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Effect of Point-of-care Hemoglobin/Hematocrit  
Devices and Autologous Blood Salvage on  
Reduction of Perioperative Allogeneic  
Blood Transfusion

Wei-yun Chen, Xue-rong Yu\*, Jiao Zhang, Qing Yuan,  
and Yu-guang Huang

Department of Anesthesiology, Peking Union Medical College Hospital,  
Chinese Academy of Medical Sciences & Peking Union  
Medical College, Beijing 100730, China

**Key words:** point-of-care hemoglobin/hematocrit devices; autologous blood transfusion;  
blood management; red blood cell transfusion; transfusion practices

**Objective** To evaluate the effect of point-of-care hemoglobin/hematocrit (POC HGB/HCT) devices and intraoperative blood salvage on the amount of perioperative allogeneic blood transfusion and blood conservation in clinical practice.

**Methods** A total of 46 378 medical records of 22 selected hospitals were reviewed. The volume of allogeneic red blood cell and plasma, number of patients transfused, number of intraoperative autologous blood salvage, total volume of autologous blood transfusion, and amount of surgery in the year of 2011 and 2013 were tracked. Paired *t*-test was used in intra-group comparison, while *t*-test of two isolated samples carried out in inter-group comparison.  $P < 0.05$  was defined as statistically significant difference.

**Results** In the hospitals where POC HGB/HCT device was used ( $n=9$ ), the average allogeneic blood transfusion volume per 100 surgical cases in 2013 was significantly lower than that in 2011 ( $39.86 \pm 20.20$  vs.  $30.49 \pm 17.50$  Units,  $t=3.522$ ,  $P=0.008$ ). In the hospitals without POC HGB/HCT meter, the index was not significantly different between 2013 and 2011. The average allogeneic blood transfusion volume was significantly reduced in 2013 than in 2011 in the hospitals where intraoperative autologous blood salvage ratio [autologous transfusion volume/(autologous transfusion volume+allogeneic transfusion volume)] was increased ( $n=12$ ,  $t=2.290$ ,  $P=0.042$ ). No significant difference of the above index was found in the hospitals whose autologous transfusion ratio did not grow.

**Conclusion** Intraoperative usage of POC HGB/HCT devices and increasing autologous transfusion ratio could reduce perioperative allogeneic blood transfusion.

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**P**ATIENTS who received allogeneic blood transfusion may have a potential risk of transfusion transmitted infectious disease. In addition, transfusion related immunomodulation also increases the risk of postoperative infection<sup>1</sup> and tumor recurrence.<sup>2</sup> Therefore, it is encouraged to minimize or avoid allogeneic transfusion with the premise of patient's safety. According to published data, 60% of allogeneic blood was transfused to surgical patients.<sup>3</sup> Perioperative blood management plays very important roles in the reduction of allogeneic transfusion and the improvement of patients' outcome.

Transfusion guidelines<sup>4, 5</sup> also suggest intraoperative point-of-care hemoglobin/hematocrit (POC HGB/HCT) test. Decision of red blood cell transfusion should be based on the result, medical history, and clinical demonstration. The conventional routine hematologic test by hospital central lab is not practical to be used intraoperatively because of the long turnaround time. Value of hemoglobin can be obtained quicker by the blood gas device which has been installed in the operating room in quite a few hospitals. But the application of blood gas was limited by several factors such as minimum of 0.5 ml venous or arterial blood, access site covered by surgical sheet, the invasive process and relevantly high expense. The POC HGB/HCT test which only needs 1 drop of capillary blood is quicker and cheaper. It is coming to be the best option for perioperative HGB/HCT measurement. This kind of device was getting more popular recently in operating rooms but its efficacy in reduction of erythrocyte consumption by guiding transfusions has not been reported.

Many studies showed that intraoperative autologous salvage blood transfusion was helpful in reduction of perioperative allogeneic transfusion rate and transfusion volume.<sup>6</sup> Auto-transfusion devices were installed in more and more hospitals and whether or not supplied with this device was also set as one of the evaluation indexes by some local healthcare administrative department.<sup>7</sup> However, further evaluation of these indexes is necessary as to properly reflecting blood conservation work of the hospitals.

The goal of this study was to evaluate whether or not intraoperative POC HGB/HCT test and autologous blood salvage device can reduce allogeneic blood transfusion and provide the reference for blood conservation for the administrative department developing appropriate evaluation indexes.

## PATIENTS AND METHODS

### Patients

Using a random sampling with a sampling proportion of

10% in the year of 2011 and 2013 respectively, 46 378 records of 22 selected hospitals, including Daqing Oilfield General Hospital, the Affiliated Hospital of Hainan Medical University, Haikou People's Hospital, Huashan Hospital, Shanghai General Hospital, Siping Central People's Hospital, Changchun Central Hospital, Yueyang Second People's Hospital, Guizhou Sinan People's Hospital, Zunyi Maternal and Child Health Hospital, Jingdezhen Second People's Hospital, the First Affiliated Hospital of Nanchang University, Jiangxi Provincial People's Hospital, Weifang People's Hospital, Hunan Provincial People's Hospital, Shanghai Children's Medical Center, Qingdao Municipal Hospital, the Third Xiangya Hospital of Central South University, the First People's Hospital of Yueyang, the Affiliated Hospital of Qingdao University, the Affiliated Hospital of Guizhou Medical University, and Guizhou Provincial People's Hospital, were reviewed through exploring database and original records. The volume of allogeneic red blood cell and plasma, number of patients transfused, number of intraoperative autologous blood salvage, total volume of autologous blood transfusion and amount of surgery in each year were recorded.

### Statistical analysis

Data analysis was performed by SPSS 17.0 software (Microsoft Corporation). All data were expressed as mean±standard deviation (SD). Paired *t*-test was used in intra-group comparison, while *t*-test of two isolated samples was performed in inter-group comparison.  $P < 0.05$  was defined as statistically significant difference.

## RESULTS

### Allogeneic blood transfusion in surgical patients

Twenty-two inspected hospitals were classified into two groups by whether or not the POC HGB/HCT device was used in operation by the end of 2013: non-using group ( $n=13$ ) and using group ( $n=9$ ). There was no significant difference in average allogeneic red blood cell volume, plasma volume, and number of surgical patients received allogeneic blood transfusion per 100 surgeries between the non-using and using POC HGB/HCT groups in 2011 and 2013, respectively (all  $P > 0.05$ ), Table 1.

There was no significant difference of average allogeneic red blood cell transfusion volume, plasma volume, and number of allogeneic transfused patients per 100 surgeries between 2013 and 2011 (all  $P > 0.05$ ) in the non-using group. On the contrary, the average allogeneic red blood cell transfusion volume per 100 surgeries was significantly lower in 2013 comparing with 2011 ( $t=3.522$ ,

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