ANTHONY NOLAN
YOUNG DONOR PROJECT
EXEC SUMMARY

ANTHONY NOLAN

saving the lives
of people with
blood cancer

INTRODUCTION

In 2012, we changed our joining policy for unrelated stem cell donors joining the Anthony Nolan stem cell register to include 16- and 17-year olds. This decision was based on the increasing availability of safety data in the paediatric and adolescent bone marrow (BM) and peripheral blood stem cell (PBSC) donor population settings. Additionally, a large multi-centre study showed that younger donors were associated with improved patient survival (or outcomes) after transplant . Therefore, donor age is an important consideration for transplant centres when selecting a donor, which in turn increases the demand for younger donors from our register.

This study aimed to demonstrate that younger donors are suitable donors, who are as adequately capable of handling the physical and mental demands of the donation process as their older counterparts. To achieve this, we have retrospectively reviewed our experience of donors from the age of 16 upwards, undergoing PBSC and BM donations.

DESIGN

This retrospective study focused on unrelated donors from the Anthony Nolan registry from aged 16 to 30+ who donated between April 2015-2017. This allowed for a minimum of one year's follow-up data to be collected for every donor. Data was collected from July 2018 to February 2019, with data analysis occurring from February 2019 until June 2019. The, final numbers of donors included in this study were 1013 donors - 134 undergoing BM donation and 879 undergoing peripheral stem cell collection.

A combination of donor completed questionnaires and the collection of clinical data stored in our donor database was used to determine if aspects of the donor experience were significantly different within different donor age groups. main aspects under investigation were as follows:

- Turnaround time needed from verification typing (VT) request to donation - defined as the time from first contact for VT to the day of donation
- Achievement of optimal cell collection yield from both PBSC and BM donations
- Side effects from the donation process including pain, tiredness, insomnia, nausea, dizziness and fever
- Physical recovery
- Emotional recovery

STATISTICAL ANALYSIS

BM and PBSC donors were analysed separately due to inherent differences in the two donation processes and the time needed to recover from them. Due to a low number of donors aged 16-17, donors were grouped into age-based quartiles to provide meaningful numbers within each cohort to allow comparison, with the lowest quartile 17-22 and 17-21 in PBSC and BM respectively, representing 'young donors'. Tables 1 and 2 contain the information on the donor age quartiles, the response rate to the follow up stages and the amount of collection data available for each cohort Groups were compared using the chi-squared test, or chi-squared trend test for categorical variables, and the Kruskal-Wallis test for continuous variables. Multivariate analyses and binary logistic regression analyses were performed.

TABLE 1 PBSC DATA						
Number of Donors	Collection Data Available	Day 2/3 Responses	Day 7 Responses	Day 30 Responses		
Total		885	875	755	801	485
Gender	Female	204	201	165	184	124
	Male	681	674	590	617	361
Age quartiles	17-22.7	236	235	197	204	119
	22.7-26.2	205	204	179	196	103
	26.3-31.4	222	216	186	197	118
	31.4-59	222	220	193	204	145

TABLE 2 BONE MARROW DATA						
		Number of Donors	Collection Data Available	Day 2/3 Respons-es	Day 7 Responses	Day 30 Responses
Total		134	101	118	120	75
Gender	Female	39	29	34	33	23
	Male	95	72	84	87	52
Age quartiles	17-21	34	26	30	30	19
	22-26	33	25	29	30	19
	27-32	34	25	30	30	19
	33-54	33	25	29	30	18

SUMMARY OF RESULTS

DONOR AVAILABILITY AND TURNAROUND TIME

There was no statistically significant difference found in turnaround time between the different age groups, nor was there any statistical significance between men and women.

PBSC COHORT

Cell collection

There were no significant differences in the proportion of donors achieving the optimal CD34+ count between the different age groups, regardless of the number of collection days required.

Male donors, donors with a BMI >30, and donors whose weight was higher than their patient were more likely to achieve the optimal CD34 count and the required dose specified by the transplant centre. They were also less likely to need a 2nd day of collection compared to female donors. Central line access was required in only 19 donors, with no increased requirement in the young donor group. However, the low number of central lines required made statistical analysis unsuitable.

G-CSF mobilisation and collection side effects

A quarter of donors who received G-CSF injections prior to their collection day reported side-effects. However, these were recorded by an external healthcare provider who did not use a standardised symptom checker so there may be slight discrepancies in the reporting of this data.

During G-CSF administration, older donors were more likely to suffer from bone pain (and general symptoms such as loss of appetite, tiredness or night sweats) compared to younger donors. Generally, younger donors appeared to report pain at less typical sites (sore throat and headache) than the older donors. Symptoms including tiredness were also more frequent in women than men.

Physical and emotional recovery

Two days post-collection, a higher number of younger donors reported emotional recovery compared to older donors, as well as having recovered physically. Older donors experienced more general symptoms and tiredness after donation.

Sub-group analysis performed on those requiring one day versus two-day collections showed that a higher number of donors who required a two-day collection had not recovered both physically and emotionally compared to those who underwent a one-day collection. They also reported more bone pain. For those requiring a two-day donation, men and younger donors' emotional recovery was faster than women and older donors at day two to three post-collection.

One week after donation, at day seven post-donation there was a higher physical recovery rate in younger donors. There was no difference in physical recovery or symptoms for those receiving two-day collections by this time, but these donors did report a delayed emotional recovery at day seven.

One month to one year after donation

At one month post donation there was excellent achievement of emotional and physical recovery of donors, with no difference between those needing one- or two-day collections, or between male and female donors. There was no statistically reported difference in physical or emotional recovery at one month for the young donor cohort. At one year post-donation, nearly all the donors reported that they had physically and emotionally recovered, irrespective of their age.

Overall, 7% of donors called the emergency phoneline. The numbers were too low for further statistical analysis of use by donor specific demographics. 90% of the calls were out of hours, 54% were due to medical issues, and the remainder for logistical issues.

BM COHORT

Cell collection
In the young donor cohort, 53% achieved the total nucleated cell (TCN) target yield of >4 x10^8 TNC for BM collection. There were no differences based on age or gender in a donor's ability to reach the optimal / requested cell count. However, younger donors achieved this goal more frequently than other age groups, but this was not statistically significant.

Donor-recipient weight ratio was significantly associated with achieving optimal yields: less than 10% of donations where the donor was lighter than the recipient achieved an optimal yield. Higher-volume harvests were significantly less likely to achieve the optimal yield compared to lower-volume harvests.

The proportion of donors who achieved an optimal harvest yield varied significantly between the four collection centres that took part in the study.

Physical and emotional recovery of BM donors
The incidence of complications following bone marrow harvest (including general symptoms and skeletal pain) and recovery were reviewed at day two post-donation, at one week and at one month.

Young donors (17-21) reported fewer symptoms at day two, though this was not statistically significant. However, at day seven young donors were less likely to report experiencing pain than the older cohorts.

Women were significantly more likely to report physical side-effects, including pain, compared to men. There was a trend of donors with lower Haemoglobin levels pre-donation to experience a delayed physical recovery. There was also an association of donors having not recovered emotionally being significantly less likely to have recovered physically too. However, in the multivariate analyses, gender emerged as the only significant factor impacting physical recovery. Female donors were more likely to report experiencing physical symptoms, pain and general symptoms.

Emotional recovery was not impacted by donor age, with the younger age donors showing no difference in emotional recovery than their older counterparts.

One year after donation, all donors who responded to the survey reported that they were fully recovered from their donation.

CONCLUSION

This study has shown that younger donors are as reliable as older donors in responding to VT requests, they are as effective at mobilising and reaching optimal cell counts as older donors following both BM and PBSC donation, without increased risk of side effects or complications and with a favourable recovery profile.

Young donors are reliable and effective donors, with good emotional recovery, indicating a level of maturity necessary for this experience. This supports the ongoing inclusion of young unrelated donors to the registry from 16 years onwards and justifies our current donor recruitment strategies. Our continued focus on this age group will give us a better understanding of their motivations to donate and ensure that we continue to provide the best possible donors for patients in need of a stem cell transplant.

We welcome and encourage ongoing data collection, particularly around formal standardised collection of symptoms throughout the process to continue to better understand our young donors' experience.

[1.] BE, Logan BR, Spellman SR. et al. Development of an unrelated donor selection score predictive of survival after HCT; age matters most. BBMT. 2018. 24; 1049-1056.