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Should Red Blood Cells and Platelet Concentrates Be Labeled for Content?

Dr. Robertson Davenport of the University of Michigan (attribution used with permission) is of the opinion that Red Blood Cells (RBCs) and Platelet Concentrates (PC) SHOULD Be Labeled for Content. He states: "Currently we do not know the actual content of RBCs or PCs. Typical transfusion practice is to administer a given number of units of RBCs or PCs without consideration of the actual dose of cells administered. It is commonly assumed that transfusion of one RBC unit to an adult will increase the hemoglobin by 1 g/dL or the hematocrit by 3%. Similarly, it is commonly assumed that transfusion of one apheresis PC or one pool of whole blood derived PC will increase the platelet count of an adult by 20,000 - 40,000/microliter. However, there is considerable variation in actual response to transfusion. Without knowledge of the dose administered, it is difficult to appropriately dose transfusions or evaluate their effectiveness. Current AABB Standards define minimum criteria for platelet content, but do not state requirements for red cell content. In practice, the actual dose of cells transfused in a unit can vary considerably. A recent study of actual platelet transfusion dosage in five hospitals found that out of 1831 transfusions, one-third (n=591) contained less than 3×10^{11} platelets (Transfusion 2003; 43:30A). The targeted dose of $3-6 \times 10^{11}$ platelets was achieved in less than 50% of transfusions at two of the hospitals. We lack similar data for RBC. However, the red cell content of a 450 ml donation from a donor with hematocrit 38% would be 171 ml, while that of a 550 ml donation from a donor with hematocrit 45% would be 247.5 ml. The impact of this variability is magnified by storage-induced senescence. A unit transfused at the end of the dating period should have 75% recovery of transfused RBC at 24 hours. Thus, the functional red cell mass of the first example above could be only 128 ml the end of storage. **Lacking that ability to dose transfusions by actual content can have a negative impact for patients.** Undertransfusion may result in insufficient oxygen-carrying capacity or inadequate hemostasis. Alternatively, overtransfusion may cause circulatory overload, unnecessary donor exposures with attendant risks, and waste of resources. Evaluation of the effectiveness of transfusion is particularly difficult without knowledge of the actual dose transfused. This may delay or impair diagnosis of hemorrhage, hemolysis, transfusion reactions, or alloimmunization. It is particularly a problem for platelet transfusion, where calculation of a corrected count increment is important to assess effectiveness, and differentiate immune from non-immune refractoriness. It is unthinkable to administer a drug without knowledge of the actual dose".

Dr. Davenport is interested in learning **what others think about this proposal.**

The following response has been received.

ADDENDA Dec. 17, 2003

1. **A colleague at an academic center in Los Angeles** which is a cross town rival of the Editor's institution suggests that the following article may be germane to the concerns raised by Dr. Robertson Davenport's comments on the content of RBC and Platelet units and patient dosage: [Gorlin JB, Cable R, "What is a Unit?" Transfusion 2000;40:263-265.](#)
2. **A colleague in Australia** comments that the issue raised by Dr. Davenport is one that many colleagues in the Australian system have **also raised**. Most 'fresh products' - red cells, platelets, FFP and cryoprecipitate - are not labelled for their content (ie., their activity'). In comparison to fractionated products they are therefore very difficult to 'dose' accurately. He adds that the possibility of apheresis red cells, a standardised FFP product and total platelet count per dose would go a long way toward making these products easier to 'prescribe' for desired outcome. Finally, the Australian colleague concludes saying "Dr Davenport's concerns are ones that many transfusionists would support and having a known dose/activity is highly desirable."
3. **A colleague in California** who is very familiar with the fine details of the California Laboratory Inspection process has **similar concerns** to those articulated by Dr. Davenport. The responding Californian reports that he has asked his FDA and AABB contacts to clarify this issue, especially as it relates to the requirements and expectations of the Circular of Information.

ADDENDA Dec. 19, 2003

4. **A technical supervisor from a Children's Hospital in one of the Rocky Mountain states** reports that for years they **have calculated and labeled all** blood products they collect with the content. She states, "As a pediatric facility, we require knowing not only the volume of these products but also the cellular content (hematocrit in the case of RBC and platelet count in the case of apheresed platelet concentrates). Because we aliquot both these products daily for infants and small children, our physicians are accustomed to ordering more precisely based upon the patient's blood volume. Although we collect red blood cells in both CPDA-1 and anticoagulants with additives, we have always preferred to make aliquots for babies from CPDA-1 units because their hematocrits are reliably above 70% and the infants presumably receive a greater therapeutic benefit when being transfused at 10 ml/kg. For our apheresed platelets, we calculate the number of ml per 'random donor equivalent' or 'rde' (5.5×10^{10}) and dose accordingly. Our physicians are accustomed, also, to ordering by 'rde' for their patients, so it is quite simple for our staff to prepare appropriate platelet aliquots of any size. (We have also aliquotted FFP units for infants receiving multiple transfusions in a 24-hour period in order to minimize donor exposures.)"

ADDENDA Dec. 23, 2003

5. **A Quality Manager from Spain** wishes to share this information about Red Cell content from regulations of the **Council of Europe**.

- The hemoglobin content of Red Cells should be >45 g/unit. The hematocrit should be 65-75 percent. The volume should be 280+/-50 ml. In the case of Red Cells in **additive** solution, where hematocrit ranges from 50-70 percent, the volume can be adapted accordingly.

ADDENDA Dec. 23, 2003

6. **A Manager of Regulatory Affairs and Quality Assurance from a blood supplier in Southern California** wishes to comment from the supplier perspective: "While I would not debate the usefulness of knowing the exact platelet count or hemoglobin content of a given unit, the question is how much are you, the end user, willing to pay for the added information? The additional work involved would not be trivial. Consider that the basic steps would be very similar to that of obtaining a platelet count from a patient. One would need to identify the unit, collect the sample, test the sample, and then ensure that the proper result was attached to the proper unit. For even a modest donor center this would add up to considerable time and effort which would translate into additional FTE's, and therefore an increase in cost of the products. The other question I have is: Would knowing the content of a unit modify the physician's ordering practices for post-transfusion laboratory work? I don't think that it would, but if it did, how many post-transfusion automated platelet counts or hemoglobins would be needed to offset the price increase?"

ADDENDA Dec. 23, 2004

7. **Editor's note:** The editorial, "[Blood components should be labeled for content](#)" in *Transfusion*; Volume 45, Issue 1, Page 3 by Dr. Davenport further expands on this discussion.

Please submit comments to the [e-Network Forum](#).



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