

## The Impact of Urinary Incontinence on Quality of Life of the Elderly

Yu Ko, MS; Swu-Jane Lin, PhD; J. Warren Salmon, PhD;  
and Morgan S. Bron, PharmD, MS

### Abstract

**Objectives:** To investigate the impact of urinary incontinence (UI) on health-related quality of life (QOL), as measured by the Medical Outcomes Study Short Form-36 (SF-36) and to compare UI and non-UI elderly Medicare beneficiaries enrolled in managed care plans on the prevalence of depression and self-rated health.

**Methods:** After excluding beneficiaries younger than 65 years old, a total of 141 815 completed surveys were used for analysis. The survey included 1 question on difficulty in controlling urination, 3 questions on depression, 3 questions on health, a series of questions regarding comorbid medical conditions, and the SF-36. Self-rated health, prevalence of depression, and scores in each domain of QOL were compared between UI and non-UI groups.

**Results:** Overall, the prevalence of UI was 24.7% (20.9% in men, 27.5% in women). The UI group was about twice as likely to feel depressed as the non-UI group. The UI group also rated their health more negatively. Compared with continent respondents, those who were incontinent had lower standardized scores on all 8 subscales of SF-36 as well as 2 summary scores. Results from multiple regressions indicated that UI had a significantly negative impact on all aspects of QOL after adjusting for comorbidities and demographic differences.

**Conclusion:** Findings indicate that elderly patients with UI are more depressed and have worse perceived health. On certain domains of QOL, the negative impact of UI even surpasses that of other severe comorbidities.

(*Am J Manag Care. 2005;11:S103-S111*)

Urinary incontinence (UI), or the involuntary loss of urine, can occur at any age, but is especially common in elderly women.<sup>1,2</sup> UI has been estimated to affect 20% to 33% of adults<sup>3,4</sup> or 11% to 55% of the elderly,<sup>1,2,5-8</sup> depending on the age of the subjects, the healthcare setting where the study was performed, the definition of UI employed, and, potentially, the format of the questions being asked about UI. The preva-

lence of UI in older women is approximately 2 times that of older men.<sup>1,6</sup> Compared with the elderly living at home, those residing in nursing homes or hospitals also have a higher prevalence of UI,<sup>1</sup> which may be one of the contributing factors to institutionalization. Despite the high estimate of prevalence, as many as 50% of all cases of UI may not have been reported, because individuals with UI do not always seek medical help.<sup>3,9-11</sup>

Current treatments for UI include behavioral (eg, bladder training, fluid manipulation, scheduled toileting, pelvic muscle exercises), pharmacological, and surgical interventions, used either alone or in combination.<sup>11-13</sup> Behavioral techniques are now currently recommended as first-line therapy in the treatment of UI.<sup>14,15</sup> Behavioral interventions are usually relatively inexpensive and easy to implement, but the effectiveness chiefly depends on the patient's adherence.<sup>16</sup> When nonpharmacologic interventions have failed, drug therapy can be an option.<sup>11</sup> The effectiveness of older drugs, such as immediate-release (IR) oxybutynin, is not satisfactory, partly because of poor compliance as a result of adverse events (AEs).<sup>17</sup> The new generation of pharmacological treatments, such as extended-release (ER) tolterodine and transdermal oxybutynin, provide better or comparable efficacy, but with fewer AEs.<sup>18-21</sup> Although surgical interventions are used in only the most refractory cases of urge UI, they are more commonly used in the treatment of stress UI.<sup>11</sup>

Because UI may cause social isolation, loss of sexual function, and other psychosocial problems,<sup>3,22,23</sup> it could have significant impact on patients' psychosocial well-being and quality of life (QOL). Studies have shown that patients suffering with UI are more depressed,<sup>24,25</sup> psychologically dis-

tressed,<sup>26</sup> emotionally disturbed,<sup>27</sup> and socially isolated.<sup>27</sup> Moreover, compared with continent individuals, those patients with UI also have higher levels of anxiety,<sup>28</sup> lower QOL,<sup>27</sup> and poorer life satisfaction.<sup>25</sup> The severity of UI is also correlated with degrees of mental distress, social restrictions, and restricted activities.<sup>3,23</sup> As a result, UI has an adverse effect on patients' daily lives and could become a barrier for normal social function.<sup>27</sup>

Previous studies have indicated that depression was common in adults with UI. A study using the Geriatric Depression Scale on homebound elders with UI found that up to 50% of the elderly patients had significant depressive symptomatology.<sup>29</sup> Another study found that those patients with UI were more likely to have major depression than those without UI (odds ratio [OR] = 4.5; 95% confidence interval [CI] = 2.3-8.8), as assessed using the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III)*.<sup>24</sup> Although UI is associated with depression, the causal pathway from UI to depression is not entirely clear.

Several generic and disease-specific instruments have been used to assess the QOL of adults with UI. Although UI-specific instruments, such as the Incontinence Impact Questionnaire<sup>30</sup> and the Incontinence Quality of Life Instrument,<sup>31</sup> tend to be more sensitive to the unique impact of UI, generic measures permit the comparison among different populations or interventions.<sup>32</sup> One study using the Sickness Impact Profile, a generic health status instrument, found that the QOL of community-living women was adversely affected by UI considerably.<sup>33</sup> Another study using the Nottingham Health Profile Questionnaire, a generic health status instrument as well, indicated that women with UI were more emotionally disturbed and socially isolated than those from the age-matched control group without UI.<sup>27</sup> The literature also suggests that patients with urge UI and mixed UI are more likely to suffer with depression and poorer QOL than those with stress UI.<sup>34-36</sup>

Among the generic measures of QOL instruments, the Medical Outcome Study Short Form-36 (SF-36) is most widely used and well known in healthcare research. It

contains 1 item assessing health transition and 35 items assessing 8 domains of health status—physical functioning (PF), role limitations as a result of physical problems (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role limitations as a result of emotional problems (RE), and mental health (MH).<sup>37</sup> These 8 subscales are also used to generate 2 health summary scores, the physical component summary (PCS) and the mental component summary (MCS).<sup>38</sup> Two studies showed that SF-36 scores of the patients with UI were lower in all 8 domains compared with the general population or the control group.<sup>39,40</sup> However, O'Connor and colleagues found that patients with urge or mixed UI had significantly lower scores in only 5 of 8 dimensions (ie, PF, SF, RE, RP, VT) compared with the general US population,<sup>17</sup> and Kutner and colleagues showed that UI significantly affected GH, RP, and RE, but not SF.<sup>41</sup> In summary, previous studies are inconsistent regarding the specific domains of QOL affected by UI, but it appears that numerous domains are affected.

Previous studies of QOL and UI usually recruited subjects only from a particular setting, such as nursing homes,<sup>7,8</sup> communities,<sup>5,23,41</sup> or hospitals,<sup>22</sup> and they have a limited sample size, which ranges from several dozen to several hundred persons.<sup>8,17,22,23,28,33,39-41</sup> Therefore, the overall prevalence and impact of UI on the US elderly population remains unknown. The primary purpose of this study was to investigate the prevalence of UI among the elderly using a sample of Medicare managed care enrollees. The self-rated health and the presence of depression in the UI and non-UI subjects were also compared.

## Methods

**Data Source.** The Medicare Health Outcomes Survey (HOS), formerly titled Health of Seniors, was the first large-scale subject-based outcomes measure funded by the Centers for Medicare and Medicaid Services to assess the quality of care provided to Medicare beneficiaries enrolled in managed care.<sup>42</sup> A random sample was selected and surveyed every spring, and the same respondents were surveyed again 2 years later. The

first baseline cohort was surveyed in May 1998, which was composed of 279 135 Medicare beneficiaries enrolled in 269 Medicare + Choice Organizations from 287 market areas.<sup>42</sup> A combination of mail and phone surveys was used to collect the data. A returned survey was considered "complete" if at least 80% of the response items were completed and 3 specific questions about the respondent's overall health status were answered. The final response rate was about 60%. More detailed descriptions about the data collection process were reported elsewhere.<sup>43</sup> In this study, only those respondents aged 65 years and older were included in the analyses.

The HOS is a self-administered survey that includes several questions on demographics, health status, depression, comorbid medical conditions, and the SF-36. The 3 health status questions focus on the subject's general health, health compared with 1 year ago, and health compared with their peers. Each question was measured on a 5-point scale from 1 (excellent/much better now) to 5 (poor/much worse now). Depression was measured by 3 yes/no questions: (1) In the past year, have you had 2 weeks or more during which you felt sad, blue, or depressed, or when you lost interest or pleasure in things that you usually cared about or enjoyed?; (2) In the past year, have you felt depressed or sad much of the time?; and (3) Have you ever had 2 years or more in your life when you felt depressed or sad most days, even if you felt okay sometimes?

The SF-36 is a widely used instrument in health services research for assessing health-related QOL. The validity and reliability of this instrument has been established for measuring QOL in large populations of both healthy and diseased individuals.<sup>44-46</sup> Scores of the 8 dimensions of SF-36 range from zero (the worst QOL) to 100 (the best QOL). To compare with the general US population, the zero to 100 scores are also transformed to standardized scores (mean of 50, standard deviation of 10), with a score of 50 representing the national average for a given scale or summary score. In this study, the standardized scores were used.

The question, "Do you have difficulty controlling urination?" in the HOS survey

was used to identify respondents suffering from UI. Respondents were classified as the UI or non-UI group depending on whether they answered "yes" or "no" to the same question; persons denying the condition were unable to be distinguished. A checklist of various comorbidities was included in the survey. Eleven common medical conditions that have been reported to have adverse effects on QOL<sup>47</sup> were included in this study as covariates; they are hypertension, angina pectoris, congestive heart failure, myocardial infarction, other heart conditions, stroke, emphysema/asthma/chronic obstructive pulmonary disease (COPD), arthritis of the hip/knee, arthritis of the hand/wrist, cancer, and diabetes.

**Statistical Methods.** The chi square test was used to compare the distributions of demographic characteristics, depression, comorbidities, and perceived health status among the UI group and non-UI group. Two-tailed Student's *t*-test was used to compare each domain of the SF-36 scores between the 2 groups.

A multiple regression model was conducted for each of the 8 domains and the 2 summary scores of the SF-36. The impact of UI on the QOL scores was estimated, after controlling for age, sex, race, marital status, education level, and the 11 common medical conditions listed above. All analyses were conducted with SPSS for Windows (Version 11.0). Findings were considered statistically significant if  $P < .05$ .

## Results

**Characteristics of Subjects.** Of the 141 815 respondents who completed the survey, 60.3% were between the ages of 65 to 74 years old, 90.3% were Caucasian, 58% were women, and 59.1% were married. One third (36.0%) had graduated from high school or held a General Educational Development diploma, and another one third (37.3%) had at least some college education or a 2-year college degree.

About 2.1% (2996) of the subjects did not answer the UI question. Of the remaining subjects, 34 292 (24.7%) reported having difficulty controlling urination. The prevalence of UI among men and women was 20.9% and

**Table 1.** Characteristics of the Sample

Variable	UI group (n = 34 292) No. (column %)	Non-UI group (n = 104 527) No. (column %)
Sex		
Men	12 238 (35.7)	46 272 (44.3)
Women	22 054 (64.3)	58 255 (55.7)
Race		
Caucasian	30 523 (90.7)	92 491 (90.1)
African American	1 793 (5.3)	5 943 (5.8)
Other	1 319 (3.9)	4 180 (4.1)
Education level		
< High school	9 785 (29.0)	26 546 (25.8)
= High school	11 838 (35.1)	37 352 (36.3)
> High school	12 078 (35.8)	39 011 (37.9)
Marital status		
Married	18 441 (54.4)	62 861 (60.8)
Not married	15 442 (45.6)	40 601 (39.2)
Age group		
65-74	18 037 (52.6)	65 968 (63.1)
≥75	16 255 (47.4)	38 559 (36.9)

All  $\chi^2$  statistics are significant ( $P < .001$ ).  
UI indicates urinary incontinence.

27.5%, respectively. Compared with the non-UI group, the UI group was more likely to be women, Caucasian, older than 74 years, unmarried, and had less than a high school education (Table 1). The distribution of comorbidities differed significantly between UI and non-UI groups ( $P < .001$ ). Patients with UI tended to have more comorbid medical conditions than those without UI.

**UI and General Health.** Generally, patients with UI had a more negative view on their health. About 65% of the UI group and 80% of the non-UI group rated their general health as good or better. Approximately 70% of the UI group rated their health as good or better than their peers compared with 85% in the non-UI group. In addition, 25% of those with UI perceived their health as declining compared with 1 year ago, whereas only 13% of the continent respondents did so.

**UI and Depression.** Depression was more prevalent in the UI group. Respondents with UI were about twice as likely to report being

depressed as the non-UI group. Approximately 28% of the UI population felt depressed or lost interest for 2 weeks or more in things that they usually enjoyed compared with only 15.4% in the non-UI group. About 18% of persons with UI felt depressed or sad much of the time in the past year, whereas less than 10% of continent respondents felt the same way. Similarly, 17.7% of persons with UI had experienced depression for 2 or more years compared with 9.7% in the non-UI group.

**Impact of UI on QOL.** As standardized scores were used, a score of 50 represents the national average for both the subscale scores and summary scores. A score of 10 points above or below 50 represents a difference of 1 standard deviation from the national average.

As shown in Table 2, UI had a significant impact on QOL. Mean scores for UI were all lower than 50; this suggests that the UI group scored lower than the general US population on all domains of the SF-36. The largest differences between UI group and the general US population were observed in the PF and role-physical domains (Table 2). The UI group had significantly lower scores than the non-UI group in all of the 8 subscales and in the 2 component summaries ( $P < .001$ ), indicating that persons with UI have relatively poorer QOL compared with those who are continent (Table 2). On average, the incontinent elderly patient scored 6.6 and 3.9 points lower than the continent group in PCS and MCS, respectively. The adverse impact of UI on the SF-36 domain scores ranged from 4.0 points in MH to 6.7 points in RP compared with respondents without UI.

After adjusting for age, sex, race, marital status, education level, and other comorbidities, UI remained a significant predictor of all domains of SF-36 and 2 summary scores ( $P < .05$ ). Results from multiple regression indicated that the presence of UI reduced PCS and MCS by 3.7 and 3.0 points, respectively. In the 8 domains of SF-36, the UI group scored 2.9 to 4.2 points less than the non-UI group. The  $R^2$  for the 10 regression models ranged from .07 for MCS to .32 for PCS.

The standardized regression coefficients allow us to compare the relative impact of

**Table 2.** Standardized SF-36 Scores Between UI Group and Non-UI Group

SF-36	UI group Mean	Non-UI group Mean	Mean difference	Standard error difference	P value
Physical component summary score	37.2	43.8	6.6	.07387	<.001
Mental component summary score	50.3	54.2	3.9	.06628	<.001
Physical functioning	37.1	43.6	6.5	.07682	<.001
Role physical	39.0	45.7	6.7	.07900	<.001
Bodily pain	41.3	47.1	5.8	.06679	<.001
General health	42.9	48.2	5.3	.06632	<.001
Vitality	44.3	50.2	5.9	.06486	<.001
Social functioning	45.0	50.5	5.5	.07301	<.001
Role emotional	45.6	50.4	4.8	.07610	<.001
Mental health	49.1	53.1	4.0	.06331	<.001

SF-36 indicates Medical Outcomes Study Short Form-36; UI, urinary incontinence.

independent variables; the larger the coefficient, the greater the impact of a variable on the outcome. As shown in **Table 3**, among all the medical conditions, UI had the largest standardized coefficient (in absolute value) on VT, SF, RE, and MH scales. In other words, UI had a relatively greater impact on these domains of QOL than other comorbidities. Moreover, the adverse impact of UI on PF and GH was the second highest, next only to emphysema, asthma, COPD and arthritis of the hip and knee. The adverse impact of UI on bodily pain was only second to arthritis of the hand and wrist and hip and knee.

**Discussion**

This is the first study investigating the prevalence of UI among the elderly Medicare population enrolled in managed care plans. In this large random sample, about one fourth of the population reported having difficulty controlling urination. Moreover, women were significantly more likely than men to report suffering with UI, which is consistent with the results of previous studies.<sup>1,6</sup>

This study shows that elderly patients with UI had a worse perception of health and were more likely to be depressed. However, these associations could be because respondents with UI were indeed less healthy as a result of greater comorbidities. Similar to

previous studies on UI and depression, this study is based on cross-sectional data and cannot provide evidence on the temporal or causal relationships between UI and depression. Prospective studies are needed in the future to delineate the causality between the 2 health conditions.

Compared with other medical conditions included in our models, UI has a more substantial impact on both physical and mental dimensions of QOL. UI decreases MCS scores more than other medical conditions. This was not surprising, given the plethora of psychosocial problems associated with this disease condition. It is notable that the impact of UI on PCS was only secondary to that of emphysema/asthma/COPD and arthritis of the hip/knee. The impact of UI on the pain domain of QOL further exemplifies how a medical condition could affect a person’s QOL, even on those unanticipated domains. A medical condition that does not directly cause much pain may, nonetheless, exacerbate other underlying conditions and intensify the perception of pain.

As the population in the United States ages and the proportion of elderly aged 65 years and older grows from 12.7% in 1999 to 18.5% in 2025,<sup>43</sup> there is an urgent need for effective and efficacious management strategies for chronic degenerative diseases. As

**Table 3.** Regression Coefficients of Independent Predictors of Standardized SF-36 Scores

Predictors*	PCS		MCS		PF		RP		BP	
	UnS	S	UnS	S	UnS	S	UnS	S	UnS	S
Coefficients†	49.890		54.898		49.817		50.550		51.821	
Age group ≥ 75 yrs	-2.692	-.114	-.206	-.011	-3.466	-.141	-3.229	-.126	-.659	-.030
Sex (women)	-.564	-.024	-.143	-.008	-1.525	-.063	-.116	-.005	-.629	-.029
Race nonwhite	-.190	-.005	-.461	-.014	-.559	-.014	-.036	-.001	.423	.011
Not married	-.206	-.009	-.760	-.040	-1.018	-.042	-.452	-.018	.156	.007
Education = HS	1.369	.057	1.680	.087	1.978	.080	1.562	.060	.974	.043
Education ≥ HS	2.511	.107	2.688	.141	3.452	.140	2.709	.106	1.818	.082
UI	-3.643	-.135	-2.925	-.134	-3.574	-.127	-4.118	-.141	-3.323	-.131
Hypertension	-1.551	-.068	-.531	-.029	-1.479	-.062	-1.133	-.045	-.991	-.046
Angina pectoris	-2.481	-.076	-.917	-.035	-1.822	-.054	-2.266	-.064	-1.982	-.065
CHF	-4.308	-.085	-1.360	-.033	-4.881	-.093	-3.440	-.063	-1.780	-.037
MI	-1.036	-.026	-.316	-.010	-.934	-.023	-.891	-.021	-.408	-.011
Other heart conditions	-1.927	-.067	-1.103	-.047	-1.407	-.047	-1.989	-.063	-1.494	-.055
Stroke	-3.600	-.074	-1.995	-.051	-4.358	-.087	-3.639	-.070	-1.784	-.039
Emphysema										
Asthma/COPD	-5.591	-.157	-2.043	-.071	-5.922	-.160	-4.928	-.127	-2.678	-.080
Arthritis of the hip or knee	-6.474	-.271	-.288	-.015	-5.945	-.239	-4.482	-.173	-6.805	-.302
Arthritis of the hand or wrist	-2.475	-.101	-1.214	-.061	-1.518	-.059	-2.216	-.083	-3.556	-.154
Diabetes	-2.615	-.081	-1.049	-.040	-2.650	-.079	-2.013	-.058	-1.427	-.047
Cancer	-1.885	-.055	-.746	-.027	-1.496	-.042	-1.812	-.049	-.971	-.030

\*Aged 65 to 74 years, men, Caucasian, married, and education less than high school are the reference group.

†All coefficients are significant ( $P < .05$ ).

SF-36 indicates Medical Outcome Study Short Form-36; PCS, physical component summary score; MCS, mental component summary score; PF, physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; UnS, unstandardized coefficients; S, standardized coefficients; HS, high school; UI, urinary incontinence; CHF, congestive heart failure; MI, myocardial infarction; COPD, chronic obstructive pulmonary disease.

baby boomers (those aged 39-57 years in 2003) grow older, the demand for senior care will increase rapidly during the 2010 to 2030 period. The goal of healthy aging should be to not only extend life expectancy, but improve QOL as well. From a managed care perspective, the undeniable impact of a “benign” condition, such as UI on physical and MH, has policy implications. Future studies need to focus on whether early diagnosis and more aggressive interventions for

UI could reduce long-term healthcare costs, decrease disease burden, and increase QOL and patient satisfaction of health-plan enrollees.

There are a few limitations to this study. The presence or absence of UI and other health conditions was self-reported. The extent to which the information was consistent with medical records is unknown, although based on the results of a previous study, the accuracy is generally satisfactory

GH		VT		SF		RE		MH	
UnS	S	UnS	S	UnS	S	UnS	S	UnS	S
51.706		54.299		53.913		52.074		54.341	
-.863	-.041	-1.466	-.069	-1.271	-.058	-1.943	-.089	.092	.005
.573	.027	-.528	-.025	-.097	-.005	-.159	-.007	-.673	-.036
-1.361	-.038	1.135	.032	-1.098	-.030	-1.147	-.031	-.089	-.003
-.084	-.004	-.153	-.007	-.976	-.045	-.965	-.044	-.695	-.036
1.858	.087	1.154	.053	1.523	.069	2.183	.099	1.730	.089
3.302	.156	2.210	.104	2.034	.093	3.389	.156	3.139	.163
-3.177	-.131	-3.851	-.158	-3.506	-.141	-3.226	-.129	-2.845	-.129
-1.779	-.086	-1.322	-.064	-.731	-.034	-.494	-.023	-.849	-.045
-2.735	-.093	-1.881	-.064	-1.555	-.052	-.992	-.033	-1.097	-.041
-4.230	-.093	-3.049	-.067	-3.446	-.074	-2.013	-.043	-1.303	-.032
-1.323	-.037	-.844	-.024	-.633	-.017	-.361	-.010	-.361	-.011
-2.236	-.086	-2.021	-.077	-1.470	-.055	-1.071	-.040	-1.069	-.045
-3.139	-.072	-3.057	-.070	-3.451	-.078	-2.433	-.054	-2.007	-.051
-5.736	-.179	-4.575	-.142	-4.085	-.124	-2.257	-.068	-2.537	-.087
-2.959	-.138	-3.337	-.154	-2.891	-.131	-1.580	-.071	-1.337	-.068
-1.880	-.085	-2.098	-.095	-1.660	-.073	-1.315	-.058	-1.465	-.073
-3.239	-.112	-2.143	-.074	-1.776	-.060	-1.572	-.053	-.919	-.035
-2.352	-.077	-1.677	-.055	-1.577	-.050	-.787	-.025	-.579	-.021

with a few exceptions.<sup>48</sup> In addition, the survey data used in this study were obtained from the elderly Medicare beneficiaries enrolled in managed care plans; therefore, these survey findings may not be generalized to a younger population or the elderly covered by a different type of health plan. As a result of data limitations, it was not possible to differentiate the types of incontinence in respondents, although previous studies indicated that QOL of the elderly with stress

incontinence was less affected than those with UI.<sup>27,33,39</sup>

**Conclusion**

Our results suggest that UI is prevalent and can have significant impact on both the physical and mental health of the elderly population. This is an important epidemiological and clinical finding that suggests further study and action, both by clinicians and policymakers. Some incontinent individuals

do not seek medical help because they either are not aware that effective treatments are possible, consider it as a natural aging process, or are too ashamed to mention it to their healthcare providers.<sup>3,49</sup> As a result, only one quarter to one half of individuals actually sought medical help.<sup>12</sup> Healthcare providers need to be sensitive to these deterrents and identify better ways of evaluating and discussing UI with their patients. In addition, clinicians can play an important role in educating patients about their health condition, treatment options, and disease management. Several treatment choices are now available with greater effectiveness and feasibility, and with increased awareness, proper differential diagnosis, and better screening of UI, health providers can seize opportunities to significantly improve the QOL of the elderly population along this dimension.

**Acknowledgments**

The authors wish to thank Pfizer/Pharmacia Corporation for partial financial support for this work. We also wish to acknowledge Zhanna Jumadilova, MD, MBA, of Pfizer's US Outcomes Research for review of a previous version of this manuscript.

.....  
**REFERENCES**

**1. Hellstrom I, Ekelund P, Milsom I, Mellstrom D.** The prevalence of urinary incontinence and use of incontinence aids in 85-year-old men and women. *Age Ageing*. 1990;19:383-389.

**2. Brown JS, Seeley DG, Fong J, Black DM, Ensrud KE, Grady D.** Urinary incontinence in older women: who is at risk? Study of Osteopathic Fractures Research Group. *Obstet Gynecol*. 1996;87:715-721.

**3. Shaw C.** A review of the psychosocial predictors of help-seeking behaviour and impact on quality of life in people with urinary incontinence. *J Clin Nurs*. 2001; 10:15-24.

**4. Lagace EA, Hansen W, Hickner JM.** Prevalence and severity of urinary incontinence in ambulatory adults: an UPRNet study. *J Fam Pract*. 1993;36:610-614.

**5. Diokno AC, Brock BM, Brown MB, Herzog AR.** Prevalence of urinary incontinence and other urological symptoms in the noninstitutionalized elderly. *J Urol*. 1986;136:1022-1025.

**6. Thom D.** Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc*. 1998;46:473-480.

**7. Ouslander JG, Kane RL, Abrass IB.** Urinary incontinence in elderly nursing home patients. *JAMA*. 1982;248:1194-1198.

**8. Ouslander JG, Palmer MH, Rovner BW, German PS.** Urinary incontinence in nursing homes: incidence, remission and associated factors. *J Am Geriatr Soc*. 1993;41:1083-1089.

**9. Burgio KL, Matthews KA, Engel BT.** Prevalence, incidence and correlates of urinary incontinence in healthy, middle-aged women. *J Urol*. 1991;146:1255-1259.

**10. Hampel C, Wienhold D, Benken N, Eggersmann C, Thuroff JW.** Definition of overactive bladder and epidemiology of urinary incontinence. *Urology*. 1997;50:4-14.

**11. Couture JA, Valiquette L.** Urinary incontinence. *Ann Pharmacother*. 2000;34:646-655.

**12. Wilson L, Brown JS, Shin GP, Luc KO, Subak LL.** Annual direct cost of urinary incontinence. *Obstet Gynecol*. 2001;98:398-406.

**13. Gormley EA.** Biofeedback and behavioral therapy for the management of female urinary incontinence. *Urol Clin North Am*. 2002;29:551-557.

**14. Sampsel CM.** Behavioral intervention: the first-line treatment for women with urinary incontinence. *Curr Urol Rep*. 2003;4:356-361.

**15. Marcell D, Ransel S, Schiau M, Duffy EG.** Treatment options alleviate female urge incontinence. *Nurse Pract*. 2003;28:48-54.

**16. Vapnek JM.** Urinary incontinence. Screening and treatment of urinary dysfunction. *Geriatrics*. 2001;56:25-29.

**17. O'Conor RM, Johannesson M, Hass SL, Kobelt-Nguyen G.** Urge incontinence. Quality of life and patients' valuation of symptom reduction. *Pharmacoeconomics*. 1998;14:531-539.

**18. Van Kerrebroeck P, Kreder K, Jonas U, Zinner N, Wein A.** Tolterodine once-daily: superior efficacy and tolerability in the treatment of the overactive bladder. *Urology*. 2001;57:414-421.

**19. Harvey MA, Baker K, Wells GA.** Tolterodine versus oxybutynin in the treatment of urge urinary incontinence: a meta-analysis. *Am J Obstet Gynecol*. 2001; 185:56-61.

**20. Dmochowski RR, Sand PK, Zinner NR, Gittelman MC, Davila GW, Sanders SW.** Comparative efficacy and safety of transdermal oxybutynin and oral tolterodine versus placebo in previously treated patients with urge and mixed urinary incontinence. *Urology*. 2003;62: 237-242.

**21. Homma Y, Paick JS, Lee JG, Kawabe K.** Clinical efficacy and tolerability of extended-release tolterodine and immediate-release oxybutynin in Japanese and Korean patients with an overactive bladder: a randomized, placebo-controlled trial. *BJU Int*. 2003;92:741-747.

**22. Stach-Lempinen B, Kujansuu E, Laippala P, Metsanoja R.** Visual analogue scale, urinary incontinence severity score and 15 D—psychometric testing of three different health-related quality-of-life instruments for urinary incontinent women. *Scand J Urol Nephrol*. 2001;35:476-483.

**23. Hunskar S, Sandvik H.** One hundred and fifty men with urinary incontinence. III. Psychosocial consequences. *Scand J Prim Health Care*. 1993;11:193-196.

**24. Valvanne J, Juva K, Erkinjuntti T, Tilvis R.** Major depression in the elderly: a population study in Helsinki. *Int Psychogeriatr*. 1996;8:437-443.

**25. Herzog AR, Fultz NH, Brock BM, Brown MB, Diokno AC.** Urinary incontinence and psychological distress among older adults. *Psychol Aging*. 1988;3: 115-121.



26. **Bogner HR, Gallo JJ, Sammel MD, Ford DE, Armenian HK, Eaton WW.** Urinary incontinence and psychological distress in community-dwelling older adults. *J Am Geriatr Soc.* 2002;50:489-495.
27. **Grimby A, Milsom I, Molander U, Wiklund I, Ekelund P.** The influence of urinary incontinence on the quality of life of elderly women. *Age Ageing.* 1993;22:82-89.
28. **Berglund AL, Eisemann M, Lalos O.** Personality characteristics of stress incontinent women: a pilot study. *J Psychosom Obstet Gynaecol.* 1994;15:165-170.
29. **Engberg S, Sereika S, Weber E, Engberg R, McDowell BJ, Reynolds CF.** Prevalence and recognition of depressive symptoms among homebound older adults with urinary incontinence. *J Geriatr Psychiatry Neurol.* 2001;14:130-139.
30. **Uebersax JS, Wyman JF, Shumaker SA, McClish DK, Fantl JA.** Short forms to assess life quality and symptom distress for urinary incontinence in women: the Incontinence Impact Questionnaire and the Urogenital Distress Inventory. Continence Program for Women Research Group. *Neurourol Urodyn.* 1995;14:131-139.
31. **Patrick DL, Martin ML, Bushnell DM, Yalcin I, Wagner TH, Buesching DP.** Quality of life of women with urinary incontinence: further development of the incontinence quality of life instrument (I-QOL). *Urology.* 1999;53:71-76.
32. **Patrick DL, Deyo RA.** Generic and disease-specific measures in assessing health status and quality of life. *Med Care.* 1989;27(3 suppl):S217-S232.
33. **Hunnskaar S, Vinsnes A.** The quality of life in women with urinary incontinence as measured by the sickness impact profile. *J Am Geriatr Soc.* 1991;39:378-382.
34. **Zorn BH, Montgomery H, Pieper K, Gray M, Steers WD.** Urinary incontinence and depression. *J Urol.* 1999;162:82-84.
35. **Melville JL, Walker E, Katon W, Lentz G, Miller J, Fenner D.** Prevalence of comorbid psychiatric illness and its impact on symptom perception, quality of life, and functional status in women with urinary incontinence. *Am J Obstet Gynecol.* 2002;187:80-87.
36. **Lenderking WR, Nackley JF, Anderson RB, Testa MA.** A review of the quality-of-life aspects of urinary urge incontinence. *Pharmacoeconomics.* 1996;9:11-23.
37. **Ware JE Jr, Sherbourne CD.** The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992;30:473-483.
38. **Ware JE Jr.** *SF-36 Health Survey. Manual & Interpretation Guide.* Boston: The Health Institute, New England Medical Center; 1993.
39. **Hagglund D, Walker-Engstrom ML, Larsson G, Leppert J.** Quality of life and seeking help in women with urinary incontinence. *Acta Obstet Gynecol Scand.* 2001;80:1051-1055.
40. **Kobelt G.** Economic considerations and outcome measurement in urge incontinence. *Urology.* 1997;50:S100-S107.
41. **Kutner NG, Schechtman KB, Ory MG, Baker DI.** Older adults' perceptions of their health and functioning in relation to sleep disturbance, falling, and urinary incontinence. FICSIT Group. *J Am Geriatr Soc.* 1994;42:757-762.
42. **Stevic MO, Haffer SC, Cooper JK, Adams RW, Michael JA.** How healthy are our seniors? Baseline results from the Medicare Health Outcomes Survey. *J Clin Outcomes Manage.* 2000;7:39-42.
43. **Arday DR, Milton MH, Husten CG, et al.** Smoking and functional status among Medicare managed care enrollees. *Am J Prev Med.* 2003;24:234-241.
44. **Tarlov AR, Ware JE Jr, Greenfield S, et al.** The Medical Outcomes Study. An application of methods for monitoring the results of medical care. *JAMA.* 1989;262:925-930.
45. **McHorney CA, Ware JE Jr, Lu JF, Sherbourne CD.** The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care.* 1994;32:40-66.
46. **McHorney CA, Ware JE Jr, Raczek AE.** The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care.* 1993;31:247-263.
47. **Gage H, Hendricks A, Zhang S, Kazis L.** The relative health related quality of life of veterans with Parkinson's disease. *J Neurol Neurosurg Psychiatry.* 2003;74:163-169.
48. **Kriegsman DM, Penninx BW, van Eijk JT, Boeke AJ, Deeg DJ.** Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly. A study on the accuracy of patients' self-reports and on determinants of inaccuracy. *J Clin Epidemiol.* 1996;49:1407-1417.
49. **Mitteneess LS, Barker JC.** Stigmatizing a "normal" condition: urinary incontinence in late life. *Med Anthropol Q.* 1995;9:188-210.