GYNECOLOGY

Clinical utility of postoperative hemoglobin level testing following total laparoscopic hysterectomy

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OBJECTIVE: To determine the clinical utility of hemoglobin level testing in guiding postoperative care following total laparoscopic hysterectomies performed for benign indications.

STUDY DESIGN: Retrospective cohort study.

RESULTS: A total of 629 women underwent total laparoscopic hysterectomies during the 24 month study period. Only 16 (2.5%) developed symptoms and/or signs suggestive of hemodynamic compromise. When compared to asymptomatic patients, symptomatic patients had a larger decrease in postoperative hemoglobin level (2.66 vs 1.80g/dL, $P = .007$) and were more likely to undergo blood transfusion, pelvic imaging or reoperation ($P < .001$). Women with a smaller body mass index and/or higher intraoperative intravenous fluid volume were more likely to have a larger decrease in postoperative hemoglobin level ($P < .05$). Past surgical history, duration and complexity of the hysterectomy, estimated surgical blood loss, uterine weight, and perioperative use of intravenous ketorolac were not associated with a greater decrease in postoperative hemoglobin ($P > .05$). Using the University of Pittsburgh Medical Center's annual laparoscopic hysterectomy rate and insurance companies' reimbursement for blood hemoglobin testing, we estimated the national annual cost for hemoglobin testing following total laparoscopic hysterectomy to be $2,804,662.

CONCLUSION: Hemoglobin level testing has little clinical benefit following elective total laparoscopic hysterectomy and should be reserved for patients who develop signs or symptoms suggestive of acute anemia. Heath care cost savings can be substantial if this test is no longer routinely requested following total laparoscopic hysterectomies.

Key words: hemoglobin, hysterectomy, laparoscopy, postoperative bleeding

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It is common practice for surgeons in some institutions to check a postoperative hemoglobin level following a total laparoscopic hysterectomy to unmask potential postoperative bleeding and prevent its consequences. Even though laparoscopic hysterectomy is a minimally invasive procedure, it involves the ligation of major blood vessels and subsequently, patients are at risk of potential vascular complications. Although an appropriate decrease in postoperative hemoglobin level provides reassurance that patients are hemodynamically stable, it is unclear if routine hemoglobin level testing following total laparoscopic hysterectomy is clinically relevant and affects patient management.

Several studies have reported physician overuse of various laboratory tests, mostly preoperatively, and all concluded that such testing has no clinical use and should therefore be individualized.[1-3] Very few studies have addressed the benefits of routinely testing for hemoglobin levels postoperatively. Kohli et al[4] assessed the need to check a postoperative hemoglobin level following various gynecologic procedures and concluded that such testing does not affect postoperative management. Patients undergoing total laparoscopic hysterectomies, however, were not part of the study population. Api et al[5] and Horowitz et al[6] evaluated the need for hemoglobin testing following uncomplicated caesarean sections and both determined that such testing was unnecessary.

To date, no study has specifically analyzed the use of hemoglobin testing following total laparoscopic hysterectomy. The purpose of this retrospective chart review is to examine whether routine hemoglobin level testing following total laparoscopic hysterectomy has any clinical use in guiding postoperative care. Furthermore, as the number of laparoscopic hysterectomies

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TABLE 1
Demographic and perioperative data: numeric variables

Demographic (n = 629)	Mean ± standard deviation
Age, y	42.92 ± 7.66
Body mass index[a], kg/m^2	28.61 ± 6.40
Blood loss, mL	140.50 ± 102.28
Intraoperative intravenous fluids, L	2.18 ± 0.73
Uterine weight[a], g	251.03 ± 232.32
Surgery duration, min	136.77 ± 61.18

[a] Body mass index and uterine weight were only available on 627 patients.

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increases and physicians are urged to practice cost-effective medicine, the economic burden of this routine postoperative laboratory test must be examined.

Materials and Methods

We identified women who underwent elective total laparoscopic hysterectomy for benign indications at Magee-Womens Hospital, a large tertiary care academic hospital of the University of Pittsburgh Medical Center (UPMC), and 2 satellite hospitals, Passavant and Cranberry, between June 2010 and June 2012. Institutional review board approval was obtained. A detailed computer-based chart review was conducted on all identified patients. We decided to limit our study to total laparoscopic hysterectomies done for benign indications as those tend to be associated with a greater degree of dissection and blood loss compared with supracervical hysterectomies. We therefore excluded women who underwent laparoscopic supracervical hysterectomies, hysterectomies with pathology confirming malignancy, as women with cancer may have additional medical comorbidities that could confound our data, surgeries that necessitated conversion to laparotomies, and cases where concomitant vaginal procedures were performed. Patients were also excluded if they had a history of coagulopathy, were on blood thinners, received a preoperative blood transfusion, or lacked a preoperative hemoglobin level drawn within a month from the surgery date.

The following data was collected on all patients that met our inclusion criteria: (1) demographics including age, race, parity, body mass index (BMI), past medical, and surgical histories; (2) hysterectomy indication; (3) intraoperative details including type of laparoscopic hysterectomy (ligation of the uterine artery at the traditional ligation point at the level of the internal os, vs its ligation at its origin off the hypogastric artery), any concomitant abdominal procedures, estimated blood loss, intravenous fluid volume (IVFV), surgery duration, administration of intravenous ketorolac within an hour from surgery start and end-times, surgical pathology. and uterine weight; (4) laboratory results including preoperative and postoperative hemoglobin levels, timing of postoperative hemoglobin testing relative to surgery end-time; and (5) postoperative course including symptoms or signs suggesting anemia such as dizziness, tachycardia (pulse $\geq$100 beats per minute), hypotension (blood pressure $\leq$90/60 mm Hg), and low urine output ($<$30 mL per hour), repeat postoperative hemoglobin level testing, abdominal imaging, blood transfusion, reoperation, and readmission. The hospital charges for blood hemoglobin testing at UPMC and the major insurance companies' amount of reimbursement for that test were obtained from the hospital's billing department.

Statistical analysis used several methods to investigate significant univariate trends and influences of observed variables associated with a decrease in hemoglobin levels as well as significant differences between symptomatic and asymptomatic patients. Pearson correlation coefficient was used to describe the correlation between mean decrease in hemoglobin level and numerical demographic and perioperative variables. The Student t test and analysis of variance were used to compare the mean decrease in postoperative hemoglobin levels among categorical variables. The Student t test was also used to compare numerical variables between the symptomatic and asymptomatic groups of patients whereas the χ^2 and Fisher exact tests were used to compare categorical variables among these 2 groups. Statistical significance was set at a P value $< .05$.

Results

We identified 629 women who underwent total laparoscopic hysterectomies for benign indications during the 24 month study period. Tables 1 and 2 summarize basic demographic and perioperative data. Tables 3 and 4 analyze the association between various demographic and perioperative variables and the mean decrease in postoperative hemoglobin level. The majority of surgeries (94.4%) were performed by minimally invasive gynecologic surgery (MIGS) faculty, whereas 5.2% were performed by second year MIGS fellows on cases recruited from their own clinics without the presence of a MIGS faculty. Patients who received a larger intraoperative IVFV and those with a smaller BMI were more likely to exhibit a more pronounced decrease in postoperative hemoglobin ($P < .01$). The shorter the time interval between postoperative hemoglobin testing and surgery end-time, the greater the decrease in postoperative hemoglobin level ($P < .001$).

Associations between the mean decrease in postoperative hemoglobin level and parity, patients' past surgical history (divided into 5 categories: negative, previous laparoscopy, caesarian section, other laparotomy, and a