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Prevention of Urinary Incontinence in Adults

Population-Based Strategies

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► ***Background:*** Urinary incontinence (UI) affects large numbers of adults, especially older adults, with an estimated 200 million adults worldwide having this life-altering condition.

► ***Objectives:*** To identify key populations at risk for urinary incontinence and propose population-based strategies to promote continence with a substantive focus on UI prevention.

► ***Methods:*** Critical review of extant literature and iterative synthesis were undertaken to generate an action plan to guide future UI prevention research.

► ***Results:*** Key populations identified to be at risk for UI are women in selected occupations, childbearing women, older adults with lifestyle risk factors, older adults with comorbid conditions, and nursing home residents. Population-based research activities are proposed. Growing evidence supports the benefit of pelvic floor muscle training to prevent childbirth and prostatectomy-related UI. Bladder training has demonstrated preventive capacity.

► ***Conclusions:*** Because of its high prevalence and chronic but preventable nature, UI is most appropriately considered a public health problem. Nursing research is needed to test prevention programs for UI using a population-based public health focus.

► ***Key Words:*** incontinence · population-based · prevention

Urinary incontinence (UI) affects large numbers of adults, especially older adults. In a recent report, Abrams and the Scientific Committee of the International Continence Society (2002) estimated that 200 million adults worldwide are incontinent. The prevalence of incontinence in women increases along the lifespan, stabilizing at age 50 years (at around 30%) and then increasing at age 70 years (to approximately 40%; Hunskaar et al., 2003). UI prevalence in men is half that of women, although it increases with age (Hunskaar et al., 2002). Importantly, prevalence in long-term care facility residents is higher; approximately 50% of both sexes are incontinent of urine (Watson, Brink, Zimmer, & Mayer, 2003). UI imposes high economic costs, with two-thirds of these costs deriving from UI in the elderly (Brown et al., 2003).

Based on high prevalence and significant financial impact, UI is an important geriatric public health problem that is often cited as a reason for institutionalization (Hu et al., 2002). Taking the role of modifiable risk factors into account, calls have been made to decrease the number of older adults who develop incontinence (Siu, Beers, & Morgenstern, 1993). However, primary prevention intervention directed towards continent people has received little attention from nurse researchers and healthcare providers. Most nursing research efforts have focused on secondary prevention directed at incontinent individuals and have been designed to reduce or cure existing incontinence (Palmer, 2002). The purpose of this presentation is to identify key populations at risk for UI and to propose population-based strategies to promote continence with a substantive focus on UI prevention.

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The Theoretical Framework of Population-Based Strategies

Interest in changing behavior, particularly health behavior of certain populations (e.g., smokers), has been the focus of researchers' attention for at least 50 years (Glanz, Rimer, & Lewis, 2002). Gielen and McDonald (2002), extending the planning model developed by Green and Krueter (1991), have pointed out that different theories are appropriate to guide various aspects of intervention design, emphasizing that a single theory cannot provide the necessary direction in all cases. Informing people about the nature of, risk factors for, and methods to prevent a disease or condition are important components of some theories such as the Health Belief Model and Social Cognitive Theory, which focus on individual behavior. Other theories, such as organizational change theory, focus on organizational strata and culture, how organizations work together, diffusing innovations, and enhancing organizational capacity (Steckler, Goodman, & Kegler, 2002). Hence, the Health Belief Model may effectively guide the development of interventions that increase adherence to self-care practices such as pelvic floor muscle exercises (PFME) and bladder training. In contrast, organizational change theory provides a better framework for improved bathroom accessibility in the workplace.

Assumptions common to all theories to guide population-based intervention are: (a) behaviors under volitional control affect health outcomes; (b) some risk factors are modifiable; (c) education and communication leading to heightened awareness are important; and (d) individuals at risk share similar or common characteristics. As the theories evolve, participation by the target audience (individuals or groups) is important in the development of interventions. Because UI is an embarrassing condition that violates social norms, screening and detection campaigns as well as invitations to participate in intervention development must be sensitive to this stigma.

At-Risk Populations and the Role of Prevention Strategies

Multiple factors are associated with UI and place older adults at increased risk. In women, risk factors include: increased body mass index (BMI; Miller, Brown, Russell, & Chiarelli, 2003), obesity (Miller et al., 2003), current cigarette smoking (Sampselle, Harlow, Skurnick, Burbacker, & Bondarenko, 2002), menopause (Hunskaar et al., 2002), hysterectomy (Brown et al., 1996), and parity (Sampselle et al., 2002). Surgical treatment for prostate cancer is associated with incontinence in men (Palmer, Fogarty, Somerfield, & Powell, 2003). For frail men and women, identified correlates are functional impairment (Wetle et al., 1995), altered cognitive status (Palmer, Baumgarten, Langenberg, & Carson, 2002), diabetes (Brown et al., 2003), and neurological conditions such as multiple sclerosis, Parkinson's disease, or cerebrovascular accidents (Madersbacher et al., 2002).

To enhance primary prevention, researchers identify populations at risk of prevalent health problems, factors associated with those problems, and strategies that help individuals alter the modifiable risk factors in their lives. Similarly, prevention research includes a focus on early treatment to eliminate symptoms or disease progression. In this section key populations at risk for UI are identified: women in selected occupations, childbearing women, older adults with lifestyle risk factors, older adults with comorbid conditions, and nursing home residents. Lifestyle choices such as smoking or caffeine consumption and modifiable risk factors such as overeating or lack of exercise are also considered. Needed population-specific research is identified.

Women in Selected Occupations

Preliminary research suggests that women employed in occupations that place constraints on the elimination of urine are at increased risk of developing UI. Examples include women working on production lines, nurses, teachers, and women in the military. In a survey of women working in a pottery manufacturing facility with set break times and limited allowance for self-initiated bathroom breaks, 29% reported UI at least monthly (Fitzgerald, Palmer, Kirkland, & Robinson, 2002). A survey of nurses and nursing assistants found 69% avoiding urinary elimination during their work shift (Bendtsen, Anderson, & Anderson, 1991). Nearly half of female teachers used self-imposed fluid restriction to decrease urinary frequency and 19% used absorbent pads at least some of the time; this was associated with urinary tract infections (Nygaard & Linder, 1997). Approximately 13% of female soldiers with UI during physical exercise restricted their own fluid intake (Sherman, Davis, & Wong, 1997) and 31% reported UI that interfered with job performance (Davis et al., 1999). These studies raise concerns about the long-term effect of self-management techniques such as fluid restriction, absorbent pad use, and prolonged voiding intervals. Finally, the scheduling of breaks is an employment practice that is likely associated with poor bladder habits. No intervention studies with these populations were found in the literature.

United States Department of Labor Women's Bureau (n.d.) statistics show approximately 43,773,000 women employed full-time for the year 2002. The top five occupations were: retail and personal sales workers, including cashiers; secretaries; elementary school teachers; registered nurses; and nursing aides and attendants. These groups offer a starting point for the conduct of survey epidemiological studies to identify and investigate groups of women at risk for UI. Longitudinal study of risk factors in continent women in these occupations could extend knowledge about preventing UI in older women. Finally, prevention interventions that address current workplace practices and lifestyles for particular groups could be tested for short- and long-term benefits.

Childbearing Women

Although UI occurs in women who have never given birth, women who have had even one vaginal birth are significantly more likely to report UI than their nulliparous counterparts. Odds ratios of self-reported UI in nulliparous compared with parous women range from 1.5 to 3.2 (Burgio, Matthews, & Engel, 1991; Lagace, Hansen, & Hick-

ner, 1993; Sampselle et al., 2002). The occurrence of prospectively documented *de novo* UI (newly appearing symptoms) after vaginal birth is further evidence of the role of parity. The incidence of *de novo* UI in primiparas has been documented at 21% following nonoperative birth and 36% after forceps-assisted birth (Meyer, Schreyer, De Grandi, & Hohlfeld, 1998). Childbirth-related factors that have been associated with UI during the postpartum year or at middle age include age at first delivery, birth weight, epidural analgesia, midline episiotomy, and forceps or vacuum extraction (Handa, Harris, & Ostergard, 1996; Persson, Wolner-Hanssen, & Rydhstroem, 2000).

Taking the above findings of parity-related UI into account, it is tempting to consider cesarean section as a protective strategy. However, recent research suggests that the substitution of this major surgical procedure with its attendant increased morbidity does not significantly reduce the risk of incontinence at midlife (Faudes, Guarisi, & Pinto-Neto, 2001; MacLennan, Taylor, Wilson, & Wilson, 2000). Any potential protection from UI that might be derived is not viewed as justification for an increased use of cesarean section (Rortveit, Dalveit, Hannestad, & Hunskaar, 2003).

There is a persuasive body of evidence that demonstrates the protective effect of antenatal PFME. Several carefully controlled randomized trials have demonstrated significantly lower UI incidence up to 6 months postpartum. Controlling for baseline incontinence, nulliparous women who received individual PFME instruction at 20 weeks gestation were significantly less likely to experience UI at 6 weeks and 6 months postpartum (Sampselle et al., 1998). At 3 months postpartum, primigravid women who participated in supervised PFME prenatally were 59% less likely to demonstrate UI and those who practiced 28 or more contractions per day were more likely to remain continent than those who practiced a lower number (Reilly et al., 2002). Nulligravid women randomized to supervised PFME during pregnancy, as compared to those who received routine care, were 39% less likely to report UI at 3 months postpartum (Morkved, Bo, Schei, & Salvesen, 2003). The effectiveness of prenatal PFME in preventing childbirth-related incontinence, in conjunction with the noninvasive nature of this self-care strategy, makes it a logical focus for UI prevention efforts among women during the period of childbearing. As with other self-care interventions, knowledge of a preventive effect is not sufficient to ensure that PFME will be practiced consistently and strategies to promote adherence need to be tested. The increased potential for UI during pregnancy makes antepartum women an ideal population for early identification, through provider screening and the consistent incorporation of preventive self-care.

Older Adults With Lifestyle Risk Factors

Lifestyle factors associated with UI that are labeled as modifiable risk factors include cigarette smoking (Bump & McClish, 1992; Hannestad, Rortveit, Dalveit, & Hunskaar, 2003), caffeine consumption (Bryant, Dowell, & Fairbrother, 2002; Tomlinson et al., 1999), obesity (Miller et al., 2003), and high-impact sports or exercise (Thyssen, Clevin, Olesen, & Lose, 2002). It is not known if adoption of prevention interventions by at-risk younger women affords later protection from development of UI.

Longitudinal studies that test caffeine and nicotine avoidance are needed to assess the long-term prevention effect. A longitudinal perspective on high impact physical activities was reported by Nygaard (1997) who conducted a retrospective cohort study of women who participated in Olympic sports between 1960 and 1976. Women who exercised regularly at young ages were not predisposed to a higher rate of UI in later life. This finding could be explained by lower BMI associated with regular exercise, but research is needed to disentangle this variable. Also, prospective studies of the long-term effect of exercise on UI are needed.

Older Adults With Comorbid Conditions

UI is often associated with other disease entities or injuries. Progressive neuromuscular diseases are associated with loss of control of pelvic floor function, but at varying rates and as a result of varied pathologic changes. For example, incontinence or retention are associated with some types of Parkinson's disease and not others, and do not typically appear early in the disease process (Mitchell et al., 2000). On the other hand, rates of bladder dysfunction (up to 93%) or bowel dysfunction (up to 64%) are common with multiple sclerosis where urinary disturbances are often an initial, underrecognized symptom of onset (Betts, D'Mellow, & Fowler, 1993). Older diabetic women have urge-predominant UI rates up to 70% higher than their nondiabetic counterparts, resulting from microvascular changes that damage detrusor innervation (Brown et al., 2003). Prevention strategies with these comorbidities are complicated by the complexity and uncertainty related to manifestations and progression.

Mental illness and cognitive impairment, including depression and progressive conditions like Alzheimer's disease, are also associated with UI (Chassagne et al., 1999; Palmer, German, & Ouslander, 1991). Outcome assessments are complicated in the cognitively impaired, but are an important emerging area of study; care preferences have been reliably identified in patients with significant cognitive decline (Simmons & Schnelle, 1999) and effective strategies for managing incontinence in the cognitively impaired have been reported (Ouslander et al., 1995). The feasibility of primary prevention of UI in this population should be investigated.

Arthritis and other diseases that progressively decrease mobility, dexterity, or both have been implicated in incontinence-related loss of independence; decreased functional mobility is a risk factor for both UI and fecal incontinence (FI) in older adults (Borrie & Davidson, 1992; Jakobsson & Hallberg, 2002; Palmer et al., 1991). For example, in a sample of French long-term care (LTC) residents, the relative risk of developing FI related to existing UI was 2.0 (95% *CI* 1.5 to 2.6; $p = .001$) and to poor mobility was 1.7 (95% *CI* 1.2 to 2.4; $p = .001$; Chassagne et al., 1999). Little is known about the potential to prevent incontinence through strategies that maintain dexterity and mobility associated with chronic progressive disease.

Prostate cancer looms as the highest incident cancer and second highest cause of cancer mortality in men (MCG

Health Center, 2000-2002), with incidence estimated at 198,100 cases for 2001 (Moorhouse, Robinson, Bradway, Zoltick, & Newman, 2001). Reports of comorbid UI following prostatectomy are mixed and highly variable with UI rates ranging from 8% to 87% at 6 months and 5% to 44% at 1 year following prostatectomy (Van Kampen et al., 2000). Improved surgical techniques for radical prostatectomies have been developed to reduce postoperative UI, resulting in earlier return of continence and a 14% to 34% increase in 3- to 6-month continence status (Deliveliotis, Protogerou, Alargof, & Varkarakis, 2002; John & Hauri, 2000; Steiner, 2000; Walsh & Marschke, 2002). Experience of the surgeon has also been shown to reduce postoperative complications (Catalona, Carvalhal, Mager, & Smith, 1999). Techniques that avoid nerve and muscle damage improve the patient's chances for continence. Delaying catheter removal up to 7 days postprostatectomy has a positive effect on restoring continence, avoiding urinary retention, and maintaining urethral anastomosis (Patel & Lepor, 2003).

Integrity of the pelvic floor, rhabdosphincter, and bladder neck contribute to effective bladder control in men. PFME is recommended to maintain close apposition of the mucosal folds of the urethral lumen to prevent the unintended flow of urine and to inhibit detrusor contraction (Blaivas, Romanzi, & Heritz, 1998; Moorhouse et al., 2001). Teaching PFME pre- and postoperatively has decreased UI by at least 14% (Sueppel, Kreder, & See, 2001; Van Kampen et al., 2000). In the Cochrane Database of Systematic Reviews, Hunter, Moore, Cody, and Glazener (2004) concluded that "there may be some benefit of offering PFME with biofeedback early in the postoperative period immediately following the removal of the catheter as it may promote an earlier return to continence." Reliance on protective devices, including condoms and pads, is associated with increased long-term UI (Joseph, 2001). Thus, prevention of postprostatectomy UI involves patient education (Diokno, 1998; Palmer, 2001). Teaching correct technique for PFME is essential, recognizing that use of this strategy has been shown to improve UI sooner and aid in the achievement of complete continence (Moorhouse et al.; Sueppel et al.; Van Kampen et al.).

Researchers interested in prevention of incontinence in older adults with these and other high-risk comorbidities may be particularly interested in investigating patient attitudes related to symptom and intervention burden and adherence. A further strategy is involving patients, caregivers, and long-term care providers in research planning.

Nursing Home Residents

Besides functional and health-related conditions, environmental factors including toilet access and need for physical assistance are relevant to the prevention of UI for nursing home residents (Schnelle et al., 2003). Nursing home residents are by definition heavily dependent upon care providers for timely and consistent toileting assistance, therefore providers will constitute a key target group in the development of UI prevention in long-term care settings. The documented inertia in LTC provider attitudes towards incontinence and low continence care expectations must be addressed (Schnelle et al.; Watson et al., 2003). The earlier noted 50% of LTC residents with UI also means that approximately 50% do not have the condition and could benefit from primary prevention intervention. Prevention research related to promotion of mobility, mechanical aids, and nonsurgical treatments may demonstrate cost-effective interventions that promote continence and maintain independence. Feasible incentives must be identified to encourage LTC providers to place a higher priority on continence promotion in contrast to incontinence management.

Emerging Primary Prevention Research

Because of its high prevalence and chronic but preventable nature, UI is most appropriately considered a public health problem (Palmer, 2002). Primary prevention strategies developed for the general population or large proportions of the population, such as immunizations and screening programs that have been effective for other chronic conditions such as hypertension, cancer, heart disease, and obesity can guide UI prevention efforts. Some population-based programs have focused on educating healthcare providers to heighten their awareness about specific conditions and to improve screening and detection, early treatment, and prevention. Other programs are designed to promote individual behavioral change to prevent or delay disability, such as physical exercise recommendations. However, few continence-promoting interventions have been designed and implemented. Although there is clear need for this type of intervention, several barriers exist. Many older adults do not report UI to healthcare providers (Roberts et al., 1998). Some older adults have misinformation about the causes of incontinence and are uninformed about treatment options (Schnelle & Smith, 2001).

Palmer (2002) noted the absence of primary prevention intervention programs for UI focusing on older adults. Rather, UI prevention studies focused on childbearing women and men facing prostatectomy as outlined above.

Diokno and colleagues (2004) recently reported behavioral modification program results that extend our knowledge of prevention intervention outcomes in older women. This randomized clinical trial of bladder training and PFME demonstrated the preventive capacity of these self-care strategies. Women who were 55 years and older and essentially continent (0-5 episodes in past year and no observed urine leakage during deep coughing) were randomized to treatment and control groups. Those in the treatment group attended a 2-hour group session that provided information about UI and the role of bladder and PFME in bladder health; individualized instruction was provided as needed. One year after instruction, women in the treatment group were twice as likely to remain or become absolutely continent as compared to their control group counterparts ($OR = 2.03$, 95% $CI = 1.04\text{-}3.98$, $p = .04$).

A growing body of literature supports the benefit of PFME to prevent childbirth- and prostatectomy-related UI. The preventive effect of bladder and PFME described above adds to the evidence supporting the health benefits of these techniques.

TABLE 1. Population-Based Research Activities Using the PRECEDE-PROCEED Planning Model

PRECEDE-PROCEED Step	Example of Research Activity
1. Social Assessment	Focus group input from potential residents of a planned retirement community
2. Epidemiological Assessment	Secondary analysis of existing databases (Nursing Home Minimum Dataset, Women's Health Initiative, Study of Women's Health Across the Nation, Harvard Nurses Study) for incidence and prevalence benchmarks
3. Behavioral and Environmental Assessment	Survey population behavior practices such as pelvic floor muscle training and bladder training
	Map toilet locations in selected sites; for example, the National Toilet Map of Australia (Commonwealth Department of Health and Ageing, 2003)
4. Educational and Ecological Assessment	Focus group input from LTC providers regarding incontinence management versus continence promotion
	Cost/benefit analysis of incontinence management versus continence promotion in LTC facilities
	Outcome of LTC provider incentive for effective continence care
5. Administrative and Policy Assessment	Determine resources (time, personnel, funding)
	Identify barriers (lack of staff commitment, accessible toilets)
	Consider fit with policy and philosophy of focal institution

Note. LTC = long-term care.

Action Plan for Population-Based Research on UI Prevention

The time is ripe to expand the scope of primary prevention programs for UI using a population-based public health focus. A successful application of various health behavior theories into a broadly focused effort is described by Gielen and McDonald (2002), who have extended the PRECEDE-PROCEED planning model (Green et al., 1991) and have called for social, epidemiological, behavioral, environmental, educational, ecological, administrative, and policy assessments as critical elements of a population-based primary prevention intervention (Table 1).

New partnerships should be sought for the development of population-based UI prevention programs. For example, the role of obesity in UI suggests that collaboration with an organization such as Weight Watchers might yield effective and widely disseminated prevention programs. Professional organizations such as the Association of Women's Health, Obstetric, and Neonatal Nurses have been productive partners in past initiatives for the diffusion of evidence-based practice (Sampselle et al., 2000). Future links might be sought with the American Urological or the American Urogynecological Associations.

With implementation of prevention programs comes evaluation of the process, impact, and outcomes. The measure of success in continence research rests with outcomes such as reduced incidence (where incidence is known in the population) and shifts in financial burden. For example, costs may be reduced for absorbent products, but increased for diagnostic procedures and certain treatments. Consumer-oriented outcomes such as satisfaction with the intervention and the ease to implement and maintain it must be developed as well.

In summary, nursing has an admirable history of research contributions that have advanced the premise that UI is not an inevitable component of aging but is treatable, often effectively, with behavioral intervention. Nurse scientists, in collaboration with their interdisciplinary colleagues and various advocacy agencies, are now urged to use the proposed action plan to make comparable advances in UI prevention. ▼

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