

Routine Preoperative Typing and Screening: A Safeguard or a Misuse of Resources

Silvio Fabian Ghirardo, MD, Ishwaria Mohan, MD,
Alicia Gomensoro, MD, Mitchell I. Chorost, MD

ABSTRACT

Objective: To assess the necessity of routine preoperative type and screen testing before a cholecystectomy, hernia repair, or appendectomy based on the risk of transfusion in our department.

Method: We conducted a retrospective analysis of the surgical database of patients who underwent a cholecystectomy, a hernia repair, or an appendectomy at Maimonides Medical Center over a 2-year period and examined the number of patients who actually received transfusions either on the day of surgery or on postoperative day 1.

Result: We examined 3424 patients who underwent a cholecystectomy, hernia repair, or appendectomy over a 2-year period and examined how many patients required an RBC transfusion on the day of surgery or on postoperative day 1. Of our 3424 patients, 11 required a transfusion (1 appendectomy, 5 cholecystectomy, and 5 hernia repair) in the aforementioned time frame. Consequently, the risk of undergoing a transfusion in this perioperative period is 0.32%.

Conclusion: With this low probability of requiring blood products during or immediately after surgery, our data and supporting literature firmly support the elimination of the routine type and screens before cholecystectomy, hernia repair, and appendectomy without diminishing the quality of patient care.

Key Words: Appendectomy, Cholecystectomy hernia repair type, screen, and cross testing.

Department of Surgery, Maimonides Hospital, Brooklyn, New York, USA (Drs Ghirardo, Mohan).;

Blood Bank Director Maimonides Hospital, Brooklyn, New York, USA (Dr Gomensoro).

Chief, Gastro Intestinal Oncology Department of Surgery, Maimonides Hospital, Brooklyn, New York, USA (Dr Chorost).;

Presented as poster at the 18th Society of Laparoendoscopic Surgeons Annual Meeting and Endo Expo 2009, Boston, Massachusetts, September 9–12, 2009.

Address correspondence to: Silvio F. Ghirardo, 4802 Tenth Avenue, Brooklyn, New York, 11219, USA. E-mail: silvio.ghirardo@gmail.com

DOI: 10.4293/108680810X12924466007241

© 2010 by JSLS, *Journal of the Society of Laparoendoscopic Surgeons*. Published by the Society of Laparoendoscopic Surgeons, Inc.

INTRODUCTION

With burgeoning medical care costs and steadily rising populations, streamlining the healthcare delivery process to maximize efficiency has become a priority. Clinicians look to improve the effectiveness and quality of care delivered by minimizing the unnecessary consumption of resources. Questioning long-standing clinical practices with evidence-based medicine forms a crucial part of these efforts.

In many institutions, the protocol for elective surgical procedures, specifically cholecystectomies, appendectomies, and hernia repairs, mandates that the surgeon order preoperative type and screen testing.¹ The rationale behind this mandate revolves around the possibility of a significant vascular injury during surgery that will require an emergent RBC transfusion. However, previous studies draw a conflicting conclusion, showing that the incidence of these major vascular injuries during these procedures is <1/2 of 1% (0.11%).²

Such data lead us to question whether there is sufficient evidence to support the routine acquisition of a baseline pretransfusion blood sample for type and screen testing in these patients. Can we eliminate routine type and screen testing preoperatively and be more selective in whom we type and screen without compromising the quality of care that our patients receive?

We assessed the necessity of routine preoperative type and screen testing before a cholecystectomy, hernia repair, or appendectomy based in the risk of transfusion in our department.

METHODS

We conducted a retrospective analysis of the surgical database at Maimonides Medical Center over the 2-year period from July 1, 2005 to July 1, 2007, cataloging all patients who underwent a cholecystectomy, an appendectomy, or a hernia repair. We then matched this information with the database of the Maimonides Blood Bank to identify the patients who were given transfusions with RBCs on the day of surgery, the first postoperative day, or both of these times.

Data Collection

We recorded the number of cholecystectomies, hernia repairs, and appendectomies, number of RBC transfusions, indication for the transfusion (preexisting medical condition or surgical injury), and the time of RBC transfusion in relation to the procedure (day of surgery or/and first operative day). From this information, we calculated the risk of transfusion: (Number of transfusions per procedure/Number of procedures) x 100.

RESULTS

Included in the study were 3424 patients; 1959 male patients and 1525 female patients. See **Table 1** for a distribution by age.

Risk of Transfusion by Age

We stratified the risk of transfusion by age. Patients younger than 21 years old (n=333) were not transfused. The 1983 patients who were between 21 to 60 years old had a 0.10% risk of transfusion (2 transfused of 1983 patients). The 1108 patients from 61 to 98 years old had a 0.81% risk of transfusion (9 transfused of 1108). None of the transfused patients received an emergency transfusion intraoperatively, and none received more than 2 units of red blood cells.

Risk of Transfusion by Procedure

Appendectomy

Over the 2-year period, 726 patients underwent an appendectomy. The average age was 27.58±18.44 years with 294 female and 432 male patients. Of the 726 patients who underwent appendectomies, one patient was transfused, which places the risk of transfusion at 0.13%.

An open appendectomy was performed in 113 patients. None of these patients required a transfusion during the

day of surgery or on postoperative day 1, making the risk of transfusion with an open appendectomy 0%.

A total of 613 patients underwent a laparoscopic appendectomy, one of whom received an RBC transfusion (1 unit) on postoperative day 1 for a rectus sheath hematoma. The risk of transfusion with a laparoscopic appendectomy is 0.16%.

Cholecystectomy

A total of 1167 patients underwent a cholecystectomy. The average age was 49.41±19.02 with 18% of the patients (n=213) being over 70 years of age. Of these patients, 5 required a transfusion. The risk of transfusion is 0.51%.

Of the 456 ambulatory patients, 2 open and 454 laparoscopic cholecystectomies were performed. The average age of these patients was 45.37±16.26. There were 371 female and 85 male patients, none of whom required a transfusion.

Of the 711 inpatients who underwent a cholecystectomy, 28 had an open procedure and 683 underwent a laparoscopic cholecystectomy. The average age was 52.0±20.18 with 477 female patients and 234 male patients. Five patients required an RBC transfusion. All 5 were inpatients; one of these underwent an open cholecystectomy, and 4 underwent a laparoscopic procedure. The calculated risk of transfusion for inpatients is 0.70%. The risk of transfusion for the open procedure is 3.5% and for the laparoscopic procedure is 0.58%. No patient was transfused with more than 2 units.

The average age of the 5 patients requiring transfusion was 74.5±13.09 years; all 5 were female patients. If we continue analyzing the inpatient group, we find that the risk of transfusion for open cholecystectomy for the inpatient group is 3.5% and for the laparoscopic cholecystectomy inpatient group is 0.73%. The preoperative hemoglobin, hematocrit, and past medical history of the transfused patients were then examined to see whether these patients were fundamentally at a higher risk of transfusion based on their prior medical status (**Table 2**).

Hernia Repair

A total of 1531 patients underwent hernia repairs, 383 of whom were females and 1148 were males. The average age was 56.68±17.66.

The ambulatory service operated on 1249 patients with the average age of 52.28±17.44 years; 95 were females and 1154 were males. No patient in this group was transfused.

The inpatient service performed hernia repairs on 282

Table 1.
Distribution by Age

Age	n
01 to 20	333
21 to 40	916
41 to 60	1067
61 to 80	900
80 to 98	208

Table 2.
Cholecystectomy Patients Requiring Transfusions

Age /Sex	Preop Hb	Procedure	Other Medical Condition
76 F	10.2	Laparoscopic	Anticoagulation with IV Heparin
63 F	10.8	Laparoscopic	Coagulopathy
85 M	10	Open	Congestive Heart Failure
57 F	11.7	Laparoscopic	Post operative bleeding; not urgent transfusion
92 F	8.9	Laparoscopic converted to open	Chronic leukemic with a platelet deficit.

patients with the average age of 62.87 ± 17.30 years; 133 were women and 149 were men. Five patients were transfused, placing the risk of transfusion for inpatient hernia repairs at 1.77%.

The overall data for all patients who underwent hernia repairs shows that 5 of the 1531 patients were transfused on the day of surgery or on postoperative day 1, which places the risk of transfusion at 0.32%. The average age of the 5 transfused patients was 82.6 ± 7.82 years.

We then investigated the medical status of the 5 patients who required transfusion during or immediately after their hernia repairs. The first case was an 87-year-old male with bilateral inguinal hernia. This patient was admitted for the repair of an abdominal aortic aneurysm. During the course of his hospital stay, he was diagnosed with pneumonia, and he underwent the hernia repair after recovery. He was on total parenteral nutrition and had a decubitus ulcer grade II. The second patient was an 83-year-old male with a ventral hernia who was admitted for mitral valve repair. Two days after his mitral valve repair, he underwent hernia repair. The third patient was a 76-year-old female with a parastomal hernia and multiple comorbidities including hypertension, colon cancer, and atrial fibrillation. The final patient was a 93-year-old female who underwent a combined hernia repair and intestinal resection.

DISCUSSION

Soaring healthcare costs have prompted an assessment of the liberal use of laboratory testing in medical practice. Specifically, several studies have commented on the overuse of laboratory work in the perioperative care of a surgical patient.^{3,4} Mandated preoperative type and screen testing prior to elective surgeries is a prime example. While a single type and screen may not be expensive, when noting the large numbers of routine surgeries com-

pleted annually, the cumulative expense of the individually low-costing type and screens becomes significant.

The incidence of major vascular injury during laparoscopic cholecystectomy described in the literature is low, ranging from 0.11% to 0.34%, according to different authors.² The incidence of major vascular injury during pelvic laparoscopic surgery goes from 0.06% to 0.75%.⁵

Usal et al² described the cost effectiveness of routine type and screen testing before laparoscopic cholecystectomy. With a risk of transfusion of 0.46% for laparoscopic cholecystectomy and 5.47% for open cholecystectomy, his institution modified their preoperative protocol to omit routine type and screen testing without reducing quality of care. The real incidence of emergency transfusion due to vascular injury was 0.07% (2/2589).

Ransom et al⁵⁻⁸ studied the cost effectiveness of preoperative routine type and screen testing for different procedures in a department of obstetrics and gynecology. They concluded that for elective laparoscopic surgery,⁵ cesarean delivery,⁶ vaginal hysterectomy,⁷ and expected vaginal delivery,⁸ the incidence of transfusion was 0%, 3.3%, 0.66%, and 0.46%, respectively. His conclusions directly led his institution to cancel the routine type and screen testing prior to these procedures.

Similarly, Lin et al⁹ retrospectively audited preoperative blood orders for several procedures. They concluded that certain procedures including cholecystectomy and appendectomy have a low-transfusion probability and therefore preoperative blood sampling could be safely eliminated.

If we analyze the transfusion outcomes by age groups, we see that the risk of transfusion is still low, being <1% with a slight increase in the risk among older patients compared with younger patients. Looking only at age is not an indication for type and screening of patients who need appendectomy, cholecystectomy, or hernia repair. The risk of transfusion seems to be related to a preexisting

medical condition (anticoagulation treatment, preoperative anemia) other than the procedure per se; that is why the indication for type and screen must be done based on the clinical characteristics of each patient.

In the unlikely case of a major complication that requires an emergency blood transfusion, an uncross-matched O-negative universal donor can be initiated while a formal crossmatching is undertaken. At our patient institution, the type and screen process takes 20 minutes to 30 minutes with blood available for delivery to the OR immediately thereafter. Advancements in transfusion technologies have led to steady decreases in crossmatching times while retaining satisfactory detection of clinically significant antigen-antibody interactions. The use of O-negative blood has the advantage that this group has already been screened for the presence of the most significant non-ABO antibodies. With the prevalence of irregular erythrocyte antibody in the general population ranging between 1.9% and 2.5%, the risk of transfusion-related adverse reactions is equally low. Rapid administration of O-ve blood acceptably addresses any hemodynamic instability in an emergency situation with evidence that no patient has died from a transfusion complication and the rate of seroconversion in Rh-ve patients is low.¹⁰ Additional transfusion options including a rapid-spin restricted crossmatch (which effectively confirms ABO compatibility) and group-specific blood (which is more readily available than screened O-negative blood) provide viable alternatives for blood compatibility in an emergent situation. In our parent institution, a routine type and screen takes 20 minutes to 30 minutes with subsequent blood available immediately thereafter.

The approximate cost of the type and screen test is \$30 US dollars. Eliminating this test for routine appendectomies, cholecystectomies, and hernia repairs will bring an annual savings of \$55,000 per year at our parent institution.

We recommend the elimination of routine preoperative type and screen testing due to the low incidence of transfusions for cholecystectomies, appendectomies, and her-

nia repairs and the rapid availability of blood in the exceptional case of major bleeding.

References:

1. Saxena S, Nelson JM, Osby M, Shah M, Kempf R, Shulman IA. Ensuring timely completion of type and screen testing and the verification of ABO/Rh status for elective surgical patients. *Arch Pathol Lab Med.* 2007 Apr;131(4):576–581.
2. Usal H, Nabagiez J, Sayad P, Ferzli GS. Cost effectiveness of routine type and screen testing before laparoscopic cholecystectomy. *Surg Endosc.* 1999 Feb;13(2):146–147.
3. Schein OD, Katz J, Bass EB, et al. The value of routine preoperative medical testing before cataract surgery. Study of Medical Testing for Cataract Surgery. *N Engl J Med.* 2000 Jan 20;342(3):168–175.
4. Perez A, Planell J, Bacardaz C, et al. Value of routine preoperative tests: a multicentre study in four general hospitals. *Br J Anaesth.* 1995 Mar;74(3):250–256.
5. Ransom SB, McNeely SG, Hosseini RB. Cost-effectiveness of routine blood type and screen testing before elective laparoscopy. *Obstet Gynecol.* 1995 Sep;86(3):346–348.
6. Ransom SB, Fundaro G, Dombrowski MP. Cost-effectiveness of routine blood type and screen testing for cesarean section. *J Reprod Med.* 1999 Jul;44(7):592–594.
7. Ransom SB, McNeely SG, Malone JM. A cost-effectiveness evaluation of preoperative type-and-screen testing for vaginal hysterectomy. *Am J Obstet Gynecol.* 1996 Nov;175(5):1201–1203.
8. Ransom SB, Fundaro G, Domrowski MP. The cost-effectiveness of routine type and screen admission testing for expected vaginal delivery. *Obstet Gynecol.* 1998 Oct;92(4 Pt 1):493–495.
9. Lin JS, Chen YJ, Tzeng CH, Lyuo JY, Lee CH. Revisiting of preoperative blood ordering policy—a single institute's experience in Taiwan. *J Chin Med Assoc.* 2006 Nov;69(11):507–511.
10. Heddle NM, Soutar RL, O'Hoski PL, et al. A prospective study to determine the frequency and clinical significance of alloimmunization post-transfusion. *Br J Haematol.* 1995 Dec;91(4):1000–1005.