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Urgency Urinary Incontinence in Women ≥ 50 years: Incidence, Remission and Predictors of Change

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Abstract

Objectives—To estimate 2 year incidence, remission and predictors of urgency urinary incontinence (UUI) in a community based population of women ≥50.

Methods—We analyzed 2004–2006 data in the Health and Retirement Study. Subjects were women ≥ 50 with baseline and follow-up UUI information. UUI incidence and remission were calculated. Predictors of UUI progression and improvement were estimated controlling for age, ethnicity, body mass index (BMI), parity, psychiatric illness, medical co-morbidities, functional limitations and stress urinary incontinence (SUI). We evaluated whether baseline UUI status predicted follow-up status and used multivariable logistic regression to identify predictor variables.

Results—8,581 women reported UUI status at baseline and follow-up. Of 7,244 women continent at baseline, 268 affirmed UUI at follow-up for a 2 year incidence of 3.7%. Of 581 women with UUI at baseline, 150 were continent at follow-up for a 2 year remission of 25.8%. Predictors of UUI development included increased age (7th and 10th decade compared to 6th decade; OR 1.5 and 7.2, CI 1.1–2.1 and 4.2–12.5, respectively), obesity (OR 1.6, CI 1.2–2.1), history of psychiatric illness (OR 1.6, CI 1.3–2.0), functional limitations (OR 6.2, CI 4.2–9.2) and SUI (OR 5.0, CI 3.0–8.3). Women who denied UUI at baseline were also likely to deny UUI at follow-up (OR 47.4, CI 22.9–98.1).

Conclusions—In this community based population of women ≥ 50 UUI incidence was low and remission was high. Predictors of UUI included increased age, severe obesity, functional limitations, a positive psychiatric history and incontinence status at baseline.

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Keywords

incidence; urgency; urinary; incontinence

Introduction

Although urinary incontinence (UI) poses an economic and emotional burden upon individuals and society, longitudinal information regarding its natural history is scarce.(1) Still less information is available specific to urgency urinary incontinence (UUI),(1) the type of incontinence which commonly develops in the elderly.(2,3)

Identified by some as a geriatric syndrome, UI has been described as a marker of progressive, irreversible debility in older populations.(4) Paradoxically, remission of UUI among older subjects is high,(3) suggesting that subjects with UUI are a heterogeneous population. While development of UUI in some may be a marker for decline in health, it is a reversible state in others.

We used the Health and Retirement Study (HRS) to clarify the relationship between UUI and health in older women. Our goal was to estimate the 2-year incidence and remission of UUI in women ≥ 50 years. We then sought predictors of UUI progression and improvement that could account for the apparent heterogeneity of its course in older women.

Materials and Methods

Data Source

Our study was based upon women ≥50 years participating in the HRS between 2004–2006.(5) Since its inception in 1992 the HRS has collected health information in a multi-stage area probability sample of more than 30,000 community-dwelling U.S. residents over 50 years old. It oversampled Hispanic and non-Hispanic Black subjects to obtain more reliable data estimates for these groups. The HRS has performed in person interviews every 2 years with overall response rates of 87–89%. Data are posted on a publicly available database. The University of New Mexico IRB granted this study exempt status (HRRC #07-284) as the HRS de-identified information in its database.

We have previously reported 4-year UI remission and incidence rates of women in the HRS.(6) The current study focuses more narrowly upon women in the HRS whose records contained adequate data for UUI assessment. In 2002 the HRS first began asking questions which categorized incontinence into stress and/or urge and also began recording severity of incontinence based on urine leakage quantity and frequency. In this study we analyze the HRS population with UUI information 2004–2006. We also report overall UI incidence and remission so data specific to UUI can be interpreted in the context of general UI in this population.

Definitions and Variables

We defined UI based upon the HRS question, ”During the last 12 months have you lost any amount of urine beyond your control?” Women who answered “no” were continent. Women who answered “yes” were incontinent.

We defined UI severity based on a modification of a validated incontinence severity index (Table 1). (7) UI severity was determined by the frequency and quantity of urine loss reported in the HRS. Incontinent women specified the number of days in the prior month they were incontinent. We transcribed these responses to a 4 point scale (Table 1 & Fig. 1a). The HRS also asked respondents incontinent ≥ 2 days in the prior month to describe quantity of urine loss. We transcribed those responses to a 3 point scale (Table 1 & Figure 1a). We then multiplied quantity and frequency values to create a severity score analagous to Sandvik’s index. (7) Although HRS wording varied from Sandvik’s severity index (Table 1), we believed HRS wording was sufficiently similar to Sandvik’s to distinguish moderate-severe incontinence from lesser incontinence. UI was grouped into mild (scores= 1–2) or moderate-severe (scores≥3) incontinence (Table 1 & Figure 1). This study focuses on women with moderate-severe incontinence.

We defined UUI presence or absence based upon the (above) severity scale in combination with the response to the following question, “In the last month how often did you leak with an urge to urinate and could not get to the bathroom fast enough?” The HRS only asked subjects who leaked ≥ 2 days in the last month this question (Fig. 1b). To determine UUI incidence and its predictors, we defined women as being UUI positive if they had moderate-severe incontinence and answered “yes” to the UUI question (Figure 1b). Similarly, for purposes of determining UUI incidence and its predictors, subjects who answered “no” to the UUI question, subjects with mild incontinence and continent patients were considered UUI negative. This created a dichomotous variable for logistic regression analysis (below). Change in condition from UUI positive at baseline to UUI negative at follow-up was termed improvement. Change in condition from UUI negative to UUI positive was termed progression. Our definition of UUI for evaluation of UUI incidence, remission, progression, improvement and its predictors was confined to women with more severe symptoms (ie. moderate-severe) because we believed these subjects had more clinically significant incontinence and would more reliably recall these symptoms, avoiding misclassification.(2) Any further references to UUI incidence, remission, progression, improvement or its predictors will be understood to involve moderate-severe UUI.

Women who leaked ≥ 2 days in the last month were also asked the question which determined presence of stress urinary incontinence (SUI); “How often did you leak with activities such as coughing, laughing or sneezing?”(Figure 1b) For evaluation of UUI predictors, we considered women with moderate-severe incontinence who answered “yes” to the SUI question to have SUI. Analogous to UUI, subjects who did not fulfill the definition of SUI were classified as SUI negative. Women with moderate or severe incontinence who answered yes to both the UUI and SUI questions were considered to have both types of incontinence in the logistic regression model evaluating UUI predictors.

Subject characteristics that were potential predictors for UUI progression and improvement were extracted from the HRS database. Self-reported race/ethnicity included White, non-Hispanic Black, Hispanic, and Other. Age and body mass index (BMI) were categorized based upon subjects' age, height and weight in 2004. We categorized BMI as < 25 (normal or less than normal), ≥25– <30 (overweight), ≥30– <35 (obese), and ≥ 35 (very obese). We grouped parity into 0, 1, 2 and > 2 births based on the question, "How many children have you given birth to?"

We also collected information from the HRS regarding other variables previously identified as incontinence risk factors. These included a history of psychiatric illness (including depression), medical illnesses and functional limitations. Hormone replacement information was not available.

Medical illnesses included hypertension, diabetes mellitus, cancer, lung disease, heart disease, arthritis, stroke. We categorized patients into groups of 0, 1, 2 and ≥ 3 illnesses. Functional limitations included 9 activities of daily living questions. The HRS asked," … because of health problems do you have any difficulty … walking several blocks, sitting 2 hours, getting up from a chair, climbing stairs, stooping, reaching arms above shoulder level, pushing or pulling large objects, lifting weights over 10 pounds, picking up a dime?" Answers were categorical and affirmative answers were weighted equally. Affirmative answers were summed and the numbers of functional limitations were entered into the regression equation.

Analysis

We estimated prevalence of any UI at baseline by taking the proportion of women who answered "yes" to the question, "During the last 12 months have you lost any amount of urine beyond your control?" over the population at risk. Prevalence of moderate-severe UI was estimated using the severity definitions described previously, again noting that severity was queried only of subjects who leaked ≥ 2 days in the last month. Prevalence estimates were also calculated for UI sub-types, UUI and SUI, at baseline. Although only moderate-severe UUI and SUI were used in the logistic regression analysis to determine UUI predictors, incidence, remission, progression or improvement, any affirmative answers to the UUI or the SUI questions (irrespective of severity) were used to describe baseline prevalence of UI sub-types (see Table 2).

We estimated 2-year cumulative incidence and remission of moderate-severe UI. For incidence we identified all respondents who were continent at baseline but reported moderate-severe UI at 2-year follow-up and divided that number by respondents at risk. For remission we identified all respondents with moderate-severe UI at baseline who had regained continence at 2-year follow-up and divided that number by respondents at risk.

We also estimated UUI incidence and remission. For UUI incidence we included only women who were continent at baseline who went on to have UUI at follow-up. For UUI remission we included all those who had UUI at baseline and became continent at follow-up.

In order to identify predictors of UUI improvement or progression within the entire population we used the dichotomous variable created above and categorized each patient as UUI positive or UUI negative. Using this as an outcome variable for determining improvement or progression, age, ethnicity, parity, medical co-morbidities, functional limitations, psychiatric illness, BMI, and UUI and SUI status at baseline were placed in a multivariable step-wise logistic regression equation. We fit these variables using a transition model in Proc Logistic (SAS® version 9.2, Copyright® 2009, SAS Institute, Cary, NC). Adjusted odds ratios (OR) were calculated for the model predicting progression and improvement and were expressed as 95% Confidence Intervals (CI).

Women missing follow-up data were excluded from analysis of UUI incidence, remission, progression and improvement. Data from these women were not used to generate predictor variables. Comparisons of descriptive data for UUI negative and positive subjects and women with and without follow-up data were analyzed using ANOVA for multiple comparisons, t-test (Satterthwaite adjusted) for continuous variables and Fischer's exact test for categorical variables with significance of $P < .05$.

Results

There were 10,759 women with UI information in 2004; of these, 2,286 women affirmed urine loss in the last year for an overall UI prevalence of 21.3% (2,286/10,759). In this population, 514 women were missing UI severity information as it was only asked of subjects who leaked ≥2 days in the last month, leaving 10,245 women with UI severity data. One thousand one hundred thirty-four or 11.1% (1,134/10,245) had moderate-severe UI. Baseline prevalence of the UI subtypes are listed in Table 2. At follow-up in 2006, 1642/10,245 (16%) women were missing incontinence information. Of these, approximately half (855/1642) had died and half (787/1642) were alive but missing follow-up data.

The remaining 8,603 women with UI information at baseline and follow-up formed the population upon which 2-year cumulative UI incidence and remission calculations were based. Of the 7,249 women who were continent at baseline, 384 reported presence of moderate-severe incontinence at follow-up constituting a 2-year cumulative incidence of moderate-severe incontinence of 5.3%. Of the 846 women with moderate-severe UI at baseline, 239 became continent at follow-up for a 2-year remission of 28.3%.

Of the 8,603 women with UI information at baseline and follow up, 22 subjects were missing either baseline or follow-up UUI information. Of the 8,581 women who had UUI information both at baseline and follow-up 7,244 women were continent in 2004. Two hundred sixty-eight of these women met our definition of UUI in 2006 constituting a UUI incidence of 3.7%. Of the 581 women UUI in 2004, 150 were continent in 2006 representing a UUI remission of 25.8%. The composition of and transitions between UUI present and absent groups are presented in Fig. 2.

Baseline characteristics of women with UUI information are noted in Table 3. The mean age was 67.6 (+/−10.15) years. The majority were White (74.8%), with the remainder non-Hispanic Black (14.2%), Hispanic (8.7%) or Other (2.3%). Most women were overweight

(mean BMI 27.8 +/− 5.7 kg/m^2) and multiparous (10% nulliparous, 90% multiparous) with a median of two functional limitations and medical co-morbidities. There were no differences in subject characteristics between women with baseline and follow-up UUI information and those alive but lost to follow-up. There were differences between those subjects who died before follow-up compared to those with complete UUI information. Those who died were older (76.1± 12.1 vs 67.6±10.6 years), thinner (BMI 25.3±5.7 vs. 27.8±5.7), and had more medical co-morbidities (2.1±1.0 vs 1.7±1.1) and functional limitations (4.1±3 vs 2.4±2), all P<.0001.

Predictors of UUI progression, improvement and adjusted ORs are listed in Table 3. Increasing age predicted UUI progression. Compared to the 6th decade OR ranged from 1.5 in the 7th decade to 7.2 by the 10th decade of life. BMI predicted UUI progression in severely obese women, but not in other BMI groups. Increasing functional limitations and psychiatric illness also predicted UUI progression. Neither ethnicity, medical co-morbidities nor parity were independent predictors of UUI progression when controlling for the other variables.

Both UUI and SUI at baseline were important predictors of UUI progression. Baseline prevalence of moderate-severe UI subtypes in these subjects with baseline and follow-up information was: 4.6% only UUI (395/8574), 2.9% only SUI (247/8574) and 2.1% with both (181/8574). Presence of SUI at baseline predicted UUI progression, increasing the odds of UUI at follow-up fivefold. Patients with UUI at baseline were much more likely to continue to have UUI (OR 47.4, CI 22.9–98.1) than to improve. Patients without UUI had the same odds of being free from progression of symptoms. Our model did not identify any positive predictors of UUI improvement. Two variables, severe obesity and history of psychiatric illness, were negative predictors of UUI improvement (Table 3).

Discussion

Our longitudinal evaluation revealed that among older women UUI is a dynamic process. Incidence rates were low and remission rates high. Measures of overall incontinence among subjects in the HRS show these subjects were comparable to other study populations. UI prevalence in older women typically ranges from 20–40%.(8) Prevalence estimates for this population were similar to other lower-end estimates; 21% for any incontinence and 11% for moderate-severe incontinence. The 5.3% 2-year cumulative incidence of moderate-severe incontinence in the HRS is similar to both the 3.6–9.2% two year incontinence rates reported by Lifford, (2) as well as the 6% average annual incidence suggested by an NIH panel.(1) The 2-year remission of moderate-severe incontinence of 28% was much higher than the 2% 2-year remission reported by some, (2) but comparable to the 11–13% 1-year remission reported by others.(9)

The values we report are likely affected because the HRS is administered in person and incontinence questions comprise only a small portion of a lengthy questionnaire. The neccessity for subjects to describe UI firsthand and the questionnaire's lack of focus on urinary symptoms could lead to systematic under-reporting of incontinence. Under-reporting lowers apparent incidence and increases apparent remission of both UUI and UI. Our

concentration on moderate-severe symptoms reduces the possibility of this systematic error but does not eliminate it.

We were particularly interested in the natural history of UUI. For most of this population UUI status was static over two years. In our regression model the strongest predictor of persistent UUI at follow-up was UUI at baseline. Similarly, the majority of women free of UUI at baseline remained so at follow-up. This is consistent with prior work which also found that women who were continent at baseline were likely to remain so at final follow-up. (3,9)

Within the study population, there were subjects whose continence status was likely to change. Predictors of UUI progression included a history of psychiatric disease, severe obesity, increased functional limitations and age. The association with age suggests that in some individuals UUI progression may be a component of a broader geriatric syndrome associated with increased debility and illness. For these subjects, UUI may indicate general frailty and poor health.

In contrast to subjects for whom UUI is a component of a progressive geriatric syndrome, for others UUI, like the presence of functional limitations, is a potentially reversible condition that is not inexorably linked to health decline. In the HRS population UUI improved or remitted in one quarter of patients over two years. This is similar to UUI remission rates reported by Nygaard (3) who not only found UUI to be reversible, but noted that improvement in activities of daily living predicted its resolution. This supports the postulate that subjects with UUI are a heterogenous group (10); though UUI may be a marker of poor health refractory to improvement in some, in others it may represent a symptom that spontaneously resolves. This has important implications for therapy. The reported high rate of improvement (11,12) of UUI in the placebo arms of trials may in part reflect its natural history.

The association between SUI and UUI is likely still more complex. Inclusion of SUI as a predictor in logistic regression analysis may simply reflect patients' inability to classify incontinence symptoms as urge or stress. Alternatively, in some patients incontinence may be a product of both pathologic processes. A recent report demonstrated that co-occurence of both SUI and UUI was 17 times higher than would have been expected had SUI and UUI been independent event. (13) Our longitudinal study further supports this association showing SUI is an independent predictor of UUI progression. Whether SUI and UUI occur as different manifestations of a single pathologic process as suggested by Petros (14) or are separate entities with overlapping symptoms remains unknown.

Search for factors which identified subjects in our study population whose UUI was most likely to improve has thus far not been as fruitful. Identification of these predictors may require a more complex analysis of transition states. For example in our study severe obesity predicted progression of UUI and was a negative predictor for its improvement but the absence of obesity at baseline was not a positive predictor of improvement. Rather than simple baseline measurements, changes in modifiable variables over time may prove more

powerful predictors of improvement or remission in UUI. Interventional trials that have reported that weight loss improved UUI symptoms support this speculation. (15,16)

A potential limitation of our study was the unknown extent of treatment effect. Specific treatment of incontinence was not recorded. Several factors mitigate against the likelihood of a large treatment affect. Compliance with anti-cholinergics, the principal pharmaco-therapy of UUI, is low with high discontinuation rates after 6 months.(17,18,19) Additionally, others have reported that a minority of patients discuss UI with their providers or seek treatment.(20,21) Treatment was likely responsible for a minority of the improvement noted in other population studies.(2)

Scrutiny of most categorizations of incontinence can uncover exceptions that break the rule. For instance according to our definitions a subject who leaked a large amount of urine once a month would be categorized as mildly incontinent, a classification which some might debate. Our categorization also relied on the use of questionnaires to ascertain presence of UI and UUI. Previous work, however, suggests this is not a major limitation. Self-report of UI has 83% agreement with clinicians' assessments, (22) and questionnaires have 62% sensitivity and 95% specificity in identifying UUI compared to urodynamic testing. (23) We acknowledge there may be a bias towards under-reporting of symptoms and recognize our categorization of UUI improvement includes women with moderate-severe incontinence who denied UUI symptoms. Since this group comprised only 3% of the UUI negative group their inclusion did not substantively affected the selection of predictors.

Last, it should be noted that we did not adjust for overweighting of Hispanic and non-Hispanic Black women in the HRS, so overall prevalence, incidence and remission proportions are specific to this population and may not represent proportions for the U.S. population as a whole.

The strength of this analysis is its use of the HRS database with its wealth of longitudinal information. The database allowed analysis of the relationship of UUI to variables previously reported to be associated with incontinence in general. This evaluation of UUI adds to the small number of prior reports which have described the natural history of UUI in older women. (2,3,9,24,25) Future work with this database will entail longer term follow up of the effects of dynamic risk factors on longitudinal change of UUI status.

In this community-based population, UI and UUI incidence was low and remission high. Although for the majority of women continence status remained unchanged during the study period, the natural history of those who had UUI was heterogeneous. Increased age, severe obesity, history of psychiatric illness, increased functional limitations and SUI predicted progression of UUI. Severe obesity and a history of psychiatric illness decreased the probability of its improvement.

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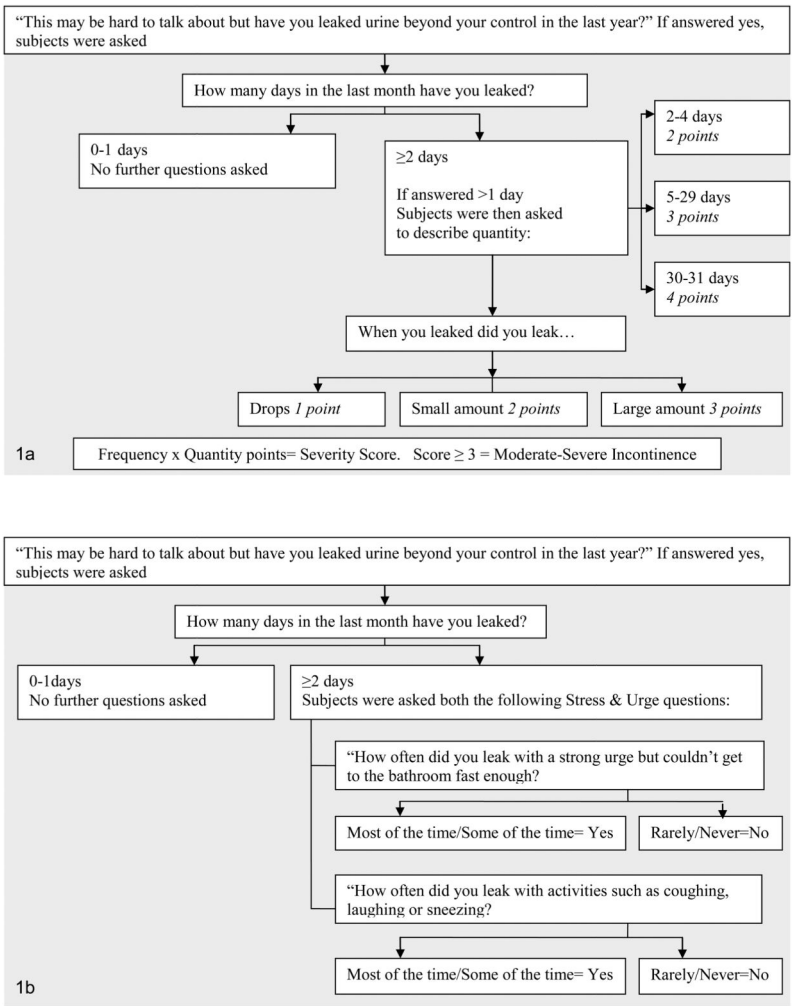

Figure 1. Flow Diagram of HRS Questionnaire

1a. Assignment of Urinary Incontinence Severity Score

1b. Diagram of Urge and Stress Questions

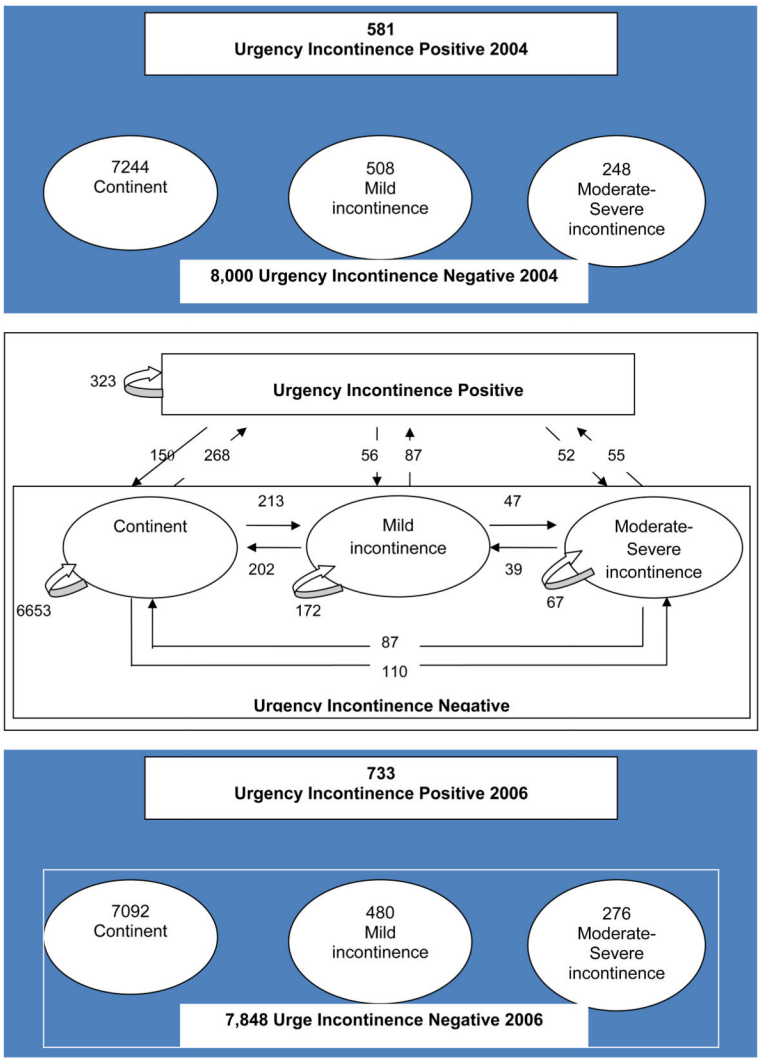

Figure 2. Urgency Urinary Incontinence Groups and Transitions between Groups Baseline to Follow-up

2a. Number of Subjects in Urgency Incontinence Groups 2004

2b. Transitions between Urgency Incontinence Groups 2004→2006

2c. Number of Subjects in Urgency Incontinence Groups 2006

Table 1

Comparison Sandvik Severity Score to Modified Severity Score

	Sandvik	HRS	Points
Frequency	< once a month	0–1 time last month (But answered "yes" to question: "During the last 12 months have you lost any amount of urine beyond your control?")	1
	Few times a month	2–4 days last month	2
	Few times a week	5–29 days last month	3
	Every day	30–31 days last month	4
Quantity			
	Drops	Few drops	1
	Small splashes	Small amount	2
	More	Large amount	3

Severity Score= Multiply Frequency × Quantity

Milder Incontinence=1–2

Moderate-Severe Incontinence= ≥3

Table 2

Prevalence Urinary Incontinence, Urgency Urinary Incontinence, Stress Urinary Incontinence at Baseline

	Any (%)	Moderate-Severe* (%)
Urinary Incontinence	2,286/10,759 (21.3%)	1,134/10,245 (11.1%)
Urgency Urinary Incontinence*	1,142/10,229 (11.2%)	804/10,210 (7.9%)†
Stress Urinary Incontinence*	1,046/10,240 (10.2%)	696/10,229 (6.8%)†
	Only‡	**Both‡**
Urgency Urinary Incontinence*	454/10,230 (4.4%)	674/10,230 (6.6%)
Stress Urinary Incontinence*	367/10,230 (3.6%)	

*Incontinence Severity & Type only asked of those who leaked ≥ 2 days in the last month resulting in different denominators for each category

†11–19 subjects with missing values

‡Includes all subjects who answered both Urgency and Stress Incontinence answers

Table 3

Subjects' Baseline Characteristics & Moderate-Severe Urgency Urinary Incontinence Predictors

Variables (N)	Subjects with No Urgency UI @ Baseline Total=8000	Subjects with Urgency UI @ Baseline Total=581	Predictors Urge Incontinence Progression Adjusted Odds Ratio* (95% CI)	Predictors Urge Incontinence Improvement Adjusted Odds Ratio* (95% CI)
Decade Life				
6th:50-<60 years (2173)	97.5% (2118/2173)	2.5% (55/2173)	*Reference group*	
7th:60-<70 years (2906)	94.8% (2755/2906)	5.2 % (151/2906)	**1.5 (1.1–2.1)**	
8th:70-<80 years (2179)	91.6% (1995/2179)	8.4 % (184/2179)	**2.1 (1.5–3.0)**	
9th:80-<90 years(1149)	86.7% (996/1149)	13.3% (153/1149)	**5.9 (4.1–8.3)**	
10th: ≥90 years (174)	78.2% (136/174)	21.8% (38/174)	**7.2 (4.2–12.5)**	
Ethnicity				
White (6418)	93.2% (5979/6418)	6.8% (439/6418)		
Black (1222)	92.9% (1135/1222)	7.1% (87/1222)		
Hispanic(746)	94.1% (702/746)	5.9% (44/746)		
Other(195)	94.4%(184/195)	5.6% (11/195)		
# Medical Co-morbidities				
0 (1487)	98.1%(1458/1487)	2.0% (29/1487)		
1 (2314)	96.5%(2233/2314)	3.5% (810/2314)		
2 (2349)	93.5%(2196/2349)	6.5% (153/2349)		
≥3(2431)	86.9%(2113/2431)	13.1% (318/2431)		
BMI (kg/m^2)				
<25 (2880)	94.0% (2707/2880)	6.0%(173/2880)	*Reference group*	*Reference group*
≥25 to <30(3340)	93.9% (3135/3340)	6.1% (205/3340)	.9 (.7–1.1)	1.1(.9–1.4)
≥30 to <35(1535)	92.8% (1424/1535)	7.2% (111/1535)	1.1(.9–1.4)	.9(0.7–1.1)
≥35(826)	88.9% (734/826)	11.1% (92/826)	**1.6(1.2–2.1)**	**.6(0.5–0.8)**
Psychiatric History†				
No (7308)	94.6%(6912/7308)	5.4% (396/7308)	*Reference group*	*Reference group*
Yes(1263)	85.3%(1078/1263)	14.7%(185/1263)	**1.6 (1.3–2.0)**	**.8 (.5-.8)**
Functional Limitations				
None (2693)	98.9% (2664/2693)	1.1% (29/2693)	*Reference group*	
1(1424)	96.3% (1371/1424)	3.7% (53/1424)	**1.4 (1.3–1.5)**	
2(1089)	95.8% (1043/1089)	4.2% (47/1089)	**1.5 (1.4–1.6)**	
5(603)	86.1% (519/603)	13.9% (84/603)	**2.8 (2.2–3.4)**	
9(66)	69.7% (46/66)	30.3%(20/66)	**6.2 (4.2–9.1)**	
Stress Incontinence†				
No	95.1%(7751/8146)	4.9% (395/8146)	*Reference group*	
Yes	57.7%(247/428)	42.3%(181/428)	**5.0 (3.0–8.3)**	

*Reported Adjusted OR and Confidence Intervals in bold only for significant predictors

†Some subjects missing information