Reduction in vasovagal reaction rate in young first-time blood donors by collecting 350 mL rather than 450 mL


BACKGROUND: There is a paucity of studies on the magnitude of reduction of vasovagal reaction by reduced collection volume. This study was thus conducted to determine the difference in reaction rates between two collection volumes among the young first-time donors who are at particular risk of reaction.

STUDY DESIGN AND METHODS: This retrospective study analyzed 38,436 whole blood donations made by young (aged 16 to 18 years) first-time donors. The effect of collection volume on vasovagal reaction was compared among different weight subgroups for both sexes by chi-square test.

RESULTS: For females in all weight subgroups and two of the male lower-weight subgroups, the reduction percentages ranged from 35% to 58% (p < 0.05). It was also noted that, among the females, a higher weight was associated with a higher percent reduction in the reaction rate.

CONCLUSION: With reduced collection volume, this study detected large and significant reduction in reaction rates among all females, as well as lower-weight males.

To maintain a safe and adequate supply of blood and at the same time strive to minimize the frequency of adverse events associated with donation is the dual responsibility of all blood centers. Vasovagal reactions are of particular concern because they are relatively common, may cause injuries, and are a rather important disincentive for repeat donation. Various interventional measures have been proposed, one of which is that lower blood collection volume may associate with a lower vasovagal reaction rate. However, there is a paucity of studies on the magnitude of reduction. While no difference could be detected among the general donor population, mathematical modeling in one study suggested that a change in collection volume might have a significant effect on reaction rates among the young, first-time, and low-weight donors, while the potential impact on high-weight donors remained undetermined.

Similar to that reported in other countries, local data showed that young first-time donors were of particular risk of vasovagal reaction. This study was thus conducted to look into the difference in reaction rates between two collection volumes among these donors, including those with high body weight.

MATERIALS AND METHODS

This was a retrospective study of the whole blood donations (apheresis donations were excluded) collected from July 1, 2010, to December 31, 2011. Donor selection and blood collection were done according to the standard operating procedure of the Hong Kong Red Cross Blood Transfusion Service. Each blood donor must fulfill all the eligibility criteria before being subjected to phlebotomy.

During the study period, 340,215 whole blood donations were collected and all those made by the young (aged 16 to 18) first-time donors (n = 38,436) were included for analysis. Donors weighing between 41 and 49 kg donated 350 mL, while those weighing 50 kg or above could give 450 mL. Many donors of the latter group, however, still opted for and donated 350 mL, with a common reason being fearful about the new donation experience.

A vasovagal reaction happens as a general feeling of discomfort. Any symptom or sign of a vasovagal reaction would be recorded. The effect of collection volume on vasovagal reaction, which was detected by staff observation or self-reported by the donors before leaving the donation venue, was compared among different weight subgroups by chi-square test conducted with computer software.

ABBREVIATION: EBV = estimated blood volume.

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(Prism, Version 5.04, GraphPad, San Diego, CA) for both sexes. A two-sided p value less than 0.05 was considered as significant. Estimated blood volume (EBV) was not calculated on site but with the body weight and height provided by the donors, it was subsequently calculated by the Nadler formula with descriptive statistics tabulated for each subgroup.

### RESULTS

The vasovagal reaction rate of the general donor population was 1.4% (4632/340,215) during the study period. On the other hand, the reaction rate in young first-time donors giving 450 mL of blood was 4.2% (825/19,464), and this accounted for as much as 17.8% (825/4632) of all reactions among all donors.

Females in all weight subgroups and two of the male subgroups with lower weight showed significantly fewer reactions when they donated 350 mL of blood only (p < 0.05). The reduction ranged from 35% to 58%. It was also noted that, among the females, a higher weight was associated with a greater percent reduction in the reaction rate, with the highest weight subgroup carrying the greatest reduction percentage (Table 1).

For all the subgroups that showed a significant reduction in reaction rate, the median EBV values of the subgroups with reduced collection volume were always less than or equal to their counterparts who donated more.

### DISCUSSION

Due to an unacceptable risk of syncope, the acute loss of 15% of one’s blood volume has been acknowledged as the limit that should not be exceeded. In line with this and based on the conventional estimation of 70 mL of whole blood per kilogram of body weight, the AABB Standards have been set to limit blood loss to no more than 15% of a person’s total blood volume. Similar to the Council of Europe, which defines 13% as the acceptable limit, the maximum percentage of blood volume removed for a whole blood donation is also about 13% in Hong Kong.

Using the Nadler formula for EBV, however, 0.7% of the female donors in this study were noted to have more than 15% of their respective EBV collected, all of which donated 450 mL. While 23% of the female donors had more than 13% removed, no male subject was found to have removal of more than 15% and only a few (less than 0.1%) had more than 13% of their EBV removed.

With collection volume reduced by 100 mL, this study detected large and significant reduction in reaction rates among all females and most males except the higher-weight subgroups. The actual effect is possibly even more pronounced, as these 350-mL subgroups did not show higher median EBV values, and fear or anxiety about blood donation is known to be associated with a higher reaction rate.

The study was limited in the way that this was not a randomized trial, which might have introduced some unknown bias. Therefore, further study is needed to confirm the observation that females of higher weight were associated with a higher reduction in reaction rate than those with low weight.

Vasovagal reactions affect blood donor safety and comfort and reduce donor return rates, and even after interventions young donors are still at high risk. Although selective deferral of young donors with low EBV has been successful, it carries the drawback that many of them may never attempt to donate again. The introduction of a multitiered collection system should be considered as an intervention to protect the most susceptible donors, balancing against the complexity in manufacturing, distribution, and dosage. Moreover, further reduction

### TABLE 1. The reduction percentages in vasovagal reaction (VVR) rates for different sex and weight subgroups

<table>
<thead>
<tr>
<th>Sex and weight (kg)</th>
<th>350-mL collection</th>
<th>450-mL collection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of donors</td>
<td>EBV</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 to 49</td>
<td>1025</td>
<td>3.83</td>
</tr>
<tr>
<td>50 to 54</td>
<td>1252</td>
<td>4.05</td>
</tr>
<tr>
<td>55 to 59</td>
<td>771</td>
<td>4.27</td>
</tr>
<tr>
<td>60 to 64</td>
<td>504</td>
<td>4.50</td>
</tr>
<tr>
<td>≥65</td>
<td>474</td>
<td>4.86</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 to 49</td>
<td>8369</td>
<td>3.12</td>
</tr>
<tr>
<td>50 to 54</td>
<td>4051</td>
<td>3.36</td>
</tr>
<tr>
<td>55 to 59</td>
<td>1488</td>
<td>3.56</td>
</tr>
<tr>
<td>60 to 64</td>
<td>560</td>
<td>3.75</td>
</tr>
<tr>
<td>≥65</td>
<td>478</td>
<td>4.05</td>
</tr>
</tbody>
</table>

* EBV is expressed as median (25th, 75th percentiles). The reduction in VVR is calculated by ((VVR<sub>450</sub> − VVR<sub>350</sub>)/VVR<sub>450</sub>) × 100%.
† p < 0.05 for comparison of the number of reactors between 350 and 450 mL collections in that subgroup.
‡ Nonsignificant; thus, no reduction percentage is provided.
in collection volume may also be experimentally tested for our 41- to 49-kg donors who carry the highest rate of vasovagal reactions.

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CONFLICT OF INTEREST

The authors declared no conflict of interest in the study.

REFERENCES
