What Type of Urinary Incontinence Does This Woman Have?

Jayna M. Holroyd-Leduc; Cara Tannenbaum; Kevin E. Thorpe; et al.


http://jama.ama-assn.org/cgi/content/full/299/12/1446

**Correction**
Contact me if this article is corrected.

**Citations**
This article has been cited 3 times.
Contact me when this article is cited.

**Topic collections**
Urinary Tract Disorders; Women's Health; Women's Health, Other; Diagnosis; The Rational Clinical Examination
Contact me when new articles are published in these topic areas.

**Related Letters**
Diagnosis of Urinary Incontinence

In Reply:

**Subscribe**
http://jama.com/subscribe

**Email Alerts**
http://jamaarchives.com/alerts

**Permissions**
permissions@ama-assn.org
http://pubs.ama-assn.org/misc/permissions.dtl

**Reprints/E-prints**
reprints@ama-assn.org
What Type of Urinary Incontinence Does This Woman Have?

Jayna M Holroyd-Leduc, MD
Cara Tannenbaum, MD, MSc
Kevin E Thorpe, MMath
Sharon E Straus, MD, MSc

PATIENT SCENARIO
A 70-year-old woman comes to the physician’s office for follow-up of hypertension. Her medical history is otherwise unremarkable and her medications include a β-blocker. She has 4 grown children who were all delivered vaginally. She says that she has been experiencing involuntary leakage of urine for several years and recently heard from a friend that there may be treatment options. Together, she and her physician decide to evaluate this issue further and schedule an office visit for the following week. To fully determine what treatment options will be best for this patient, it is important to determine what type of urinary incontinence she has. What is the most accurate way to determine the type of urinary incontinence during an office assessment?

WHY DETERMINE THE TYPE OF URINARY INCONTINENCE?
Urinary incontinence, defined as involuntary leakage of urine, affects up to 55% of women.\(^1,2\) It can be divided into several different types, including stress, urge, mixed, overflow, and functional incontinence. The symptom of stress incontinence is involuntary leakage on effort or exertion, or on sneezing or coughing, and it is the result of weak pelvic floor muscles, poor intrinsic sphincter function, increased urethral mobility, or all of the above.

Context  Urinary incontinence is a prevalent condition and treatment options can depend on what type of incontinence is present.

Objective  To systematically review the evidence about the most accurate way to determine the type of urinary incontinence during an office assessment.

Data Sources  A search of MEDLINE using Ovid (1966-July 2007) and EMBASE (1980-July 2007), and the bibliographies of retrieved articles to identify relevant studies. Search terms included urinary incontinence, diagnostic tests, medical history taking, physical examination, cough stress test, and urodynamics.

Study Selection  English-language articles were identified that addressed the office diagnosis of urinary incontinence in adults, in which data was not limited to case reports. Cohort studies of patients undergoing history, physical examination, and/or office procedures (excluding urodynamics) for diagnosing the type of urinary incontinence were included. Case-control studies were considered when there was insufficient data available from cohort studies. The accepted reference standard for categorization of incontinence type was diagnosis confirmed by an expert, urodynamics study, or both.

Data Extraction  Two investigators independently appraised study quality and extracted relevant data. Minimum inclusion criteria were completion of an appropriate reference standard in all patients and the ability to extract relevant data.

Data Synthesis  Forty articles were identified for inclusion. A random-effects model was used for quantitative synthesis. Minimal data was available for men. In women, simple questions modestly helped diagnose stress urinary incontinence (summary positive likelihood ratio [LR], 2.2; 95% confidence interval [CI], 1.6-3.2; summary negative LR, 0.39; 95% CI, 0.25-0.61) but are more helpful in diagnosing urge urinary incontinence (summary positive LR, 4.2; 95% CI, 2.3-7.6; summary negative LR, 0.48; 95% CI, 0.36-0.62). A positive bladder stress test may help diagnose stress urinary incontinence (summary LR, 3.1; 95% CI, 1.7-5.5); however, a negative test is not as useful (summary LR, 0.36; 95% CI, 0.21-0.60). A systematic assessment combining the history, physical examination, and results of bedside tests to establish a clinical diagnosis appears to be of modest value in diagnosing stress urinary incontinence (summary positive LR, 3.7; 95% CI, 2.6-5.2; summary negative LR, 0.20; 95% CI, 0.08-0.51). The systematic assessment is less helpful in diagnosing urge urinary incontinence (summary positive LR, 2.2; 95% CI, 0.55-8.7; summary negative LR, 0.63; 95% CI, 0.34-1.17).

Conclusions  The most helpful component for diagnosing urge urinary incontinence is a history of urine loss associated with urgency. A bladder stress test may be helpful for diagnosing stress urinary incontinence.

JAMA. 2008;299(12):1446-1456  www.jama.com
The symptom of urge incontinence is involuntary leakage accompanied or immediately preceded by urgency (a sudden strong need to void), and it results from detrusor overactivity. Mixed incontinence is the combination of stress and urge incontinence. Women with mixed incontinence can have both stress and urge symptoms with the same incontinence episode, while others can experience discrete episodes of stress or urge incontinence.

Overflow incontinence is associated with overdistention of the bladder caused by obstruction (eg, pelvic organ prolapse) or a neurological condition (eg, spinal cord injury). Functional incontinence is incontinence resulting from cognitive, functional, or mobility difficulties in a person who may or may not have lower urinary tract deficits.

Most primary treatment options, such as lifestyle modifications and behavioral treatments, do not vary by type of incontinence. However, it is important to determine the type of urinary incontinence because some treatment options do vary according to incontinence type. For example, there are surgical treatment options for stress incontinence and pharmacological options (eg, anticholinergic medications) for treating urge incontinence.

**Prevalence of Urinary Incontinence**

The prevalence of urinary incontinence varies depending on the sex and age group examined. The definition of urinary incontinence used (daily vs weekly vs monthly vs any episodes of involuntary leakage) also impacts reported prevalence rates. The overall prevalence of urinary incontinence among older women ranges from 17% to 55%, with daily incontinence ranging from 3% to 17%. Among middle-aged and younger women, the overall prevalence ranges from 12% to 42%.

Stress, urge, and mixed incontinence are the most common types of incontinence among women. Stress urinary incontinence is the prominent type of incontinence among younger women, with approximately one-half to two-thirds of incontinence being stress. As women age, urge urinary incontinence becomes more prevalent. In the older age group, urge and mixed incontinence make up approximately two-thirds to three-fourths of reported incontinence.

![Figure 1: Female Pelvis and Pelvic Floor Anatomy](image-url)
incontinence. Thus, among women with urinary leakage, those younger than 65 years have a prior probability of isolated stress urinary incontinence of approximately 50% to 66%, while the prevalence among older women (≥65 years) decreases to approximately 25% to 33%, because other causes emerge with aging.

Assessment of Women With Incontinence

Generalist physicians may identify a woman with incontinence through the review of systems during a routine visit or the patient may initiate discussion about incontinence problems. If a woman reports leaking urine, she is incontinent and the symptoms should not be ignored. The assessment of incontinence should help the physician understand the type of incontinence, while identifying potentially modifiable contributing factors.3

The history should include the nature and impact of incontinence symptoms, gynecological and obstetrical history, relevant coexisting diseases (eg, diabetes, stroke, dementia, parkinsonism, and arthritis), current medications, functional status including mobility and sensory impairments, review of environmental factors (social, cultural, and physical) and lifestyle factors (exercise and fluid intake), previous treatment history, and current goals and expectations of treatment.3

Symptoms. Determining whether urine is involuntarily lost with effort or exertion, or on coughing or sneezing, is commonly used to help identify stress incontinence.1 For example, a woman can be asked, “Do you lose urine during sudden physical exertion, lifting, coughing, or sneezing?” To help diagnose urge incontinence, the person is asked about the association between involuntary urinary leakage and feelings of urinary urgency.1 An example of such a question is “Do you experience such a strong and sudden urge to void that you leak before reaching the toilet?” A number of questionnaires exist to help differentiate these conditions in a more standardized way. Urge incontinence is also more likely to be associated with large volume urine loss, while the volume of urine lost with episodes of stress incontinence tends to be small. However, the amount of urine lost during an incontinence episode of any type can depend on the amount of urine present in the bladder at that time.

Physical Examination. A physical examination is an important component of the assessment, because it may detect modifiable factors or associated conditions and help determine the type of urinary incontinence. The American College of Obstetricians and Gynecologists practice guidelines (level C evidence: consensus and expert opinion) and the International Consultation on Incontinence committee (level of evidence not given) both suggest that every woman presenting with symptoms of incontinence undergo a general examination during assessment for incontinence that includes a gynecological, an abdominal, a rectal, and a neurological examination.3,7 The gynecological examination includes examination of the external genitalia, vagina, and perineum to assess for excoriations, masses, prolapse, and abnormal perineal sensation. Urinary incontinence and pelvic organ prolapse are separate clinical entities that often coexist.1 Pelvic organ prolapse can obstruct voiding and women may have to reduce their prolapse to void. Women with pelvic organ prolapse and large postvoid residual urine volumes should be evaluated for voiding dysfunction (eg, outlet obstruction, detrusor hypotonia).

The rectal examination assesses for fecal impaction and rectal tone. The neurological examination focuses on the sacral nerves and lower body. Pelvic floor muscle strength can be determined by asking the patient to contract their pelvic floor muscles while the examiner performs a digital vaginal examination. Because many women do not know how to consciously contract their pelvic floor muscles, they can be instructed to contract the muscles they would use to keep from passing gas or to stop themselves from voiding.

Special Maneuvers. Special maneuvers that can be performed at the office assessment include the stress test, the Q-tip test, and the pad test. The stress test involves observation for urine loss with coughing or Valsalva maneuver. This procedure can be performed while the patient is in the lithotomy position or standing. Instantaneous urine leakage on coughing or during a Valsalva maneuver is a positive test and is consistent with stress incontinence.

The Q-tip test involves placement of a lubricated cotton swab in the urethra to the level of the bladder neck while the woman is in the lithotomy position.8 Change in the axis of the free end of the swab is then measured while the woman performs a Valsalva maneuver. The free end should remain horizontal if no anatomical defect is present. If the free end moves above the horizontal, urethral hypermobility is suspected, which can occur in patients with stress incontinence. A goniometer can be used to measure the exact degree of angle change from the nonstraining position.9

A pad test involves the continuous wearing of continence pads for a set period of time. The pads are weighed on their removal and checked for abnormal increases (>15 g) in pad weight gain.10 A pad test is usually used to help make a general diagnosis of urinary incontinence.

Another component of the office assessment includes measurement of the postvoid residual urine volume by using either an ultrasound bladder scanner or in-and-out bladder catheterization. A urinalysis screening for hematuria, glucosuria, pyuria, and bacteriuria should also be performed,3 along with other tests as indicated from the history and physical examination.

A bladder diary, which measures the frequency and volume of urine output and the circumstances around urine leakage, can be completed by the patient. A bladder diary can be used during the assessment of urinary incontinence and it may also be used to monitor the effectiveness of treatment (to compare changes in urinary symptoms before and during treatment).
When to Consider a Referral to an Incontinence Specialist

If after completing an initial assessment the type of urinary incontinence remains unclear, a referral to an incontinence specialist (urologist or urogynecologist) can be considered. Other reasons to consider referring to an incontinence specialist include a lack of response to an adequate therapeutic trial, if a patient is interested in pursuing further investigations and/or surgical options, if a patient has had previous anti-incontinence surgery or radical pelvic surgery, or the presence of symptomatic pelvic organ prolapse. The finding of hematuria in the absence of infection, a history of recurrent symptomatic urinary tract infections, and abnormal postvoid residual urine volumes are also all indications to consider referring a patient for further evaluation.

METHODS

A search of MEDLINE using Ovid (1966-July 2007) and EMBASE (1980-July 2007) was completed to identify relevant studies. The search strategy included the terms: urinary incontinence, urine incontinence, stress urinary incontinence, urge urinary incontinence, over- flow urinary incontinence, incontinence, urinary leakage, diagnostic tests, symptomatology, symptom, medical history taking, physical examination, pelvic examination, cough stress test, Q-tip test, postvoid residual urine volume measurement, ultrasonography, urodynamics, and cystoscopy. We identified English-language articles that addressed the office diagnosis of urinary incontinence in adult humans, in which data was not limited to case reports. Additional articles were identified from searching bibliographies of retrieved articles. Details on the search strategy are available on request.

Cohort studies of adult patients undergoing history, physical examination, and/or office procedures (excluding urodynamics) for diagnosing the type of urinary incontinence were included. Case-control studies were considered when there was insufficient data available from cohort studies. The accepted reference standard for categorization of urinary incontinence type was diagnosis confirmed by an expert in urinary incontinence (urologist or urogynecologist), urodynamic studies (cystometry, uroflowmetry, pressure-flow voiding studies, videofluoroscopy, Valsalva leak point pressure measurement), or both.

Two reviewers (J.M.H.-L., C.T., or S.E.S.) independently reviewed and selected relevant publications that met the inclusion criteria from the search results. Minimum inclusion criteria were the completion of an appropriate reference standard in all patients and the ability to extract relevant data. Differences in assessment by the reviewers were resolved through discussion and a third investigator was available if necessary. There was good agreement between reviewers for review of full-text articles (κ = 0.83; 95% confidence interval [CI], 0.74-0.92). The investigators also assessed study quality. Data extraction forms were used to extract information on index test, reference standard, presence of blinding, and population demographics.

Summary likelihood ratios (LRs) and tests of heterogeneity were calculated by using a random-effects model (DerSimonian and Laird). The summary measures were calculated on the natural logarithm of the LR and then exponentiated to arrive at LRs. If 1 or more studies contained zeros in their 2-by-2 table, resulting in LR estimates of zero or infinity, 0.5 was added to the counts for all studies in that analysis. Statistical analysis was conducted by using R: A Language and Environment for Statistical Computing version 2.5.0 and the Meta Contributed Package version 0.8-2. R is an open-source dialect of the S language (S was developed by AT&T) that is maintained by a core team (http: //www.r-project.org). A likelihood ratio is the likelihood that a given test result would be expected in a patient with the target condition compared with the likelihood that the same result would be expected in a patient without the target condition.

RESULTS

Our search yielded 1896 citations, including 1487 citations from MEDLINE and 409 citations from EMBASE. A total of 164 full-text articles met initial inclusion criteria and were retrieved for assessment. An additional 38 articles were identified from review of the reference lists of the 164 retrieved articles (FIGURE 2).
We identified 40 articles for inclusion. Reasons for exclusion included inability to meet inclusion criteria (134 studies), assessment of test reliability only (21 studies), and inability to obtain outcomes data (7 studies). Attempts were made to contact the lead authors and obtain further data from the articles that were missing outcomes data.

The included studies were published between 1980 and 2007, and ranged in size from 25 to 4500 patients. These studies assessed questionnaires and questions, stress test, Q-tip test, the Larsson frequency/volume chart nomogram, pad tests, and the overall clinical assessment for diagnosis of urinary incontinence. All the included studies enrolled only women, except for 1 study that enrolled primarily women (80%).

The History in Diagnosing Urinary Incontinence

Reliability. Simple questions to diagnose stress or urge incontinence have high reliability (κ = 0.8; 95% CI, 0.3-0.9). The percentage agreement between the first and second interviews was 90% (95% CI, 84%-95%) for all incontinence types (stress, urge, or both) among a sample of 123 women aged 75 years or older.

Stress Incontinence. We identified 10 cohort studies that focused on what questions to ask when diagnosing stress urinary incontinence (Table 1). These were questions related to urinary leakage with activities such as coughing, sneezing, lifting, walking, or running. There was significant heterogeneity among the studies (all P for heterogeneity < .001). Age of participants ranged from 18 to 98 years. The majority of the studies were conducted in gynecology clinics or urodynamic units; however, 1 study included nondemented nursing home residents, another study involved assessments by general practitioners, and two other studies sampled women from the community. The type of question to elicit the symptoms of urge incontinence varied slightly across the studies. The results had slight statistical heterogeneity (all P < .008), but the CIs were narrow enough to infer the clinical use of the findings. An endorsement of an urge incontinence question, such as “Do you experience such a strong and sudden urge to void that you leak before reaching the toilet?” demonstrated that positive answers increased the likelihood of urge incontinence (summary LR, 4.2; 95% CI, 2.3-7.6). Similar to stress incontinence, the absence of urgency symptoms decreased the likelihood of urge incontinence (summary LR, 0.48; 95% CI, 0.36-0.62). Excluding the 2 studies...

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Question(s)</th>
<th>Likelihood Ratio (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirschner-Herrmanns et al, 1998</td>
<td>Prospective cohort</td>
<td>130</td>
<td>Asked total of 5 incontinence questions: leaks only with stress, no warning</td>
<td>6.0 (0.11-308.9) 0.98 (0.49-1.95)</td>
</tr>
<tr>
<td>Sandvik et al, 1995</td>
<td>Prospective cohort</td>
<td>236</td>
<td>“Do you lose urine during sudden physical exertion, lifting, coughing or sneezing?”</td>
<td>5.6 (2.9-10.5) 0.38 (0.25-0.60)</td>
</tr>
<tr>
<td>Lagro-Janssen et al, 1997</td>
<td>Prospective cohort</td>
<td>103</td>
<td>“Do you lose urine by spurs during coughing, sneezing, jumping or lifting?”</td>
<td>4.8 (2.0-11.7) 0.26 (0.12-0.55)</td>
</tr>
<tr>
<td>Cundiff et al, 1997</td>
<td>Retrospective</td>
<td>535</td>
<td>Occurrence of incontinence coincident with coughing, sneezing, lifting, and walking</td>
<td>3.4 (2.1-5.4) 0.64 (0.49-0.84)</td>
</tr>
<tr>
<td>Bent et al, 1983</td>
<td>Retrospective</td>
<td>81</td>
<td>Patients rate symptom of stress incontinence</td>
<td>2.6 (1.2-5.7) 0.08 (0.01-0.58)</td>
</tr>
<tr>
<td>Le Coutour et al, 1990</td>
<td>Prospective cohort</td>
<td>154</td>
<td>“Do you lose urine—when coughing or running—when walking or with minimal effort?”</td>
<td>1.5 (0.75-3.1) 0.20 (0.07-0.53)</td>
</tr>
<tr>
<td>Weidner et al, 2001</td>
<td>Retrospective</td>
<td>950</td>
<td>Any stress symptoms on history</td>
<td>1.5 (1.2-1.8) 0.21 (0.14-0.30)</td>
</tr>
<tr>
<td>Fantl et al, 1990</td>
<td>Prospective cohort</td>
<td>145</td>
<td>Symptoms of stress incontinence on history</td>
<td>1.5 (0.79-2.8) 0.36 (0.16-0.81)</td>
</tr>
<tr>
<td>Glezerman et al, 1986</td>
<td>Cohort (not clear if prospective)</td>
<td>105</td>
<td>Loss of urine during coughing, sneezing, or both</td>
<td>1.3 (0.41-4.3) 0.18 (0.03-1.09)</td>
</tr>
<tr>
<td>Sand et al, 1988</td>
<td>Prospective cohort</td>
<td>218</td>
<td>History of urine loss associated with stress (cough, Valsalva, running, sneezing)</td>
<td>1.3 (0.65-2.5) 0.94 (0.63-1.41)</td>
</tr>
</tbody>
</table>
ies\textsuperscript{13,14} that included both urge and mixed incontinence did not change these findings.

A study of 4500 women examined the relationship between overactive bladder symptoms (urinary frequency, urgency with or without urge incontinence) and an urodynamic diagnosis of detrusor overactivity (defined as detrusor contractions observed in the presence of urgency or urinary leakage during urodynamic studies).\textsuperscript{24} Urge incontinence is considered an overactive bladder symptom, but women can have overactive bladder symptoms without being incontinent in that they can have urinary frequency, urinary urgency, or both but always reach the toilet on time. The presence of overactive bladder symptoms increases the likelihood of accurately diagnosing detrusor overactivity (LR, 2.1; 95% CI, 1.8-2.3), although the absence of symptoms has little effect on the likelihood of diagnosing detrusor overactivity during urodynamics (LR, 0.83; 95% CI, 0.81-0.86).\textsuperscript{24}

**Questionnaires.** There are a number of questionnaires that have been developed to help diagnosis the type of urinary incontinence, and these questionnaires vary in their diagnostic usefulness (TABLE 3).\textsuperscript{25-37} Although the Modified Gaudenz-Incontinence questionnaire appears to increase the likelihood of accurately diagnosing both stress and urge incontinence, this questionnaire was designed for and has only been studied among Japanese women.\textsuperscript{25} The Bladder Instability Discrimination Index has acceptable LRs for diagnosing urge incontinence; however, it involves a complex calculation that is not practical in the clinical setting.\textsuperscript{26} Similarly, the 20-item questionnaire developed by Versi et al\textsuperscript{36} has acceptable LRs for diagnosing stress incontinence but requires computed statistical analysis to determine a score.

The patient-completed Questionnaire for Urinary Incontinence diagnoses contains 6 questions, of which 3 are intended to predict stress incontinence and 3 are intended to predict urge incontinence. The internal consistency (Cronbach \( \alpha \)) of the items pertaining to stress and pertaining to urge incontinence was 0.85 and 0.87, respectively. The test-retest reliability was good when measured in 79 women (67.5%) who responded to the first mailed questionnaire (median test-retest interval, 7 days; weighted \( k \) range, 0.66-0.93).\textsuperscript{27} This patient-completed questionnaire appears to increase the likelihood of correctly diagnosing urge incontinence (positive LR, 3.7; 95% CI, 1.6-9.0; negative LR, 0.27; 95% CI, 0.17-0.42), but is not as helpful in the diagnosis of stress incontinence (positive LR, 2.8; 95% CI, 1.6-4.9; negative LR, 0.21; 95% CI, 0.12-0.37).

**Accuracy of the Physical Examination in Diagnosing Urinary Incontinence**

Performing a physical examination is arguably important for ruling out significant pathology, such as obstruction, significant prolapse, and malignancy. We were unable to find any studies that addressed the physical examination for diagnosing the type of urinary incontinence that met our inclusion criteria, but there is some evidence supporting use of special tests such as the stress test.

**Stress Test.** The stress test, performed while the woman is supine or standing, involves observation for urine loss immediately on coughing or with a Valsalva maneuver. The test can be performed before the bladder is emptied, after emptying the bladder, or after filling the bladder with saline through a catheter. Five cohort studies of the stress test were identified (TABLE 4).\textsuperscript{38-42} All 5 studies were conducted in specialized clinics, with the age of the women ranging from 23 to 92 years. Three studies (a total of 582 women) involved empty-bladder supine stress tests.\textsuperscript{40-42} One study (41 women)\textsuperscript{39} conducted the supine stress test after the bladder was filled with 200

---

### Table 2. Studies Assessing the Role of the History in Diagnosing Urge Incontinence

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Question(s)</th>
<th>Likelihood Ratio (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown et al,\textsuperscript{27} 2006</td>
<td>Prospective cohort</td>
<td>301</td>
<td>3 questions in series: leak urine most often with the urge to empty the bladder</td>
<td>Positive: 3.3 (2.1-5.2), Negative: 0.32 (0.21-0.49)</td>
</tr>
<tr>
<td>Kirschner-Hermanns et al,\textsuperscript{18} 1998</td>
<td>Prospective cohort</td>
<td>130</td>
<td>Asked total of 5 incontinence questions: no leak with stress, less than 5 min warning</td>
<td>Positive: 2.2 (0.80-6.2), Negative: 0.80 (0.45-1.43)</td>
</tr>
<tr>
<td>Cantor and Bates,\textsuperscript{23} 1980</td>
<td>Cohort (not clear if prospective)</td>
<td>214</td>
<td>Involuntary loss of urine associated with urgency</td>
<td>Positive: 1.6 (1.1-2.5), Negative: 0.21 (0.10-0.43)</td>
</tr>
<tr>
<td>Bent et al,\textsuperscript{20} 1983</td>
<td>Retrospective</td>
<td>81</td>
<td>Patients rate symptoms of urge incontinence</td>
<td>Positive: 1.6 (0.73-3.7), Negative: 0.34 (0.09-1.24)</td>
</tr>
<tr>
<td>Fantl et al,\textsuperscript{29} 1990</td>
<td>Prospective cohort</td>
<td>145</td>
<td>Symptoms of urge incontinence on history</td>
<td>Positive: 1.3 (0.75-2.4), Negative: 0.57 (0.20-2.24)</td>
</tr>
</tbody>
</table>

©2008 American Medical Association. All rights reserved.
mL normal saline. The final study (37 women) looked at non–empty bladder supine and standing stress tests in which the stress test was conducted initially without emptying the bladder and repeated with controlled bladder filling only if the initial test was negative. These studies combined suggest that a positive stress test makes stress incontinence much more likely (summary LR, 3.1; 95% CI, 1.7-5.5; P for heterogeneity = .12), while a negative test result decreases the likelihood (summary LR, 0.36; 95% CI, 0.21-0.60; P for heterogeneity = .13).

A positive filled-bladder supine stress test result (LR, 9.4; 95% CI, 1.1-77.7) may be more accurate than a positive empty–bladder supine stress test result (LR, 2.8; 95% CI, 1.3-1.5; P for heterogeneity = .06) for confirming a diagnosis of stress incontinence. A negative filled-bladder supine stress test is helpful for finding women less likely to have stress incontinence (LR, 0.07; 95% CI, 0.01-0.39), whereas a negative empty-bladder supine stress test is less accurate (LR, 0.48; 95% CI, 0.34-0.68; P for heterogeneity = .56). Doing a more complicated stress test that uses a step-wise approach to bladder filling and combines supine and standing testing does not further improve diagnostic accuracy for stress incontinence (positive LR, 3.4; 95% CI, 0.97-12.1; negative LR, 0.19; 95% CI, 0.05-0.79).

The stress test performed with coughing appears to be a reliable test. A cohort study of 50 incontinent women found this to be a highly precise test for both positive and negative test results. Test-retest analysis demonstrated that in 32 of 35 women (91%), the test was positive both times and in 13 of 15 women (87%), it was negative both times (κ = 0.77). We did not identify any tests of reliability when the stress test involved a Valsalva maneuver.

### Table 3. Questionnaires Used to Diagnose Urge and Stress Incontinence

<table>
<thead>
<tr>
<th>Source</th>
<th>Questionnaire</th>
<th>Description</th>
<th>Sample Size</th>
<th>Sample Size</th>
<th>Likelihood Ratio (95% Confidence Interval)</th>
<th>Likelihood Ratio (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Urge Positive 0.14 (0.06-0.36) 10.1 (4.7-21.9) 0.18 (0.12-0.27)</td>
<td>Stress Negative 0.14 (0.05-0.41) NR NR</td>
</tr>
<tr>
<td>Ishikawa et al, 2000</td>
<td>Modified Gaudenz-Incontinence Questionnaire</td>
<td>15 Questions divided into stress and urge scores for Japanese women</td>
<td>198</td>
<td>198</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contreras Ortiz et al, 1993</td>
<td>Bladder Instability Discrimination Index</td>
<td>Mathematical model for diagnosing bladder instability</td>
<td>271</td>
<td>271</td>
<td>5.1 (3.6-7.2) 0.14 (0.05-0.41) NR NR</td>
<td></td>
</tr>
<tr>
<td>Bradley et al, 2005</td>
<td>Questionnaire for Urinary Incontinence Diagnosis</td>
<td>Score of ≥6 is cutoff for urge; ≥4 is cutoff for stress</td>
<td>117</td>
<td>117</td>
<td>3.7 (1.6-9.0) 0.27 (0.17-0.42) 2.8 (1.6-4.9) 0.21 (0.12-0.37)</td>
<td></td>
</tr>
<tr>
<td>Kujansuu and Kauppila, 1982</td>
<td>Urgency Score</td>
<td>10 Questions summarized into an urgency score</td>
<td>121</td>
<td>121</td>
<td>2.8 (1.8-4.2) 0.36 (0.22-0.59) NR NR</td>
<td></td>
</tr>
<tr>
<td>Basra et al, 2007</td>
<td>The Bladder Control Self-Assessment Questionnaire</td>
<td>Designed for self-assessment of overactive bladder symptoms</td>
<td>293</td>
<td>293</td>
<td>2.3* 0.24* NR NR</td>
<td></td>
</tr>
<tr>
<td>Dijkstra et al, 1990</td>
<td>Self-report of continence status</td>
<td>Based on answers to standardized set of questions</td>
<td>166 (urge) 161 (stress)</td>
<td>166 (urge) 161 (stress)</td>
<td>1.9 (1.2-3.1) 0.51 (0.23-1.14) 3.2 (2.0-5.2) 0.40 (0.29-0.56)</td>
<td></td>
</tr>
<tr>
<td>FitzGerald and Brubaker, 2002</td>
<td>Urogenital Distress Inventory–Short Form</td>
<td>Designed to evaluate symptom distress</td>
<td>293</td>
<td>293</td>
<td>1.6 (1.1-2.4) 0.57 (0.25-1.31) 3.4 (2.1-5.6) 0.51 (0.43-0.61)</td>
<td></td>
</tr>
<tr>
<td>Lemack and Zimmern, 1999</td>
<td>Dutch version of the Urogenital Distress Inventory and the Incontinence Impact Questionnaire</td>
<td>Designed to evaluate symptom distress and life impact of incontinence</td>
<td>95</td>
<td>95</td>
<td>1.4 (1.2-1.7) 0.18 (0.03-1.25) NR NR</td>
<td></td>
</tr>
<tr>
<td>van Brummen et al, 2004</td>
<td>Gaudenz-Incontinence Questionnaire and urge</td>
<td>26 Questions related to stress and urge</td>
<td>1911</td>
<td>1911</td>
<td>1.4* 0.68* 1.0* 0.99*</td>
<td></td>
</tr>
<tr>
<td>Haessler et al, 1995</td>
<td>Bristol Female Lower Urinary Tract Symptom Questionnaire</td>
<td>Designed to assess urinary symptoms</td>
<td>69</td>
<td>69</td>
<td>NR NR 5.7* 0.86*</td>
<td></td>
</tr>
<tr>
<td>Khan et al, 2004</td>
<td>Computer-based score</td>
<td>Calculated from answers to 20 questions</td>
<td>252</td>
<td>252</td>
<td>NR NR 5.0 (3.3-7.5) 0.26 (0.19-0.37)</td>
<td></td>
</tr>
<tr>
<td>Versi et al, 1991</td>
<td>Detrusor Instability Score</td>
<td>Scoring questionnaire (cut point = 5)</td>
<td>250</td>
<td>250</td>
<td>NR NR 2.6* 0.52*</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: NR, not reported.

*Unable to calculate 95% confidence interval from data available.
Q-Tip Test. Two relevant studies met the inclusion criteria. One study was a retrospective study that used a cutoff angle of 20° and involved 138 women (90 with stress incontinence and 48 without stress incontinence) aged in their 50s attending an urogynecology clinic. The second study was a case-control study with 79 cases and 36 controls and a cutoff angle of 35° from horizontal with straining. These women ranged in age from 32 to 74 years and were recruited from an urodynamic unit (cases) or gynecology clinic (controls).

Based on these 2 studies, a positive Q-tip test does not contribute to the diagnosis of stress urinary incontinence with an LR of 1.38 (95% CI, 0.91-2.09), although a normal test result decreases the likelihood of stress incontinence (LR, 0.41; 95% CI, 0.22-0.76). There was no significant heterogeneity between the studies (all P > .29), but the reproducibility of the Q-tip test has not been reported. It is not clear if the angle change in these studies confirms an incontinence problem, but it can be concluded that the pad test is not an accurate method for diagnosing urge incontinence.

Pad Test. Only 1 study in which urodynamics test results were compared with home pad test results met our inclusion criteria. The comparison included 62 patients with an urodynamically diagnosed stress incontinence and 43 with no urodynamic abnormality. A positive pad test increases the likelihood of an incontinence problem (LR, 3.3; 95% CI, 2.0-5.4). A negative pad test makes an incontinence problem much less likely (LR, 0.11; 95% CI, 0.03-0.27). Given that patients with other types of incontinence were not included in this study, it can be concluded that the pad test confirms an incontinence problem, but it is less clear if it can be used in the clinical setting of research studies.

Larsson Frequency/Volume Chart Nomogram. Larsson et al compared the readings of a 48-hour urine frequency/volume chart to the urodynamic diagnoses of urge or stress incontinence. Study participants recorded the number of times they urinated over 48 hours, and recorded the volume of each micturition. These data were used to develop the Larsson chart.

A subsequent retrospective study of 216 patients found that the optimum cutoff point for diagnosing urge incontinence was at a probability of 0.6 on the Larsson chart (sensitivity, 52%; specificity, 70%; positive LR, 1.7). A cutoff point of 0.3 probability was optimum for identifying women less likely to have urge incontinence (sensitivity, 66%; specificity, 69%; negative LR, 0.53), indicating that the chart is not an accurate method for diagnosing urge incontinence.

Postvoid Residual Urine Volume. Postvoid residual urine volumes are measured, either with a bladder scanner or through in-and-out catheterization, to help diagnose urinary retention. A postvoid residual urine volume of more than 100 mL is considered inadequate bladder emptying. No studies of postvoid urine volume measurement as a test for determining urinary incontinence type met the inclusion criteria. However, this is a test commonly used in clinical practice when overflow urinary incontinence is suspected. It is also an important test for older women with urge incontinence because of their increased risk of having detrusor hyperactivity with impaired contractility. These women are at increased risk of developing urinary retention and overflow incontinence when treated with anticholinergic medications.

Accuracy of the Overall Clinical Assessment

Four studies assessed the accuracy of the clinical diagnosis of stress urinary incontinence, established using a systematic approach to the assessment and confirmed with reference standards that included urodynamic studies (Table 5). The first study involved 863 consecutive women...
referred to an urogynecology clinic where they underwent a detailed history using a standardized questionnaire, physical examination, and stress test. The second study\textsuperscript{50} enrolled 408 women aged 18 to 78 years, who presented with urinary incontinence to a gynecologist or urologist during a 29-month period. These women underwent a standardized history, physical examination, and postvoid residual urine measurement; the office diagnosis was based on the presenting symptom complexes. The third study\textsuperscript{51} involved a retrospective chart review of 77 women who had presented to an urogynecology clinic complaining of urinary incontinence. The clinic evaluation included history taking, physical examination, postvoid residual urine measurement following voiding into a urine flow meter, stress test during and after filling of the bladder to capacity using a catheter, and evaluation for leakage associated with a strong sense of urgency, while listening to running water or splashing hands in a basin of warm water, when the bladder was filled to capacity. The clinical diagnosis was based primarily on the results of these later 2 tests. The fourth study\textsuperscript{52} involved the separate assessment of 2 different groups of women (101 and 45) at a continence clinic, using the same assessment methods. The assessment included medical history; completion of a modified version of the validated Medical, Epidemiologic, and Social Aspects of Aging (MESA) Urinary Incontinence questionnaire; and focused physical examination, including pelvic examination, stress test, and postvoid residual urine measurement.

There appears to be value in doing a systematic evaluation to help diagnose stress incontinence (positive LR, 3.7; 95% CI, 2.6-5.2; P for heterogeneity = .14; negative LR, 0.20; 95% CI, 0.08-0.51; P for heterogeneity < .001) (Table 5).\textsuperscript{49-52} In the 2 studies that evaluated urge incontinence,\textsuperscript{05,53} a comprehensive clinical assessment is less helpful in confirming a diagnosis (positive LR, 2.2; 95% CI, 0.55-8.7; P for heterogeneity = .01; negative LR, 0.63; 95% CI, 0.34-1.17; P for heterogeneity = .13).

Another cohort study,\textsuperscript{53} involving 50 women aged 65 years or older, examined the role of simplified diagnostic tests (history, physical examination, postvoid residual measurement, stress test, and other simple bladder filling tests using a catheter) conducted by a nurse practitioner in conjunction with a clinical algorithm. The objective of the algorithm and simplified tests was to diagnose reversible causes of incontinence, to identify patients who should be referred to a specialist for further evaluation, and to appropriately prescribe medical therapy without the need for urodynamic testing. Based on these data, a standardized approach used by a nurse practitioner provides results that may help confirm (positive LR, 4.6; 95% CI, 1.7-12.6) or exclude (negative LR, 0.11; 95% CI, 0.04-0.33) a diagnosis of urge incontinence among older women.

**Limitations**

Given the controversy around the role of urodynamics in diagnosing urinary incontinence, we chose to include studies that used urodynamic studies, expert opinion, or both as the reference standard for diagnosis. This definition of the reference standard best reflects current clinical practice, in which a definitive diagnosis is determined by an expert with or without the aid of urodynamic findings. Using the clinical examination, with or without additional tests, to make a definitive diagnosis is not unique to urinary incontinence, but also occurs in the diagnosis of arthritis, dementia, and Parkinson disease. However, including expert opinion as the reference standard might raise concern of incorporation bias.

Of the 40 included studies, 6 included expert opinion within the reference standard.\textsuperscript{5,22,27,29,37,50} Two of these studies\textsuperscript{6,22} compared the diagnostic accuracy of questions asked by a nurse with a comprehensive assessment by an expert (gynecologist, urogynecologist, or urologist) blinded to the answers of the questions. In the 1 study,\textsuperscript{5} the expert’s assessment included urodynamics. Excluding these 2 studies from the meta-analysis did not change the conclusions regarding the role of questions in diagnosing urge incontinence (new summary positive LR, 3.8; 95% CI, 1.8-7.8; new summary negative LR, 0.52; 95% CI, 0.39-0.71) or stress incontinence (new summary positive LR, 2.0; 95% CI, 1.4-2.7; new summary negative LR, 0.38; 95% CI, 0.23-0.64). Three other studies compared results of standardized questionnaires (2 questionnaires were completed by patients\textsuperscript{27,29} and 1 questionnaire was completed by a specialized nurse\textsuperscript{37}) with an assessment by an expert (including urodynamics in 2 studies\textsuperscript{27,37}) blinded to the questionnaire results. The LRs for these questionnaires were comparable with other questionnaires examined. The sixth study\textsuperscript{50} involved the overall clinical assessment in diagnosing stress incontinence. This study compared the overall clinical assessment to the overall clinical assessment with urodynamics, where the expert making the diagnosis based on just the overall clinical assessment did not have access to the urodynamic results. Excluding this study from the meta-analysis did not change the value of the overall clinical assessment in diagnosing stress incontinence (new summary positive LR, 3.7; 95% CI, 2.3-6.0; new summary negative LR, 0.20; 95% CI, 0.05-0.73). Therefore, we do not feel that including these 6 studies within this review resulted in biased conclusions.

The data for the overall clinical examination were all from studies of patients evaluated by specialists, suggesting possible uncertainty as to whether the results would generalize to an evaluation performed by a primary care physician. Although each specialist physician might have performed a slightly different examination, the overall clinical assessment is understandable in that it involves a focused history, physical examination, and simple specialized tests. A study with a nurse practitioner doing a similar clinical assessment had results comparable with that of the specialists. Therefore, it is rea-
sonable to assume that the results could be replicated in a generalist’s office.

SCENARIO RESOLUTION

On review of symptoms, the patient reports urine loss in association with urgency and on 1 occasion she lost urine when coughing. Her physical examination is unremarkable. A filled-bladder stress test is negative for urine leakage. Her postvoid residual urine volume is 30 mL, which is within the normal range of 100 mL or less. Her urinalysis has no abnormal findings.

Her pretest probability for urge incontinence is approximately 67% (pretest odds = 0.67/[1-0.67] = 2.0), while her pretest probability for isolated stress incontinence is approximately 25% (pretest odds = 0.25/[1-0.25] = 0.3). Her history supports a diagnosis of urge incontinence (positive LR, 4.2), giving a posttest probability of 89% (posttest odds = 2.0 × 4.2 = 8.4). Her negative filled-bladder stress test decreases her probability of stress incontinence (negative LR, 0.07), with a posttest probability of 89% (posttest odds = 0.3 × 0.07 = 0.02).

Based on the assessment, she has urge incontinence. All the appropriate treatment options can now be discussed with this patient.

THE BOTTOM LINE

When evaluating a woman with urinary incontinence, a systematic approach that includes a history, physical examination, and stress test increases the likelihood of correctly classifying the type of incontinence (for stress: positive LR, 3.7; negative LR, 0.20; and for urge: positive LR, 2.2; negative LR, 0.63). The most helpful component of the assessment for determining the presence of urge incontinence is a history of urine loss associated with urinary urgency (positive LR, 4.2).

A stress test (preferably a filled-bladder stress test) may be helpful for diagnosing stress incontinence (filled-bladder stress test: positive LR, 9.4; negative LR, 0.07). For primary care physicians unable to perform stress tests in their office, it would be reasonable to refer patients for further evaluation when a diagnosis is needed with more certainty. Measurement of the postvoid residual urine volume detects incomplete bladder emptying, but no data support using this in women for separating out incontinence type.

Author Contributions: Dr Holroyd-Leduc had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Holroyd-Leduc, Tannenbaum, Straus.

Acquisition of data: Holroyd-Leduc, Straus.

Analysis and interpretation of data: Holroyd-Leduc, Tannenbaum, Thorpe, Straus.

Drafting of the manuscript: Holroyd-Leduc, Straus.

Critical revision of the manuscript for important intellectual content: Tannenbaum, Thorpe, Straus.

Statistical analysis: Thorpe, Straus.

Administrative, technical, or material support: Holroyd-Leduc, Straus.

Study supervision: Tannenbaum, Straus.

Financial Disclosures: Cathleen Colon-Emeric, MD, and Joanne T. Piscitelli, MD (Duke University, Durham, North Carolina), provided advice on earlier versions of the article. Drs Colon-Emeric and Piscitelli did not receive any compensation for their contribution.

REFERENCES


©2008 American Medical Association. All rights reserved.

(Reprinted) JAMA. March 26, 2008—Vol 299, No. 12 1455

Downloaded from www.jama.com at American University of Beirut on February 1, 2010


Education should have two objects: first, to give definite knowledge, reading and writing, language and mathematics, and so on; second, to create those mental habits which will enable people to acquire knowledge and form sound judgments for themselves.

—Bertrand Russell (1872-1970)