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Performance of a checklist to exclude pregnancy at the time of contraceptive initiation among women with a negative urine pregnancy test

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Abstract

Objective: Our objective was to measure the sensitivity and specificity of a six-item "pregnancy checklist" at excluding early- or luteal-phase pregnancy among women with a negative urine pregnancy test who were initiating contraception.

Study design: This was a secondary analysis of the Contraceptive CHOICE Project, a prospective cohort study of 9256 women in the St. Louis region. Women who had a negative urine pregnancy test on the day of enrollment were included in this analysis. Women with a positive urine pregnancy test or without urine pregnancy testing were excluded. We identified all luteal-phase pregnancies that occurred among women with a negative urine pregnancy test. We calculated the sensitivity, specificity, positive predictive value and negative predictive value (NPV) and likelihood ratios of the pregnancy checklist for excluding luteal-phase pregnancies.

Results: There were 6929 women included in this analysis; 69% of these women met at least one checklist criterion to exclude pregnancy ("negative screen"). There were 36 luteal-phase pregnancies (0.5%) subsequently diagnosed among women with a negative urine pregnancy test. The sensitivity and specificity of the checklist were 77.7% and 69.1%, respectively. The NPV of the checklist was 99.8% and the positive predictive value was 1.3%.

Conclusion: Among women with a negative urine pregnancy test, the pregnancy checklist can be used to safely exclude more than 99% of early pregnancies at the time of contraceptive initiation.

Implications: In patients with a negative urine pregnancy test, a pregnancy checklist using six criteria based on patient history has high NPV in excluding early pregnancy. This checklist can be used to facilitate same-day initiation of contraceptive methods, including long-acting reversible contraception. Although the checklist had a high false positive rate, initiation of contraception should not be delayed in women with a "positive screen." Rather women who desire an intrauterine device or implant can be "bridged" with a shorter-acting method until pregnancy can be excluded.

Keywords: Pregnancy testing; Pregnancy checklist; Contraception; Contraceptive initiation

1. Introduction

Long-acting reversible contraceptive (LARC) methods, which include the intrauterine device (IUD) and subdermal implant, are the most effective forms of contraception [1,2]. Safe initiation of LARC methods requires the accurate exclusion of pregnancy in patients. Insertion of an IUD during pregnancy can lead to complications including miscarriage, premature rupture of membranes and septic abortion [3]. While the presence of menses almost always excludes pregnancy, requiring patients to return for a second visit at the time of menses is burdensome and creates a barrier to contraceptive uptake [4]. Urine pregnancy testing is simple to perform and inexpensive but does not detect very early or luteal-phase pregnancies and is not always available in low-resource settings [5].

A six-item checklist to exclude pregnancy has been previously developed and described [6]. If a woman meets any one of the six criteria included in the checklist, shown in Table 1, the health care provider can be "reasonably certain" that a woman is not pregnant (therefore, the test is "negative"

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Table 1
Criteria that can be used by a health care provider to be "reasonably certain" that a woman is not pregnant

A health care provider can be reasonably certain that a woman is not pregnant if she has no symptoms or signs of pregnancy and meets any one of the following criteria:

(1) Is ≤7 days after the start of normal menses
(2) Has not had sexual intercourse since the start of last normal menses
(3) Has been correctly and consistently using a reliable method of contraception
(4) Is ≤7 days after spontaneous or induced abortion
(5) Is within 4 weeks postpartum
(6) Is fully or nearly fully breastfeeding, amenorrheic and <6 months postpartum

Source: Center for Disease Control and Prevention. U.S. Selected Practice Recommendations for Contraceptive Use, 2013: adapted from the World Health Organization Selected Practice Recommendations for Contraceptive Use, 2nd edition. MMWR Recomm Rep 2013;62:1–60.

for pregnancy). Prior studies have shown that this checklist is highly accurate [i.e., a negative predictive value (NPV) of 99–100%] in ruling out pregnancy compared to using urine pregnancy testing as the gold standard [7]. A study conducted at seven family planning clinics in Kenya enrolled 1852 non-menstruating women seeking contraception [8]. The sensitivity, specificity and NPV were 64%, 89% and 99%, respectively. A second study of 263 women conducted in Nicaragua examined the sensitivity and specificity of the criteria among women enrolling in a randomized trial of oral contraceptives [9]. The sensitivity, specificity and NPV were 100%, 60% and 100%, respectively. A third study that was conducted across 20 sites in Zambia and included 535 women examined the performance of the criteria among HIV-infected women [10]. The sensitivity, specificity and NPV were 91%, 39% and 99%, respectively. Among these studies, the sensitivity ranged from 64% to 100% and the specificity ranged from 39% to 89%. NPVs were consistently high, 99–100%. Use of this checklist has been shown to result in a reduction in the number of women being denied contraception on the day of initial visit due to menstrual status [11]. The Center for Disease Control and Prevention recommends use of the pregnancy checklist prior to contraceptive initiation in their recently published guidelines for contraceptive use, "Selected Practice Recommendations for Contraceptive Use" [12].

No prior studies have measured the diagnostic accuracy of the checklist in excluding luteal-phase pregnancies. The objective of this analysis was to measure the performance of the pregnancy checklist at excluding early- or luteal-phase pregnancy among participants with a negative urine pregnancy test enrolling into the Contraceptive CHOICE Project. We hypothesized that this checklist would have a high NPV for excluding luteal-phase pregnancy in women without a known pregnancy.

2. Materials and methods

This study was a secondary analysis of the Contraceptive CHOICE Project (CHOICE). CHOICE is a prospective cohort study of 9256 women provided no-cost contraception in the St. Louis region and was designed to promote the use of LARC methods, remove financial barriers to contraception and evaluate method continuation and satisfaction. The methods have been described elsewhere in detail [13]. Women were eligible for inclusion into CHOICE if they were between 14 and 45 years of age, desired reversible contraception, were currently not using a contraceptive method or were willing to start a new method; had no desire for pregnancy for at least the next 12 months; had not had a hysterectomy or sterilization; spoke English or Spanish; and were sexually active or planning to become sexually active with a male partner in the next 6 months.

Only women with a negative urine pregnancy test at baseline were included in this analysis; women with a positive urine pregnancy test or no urine pregnancy test performed were excluded. Urine pregnancy testing was conducted prior to contraceptive counseling and study enrollment. A pregnancy test was not performed under three scenarios: when a woman had a known pregnancy, was recently postpartum or had a recent induced or spontaneous abortion. Women who had an unexpected positive pregnancy test prior to study enrollment were not enrolled into CHOICE; rather they were counseled about their options and referred for care. Pregnant women were only eligible to participate in CHOICE if they were actively seeking contraception (i.e., 36 weeks or more pregnant or planning on pregnancy termination). Enrollment was conducted between August 2007 and September 2011. Approval was obtained from the Washington University School of Medicine Human Research Protection Office prior to participant recruitment.

Contraceptive methods were initiated on the same day of enrollment unless the woman was currently pregnant. If a woman desired an IUD or implant and pregnancy could not be reasonably excluded, the woman was offered a shorter-acting method such as oral contraceptive pills (OCPs), the contraceptive patch, the vaginal ring or depot medroxyprogesterone (DMPA) and was scheduled to return for placement of the IUD or implant when pregnancy could be excluded, usually in 3–4 weeks.

A luteal-phase pregnancy is an early pregnancy where the urine pregnancy test is not yet positive. To identify luteal-phase pregnancies, we identified all women who had a negative urine pregnancy test at the time of enrollment who subsequently reported a pregnancy in the first 4 weeks of study participation. Data were collected from two sources: survey data and the study pregnancy log, which is a separately maintained database including data about any woman who reported a pregnancy during study participation. We compared the date of enrollment with the estimated date of conception to identify luteal-phase pregnancies. All charts of luteal-phase pregnancies were reviewed by study team members (J.M. and T.M.) to confirm the diagnosis.

Baseline clinical data were collected for all participants as part of the standard study protocol and contained information

for five of the six criteria in the checklist. Correct and consistent use of contraception (criterion 2) was compiled from 3 survey questions that asked about current contraceptive method use, date of last use of contraceptive method and consistent use of the current method. Data from these 3 variables were consolidated to create a single dichotomous variable for correct and consistent use. Data about breastfeeding (criteria 6) were also not collected routinely. When this information was missing from the baseline data form, we reviewed the participant's study medical chart to abstract breastfeeding data when documented.

We performed descriptive statistics to summarize the baseline characteristics of the cohort with a negative pregnancy test. Women who met any one of the six criteria were considered to have a "negative screen." In women who did not meet any of the six criteria, pregnancy could not be reasonably excluded and these women were considered to have a "positive screen." We compared positive and negative screens to the actual luteal-phase pregnancies observed during the study period and calculated the sensitivity, specificity, positive predictive value and NPV and likelihood ratios of the pregnancy checklist. All analyses were performed with Stata version 11 (Stata Corp, College Station, TX).

3. Results

There were 9256 women enrolled into CHOICE. There were 6929 (75%) women who had a negative urine pregnancy result at baseline. Urine pregnancy testing was positive (6%, $n=559$) or not performed (18%, $n=1691$) if the woman was currently pregnant or had a recent pregnancy that ended in delivery or spontaneous or induced abortion. Urine pregnancy test results were missing for 72 (0.8%) women. The 3-month follow-up rate among CHOICE participants was 99%.

The mean age of participants with a negative urine pregnancy test at baseline was 25.1 (S.D. 5.9), 46% were black, 31% had less than or equal to a high school education, 60% were single, 45% were uninsured, 54% reported receiving public assistance or difficulty paying for basic necessities in the past 12 months and 48% had at least one child. Overall, 4771 (69%) met at least one of the six checklist criteria at enrollment.

We identified 36 women with subsequent luteal-phase pregnancies. Table 2 shows a two-by-two comparison of the pregnancy checklist result and luteal-phase pregnancies. The sensitivity for the checklist in identifying a luteal-phase pregnancy was 77.8% [95% confidence interval (CI) 60.4%, 89.3%] and the specificity was 69.1% (95% CI 68.0%, 70.2%). The positive predictive value was 1.3% and the NPV was 99.8%. The positive likelihood ratio was 2.52 (95% CI 2.11, 3.01) and the negative likelihood ratio was 0.32 (95% CI 0.17, 0.59).

There were eight women (0.17%=8/4771) subsequently diagnosed with a luteal-phase pregnancy who had both a negative urine pregnancy test at baseline and met at least one of the six criteria to exclude pregnancy. Review of the medical charts indicated that one participant received a levonorgestrel intrauterine system (LNG-IUS). She had reported no sexual activity since her last menstrual period. She had an uncomplicated pregnancy and expelled the LNG-IUS at the time of delivery. Two participants received implants; one reported consistent condom use and the other reported no sexual activity since her last menstrual period. Both of these participants chose to terminate the pregnancy and continue their implant. There were an additional four women who reported consistent condom use who received shorter-acting methods and one woman who reported recent receipt of postpartum DMPA.

Table 2
Two-by-two table of pregnancy checklist exclusion criteria and luteal-phase pregnancies in women with a negative urine pregnancy test at study enrollment ($n=6929$)

Results of pregnancy checklist	Luteal-phase pregnancy ($N=36$)		
	Pregnant	Not pregnant	Total (n)
"Pregnancy Not Excluded"	28	2130	2158
"Pregnancy Excluded"	8	4763	4771
Total	36	6893	6929

Sensitivity=0.78
Specificity=0.69
Positive predictive value=0.013
NPV=0.998

4. Discussion

Our analysis demonstrates that the pregnancy checklist can accurately exclude pregnancy in 69% of women with a negative urine pregnancy test. This means that contraception, including IUDs and implants, can and should be initiated on the same day for the majority of patients.

The sensitivity and specificity of the pregnancy checklist among women with a negative urine pregnancy test were moderately strong. Most importantly, the pregnancy checklist correctly identified 28 of 36 (78%) women with a luteal-phase pregnancy and a negative urine pregnancy test at enrollment. The positive predictive value was low, which we would expect given the very low prevalence of luteal-phase pregnancies in our population. Our NPV was very high and is consistent with other studies comparing the pregnancy checklist to urine pregnancy testing. Given a positive likelihood ratio of 2.5, the likelihood of a woman having a luteal-phase pregnancy is increased approximately 2- to 3-fold with a "positive screen" on the pregnancy checklist. Alternatively, with a negative likelihood ratio of 0.13, the likelihood of having a luteal-phase pregnancy is reduced by approximately one-tenth given a negative result on the checklist.

While the overall performance of the pregnancy checklist was only moderate, the checklist is easy and inexpensive to

implement in clinical settings. Our finding of a specificity of 69% for the pregnancy checklist means that pregnancy could not be "reasonably" excluded in 31% of women. While this is a high false positive rate, we are not recommending that initiation of contraception be deferred in women with a "positive screen." Women who desire shorter-acting methods such as OCPs or DMPA should be started on the method the same day. There are ample data supporting the same-day start of combined hormonal contraception and DMPA [14–17]. If the patient desires an IUD or an implant, our practice is to "bridge" patients with a shorter-acting method and have the patient return for placement when pregnancy can be ruled out. Some health care providers do not provide any same-day insertions of IUDs and implants due to concerns about luteal-phase pregnancy. Our results should offer reassurance that the risk of pregnancy is very low in a patient with a negative urine pregnancy where pregnancy is reasonable excluded using the pregnancy checklist.

In addition, there were 1908 women in CHOICE with a recent pregnancy and either a positive urine pregnancy result or no urine pregnancy testing performed. One hundred percent of these women met one of the pregnancy checklist criteria (data not shown). Therefore, in the setting of a recent pregnancy, urine pregnancy testing has little clinical utility and the pregnancy checklist is likely to be more effective at excluding pregnancy.

Our study has several strengths. Our study population was large and diverse, and the data were collected prospectively. In addition, prior studies evaluating the effectiveness of the pregnancy checklist were in non-U.S. settings. Data about subsequent pregnancy were collected using two approaches: scheduled telephone survey and any unscheduled participant telephone calls or clinic visits. The rate of follow-up in CHOICE at 3 months was 99%, which means that we were likely to have captured almost early pregnancies. All reported pregnancies were then systematically reviewed by study clinicians, which allowed us to accurately identify any luteal-phase pregnancies.

There are several potential limitations to this analysis. The first is that we had a relatively small number of outcomes that may limit the precision of our estimate. The second is that we did not systematically set out to evaluate the checklist criteria at the time of contraceptive initiation among CHOICE participants. Therefore, data collection for correct and consistent contraceptive use and for women who were fully or near-fully breastfeeding may have limited accuracy. Misclassification of correct and consistent contraceptive use may have accounted for the 7 women who were considered to be consistent contraceptive users who were subsequently diagnosed with luteal-phase pregnancies. In 3 of these cases, the woman desired a LARC method but was "bridged" with a shorter-acting method, possibly because further discussion between the woman and clinician revealed that contraceptive use had not actually been consistent. This underscores the importance of clinicians encouraging accurate and honest reporting from patients about last sexual activity and contraceptive use. However, the vast majority of women who met at least one of the exclusion criteria did not have a luteal-phase pregnancy, suggesting that the majority of the women provided an accurate history. In addition, none of the women who received a LARC method and were subsequently diagnosed with a luteal-phase pregnancy had a poor outcome related to placement of the LARC method in the setting of early pregnancy.

Given the high NPV of the checklist in this study and other studies, if pregnancy is excluded, health care providers should be confident that a woman is not pregnant. The pregnancy exclusion criteria can be used, in conjunction with urine pregnancy test as necessary, to rule out early pregnancies in the clinical setting. This will allow health care providers to accurately exclude early pregnancy and safely initiate contraceptive methods, including IUDs and implants, as expediently as possible.

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References

[1] Winner B, Peipert JF, Zhao Q, Buckel C, Madden T, Allsworth JE, et al. Effectiveness of long-acting reversible contraception. N Engl J Med 2012;366:1998–2007.
[2] Trussell J. Contraceptive failure in the United States. Contraception 2011;83:397–404.
[3] Brahmi D, Steenland MW, Renner RM, Gaffield ME, Curtis KM. Pregnancy outcomes with an IUD in situ: a systematic review. Contraception 2012;85:131–9.
[4] Bergin A, Tristan S, Terplan M, Gilliam ML, Whitaker AK. A missed opportunity for care: two-visit IUD insertion protocols inhibit placement. Contraception 2012;86:694–7.
[5] Cervinski MA, Gronowski AM. Reproductive-endocrine point-of-care testing: current status and limitations. Clin Chem Lab Med 2010;48:935–42.
[6] Stanback J, Qureshi Z, Sekadde-Kigondu C, Gonzalez B, Nutley T. Checklist for ruling out pregnancy among family-planning clients in primary care. Lancet 1999;354:566.
[7] Tepper NK, Marchbanks PA, Curtis KM. Use of a checklist to rule out pregnancy: a systematic review. Contraception 2013;87:661–5.
[8] Stanback J, Nakintu N, Qureshi Z, Nasution M. Does assessment of signs and symptoms add to the predictive value of an algorithm to rule out pregnancy? J Fam Plann Reprod Health Care 2006;32:27–9.

[9] Stanback J, Nanda K, Ramirez Y, Rountree W, Cameron SB. Validation of a job aid to rule out pregnancy among family planning clients in Nicaragua. Rev Panam Salud Publica 2008;23:116–8.
[10] Torpey K, Mwenda L, Kabaso M, Malebe T, Makelele P, Mwema F, et al. Excluding pregnancy among women initiating antiretroviral therapy: efficacy of a family planning job aid. BMC Public Health 2010;10:249.
[11] Stanback J, Diabate F, Dieng T, de Morales TD, Cummings S, Traore M. Ruling out pregnancy among family planning clients: the impact of a checklist in three countries. Stud Fam Plann 2005;36:311–5.
[12] Division of Reproductive Health, Centers for Disease Control and Prevention. U.S. Selected Practice Recommendations for Contraceptive Use, 2013: adapted from the World Health Organization selected practice recommendations for contraceptive use. MMWR Recomm Rep, 2nd ed., 62; 2013, pp. 1–0.
[13] Secura GM, Allsworth JE, Madden T, Mullersman JL, Peipert JF. The Contraceptive CHOICE Project: reducing barriers to long-acting reversible contraception. Am J Obstet Gynecol 2010;203:115.e1–7.
[14] Westhoff C, Kerns J, Morroni C, Cushman LF, Tiezzi L, Murphy PA. Quick start: novel oral contraceptive initiation method. Contraception 2002;66:141–5.
[15] Sneed R, Westhoff C, Morroni C, Tiezzi L. A prospective study of immediate initiation of depo medroxyprogesterone acetate contraceptive injection. Contraception 2005;71:99–03.
[16] Schafer JE, Osborne LM, Davis AR, Westhoff C. Acceptability and satisfaction using Quick Start with the contraceptive vaginal ring versus an oral contraceptive. Contraception 2006;73:488–92.
[17] Nelson AL, Katz T. Initiation and continuation rates seen in 2-year experience with same day injections of DMPA. Contraception 2007;75:84–7.