Retrospective Review of Universal Preoperative Pregnancy Testing: Results and Perspectives

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Unrecognized pregnancy in patients presenting for elective surgery is of particular concern due to the potential for significant complications. Accurate and inexpensive urine pregnancy tests are widely available in the developed world. As a result, universal preoperative pregnancy screening is commonly implemented. However, the utility of such routine testing is controversial. We retrospectively studied 8245 immediate presurgery pregnancy tests at Mayo Clinic Hospital, Phoenix, AZ, and found 11 positive tests of which 6 were false positives. We constructed a census-based approximation for unrecognized pregnancies, which shows significantly low pretest probability in this patient population. Taken together, the utility of immediate universal presurgical pregnancy testing is questionable. (Anesth Analg 2018;127:e4–5)

Unrecognized pregnancy in surgical patients is a controversial issue with potentially significant ramifications. Medical interventions including surgery and anesthesia are often recommended to be deferred during the first trimester of pregnancy due to possible connections to detrimental outcomes.[1] Preoperative urine pregnancy testing is 1 method to identify patients with a first-trimester pregnancy and thus allow informed, collaborative decision making about the risks and benefits of surgery and anesthesia during this period.[2] As a result, pregnancy testing before elective surgical procedures is widely implemented, although indications for testing vary from universal to highly selective.[3–5] At Mayo Clinic Arizona, routine universal screening of women between menarche and menopause has been performed before elective surgery, with only limited exceptions. We performed a retrospective analysis of our immediate preoperative pregnancy tests. Our hypothesis was that our universal testing policy would be an effective process to identify otherwise unsuspected pregnancies in surgical patients.

METHODS

After the institutional review board approved the study and waived written informed consent, the electronic medical record database at Mayo Clinic Arizona was queried for adult female patients, age >18 years, scheduled for elective surgery who underwent day of surgery pregnancy testing between September 1, 2010, and May 1, 2015. At the time period of this review, our institution did not routinely care for patients age <18. A total of 8245 patients were tested. Premenopausal female patients were tested on the day of surgery unless they reported a history of surgical sterilization, had been tested in clinic within the past 7 days, or explicitly refused testing. Urine pregnancy testing was completed in the preoperative area utilizing a commonly available point-of-care qualitative test (ICON 20 HCG, Beckman Coulter). If a positive result was obtained, the surgeon and anesthesiologist were notified, and further steps were decided on collaboratively in discussion with the patient and surgical and anesthesia teams. Where pregnancy might be in doubt by patient history, serum quantitative human chorionic gonadotropin was performed.

To further study the odds of a positive pregnancy in our surgical population, pregnancy data from the US Census Bureau was used to construct a simple model.[6] The probability of an unknown pregnancy that is in its first trimester (G) was estimated age group wise using the following equation:

$$G = P(\text{preg} \mid \text{age group, birth}) \times P(\text{preg} \mid \text{1st trimester}) \times P(\text{preg} \vee \text{unknown, 1st trimester})$$

The probability of pregnancy and subsequent birth was extracted from census data for the first term. A pregnancy that is in the first trimester is estimated to be 1/3. The probability of unrecognized pregnancy in the first trimester was approximated using an exponential fit based on the odds of cryptic pregnancy over time (Supplemental Digital Content, Figure S1-A, http://links.lww.com/AA/C155).[7] The combined value G estimates the probability of a pregnancy resulting in a potential live birth that is in its first trimester and unknown to the mother. This value is then used in the context of our study population age groups to determine a projected unrecognized pregnancy probability, the primary target of universal testing. All data processing was performed off-line using a commercial software package (MATLAB 2016, The MathWorks Inc, Natick, MA, 2000).

RESULTS

Of the study population of 8245 patients tested on day of surgery, 11 tests were positive. On further investigation (serum quantitative human chorionic gonadotropin testing), 6 of these were determined to be false positives. Four of these false positives were in patients age >35, who accounted for 75% of the tested population (Figure). Of the 5 true positive tests, 3 decided to cancel elective surgery; 1 had surgery for malignancy followed by pregnancy termination, and 1 elected to have surgery under local anesthesia.

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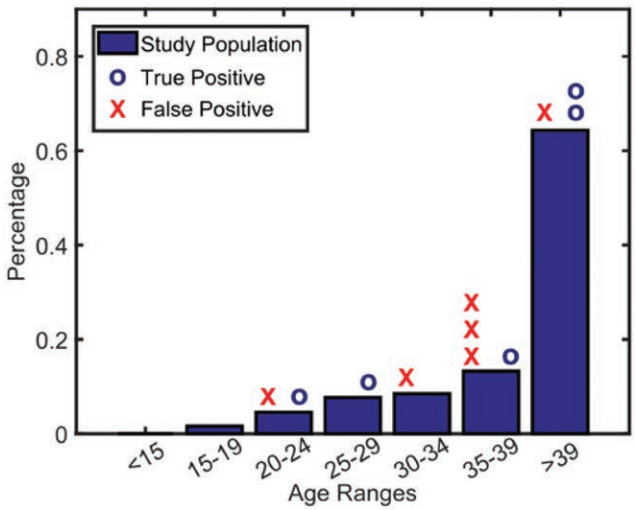

Figure. Study population distribution and positive results. Positive testing are individually labeled with "X" and "O" for false and true positives, respectively.

This yields a positive pregnancy test rate of 0.13%, with a true positive of 0.06%. Because each bedside test had an acquisition cost of approximately $30, a conservative estimated cost of each of the true positive tests was approximately $49,000. Our review could not realistically evaluate false-negative results due to incomplete follow-up.

Our model based on census data was used to estimate the probability of a cryptic pregnancy that is in its first trimester for each age group. Only the age group of 25–29 exceeded a 5% threshold at 5.4% (Supplemental Digital Content, Figure S1-B, http://links.lww.com/AA/C155). However, adjusting for our study population distribution, which consists of primarily other age groups, the incidence of a 25- to 29-year-old woman testing positive for pregnancy was <0.1% (Supplemental Digital Content, Figure S1-C, http://links.lww.com/AA/C155).

DISCUSSION

The incidence of unrecognized pregnancies found on day of surgery urine testing is extremely low in both our data and a population census–based model.[3,8,9] This is because of a significantly low pretest probability in our surgical population. This in turn is due to our surgical population having a relatively high proportion of patients age >35 (>75%), as well as the opportunity for women who suspect the possibility of pregnancy to self-test before scheduling surgery. Thus, for our patient population, the low yield and high false-positive rate call into question the utility of routine universal pregnancy screening for all women of child-bearing age.

Our recommendation is that the characteristics of the surgical population with regard to pretest probability of unrecognized pregnancy be carefully considered when planning the indications for preoperative pregnancy screening.

DISCLOSURES

Name: Xun Gong, MD, PhD.
Contribution: This author helped perform the analysis and write the manuscript.
Name: Karl A. Poterack MD.
Contribution: This author helped design study, obtain the data, and write the manuscript.
This manuscript was handled by: Jill M. Mhyre, MD.

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