Urinary Incontinence in Elderly Women: Clinical Findings

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Two-hundred women self-described as having urinary incontinence, aged 55 to 90 years and living in the community completed a comprehensive history and physical examination. Initial presentation of urine loss was most commonly stress incontinence symptoms (35%). Scoring of peak response to volume lost and frequency revealed urine loss necessitating a clothing change for 78% and daily loss experienced by 73%. Over half had experienced a urine loss problem for more than five years. Most (65%) had sought treatment, but a minority reported current (11%) or previous (36%) treatment. Thirty-six percent were found to have severe atrophic vaginitis with severe urethocele (10%), cystocele (13%), rectocele (12%) less common. Pelvic floor strength by clinical scoring was weak (mean, 1.05 on a 5-point scale). The vaginal electromyograph first contraction peak mean was 5.94 microvolts sustained at 50% or better for 3.92 seconds. Clinical criteria established that 66% had stress, 27% a mixture of stress and urge, only 4% pure urge incontinence, and 4% other. J Am Geriatr Soc 35:933–939, 1987

Inconvenient to say the least, urinary incontinence in the elderly may cause physical discomfort, disrupt social life, undermine self-confidence, and ultimately determine one's fate, eg, a need for institutionalization. It is defined as an objectively demonstrated condition of involuntary urine loss with social or hygienic impact.[1] British and American data indicate that 22 to 30% of those 65 years of age and older have occasional or regular urinary incontinence, with the older female almost twice as likely as the older male to experience this difficulty.[2,3] In long-term care, where females outnumber males by more than two to one, estimates from national samples denote 35 to 55% of patients incontinent of urine.[4,5] Thus, uncontrolled urine loss in the elderly is a significant clinical problem, especially for women.

Relevant, prior studies of urinary incontinence in community-living adults may be organized into two groups, those of a questionnaire survey design[2,3,6–10] and those of a clinical, documentation nature including urodynamic evaluation.[12–17] The former are characterized by large sample sizes, most randomly selected and responding to interview formats.[7–10] They vary in the extent of data reported and the attention directed to age and sex demarcation. In general, these studies show that urine loss among incontinent adults is relatively infrequent, usually on a monthly or episodic pattern, with urine loss less than a tablespoon.[7,8,10] The cause of urine loss for women, classified by symptomatology, was most frequently stress urinary incontinence.[6,8,10] These surveys provide limited detail of subject characteristics and rely wholly on subjective response.

Clinical studies tend to have smaller, convenient samples which derive from studies in geriatric,[14,15] obstetric/gynecology,[12,15] or urology departments.[13,17]

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There is an explicit or implied outpatient setting, but often patient-residence detail, as well as symptomatology and relevant history, are missing, and there is variation in the extent of urodynamic evaluation and methodology. In contrast to the prevalence studies, most of these investigations found urge urinary incontinence the predominant cause of uncontrolled wetting, and in the one exception it was a close second.[14] Variance between clinical (history and physical) and urodynamic evaluation was commonly acknowledged, with greater accuracy attributed to the latter, especially in distinguishing pure stress incontinence from a combination of stress and urge and in identifying atonic bladder.[10]

Because prior studies present a variety of limitations, knowledge about urinary incontinence in elderly, community-living women is incomplete. Thus, a comprehensive study was done to determine the characteristics and etiology of urinary incontinence in a sample of at least 400 women 55 years of age and older who are living in the community and are self-described as having uncontrolled urine loss. A further purpose is to evaluate specific exercise in comparison to conventional drug treatment for the anticipated two major types of urinary incontinence: stress and urge incontinence. This paper reports clinical data from 200 women who have completed the diagnostic phase of the study. A companion paper presents urological evaluation data and provides comparison between the two data sources.[11]

METHOD

Subject selection criteria included a female, 55 years of age or older at the last birthday, self-described as having uncontrolled urine loss of any degree, not a nursing home resident, able to read and understand a research consent form, able to speak and hear conversation adequately, and willing to participate in the study as evidenced by consent form signing. Subject recruitment materials consisted of an informational brochure, a form letter to health professionals, posters, newspaper notices, and an informational slide/tape program. Recruitment strategies included selected mailings and various site distribution of informational materials, contact with senior citizen newsletters, attraction of public newspaper interest, provision of informational programs for professional and public meetings, and participation in senior citizen radio programs and television health programs.

Over a period of approximately two years and eight months 225 eligible subjects entered the study. The attrition rate prior to completion of data collection was 11% (N = 25), predominantly because of subject reconsideration of the required urodynamic evaluation with subsequent refusal (17 of 25 who left the study). Table 1 displays the source of subject referral for those who completed data collection. Fifty-three percent self-referred, reflecting intense recruitment efforts. Professional referrals accounted for 39% of subjects; most of these (60%) were from physicians. Referral patterns differed substantially by age group with younger women more likely to be self-referred while older women were more often referred by a health professional.

Subjects were seen by appointment in an outpatient clinic. The history of urine control difficulty was gathered by a 120-item questionnaire-guided interview lasting approximately 45 minutes. The questionnaire was derived from an extensive literature review of urological history gathering and instruments, combined with piloting in a continence clinic for older people which was jointly maintained by the authors. A specially trained nurse interviewer sought detailed information about the presentation, pattern, and management of wetting; specific urological symptomatology; voiding pattern; health history including, prescription and over-the-counter medications; and general demographic data. Each completed questionnaire was independently reviewed for clinical accuracy by one of the nurse investigators. Any question of inconsistency was resolved through discussion between the interviewer and the investigator with occasional repeated interviewing on selected questions. In addition, the subject was given a 53-item history form for completion at home; this sought information

TABLE 1. SUBJECT REFERRAL SOURCE BY AGE GROUP*

Age (Yr)	Referral Source†			Subjects (N)
	Self	Professional	Family/Friend	
55–90	53%	39%	8%	200
55–64	73%	21%	6%	78
65–74	50%	43%	7%	70
75–90	27%	62%	12%	52

*Patterns of referral differ significantly by age group $\chi^2 = 27.7$; $P < .01$.

†Percents add to 100% in each row (except for rounding effects).

regarding sociodemographics, health status, personal and familial urine control patterns, and attitudes/beliefs about urinary continence/incontinence. A research associate reviewed each of these forms for thoroughness and clarity, resolving difficulties with subjects as possible.

A physical examination was performed by a specially trained nurse practitioner utilizing a 62-item data collection form developed and tested collaboratively by the authors. General health parameters were assessed such as weight, blood pressure, vision, cardiac and respiratory status, mobility, and mental function, as judged by the examiner. Screening for abnormal neurological signs and a thorough pelvic examination were done. This included evaluation and, if present, grading of the following: atrophic vaginitis, urethrocele, cystocele, rectocele, uterine prolapse, and enterocele. Standards for evaluation were set by the urologist author who provided special training for the certified nurse practitioner investigator. Reliability of screening between nurse examiners was tested on a regular basis with all clinical abnormalities checked, no variance on gross measures, and agreement within 0.5 on a 5 place observational scale (eg, cystocele grade scale 0–4).

The subject's pelvic examination included both a clinical and instrumental evaluation of pelvic floor muscle strength. The clinical measure required the subject to squeeze the perivaginal muscles around one or two of the examiner's fingers. Strength was subjectively assessed on a 5-point scale (0, no muscle contraction, to 4, strong muscle contraction) for both lateral and anterior-posterior contractions. A comparison of independent nurse examiner scores for 45 subjects was found to be highly significant (Pearson R, .91, $P < .01$ for lateral; Pearson R, .92, $P < .01$ for anterior-posterior). The instrumented pelvic floor muscle strength measure was a vaginal electromyography surface sensor (Electronic Perineometer™ PP-100, Farrall Instruments) connected to a digital/analog converter (ISAAC, Cyborg) and a microcomputer (Apple IIe, Apple Computer). Muscle strength was measured in microvoltage units from 1 to 60, increased voltage indicating strength. There are no published reliability or validity data for this instrument. Correlation between both the clinical lateral and anterior posterior score and the ISAAC acquired perineometer score ($N = 168$) was significant (Pearson R, .40; Pearson R, .49; $P < .01$).

Subjects were asked to demonstrate increased abdominal pressure at two points in the examination, before and during the pelvic evaluation. Before the pelvic evaluation, the women were directed to the toilet for a standing stress test, ie, in an upright position before emptying their bladder. They held a piece of folded tissue over the urethral area to catch any leakage while they coughed once or twice. The tissue was evaluated by the examiner as negative (no leakage) or positive (any leakage). During the pelvic evaluation subjects performed a lying stress test, ie, they were asked to cough vigorously several times while the examiner observed the urethral orifice for urine leakage. Physical examination also included an analysis of a midstream urine specimen. Samples with ten or more white blood cells per high-powered field were followed by catheterized specimen for culture and sensitivity. Newly discovered bladder infections were treated and subsequent urinalysis determined to be negative prior to any further evaluation. Subjects were not routinely catheterized for post void residual because the study was designed to evaluate this parameter during urodynamic testing. Catheterization was done if, in the examiner's judgment, it was warranted for palpable bladder, suspicion of overflow by history, or for bladder urine samples in cases of urinalysis abnormalities. The physical examination took about 45 minutes to complete out of the one and one-half hours required for the initial clinic visit.

Clinical diagnosis was made on the basis of both history and physical examination findings. Stress urinary incontinence was the diagnosis if the subject was positive to any of the following: history questions of loss of urine on increased abdominal pressure, position changing, and/or demonstrated leakage of urine during the standing or lying coughing test. Urge urinary incontinence was the diagnosis if the subject reported loss of urine immediately following an urge to toilet and nocturia of three or more times per night. This criterion was chosen to attempt to distinguish sensory from motor urge in this incontinent sample. It was thought that sensory urge might be often elicited during waking hours in relation to social cues and/or positional changes, a factor which might confound answers to the question of loss of urine immediately following an urge to toilet. Nocturnal bladder behavior might be a helpful additional indicator of detrusor function. Three or more was the frequency chosen based on clinical belief that while a frequency of one to two is common, more than this is characteristic of detrusor hyperactivity. Mixed incontinence was the diagnosis for combinations of stress and urge findings as noted. Those subjects not meeting these diagnoses were grouped as "other." At the completion of this intake session subjects were taught how to measure and record fluid intake/urine output and were given a toilet fitting urine collector and instruction sheets. Each was instructed to keep careful intake/output detail including all urine wetting episodes for a minimum of four days and nights. In addition to oral and written descriptions of the study format, as presented in consent documentation, subjects received an informational guide to the two-hour uro-

TABLE 2. PRESENTING UROLOGICAL SYMPTOM BY AGE GROUP*

Age (Yr)	Incontinence Symptom†						Subjects (N)
	Stress Loss	Urge Loss	Mixed Loss	Multiple	Dribble	Other	
55–90	35%	26%	22%	12%	5%	2%	200
55–64	42%	26%	24%	6%	0	1%	78
65–74	37%	23%	23%	13%	3%	1%	70
75–90	19%	29%	15%	19%	15%	2%	52

*Presentation of urological symptoms differ significantly by age group $\chi^2 = 26.9$; $P < .01$.

†Percents add to 100% in each row (except for rounding effect).

dynamic evaluation that would occur on their next research visit. This guide presented sequenced, nontechnical facts about each subsequent bladder test such as the urine stream test (uroflowmetry), the muscle test (sphincter electromyography), the bladder test (cystometry), and the coughing and X-ray test (urodynamic stress test, simultaneous bladder and urethral pressures, and cystourethrography). Usually within two weeks of urodynamic evaluation subjects returned for a third clinic visit for a diagnostic summary and discussion of treatment options including participation in the treatment evaluation part of the study.

This paper presents a description of the study sample with an emphasis on clinical evaluation. It will neither discuss nor compare the urodynamic evaluation (presented in the following companion article) nor the treatment phase of the study which will be presented later.

RESULTS

The 200 women ranged in age from 55 to 90 years of age (mean, 68.5 years; SD, 8.7); 96.5% were white. The majority (74%) resided in their own home, the remainder in apartments (24%) or foster homes/homes for the aged (3%). Slightly less than half (45%) lived alone with almost an equal number living with their spouse (44%); a minority (11%) lived with other family members, friends, or in congregate arrangements. These were well-educated women; most (60%) had partial college experience extending to graduate school degrees, 23% had high school diplomas, and 17% had less than a high school education. There was no substantial or significant association between educational level and age group.

Table 2 displays the presenting urological symptom by age group. The most common complaint was of stress urine leakage (35%), followed by urge loss in 26%. When the presenting urological symptom was analyzed by age group, the frequency of stress urine loss complaint decreased with age.

Table 3 reports the characteristics of self-reported uncontrolled urine loss as reflected by extent, frequency, and duration of incontinence. Extent and frequency have been scored as the subject's peak response on several questionnaire items. More than three-fourths (78%) of these women had experienced large-volume urine loss. Seventy-three percent of women were incontinent daily with another 20% weekly or more often. Over half the sample (56%) had experienced a urine loss problem for over five years, two-thirds of these for ten years or longer. Age group was not significantly associated with these variables ($P > .05$).

Sixty-five percent of subjects remembered seeking help in the past for their urinary incontinence. However, only 11% reported any current urological treatment while 36% recalled previous medical treatment for the problem. Twenty-six percent of women reported some type of abdominal surgery for "bladder repair." Day toileting patterns by history yielded a range of 3 to 35 toilet visits (mean, 9.6; SD, 4.6). Twenty

TABLE 3. CHARACTERISTICS OF PRESENTING URINE LOSS

	Extent*		Frequency		Duration	
	Damp	22%	Daily	73%	1 yr	10%
	Wet	14%	Weekly	20%	1–5 yr	35%
	Down legs	27%	Monthly	7%	5–10 yr	19%
	Pools	36%	Yearly	1%	>10 yr	37%
Sample size†		197		186		197

*Percents add to 100% in each column (except for rounding effect).

†Three subjects presented initially with other than incontinence symptoms and 11 subjects reported the frequency of their loss as too variable to categorize.

percent of the sample denied nocturia. For the remainder, nightly toileting ranged from 1 to 10 (mean, of 2.5; SD 1.6). Sixteen percent reported bed wetting. Self-reported obstetrical/gynecological history revealed that most (85%) had been pregnant and given vaginal birth from one to eleven children with a mean birth rate of 3 among those having delivered children. Almost half (47%) reported having had a hysterectomy and, with one exception, all were postmenopausal. Age group was not significantly associated with any of these variables ($P > .05$).

The majority of women (70%) reported their health to be good to excellent with age and self-reported health status negatively correlated (Spearman rho, $-.23$; $P < .01$). The oldest age group was significantly more likely to report fair to poor health. In addition, subject health perception was significantly correlated to health status as judged independently by the nurse examiner (Spearman rho, .35; $P < .01$). Evaluation of function revealed that 90% had normal or corrected vision, 88% normal or corrected hearing, and 91% could walk without an aid. Ninety-four percent showed no apparent evidence of memory or orientation difficulty as evaluated by orientation, ease and logic of recall, and ability to follow directions during history and physical examination. Evidence of chronic disease was found in 86% of the sample, including cardiovascular (51%), musculoskeletal (50%), gastrointestinal (28%), metabolic (25%), pulmonary (12%), and diseases and neurological disorders (12%). The presence of chronic disease was not significantly associated with either stress or urge clinical diagnosis. One hundred sixty-six women reported taking prescription drugs, most frequently thyroid (30%), antiinflammatory agents (30%) (usually nonsteroidal), diuretics (29%), vitamins (28%), and antihypertensives (27%). These medications were not significantly associated with clinical diagnostic group ($P > .05$).

Sixteen women in the sample were found to have a current urinary tract infection with the youngest age group less likely to be infected ($\chi^2 = 15.44$; $P < .05$). A majority (56%) of those with current urinary tract infections reported a history of recurrent episodes. *Escherichia coli* was the most common bacteria (56%) identified in the 16 positive cultures.

One hundred twenty-nine (64%) of the study subjects performed the standing stress test; the exclusions predominately due to subject inability to delay toileting or inadvertent tissue discard before examiner evaluation, and to the first 20 in this series who were not given the standing stress test. Forty-four percent of these tested had a positive standing stress test despite variation in the bladder volume and fullness. Fourteen percent of those performing the lying stress test (N = 197) leaked a few drops to a stream of urine.

Twenty-two women were catheterized; of the 22 women, only four (18%) were catheterized because of a palpable bladder noted on abdominal examination with the remainder to obtain urine for culture and sensitivity in response to positive urinalysis (some individuals were catheterized for both reasons). Residual urine for those thought to have retention ranged from 125 to 200 cc (mean, 158 cc).

Atrophic vaginitis was graded on a scale from 0 to 4 in order of increasing severity. Thirty-six percent of the women were found to have either grade 3 or 4 with the youngest group less likely to have severe atrophic vaginitis and the oldest group most likely ($\chi^2 = 38.74$; $P < .01$). Urethrocele, cystocele, and rectocele were similarly graded. Of the three, severity (grade 3 or 4) was most common in cystocele (13%), followed by rectocele (12%), and urethrocele (10%). Age group was not significantly associated with these findings ($P > .05$).

Clinical anterior-posterior perivaginal muscle contraction ranged across the scale: 0 (none) to 4 (very strong) (mean, 1.05; SD, .83) for the 180 women evaluated on this measure. Only 177 women were tested with the comprehensive vaginal electromyography (EMG) unit, representing measurement evolution in this clinical study. Following clinical perivaginal strength assessment, the vaginal probe was inserted and subjects were asked to contract the perivaginal muscles around the probe as strongly as possible and to hold it as long as possible. Peak microvoltage ranged from .20 to 20 (mean, 5.94; SD, 4.04). These contractions were sustained at 50% or better for an average of 3.92 seconds (range, 0 to 45; SD, 5.7). Clinical anterior-posterior pelvic floor muscle strength significantly decreased with age (Pearson R, $-.19$; $P < .01$) but was not significantly associated with clinical diagnostic group. However, the mean vaginal myography score for six ten second contraction trials was very low (2.53) and was significantly associated with clinical diagnostic group (ANOVA, $P < .05$). Those judged to have clinical stress or other type of incontinence had higher scores, on average a score of 2.68 microvolts in contrast to 1.78 microvolts for those with urge or mixed.

Usable subject fluid intake/urine output diaries were returned by 184 (92%) who kept recordings from 1 to 20 days (mean, 4.7 days; SD, 2). Fluid intake averaged 1700 mL and urine output 1730 mL; fluid intake was not correlated with age, while urine output decreased as age increased (Pearson R, $-.30$; $P < .01$). Wetting episodes were recorded by 76% with a mean of 1.92 episodes per day; increasing age was not significantly associated with self-reported wetting episodes (Pearson R, .40; $P > .05$).

A clinical diagnosis of stress incontinence was made if subjects gave a positive response to any of three history questions and/or demonstrated stress loss

during examination. One hundred and eighty-five women met these clinical criteria; 132 (71%) as pure stress and 53 (29%) as stress and urge mixed. Ninety-eight percent of the clinical stress incontinence women met the criteria through positive history responses. Positive response to such questions was not associated with age group (χ^2 14.54; $P = .41$). As a single item loss of urine on position change elicited more positive responses than the other stress loss questions. Only four subjects denied stress loss on history but demonstrated such loss during standing or lying stress testing done without instrumented bladder filling.

A clinical diagnosis of urge incontinence was made if subjects reported loss of urine immediately after a toilet urge and nocturia of three or more times on history. Sixty-one women met this criteria with only eight as pure urge and the majority (88%) in combination with stress. Fifty-eight percent of those responding positively to the urge loss history question reported nocturia of less than three, and 10% of those reporting nocturia of three or more denied urge urine loss but met stress incontinence clinical criteria. Only 4% of the sample met neither clinical diagnosis criteria, although one of these reported nocturia of three or more only and four acknowledged urge urine loss without such nocturia. Additional frequency and bladder volume variables were considered. Both diary day frequency of nine or more voids and nocturia of three or more were significantly associated with clinical diagnosis. Those subjects judged to have clinical stress incontinence only were more likely to record a day frequency of less than nine voids (χ^2 16.01; $P < .01$), and nocturia of less than three (χ^2 17.53; $P < .01$). Although neither mean daily intake or output were significantly associated with clinical diagnostic group, the diary mean daily volume per void was. Those subjects judged to have either clinical urge or mixed incontinence had significantly different volumes (ANOVA, $P < .01$), on average 160 cc in contrast to 217 cc for those with stress or other clinical diagnoses.

DISCUSSION

This sample of urinary incontinent older women is atypical in terms of education. The 1983 national median for education in older females was 11 years, ie, not a high school graduate.[17] Yet, 83% of this sample had a high school diploma or higher degree, reflecting the study's location in a small midwestern city which houses a large University and other academic and research institutions. In contrast to findings from prevalence surveys,[2,3,6–9] these women had predominantly frequent, large volume loss. The decision to score peak response rather than estimated typical response as well as the selectivity of this sample probably account for this difference. Nonetheless it is interesting to observe the predominately long experience of urinary incontinence with lack of effective treatment in these essentially well-educated, healthy women.

Similar to prior studies,[6,8,10] presenting symptoms described stress urinary incontinence most often and, in this study, a comprehensive history and physical examination supported its predominance. Immediate loss of urine after an urge to toilet was common, reported in 78% of the women. Nocturia of three or more was less common, reported by 35%, and recorded by 29% of those completing diaries. However, nocturnal frequency as a clinical measure for detrusor hyperactivity is problematic. The sample varied by sleep pattern and duration, factors not taken into account. Altered urinary excretion as a function of chronic illness or its treatment, as well as fluctuations in general physical and mental health may effect night toileting. Using the criteria of both reported urge loss and nocturia of three or more; only 31% of the sample had clinical urge incontinence alone or in combination with stress.

The overall pattern of toileting by history showed behavior more typical of frequency than the norm which is thought to be six to eight voids per day with one at night in contrast to a day mean of 9.6 and a night toileting mean of 2.5 for this sample. A current urinary tract infection or retention as evidenced in abdominal examination were uncommon. However, a simple standing stress test yielded positive results in almost half the women tested on this measure. Severe urethrocele, cystocele, and rectocele were uncommon but severe atrophic vaginitis was observed in more than a third.

Pelvic floor strength as measured by a clinical scoring method was minimal. Such scoring should be evaluated in a similar age but continent sample. Limited normative data have been reported for the vaginal myography unit used. Perry and Whipple tested the device with approximately 150 women aged 21 to 63 years of age (mean age, 34 years).[19] "Average" women scored a mean of 8.77 microvolts in six ten second contraction trials while those with histories of stress incontinence scored two to four microvolts lower. Women in our sample scored on average only 2.53 microvolts for those contraction trials but our sample's age mean was much higher. In contrast to Perry and Whipple's finding, women with clinical stress or other type incontinence in our sample scored differently and on average higher than those with urge or mixed clinical diagnoses on the contraction trials. However, higher was still a mean score of only 2.68 in contrast to 1.78 microvolts. Pelvic floor strength measured both clinically and by vaginal myography will continue in those women able to participate in

the current treatment evaluation phase of this study. Both measures have potential usefulness for the clinician.

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