 0–100 with higher scores indicating better physical/mental health. Anxiety and depression were assessed with the anxiety and depression subscales of the Brief Symptom Inventory (BSI). Each subscale consisted of 6 items which were averaged to create a score ranging from 0–4. Higher scores indicate greater emotional distress.^{14,15}

Donation-related—At all three interview time points: *Ambivalence* about the decision of whether or not to donate was assessed with the 7-item Ambivalence scale.^{16–19} Items were averaged—a higher score indicates greater uncertainty/reluctance about donation. *Satisfaction with the donation decision* was assessed with two items asking about overall satisfaction and happiness with the decision (1=not at all; 4=extremely).²⁰ *Perceived risk of donation* was assessed with three items asking about the likelihood of a serious donation-related complication (1=not at all likely; 4=very likely), likelihood that a donor could feel sad or let down following donation (1=not at all likely; 4=very likely), and the likelihood that a donor could feel responsible if the recipient did not survive (1=strongly disagree; 4=strongly agree).²⁰ **At pre-donation and 4-weeks post-donation:** *Concerns about donation* were assessed with 11 concerns summed across three categories –medical, work/family, and other (yes/no).^{19–21} *Interactions with others* was assessed with four items asking

whether donors consulted family/friends or professionals about donation and whether they had been encouraged/discouraged from donating (yes/no).^{19,20} **At 4-weeks and 1 year post-donation:** *Physical effects of donation* were assessed with 5 items asking about the physical experience of donation including donation-related pain (1= a lot less painful than expected; 5=much more painful than expected), whether the donor had a fever (yes/no), whether the donor currently felt back to normal following donation (yes/no), the number of days following donation until they felt completely well, and their use of prescription and nonprescription medications (yes/no).¹⁹ *Current symptoms* assessed as present/absent in the previous 48 hours included tiredness, problems sleeping, muscle aches, bone pain, difficulty walking, light headedness, bleeding, pain where the needles were inserted, chills, fainting, nausea, and infection.²¹ *Psychological effects of donation* were assessed with 3 items including stressfulness of donation (1=not at all stressful; 4=very stressful), concern about their own current health as a result of donation (1=not at all worried; 4=very worried), or the longer-term effects of donation (1=definitely will not have impact; 4=definitely will have impact).^{19,21} **At 1 year post-donation:** *Recipient status* for each related donor (alive/deceased) was assessed at 1 year post-donation.

Statistical analysis

Data were cleaned and exported from the CATI system to IBM SPSS Statistics for Windows, Version 22.0 (IBM Corporation, Armonk, NY, USA) for analysis. Cross-sectional differences in donor HRQoL by age group at each key time point were examined using odds-ratios for categorical variables and t-tests for continuous variables. To examine longitudinal differences in physical and mental health (SF12v2 physical and mental health summary scores) by age group, we used linear mixed models analyses. Main effects for age group and time and the age group by time interactions were examined. Oneway Analysis of Variance (ANOVA) was used to examine differences across the 3 age groups of older donors (61–64, 65–69, and 70). Generalized linear models were used to examine differences in key HRQoL variables by age and recipient status.

RESULTS

Participants

Donors were randomly selected for the HRQoL study from the eligible pool of potential participants in the larger RDSafe study with the goal of reaching target samples of ~100 in each of the older and younger related donor age groups. The final sample included 119 donors ages 18–60 and 104 donors ages >60. Because all the older donors donated PBSC, only the younger donors who donated PBSC (N=60) were used as a comparator. Completion rates by cross-sectional time point for younger and older donors respectively were; pre-donation, 91%/92%, 4-weeks post-donation, 90%/92% and 1-year post-donation, 84%/88%. A total panel of 142 (87%) completed all three interviews. Results from the panel with complete data were identical to those for the full sample— results presented here are based on all data from all time points.

Pre-donation—As would be expected, older donors were less likely to be employed (OR=0.14; p<.001) and more likely be white (OR=3.21; p<.01), married (OR=2.06; p<.05),

and to have children (OR=5.26; $p<.001$; Table 1). Prior to donation, older donors had poorer general physical health ($t=-3.27$; $p=.001$) but better general mental health ($t=2.11$; $p<.05$). There were no age differences in anxiety, depression, ambivalence about donation, satisfaction with the donation decision, medical concerns about donation or perceived risks of donation. Older donors were more likely to consult their personal physician about donation (OR=1.96; $p<.05$) but had fewer work/family concerns ($t=-1.99$; $p<.05$).

Four weeks post-donation—At 4 weeks post-donation, there were no age group differences in general physical or mental health, ambivalence/satisfaction with the donation decision, 12 donation-related symptoms, or in psychological effects of donation (Table 2). Older donors were less likely to report donation-related pain ($t=-2.26$; $p<.05$), and other concerns about the donation process ($t=-2.14$; $p<.05$)—particularly less concern about who would pay for the procedure. They continued after donation to have fewer work/family concerns about the donation process ($t=-3.38$; $p=.001$). Older donors were also less likely to report the risk of feeling responsible if the recipient did not survive ($t=-2.31$; $p<.05$). There were no statistically significant age group differences in the percentage of each group reporting feeling physically back to normal (younger=91%; older=85%), or in the number of days it took donors to feel completely well following donation among those who reported full recovery ($p=.196$).

One year post-donation—At 1 year post-donation, there were no differences between older and younger donors in overall physical and mental health as assessed with the SF-12v2—although older donors reported significantly less anxiety than did younger donors ($t=-2.49$; $p<.05$; Table 3). Older donors continued to be less likely to report the risk of feeling responsible if the recipient did not survive ($t=-2.27$; $p<.05$). There was no difference in the percentage of donors reporting feeling completely back to normal, and no difference in number of days to recovery ($t=1.22$; $p=.23$; median recovery for both groups was 7 days). Fifteen and 16% respectively of the older and younger groups reported recovery periods of longer than 30 days and 3% and 8% respectively reported not being recovered by one-year post-donation. Older donors reported fewer current problems sleeping (OR=0.40; $p<.05$) but did not differ from younger donors on any other symptoms or in concern about longer-term donation effects. Recipient status (alive versus deceased) did not differ by donor age group.

Group comparisons of key variables for three groups of older donors—Within the older donor group (age >60), age was trichotomized 61–64 (N=49), 65–69 (N=39), and 70+ (N=16) and the three groups were compared on key general physical/mental health and days to full recovery assessed at 1 year post-donation. In terms of basic demographic characteristics, the three age groups did not differ significantly in gender representation (range = 51%–56% female), race/ethnicity (range 90%–94% White), education (range = 31%–51% Bachelor's degree), or marital status (range 76%–81% married). At pre-donation, the middle age group (65–69) had better general mental health ($F=4.03$; $df=2,101$, $p<.05$; Table 4) and less depression ($F=4.95$; $df=2,101$, $p<.01$) compared to the other two age groups. There were no significant age group differences in general physical/mental health at either of the post-donation assessment time points. Age groups did not differ

significantly in the number of days to full recovery ($F=1.03$; $df=2,89$, $p=.36$; age=61–64, median=7 days; age=65–69, median=7 days; age=70–76, median=10.5 days).

DISCUSSION

This is the first large systematic investigation of HRQoL among older, related HSC donors. The central goal of this investigation was to examine the HRQoL and donation-related experiences of sibling HSC donors >60 years of age and to compare them to those of their younger adult counterparts. Our overall conclusion is that there were few differences in donation-related experiences between older donors in this study and a younger donor comparison group.

At pre-donation there were a few, anticipated, demographic differences between older and younger donors—older donors were more likely to be white, married, and to have children. Also not surprisingly, older donors reported significantly poorer general physical health but better mental health than their younger counterparts. These findings reflect trends in the general population that suggest that while aging produces physical declines, it may also be associated with better mental health including lower distress/depression levels and greater happiness.^{22–24} The older and younger donor groups did not differ in their view of the donation process including satisfaction with the decision to donate, ambivalence about donation, and perceived risks of donating although older donors did have fewer donation-related concerns related to work and family.

At 4 weeks post-donation—the point at which we might have expected any differences in the physical experience of donation to be most likely to be reported—older and younger donors did not differ in overall physical/mental health, current symptom levels, the percent that felt back to normal following donation, or the number of days until they felt completely well following donation. Older donors did report less donation-related pain, fewer family/work concerns, and less perceived responsibility if the transplant was not successful for the patient.

A similar pattern was evident at one-year post-donation—there were few age-related differences in indicators of physical and mental health, although older donors did report significantly less anxiety than their younger counterparts. At one year, there was no difference in recovery periods following donation (median=7 for both groups).

Finally, there is no evidence from this investigation that advancing age within the older donor group is associated with poorer post-donation physical or mental health. The recovery time for the three older age groups did not differ significantly.

There are some characteristics of this investigation and the study population that are important to note. First, older donors in this study were selected by transplant centers based on their physical health and the likelihood that they would be able to withstand the rigors of the donation process. It is therefore likely that they are healthier than their similarly-aged counterparts in the general population. A comparison of SF12v2 physical health summary scores of older donors to published norms for similarly aged groups seems to support this conclusion. The pre-donation physical health summary mean for our cohort of donors aged

60–69 was 52.95 versus 44 for a similarly aged normative population cohort and 52.76 versus 40 for our donor cohort aged 70–79 and an age-matched population cohort.²⁵ The mental health summary scores for donors and age-matched norms were similar. Our findings are generalizable only to this selected population of relatively healthy older sibling HSC donors. Second, because we did not assess symptoms at pre-donation we are limited in our ability to chart changes in symptoms from pre- to post-donation. However, this was not a goal of this investigation. Finally, the number of donors in the oldest category ages 70–76 is small and will require additional investigation with larger numbers to verify that this group has similar donation-related HRQoL compared to their younger counterparts.

With these caveats in mind, our findings clearly indicate that older sibling donors do not experience the donation process as significantly more physically or psychologically impactful than their younger counterparts and that in some ways their experiences may be more positive—e.g., less donation-related pain and fewer concerns about donation. Taken together, these findings support the practice of PBSC donation by healthy siblings in their sixties, with less conclusive evidence supporting the procedure in sibling donors as old as mid-seventies. However, it is clear that further research is needed to examine factors that may predict longer recovery among the subset of older donors who had extended recovery periods, to increase and evaluate our samples of the oldest group of donors, and to continue to monitor the HRQoL of older sibling donors as they are increasingly asked to donate.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This project was supported by a grant from the National Heart, Lung, and Blood Institute (NHLBI R01 HL085707).

Funding source: Supported by a grant from the National Heart, Lung, and Blood Institute (NHLBI R01 HL085707).

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Highlights

- Donation-related HRQoL among older sibling HSC donors >60 is similar to that of their younger counterparts 18–60.
- Among older sibling HSC donors 61–76, there is no evidence that increasing age is associated with poorer donation-related HRQoL.
- These data support the current practice of HSC donation by sibling donors above age 60, and provide no evidence of worsening HRQoL up to one year after donation in this group.

Legend for Tables 1–3

- Broad categories of variables are grouped together under bolded headings.
- Main comparisons are between younger (18–60) and older (>60) donors.
- Both categorical and continuous variables are included in the tables.
- The far left column indicates whether the data for the variable in the row is presented as a percentage (%) or as a mean and standard deviation (mean, sd).
- Chi-square and odds-ratios were used to examine differences for categorical variables.
- T-tests were used to examine differences for continuous variables.
- Either chi-square or t-values are presented in the fourth column of each table.
- P-values presented correspond to chi-square values for categorical and t-values for continuous variables.
- Fisher’s exact test was used for comparisons with small cell sizes.

Pre-donation comparisons of related PBSC donors >60 and related PBSC donors 18–60

Table 1

Variable	Age 18–60 (n=59)	Age >60 (n=104)	chi-square or t	odds-ratio (95% CI)	p-value
Socio-demographic					
% Female	49	53	0.21	1.16 (0.61–2.20)	.647
Age (mean, sd) (18–60)* (older adults: 61–76)*	41.07 (12.33)	65.55 (3.87)	18.75		<.001
% White	77	91	6.80	3.21 (1.30–7.97)	.009
Education (% Bachelor's degree)	34	41	0.88	1.38 (0.71–2.67)	.348
% Employed	86	47	-24.55	0.14 (0.06–0.32)	<.001
Income					
% < 35K	16	21	0.66		.718
% 35K-75K	40	35			
% > 75K	44	44			
% Married/marriage-like relationship	64	79	4.04	2.06 (1.01–4.19)	.044
% Have Children	73	93	12.91	5.26 (1.96–14.29)	<.001
% Blood or apheresis donor	42	41	-0.02	0.96 (0.5–1.81)	.898
General physical/mental health					
SF-12v2 Physical summary	56.63 (4.98)	52.92 (7.84)	-3.27		.001
SF-12v2 Mental summary	53.93 (5.66)	55.80 (5.29)	-2.11		.036
Anxiety (mean, sd) (0–4)*	0.25 (0.42)	0.30 (0.36)	0.69		.491
Depression (mean, sd) (0–4)*	0.14 (0.32)	0.14 (0.25)	0.11		.911
Donation-related					

Variable	Age 18-60 (n=59)	Age >60 (n=104)	chi-square or t	odds-ratio (95% CI)	p-value
Ambivalence (mean, sd) (1-3.86)*	1.31 (0.38)	1.37 (0.42)	0.88		.382
Satisfaction with decision (mean, sd) (1-4)*	3.92 (0.26)	3.92 (0.27)	0.03		.974
Medical concerns sum (mean, sd) (0-5)*	1.46 (1.42)	1.32 (1.37)	-0.62		.537
% procedure painful	48	45	-0.12	0.89 (0.47-1.70)	.731
% anesthesia	22	16	-1.08	0.65 (0.29-1.47)	.299
% procedure might damage health	29	27	-0.05	0.92 (0.45-1.88)	.824
% use of needles	36	24	-2.48	0.57 (0.29-1.15)	.115
% other medical concerns	12	21	2.22	1.99 (0.80-5.00)	.136
Work/family concerns sum (mean, sd) (0-6)*	1.31 (1.29)	0.93 (1.06)	-1.99		.049
% missing time from work	27	11	-7.30	0.32 (0.14-0.75)	.007
% missing family activities	10	11	0.01	1.05 (0.37-2.99)	.935
% family will worry	54	46	-0.98	0.72 (0.38-1.37)	.321
% what others will think	12	6	-1.85	0.46 (0.15-1.44)	.173
% who will take care of family	15	12	-0.46	0.73 (0.29-1.84)	.496
% other work and family concerns	12	9	-0.44	0.70 (0.25-2.00)	.508
Other concerns sum (mean, sd) (0-3)*	0.51 (0.73)	0.36 (0.61)	-1.44		.153
% who would pay for procedure	25	14	-3.68	0.46 (0.20-1.03)	.055
% how to get to and from center	19	12	-1.57	0.57 (0.23-1.39)	.210
% other concerns	7	11	0.65	1.63 (0.49-5.36)	.576†
% Consulted friends/family	83	77	-0.86	0.68 (0.30-1.54)	.355

Variable	Age 18–60 (n=59)	Age >60 (n=104)	chi-square or t	odds-ratio (95% CI)	p-value
% Consulted professionals	32	48	3.89	1.96 (1.00–3.85)	.049
% Someone encouraged donation	48	39	-1.47	0.67 (0.35–1.28)	.225
% Someone discouraged donation	12	20	1.84	1.89 (0.75–4.76)	.176
Perceived risks					
serious complication (mean, sd) (1–4)*	1.49 (0.50)	1.64 (0.56)	1.70		.092
feeling sad/let down (mean, sd) (1–4)*	1.55 (0.65)	1.55 (0.57)	0.03		.978
feeling responsible (mean, sd) (1–4)*	2.75 (0.76)	2.51 (0.82)	-1.81		.072

* response range

† Fisher's exact test p-value

4 weeks post-donation comparisons of related PBSC donors >60 and related PBSC donors 18–60

Table 2

Variable	Age 18–60 (n=55)	Age >60 (n=97)	chi-square or t	odds-ratio (95% CI)	p-value
General physical/mental health					
SF-12v2 Physical summary	54.48 (7.28)	52.90 (8.43)	-1.16		.248
SF-12v2 Mental summary	54.17 (5.84)	54.72 (6.68)	0.51		.609
Anxiety (mean, sd) (0–4) *	0.18 (0.31)	0.12 (0.20)	-1.52		.131
Depression (mean, sd) (0–4) *	0.11 (0.24)	0.13 (0.29)	0.40		.688
Donation Related					
Ambivalence (mean, sd) (1–3.86) *	1.30 (0.34)	1.38 (0.41)	1.28		.202
Satisfaction with decision (mean, sd) (1–4) *	3.95 (0.21)	3.90 (0.33)	-0.98		.327
Medical concerns sum (mean, sd) (0–5) *	1.73 (1.53)	1.42 (1.32)	1.29		.200
% procedure painful	62	54	-0.96	0.71 (0.36–1.40)	.326
% anesthesia	26	19	-1.13	1.54 (0.69–3.45)	.288
% procedure might damage health	29	25	-0.34	0.80 (0.38–1.68)	.559
% use of needles	38	23	-4.16	0.48 (0.23–0.98)	.041
% other medical concerns	18	23	0.43	1.32 (0.57–3.04)	.513
Work/family concerns sum (mean, sd) (0–6) *	1.56 (1.32)	0.92 (1.02)	-3.38		.001
% missing time from work	41	14	-13.22	0.25 (0.11–0.54)	<.001
% missing family activities	13	9	-0.44	0.70 (0.25–2.00)	.506
% family will worry	64	44	-5.24	0.46 (0.23–0.90)	.022
% what others will think	13	3	-5.30	0.22 (0.05–0.88)	.036 [†]
% who will take care of family	26	13	-3.49	0.45 (0.20–1.05)	.062
% other work and family concerns	2	7	2.05	4.20 (0.50–5.07)	.259 [‡]
Other concerns sum (mean, sd) (0–3) *	0.65 (0.80)	0.39 (0.69)	-2.14		.034
% who would pay for procedure	38	14	-11.17	0.27 (0.13–0.60)	.001
% how to get to and from center	16	16	-0.02	0.94 (0.38–2.30)	.884
% other concerns	11	9	-0.11	0.84 (0.28–2.49)	.746

Variable	Age 18-60 (n=55)	Age >60 (n=97)	chi-square or t	odds-ratio (95% CI)	p-value
% Consulted friends/family	84	83	-0.03	0.92 (0.38-2.22)	.855
% Consulted professionals	26	37	2.16	1.72 (0.83-3.57)	.142
% Someone encouraged donation	51	50	-0.03	0.94 (1.81-0.49)	.866
% Someone discouraged donation	11	12	0.07	1.15 (0.41-3.23)	.789
Perceived risks					
serious complication (mean, sd) (1-4)*	1.47 (0.54)	1.57 (0.56)	-1.02		.309
feeling sad/let down (mean, sd) (1-4)*	1.74 (0.76)	1.67 (0.75)	-0.52		.602
feeling responsible (mean, sd) (1-4)*	2.84 (0.86)	2.46 (1.02)	-2.31		.022
Physical effects					
donation painful (mean, sd) (1-5)*	2.98 (1.16)	2.49 (1.34)	-2.26		.025
% feel back to normal	91	85	-0.96	0.59 (0.20-1.71)	.446 [†]
days until felt well (mean, median, sd) (0-30)*	4.98/4 (4.18)	6.30/4 (6.42)	1.30		.196
% fever	11	13	0.10	1.18 (0.42-3.33)	.754
% took medication	53	39	-2.62	0.58 (0.30-1.12)	.106
% took prescription medicine	45	37	-0.44	0.72 (0.27-1.92)	.509
Physical symptoms					
% tiredness	44	38	-0.44	0.80 (0.41-1.56)	.507
% problems sleeping	26	21	-0.47	0.76 (0.35-1.66)	.492
% muscle aches	24	25	0.02	1.06 (0.49-2.30)	.879
% lightheadedness	13	7	-1.28	0.53 (0.18-1.61)	.259
% bone pain	11	19	1.54	1.86 (0.69-5.01)	.214
% difficulty walking	6	13	2.35	2.68 (0.73-9.87)	.171
% chills	4	3	-0.03	0.85 (0.14-5.22)	1.00 [†]
% bleeding	4	2	-0.34	0.56 (0.08-4.08)	.621 [†]
% pain where needles inserted	2	5	1.03	2.94 (0.33-25.79)	.419 [†]
% infection	4	1	-1.27	0.27 (0.02-3.06)	.291 [†]
% fainting	2	1	-0.17	0.56 (0.03-9.17)	1.00 [†]

Variable	Age 18-60 (n=55)	Age >60 (n=97)	chi-square or t	odds-ratio (95% CI)	p-value
% nausea/vomiting	2	1	-0.17	0.56 (0.03-9.17)	1.00 [‡]
% other	9	11	0.19	1.28 (0.42-3.89)	.787 [‡]
Psychological effects					
donation stressful (mean, sd) (1-4) *	2.07 (0.86)	2.12 (0.86)	0.35		.725
concern about long-term effects (mean, sd) (1-4) *	1.40 (0.60)	1.40 (0.49)	0.04		.967
worried about own health (mean, sd) (1-4) *	1.11 (0.42)	1.13 (0.37)	0.38		.704

* response range

[‡] Fisher's exact test p-value

Table 3 1 year post-donation comparisons of related PBSC donors >60 and related PBSC donors 18–60

Variable	Age 18–60 (n=51)	Age >60 (n=92)	chi-square or t	odds-ratio (95% CI)	p-value
General physical/mental health					
SF-12v2 Physical summary	55.61 (6.29)	54.14 (7.78)	-1.15		.252
SF-12v2 Mental summary	52.58 (7.19)	54.82 (8.18)	1.63		.105
Anxiety (mean, sd) (0–4) *	0.25 (0.42)	0.12 (0.24)	-2.49		.014
Depression (mean, sd) (0–4) *	0.22 (0.35)	0.18 (0.39)	-0.58		.564
Donation Related					
Ambivalence (mean, sd) (1–3.86) *	1.28 (0.30)	1.34 (0.37)	0.95		.344
Satisfaction with decision (mean, sd) (1–4) *	3.76 (0.53)	3.86 (0.34)	1.27		.207
Perceived risks					
serious complication (mean, sd) (1–4) *	1.49 (0.50)	1.52 (0.53)	0.30		.768
feeling sad or let down (mean, sd) (1–4) *	1.96 (0.96)	1.73 (0.80)	-1.56		.121
feeling responsible (mean, sd) (1–4) *	3.08 (0.82)	2.73 (0.92)	-2.27		.025
Physical effects					
donation painful (mean, sd) (1–5) *	2.64 (1.27)	2.47 (1.32)	-0.75		.453
% feel back to normal	92	97	3.38	2.50 (0.54–11.11)	.21 †
days until felt well (mean/median, sd) (0–365) *	36.33/7 (97.88)	31.70/7 (75.48)	0.32		.753
% fever	22	11	-2.90	0.45 (0.18–1.15)	.088
% took medication	16	10	-1.19	0.57 (0.21–1.59)	.276
% took prescription medication	75	56	-0.70	0.42 (0.05–3.31)	.620 †
Physical symptoms					
% tiredness	43	33	-1.57	0.64 (0.32–1.29)	.210
% problems sleeping	29	14	-4.87	0.40 (0.17–.92)	.027
% muscle aches	18	23	0.53	1.38 (0.58–3.29)	.466
% bone pain	18	8	-3.33	0.38 (0.13–1.10)	.068
% difficulty walking	6	9	0.37	1.52 (0.39–6.02)	.746 †

Variable	Age 18-60 (n=51)	Age >60 (n=92)	chi-square or t	odds-ratio (95% CI)	p-value
% lightheadedness	4	5	0.16	1.41 (0.26-7.53)	1.00 [‡]
% bleeding	4	1	-1.28	0.27 (0.02-3.04)	.289 [‡]
% pain where needles inserted	4	3	-0.04	0.83 (0.13-5.11)	1.00 [‡]
% chills	2	4	0.57	2.30 (0.25-21.14)	.654 [‡]
% fainting	2	0	-1.82	--	.357 [‡]
% nausea/vomiting	0	2	1.12	--	.538
% infection	0	0	--	--	--
% other	10	5	-0.96	0.53 (0.15-1.92)	.329 [‡]
Psychological effects					
donation stressful (mean, sd) (1-4) *	2.12 (0.93)	1.91 (0.77)	-1.42		.159
concern about long-term effects (mean, sd) (1-4) *	1.39 (0.53)	1.46 (0.58)	-0.70		.484
worried about own health (mean, sd) (1-4) *	1.12 (0.33)	1.08 (0.31)	-0.76		.447
Recipient status (% deceased)	41	45	0.26	1.19 (0.60-2.36)	.612

* response range

[‡]Fisher's exact test p-value

HRQoL comparisons of three age groups of older adult HSC donors.

Table 4

HRQoL Variable	Age 61–64 (n=49)	Age 65–69 (n=39)	Age 70–76 (n=16)	F	p-value
Pre-donation (mean, sd)					
SF12v2 Physical Summary	53.52 (8.48)	52.24 (8.25)	52.76 (4.08)	0.03	.747
SF12v2 Mental Summary	54.95 (5.88)	57.60 (3.52)	54.01 (6.02)	4.03	.021
4 Weeks Post-donation (mean, sd)					
SF12v2 Physical Summary	52.61 (9.56)	53.66 (7.50)	52.07 (6.94)	0.24	.788
SF12v2 Mental Summary	55.14 (6.30)	54.83 (5.93)	53.16 (9.32)	0.50	.607
1 Year Post-donation (mean, sd)					
SF12v2 Physical Summary	54.57 (8.15)	54.66 (5.80)	51.55 (10.36)	0.92	.404
SF12v2 Mental Summary	54.50 (7.95)	55.80 (7.32)	53.55 (10.87)	0.43	.650