
Incidence of undisclosed pregnancy

The reported incidence of pregnancy in adolescent girls, revealed by preoperative testing, varies from 0.49% to 1.2% in the USA. No similar major studies have been carried out in the UK.

Boston: 0.49%

801 adolescent girls (aged 12-21 years) attending for day surgery in 1994-1996 had routine urine tests for pregnancy, after being asked for date of LMP, whether they were sexually active and whether they might be pregnant. 6 tests were positive, two of which were false positive, associated with ovarian failure and elevated gonadotrophins. Four patients were pregnant. Only two had been able to identify an exact LMP and two had denied sexual activity. One of the two who had admitted sexual activity also disclosed the possibility of pregnancy on direct questioning. The surgery of all four pregnant patients was postponed.¹

California: 0.9%

532 teenage girls (aged 12-19 years) presenting for orthopaedic surgery had urine tests for pregnancy over a three year period after a protocol for routine testing was instituted in 1995. 5 tests were positive, including three patients scheduled for posterior spine fusion. The ages of the patients were 13, 14, 15, 17 and 18 years. In all cases, surgery was cancelled.²

Chicago: 1.3% (including adults)

235 routine pregnancy tests were performed in patients attending a tertiary care paediatric hospital during a 15-month period. (This prospective study was prompted by two adolescent patients who had positive pregnancy tests despite denying the possibility of pregnancy in the previous 6 months of routine testing.) Patients ranged in age from 10 to 34 years. 3 tests were positive, in patients aged 15, 22 and 26 years. All denied the possibility of pregnancy and all reported an LMP within the three weeks prior to their scheduled surgery. The 15 year old girl's surgery was cancelled and she carried the baby to term. The 22 year old patient's revision of VP shunt was carried out with uneventful surgery and anaesthesia, but the patient miscarried 1 month later. The strabismus surgery planned for the 26 year old was postponed. She underwent a termination of pregnancy and returned for surgery some time later.³

St Louis: 1.2%

412 patients who had mandatory routine pregnancy tests prior to surgery in 1992-1994 were reviewed. There had been anecdotal reports of anaesthetics inadvertently administered to pregnant teenagers, whose pregnancy was diagnosed weeks to months later. The age range of the girls was 10-20 years. 5 patients had a positive pregnancy test. All were aged 15 years or over. In three patients the LMP was misleading and in two it had not been recorded. 1 case proceeded under general anaesthesia, one was carried out under local anaesthesia and three were postponed.⁴

Michigan: 0%

444 patients aged 10-17 years presenting for elective orthopaedic surgery were enrolled into a

prospective study. They were educated about the potential risks of anaesthetics to the fetus and questioned about the possibility of pregnancy. Urine testing for pregnancy was also carried out routinely. 8 patients stated that there was a possibility they could be pregnant. No tests were positive. One was indeterminate, but the patient had been anaesthetised prior to the test result being available. The patient was subsequently confirmed not to be pregnant. Seven families were offended by the policy of routine testing. The authors conclude that history may be reliable in excluding pregnancy in some adolescent populations. However they advocate extremely robust history taking, including education of the potential fetal risks of anaesthesia, and questioning in the absence of parents.⁵

Further studies in adult patients are helpful

Chicago: 0.3%

A prospective study identified all women of childbearing potential presenting for elective ambulatory surgery and tested them routinely for pregnancy. Of 2056 patients, 7 had previously unrecognised pregnancies. All patients postponed their procedure. All of the patients had denied the possibility of pregnancy during preoperative assessment. Tests cost \$9.80 per patient - \$2879 per pregnancy detected.⁶

New York: 0.15%

Routine preoperative pregnancy testing was implemented prior to elective orthopaedic surgery. In the first year, 2588 patients were tested and there were 5 positive results resulting in cancellation of surgery. Of these five, three were previously unrecognised pregnancies, one was an unrecognised asymptomatic ectopic pregnancy and one was a false-positive result in a perimenopausal woman. There were three further weak positive results in perimenopausal women, whose subsequent serum hCG tests were negative. Each test cost \$5.03 - \$3273 for each true positive result. The number-needed-to-treat to detect one true positive result is 647.⁷

Controversies and discussions surrounding pregnancy testing

The USA context

Statistics regarding teenage pregnancy suggest that one of every ten women between 15 and 19 years of age becomes pregnant every year in the USA⁸ 95% of these pregnancies are unplanned. The average age of first sexual intercourse for American teenage girls is 15.2 years.⁹ It is felt, therefore, that determining the pregnancy status of a female teenager during the preoperative evaluation is essential.² However, pregnancies in children aged 14 years and younger constitute only 2.7% of all pregnancies in adolescents and 60% of those pregnancies are terminated.⁸ It has been suggested that it is reasonable to apply routine testing only to patients aged 15 years and older.⁴

The American Society of Anesthesiologists' (ASA) view

The ASA Task Force on preoperative testing developed a policy addressing unrecognised pregnancy, to optimise patient safety, improve risk management and improve informed decision making. This publication reported that 88% consultants and 78% ASA members agreed that pregnancy testing should be carried out in selected populations only, with only 7% of consultants and 17% ASA members agreeing that routine testing was appropriate.¹⁰ The policy recommended the following:

*'Preanesthesia Pregnancy Testing. The Task Force recognizes that a history and physical examination may be insufficient for identification of early pregnancy. Pregnancy testing may be considered for all female patients of childbearing age. Clinical characteristics to consider include an uncertain pregnancy history or a history suggestive of current pregnancy.'*¹⁰

This policy was amended, with regard to routine preanaesthesia pregnancy testing in 2003, with the following statement:

*'The Task Force recognises that patients may present for anesthesia with early undetected pregnancy. The Task Force believes that the literature is inadequate to inform patients or physicians on whether anesthesia causes harmful effects on early pregnancy. Pregnancy testing may be offered to female patients of childbearing age and for whom the result would alter the patient's management.'*¹¹

In a further document in 2008, the ASA states that:

'No routine laboratory or diagnostic screening† test is necessary for the preanesthetic evaluation of patients.'* (* Routine refers to a policy of performing a test or tests without regard to clinical indications in an individual patient. † Screening means efforts to detect disease in unselected populations of asymptomatic patients.)¹²

It is acknowledged in the ASA policy that the detection of early pregnancy on preoperative testing leads to changes in clinical management, delay or cancellation of surgery in 100% of cases.

Pregnancy loss

The rate of spontaneous loss of pregnancy has been reported as 31%, with 22% pregnancies ending before they have become clinically detectable.¹³ If a pregnancy is lost, or a baby is born with a congenital abnormality following an exposure to anaesthesia or surgery, it is therefore difficult to establish a clear cause and effect relationship, but the tendency will be to ascribe a causative role to the anaesthesia and surgery. From a risk management perspective, this is a situation best avoided. In the paper by Kahn et al, two patients whose operations were cancelled due to a positive preoperative pregnancy test went on to have spontaneous miscarriages, which may well have been blamed on the surgery if it had proceeded. A further patient chose to have the pregnancy terminated, and it is argued that the routine preoperative test allowed her to make the difficult decision earlier in the pregnancy, without the added complexity of a recent exposure to anaesthesia and surgery. A fourth patient had an ectopic pregnancy, and the early detection not only prevented potential morbidity complicating the recovery from orthopaedic surgery, but also allowed the ectopic pregnancy to be treated before it became symptomatic or ruptured.⁷

Patient history

Several references comment on the unreliability of patient history in determining the possibility of early pregnancy^{1,3,4,14,15} although one paper reported above felt that education and careful questioning may allow selective testing.⁵ Unmarried teenagers are especially unwilling or unable to report accurately their history of sexual activity, last menstrual period or possible pregnancy and teenagers may be reluctant to disclose pregnancy until the physical signs are obvious.¹⁶ It may also be very difficult to question teenagers about sensitive issues in the presence of their parents.

Consent for testing

Publication of the studies quoted above revealed confusion and controversy about the ethics of pregnancy testing without explicit and specific informed consent. In some States, the general surgical consent is valid for all preoperative testing except for HIV testing.³ Two surveys of clinical practice demonstrate the variability in the clinical practice of preoperative pregnancy testing for both adult and

paediatric patients.^{17,18} There is also much variability in the processes in place for informing adolescent patients of a positive result and action taken with regard to the possibility of child abuse.¹⁷ A review of medical ethics and legal standards challenged the view that pregnancy testing could be considered part of a routine admission protocol without the need for specific informed consent. Mandatory testing is considered an intrusion into the patients' rights of personal autonomy, and it is argued that the potential for double standards exists, if a routine testing policy is applied to adolescents where more selective testing might be undertaken in adult patients. This discrepancy is inappropriate when the ability to consent may be determined more by capacity and competence than by age alone.¹⁹ Other authors argue that the clinical and medico-legal implications of an unrecognised pregnancy in a surgical patient make it unethical not to test.²⁰ It has, however, been argued that asking for explicit consent for pregnancy testing also poses ethical dilemmas. A patient's refusal may be considered as important as a positive test result, as it may indicate an acknowledgement of the possibility of pregnancy. In addition, the request for consent places the adolescent patient in a situation whereby her acceptance or refusal of a pregnancy test carries implications concerning her sexual activity. It is argued that the main issue is that adolescent patients presenting for surgery may be pregnant and that it would be inappropriate to subject a fetus to the possible hazards of anaesthetics, antibiotics, radiographic and operative procedures without due consideration.²¹

Cost of testing

In the article on ethics and legal standards, the concept of 'Distributive Justice' is discussed.¹⁹ It is questioned whether the routine preoperative screening of adolescent girls for undetected pregnancy can be supported as an acceptable use of health care resources. The cost of an individual test may be small, but overall costs become significant when applied to every adolescent girl presenting for surgery. It is suggested that the evidence for risk to the patient or pregnancy is small from exposing an undetected pregnancy to anaesthesia, and the authors state that 'it has been known for some time that the performance of "routine" preoperative laboratory testing yields few results that have useful implications for anesthesia or surgery. In the absence of specific indications, such tests contribute little to patient care.' An alternative view suggests that there may be considerable costs associated with the absence of pregnancy testing, in terms of the emotional cost to a patient who loses a child through miscarriage after surgery, or who unnecessarily exposes her child to anaesthetic drugs, and in terms of the risk of litigation if a pregnant teenager undergoes anaesthesia and surgery without a preoperative test.

Reliability of pregnancy tests

Urine pregnancy tests are not 100% sensitive or specific, and yet they form the basis of preoperative testing. False negative results may occur until week 5 of pregnancy, with the possibility that anaesthesia and surgery may have taken place before the pregnancy becomes detectable. Quantitative serum tests may be more sensitive, but are more likely to yield false positive results in patients with quiescent gestational trophoblastic disease, or in pregnancies that fail before week 6 due to ineffective implantation or immune interactions. It is suggested that a patient with a positive test should not be told immediately by an anaesthesia provider that she is pregnant, but that a gynaecologist should discuss the result. In addition, when decisions about anaesthesia and surgery are dependant on the results of preoperative pregnancy tests, the inherent uncertainty about the results should be taken into account.²²

In summary, opinion is divided in the USA on the value of routine testing for pregnancy in preoperative adolescent girls, but there is general acknowledgement that such patients may be pregnant and that it would generally be considered unwise to proceed with surgery in that circumstance.

Arguments for routine preoperative testing

- lack of reliability of patient history
- the potential for fetal injury or loss
- maternal complications related to the physiological changes of pregnancy
- the cost of liability if fetal and/or maternal injury occurred during an elective surgical procedure.
- the avoidance of awkwardness regarding patient questioning about sexual activity and the implications of refusal of consent for testing
- studies indicate that in the absence of routine testing, early pregnancies will be missed

Arguments against routine testing

- a lack of demonstrated cost-effectiveness
- the low yield of positive results in this population
- the perceived reliability of patient history
- the possibility of angering the patient and/or parents
- the unclear relationship between a single anaesthetic exposure and harm to either mother or fetus
- ethical and legal concerns regarding pregnancy testing, particularly in minors
- the need to obtain consent for testing from every eligible patient
- the possibility of a false-positive result

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1. Pierre N et al. Evaluation of a pregnancy-testing protocol in adolescents undergoing surgery. *J Pediatr Adolesc Gynecol* 1998; 11(3): 139-41
 2. Hennrikus WL et al. Prevalence of positive pregnancy testing in teenagers scheduled for orthopaedic surgery. *Journal of Pediatric Orthopedics* 2001; 21(5): 677-9
 3. Wheeler M and Cote C. Preoperative pregnancy testing in a tertiary care children's hospital: a medico-legal conundrum. *Journal of Clinical Anesthesia* 1999; 11:56-63
 4. Azzam FJ et al. Preoperative pregnancy testing in adolescents. *Anesthesia and Analgesia* 1996; 82: 4-7
 5. Malviya S et al. Should pregnancy testing be routine in adolescent patients prior to surgery? *Anesthesia and Analgesia* 1996; 83: 854-8
 6. Manley S et al. Preoperative pregnancy testing in ambulatory surgery. *Anesthesiology* 1995; 83(4): 690-3
 7. Kahn RL et al. One-year experience with day-of-surgery pregnancy testing before elective orthopedic procedures. *Anesthesia and Analgesia* 2008; 106: 1127-31
 8. Trussell J. Teenage pregnancy in the United States. *Fam Plann Perspect* 1988; 20:262-72
 9. Howard M and Mitchell ME. Preventing teenage pregnancy: some questions to be answered and some questions to be questioned. *Pediatr Ann* 1993; 22:109-18
 10. American Society of Anesthesiologists Task Force on Pre-Anesthesia Evaluation. Practice advisory for pre-anesthesia evaluation. *Anesthesiology* 2002; 96: 485-96
 11. Palmer SK et al. Routine pregnancy testing before elective anesthesia is not an American Society of Anesthesiologists standard. *Anesthesia and Analgesia* 2009; 108(5): 1715-6
 12. Routine preoperative laboratory and diagnostic screening. Statement on (2008) <http://www.asahq.org/For-Members/Standards-Guidelines-and-Statements.aspx>
 13. Wilcox AJ et al. Incidence of early loss of pregnancy. *New England Journal of Medicine* 1988; 319: 189-94
 14. Ramoska EA et al. Reliability of patient history in determining the possibility of pregnancy. *Ann Emerg Med* 1989; 18: 48-50
 15. Causey et al. Pregnant adolescents in the emergency department: diagnosed or not diagnosed. *Am J Emerg Med* 1997; 15: 125-9
 16. Bluestein D and Rutledge CM. Determinants of delayed pregnancy testing among adolescents. *J Fam Pract* 1992; 35: 406-10
 17. Kempen PM. Preoperative pregnancy testing: a survey of current practice. *J Clin Anesth* 1997; 9: 546-50
 18. Patel RI et al. Preoperative laboratory testing in children undergoing elective surgery: analysis of current practice. *J Clin Anesth* 1997; 9: 569-75
 19. Duncan PG and Pope DB. Medical ethics and legal standards. *Anesthesia and Analgesia* 1996; 82: 1-3
 20. Twersky RS and Singleton G. Preoperative Pregnancy Testing: "Justice and Testing for All" [Letter]. *Anesthesia and Analgesia* 1996; 83: 438-9
 21. Azzam FJ et al. [Letter] *Anesthesia and Analgesia* 1996; 83: 439-40
 22. Bodin SG et al. False confidences in preoperative pregnancy testing [Letter]. *Anesthesia and Analgesia* 2010; 110(1): 256-7