AUTOLOGOUS BLOOD USAGE AT SFGH

Introduction

Preoperative autologous donation of blood for surgery is becoming increasingly routine in the care of surgical patients. The application of autologous blood donation to the county or public hospital setting, however, is unclear. Potential barriers to the use of autologous pre-donated blood include a large volume of emergency cases and lack of permanent physician-patient relationships in a teaching hospital setting. To assess the potential and actual use of autologous blood in a county hospital, a pilot study was done of all patients undergoing elective surgery at San Francisco General Hospital in an eight-week period. Monitoring of autologous blood use was also incorporated into the ongoing blood use review program.

Materials and Methods

The elective surgery schedule was reviewed daily for eight weeks in July to September, 1989. Cases were identified for which blood was ordered in advance or for which the maximum surgical blood order schedule (MSBO) indicated that blood should be crossmatched in advance. There were several cases which would normally have had blood crossmatched in advance (by MSBO) but blood was not ordered by the physician. None of these patients required a transfusion. However, both patients whose physicians ordered blood and those who would normally have had blood allocated (by MSBO) were included in the study. After surgery, the records of all patients were reviewed for eligibility to pre-deposit autologous blood.

For those patients who qualified as potential autologous donors, additional information was collected about the amount of autologous and homologous blood used, the pre-transfusion and discharge hemoglobins, and the amount of blood lost during surgery. This additional information was also collected on the patients who would have been excluded based on pre-operative hemoglobin but who had donated autologous blood for surgery.
Patients were excluded as potential autologous donors for the following reasons: brain surgery, recent fracture or trauma, acute surgical emergency, transfer from another institution, pre-op hospital stay of 7 days or more, significant cardiac disease, hemoglobin pre-op < 11.0 gm/dl, transfusion pre-op during the same hospitalization, or age less than 12 years. The reasons for exclusion from autologous donation were coded. Many patients had multiple reasons for exclusion.

The cases of patients who were autologous donors or potential autologous donors were reviewed with the Blood Bank Director and the hospital Transfusion Committee. The patients who were potential autologous donors and who received homologous blood were identified and letters were sent to the attendings on the cases about the potential for autologous donation. Letters of commendation were also sent to those attendings who supervised cases in which autologous blood was ordered and used appropriately.

Results

Table 1 gives an overview of the number of operations reviewed and the number of operations for which blood was available either by physician order or per maximum blood order schedule. A total of 130 elective surgeries with blood available were reviewed (23% of the elective cases performed). Only 26 patients (4% of total elective cases) were actually transfused perioperatively. Of the patients undergoing elective surgery with blood available, 28 (21%) were potential autologous blood donors.

Table 2 shows the reasons for exclusion from autologous blood donation in the 102 patients excluded. Many patients had more than one reason for exclusion and all the reasons were recorded. The most common reason for exclusion was recent trauma or fracture (75%). Most of these patients were on the Orthopedic service undergoing operative repair of fractures. A significant number of patients (37%) had low hemoglobins prior to surgery and on this basis alone were excluded as autologous donors. Twelve percent of patients received blood during the same hospitalization prior to surgery. Only two children less than 12 years underwent elective surgery for which blood was pre-ordered. There were only three cases of elective brain surgery. No patients were excluded on the basis of cardiac disease.

Table 3 summarizes the patients who were potential autologous donors. Thirteen of the 28 potential (or actual) autologous donors were cancer patients on a variety of services. Of these cancer patients only one was transfused.
Three patients underwent elective orthopedic procedures. All three patients were transfused and all three used autologous blood. One patient undergoing a laminectomy used only autologous blood (three units). He was the only patient followed who used only autologous blood. The other two orthopedic patients had total joint arthroplasties and each used two units of autologous blood and one unit of homologous blood. One woman who had a total hip replacement used two units of her own blood during surgery but was transfused with a donor-designated unit two days after surgery when her hemoglobin was 10.1 gm/dl. This transfusion was judged to be inappropriate on retrospective review by the hospital Transfusion Committee.

There were three patients who could have donated blood for themselves but did not and were transfused during surgery. One patient underwent a laparotomy for excision of an abdominal mass thought to be lymphoma. A second general surgery patient underwent abdominal aortic aneurysm repair and required massive transfusion of blood products for an intraoperative coagulopathy. The third patient had an elective laminectomy on the neurosurgery service and used one unit of packed cells.

Discussion

The potential for use of autologous blood at SFGH is small. This is evident from the number of patients excluded as potential autologous donors—many patients have recent trauma, are anemic, or are otherwise ineligible. In addition, few elective cases done at SFGH actually use blood (4%). There is little evidence, however, that autologous blood donation is being grossly underused at SFGH in patients who could donate for themselves. There was only one clear-cut case of a patient undergoing elective laminectomy who could have donated blood for himself and who ended up needing blood during his procedure. The orthopedic service is making especially good use of autologous pre-donation in its patients who are eligible. Only two orthopedic patients during the study period were eligible for autologous donation and both donated blood for themselves. An additional orthopedic patient pre-deposited blood even though her pre-operative hemoglobin was only 6.8 gm/dl.

Of interest, all of the patients who had autologous blood available for their operations used that blood. However, there were many more potential autologous donors who had blood ordered for their operations but did not require transfusion. It is unclear whether these patients were at risk of exposure to homologous blood and escaped by chance, or that their surgeons, in having a prior knowledge of their patients did not anticipate actually having to transfuse during surgery.
Recommendations

Autologous pre-donation of blood for elective surgery is a part of good transfusion practice and quality patient care. During the study period, the potential use of autologous donation in appropriate patients was incorporated into the daily blood use review done by the Blood Bank laboratory resident. The most important function of this review is to identify those patients who could have donated for themselves and who did not and received homologous blood. Rather than reviewing all elective surgeries, only those cases in which blood was actually transfused are now reviewed. These cases are found by comparing the elective surgery schedule with the computer printout of patients transfused both on the day of surgery and the day after surgery. The charts of the patients transfused are then checked to see if these patients were potential autologous donors. Patients with low hemoglobins or who were recently transfused, or who are undergoing fracture repair may be excluded automatically without further chart review. If a case is found in which autologous blood was used appropriately, a letter of commendation is sent to the attending involved with the case. If autologous blood could have been used and was not used, a letter discussing the case is also sent to the attending.
### Table 1
**AUTOLOGOUS BLOOD USAGE**

San Francisco General Hospital  
July - September 1989

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Room Days Surveyed</td>
<td>38</td>
</tr>
<tr>
<td>Elective Surgeries Performed</td>
<td>576</td>
</tr>
<tr>
<td>Elective Surgeries with Blood Available(^1)</td>
<td>130 (23%) (^2)</td>
</tr>
<tr>
<td>Patients Transfused Perioperatively(^3)</td>
<td>26 (4%) (^2)</td>
</tr>
<tr>
<td>Potential Autologous Blood Donors</td>
<td>28 (5%) (^2)</td>
</tr>
<tr>
<td>Patients Ineligible for Autologous Donation</td>
<td>102</td>
</tr>
</tbody>
</table>

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1. Either ordered by physician or available per maximum blood order schedule.  
2. Percentage of elective surgeries performed (total 576).  
3. Perioperative transfusion defined as day of surgery or day after surgery. Includes both potential autologous donors and patients ineligible for donation.
Table 2

PATIENTS UNDERGOING ELECTIVE SURGERY.

Reasons for Exclusion as Potential Autologous Donors

<table>
<thead>
<tr>
<th>Reason for Exclusion</th>
<th># Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # patients excluded</td>
<td>102</td>
</tr>
<tr>
<td>Recent trauma/fracture</td>
<td>77 (75%)</td>
</tr>
<tr>
<td>Transfers or hospitalized &gt; 7 days pre-op</td>
<td>30 (29%)</td>
</tr>
<tr>
<td>Hemoglobin preop &lt; 11 gm/dl</td>
<td>38 (37%)</td>
</tr>
<tr>
<td>Transfused pre-op during hospitalization</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>Age &lt;12 years</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Brain surgery</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>0</td>
</tr>
</tbody>
</table>

(1) Patients may be excluded for multiple reasons.
<table>
<thead>
<tr>
<th>Diagnosis/Service</th>
<th># Patients</th>
<th>Total # Patients Transfused Perioperatively</th>
<th># Patients Using Autologous Blood</th>
<th># Patients Using Autologous Blood Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer (All services)</td>
<td>13</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Plastic Surgery</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>GYN, non cancer</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>General Elective Surgery</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>28</strong></td>
<td><strong>7</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>
APPENDIX #1: EXCLUSION CRITERIA

FORM / A-2: NON-AUTOLOGOUS DONATION CANDIDATE CRITERIA

1. < 12 Years of Age

2. Surgical Procedures
   2.1 Brain Aneurysm / A-V Malformation
   2.2 Brain Tumor / Cysts
   2.3 ESRD / Shunts
   2.4 Renal Transplant
   2.5 Repeat Surgery - SEE INSTRUCTIONS!!!
   2.6 Other - (Specify at the bottom of A-1)

3. Emergencies
   3.1 Acute Hemorrhage
   3.2 Acute Surgical Abdomen
   3.3 Acute Trauma & Recent Fractures
   3.4 Burns
   3.5 Other - (Specify at the bottom of A-1)

4. A.S.A. / Physical Status - 4 or 5

5. Admission Data
   5.1 > 7 Pre-op Days
   5.2 Transfers - Hospital, Jail, Nursing Home, Psychiatric Inst
   5.3 Medical Admissions & ICU Patients

6. Diagnoses
   6.1 Aortic Stenosis
   6.2 CHF
   6.3 L. Main CAD
   6.4 Unstable Angina
   6.5 Other / i.e. Infection - (Specify at the bottom of A-1)

7. Post-Admission Data
   7.1 Previous Discharge - 5 wks / - EXCEPT: Diagnostic Procedures
   7.2 Transfused Before Surgery - during this admission
   7.3 No Hemoglobin Recorded before Surgery

8. Other / i.e., No Medical Record - (Specify at the bottom of A-1)

9. < 11 gm/dl Hemoglobin - EXCEPTION: Autologous Donor

Revision #3 - 4/27/89
**APPENDIX 2: Log of patients receiving blood during elective surgery**

**Patients receiving blood for elective/scheduled surgery**

SF6H

<table>
<thead>
<tr>
<th><strong>PATIENT INITIALS - HOSP. #</strong></th>
<th><strong>PRE-OP # OF UNITS AVAIL.</strong></th>
<th><strong># UNITS USED IN SURGERY</strong></th>
<th><strong>PT LOCATION</strong></th>
<th><strong>NON-AUTO DONOR CANDIDATE EXCLUSIONS</strong></th>
<th><strong>AUTO DONOR &amp; CANDIDATE ID #</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>HOMOL.</strong> AU DD</td>
<td><strong>H</strong> AU DD</td>
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<td>5</td>
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</tbody>
</table>

**SEE FORM / A-2**

**COMPLETE FORM B-1 FOR THESE PATIENTS**
Appendix 3: Additional information on potential autologous donors

FORM / B-1: CANDIDATE FOR AUTOLOGOUS DONATION


Hospital Name/Code#: / A2.

Surgeon Name/Code#: / A3.

Patient Initials: __________


ICD-9 Code: / A5.

Surgery Date: A6.

Admission Date: A7.

Previous Discharge Date: __________

Last Value, Before Surgery: Hgb/Hct: A8. / A9. Hgb/Hct Date: __________

Last Value, Before Discharge: Hgb/Hct: / A10. Hgb/Hct Date: __________

Patient's Physical Status: Circle ONE - ASA: 1 - 2 - 3 - 4 B11.

Hct Before Intra-op RBC Tx: B12.

EBL Before Intra-op RBC Tx: ml B8.

Total EBL: ml B9.

Pt. Weight: lbs/Kg B10. -OVER-
# AND KIND OF PRE-OP RBC UNITS AVAILABLE FOR SURGERY:

Homologous: ____________________  Designated Donor: ____________________

Autologous /Auto ONLY: ____________________

C3.——— FILL IN FORM / B-3

LOCAL MSBOS: ____________________

D1.

# OF RBC & COMPONENT UNITS TRANSFUSED.

& METHODS OF TRANSFUSION FOR THIS HOSPITALIZATION:

a. = OR - Day 1  /  b. = Days 2 & 3  /  c. = Days 4 to Discharge

DATE: a.______ b.______ c.______

Homologous: ____________________ /  ____________________ /  ____________________

E1a.  /  E1b.*  /  E1c.*

Designated: ____________________ /  ____________________ /  ____________________

E2a.  /  E2b.*  /  E2c.*

Platelets: ____________________ /  ____________________ /  ____________________

E4a.  /  E4b.  /  E4c.

Cryo: ____________________ /  ____________________ /  ____________________

E6a.  /  E6b.  /  E6c.

FFP: ____________________ /  ____________________ /  ____________________

E5a.  /  E5b.  /  E5c.

Cell Saver: Y / N

E7.

Cardiac Pump: Y / N

E8.

*E - b. & Ec.——— FILL IN FORM / B-4

RELATED REPEAT SURGERY:

Y / N

Fl.

Date

Procedure

1. ___________ /  ____________________

2. ___________ /  ____________________

4. ___________ /  ____________________

TRANSFUSION REACTION: Y / N

If YES, attach a copy of the Blood Transfusion Reaction Form.

G1.

Date

Reviewer