# CHAPTER 18

## Committee 13

# Incontinence in the Frail Elderly


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**Abbreviations used**

| | |
|---|---|
| ADE | adverse drug effect |
| ANP | atrial naturetic peptide |
| AVP | arginine vasopression |
| BPH | benign prostate hyperplasia |
| CI | confidence interval |
| CNS | central nervous system |
| DHIC | detrusor hyperactivity with impaired contractility |
| ER | extended release |
| FI | faecal incontinence |
| ICS | International Continence Society |
| IR | immediate release |
| ISC | intermittent straight catheterization |
| LUT | lower urinary tract |
| LUTS | lower urinary tract symptoms |
| OR | odds ratio |
| PVR | postvoiding residual volume |
| RCT | randomized controlled trial |
| UI | urinary incontinence |
| US | United States |
| UTI | urinary tract infection |

# Incontinence in the Frail Elderly

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## A. URINARY INCONTINENCE INTRODUCTION

Older people have the highest known prevalence of urinary incontinence (UI) and faecal incontinence (FI) of any group, apart from those with special neurological disorders (e.g., spinal cord injury). Moreover, population aging is now a global phenomenon, [1] resulting in exponential increases in the number of older and incontinent people worldwide (**Table 1**). In developed countries, the population of centenarians has doubled every decade since 1960, mostly as a result of increases in survival after age 80. [1] Between now and 2030, the percentage of elderly people in the U.S. will increase from 13 percent of the population to 20 percent, according to Census Bureau projections. As the baby boomers age, the number of persons aged 85 or older will rise steadily from just under 2 percent of the population now to nearly 5 percent by 2050. Even if the observed improvements in physical functioning continue and research is able to demonstrate improved health and lower costs, the impact on future health care and long-term care costs will be profound. [2]

The challenge of providing a state of the art review of UI and FI in older people is the heterogeneity of the target population. Throughout the world, no matter how one defines "older" or "elderly," this population is characterized by its variety, ranging from active, community-dwelling, working, healthy nonagenarians to bed-bound, chronically ill, functionally- and cognitively-impaired people in their late 60's. The former healthier group is closer in phenotype and physiology to middle aged persons than to frailer older people. For these reasons, the Third ICI has

***Table 1. Estimated population growth of persons older than age 60 for the world and selected countries in 1970 and 1997 and projected for 2025 (adopted from reference 1).***

| | Millions over age 60 | | | Percent over age 60 | | |
|---|---|---|---|---|---|---|
| **Country** | **1970** | **1997** | **2025** | **1970** | **1997** | **2025** |
| World | 300.0 | 530.0 | 1200.0 | 8 | 9 | 15 |
| Italy | 9.0 | 13.0 | 18.0 | 16 | 23 | 33 |
| Sweden | 1.6 | 2.0 | 2.7 | 20 | 22 | 29 |
| Germany | 15.0 | 18.0 | 28.0 | 20 | 21 | 32 |
| Japan | 11.0 | 27.0 | 40.0 | 11 | 21 | 33 |
| U.S.A. | 29.0 | 44.0 | 83.0 | 14 | 17 | 25 |
| China | 57.0 | 118.0 | 290.0 | 7 | 10 | 20 |
| India | 29.0 | 64.0 | 165.0 | 6 | 7 | 12 |
| Mexico | 3.0 | 6.5 | 18.0 | 6 | 7 | 13 |

taken a different approach than previous in organizing information about people older than 65 years of age. Data regarding healthier older people has been integrated in all other sections regarding anatomy, physiology, evaluation, and treatment. Pads and appliances are covered in Chapter 22: Technical Aspects of Continence Devices. This chapter specifically covers the frailer group, emphasizing not only the different aetiologies and treatment of UI and FI, but the additional issues of disease burden, disability, altered responses to drug therapy, the role of caregivers, and goals and organization of care.

Who, then, are the frail elderly? Consistent with increasing consensus in the geriatric literature, we define "frail older persons" as those over the age of 65 with a clinical presentation or phenotype combining impaired physical activity, mobility, balance, muscle strength, motor processing, cognition, nutrition, and endurance (including feelings of fatigue and exhaustion). [3-5] Such frail people usually have multiple chronic medical conditions, take multiple medications, and require the assistance of others to perform some or all of the activities of daily living (ADLs), including bathing, dressing, toileting, and ambulation. A substantial number are homebound or institutionalised in nursing homes or long-term or continuing care hospitals, and those in the community may reside in special facilities (e.g., group homes, assisted living) which differ by country. All are vulnerable to intercurrent disease and at high risk for developing disability. Their care usually involves other people (family, friends, neighbours, caregivers, professional staff) and often requires special organization and packages of care. In the US, 10% of all people over 65 require help/supervision with at least one activity of daily living, [6] and the total prevalence of frail elders has been estimated at 6.1%. [7]

The relationship between UI/FI and frailty clearly exists yet is complex. Incident UI in people over age 65 has been associated with a two-fold increased risk of impairment in activities of daily living, instrumental activities of daily living, and poor performance on three physical measures, suggesting that new UI may be an early marker of the onset of frailty. [7] Others have found similar results, with UI associated with activities of daily living decline (adjusted OR=1.24, 95% CI=0.92-1.68) and instrumental activities of daily living decline (adjusted OR=1.31; 95% CI=1.05-1.63), although adjustment reduced the strength of the associations. [2] These authors concluded that although UI is a marker of frailty, it is not a strong independent risk factor for functional decline. [2] Despite temporal changes in elder care, UI appears to remain a risk factor for nursing home admission in the US (especially for men [8] and people in rural areas [9]) and Germany, [10] although there are some negative studies. [2] There appears to be no association between UI and higher mortality. The hazard ratio for mild to moderate UI is 1.20 (95% CI 0.85-1.68) and for severe UI 0.91 (95% CI 0.59-1.39), after adjustment for age, gender, education, health, and functional status. In another study, the adjusted OR for death was 0.90 (95% CI 0.67-1.21). [2]

The key differentiating feature of UI and FI in frail elderly versus healthier populations is that in the frail these conditions are universally *multifactorial*, and always include aetiological factors beyond urinary and bowel physiology alone. This has significant implications for understanding the causes of UI and FI, planning evaluation, and designing and implementing effective treatment. Failure to address the multifactorial nature of these urinary and bowel conditions limits not only clinical care of UI and FI and research regarding aetiology and treatment, but also important opportunities to improve function and quality of life. [11] At the same time, one cannot assume that outcomes from established treatment will be poorer in the frail elderly than in younger populations without special data to so prove. Evaluations of interventions as well as outcomes [12] need to be broader based, incorporating caregivers, settings, different models of care, and goals of care unique to this population.

The field of UI and FI in frail older people faces a profound question: Is cure (dryness) possible? The short answer is: it depends on whom we are talking about, which treatment(s), and what is the target outcome. While no geriatrician endorses "ageism" and therapeutic nihilism, we recognize that research in the field (particularly regarding treatment of institutionalized frail people with severe cognitive and functional impairment) indicates that complete dryness is unlikely for certain frail patients. Even in young healthy people, "cure" may occur in the minority, is often relatively defined (e.g., no leakage on a 7-day bladder diary), and from the patient's perspective may relate more to quality of life than quantity of leakage. Moreover, quality of life is a *central* concern for frail people, especially those with limited life expectancy. Even incontinence that is "intractable" is amenable to interventions that can improve the patient's urinary and bowel function, and quality of life. [11]

The above considerations have led to suggestions for an alternative continence paradigm[11, 13] to descri-

be a number of ways that frail elders with UI/FI may be more effectively managed (**Figure 1**). In this paradigm, "dependent continence" refers to people who become dry as a result of assistance, behavioural treatment, and/or medications [11]. They would no longer be completely dry if the interventions ceased, which is analogous to chronic disease models [14] such as "controlled hypertension" or "controlled diabetes." "Independent continence" refers to those who are continent without ongoing treatment (e.g., after successful anti-incontinence surgery). Finally, in patients who are unable to achieve independent or dependent continence, contained incontinence should be possible by use of appropriate products such pads, catheters and appliances (See Chapter 22: Technical Aspects of Continence Devices), and thus "accepted" or considered adequately managed by patients and/or caregivers. [11,13,15] The latter situation has been variably referred to as "social continence," or "managed incontinence."

The balance between the types of continence achieved may vary as incontinence severity changes, and in conjunction with patient and caregiver preferences. These terms are in the process of codification by the Standardisation Committee of the International Continence Society (ICS). They all encompass a common need: to be both realistic and hopeful about UI and FI in frail elders while avoiding nihilism and neglect, maintaining comfort and dignity, and preventing avoidable complications of incontinence. This paradigm also can be applied to other clinical settings, such as people with neurogenic bladders and/or various disabilities.

A final challenge in providing a review of UI and FI in frail older people is the relative dearth of Level 1

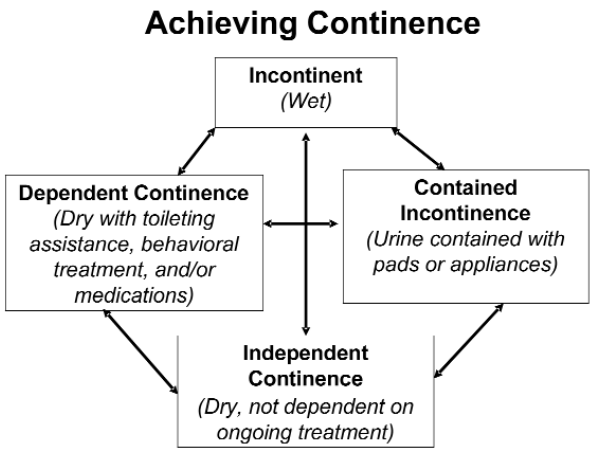



***Figure 1. A Paradigm for Continence***

evidence. This is not to say that the literature lacks robustness, as the frail present multiple challenges for research (not the least of which is substantial trial drop-out due to intervening illness and death). What it does indicate is the continuing paucity of clinical trials, despite the clear epidemiological imperative that this is the fastest growing group of affected individuals. Reasons for this are myriad, including a lack of funding for multi-component interventions and "riskier" trials involving drug therapy. **Table 2** outlines challenges and recommendations to provide a basic road map for future research for this field. We adapted and expanded these from a recent consensus report on research in the frail. [4] While these recommendations are overall Grade C, they reflect Level 1 studies regarding frailty and Level 1, 2 and 3 studies on continence. More specific recommendations regarding germane areas follow each section below.

# B. AETIOLOGY AND ASSESSMENT

## I. BACKGROUND

The aetiology of urinary incontinence in frail older adults is almost always multifactorial. Frail elderly people may have multiple age-related changes in the lower urinary tract and age-associated conditions that can cause or contribute to UI. A key distinction in the aetiology of UI between younger individuals and the frail elderly is the frequent role of conditions outside the lower urinary tract in precipitating or aggravating their symptoms. This is especially true for conditions that impair the functional ability to toilet independently, i.e. dementia and immobility. In addition, many treatable, potentially reversible conditions can cause or contribute to UI, and should be identified and managed before more specific incontinence treatments are implemented. All of these factors must be addressed in the optimal assessment and management of frail older people with UI.

The literature on "normal" ageing of the lower urinary tract (LUT) has many potentially confounding methodological limitations. Normal ageing changes are difficult to study, because longitudinal data on a large number of individuals spanning many years are necessary to make definitive conclusions about "normal ageing" vs. the effects of comorbid conditions that develop over time.

*Table 2. Challenges of and recommendations for research studies on UI and FI in frail older people*

| Challenges | Recommendations |
|---|---|
| **Incomplete standard criteria of "frailty" for research** | • Provide specific definition of frailty used.<br>• Explicitly define variables in the domains of mobility, cognition, and nutrition. |
| **Incomplete understanding of natural history of UI** | Include control/placebo arms that consider time effects and measurement of primary and secondary outcomes of interest |
| **Multifactorial nature of incontinence** | • Collect and describe measures to assess and address relevant comorbidity, e.g:<br>- Medication changes<br>- Interval illnesses<br>- Interval bacteriuria,<br>- Care setting<br>- Interventions affecting domains of continence (e.g., exercise programmes) |
| **Complexity and expense of enrollment** | • Multistage selection process:<br>- Exclude robust/healthy;<br>- Identify the frail;<br>- Identify subset according to specific domain of frailty (e.g., need for toileting assistance).<br>• Prepare to contact family members or other proxy decision makers for consent [17] |
| **High trial attrition rates** | • Plan for intention to treat analysis with explicit plans for dealing with drop-outs/deaths in the analysis.<br>• Improve intervention adherence by:<br>- designing interventions feasible by most, and incorporating caregivers/care setting in that consideration<br>- allowing flexible time frame for follow-up assessments<br>- prioritising safety<br>- providing transportation<br>- preplanning alternatives to clinic-based follow-up (e.g., home visit, telephone)<br>- establishing good relationship and incentives to participate for family, caregivers, and/or care setting<br>- understanding priority rank and definition of important potential outcomes to patients, caregivers, and care settings<br>• Anticipated attrition rates should not preclude attempts at long-term follow-up. |
| **Exclusions that decrease generalisability** | • Principle exclusion should be factors that prevent participation.<br>• Avoid exclusions for comorbidity.<br>• Exclude only those persons whose cognition is not compatible with the *specific* intervention.<br>• Use explicit procedures for consenting participants; involve a surrogate/proxy when needed. Include discussion of ethical concerns and how they were addressed in report. |
| **Problems using self-report to assess outcomes** | • Supplement *self-report* to primary outcomes with "hard" measures, e.g. assist with toileting.<br>• Collect *"objective"* measures of function and proxy information in parallel, e.g. percent of wet checks, hours of caregiver time.<br>• Set outcomes to be less sensitive to random fluctuations (e.g., end point of "50% decrease in UI").<br>• Use outcome measures specific to the target population: e.g., for quality of life, use established measures of social interaction [18] rather than existing UI-specific scales; re-validate existing UI-specific scales; for community-dwelling persons, transfer to setting with higher level of care (e.g., from home to residential/institutional care)<br>• Include measures related to caregiver time commitment, burden, costs, morbidity, quality of life, and satisfaction with intervention (regarding the patient and themselves).<br>• Consider and assess possible caregiver preferences for care. |
| **Mechanism by which intervention changes continence status is unclear** | • Use as secondary outcomes or covariates any physiological, functional, and care measures that are in the theoretical pathway between the interventions target and need for continence care: e.g., improvement in mobility; changes in functional MRI or SPECT; change in nursing home staffing.<br>• Evaluate multi-component interventions |

*Table 2. Challenges of and recommendations for research studies on UI and FI in frail older people (continued)*

| Challenges | Recommendations |
|---|---|
| **Improvements in continence status may not translate into well-being or better quality of life** | • Develop and use standardised measures of adverse effects particular to/of special importance for frail persons: e.g., assessment of cognitive and behavioural effects of drug therapy in persons with cognitive impairment (ranging from mild to end-stage dementia); visual changes; bowel frequency; falls.<br>• Use secondary outcome measures that assess perceived well-being and factors (such as somatic symptoms, social interaction, activities of daily living) that are important for frail older persons and their caretakers.<br>• Include assessment not just of intervention effectiveness but also its efficacy, durability, and applicability.<br>• Emphasise patient- and caregiver-centered outcome measures; minimize use of/dependence on provider/ researcher-based outcomes assessment.<br>• Consider development of clinical global impression scales (i.e., as used in dementia and depression studies) |
| **Translating research into clinical practice** | • Imbed qualitative research into quantitative trials in order to determine potential barriers to implementation<br>• Conduct feasibility studies of evidence-based interventions within non-research settings, preferably using pre-existing services (e.g. care home staff, primary care providers) rather than research staff |

Cross sectional studies are subject to confounding by these age-related comorbid conditions. Thus, studies to date have basically described "age-related" associations, as opposed to normal ageing. In addition, most of the cellular and neurochemical data come from animal studies; morphologic studies have used cadavers with unknown parity, comorbidity, and LUT symptoms; age-effects are derived from studies of symptomatic people; "normal" controls are surgical patients at tertiary centres; and cross-sectional results may be due entirely to time-dependent cohort effects, such as change in delivery practices.

Even the definition of "normal" can be difficult: is it a person with intact function, without symptoms or comorbid disease, or with normal physiologic testing? [16] The following section focuses on findings from more robust and, where possible, confirmatory studies.

## II. QUALITY OF THE DATA

The data on the aetiology of UI in the frail elderly population is limited, and includes only studies that are rated at Levels 3 and 4. In part, this is because studies of aetiology do not lend themselves to randomized, controlled trials. In addition, longitudinal studies of large numbers of individuals over long periods of time are difficult to carry out. Despite the lack of such studies, many relatively large, careful descriptive studies and case series, as well as expert consensus processes, have made important contributions to our understanding of the aetiology of UI in this population.

## III. AGE-RELATED CHANGES RELEVANT TO INCONTINENCE IN THE FRAIL ELDERLY

Several age-related changes can contribute to the development, maintenance, and worsening of UI in frail elderly people **(Table 3)**. In the text that follows, age-related changes in each structure of the LUT relevant to UI in the frail elderly will be described.

### 1. Bladder

Understanding age-related changes in the bladder is complicated by a paucity of longitudinal data, variable definitions of "normal," and use of potentially biased (and symptomatic) referral populations. It is difficult to isolate such factors as the role of decreased blood flow, poor voiding habits, comorbidity, central and peripheral nervous system innervation, and reflex patterns as determinants of bladder function in older people. [17] The research focus has been urodynamic function, neurohumoral responsiveness of detrusor smooth muscle, and ultrastructure. While the key role of the urothelium and afferent systems on micturition are increasingly appreciated (See Chapter 2: Cell Biology, Chapter 3: Neural Control and Chapter 4: Pathophysiology), there are only limited human data on urothelial changes with age.

Urodynamic changes associated with age include smaller voided volume, increased residual volume, smaller bladder capacity, and increased involuntary detrusor contractions. Correlations with age are

*Table 3. Age-related changes that can contribute to urinary incontinence in frail elderly people*

| Age-Related | Change Potential Effects on Continence |
|---|---|
| **1. Bladder ultrastructure on electron microscopy** | |
| a. Dysjunction pattern | Bladder overactivity and urge incontinence |
| b. Muscle and axon degeneration | Impaired bladder contractility, increased residual urine, and decreased functional bladder capacity |
| **2. Bladder function** | |
| a. Decreased capacity<br>b. Increased involuntary detrusor contractions<br>c. Decreased contractility during voiding<br>d. Increased residual urine | Increased likelihood of urinary symptoms and incontinence |
| **3. Urethra** | |
| a. Decreased closure pressure in women | Increased likelihood of stress and urge incontinence |
| **4. Prostate** | |
| a. Increased incidence of benign prostatic obstruction | Increased likelihood of urinary symptoms and incontinence |
| **5. Decreased estrogen (women)** | Increased incidence of atrophic vaginitis and related symptoms<br>Increased incidence of recurrent urinary tract infections<br>Decreased urethral pressure |
| **6. Increased nighttime urine production** | Increased likelihood of nocturia and nighttime incontinence |
| **7. Altered central and peripheral neurotransmitter concentrations and actions** | Increased likelihood of lower urinary tract dysfunction |
| **8. Altered immune function** | Increased likelihood of recurrent urinary tract infections |

small, suggesting that other factors are at least as important. [18] In a study of community-based healthy people over age 55, [16] involuntary contractions were found in 42% of continent women, one-third of whom were totally free of voiding symptoms. However, within this older healthy cohort the prevalence of involuntary detrusor contractions did not increase with age. Notably, completely normal urodynamic studies were found in only 18%. Detrusor contractility declined significantly with age, as has been observed in another study. [17] Decreased contractility during voiding is associated with lower urine flow rates and a small increase (generally $\leq$ 50 ml) in post-void residual volume. In men with bladder outlet obstruction, an elevated post-void residual may reflect decreased bladder contractility rather than obstructed voiding. [19] While some studies suggest a myogenic origin of impaired contractility, others suggest that impaired blood supply, with concomitant ischemic-reperfusion injury causing patchy denervation, leads to decreased contractility (see Chapter 3: Neural Control). Among older women, large cystoceles may also contribute to elevated post-void residual urine. Incomplete bladder emptying from all causes can reduce functional bladder capacity, and thereby contribute to the urinary frequency and nocturia common in frail older people.

The observation that bladder volume at the initial desire to void declines with age [20] may have been confounded by comorbid conditions and concurrent medications. Frail older people may have a combination of detrusor overactivity on filling and poor contractility during voiding, a condition termed detrusor hyperactivity with impaired contractility (DHIC). [21] In such cases, the bladder contraction does not empty the bladder fully, leaving a large post-void residual (which otherwise is not explained by bladder outlet obstruction). Symptoms include leakage with urgency, leakage with increases in abdominal pressure, dribbling, frequency, and nocturia—similar to other LUT conditions such as stress UI and obstruction, for which DHIC easily can be mistaken.

One series of ultrastructural studies involved symptomatic and asymptomatic people age 65 to 96, using urodynamic testing and electron microscopy of bladder biopsy specimens., which were read in a blinded fashion using explicit protocols. [22-29] A consistent, one-to-one correlation between specific urodynamic findings and bladder ultrastructure was observed. Patients with urodynamic detrusor overactivity had a "dysjunction pattern" with "protrusion junctions" and "ultra-close abutments." The latter were postulated to be the anatomic explanation for the

propagation of involuntary detrusor contractions in older patients. Patients with impaired bladder contractility had widespread degeneration of detrusor muscle and axons. A subgroup of patients had both types of pathology and had detrusor hyperactivity with impaired contractility (DHIC), a common finding in frail older persons with UI. [21] In the small number of asymptomatic patients with stable bladders, normal contractility, and no obstruction, there were normal arrangement and structure of detrusor muscle fascicles and two distinctive ultrastructural findings: muscle cell membranes characterized by numerous "dense bands" and markedly depleted caveolae, and slightly widened spaces between muscle cells with limited content of collagen and elastin. Depletion of caveolae may be related to de-differentiation of muscle cells, which could eventually result in the reversion of actively contractile cells to inactive, synthetically immature cells. A similar phenomenon has been reported in arteriosclerotic blood vessels and postmenopausal myometrium, and may be related to reports of increased collagen in bladders from older women. Whether this reflects increased synthesis versus decreased turnover is unknown. A subset of 23 patients in the ultrastructural studies was followed longitudinally (1-5.5 years, and 70% had stable clinical, urodynamic, and structural findings; in 30%, the most common new finding was new involuntary detrusor contractions with ultrastructural dysfunction pattern. Other investigators have found similar results but without the 1:1 correlation (e.g., see [30]).

## 2. URETHRA

Due to their common embryological origin, the urethra has similar mucosal and stromal changes to the vagina, and urethral changes in women can be partially inferred from examination of vaginal tissue. Because of the difficulty of obtaining non-cadaveric urethral tissue, the data on urethral smooth and striated muscle changes with age have problems with confounding factors and definitions of controls.

In women, mucosal thinning and lack of proteoglycans reduce urethral wall apposition, and may contribute to retrograde movement of perineal bacteria into the bladder causing urinary tract infections. These mucosal changes may extend up to the bladder trigone, causing irritation of sensory afferent nerves, and possibly triggering involuntary detrustor contractions. The change in volume, consistency, and vascularity of the submucosa also lessens resting urethral compression. The submuscosal venous plexus in the proximal urethra loses its corkscrew shape, the number and volume of arterial vessels decrease, and vascular pulsations lessen. [31] All of these changes contribute to the observed decrease in urethral closure pressure in older women. The relative importance of decreased vascular volume versus hypoxia on urethral functional integrity is unclear. Other alterations in the urethral stroma are increased volume of connective tissue, decreased ratio of proteoglycans to collagen, and decrease in nerve density. [32,33]

Cadaver studies suggest that the number and density of urethral striated muscle fibres decrease, especially in the ventral wall of the proximal urethra; this also may contribute to decreased urethral closure pressure. [34,35] Large inter-individual variations were observed, with age and parity accounting for only a small part of the variability, suggesting that other yet-defined factors play an important role. These studies also found that cross-sectional muscle fibre area decreased while fibre diameter was preserved.

With age, the urethral meatus generally moves toward the vaginal introitus, yet the meatus may be difficult to see if there is considerable introital stenosis. Caruncles—benign violaceous soft nodules—often appear at the meatus, and are not problematic unless they cause discomfort or obstruction. Urethral obstruction is relatively uncommon in older women. Other causes of obstruction in women are large cystoceles that "kink" the urethra (especially when abdominal pressure is increased), and scarring from urethral/vaginal surgery or radiation. Urethral diverticula can be a diagnostic challenge, especially in older women, because the symptoms (pain, UI, frequency, urgency, dyspareunia) usually are attributed to postmenopausal changes and age. [36] Diverticula should be considered in women who have repeatedly failed "conventional" treatment. Diagnosis requires voiding cystourethrography or imaging by ultrasound or magnetic resonance imaging.

An age-related decrease in striated sphincter muscle cell density has been described, [37,38] and associated with increased muscle cell apoptosis. [37] While some investigations describe an increase in resting prostatic urethral pressure with age, [39] others note the increase occurs only to the sixth decade then subsequently decreases, along with a shortening of sphincteric urethral length. [40] These discrepancies likely reflect differences in prostate volume and morphology.

## 3. PELVIC FLOOR

Pelvic floor changes in normal older men have not

been well studied. In women, the effect of age on pelvic floor structure and function is difficult to separate from the effects of hormonal status and parity. Studies are cross sectional rather than longitudinal, and often focus on symptomatic women. Evidence of denervation and changes in striated muscle fibre number, type, and diameter have been found in asymptomatic and nulliparous women (see Chapter 2: Cell Biology). Constipation may contribute to pelvic floor dysfunction in older women, [41] and possibly in men. Total collagen content in pelvic muscle and fascia declines with age, with increased cross-linking and decreased elasticity, [42] but this association does not imply a direct causative effect of "ageing."

## 4. Vagina

The prevalence of age-related changes in the vagina can vary with hormonal status, coexistent vascular disease, and the continuation or lack of sexual activity. [43] The postmenopausal decrease in oestrogen plays a part in many age-associated vaginal changes. Oestrogen is trophic for much of the LUT track in women, with oestrogen receptors found in the vagina, vestibule, distal urethra, bladder trigone, pelvic muscles, and ligamentum rotundum. [44] Yet, as the Women's Health Initiative[45] and HERS trial have shown, [46] one cannot assume that the association between low oestrogen levels and physiological changes implies that hormone replacement will reverse these changes, restore function, or reduce symptoms. Moreover, the data are equivocal on whether and how LUT oestrogen receptors decrease in number, density, or function in older women. [31]

Following menopause, the vaginal epithelium loses the majority of its superficial and intermediate layers. Mucosal thinning may be associated with inflammation, evident as erythema, telangiectasias, petechiae, friability, and erosions. This may be responsible for irritative LUTS in many frail elderly women. In addition, there is loss of epithelial glycogen and lubrication, and mucosal pH increases from 4.5-5.5 to 7.0-7.4. [31] These changes can lead to loss of normal adherent flora (lactobacillus), and colonization with pathogenic organisms such as *E coli* and enterococci. This in turn may result in recurrent symptomatic urinary tract infections and some associated LUTS.

Vaginal blood flow, which is important for mucosal integrity and submucosal fullness, decreases with age. Whether this is oestrogen-related, and/or due to concomitant vascular disease is not known. Collagen and lipofuscin deposition in the stroma increases, and may be accompanied by invasion by lymphocytes and plasma cells. [31] The combined epithelial and stromal changes are associated with vaginal wall thinning and flattening of rugae. [44] The vaginal vault may shorten and narrow, and the introital opening decrease (and in severe cases become stenotic), all of which may make vaginal examination difficult. Vaginal shape may be altered by pelvic floor laxity, with resultant cystocele, rectocele, and/or uterine prolapse. Each of these may contribute to incontinence in frail elderly women.

Because of the multiple potential confounding factors discussed above, a causal relationship between the presence of urogenital atrophy and urogenital symptoms should not be automatically assumed. Moreover, very few randomized trials of oestrogen for urogenital symptoms include women over age 75, use patient-defined outcomes in addition to physiological measures, or evaluate quality of life outcomes. [47] Thus, there are insufficient data to provide an evidence-based approach to symptomatic urogenital atrophy in older women. Expert opinion does suggest that if oestrogen treatment is initiated, it should be limited to topical formulations (cream, intravaginal tablets, or oestrogen-impregnated pessary-like ring).

## 5. Prostate

Histologic benign prostate hyperplasia (BPH) is strongly age-related, and may lead to gland enlargement and outlet obstruction. While many LUT changes in women are associated with lower oestrogen levels, BPH results from the development of an oestrogen-predominant hormonal milieu in the prostate. The trophic androgen in the prostate, dihydrotesterone, is formed by the 5-$\alpha$ reduction of testosterone. Dihydrotesterone levels decrease with age, while estradiol concentrations increase in the prostate stroma and remain constant in epithelial tissues, leading to an increase in the estradiol/dihydrotesterone ratio [48,49] that promotes stromal proliferation. Epithelial hyperplasia in turn is mediated by an array of stromal factors.

Histological BPH occurs in nearly 80% of men by age eighty. Mean prostate volume increases with age but is very variable; its strongest predictor is prostate specific antigen >1.4-2 ng/mL. [50] LUTS in men increase linearly over time, with the fastest increase during the seventh decade, such that by age 80 approximately one-third of men have received treatment for moderate to severe LUTS. [51] Natural his-

tory studies and randomized intervention trials, however, consistently demonstrate that symptomatic progression of benign prostate disease is not inevitable. LUTS remits in about one-third of symptomatic men without treatment. [52] Approximately one-third to one-half of affected men develop detrusor overactivity. [53] Thus, even in the presence of demonstrable prostate enlargement and/or obstruction, the aetiology of LUTS is multifactorial, making BPH-related LUTS in older men a diagnosis of exclusion.

LUTS, including urge incontinence, may be due to prostate cancer, the prevalence of which increases with age. The annual incidence of prostate cancer in the U.S. is approximately 60-80/100,000, with African Americans having the highest incidence. The median age at presentation is 68-70 years, and, while most patients are asymptomatic at the time of presentation, prostate cancer is possible in frail elderly men with UI or other LUTS. Evaluation for prostate cancer should be undertaken in frail elderly men only if it will change overall management; curative therapy in this population is inappropriate because the natural history of prostate cancer is almost always longer than life expectancy due to mortality from other comorbidity.

### 6. Other changes

The role of various neurotransmitters in the central and peripheral nervous system in UI is incompletely understood. Nevertheless, age-related changes in these neurotransmitters, their receptors, or the cellular events they stimulate may be related to the development of UI in older people. Similarly, age-related changes in immune function may predispose older people to bacteriuria and recurrent urinary tract infections, which in turn may be related to UI. Recurrent symptomatic urinary tract infections (UTIs) in older patients can precipitate UI and chronic cystitis and prostatitis, with associated LUTS. The role of otherwise asymptomatic bacteriuria (often found in association with pyuria), [54] however, in the aetiology of incontinence in frail elderly people is incompletely understood. [55] This is an important clinical issue, because the prevalence of both asymptomatic bacteriuria and UI increase with age, and the two are often found in the same frail elderly patient. Treating otherwise asymptomatic bacteriuria in frail elderly patients with chronic, stable UI does not, in general, reduce UI severity. [56] But UTI symptoms may be subtle and nonspecific in this population, and include worsening of UI, altered mental status in patients with dementia, decreased oral intake, or a minor but important decline in functional ability. Clinicians must be cautious in labelling bacteriuria as "asymptomatic" in frail elders.

## IV. FACTORS OUTSIDE THE LOWER URINARY TRACT THAT CAN CAUSE OR CONTRIBUTE TO INCONTINENCE IN THE FRAIL ELDERLY

A hallmark of UI in the frail elderly population is the wide variety of factors and conditions outside the lower urinary tract that can cause or contribute to the problem (**Table 4**).

### 1. Comorbid medical illnesses

Numerous medical illnesses common in the frail elderly can cause or contribute to UI. Diabetes mellitus, which occurs in approximately 15-20% of frail elderly, can contribute to the development of UI through at least two mechanisms. First, patients whose diabetes is poorly controlled may have some degree of osmotic diuresis and related polyuria, which can precipitate or exacerbate UI. Second, diabetics may develop detrusor overactivity, impaired bladder contractility, and even urinary retention as a presumed result of a diabetic neuropathy. Symptomatic degenerative joint disease in the lower extremities (hips, knees) also is prevalent in frail elderly, and can contribute to UI by impairing mobility (especially among people with urinary urgency). Chronic obstructive pulmonary disease and associated cough can precipitate or exacerbate stress UI in frail elderly women. Oedema resulting from volume overload (e.g., in patients with congestive heart failure and lower extremity venous insufficiency) causes a relative polyuria while supine, and can contribute to nocturia and nocturnal UI. Sleep apnoea also is associated with nocturnal polyuria, possible by increasing atrial natriuretic peptide levels, [57] and has been associated with nocturnal UI in frail elderly. [58] Whether treating sleep apnoea in such persons is feasible and effective in reducing nighttime UI is unknown. Finally, conditions (and medications [see below]) that cause severe constipation and faecal impaction can contribute to UI in frail elderly.

*Table 4. Treatable conditions outside the lower urinary tract that can cause or contribute to incontinence in frail elderly people*

| Conditions | Comments | Implications for Management |
|---|---|---|
| **Comorbid medical illnesses** | | |
| DIABETES MELLITUS | Poor control can cause polyuria and precipitate or exacerbate incontinence; also associated with diabetic neuropathic bladder | Better control of diabetes can reduce osmotic diuresis and associated polyuria, and improve incontinence |
| DEGENERATIVE JOINT DISEASE | Can impair mobility and precipitate urge incontinence | Optimal pharmacologic and non-pharmacologic pain management can improve mobility and toileting ability |
| CHRONIC PULMONARY DISEASE | Associated cough can worsen stress incontinence | Cough suppression can reduce stress incontinence and cough-induced urge incontinence |
| CONGESTIVE HEART FAILURE<br>LOWER EXTREMITY VENOUS INSUFFICIENCY | Increased nighttime urine production at night which contribute to nocturia and incontinence | Optimizing pharmacologic management of congestive heart failure, sodium restriction, support stockings, leg elevation, and a late afternoon dose of a rapid acting diuretic may reduce nocturnal polyuria and associated nocturia and nighttime incontinence |
| SLEEP APNOEA | May increase nighttime urine production by increasing production of atrial natriuretic peptide | Diagnosis and treatment of sleep apnoea, usually with continuous positive airway pressure devices, may improve the condition and reduce nocturnal polyuria and associated nocturia and incontinence |
| SEVERE CONSTIPATION AND FAECAL IMPACTION | Associated with "double" incontinence (UI and FI) | Appropriate use of stool softeners and laxatives if necessary<br><br>Adequate fluid intake and exercise<br><br>Disimpaction if necessary |
| **Neurological and psychiatric conditions**<br>STROKE | Can precipitate urge incontinence and less often urinary retention; also impairs mobility | Incontinence after an acute stroke often resolves with rehabilitation; persistent incontinence should be further evaluated<br><br>Regular toileting assistance essential for those with persistent mobility impairment |
| PARKINSON'S DISEASE | Associated with urge incontinence; also causes impaired mobility and cognition in late stages | Optimizing management may improve mobility enough to also improve incontinence<br><br>Regular toileting assistance essential for those with mobility and cognitive impairment in late stages |

*Table 4. Treatable conditions outside the lower urinary tract that can cause or contribute to incontinence in frail elderly people (continued)*

| Conditions | Comments | Implications for Management |
|---|---|---|
| NORMAL PRESSURE HYDROCEPHALUS | Can present with incontinence, along with gait and cognitive impairments | Patients presenting with all three symptoms should be considered for brain imaging to rule out this condition, as it may improve a ventricular-peritoneal shunt |
| DEMENTIA (Alzheimer's, multi-infarct, others) | Associated with urge incontinence; impaired cognition and apraxia interferes with toileting and hygiene | Regular toileting assistance essential for those with mobility and cognitive impairment in late stages |
| DEPRESSION | May impair motivation to be continent; may also be a consequence of incontinence | Optimizing pharmacologic and non-pharmacologic management of depression may improve incontinence |
| MEDICATIONS | A wide variety of medications can cause or contribute to incontinence (see Table 5) | Discontinuation or modification of drug regimen whenever feasible |
| **Functional impairments**<br>IMPAIRED MOBILITY<br>IMPAIRED COGNITION | Impaired cognition and/or mobility due to a variety of conditions listed above and others can interfere with the ability to toilet independently and precipitate incontinence | Regular toileting assistance essential for those with severe mobility and/or cognitive impairment |
| **Environmental factors**<br>INACCESSIBLE TOILETS<br>UNSAFE TOILET FACILITIES<br>UNAVAILABLE CAREGIVERS FOR TOILETING ASSISTANCE | Frail, functionally impaired people require accessible, safe toilet facilities, and in many cases human assistance in order to be continent | Environmental alterations may be helpful; supportive measures such as pads may be necessary if caregiver assistance is not regularly available |

### 2. Neurological and psychiatric disorders

Neurological and psychiatric disorders are highly prevalent in the frail elderly population. Stroke, dementia syndromes (most commonly Alzheimer's disease, multi-infarct dementia, or a combination of the two), and Parkinson's disease each can contribute to UI through multiple mechanisms. First, these disorders may affect the brain's pontine micturition centre, and interfere with the normal ability to inhibit the lower urinary tract. Second, each of these disorders can impair cognition, which in turn can contribute to UI. Third, each can impair mobility, and interfere with the ability to toilet independently. Normal pressure hydrocephalus should be a diagnostic consideration in any frail elderly patient who presents with new onset of UI in association with gait disturbance and cognitive impairment. A subset of these patients benefits from surgical implantation of a cerebrospinal fluid shunt. [59] Depression, common among the frail, also can contribute to UI by decreasing the motivation to be continent. Optimal pharmacologic and non- pharmacologic treatment of depression therefore may improve UI in some frail patients.

### 3. Medications

Several classes of medications commonly prescribed for the frail elderly can cause or contribute to the development of UI (**Table 5**). The potential role of one or more of these medications in a frail elderly person's UI must be carefully considered during the initial diagnostic evaluation (see below).

### 4. Functional impairments

Impaired functional ability is the common pathway by which several medical and neuropsychiatric disorders cause or contribute to UI. Numerous studies have demonstrated a close association between functional impairment and UI in the frail elderly population. [60-64] Impaired mobility can preclude a frail older person with urinary urgency from reaching the toilet in adequate time to prevent an UI episode. The apraxia associated with moderate to severe dementia (from any number of causes) interferes with independence in toileting and hygiene. The fact that UI in many cognitively and/or mobility impaired frail elderly people is markedly improved by regular toileting assistance (e.g., prompted voiding [see Behavioural Interventions below]) suggests that functional impairment plays a predominant role in the aetiology of UI in many frail elderly people.

### 5. Environmental factors

Inaccessible toilets can be a major factor in the aetiology of UI, especially in frail elderly patients with functional impairments. Visual impairment is common in the frail elderly, and also can interfere with the ability to toilet independently. Toilet accessibility also is an important safety issue. Urge UI (but not stress UI) is a major risk factor for falls and related injuries among older women. [65] Falls among frail elderly people in long-term care institutions commonly occur while attempting to reach a bathroom. [66] Thus, the appropriate use of toilet substitutes (i.e. urinals, bedside commodes, and bedpans for immobile women) and attention to potential environmental hazards (e.g. obstacles on the path to the bathroom, inadequate lighting, lack of handrails, low toilets) can be helpful in preventing UI as well as injuries. Clothing also may be altered to make toileting easier (e.g., Velcro fasteners and pants with elastic waist bands rather than buttons and zippers).

For incontinent frail elderly people with severe impairments of cognitive function and/or mobility, available, capable, and motivated caregivers are essential in UI treatment. In the home setting where caregivers may not always be available to provide toileting assistance, UI may be best managed using supportive measures (i.e. regular checking and changing of absorbent pads or products).

## V. ASSESSMENT OF THE FRAIL ELDERLY INCONTINENT PATIENT

Recommendations for the basic assessment of the frail elderly persons with UI are summarized in the Algorithm (see Annex 1). Because UI in this patient population is usually multifactorial, and the wide variety of factors and conditions outside the lower urinary tract discussed above can contribute to the problem (**Table 3**), a comprehensive assessment with the goal of identifying all potential contributing factors is critically important. The multifactorial nature of UI in frail elderly patients also implies that collaboration among primary care physicians, geriatricians, surgical specialists, health professionals, and caretakers often is necessary for optimal assessment and management.

The essential first step in assessing a frail person with UI is to identify treatable, potentially reversible conditions that can cause or contribute to UI. Such UI has been commonly termed "transient incontinen-

*Table 5. Medications that can cause or contribute to incontinence in frail elderly people Medications Effects on Continence*

| **Medications** | **Effects on Continence** |
|---|---|
| Alpha adrenergic agonists | Increase smooth muscle tone in urethra and prostatic capsule and may precipitate obstruction, urinary retention, and related symptoms |
| Alpha adrenergic antagonists | Decrease smooth muscle tone in the urethra and may precipitate stress incontinence in women |
| Angiotensin converting enzyme (ACE) inhibitors | Cause cough that can exacerbate incontinence |
| Antimuscarinic agents | May cause urinary retention and constipation that can contribute to incontinence |
| Calcium channel blockers | May cause urinary retention and constipation that can contribute to incontinence |
| Cholinesterase inhibitors | Increase bladder contractility and may precipitate incontinence |
| Diuretics | Cause polyuria and precipitate incontinence |
| Opioid analgesics | May cause urinary retention, constipation, confusion, and immobility – all of which can contribute to incontinence |
| Psychotropic drugs | |
| *Sedatives*<br>*Hypnotics*<br>*Antipsychotics* | May cause confusion and impaired mobility and precipitate incontinence<br>Some agents have anticholinergic effects |
| Other drugs | |
| *Calcium channel blockers (pyridines)*<br>*Gabapentin*<br>*Glitazones*<br>*Non-steroidal anti-inflammatory agents* | Can cause edema, which can lead to polyuria while supine and exacerbate nocturia and nighttime incontinence |

ce." While transient UI certainly occurs in frail elderly people, especially in conjunction with an acute illness, the vast majority of UI in the frail elderly is chronic, and often progressive. Using a standardized global assessment tool a study of 5418 older people receiving home care identified UTIs, physical restraints, and environmental barriers as the most common reversible UI risk factors. [67] However, a study of several hundred incontinent nursing home patients in the United States found transient UI to be rare. [68] This should not imply, however, that an assessment for treatable, potentially reversible conditions is fruitless in this patient population. In fact, most of these conditions should be treated on the basis of quality of life concerns as well as UI. Moreover, addressing one or more of these conditions in the same individual may ameliorate the UI, and thus make it more amenable to other interventions.

**Table 4** lists most of the common, treatable, potentially reversible conditions that can contribute to UI in frail older people. They can be categorized into four types:

1. Conditions that cause inflammation or irritation in or around the lower urinary tract
2. Conditions that cause an increase in urine production

3. Medication side effects

4. Conditions that impair the ability or willingness to toilet

Common, treatable conditions causing inflammation/irritation in or around the lower urinary tract in frail incontinent patients include UTI (discussed above), atrophic vaginitis, and faecal impaction. While there is no evidence that treating atrophic vaginitis cures UI in frail older women, topical oestrogen may be a useful adjunct to other therapies and should be considered in patients with signs of atrophic vaginitis on pelvic examination (inflammation and/or friability of the labia minora, vaginal epithelium, or periurethral area). Severe constipation and faecal impaction may contribute to UI and should be identified and treated (see Faecal Incontinence section below).

Conditions that increase urine production include excess fluid and/or caffeine intake, metabolic disorders that can cause an osmotic diuresis, including hyperglycaemia and hypercalcaemia, and volume overload states, including congestive heart failure and lower extremity venous insufficiency. These conditions should be identified and managed appropriately in all frail elderly incontinent patients before more specific treatments for UI are initiated.

Many frail elderly individuals are treated with multiple medications because of a large number of comorbid medical and neuropsychiatric problems. As noted above and in **Table 5,** several types of medications can precipitate or exacerbate UI in frail elderly people. Whenever feasible, these medications should be discontinued, or dosage modified, in order to manage UI effectively.

Finally, functional impairments of cognition and mobility may occur acutely and precipitate UI. Common examples include delirium in hospitalized frail elderly, and painful conditions that interfere with mobility (e.g. vertebral compression fractures, acute inflammation of lower extremity joints or bursa, fractures and contusions from falls). Identifying and managing these conditions appropriately may result in resolution of UI. Frail elderly who undergo surgery are especially susceptible to delirium and immobility post-operatively. They also are at risk for urinary retention because of immobility, anaesthesia effects, and narcotic analgesics.

A mnemonic, "DIAPPERS," has been commonly used to teach and remember these conditions (delirium, infection [urinary tract], atrophic vaginitis, pharmaceuticals, psychological, excess fluid (in/out), restricted mobility, and stool impaction [and constipation]). [69]

Carefully selected frail elderly patients may benefit from further specialized assessments, including urological and/or gynaecological examinations and urodynamic testing. Referral is pertinent if empiric therapy fails, the diagnosis is uncertain and would change management, or if the patient is appropriate for and wishes surgical intervention.

## VI. SUMMARY OF EVIDENCE

1. The aetiology of UI in the frail elderly population is usually multifactorial. (Level 2-3)
2. A large number of age-related changes in the structure and function of the lower urinary tract, as well as its innervation, can contribute to UI in frail elderly people. (Level 2-3)
3. Many treatable conditions outside the lower urinary tract can cause or contribute to the onset, maintenance, or worsening of UI in this patient population. (Level 2-3)
4. The basic assessment of UI in frail elderly people must be comprehensive, and include a careful history and physical examination, urinalysis, and assessment of post-void residual urine in order to identify potential treatable conditions, as well as assessment of cognitive function, mobility, and environmental factors that can cause or contribute to UI in this patient population. (Level 3-4)
5. Carefully selected frail elderly patients may benefit from further specialized assessments, including urological and/or gynaecological examinations and urodynamic testing. (Level 4)

## VII. RECOMMENDATIONS FOR MANAGEMENT

- The basic assessment of UI in frail elderly people should include a careful history, physical examination, urinalysis, and assessment of post-void residual urine in order to identify potentially treatable conditions, as well as assessment of cognitive function, mobility, and environmental factors that can cause or contribute to the incontinence in this patient population. (Grade B-C)

- Carefully selected frail elderly patients should be referred for specialised assessments, including urological and/or gynaecological examinations and urodynamic testing. (Grade C)

## VIII. RECOMMENDATIONS FOR FUTURE RESEARCH

- Examine the incidence, remission, and factors associated with clearly defined types of UI, in combination with urodynamic and ultrastructural studies in as many subjects as possible using standardised protocols and definitions, and involving large numbers of carefully characterized individuals who are followed for long periods of time
- Determine the nature, the origin of and genetic factors associated with the ultrastructural findings in detrusor muscle, including the dysjunction pattern (including protrusion junctions and ultra-close abutments) which appears related to detrusor overactivity in the frail older population, and muscle and axon deterioration, which appears closely related to impaired bladder contractility
- Basic science and clinical studies to determine the origin and genetic factors associated with progressive loss of urethral pressure in older women, and strategies to prevent it.
- Clinical and pathological studies to determine the role of oestrogen deficiency and its treatment in older women with UI.
- Clinical and pathological studies to better determine the role of bacteriuria and pyuria in the pathogenesis of detrusor overactivity and UI in frail older people.
- Basic science and clinical studies to determine the origin of and optimal treatments for nocturnal polyuria and nocturia, which commonly precipitate nighttime UI in frail older people
- Clinical studies to determine the prevalence of and impact of therapy on potentially treatable conditions that can cause or contribute to UI in the frail elderly.
- Clinical studies to determine the most efficient basic assessment of frail elderly incontinent patients, and its impact on outcomes.
- Better understand the implications and appropriate management of "asymptomatic" bacteriuria and pyuria in the frail elderly persons with chronic UI.

# C. FACTORS IN MANAGEMENT

## I. BACKGROUND

We have added this section, new to the 3rd ICI, to highlight the issues that distinguish management of UI and FI in frail older people from that of healthier adults. These overarching factors involve preferences for care, goals of care, determination of costs and benefits, special issues in drug treatment, and issues unique to frail elderly men. They incorporate knowledge of physiological, psychological, sociological, and economical changes associated with frailty and advanced age, and reflect the importance of patient-centered goals and the role of caregivers in this population. These factors provide the context of continence care and should be incorporated into the management of all incontinent frail people, *regardless* of the choice of specific treatment.

## II. PREFERENCE FOR CARE

As there are several treatment options available for frail older adults with UI and individualised care is emphasised, obtaining patients' opinions regarding preference is considered part of good care planning. One barrier to attaining information about patient preferences may be cognitive impairment. In a study designed to increase fluid intake, nursing home residents with more cognitive impairment increased their fluid intake in response to prompts to drink (versus being prompted to drink and being offered a preference regarding the beverage to drink). [70] When family members were asked about their preferences to improve nutrition for nursing home residents, behavioural and environmental changes were their first preference and medications and nutritional supplements their last choice. [71] Residents may express preferences in terms of end-of-life treatment and a facility must be responsive in providing individualised care according to the residents' wishes. [72] Little information, however, is available about older adults' and caregivers' preferences for UI care.

### 1. Quality of data

Two studies were located that directly addressed patient and caregiver preferences for UI care. The first [73] described 4 interview strategies used with 111 incontinent nursing home residents to determine

satisfaction and preferences for UI care. Inclusion criteria were: age > 65 years, UI (without an indwelling catheter), able to understand English, and able to pass a cognitive screen test. The interview strategies included direct questions on satisfaction, direct questions on preferences for care, comparisons between preferences and reported frequency of receiving care, and between preferences and direct observations by research staff of actual care received. 89% of the sample participated. The second study was a survey in which respondents (including residents of 2 board-and-care facilities [residential care] and 2 long-term care facilities) (n=70), their family members (n=403), and each facility's nursing staff members (n=66) were given definitions of and information about five UI treatment options (indwelling catheter, prompted voiding, adult diapers [sic], electrical stimulation, and medications). [74]

Respondents were asked their preferences between pairs of treatment options (e.g., diapers versus prompted voiding). Family members received a mailed questionnaire and nursing staff were mainly interviewed in groups (a small number were interviewed individually). 42.2% of family surveys were returned. Most nursing home residents were too cognitively impaired to reliably respond to an interview, therefore residential care residents and cognitively intact nursing home residents served as alternatives.

### 2. Results

In the first study, direct observations by researchers of the continence care provided revealed low average pad change frequencies and assists to toilet (mode of zero for both). Residents preferred an average of 2 pad changes, 1.5 toilet assists, and 2 walking assists more than they normally received. The authors noted patients' preference for low levels of care may be indicative of "reduced expectations" regarding care and acquiescence. [73]

In the second study, most of the board-and-care respondents were continent, although some were undergoing UI treatment at an outpatient clinic. Patients and family members were evenly divided between definitely or probably preferring prompted voiding versus diapers. Almost 80% of nursing staff, however, preferred prompted voiding to diapers. Families perceived staff members as unwilling to perform prompted voiding, and some thought prompted voiding was degrading to the resident and that it was bothersome to be asked to go to the toilet frequently.

### 3. Summary of evidence

1. There is evidence-based guidance on patient and caregiver preferences for UI treatment options in frail elders. (Level 3)
2. Older adults may reduce their expectations for toileting based on the limited toileting they already receive. (Level 3)
3. Discrepancies exist between preferences and continence care behaviours among nursing home staff members. (Level 3)

### 4. Recommendations for research

- Determine UI treatment preferences of frail elders (including cognitively impaired individuals), families, and caregivers in various care settings.
- Determine the factors that guide the preferences for patients, families, and caregivers UI care.
- Explore the effect of organisational factors such as staff-patient ratio, presence of advanced practice nurse in the facility, and staff performance of toileting on continence care preferences.

## III. COSTS AND BENEFITS OF UI TREATMENT IN FRAIL ELDERLY

An overall discussion regarding UI-related costs is in Chapter 24: Economics of Incontinence. The following discusses UI cost issues specific to the frail elderly.

### 1. Estimating Costs

Costs related to UI will increase with the aging of the population: by 2030, the greatest increase in demand for UI care (81%) will be in older women aged 60-89 with "overactive bladder". [75] Such costs can be divided into direct costs, indirect costs, and intangible costs. [76] Previous estimates have focused on diagnostic costs, treatment (including routine care and pads), and consequence costs (skin irritation, urinary tract infection, falls, fractures, additional nursing home and hospital admissions, longer hospital length of stay); intangible costs were not considered in these estimates because of their subjective nature. [76]

For frail elderly, especially those in long term care, the cost calculation is especially complex. For these people, the greatest costs by far are nursing labour costs. [77] Paradoxically, the extra nursing time needed to toilet functionally-impaired patients may lead to higher costs than the status quo (i.e., UI). [77] Routine garment and laundry costs may be lower than estimated because patients are not changed as often as needed. [77] In addition, for prompted voiding to remain effective, such things as wet sensors and/or regular refresher education programmes for staff are necessary, and rarely considered in cost estimates. [75] Moreover, the time period over which the costs and benefit are calculated needs to be explicit because both benefit and costs will change, and patient morbidity and mortality need to be considered. The costs of correcting functional and medical causes of UI are rarely considered, as are the potential differential in costs across the span of cognitive and functional impairment. [78] Costs related to caregiver time include lost wages, decreased productivity (inside and outside the home), the additional number of caretaking hours when a frail person develops UI, [79] and the cumulative effect of increased strain and burden and any resultant illness.

Costs may vary by access to care. Because so many frail elderly are homebound or live in institutions, they often do not have the same access to UI/FI treatment as other populations. Their health care providers may be limited to primary care physicians, community nurses and care assistants or aides with little to no expertise in UI or FI management. Specialist consultation may be minimally available in home or long term care settings, leading to a focus solely on conservative management.

Cost relates strongly to reimbursement, which varies considerably from country to country depending not only on structure of the health system but special programmes for the aged and people with UI (see Models of Care below). Within particular countries, there may be further variation based on insurance, co-insurance, drug versus procedure coverage and incentives, access to care, programmes for vulnerable populations (i.e., elderly, the poor) and urban/rural differences.

### 2. Benefit and effectiveness

The ability to define the benefit of UI treatment in frail older people highly depends on the individual, their caregivers, and the health care system. Outcomes research indicates that patients value quality of life, which encompasses many domains besides reduction in UI (See Chapter 6: Symptom and Quality of Life Assessment). Even in cognitively impaired people, one can still evaluate treatment preferences, [15,80] evaluate domains of quality of life (e.g., social interaction), [81] and assess satisfaction directly or behaviourally. At the same time, we have no data on the value or utilities frail elderly or their caregivers assign to varying degrees of UI (with or without treatment intervention) versus "dryness." Standard outcomes such as quality adjusted life years (QALYs) may overestimate effectiveness in older people [82] not just because of potentially different utilities but the altered importance of "years of life saved" in a population with high mortality rate. If used, QALYs should be specifically examined by age, [82] and also possibly health status.

## IV. ISSUES IN DRUG TREATMENT

### 1. Age-related changes in pharmacology

Pharmacokinetics refers to drug absorption, distribution, metabolism and clearance. Specific age-related changes in pharmacokinetics [83,84] and their potential effect on UI drugs are in **Table 6**. Pharmacodynamic changes in ageing have been described for benzodiazepines, beta-adrenergic agents, and opiates. [84] Whether or not age-related pharmacodynamic changes exist for many UI drugs is unknown. Future studies of these effects should take into consideration age-related differences in the target measure (e.g., psychomotor performance) by looking at absolute and not just relative percentage changes in outcome. [84]

Age-related pharmacokinetic changes are rarely if ever considered in planning the duration of time off previous UI medications, placebo-run in periods, and wash-out periods in UI drug trials in older people. Given the numerous factors potentially affecting drug clearance in such patients, previous and/or cross-over agents may confound observed drug effects.

### 2. Availability of low dose agents

One effect of the under-representation (if not exclusion) of frail older people in UI drug studies is a lack of knowledge regarding minimal effective drug doses for this population. The age-related changes in pharmacology noted above suggest that some UI

*Table 6. harmacokinetics in older people*

| Parameter | Age-associated Changes | Potentially Affected UI Drugs |
|---|---|---|
| Absorption | Minimal quantitative change despite ↓ gastric motility, yet little known regarding effect on slow-release agents | Extended release preparations |
| | ↓ Skin thickness | Transdermal preparations |
| Distribution | Decrease in lean body mass leads to ↓ Vd /↓T for hydrophilic drugs and ↑Vd/↑T for lipophilic agents | Lipophilic agents, tricyclic antidepressants |
| | Decreased protein binding in frail patients with low albumin, leading to higher concentration of free drug | Tolterodine (highly protein bound) [20] |
| Hepatic metabolism | ↓ Phase I reactions (oxidation/ reduction) | Tricyclic antidepressants |
| | No change in Phase II reactions (glycosylation) | |
| | ↓ Hepatic blood flow and ↓ hepatic mass, leading to reduced clearance for agents with first-pass metabolism | Oxybutynin<br>Tolterodine (higher serum concentrations) [20] |
| | Stereoselective selectivity in metabolism (hypothetical) | Enantiomers |
| | Cytochrome P450 | Oxybutynin (CYP3A4), [19]<br>Tolterodine (CYP2D6) [20] |
| Clearance | Decrease in renal clearance | Tolterodine [20]<br>Trospium |

Vd = volume of distribution, T = half life

drugs may be effective at lower than standard doses in frail elderly (with concomitant decreased adverse effects). [85] This issue is especially relevant for standard and extended-release preparations, the majority of which cannot be divided into smaller doses.

## 3. Inappropriate polypharmacy

Older people take a far greater percentage of all prescription medications than their proportion of the total population would suggest. Approximately 60% of elderly people take at least one prescribed medication and about one-third take more than five prescribed drugs. In addition, many take over-the-counter and naturopathic or herbal agents, with the rate of use varying across countries and cultures. The likelihood of adverse drug reactions and drug interactions rises exponentially as the number of medications increases. This has led to the recommendation in geriatric prescribing to "subtract before adding" a new agent. This approach is relevant in geriatric UI, as UI may have been precipitated and/or worsened by medications (e.g., impaired mobility and increased post voiding residual from haloperidol), and should be considered in the management of UI in all frail older people. Since many drugs have been associated with causing or contributing to UI, all current medications (including non-prescription) should be reviewed before initiating a new one.

## 4. Adverse drug events

Adverse drug effects (ADEs) are extremely common in older people, with U.S. rates ranging from 35% in community-dwelling persons [86] to two-thirds in long term care residents. [87] Factors associated with higher ADEs in the elderly are high drug doses, age-related pharmacological changes, polypharmacy, comorbid conditions, and the interactions between

them. Older people are at higher risk of antimuscarinic ADEs because of changes in receptor number and distribution, blood-brain barrier transport, and drug metabolism. [88] Whereas antimuscarinic ADEs in younger people are bothersome, in the frail elderly they can result in serious morbidity such as increased heart rate, sedation, heat intolerance, delirium, and falls with fractures. [88] The major ADE of concern in frail adults is cognitive side effects of antimuscarinic agents. This ADE may go under-detected by being mistaken for the effects of age-related diseases and ageing. People with dementia are at greater risk for this ADE because of decreased central cholinergic transmission. Actual incidence rates of cognitive impairment with antimuscarinic agents for UI are difficult to estimate because of the different measures used across studies, failure to specify the measure in published trials, the use of proxy measures (such as quantitative EEG), and differences in psychometrics and clinical relevance between self-report, physiologic, and performance measures of cognition.

Antimuscarinic agents for UI also cause dry mouth (xerostomia), which already exists in approximately 30% in people over age 65. Most older people already take at least one drug that causes xerostomia. [89] The morbidity from xerostomia, dental caries, problems chewing, poorly fitting dentures, dysphagia, and sleeping difficulty also should be considered when assessing risk/benefit of UI drugs in frail older people. [89] Another antimuscarinic ADE to which frail elderly people may be predisposed is decreased visual accommodation, [90] yet this has been specifically evaluated only in young healthy volunteers. [91]

Another adverse effect from antimuscarinic agents is increase in PVR, although it is poorly examined and/or quantified in intervention trials. No clear cut-off's exist to indicate when a PVR is too high to consider starting or increasing the dose of antimuscarinic drug. If UI worsens after a dosage increase, it may be because an increased PVR has lowered functional bladder capacity. High PVRs may be more tolerable in frail elderly women than men, especially regarding renal function. In the absence of frequent UTIs, frail older women may tolerate PVRs over 200 mL. PVR should always be monitored in frail older men treated with antimuscarinics.

## 5. Drug interactions

Because frail older people take higher numbers of drugs and usually have several comorbid conditions, drug interactions are more common. All antimuscarinic agents for UI will have additive side effects when combined with other anticholinergic agents, and could potentially alter other drug absorption by slowing gastrointestinal motility. *Drug-drug interactions* for both oxybutynin and tolterodine include potent CYP3A4 inhibitors (azole antifungals, macrolide antibiotics cyclosporin, vinblastine). [92,93] There is one case report of interaction between tolterodine and warfarin in 2 older patients, [94] which was not seen in healthy volunteers. [93] Little is known about interactions between antimuscarinic agents for UI and cholinesterase inhibitors used for dementia, save for case reports. [93,95] Such interactions may be complicated by worsening or new onset UI with cholinesterase inhibitors [96] (not yet systematically evaluated). Naturopathic/ herbal preparations should also be considered for potential interactions, especially in areas where these agents are used frequently. Drugs also may interact with comorbid conditions (*drug-disease interactions*), such as conditions that affect hepatic or renal metabolism and clearance, slow gastric motility (e.g., advanced diabetes), predispose to delirium, or are associated with impaired central cholinergic transmission (Alzheimer's dementia).

## 6. Potentially inappropriate drugs for older persons

Efforts at quality improvement for older populations have led to the development in several countries of expert consensus guidelines regarding inappropriate drugs for older people. [97,98] These guidelines focus on drugs with lower risk-benefit ratios and higher potential for drug-drug and drug-disease interactions. Several UI drugs are included in the American guidelines, [97] including: immediate-release oxybutynin (because of high risk of "anticholinergic adverse effects, sedation, and weakness"); oxybutynin (immediate- and extended-release), tolterodine, and flavoxate in the presence of bladder outlet obstruction (because of high risk of "decrease[d] urinary flow, leading to urinary retention"); the class of anticholinergic drugs in the setting of both cognitive impairment (because of high risk of "concern due to CNS-altering effects") and constipation (because of low risk of "exacerbat[ing] constipation"); and tricyclic antidepressants in the setting of stress incontinence (because of high risk of "produc[ing] polyuria and worsening of incontinence"). Whether or not one agrees with these recommendations, there is still value in the concerns they raise, and they are already in use for nursing home regulation and quality of care assessment in health systems.

## V. SPECIAL ISSUES UNIQUE TO FRAIL OLDER MEN

Although their ranks thin into the ninth decade, men still comprise a significant portion of frail older people. UI is a huge problem for frail men, as the prevalence of UI jumps in men 80 years and older, from about a third of the rate in women to the same. Over the past ten years, the prevalence of UI in U.S. male nursing home residents aged 65-74 has increased to a greater extent than in female residents (from 39% to 60%, compared with 45% to 59%). [99] At the same time, frail men are underrepresented in treatment trials, whether behavioural, pharmacological, or surgical (see also Chapter 15: Surgery for Urinary Incontinence in Men).

This under representation is unfortunate, because results from trials in frail women cannot be directly extrapolated to men for a variety of reasons:

- Differences in comorbidity: Frail older women have higher rates of functional impairment, [100] which may mean that frail men could be more likely to respond to behavioural interventions.
- Differences in caregivers: More older men have living spouses who can provide care, with a potential impact on the risk and type of caregiver burden associated with UI/FI management.
- Differences in the relationship between UI and cognition: One systematic urodynamic study of nursing home residents with UI found that there was a significant relationship between detrusor overactivity and more severe cognitive impairment in women but not in men (although power was likely low, as the number of men was only 17). [101]
- Benign prostate disease: The prevalence of histologic hyperplasia, benign enlargement, and outlet obstruction all increase with age, although the majority of men with hypertrophy do not have obstruction. Benign prostate disease can cause LUTS, including UI, and is associated with involuntary detrusor contractions and outlet obstruction. In the urodynamic study cited above, 29% of men had obstruction and 59% had involuntary detrusor contractions as the predominant cause of UI, [101] versus 4% obstruction and 61% involuntary detrusor contractions in women.
- Prostate cancer: Nearly all men in their ninth decade have histological evidence of prostate cancer. However, it is not clear that frail elderly men have an increased risk of prostate cancer-specific mortality, especially given that their life expectancy is primarily affected by comorbid conditions. Thus, the need to treat prostate cancer diminishes with functional status, comorbidity, and life expectancy. [102] At the same time, now more than a decade into the era of prostate specific antigen screening, more men will be living with the sequelae of prostate cancer treatment, including stress UI.
- Risk of retention: Because of age-related decrease in detrusor contractility and increased likelihood of prostate enlargement and obstruction, it is often assumed that frail elderly men have a higher prevalence and risk of urinary retention. However, this has never been demonstrated. In the nursing home urodynamic study cited above, the prevalence of an underactive detrusor was 38% in women and 41% in men, despite the higher percentage of men with obstruction. [101]

Despite these differences, at this time management of UI/FI in frail older men should in general follow the same roadmap as for women, which is why in this ICI there is one algorithm for frail elderly instead of two gender-specific ones as previous. It is unclear whether the necessity of doing a PVR in the initial evaluation and the safety of initiating antimuscarinic therapy is the same for frail men and women. In the absence of any guiding data, expert opinion remains conservative: all persons should have a PVR tested, and—although there is no contraindication to antimuscarinic use in older men with urge UI—any such treatment should only be done in carefully monitored settings with PVR follow-up.

## VI. SUMMARY OF EVIDENCE

1. Important issues in the management of frail persons with UI are:

- Patient (and caregiver) preferences for care (Level 4)
- Patient-centred care goals (Level 4)
- Understanding of the potential costs and benefits to the individual, caregiver, and health systems (Level 4)
- Special considerations in drug treatment in this population (Level 4)

2. Estimates of UI costs in frail persons include:
- Costs related to caregiver and caregiver burden (Level 2)
- Time period of interest (Level 4)
- Costs of correcting comorbidity (Level 4)
- Incentives and disincentives inherent in particular reimbursement systems (Level 4)

3. Measurement of satisfaction and quality of life benefit are possible with frail older people. (Level 1)

4. Age-related changes in pharmacokinetics affect antimuscarinic drugs. (Levels 1-2)

5. Drugs may be effective at lower doses than in younger persons. (Level 4)

6. Polypharmacy increases the chance of adverse reactions to drug therapy. (Level 1)

7. Adverse drug events are more common in the frail elderly. (Level 2)

8. Frail patients are at higher risk for cognitive adverse events (Level 2), although specific incidence is unknown.

9. Drug-drug and drug-disease interactions occur in frail older people (Level 1-3), although specific incidence is unknown.

10. Frail older men are experiencing a greater rise in the rate of UI than frail women. (Level 1)

11. Differences in functional status, caregivers, and comorbidity (especially prostate disease) preclude direct extrapolation of UI management outcomes in frail women to frail men. (Level 4)

## VII. RECOMMENDATIONS FOR MANAGEMENT

- The management of frail older people with UI must incorporate:
  - Patient (and caregiver) preferences for care (Grade C),
  - Patient-centred care goals (Grade C),
  - Understanding of its potential costs and benefits to the individual, caregiver, and health systems (Grade C),
  - Special considerations in drug treatment in this population. (Grade C)
- Cost of treatment from the perspective of the patient and caregiver should be incorporated into management decisions. (Grade C)
- All current medications should be evaluated for their impact on continence before UI/FI-specific agents are added. (Grade C)
- Age-related changes in pharmacokinetics should be considered in choosing drugs and dosages. (Grade C)
- Drug-drug and drug-disease interactions should be considered before starting novel drug therapy for incontinence. (Grade C)
- Drugs should be started at the lowest possible dosage. (Grade C)
- Adverse drug events, particularly cognitive effects, should be proactively monitored when using antimuscarinic agents. (Grade C)
- Management of UI in frail older men should be similar to that in older women, with the exceptions that men always should have a PVR done initially, and antimuscarinic therapy should only be done in settings with careful clinical monitoring and PVR follow-up. (Grade C)

## VIII. RECOMMENDATIONS FOR RESEARCH

- Develop economic models that include costs related to caregiver and caregiver burden, specify time period of interest, costs of correcting comorbidity, and intangible costs and benefits for the individual, caregiver, and health systems.
- Determine incentives and disincentives inherent in particular reimbursement systems and measure their economic and personal impact.
- Develop and validate specific quality of life and satisfaction measures for this population.
- Assess pharmacokinetics of anti-incontinence drugs in frail older people.
- Evaluate efficacy of lower drug dosages than used in younger populations.
- Develop and validate research and clinical tools to measure adverse drug events (especially cognitive) in frail elderly.

- Determine incidence and risk of cognitive adverse events from antimuscarinic drugs.
- Evaluate drug-drug interactions between antimuscarinics and cholinesterase inhibitors regarding mutual efficacy and tolerability.
- Explore gender differences in UI pathophysiology in frail older people.
- Determine the impact of PVR results on management and outcomes in frail older persons.
- Determine the efficacy and safety of antimuscarinic drugs in frail older men with urge UI, and of alpha blockers in the empiric treatment of older men with UI and outlet obstruction (by clinical or urodynamic diagnosis).

# D. TREATMENT

## I. LIFESTYLE INTERVENTIONS

### 1. Background

As potentially treatable correlates of and risk factors for UI are determined, interventions that ameliorate their effects have been devised. Several lifestyle interventions have been designed for women including weight loss regimens, diet, fluid selection and management, smoking cessation, and constipation management (See Chapter 14: Adult Conservative Management). Several of these interventions may be inappropriate in frail elders (e.g., weight loss regimens and smoking cessation programmes), yet advanced age alone should not preclude their use if assessment warrants. Diet and fluid interventions and those designed to alleviate constipation could be appropriate in this population (see Faecal Incontinence section below). Although many health care professionals advocate lifestyle interventions to treat UI, [103] we did not locate studies of many lifestyle interventions for the frail elderly.

### 2. Diet and fluid management

#### *a) Quality of data*

We located articles addressing fluid intake in older but not necessarily frail women. Small sample sizes, homogeneity of subject characteristics, and low adherence to the protocol in one study hamper its generalisability.

#### *b) Results*

The effects of hydration on the number of UI episodes in older women were investigated. [104] As many of the women randomly assigned to one of three groups did not adhere to the protocol, results were not statistically significant; some women reported a decrease in UI because they were aware of the need to increase their fluid intake. In another study, 41 community dwelling older women were instructed to reduce caffeine intake and increase oral fluid intake. Increased fluid intake was statistically significantly associated with average voided volume, and decreased caffeine was not significantly associated with fewer UI episodes. In another study with 95 adults, decreased caffeine intake was significantly associated with improved urgency and frequency. [105] One systematic literature review reported that caffeine affects smooth muscle contractility but little evidence that it acts as a diuretic. [106] It recommended advising patients to eliminate caffeine despite the scant evidence of effectiveness. In a study with women over age 40 years, (435 [6.2%] were 80 years and older), carbonated beverages and obesity were identified as risk factors for overactive bladder and stress urinary incontinence while coffee consumption appeared to be associated with lower risk. [107] In a study with nursing home residents, an exercise and toileting intervention had no statistically significant effect on constipation and appetite. It was acknowledged that the baseline food and fluid consumption of the residents was low and urged that adequate feeding assistance be provided to nursing home residents. [108] The suggestion by some to increase dietary bran to prevent constipation in fact may worsen constipation if fluid intake is low.

### 3. Summary of evidence

1. No clinical research on lifestyle changes in the frail elderly has been conducted and caution should be used to extrapolate findings from a more fit population. (Level 3)
2. Decreased caffeine intake and inclusion of bran into the diet to treat constipation are suggested[109] but there is little scientific basis that they

are effective in frail persons and are possibly detrimental (e.g., if high fiber intake is not accompanied by sufficient fluid intake, constipation can worsen). (Level 3)

3. In older populations, high fluid consumption appears not to be associated with increased UI, and nursing home residents do not get adequate oral hydration. (Level 3)

### 4. Recommendations for management

- Nursing home residents should receive adequate oral hydration to increase voided volume. (Grade C)
- Decreased caffeine intake should be considered for frail elderly. (Grade C)
- Constipation should be actively managed to improve UI. (Grade C)

### 5. Recommendations for research

- Determine the effects of caffeine reduction on UI episodes in frail elderly.
- Assess the effects of increasing oral fluid intake on UI episodes and voided volumes in frail elderly.
- Evaluate the effectiveness of constipation treatment on the number of UI episodes in frail elderly.

## II. BEHAVIOURAL INTERVENTIONS

### 1. Background

Behavioural interventions have been especially designed for frail older people with cognitive and physical impairments that may affect the ability to learn new behaviours or to actively participate in self-care activities. These interventions evolved from classical behavioural change theory, using antecedent and/or consequent conditioning to shape desired behaviour. As behavioural interventions have no side effects and can be transferred to the home setting, they have been recommended as treatments of choice in the elderly. [110] Interventions commonly used in frail adults include: prompted voiding, habit training (including patterned urge response toileting), timed voiding, and a combination of exercise and toileting activities. Comorbid conditions common in this population (e.g., cognitive impairment and neurological conditions) may preclude the use of some interventions. Although pelvic floor muscle rehabilitation has not been studied in this population, age and frailty alone should not preclude their use.

Prompted voiding involves prompts to toilet with contingent social approval and was first used in the 1980s for incontinent nursing home residents. [111] It was designed to increase requests for toileting and self-initiated toileting, and decrease the number of wet episodes. Habit retraining involves the identification of the incontinent person's individual toileting pattern, including wetness episodes, usually by means of a bladder diary. A toileting schedule is then devised to pre-empt an incontinence episode. Habit training is dependent on active caregiver participation. There is no attempt in habit retraining to alter an individual's voiding pattern as is the case with bladder retraining. [112] Timed voiding involves toileting an individual at fixed intervals, such as every 2 hours. This is considered a passive toileting programme; no attempts are made to re-establish voiding patterns and patient education or reinforcement of certain behaviours is not required. [112] The need for these interventions is obvious because many frail older people are dependent on the action of caregivers to gain access to toilet facilities.

Most behavioural research in frail elderly has taken place in the nursing home and home settings. Homebound frail older adults also need physical assistance to toilet, usually from family caregivers. Although UI and frequency are considered risk factors for falls in hospital settings, [113] scant intervention trials have been conducted. In nursing homes, admission criteria result in residents having high dependency needs (cognitive, physical, or both). Potentially treatable factors (e.g., urinary tract infections, restraints, environmental barriers) should be assessed [67] (see Aetiology and Assessment above), as is not routinely done now. [68]

### 2. Prompted voiding, habit training, timed voiding, combined exercise and toileting,

#### *a) Quality of data*

The majority of articles for review covered prompted voiding. (**Table 7**). A Cochrane review on habit retraining in adults was located but no recent (1996 to early 2004) research articles on habit retraining in

*Table 7. Behavioural interventions*

| Intervention | Authors | Study Design | Sample | Methods | Results |
|---|---|---|---|---|---|
| **Prompted Voiding** | | | | | |
| | Palmer, in press | Systematic literature review | 1 quasi-experimental, 1 repeated measures, 1 prospective case series, and 1 systematic (Cochrane) review | Sample, methods, and results were examined to address: is prompted voiding effective in reducing wetness episodes and increasing requests for toileting? | Different prompted voiding protocols were used limiting comparison across studies. Sample sizes were small and mainly white elderly female long-term care residents participated. Staff adherence to the protocol was important to its success. Little evidence exists that self-initiated requests for toileting is increased. Wetness episodes decreased in the short-term. |
| | Holroyd-Ledue & Straus, 2004 | Systematic literature review | 1998-2003 published articles on the etiology or treatment of urinary incontinence in older women | | Reports findings from the Cochrane Review on prompted voiding. See Eustice, Roe & Paterson, 2002. |

*Table 7. Behavioural interventions (Continued)*

| Intervention | Authors | Study Design | Sample | Methods | Results |
|---|---|---|---|---|---|
| **Prompted Voiding** | | | | | |
| | Bates-Jensen, Alessi, Al-Samarrai & Schnelle, 2003 | Randomized controlled trial | 190 incontinent nursing home residents | Research staff provided an exercise and toileting intervention every 2 hours to experimental group. Control group received standard nursing care from nursing home staff. Outcome measures: frequency of incontinence, appropriate toileting ratios, perineal skin wetness and skin health (e.g., blanchable erythema and pressure ulcers) | Frequency of incontinence and appropriate toileting ratios significantly improved for the intervention group ($p < .001$ for both). Skin wetness rates also significantly improved for the intervention group. |
| | Simmons & Schnelle, 2004 | Randomized controlled trial | 130 incontinent nursing home residents | Same protocol as above. Outcome measures appetite and constipation. | Intervention was not effective in significantly changing appetite and constipation. |
| | Engberg, Sereika, McDowell, Weber, & Brodak, 2002 | Prospective controlled exploratory with cross over design | 19 cognitively impaired homebound (average age 83 years) | Baseline bladder records were completed by the home caregiver for both groups. Control group received attentional control by the study's nurse practitioners. After 8 weeks, bladder records for compiled for 2 weeks and the subjects were then entered into prompted voiding intervention of 8 weekly sessions in which caregiver was instructed on how to carry out prompted voiding. Bladder records | Caregivers were adherent 89% of time to protocol. Subjects in the intervention arm experienced significantly less incontinence than those in the control arm. There was 22% reduction in daytime incontinence and 19% reduction in both day and nighttime incontinence. |

*Table 7. Behavioural interventions (Continued)*

| Intervention | Authors | Study Design | Sample | Methods | Results |
|---|---|---|---|---|---|
| **Prompted Voiding** | | | | | |
| | Eustice, Roe, & Paterson, 2002 | Cochrane Review | 5 trials included in the review (does not include trials listed above). | Literature searched according to protocol (all randomized or quasi-experimental studies). Two reviewers evaluated studies for methodological quality; third reviewer proof read the review. | Suggestive evidence exists for short-term benefit from prompted voiding. |
| | Ouslander, Maloney, Grasela, Rogers & Walawander, 2001 | Prospective field trail | 151 nursing home residents in 5 facilities participated; 81 considered clinically stable, | Staff in the nursing homes implemented a urinary incontinence management programme (prompted voiding or scheduled toileting) for a 60-day period. | Clinically stable residents on toileting programme alone (N=50) experienced 16% increase in dryness. Clinically stable residents placed on program and tolterodine (N=31) achieved 29% dryness rate. |
| | Ouslander, Al-Samarrai & Schnelle, 2001 | Prospective case series | 61 nursing home residents (average age 88 years) in 8 facilities | Residents were classified as responders and non-responders to daytime prompted voiding. Outcomes were percent of wet checks and appropriate toiletings delivered by research staff from 7pm to 7am. Residents received 3 days of protocol and 5 days of modified protocol designed to be minimally disruptive to sleep. | Prompted voiding was not an effective intervention for nighttime incontinence. It also disrupts sleep. Responders were significantly dryer and had higher number of appropriate toiletings but wet checks were higher than daytime and appropriate toileting less than daytime rates. |

*Table 7. Behavioural interventions (Continued)*

| Intervention | Authors | Study Design | Sample | Methods | Results |
|---|---|---|---|---|---|
| **Prompted Voiding** | | | | | |
| | Schnelle, et al., 2002 | Randomized control trial | 256 nursing home residents | Research staff provided intervention (exercise and incontinence care: FIT) every 2 hours from 8am-4pm 5 days a week. | Intervention requires staffing ratio of 5 residents to one nursing assistant. Intervention group maintained or improved performance on outcome measures. |
| **Timed voiding** | | | | | |
| | Ostaszkiewicz, Johnston, & Roe, 2004 | Cochrane Review | 2 trials with 298 participants | Literature search according to protocol. Protocol written by one person. Data extracted with 2 persons working independently of the other. | Data too few and of insufficient quality to provide evidence in support or against the intervention. |
| **Habit retraining** | | | | | |
| | Ostasziewicz et al., 2004 | Cochrane Review | 3 trials with 337 participants | | Data too few and of insufficient quality to provide basis for practice. |
| **Patterned Urge Response Toileting (PURT) – form of habit training** | | | | | |
| | Colling, Owen, McCreedy & Newman, 2003 | Quasi-experimental | 78 community dwelling frail elders | Randomized to immediate treatment or delayed treatment groups. 6-week post intervention data collected. Tested effects of PURT on volume and frequency of UI, skin irritation and breakdown and UTI. | Urine volume and frequency decreased significantly in experimental subjects. Skin rashes and breakdown also improved significantly and no differences in UTI between the groups were noted. |

frail older people, in community or institutional settings. One recent article on patterned urge response toileting was found. Little intervention research has been conducted with incontinent hospitalised and homebound frail elders. Limitations in the existing studies included: small samples with low power to detect significant differences; variable terminology and operational definitions, making comparisons across studies difficult; little gender, ethnic, cultural diversity; and no replication studies using diverse populations or long-term follow up studies.

Most studies excluded nursing home residents and homebound frail older adults with terminal illness, [114] inability to respond to an one-step command, [108,114] poor language ability, [108,115,116] and/or other factors. Recent studies employed random assignment. [108,114-116] Ethical concerns for human subjects prohibits withholding treatment, thus true "control" groups were nearly impossible to create. Two studies used delayed treatment as controls. [115,116] The frequency of the intervention varied across studies as well. Some studies included in the systematic reviews offered the intervention hourly while others offered it every two hours on a 12-hour, 14-hour or 24-hour schedule. [111]

***b) Results***

Level 1 evidence exists that prompted voiding is effective in the short-term for improving daytime dryness in nursing home residents and in some home care clients. Findings vary in terms of the characteristics of patients who respond to behavioural interventions (**Table 7**). Individuals with PVR > 100 mL, for example were excluded from participating in one study. [116] Residents with larger bladder capacity, willingness to use a toilet, and ability to initiate bladder emptying when in the voiding stance respond better to toileting regimens than those who do not. [117] The best predictors of responsiveness to prompted voiding in nursing home residents were the ability to ambulate independently, appropriate toileting rates $\geq$ 66% (the number of times the resident voided into the toilet divided by the total number of voids), and a wet rate of $\leq$20% (number of times the resident was wet when physically checked) in the initial days of the programme). [118] Another study found that residents with a high baseline UI rate responded to habit training with prompting, [119] suggesting that improvement was due to patient initiated requests to void. Cognitively intact residents with normal bladder capacity also were more likely to respond. The effectiveness of prompted voiding designed to be minimally disruptive to sleep as provided by research staff was tested in 61 nursing home residents residing in 4 nursing homes. [120] Fourteen (23%) had improved daytime UI but no effect was seen on night-time UI and sleep was disturbed. Patterned urge response toileting improved continence in frail community dwelling older adults and in nursing home residents. [121] A randomised controlled trial found that frail nursing home residents responded to an exercise and incontinence intervention and other outcomes, such as skin health, also improved. [114]

Operant behavioural strategies have been effective in increasing self-care behaviour in long-term care residents. [122] Their underlying principle is that behaviour is modified by its consequences, [123] even in frail adults. A balance must be struck, however, between encouraging self-care activities and patient functional status. Incident UI may be indicative of the onset of frailty[10] or the onset of end of life. [124]

## 3. Summary of evidence

1. Prompted voiding is effective for the short-term treatment of daytime UI in nursing home residents and home-care clients, if caregivers comply with the protocol. (Level 1)
2. A systematic review was unable to determine the treatment effect of habit retraining in frail older people. (Level 1)
3. A systematic review was unable to determine the treatment effect of timed voiding. (Level 1)
4. An effective intervention for nighttime incontinence in frail elders has yet to be developed. (Level 3)

## 4. Recommendations for management

- Prompted voiding should be offered to decrease daytime UI in nursing home residents and homebound older adults meeting the above mentioned criteria. (Grade A)
- Efforts must be made to increase and maintain caregiver compliance with prompted voiding. (Grade B)
- Continence care at nighttime should be individualized. (Grade C)
- No recommendation for habit retraining with frail older people is possible. (Grade D)
- No recommendation for timed voiding with frail elderly people is possible. (Grade D)

### 5. Recommendations for research

- Determine the long-term effects of prompted voiding on daytime urinary incontinence in nursing home residents and homebound frail older adults.
- Evaluate the effect of prompted voiding, habit retraining, and timed voiding on the quality of life of frail older persons in high quality studies.
- Determine whether social and cultural factors influence the acceptance and effectiveness of behavioural treatment across diverse populations.
- Evaluate the effectiveness of behavioural interventions for UI in acute care settings.

## III. INTERVENTIONS WITH LONG TERM CARE STAFF

### 1. Background

Recent research has shown that the frequency of toileting assists currently provided in U.S. nursing homes is too low to maintain continence. [125] Several studies have focused on staff compliance to protocols. A two-prong intervention, one geared towards the resident and the other geared towards staff members, appears necessary. [121,126,127] Direct care providers will be unlikely to implement programmes unless residents and their families advocate for them. [128] This advocacy, however, appears unlikely if nursing home residents hold "reduced expectations," i.e., do not anticipate receiving frequent and prompt toileting and therefore express no desire for more frequent toileting. [125] A documented barrier to implementation is the labour intensity of these interventions. Bladder and bowel training programmes are considered one of the three most time consuming activities for long-term care nursing staff. [129] Costs of toileting were reported to average $1361 $\pm$ 597 per year (1995 U.S. dollars) per subject in one small study. [130]

A specialty practice exemplar model has been proposed to improve continence care in long-term care, with a nursing faculty member with expertise in the assessment and treatment of UI having a clinical practice in a facility. Graduate nursing students working with this individual focus on the Minimum Data Set Resident Assessment Protocol for UI. Assessment and treatment skills ultimately are transferred to the facility nursing staff members through several mechanisms, including staff education and improved continence care systems. [131]

#### *a) Quality of data*

Several authors point to the difficulty of conducting research in long-term care settings. [121,126,132] Factors such as staffing ratios and changes in administrative policies are beyond the researchers' control. Prompted voiding, habit retraining, and timed voiding interventions are totally dependent on staff members' or caregivers adherence to the protocol in order for the intervention to be effective. Several researchers reported that staff compliance was less than total; some researchers experienced problems with staff training. For instance, several staff members did not attend group-training sessions and needed one-on-one training. Other staff members did not perform the protocol or document its use, especially when staffing level was low. [126] Nursing assistants play a key role in the success of behavioural programmes, and organisational schemes need to be devised to create incentives for assistants to make and keep residents continent. [119]

#### *b) Results*

In one study only 70% of toileting assists were completed, and staff knowledge and attitudes were unchanged after in-service classes on UI. [121] They noted that staff members believed that toileting was "not worthwhile" for some residents.

A staff survey revealed that nursing assistants believed prompted voiding was very helpful to residents in reducing the frequency and volume of incontinent voids. Perceptions of barriers to prompted voiding included inadequate staffing, and staff work load and turnover/absenteeism. They believed that increased number of staff, improved communication, ongoing education, and alternative modes of care delivery were necessary to facilitate prompted voiding. In sum, staff members believed the programme improved resident quality of life but the realities of long-term care made it difficult to implement. Nursing assistants believed that UI was a normal part of ageing and that nothing could be done for it. [68] In this study, 99% of the incontinent residents wore absorbent products and only 3% had received UI treatment.

When staff perceptions regarding completed toileting assistance were compared to research staff observations, staff over-inflated the percent of toilet

assists they completed (stating 80-90% when the observed was 70%). [133] Staff members also believed that residents were happier while on a prompted voiding program but only 52% thought the programme improved residents' continence. There is significant disagreement between documented UI interventions in nursing home medical records and patients' reports of receiving intervention. In one study, long-term care facility residents reported a mean of 1.8 daily assists to the toilet, and whether or not they received a scheduled toileting programme made no difference in the number of toilet assists. [125,134]

Continence care creates additional needs for family caregivers. In a small pilot study, caregivers at home perceived requirements of a behavioural protocol more than they could manage. [135] Other family caregivers reported embarrassment and social isolation as their most frequent emotional responses to UI, and a need for information about resources. [136] In contrast to long term care staff, family caregivers were adherent with prompted voiding 89% of the time, and 93% were somewhat or completely satisfied with. [115] A descriptive study found that caregivers report a high level of physical fatigue (77%). Caregivers dealing with different levels of UI (mild, moderate, and catheter managed) have different educational needs and require different levels of support from healthcare professionals. For example, carers of frail persons with moderate UI had the highest levels of need, but those of persons with catheters had the most serious need. [137]

A computerised quality management programme for prompted voiding was tested in a convenience sample of 85 residents in 8 nursing homes in the U.S. [138] Each nursing home was asked to identify staff members who would act as a contact person, quality control specialist, two licensed personnel who would conduct UI assessments, and two nursing/health care assistants who would implement the prompted voiding intervention. Information on the computer system included UI assessment and wetness rates of residents on prompted voiding. Research staff monitored the database and provided the nursing staff feedback by telephone consultations.

The programme worked for six months while research staff monitored the database, but only one facility continued the it after the research ended. [138] The researchers noted that current incentives for nursing homes to maintain UI management systems are insufficient.

## 3. Summary of evidence

1. Although long term care nursing staff generally believes prompted voiding to be helpful, they fail to implement such programmes. (Level 2)
2. Interventions designed to maintain implementation of patient-focused behavioural interventions by long-term care staff are helpful in promoting continence care. (Level 2)
3. Family caregivers in the community setting can be adherent to behavioural interventions but experience fatigue and social isolation. (Level 2)
4. The use of computerised programmes to manage quality control for UI management does not persist after research studies have ended. (Level 2)

## 4. Recommendations for management

- Long-term care institutions should implement staff development programmes to increase knowledge and skills about continence care and the efficacy of behavioural methods. (Grade A)
- Computerised databases may help caregivers determine the effectiveness of UI programmes. (Grade C)
- Family caregivers need resources to counteract fatigue and social isolation. (Grade C)
- Incentives for nursing homes to adapt incontinence programmes with a computerised quality control component need to be identified. (Grade C)

## 5. Recommendations for research

- Determine the mechanisms of short and long-term behavioural change in long term care staff.
- Evaluate the long-term effects of staff education and on-the-job training on UI outcomes.
- Study family caregiver characteristics associated with effective use of behavioural interventions for UI in the home.
- Develop aids for staff and family caregivers to maintain behavioural interventions
- Determine the magnitude of the effect policy or regulation changes has on the maintenance of UI programmes in nursing homes.

## IV. MEDICATIONS FOR UI IN FRAIL ELDERLY PEOPLE

### 1. Background

We present here data on drug treatment of UI in frail elderly people; drug management of UI in healthy older people is discussed in Chapter 10: Drug Treatment. A total of 28 studies were identified, remarkably few given the growing prevalence of the affected population. Studies were identified through the references in the 2nd ICI, PubMed searches (using MESH terms urinary incontinence, aged, medications, stress incontinence, long term care, frail), and reviewing the reference list in the identified trials. Those trials with English language transcripts and/or abstracts were predominantly done in the US, with a small number in the UK, Germany, and Japan. The available controlled studies focus on treatment of urge UI (including a small minority of patients with mixed UI).

Medical treatment of benign prostatic hyperplasia, bladder outlet obstruction, and associated lower urinary tract symptoms in frail elderly men were considered outside the purview of this chapter. Special issues in the care of frail men with UI were discussed above.

Frail people with UI who should *not* be considered for drug treatment are those who: 1) have not been thoroughly evaluated for contributing comorbid factors (especially when urgency without UI is present); 2) have not had full trial of behavioural therapy; or 3) make no attempt to toilet when aided or who become agitated with toileting.

#### *a) Quality of data*

We located 12 randomised, placebo controlled trials (RCTs), 14 case series, 1 nonrandomised experiment and 1 secondary analysis. Their modest quality often reflects their publication date (up to 40 years ago). Many older trials used a randomised cross-over design, which can lessen power and increase placebo effects due to inadequate wash-out. The adequacy of blinding and method of randomisation in the RCTs usually was indeterminate. Studies generally were small: 2 had fewer than 10 subjects, 7 had 11-20 subjects, 13 had 21-50, and 4 had greater than 50 (maximum 151). Thus, many of the studies were underpowered to begin with, and others lost power because of high drop out rates due to illness and death (inevitable when conducting research with frail elderly people). Because of these issues, many RCTs provide only Level 2 evidence.

Nearly half (12) of the studies were conducted in long-term care facilities. Subjects were overwhelmingly female. Precise definitions of the target population, including definition of "frail persons" and comprehensive description of degree of cognitive and functional impairment, were usually absent. While some investigators included information regarding patients' functional and cognitive status, as well as a list of comorbid conditions, the descriptions were often only qualitative, and none addressed these issues adequately in the analyses. Diagnosis was overwhelmingly symptom-based; only 3 studies included urodynamic evaluation. Explicit, concurrent behavioural therapy was used in most nursing home (NH) studies, yet may have occurred in many others. Because of combined drug and behavioural therapy and the high prevalence of comorbid disease, differences between drug and placebo groups could have been attenuated, and these results cannot be compared directly with studies in healthy elderly and younger individuals. Outcomes were universally assessed by UI frequency (from pad-weighing, bladder diaries, and wet-checks), and no studies reported quality of life outcomes.

A very small number of studies excluded patients with impaired bladder emptying, as defined by an elevated PVR, yet no studies accounted for the spuriously low PVR that may occur among women with a weak bladder when they strain during voiding. The majority of studies did not address bladder contractility.

Treatment of reversible causes of UI also may have affected the ability to detect drug effects. In at least 6 studies, investigators treated subjects with urinary tract infections before initiating antimuscarinic therapy, and one study excluded such subjects. In another, investigators treated atrophic vaginitis prior to pharmacotherapy. No other reversible causes were addressed prior to entry or randomisation. Adjunct behavioural therapy was specified in 3 studies, although it may have occurred in the others, regardless of setting.

The generally low quality of these studies reflects not just study design, but the larger issue of the difficulty of doing large, prospective intervention trials in a frail population. Moreover, UI in frail elderly is universally a multifactorial syndrome involving a large number of factors beyond the bladder (see Aetiology and Assessment and Factors in Management above). Thus, the expectation that drug therapy targeted solely at involuntary detrusor contractions would markedly improve/cure UI in this population is doomed to disappointment.

*b) Results*

Results from randomised trials are summarised in **Table 8.** The following sections discuss specific drugs and include non-randomised trials.

## 2. Specific Drugs

*a) Oxybutynin*

The studies in frail older people used immediate-release oxybutynin (oxybutynin-IR); there are no studies of extended-release. Published randomised trials of transdermal oxybutynin were all undertaken in people under age 65. The pharmacokinetics of oxybutynin and its active metabolite, N-desethyl oxybutynin, tended in one study to show greater plasma levels and bioavailability with increasing frailty and age. [139] Another found peak levels in 21 octogenarians similar to those reported in young normal males (12.5 ng/ml vs 8.9 ng/ml). [140]

• ***Efficacy.*** Oxybutynin-IR, when added to bladder training, did not affect the frequency of UI episodes in 15 nursing home residents. [141] These results differ somewhat from those of a subsequent and larger study [118] in nursing home residents who had failed prompted voiding alone: the addition of titrated oxybutynin-IR resulted in a significantly greater reduction in wetness than did placebo. Improvement was modest; the absolute frequency of UI decreased from 27% of checks at baseline to 24% on placebo and 20% on active drug, leading the authors to conclude that the improvement was statistically but not clinically significant. However, before beginning the study, it was decided that "clinically significant improvement" was one or fewer episodes of UI during daytime hours. This status was achieved by 40% of patients on oxybutynin but only 18% on placebo ($p<0.05$); the dose generally associated with improvement was 2.5 mg three times daily. In another controlled study of UI in institutionalised residents, there was little effect of oxybutynin-IR 5 mg twice daily given for 8 days, but all residents (n=24) also were toileted 10 times daily, and the dose may have been too high and given too infrequently. [142] In a randomised two month trial in frail community-dwelling elderly, oxybutynin-IR and bladder training was subjectively and objectively superior to bladder training alone in improving urinary frequency (95% C.I. 6-27 fewer voids per 2 weeks) but not UI. [143] Insufficient information was available regarding a Japanese study in 75 "elderly" patients to assess the population and outcome measures. [144]

Predictors of efficacy were studied in 41 people (mean age 79) with urge UI and urodynamic detrusor overactivity treated with 2-4 weeks of oxybutynin-IR (5-15 mg/day). [145] Factors associated with baseline urine loss (by pad weighing) were impaired cognitive orientation (on the Cambridge Mental Disorders of the Elderly Examination), [146] number of daily voids, and fluid intake. Persistent urine loss was associated with impaired orientation, global cortical under-perfusion on single photon emission computed tomography scan, and reduced sensation of bladder filling during cystometry. It was concluded that cortical factors are the main determinant of the severity of urge UI before and after oxybutynin. In a study of 80 older patients (mean age 74), patients with dementia (by Hasegawa dementia scale) were less likely to report subjective improvement with muscarinic agents for UI than cognitively intact patients, despite similar objective outcomes. [147] However, these results may simply reflect anti-muscarinic delirium in the patients most prone to cognitive impairment.

Intravesical oxybutynin was examined in a small Japanese case series (n=13, mean age 75) in older people with urge UI and cystometric involuntary detrusor contractions. [148] One hour after installation of 5 mg (pH 5.85), there was no significant increase in mean bladder capacity; in 4 patients who continued twice daily installation, 2 had UI "disappear" and one "markedly decrease" (duration until effect not noted). No patient developed an "increased PVR" (not defined).

• ***Adverse reactions.*** Cognitive side effects have been reported in older people. In one case series, 4 older men with Parkinson's disease and mild-severe cognitive impairment developed confusion, psychosis, hallucinations, behavioural disturbance, and/or paranoia after receiving oxybutynin-IR in doses of 5-15mg/day, all of which resolved once oxybutynin was stopped. [149] Of note, each patient was also receiving L-dopa (co-beneldopa) and selegiline, and the observed effects could be due to drug-drug interactions. There are case reports of reversible peripheral neuropathy confirmed by re-exposure in a 70 year old woman on 5-7.5 mg/day (IR)[150] and recurrent heat stroke. [151] Few studies have addressed cardiac effects. A small study of older people living in the community (n=20, mean age 75) found no change in resting heart rate or electrocardiographic evidence of prolonged PR interval and QTc, or QTc dispersion after 4 weeks of oxybutynin-IR (mean daily dose 7.6 mg [range 2.5-10 mg]). [152] Using a large administrative utilisation database, no association

*Table 8. Evaluable drug trials in frail elderly people (see text for explanation)*

| Drug | Study | Design | Setting and pts | Results | Comments |
|---|---|---|---|---|---|
| **Oxybutynin** | Zorzitto 1989 | 8 day RCT; Oxy IR 5 mg twice daily | Long term care residents (n=24) | No difference from Plac | |
| | Ouslander 1988 | RCT Oxy-IR vs Plac vs HT | 15 long term care patients who failed PV | No difference in % of checks wet, but 40% Oxy pts had ≤ 1 daytime UI episodes vs 18% Plac ($p < 0.05$) | |
| | Szonyi 1995 | 2 mos RCT; titrated Oxy IR + bladder retraining vs bladder retraining alone | Frail, community-dwelling | Significant drug effect on frequency (95% CI 6-27 fewer voids/2 wk) but not on UI | |
| | Zorzitto 1986 | RCT Oxy 1R | | | |
| | Zorzitto 1989 | 8 day cross over RCT; Oxy IR 5 mg twice daily | Long term care residents (n=24) | No difference from Plac | Subjects toileted 10 times daily, trial short |
| **Propiverine** | Dorschner 2003 | 4 weeks RCT propiverine 15 mg three times daily | Elderly (mean age 68) with urge or mixed UI (n=98) | 54% decrease in UI episodes ($p<0.05$ vs baseline; placebo response not described) | Low AE (2% drug mouth on drug), no QTc prolongation. Efficacy reportedly better for urge than mixed |
| **Impipramine** | Castleden 1986 | RCT titrated impiprame 25 mg/day, increased monthly by 25 mg | Older women referred to continence clinic (n=34) with urodynamic involuntary detrusor contraction | No statistical difference in continence rate (78% drug, 43% plc) at trial end (36 months); concluded no benefit over the habit training that all subjects received | Subjects clinically well and could understand nature of the study. Type II error possible. AE frequent: dry mouth, constipation, one episode of confusion |

*Table 8 Evaluable drug trials in frail elderly people (see text for explanation) (Continued)*

| Drug | Study | Design | Setting and pts | Results | Comments |
|---|---|---|---|---|---|
| **Emepronium** | Williams 1981 | Cross over Emepronium | Organic brain syndrome and psychiatric pts | No significant effect on daytime or nighttime UI | |
| | Walter 1982 | Cross over study emepronium | Elderly patients with urge UI and urodynamic involuntary detrusor contractions | Subjective cure/improvement rate 79% for drug and placebo; no change in cystometric parameters | |
| **Emepronium and Flavoxate** | Robinson 1983 | RCT 14-20 days Emepronium 200 mg 4x/day plus Flavoxate 100 mg 4x/day vs Plac with cross over | 22 frail women seen in a Geriatric continence clinic with urodynamic involuntary detrusor contractions | No significant change in UI episodes or cystometric detrusor overactivity, but all subjectively felt better on drug | Data presented only on 14 pts who completed trial; underpowered |
| **Propantheline** | Zorzitto 1986 | 4 day cross over RCT Prop 15 mg 4x/day vs Plac; non responders repeated cross over with doubled doses | 43 long term car patients (42% female) with urodynamic involuntary detrusor contractions | Only 30 mg 4x/day dose statistically better than Plac | 50% experienced Aes (dry mouth, constipation); 1 pt at 30 mg dose developed retention and another bowel obstruction) |
| | Deqeueker 1965 | Cross over RCT, each period 10 day treatment with Propantheline 15 mg 4x/day, or Vasopressin 5 units 2x/day or Plac | 27 women in long term care | No differences in wet checks between the drugs and Plac. Patients who could use a bed pan had better response to vasopressin | No AEs reported |
| | Whitehead 1967 | 2 week RCT Propantheline 75 mg at bedtime vs Plac, cross over at 1 week without washout, all received habit training | 40 long term care residents with severe dementia (50% female) | Propantheline moderately yet significantly better than Plac, especially in women | Urinary retention in one man found in a related case series |

*Table 8. Evaluable drug trials in frail elderly people (see text for explanation) (Continued)*

| Drug | Study | Design | Setting and pts | Results | Comments |
|---|---|---|---|---|---|
| | Doig 1956 | 9 week RCT Propantheline 15 mg 4x/day vs Plac | 31 senile long term care residents (71% female) | No difference between drug and Plac | AE: dry mouth (2 persons), hesitancy (1), transient blurred vision (1) |
| **Propantheline and Flavoxate** | Tobin 1986 | RCT Flavoxate 4x/day with Propantheline 3x/day | Long term care residents, all also toileted every 2 hours | Significant improvement in nocturia but not daytime UI with drugs | |
| **Procaine haematoporphyrin** | Hall 1987 | 26 week RCT 200 mg/day vs Plac | 65 long term care residents (85% women) with urge UI from neurogenic bladder | Intention to treat analysis: significantly better with drug only for pts with UI > 2x/week | Subjects recruited in 2 tiers after 9 pts dropped out at 12 weeks. No AE reported |
| **Flurbiprofen** | Palmer 1983 | RCT Flurbiprofen 50 mg 4x/day vs Plac with 2 week cross over periods | 37 community dwelling subjects attending hospital (65% women, 25% with dementia) with urodynamic involuntary detrusor contractions | Drug significantly increased in total bladder capacity, decreased UI episodes, and increased maximum contractile pressure; no difference for volume at first sensation, volume at first contraction, or number of voids/day | Only 27 with complete data; bladder diary data available only in 12 patients. Three patients on drug withdrawn for leukopenia, hematmesism pneumonia |
| **Estrogens** | Judge 1969 | RCT quinestradol 0.25 mg 4x/day with cross over after 4 weeks + 4 week washout | 20 long term care residents (50% mentally confused, only 3 ambulatory) | 12% decrease in UI with drug compared with 22% increase with Plc, $p<0.01$; equivalent to 4 fewer changes/week | Vaginal bleeding in one pt treated after the trial; optimum effect may not have been reached; no pt became dry; |
| | Ouslander 2001 | RCT oral estrogen (0.625 mg) combined with progesterone (2.5 mg) daily vs placebo for 6 months | 32 female long term care residents with incontinence | No difference in UI at 3 or 6 months, despite clinical changes and vaginal pH and cytology evidence of a partial estrogenic effect | |

Key: RCT randomized, placebo-controlled trial, IR = immediate release, ER = extended release, Plac = placebo, UI = urinary incontinence, AE = adverse events

was found between antimuscarinics (oxybutynin, flavoxate, hyoscyamine) and ventricular arrhythmia and sudden death. [153] Post-marketing adverse events with extended release oxybutynin include tachycardia and hallucinations. [92]

***b) Tolterodine***

• ***Efficacy.*** Although there are a number of studies of tolterodine in "older patients," they are not generalisable to the frail population. For example, the "older" patients in one RCT of tolterodine-ER[154] were all community-dwelling, able to complete a 7-day bladder diary, had a high prevalence of previous antimuscarinic treatment (53-57%), and a low prevalence of arthritis (15-18%), unlike most frail older people. Although several trials include elderly people in their ninth and tenth decades (for example, references [155] and [156]), mean age was much lower (~64 years), people with "[unspecified] disease which the investigator thought made the patient unsuitable," and/or "renal disease" (unspecified) were excluded, and results were not stratified by age. In a secondary analysis of a large, open label German trial of tolterodine-IR 2 mg twice daily, higher age was significantly associated with "less favourable efficacy."[157] However, the absolute difference in odds was only 0.019, there was no association of tolerability with age, only mean age is described, and UI frequency was based on patient report, not bladder diaries. [157] In a nonrandomised study, tolterodine was given to 48 nursing home residents who did not respond to toileting alone; 31 of these patients had a 29% increase in dryness (versus 16% in residents on toileting alone). [158]

• ***Adverse reactions.*** There is no prospective systematic data on tolerability in frail patients. There have been case reports of hallucinations (73 year old woman with dementia [159]) and worsening memory. [160] Analysis of prescription-event monitoring in England (mean patient age 62.7±16.4) found a significant association between age (>74 years) and psychiatric events and tachycardia (odds ratios not given). [161] In another study, the age- and sex-adjusted risk of hallucinations was 4.85 (95% CI 2.72-8.66) compared with 10 drugs (acarbose, alendronate, famotidine, 3 proton pump inhibitors, finasteride, meloxicam, misoprostol, and nizatidine). [161] The comparison drugs were chosen because of presumed lack of antimuscarinic, cardiovascular or CNS activity, and availability in the database. The database did not provide information on other important confounders such as other drugs and comorbidity. Post-marketing information on tachycardia and hallucinations (similar to oxybutynin-ER) was added to the package insert in 2003. [93] There are case reports of both delirium [162] and no change in cognition [95] when tolterodine was given with a cholinesterase inhibitor.

Other agents have also been evaluated, but with less impressive results:

***c) Emepronium bromide***

An older study found no significant effect on daytime or nocturnal UI among patients with chronic "organic brain syndrome" or chronic "functional psychiatric illness,"[163] similar with another small randomised trial. [164] In 20 frail patients seen in a continence clinic (only 14 of whom completed the trial) treated with both emepronium and flavoxate, there was an increase in PVR, but no significant change in UI episodes or cystometric involuntary contractions after 2 weeks of treatment. [165]

***d) Propantheline***

No difference from placebo was found in 43 long term care residents treated with 15 mg of propantheline four times daily for only 4 days. [166] When the dose was increased to 30 mg four times daily any useful clinical effects were overwhelmed by antimuscarinic side effects in about half of the patients. [166] In addition, as in their oxybutynin study cited earlier, [142] patients likely were toileted every two hours. In another small study, nursing home residents who were toileted every 2 hours experienced more improvement in nocturia while on propantheline three times daily (plus flavoxate four times daily) than did those on placebo, but the effect on daytime UI was not significant. [167]

No change in nocturnal UI was found in 31 nursing home residents using a dose of 15 mg four times/day over 9 weeks. [168] Similar negative results for wet checks were reported using the same dose for 10 days in 27 nursing home residents, [169] and in a 1 week trial using 15 mg 3 times a day plus 60 mg at night for nocturnal UI in 40 residents. [170]

***e) Imipramine***

In an RCT in 34 ambulatory patients, half of whom were elderly (although not clearly frail) and also received habit training, complete continence was greater among those who received titrated imipramine (78% vs. 43%), although the difference was not statistically significant. [171] Of note, the rate of UI at baseline was worse in the placebo group.

***f) Flavoxate***

A small trial (n=40, age 51-79) using 200 mg at bedtime for one month found a reduction in nocturia

(amount not specified), but it was not placebo controlled. [172] An even smaller trial (6 "elderly" patients with urge UI and cystometric involuntary detrusor contractions) found no cystometric or clinical effect of a loading dose of 100 mg intravenous followed by 200 mg orally four times daily for 7 days. [173]

***g) Propiverine***

In 46 patients with dementia (mean age 81), there was a 40% decrease in urge UI with propiverine 20 mg/day for 2 weeks, [174,175] similar to another Japanese trial in 31 patients[176] (quoted in[174]) and a German trial in 98 patients. [177] This agent's high protein binding, extensive first pass metabolism, 15 hour half life (in normal younger persons), and renal clearance [174] need to be considered if used in frail older people.

***h) Flurbiprofen***

When administered as 50 mg 4 times daily to 37 older people (24 women, median age 78) with "idiopathic detrusor instability" in a 4 week cross-over trial, [178] flurbiprofen decreased UI by nearly 50% (vs no change with placebo), yet complete data was available in only 11 people.

***i) Procaine haematoporphyrin***

200 mg/day was tested in a double-blind placebo controlled 26 week trial in 65 residents (mean age 85) in British (care) homes for the elderly with clinical "urge UI due to neurogenic bladder."[179] A borderline effect was seen in people with baseline UI more than twice weekly (median change –3.65 vs -.53, p=0.49).

***j) Oestrogen***

Oestriol 3 mg/day was compared to placebo for 12 weeks in 34 women aged 75. [180] The group was highly self-selected; complete results were available for 11 with SUI, 12 with urge UI, and 8 with mixed. Two-thirds of urge UI and 75% of mixed UI patients reported improvement; there was no effect on SUI. Four patients reported metrorrhagia and mastodynia. A 10 week, cross over trial of quinestradol 0.25 mg 4 times a day vs. placebo in 18 women in long term care (type of UI not reported) found a mean 12% decrease in UI episodes vs. 22% increase in those receiving the placebo. [181] The combination of conjugated estrogen 0.625 mg/day and progesterone 2.5 mg/day was evaluated in a 6 month, placebo-controlled trial in 32 female NH residents with predominantly urge UI (3 had mixed UI), who also received prompted voiding. [182] In the 21 women remaining at the trial end, there was no difference between drug and placebo in wetness rates (percent of wet checks with resident found incontinent). Increased serum oestrogens and partial oestrogen effect on vaginal mucosa (cytology and pH) were noted, with no changes found in those women receiving the placebo. Two women on the drug developed vaginal spotting, and 10% developed breast tenderness. Similar results regarding symptoms and vaginal changes were found in a case series of 9 frail women (mean age 83) with urge or mixed UI treated with an oestrogen-implanted vaginal ring (Estring ®); there were no changes in their serum oestrogen. [183]

***k) Comparative trials***

No studies were identified that compared antimuscarinic agents in frail older people. Comparison trials in older people exist, but involve "young old," healthy, community-dwelling, mobile, and cognitively intact people (e.g., see[184]).

***l) Bethanecol chloride***

No studies were identified that evaluated this agent specifically for frail elderly with impaired detrusor contractility and UI.

***m) Trospium chloride***

No studies were identified that evaluated the agent specifically in frail older persons.

## 3. SUMMARY OF EVIDENCE

1. Drug therapy has a role in UI treatment in frail elderly—and possibly larger than currently realised—but it should be explicitly combined with behavioural therapy and treatment of other potential precipitants of UI and confounding factors. (Level 2)
2. Short-term treatment with immediate-release oxybutynin has small to moderate efficacy in reducing urinary frequency and urge UI when added to behavioural therapy in long term care residents. (Level 2)
3. No data is available on extended-release or transdermal antimuscarinic agents.
4. Intravesical oxybutynin does not improve UI. (Level 3)

5. Poor response to oxybutynin is associated with impaired orientation, cerebral cortical underperfusion, and reduced bladder sensation. (Level 2)
6. Immediate-release oxybutynin is associated with cognitive side effects (especially in persons with dementia and/or Parkinson's disease) (Level 4) and tachycardia (Level 3), although the incidence and prevalence are unknown. Oxybutynin is not associated with QTc prolongation (Level 3) or ventricular arrhythmia. (Level 2)
7. No data is available to assess the efficacy of trospium.
8. No randomised trials are available to assess the efficacy of tolterodine.
9. Tolterodine is associated with cognitive impairment and tachycardia (Level 3), although the incidence and prevalence are unknown.
10. There is no evidence of efficacy with:
    - emepronium bromide (Level 2-3),
    - propantheline (Level 2-),
    - imipramine (Level 2),
    - flavoxate. (Level 3)
11. Combination of propantheline and flavoxate reduces nocturia but tolerability and safety are poorly described. (single study, Level 3)
12. Flurbiprofen, propiverine, and procaine haematoporphyrin cause a small reduction in UI but tolerability and safety are uncertain. (all Level 3, based on 1-2 studies)
13. Oral oestrogen (alone or in combination with progesterone) and topical oestrogen improves vaginal atrophy and pH (Level 2), but has little to no effect on UI. (Level 2).
14. No specific data is available regarding:
    - drug treatment of isolated stress UI or impaired detrusor contractily
    - efficacy and safety of antimuscarinics in frail older people with detrusor hyperactivity with impaired contractility (DHIC).
    - efficacy and safety of antimuscarinics when used beyond 6 months or on as "as needed" basis.

## 4. Recommendations for management

For frail elderly persons:

- Advanced age and frailty are not in themselves contraindications to drug therapy for UI. (Grade C)
- Antimuscarinic agents for urgency or mixed UI should be considered in properly selected frail elderly who 1) have been thoroughly evaluated for contributing comorbid factors; 2) make some attempt to toilet independently or when aided; 3) do not become agitated with toileting; 4) have had full trial of behavioural interventions yet have not met their continence goal; and 5) have no contraindications to the specific agent. (Grade C)
- Because no data is available on the long-term efficacy and tolerability of these agents (beyond 2-6 months) and because of the high morbidity and mortality of this population, periodic monitoring and re-evaluation of explicit efficacy, tolerability, and appropriateness of continued drug therapy is necessary. (Grade C)
- Immediate-release oxybutynin should be considered for additional benefit for those in whom behavioural therapy has been proven feasible. (Grade B)
- Extended-release antimuscarinic agents should only be used with explicit monitoring of efficacy and tolerability. (Grade C)
- Patients treated with antimuscarinic agents should be monitored for adverse events, especially increased confusion and tachycardia. (Grade B)
- Oral estrogen should not be used for UI treatment, but topical oestrogen (cream, tablet, ring) may be considered for adjunctive treatment in women with atrophic vaginitis. (Grade B)
- Combinations of antimuscarinic agents should not be used. (Grade C)
- Drugs should not be used to treat isolated impaired detrusor contractility (underactive detrusor) or stress UI. (Grade C)
- Bladder relaxants should be used in frail elderly men *only* if there is adequate and experienced supervision and follow-up to explicitly monitor post-voiding residual volume, efficacy, and tolerability. (Grade C)

### 5. Recommendations for research

- Continued evaluation of the benefit, tolerability, and safety of UI drugs in frail older people, particularly those living in the community (including assisted or supervised living situations that do not involve nursing). Studies should include adequate numbers of patients, employ appropriate diagnostic methods, and adjust for comorbidity and concurrent LUT dysfunction (e.g., DHIC, sphincter incompetence).
- Evaluation of the efficacy, tolerability, and safety of extended-release, topical, and novel antimuscarinic agents in frail and institutionalised older people. Tolerability studies should evaluate cognitive side effects, using clinically-relevant standardised methodology.
- Evaluation of the efficacy, tolerability, and safety of UI medications for extended periods (beyond 6 months).
- Further delineation of characteristics of frail and institutionalised older people who are likely to respond to antimuscarinic therapy.
- Systematic determination of the beneficial and/or adverse effects of antimuscarinic agents in subjects with dementia and/or Parkinsons disease, and frail older person taking cholinergic agents for dementia.
- Studies including outcome measures relevant in geriatric care, such as quality of life, socialisation, need for institutionalisation, and effect on caregiver burden.
- Determination of the value of "as needed" rather than continuously scheduled antimuscarinic therapy.

## V. SURGICAL TREATMENT

### 1. Background

Very little is known about surgical treatment of UI in the frail elderly, likely reflecting a bias toward using conservative therapy in this medically ill group. What data does exist is for gynaecological surgery in women and peri-operative care of frail elderly (including prevention of common post-operative complications). Evaluation of surgical treatment for post-prostatectomy UI in frail elderly men barely exists. We review the available data and general issues regarding peri-operative care which could improve surgical outcomes in this group. Surgical treatment of UI associated with benign prostatic obstruction and prostate cancer is outside the purview of this chapter. Surgical treatment of UI in healthier older persons is covered in Chapter 15: Surgery for Urinary Incontinence in Men, Chapter 16: Surgery for Urinary Incontinence in Women, and Chapter 17: Surgery for Pelvic Organ Prolapse.

An exhaustive review of surgical management of UI in the frail elderly is beyond the scope of this chapter. Therefore, in providing an evidence-based summary on this topic, we have taken advantage of the recent (2004) literature review and research recommendations from the American Geriatric Society, *New Frontiers in Geriatrics Research: An Agenda for Surgical and Related Medical Specialities*. [189] This project involved systematic literature reviews (for years 1980 – 2001) that were used to generate summary statements and recommendations for research. Their findings and recommendations pertinent to the frail elderly regarding surgical treatment of geriatric UI, [186] geriatric gynaecological surgery, [187] and general care of the geriatric surgical patient[188] are included in the summary statement. Data supporting these conclusions are available in the monograph. [189]

### 2. Incontinence surgery in frail elderly women

Data on surgery rates in older frail women are difficult to find and appear overall very low. Several studies have used U.S. national hospital discharge databases to examine surgery rates, but unfortunately they either age-adjusted results[190] or used relatively younger cut-points (e.g., </> 50 years). [191] Even in series that specifically looked at elderly women (mean age 78, range 68-90), most patients were cognitively intact (95%). [192] Cognitive impairment appears to bias against having surgery: in one study, only 0.11% of operations for UI were done in women with dementia, cerebrovascular disease, and hemiplaegia combined. [191] While absolute numbers of ambulatory UI surgery cases increased from 1994-1996, the percent done in women aged 80 years and over remained the same (4-5%), [193] and the percent is similar for pelvic organ prolapse surgery (5%). [194] In the U.S., surgery rates in elderly women vary by region of the country and race. [193,194]

One single-centre, community-based series of 54 patients aged 70 years and above provides a picture of this surgical population. [195] Twenty-eight percent of patients were aged 80 and over, 4 resided in a nursing home or assisted living, 82% had significant comorbidity, and 32% were classified as American Society of Anesthesiology class III risk. Intraoperative complications occurred in 11% of patients; post-operatively, 11% required intensive care monitoring, 6% had serious complications, 7% became delirious, and 9% had slow return of bowel function. [195] The study made a key observation about the importance of discharge planning for these patients, and recommend pre-surgery planning of place of discharge and likely care assistance needs. [195]

Although higher complication rates generally are associated with comorbidity in frail elders (10.4% complication rate with comorbidity vs. 5.8% without it, p<.001), [191] other studies have found age protective (in one, age 73 years and above was associated with lower risk of vaginal cuff infection and therefore recurrent prolapse following vaginal sacrospinous fixation[196]). Overall, the morbidity and mortality for geriatric patients undergoing anti-UI procedures are similar to those of other major non-cardiac surgical procedures. [186] Mortality is inconsistently associated with increased age, and is most commonly related to cardiac or cancer complications. [187] Many studies do not uniformly control for the impact of comorbidity on mortality. [186,187] Preoperative administration of oestrogen appears ineffective in promoting wound healing. [188] Patient-controlled analgesia provides adequate pain control or sedation and increased patient satisfaction compared with standard fixed-dose and time-administered medications in cognitively intact geriatric patients, [188] while the choice of agent may affect postoperative cognition[188] and urinary retention.

Very few age-specific data on outcomes are available, and no studies systematically examine quality of life, functional outcome, and discharge site. Injection of bulking agents in women appears to be effective in older women, and age does not appear to correlate with outcomes. [186]

## 3. Incontinence surgery in frail elderly men

No specific conclusions can be drawn regarding surgical treatment of UI in frail men. Typical studies of anti-UI surgery in elderly men are very small or fail to stratify results by age and/or comorbidity (e.g., see references[197,198]). One small study (n=46) found that advanced age was not a risk factor for poor outcome after collagen injection, [199] while another (n=12, mean age 80 years) of trans-urethral resection prostatectomy (TURP) for obstruction-associated urgency UI found that cognitively impaired men had the most UI improvement. [200] Urodynamic evaluation of post-prostatectomy UI is recommended prior to surgical treatment (see, for example, reference[198]).

## 4. General issues in surgical care of the frail elderly

Important factors in the surgical care of frail patients include: pre-operative risk stratification (e.g., American Society of Anesthesiology class, Charlson index, Modified Cardiac Risk Index, [201] Burden of Illness Score[202]); insuring adequate nutrition, especially when patients cannot take oral feeding or become delirious; management of comorbid heart disease, diabetes, and pulmonary disease; prevention, [203,204] recognition, [205] and treatment of post-operative delirium; [204, 206] pain assessment, especially in cognitively impaired people; [207] recognition of the hazards of prolonged bed rest [208] and the prevention[209] and treatment of functional impairment; use of specialised care units for the elderly; [210] and discharge planning regarding rehabilitation, need for assistance, and site of discharge. These issues should be factored into any plan of surgical care of frail elderly people.

## 5. Summary of evidence

1. No studies were identified regarding gynaecological surgery in institutionalized elderly persons. (Level 4)
2. Exogenous administration of oestrogen is ineffective in promoting wound healing. (Level 3)
3. Injection of bulking agents appears to be effective in older women, and age does not appear to correlate with outcomes. (Level 3)
4. No studies were identified that evaluated functional or quality of life outcomes
5. Risks of morbidity and mortality for geriatric patients undergoing anti-incontinence procedures are similar to those of other major non-cardiac surgical procedures. (Level 2)
6. Mortality risks are low in elderly persons, and often due to cardiac or cancer complications. (Level 2-3)

7. Operative mortality is inconsistently associated with increased age, and many studies did not uniformly control for comorbid conditions. (Level 2-3)

8. Patient-controlled analgesia provides adequate pain control or sedation and increased patient satisfaction compared with standard fixed-dose and time-administered medications in cognitively intact geriatric patients. (Level 2)

9. Choice of agent for patient-controlled analgesia may affect postoperative cognition. (Level 3)

## 6. Recommendations for management

- Age alone is not a contraindication to surgical treatment of UI. (Grade C)
- Pre-operative risk should be stratified using established indexes. (Grade A)
- Insure adequate nutrition especially in patients who cannot take oral feeding or who become delirious. (Grade A-C)
- Routine use of established measures to diagnose delirium and programmes to prevent post-operative delirium. (Grade A)
- Use measures specific for pain assessment in cognitively impaired people, and not general pain scoring tools. (Grade C)
- Implement proactive, preventative approaches to hospitalisation-related functional impairment. (Grade A)
- Specialised care units may improve selective outcomes for frail older patients. (Grade A)
- Discharge planning should begin before surgery takes place. (Grade C)
- Urodynamic evaluation should be done before considering surgical treatment of UI in frail older persons. (Grade B)
- Patient controlled analgesia can be used in cognitively-intact frail older people (Grade B), but agents associated with delirium (e.g., meperidine) should be avoided. (Grade B)

## 7. Recommendations for research

- Undertake prospective observational studies to discover the magnitude and severity of common geriatric perioperative complications, e.g., delirium, functional decline. (Grade C)[187]
- Age effects should be analysed and not adjusted for. (Grade C)
- Describe comorbidity, functional status, cognitive status, and oestrogen status in studies of gynaecological surgery that evaluate outcomes, morbidity, and/or mortality. (Grade C)
- Stratify the results from existing gynaecological surgery studies by age (even when statistical power is low) to facilitate systematic reviews. (Grade C)
- Use RCTS to determine which interventions in elderly women are effective in reducing geriatric surgical risks, e.g., delirium, electrolyte imbalance, falls, deconditioning, incident UI, functional loss, and discharge to rehabilitation or long-term care facilities. (Grade C)
- Use RCTS to determine whether pre- and post-operative local oestrogen therapy improves surgical outcomes in frail elderly women. (Grade C)
- Use RCTS to determine whether discontinuation of oestrogen replacement therapy improves perioperative morbidity in elderly women. (Grade C)[187]
- Prepare and validate guidelines for selecting candidates for gynaecological surgery from among older institutionalised populations on the basis of quality of life benefits. (Grade C)
- Perform descriptive observational studies to compare the risks of gynaecological surgery that are associated with age alone and those associated with comorbidity (Grade C)
- Use prospective cohort studies factors to identify which elderly patients will do better with earlier surgical intervention than with more conservative treatment. (Grade C)
- Use RCT results to develop and validate predictive models for guiding treatment decision in older patients. (Grade C)

## VI. CATHETERS

### 1. Background

Three basic types of catheters and catheterisation procedures are used for the management of UI in frail elderly: penile sheaths, intermittent catheterisation (sterile or clean), and long term indwelling catheterisation.

***a) Quality of the data***

Data on the use of various forms of catheterisation has been derived from level 2 and 3 observational studies and expert opinion. No studies on intermittent catheterisation specific to frail elderly were identified.

***b) Results***

Intermittent catheterisation (ISC) can be helpful in the management of patients with urinary retention (+/- UI) due to an acontractile bladder or impaired bladder emptying. ISC can be carried out by either the patient or a caregiver and is done one to four times daily, depending on residual urine volumes. In the home setting, the catheter should be kept clean (but not necessarily sterile). Studies conducted largely among younger paraplegics have shown that ISC is practical and reduces the risk of symptomatic infection as compared with long term indwelling catheterisation (See Chapter 22: Technical Aspects of Continence Devices). ISC also has been shown to be feasible for older female outpatients who are functional, willing, and able to catheterise themselves. However, such studies cannot automatically be extrapolated to the frail elderly or institutionalised populations. ISC may be useful for certain patients in acute care hospitals or nursing homes, particularly following removal of an indwelling catheter in a bladder retraining protocol. Frail elderly nursing home patients, however, may be difficult to catheterise, and commonly found anatomic LUT abnormalities may increase infection risk with repeated catheterisations. In addition, using ISC in institutional settings (which may have an abundance of multi-resistant organisms) may yield an unacceptable risk of nosocomial infections, and use of sterile catheter trays are very expensive; thus, it may be extremely difficult to implement such a programme in a typical nursing home setting.

Long term indwelling catheterisation has been shown to increase the incidence of chronic bacteriuria, symptomatic urinary infections (especially in men), bladder stones, periurethral abscesses, and even bladder cancer. [211-214] Catheters also may cause traumatic hypospadius in men and urethral incompetence in women. Condom catheters may be difficult to use in men with small, retracted penises. Condom catheters can lead to penile skin breakdown and necrosis, and if they twist can obstruct bladder emptying. Given these risks, it seems appropriate with frail elderly to recommend that long term indwelling catheters be limited to certain specific situations (see recommendations).

### 2. Recommendations for management

- Condom catheters should be used only to manage intractable UI in male patients who do not have urinary retention, who are extremely physically dependent, and whom can be closely monitored. (Grade C)
- Intermittent catheterisation may be useful for selected frail elderly with chronic urinary retention who can be taught to self-catheterise or who have a caregiver who can perform the technique. (Grade C)
- Intermittent catheterisation is useful in frail elderly undergoing bladder retraining after an episode of acute urinary retention. (Grade C)
- Indications for long term indwelling catheters for frail elderly persons with UI include (Grade C)
  - Urinary retention that cannot be corrected surgically or medically; or cannot be managed practically with intermittent catheterisation.
  - Skin wounds or pressure sores are contaminated by incontinent urine
  - Care of terminally ill or severely impaired patients for whom bed and clothing changes are uncomfortable or disruptive
  - Patient/caregiver preference when toileting or changing causes excessive discomfort or burden, and patient/caregiver are specifically informed of catheterisation risks.

### 3. Recommendations for research

- Use basic science research to better understand the mechanisms underlying bacteriuria and antimicrobial resistance in frail elderly patients requiring long term bladder catheterisation
- Determine using clinical studies the most cost-effective devices and procedures to prevent complications from long term indwelling catheters in frail elderly (e.g., frequency of catheter changes, use of silver-impregnated catheters)

# E. NOCTURIA

## I. BACKGROUND

Nocturia is defined as waking at night from sleep one or more times to void, with each void being preceded and followed by sleep. [215] Recent reviews [216, 217] and an entire journal supplement[218] have discussed various aspects of nocturia in detail. This section specifically focuses on what is known about the prevalence, impact, pathophysiology, diagnostic assessment, and treatment of nocturia in the frail elderly population. Similar to UI, nocturia is often a multifactorial problem in elderly persons. Thus, diagnostic assessment must be comprehensive, and multi-component interventions may be necessary for successful treatment.

**• Quality of the Data**

There are good epidemiological data on the prevalence of nocturia, but limited data on associated factors and impact. Studies of the pathophysiology of nocturia in the elderly population have generally been small and highly focused on one aspect of potential underlying causes. Similar to UI, there are limited data on optimal diagnostic assessment, and therefore recommendations are based generally on expert opinion. Data on treatment in elderly patients are very limited. Although some randomised trials exist, they are small and include few very elderly subjects. Data on the effectiveness of multi-component interventions for nocturia in the elderly are not available.

## II. PREVALENCE AND IMPACT

The prevalence of nocturia increases with increasing age, and has been reported to be as high as 90% for people over the age of 80. [219-223] This increasing prevalence is largely due to age-related conditions that underlie the pathophysiology of the condition (see below). Nocturia has been variably associated with chronic medical conditions such as hypertension, diabetes, and cardiovascular disease in elderly people. [224,225] Nocturia has been associated with falls. [226] Frail elderly people with nocturia who also have gait and balance disorders and other risk factors for falls are clearly at increased risk for injury and consequent morbidity as the result of inadequately treated nocturia. Nocturia has also been shown to have adverse effects on quality of life, probably as the result of its impact on sleep. [227] In turn, sleepiness has been associated with cardiovascular disease and mortality in the elderly population. [228]

## III. PATHOPHYSIOLOGY

In elderly people, the pathophysiology of nocturia is often multifactorial and can be related to one or a combination of three primary underlying causes, all of which increase with age: low bladder capacity usually as a component of an overactive bladder syndrome or prostatic obstruction in men; nocturnal polyuria; and/or a primary sleep disorder. [216-218]

The proportion of 24-hour urine volume produced at night increases with age. [229, 230] Studies of frail elderly have shown that the proportion of urine produced at night is close to 50%, rather than less than 30% as in young healthy adults. [231-233] In some elderly people, this is due to mobilisation of excess volume caused by oedema related to venous insufficiency and/or congestive heart failure. Some studies have suggested that there is an abnormality in the secretion and/or action of arginine vasopressin (AVP) at night in many elderly patients with nocturia. [234, 235] Another, however, failed to find an association between AVP deficiency as detected by water deprivation testing and nocturnal polyuria in a series of elderly people with nocturia. [236] Other research suggests that some frail elderly people with nocturia have high atrial natriuretic peptide (ANP) levels at night. [57,237] This study, however, did not use echocardiography or brain natriuretic peptide

levels to detect underlying occult congestive heart failure. Sleep disordered breathing and sleep apnoea, also have been associated with nocturia and nocturnal incontinence in the elderly. [57,58,238,239] Whether this relates to increased ANP production, [57] mechanical forces on the bladder generated during apnoea events, [58] or other mechanism(s) is unknown.

## IV. DIAGNOSTIC ASSESSMENT

The approach to the assessment of nocturia should be similar to that for UI described above. Special considerations include:

- A bladder diary that includes timing and volume of each void at night as well as during the day, as well as a specific indication of when the individual went to sleep at night and awoke in the morning.
- Additional questions in the history that focus on the possibility of a primary sleep disorder, such as asking about sleep quality, daytime sleepiness, snoring, and leg movements at night (this history is enhanced by questioning the bed partner as well as the patient.
- Additional history and focused physical examination related to volume overload due to lower extremity venous insufficiency, and/or due to congestive heart failure; in some cases additional testing such as an echocardiogram or a brain natriuretic peptide level may be helpful in ruling out the latter diagnosis.

## V. TREATMENT

Treatment of nocturia in elderly patients should be based on identification of all potential underlying causes in each patient. Although no specific data are available on multi-component interventions, elderly patients with nocturia may benefit from an approach to treatment that includes behavioural strategies, therapy for medical and sleep disorders, drug therapy, or their combination.

There are no specific data on the impact of behavioural strategies (e.g. altering fluid or sodium intake, leg elevation for oedema) on nocturia in older patients. Using bedside commodes or urinals, and minimising the distance necessary to reach a toilet and providing a safe, adequately lit path may be helpful in reducing the risk of night-time falls related to nocturia, especially in those with underlying gait instability and other risk factors for falls. Reducing volume overload associated with lower extremity venous insufficiency or congestive heart failure with a late afternoon dose of a rapid acting diuretic may be helpful in reducing nocturnal polyuria and nocturia in selected patients. [240,241] Although there are no data on the impact of treating sleep apnoea with continuous positive airway pressure on nocturia severity, this condition should be diagnosed and treated because of its potential adverse effects on sleep quality and cardiovascular morbidity. Similarly, there are no data on the impact of treating periodic leg movements during sleep on the severity of nocturia, but treatment with dopaminergic agonists and benzodiazepines may improve sleep quality in these patients.

There are several approaches to drug therapy for elderly patients with nocturia. If the history, bladder diary, and physical examination suggest that the nocturia is related primarily or in part to an overactive bladder syndrome, then treatment with an antimuscarinic agent should be considered (see Drug Treatment above). Alpha-adrenergic agents used for prostatic obstruction appear to have a modest impact on nocturia, with a mean reduction of slightly less than one episode per night. [242] Among postmenopausal women, one uncontrolled trial of estradiol in combination with a progestational agent showed a dramatic reduction in nocturia over 6 months, [243] but this was not replicated in a placebo-controlled double blind study. [244] Patients who are most bothered by nocturia as the result of awakening and being unable to fall back to sleep may benefit from taking a very short-acting hypnotic such as zaleplon.

A substantial number of studies over the last 15 years have examined the potential role of exogenous AVP (desmopressin or DDAVP) for the treatment of nocturia in older patients[245-257] (**Table 9**). The majority of these studies have been uncontrolled case series involving relatively small numbers of subjects. Moreover, the inclusion criteria, outcome measures, and route, dosing, and duration of DDAVP treatment varied considerably. The two largest studies cited were both randomised, double-blind placebo controlled trials of oral DDAVP with essentially identical designs; one was conducted in men, [255] the other in women. [256] Although these trials did include some patients older than 75, the mean age of the par-

*Table 9. Selected studies of desmopressin (DDAVP) for nocturia involving older patients*

| Reference No. (Yr.) | Study Design | N | Sex | Age (Mean) | Nocturia Definition | DDAVP Dose[1] | Outcomes | | Level of Evidence |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Nocturnal Urine Volume | Nocturnal Frequency Pre/Post | |
| [245](1992) | Open label | 9 | M/F | 73-90 | ↑ nocturnal volume | 10 µg<br>20 µg<br>40 µg | ↓ 33%<br>↓ 10%<br>↓ 50% | | 4 |
| [246](1993) | Open label | 21 | M/F | (73) | ↑ nocturnal volume | 40 µg | ↓ 20-34% | | 4 |
| [247] (1993) | Open label | 20 | F | (71) | ↑ nocturnal volume | 20 µg<br>(2 nights) | ↓ 355 ± 205 ml | | 4 |
| [248](1993) | Open label | 8 | M/F | (64) | ↑ nocturnal volume | 5-10 mg | | 4.6 / 2.5 | 4 |
| [249](1993) | Open label | 19 | M/F | (73) | ↑ nocturnal volume | 40 µg<br>2 months | ↓ 38% | | 4 |
| [250](1998) | Dose titration | 23 | M/F | 60-74<br>(68) | nocturia ≥ 2 nocturnal volume ≥ 0.9 ml/min | 0.1 mg<br>0.2 mg<br>0.4 mg<br>(oral) | ↓ 31%<br>↓ 44%<br>no further ↓ | | 3 |
| [251](1999) | RDBC[2] | 17 | M/F | 60-74<br>(68) | Nocturnal volume ≥ 0.9 ml/min | 10-40 mg<br>(oral) | ↓ 38% | 1.7 / 1.1 | 2 |

*Table 9. Selected studies of desmopressin (DDAVP) for nocturia involving older patients (Continued)*

| Reference No. (Yr.) | Study Design | N | Sex | Age (Mean) | Nocturia Definition | DDAVP Dose[1] | Outcomes | | Level of Evidence |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Nocturnal Urine Volume | Nocturnal Frequency Pre/Post | |
| [252](1999) | DBC[3] | 20 | M | 52-80 | Nocturnal volume > 33% of 24 hr volume | 20 ng<br>40 ng | ↓ 15%<br>↓ 26% | 3.0 / 2.3 | 2 |
| [253] (1999) | Open label | 12 | M | Elderly | | | | 3.6 / 1.8 | 4 |
| [254] (2002) | Open label | 30 | M / F | (75) | Nocturia ≥ 3 nocturnal polyuria | 0.1 mg (oral) | 20 patients responded<br>↓956 ml to 523 ml | 5.2 / 2.2 | 4 |
| [255] (2002) | Initial dose titration then responders randomized to optimal dose vs placebo for 3 weeks | 115 randomized | M | 18 – 88 (65) | Nocturia ≥ 2 and nocturnal urine production greater than functional bladder capacity | 0.1 – 0.4 mg (oral) | ↓36% vs 6% in placebo | 3.0 / 1.7 vs 3.2 / 2.7 placebo | 2 |
| [256](2003) | Initial dose titration then responders randomized to optimal dose vs placebo for 3 weeks | 144 randomized | F | 21-89 (55) | Nocturia ≥ 2 and nocturnal urine production greater than functional bladder capacity | 0.1 – 0.4 mg (oral) | ↓ 44% vs 6% in placebo | 2.9 / 1.6 vs 2.9 / 2.4 placebo | 2 |
| [257] (2003) | Open label | 72 | M / F | 66-90 (76) | Nocturia ≥ 2 | 0.2 mg oral (3 nights) | 306 ml mean reduction | 1 episode mean reduction | 4 |

ticipants was closer to "middle" rather than "old" age (mean age 65 and 57 respectively). Their results were very similar, with significant reductions in nocturia and nocturnal urine volume, and increases in mean duration of self-reported first night-time sleep episode. The design of these trials was unusual in that the randomised controlled portion of the trial was preceded by a dose-titration run-in during which subjects who did not respond to the DDAVP (defined as a >20% reduction in nocturnal urine volume), or who were intolerant to the medication, were identified and excluded from further participation. While this design may be useful for targeting therapy in clinical practice, it does raise questions about selection bias and the generalisability of the findings. A major concern related to DDAVP treatment in elderly patients is the possibility of fluid retention (which can exacerbate underlying cardiovascular disease) and hyponatremia (which is common in older patient due to a variety of medical conditions and drugs). A recent review[258] found the incidence of hyponatremia (using various definitions) to be in the range of 0-9%, with the exception of the randomized trial in men discussed above; the incidence of any hyponatremia in this study was 22%, but only 4% had a sodium < 130 mmol/L. Because so few frail elderly were included in these trials, the actually incidence of clinically meaningful hyponatremia that may occur as a result of DDAVP treatment for nocturia is not known.

## VI. SUMMARY OF EVIDENCE

- Late afternoon administration of a diurectic may be helpful in person with lower extremity venous insufficiency or congestive heart failure. (Level 2)
- If nocturia is felt due to overactive bladder syndrome, antimuscarinic agents should be considered. (Level 3)
- If nocturia is due to insomnia alone, then a very-short acting sedative hypnotic may be considered. (Level 3)
- DDAVP may reduce nocturnal voids and voided volume, but its use in frail elderly can be complicated by hyponatremia. (Level 1)

## VII. RECOMMENDATIONS FOR MANAGEMENT

- Older patients with bothersome nocturia should undergo a diagnostic assessment that focuses on identifying the potential underlying cause(s) of the condition, including nocturnal polyuria, a primary sleep problem, overactive bladder syndrome or a combination of these conditions. (Grade C)
- Treatment of elderly patients with nocturia should depend on the underlying causes:
- For patients with an overactive bladder syndrome, consider an antimuscarinic agent. (Grade B)
- For patients with nocturnal polyuria and evidence of volume overload, consider behavioural and medical strategies to reduce oedema and a late afternoon dose of a rapid-acting diuretic. (Grade C)
- For patients with nocturnal polyuria of uncertain cause, consider a careful, dose-titration trial of DDAVP with vigilant monitoring of serum sodium and clinical condition. (Grade B)
- For patients with a primary sleep disorder and nocturia, the sleep disorder should be treated to determine the impact on nocturia. (Grade C)
- For patients who are most bothered by inability to achieve sleep after an episode of nocturia, consider a dose of a short-acting hypnotic (Grade C)

## VIII. RECOMMENDATIONS FOR RESEARCH

- Determine the relative roles of lower urinary tract disorders, medical conditions, hormonal factors, sleep disorders, and other conditions the pathophysiology of nocturia in frail older persons.
- Further study the effectiveness of drug therapy for nocturia, in particular the role of antimuscarinics, DDAVP, alpha-adrenergic agents, and various combinations of these.
- Evaluate multi-component interventions for nocturia that include treatment for underlying medical and sleep disorders, behavioural strategies, and drug treatments.

# F. MODELS OF CARE FOR THE FRAIL ELDERLY

## I. BACKGROUND

Throughout the world, frail elderly people are cared for in a variety of settings using many different models of care. While there are very few studies that examine these models in relation to the management of UI, a discussion of selected models is useful in identifying the challenges and opportunities to improve continence care in this population. This descriptive section briefly outline four models of care particularly relevant to the management of UI in the frail elderly: home care, continence nurse advisors, collaborative practices between advance practice nurses and physicians, and long term institutional care. A comprehensive review of worldwide care models is outside the purview of this section. The models described as examples raise particular issues regarding the impact of care organization on incontinence management for frail persons.

## II. HOME CARE

Most care for the frail elderly who live at home is provided by spouses, children, other relatives, and in some cases neighbours or friends. Such "informal" care may result in important barriers to continence care. First, caregivers may not be available 24 hours per day, and thus regular toileting assistance may only be intermittently available. Toileting programmes (e.g., prompted voiding) and intermittent catheterisation therefore may be impossible to implement consistently. Second, many caregivers for frail people are in fact frail themselves. Spouses and even adult children may have medical illnesses and/or functional problems that make it physically difficult and stressful for them to provide continence care. Third, even among some caregivers who are physically capable and available to assist with continence care, negative attitudes and lack of education may pose substantial barriers to providing the required care. One trial has documented that in selected frail homebound people with UI with motivated caregivers, behavioural intervention can be effective. [259]

Trained, paid caregivers for frail elderly living at home are variably available throughout the world. In the U.S. for example, Medicare (health insurance for those aged 65 and older) pays for some in-home skilled nursing and physical therapy services on a limited basis after an acute hospitalisation and for some supplies related to catheter care. These services may be useful to improve mobility and toileting skills, or to teach the patient and/or caregiver how to manage intermittent or long term indwelling catheterisation, but they are not available for the ongoing management of UI in the home.

Provision of home health aides who can assist with continence care and continence care supplies (e.g. incontinence pads and catheter supplies) varies within and between countries. Thus, for example, the vast majority of frail elderly incontinent people in the U.S. do not receive formal, publicly supported in-home continence care. For those who do not have an available and motivated caregiver, this situation usually results in the use of incontinence pads, which themselves are expensive.

Some frail elderly will devise homemade alternatives to incontinence pads, which are not as effective, comfortable or safe.

## III. CONTINENCE NURSE ADVISORS

In many countries (U.K., Australia, and Canada, among others), continence nurse advisors are available who can provide extremely valuable services for frail elderly with UI. Continence nurse advisors are highly trained in continence assessment and management. They are generally funded by the government and function as public health nurses for a region associated with one or more hospitals. They serve as advisors to physicians, nurses, and other health care professionals, as well as patients and their families. They provide education for staff, patients, and families that is critical for optimal care of the frail elderly. They also assist hospital staff in the assessment and management of incontinence in hospitalised frail elderly, and coordinate follow up care in the home or in an outpatient clinic.

One study of continence nurse advisors in Canada demonstrated their effectiveness in assisting with the management of incontinence in older people. [260]

## IV. COLLABORATIVE PRACTICES BETWEEN ADVANCE PRACTICE NURSES AND PHYSICIANS

In many countries, publicly supported continence nurse advisors are not available. However, other models have developed that generally involve a collaborative practice between a nurse with advanced training and special interest and expertise in continence care, and a physician (usually an urologist, gynaecologist, or geriatrician). Such collaborations can be vital for providing optimal continence care for the frail elderly because of the multifactorial nature of incontinence in this population, and the multicomponent therapies that often are employed (e.g. behavioural therapy with biofeedback in conjunction with pharmacologic treatment). In the U.S. many nurses with specialised training and interest are members of specialty organisations such as the American Urological Association, the Wound Ostomy Continence Nurses Society, and the Society of Urological Nurses and Associates. Advance practice nurses with a nurse practitioner degree can be reimbursed by Medicare directly for their services, and in some rural areas of the U.S. can work independently of a physician. This enables them to provide reimbursable services in private offices and clinics, provide education and consultation to nursing homes and other long term care facilities, and to assist with the assessment and management of incontinence to frail incontinent elderly in their homes. Although little data are available to support the effectiveness of this model, it is becoming more widespread in the U.S., and successful similar models of have been described in other countries (e.g., Israel and Italy).

## V. INSTITUTIONAL LONG TERM CARE

Long term care for the frail elderly is provided in a variety of types of institutional settings throughout the world. Continence care in these settings is dependent upon many factors, including the physical environment; the organisational culture and leadership commitment to providing high quality care; the number, education, and motivation of direct care staff; access to physicians with interest and understanding of continence care; and financial and regulatory incentives to provide appropriate continence care. The U.S. National Association for Continence has issued a blueprint for continence care for assisted living facilities. Assisted living is rapidly growing in the U.S., and the population cared for in these facilities is very frail, and in fact overlaps substantially with the types of frail elderly cared for in nursing homes. Assisted living communities also are being established in other countries (e.g., the UK) but the nature of the populations, their ageing over time, and care needs are unknown. There are no data on the quality of management of UI for frail elderly residing in assisted living facilities.

The section on Behavioural Interventions above reviews studies of interventions with nursing home staff to improve continence care. These interventions have generally met with limited success because they have not addressed the culture, staffing, and overall system of care in these facilities.

There are two broad strategies that have been employed in efforts to provide high quality continence care to frail elderly people who reside in nursing homes. The first is a standardised approach to identification, assessment, and management of incontinence that is embedded in the government-required Resident Assessment Instrument. [261] The Resident Assessment Instrument is composed of two components: the Minimum Data Set, and the Resident Assessment Protocols. One of the sections of the Minimum Date Set assesses continence status. It appears to be accurate in identifying incontinent patients, but not in determining the severity of incontinence and changes over time. [262] One of the 18 Resident Assessment Protocols specifically addresses UI. The UI Resident Assessment Protocol has been partially validated in a sample of approximately 100 frail, incontinent patients in one large academically affiliated nursing home. [263] The American Medial Directors Association has published a clinical practice guideline for UI management in nursing homes, based on the U.S. Agency for Healthcare Policy and Research guideline as well as federal regulations (see below). [264] Despite the existence and dissemination of these guidelines, recent studies document major differences between the recommendations in practice guidelines and regulations and the continence care actually delivered in relatively large samples of U.S. nursing homes. [68, 128,265,266]

A second strategy has been the use of principles of continuous quality improvement and total quality management. [267] The key elements are the education and involvement of direct care staff, the identification of a “champion” and a team to implement the programme, and the continuous collection and analysis of quantitative outcome data using prin-

ciples of statistical quality control. One study successfully used a computerised assessment and quality improvement software programme and external oversight to maintain a 50% reduction in incontinence in 8 diverse, geographically dispersed U.S. nursing homes. [131] A second implemented a quality improvement programme in 5 diverse U.S. nursing homes, but UI reduction was more modest (20-30%) in this effort to translate research into practice. [158]

Nursing home staffing is major barrier to translating research on prompted voiding and other interventions (see Behavioural interventions above) into practice. Randomised trials of an intervention that combines prompted voiding with low intensity exercise (Functional Incidental Training) have documented that this intervention dramatically improves both urinary and faecal incontinence (as well as strength and mobility). [268,269] One of these studies involved nearly 200 frail, incontinent, predominantly female residents in 8 U.S. community nursing homes. [269] The intervention is costly: it takes about three times longer than usual continence care (checking, changing, and some toileting), and it does not pay for itself by reducing the incidence of acute illnesses that might, at least in theory, be prevented by the improved continence and mobility. [270] Thus, this type of UI intervention in the frail elderly must be justified by its impact on function and quality of life, and not its effects on the costs of care. This is a major barrier to improving continence care for the frail elderly throughout the world because resource constraints are stringent and only getting more challenging as we face a rapid growth in the frail elderly population. [271,272]

## VI. RECOMMENDATIONS FOR RESEARCH

- Compare the efficacy of specific models of UI care for frail elderly around the world
- Determine the factors associated with the effectiveness of care models in countries with different organization of health care
- Explore the feasibility of generalising models to different health care systems and countries
- Evaluate the efficacy of specific UI treatments across a range of specific health care systems

# G. FAECAL INCONTINENCE

## I. BACKGROUND

Faecal incontinence (FI) in older people is a distressing and socially isolating symptom that places them at greater risk of morbidity, [273,274] mortality, [275,276] and dependency. [275,277] Many older individuals with FI do not volunteer the problem to their primary care physician/general practitioner or nurse, and regrettably, health care providers do not routinely enquire about the symptom. This 'hidden problem' therefore can lead to a downward spiral of psychological distress, dependency, and poor health. The condition also takes its toll on carers; FI is a leading reason for requesting nursing home placement. [273] Even when health care professionals noted that older people have FI, the condition is often managed passively, especially in the long-term care setting where it is most prevalent. The importance of identifying treatable underlying causes of FI in frail older people rather than just applying passive management (e.g. pads provision without assessment) is highly emphasised in national guidance documents such as the UK Department of Health report *Good Practice in Continence Services*. [278] Adherence to such guidance is however generally suboptimal and infrequently audited.

## II. PREVALENCE AND RISK FACTORS FOR FAECAL INCONTINENCE

### 1. Quality of data

There is a lack of standardisation in defining FI among epidemiological studies in older adults, which creates opportunities for misclassifications of the condition and hampers cross-study comparisons. Most community-based studies examine prevalence of FI occurring at least once over the previous year, which may overestimate the prevalence of significant symptoms, but does provide the upper limit for FI occurrence in this population. Long-term care studies mostly measure weekly or monthly occurrence. None of the epidemiological studies in older adults used FI scoring systems such as the Wexner score (which includes use of pads, impact on lifestyle,

consistency and frequency of FI). [279,280] However, while the Wexner score is the most widely used scale in clinical research, there are insufficient data to support its universal use as a standardised grading system for FI, particularly as it has not been validated for use in older people.

The studies reviewed include two prospective cohort studies; [275, 281] all the others are retrospectively conducted surveys. Risk factor analyses were unadjusted in some studies, [282,283] and retrospectively conducted in all but one. [276] The epidemiology of FI in older adults varies according to the general health of the study population, so studies were examined according to the setting in which the work was conducted (community, hospital, or nursing home). Prevalence of FI in adults is discussed in full in Chapter 1: Epidemiology, and only data relevant to older people are presented below.

## 2. Results

### *a) Community-dwelling persons*

A U.S. survey of 2400 randomly selected individuals aged ≥ 50 years showed the prevalence of FI (≥ 1 episodes in the past year) increased linearly with age in men (8% among men in their 50's to 18% among men in their 80's) but not in women. [284] Half of the individuals reporting FI also reported UI.

Another similar U.S. survey reported a prevalence of 2.2% (definition for FI included uncontrolled passage of gas) for a population aged 18 and upwards, old age (≥ 65 years) was independently associated with FI in a subgroup analysis, but not as strongly as physical limitations and poor general health. [273]

An English study of 10,047 community-dwellers ≥40 years showed an age-related increase in prevalence of FI (peaking at 11.6% for FI and 22% for faecal soiling at ≥ 80 years), with no gender differences. [285] FI was more likely to have an impact on bowel-related quality of life in older people. In another British interview study (aged ≥ 65 years living at home, n=2818), FI prevalence was lower (3% in over 75's); data was obtained by interview (rather than by postal questionnaire). [274] FI was associated with greater physical disability, anxiety and depression. Over two-thirds of patients with FI also had UI. The prevalence of FI among 527 Irish primary care patients aged ≥75 years was 9%, with about 15% experiencing daily incontinence. [286]

A community-based study from Japan found the prevalence of daily FI to be 2% in people ≥ 65 years (n=1405); 8.7% of men and 6.6% of women reported "some degree" of FI. [287] Among those ≥ 85 years, 29% of women and 25.4% of men (or their carers) reported FI; the great majority of these individuals also had UI. Independent risk factors for FI were age ≥75 years, poor general health (measured as Activities of Daily Living dependency), stroke, dementia, no participation in social activities, and a feeling that there is not much to live for. The study followed up this cohort after 42 months and found that severe FI (≥once weekly) was associated with increased mortality, independently of age, gender, and poor general health. [275]

### *b) Hospitalized patients*

A British survey of 627 hospitalised patients aged ≥65 found the prevalence of at least weekly FI was 14%. [283] In an Australian survey of 247 consecutive acutely hospitalised patients of all ages, 22% self-reported FI. [288]

### *c) Long-term care residents*

A prospective study of 2,602 nursing home residents in France found a baseline prevalence of FI of 54%, and equally prevalent in women and men. [276] Among those continent at baseline, the incidence of new FI over 10 months was 20%; new FI was transient (<5 days) in 62%, and long-lasting in 38%. Of the patients who developed lasting FI, 26% died within 10 months, as compared with 6.7% of those who remained continent. Independent correlates of new-onset FI were age over 70 years, urinary incontinence, neurological disease, poor mobility, and impaired cognitive function.

A survey of nursing home residents in England (498 residents living in 21 long-term care facilities) showed that FI occurred weekly or more often in 29%, and less frequently in a further 23% (a total of 52% were incontinent at some time). [282]

Another British survey of at least once weekly incontinence in institutionalised adults aged > 65 showed prevalence rates of 13% in residential homes, and up to 37% in nursing home residents. [283] Amongst these UK studies, there was a wide variation in prevalence of FI ranging from 17% to 95% between individual nursing homes. [282,283,289] As the case-mix within these nursing homes is likely to be comparable, the variations may well be more reflective of different standards of care, rather than of different patient characteristics. The strongest univariate associations with FI in these long-term care studies (no multivariate analysis done) were physical

dependency and impaired mobility, particularly where help was needed to transfer from bed to chair. [282,283]

Prevalence rates for FI of 17-46% have been documented in US and Canadian nursing homes. [281,290] One study documented independent risk factors for FI in nursing home residents as frequent diarrhoea, watery stool, dementia, restricted mobility, and male sex. [281] Another found no gender association with FI in nursing home residents (mean age 84); risk factors were functional dependency, visual impairment, restraints, tube feeding, dementia, diarrhoea, and constipation. [277]

## 3. Faecal incontinence in older adults - the "hidden" problem

FI frequently goes unrecognised by health care providers, even in settings where systematic case finding instruments may be in place (e.g. Minimum Data Set, [291] Single Assessment Process[292]). In a British community-based study of primary care patients aged ≥ 75 years, only half of patients (or their carers) reporting FI had discussed the problem with a health care professional, and their primary care physicians had full knowledge of incontinence status in only 33% of patients with FI. [286] Likewise, another UK study found that less than 50% of older people with FI living at home had spoken with a health care professional, although 25% (women more so then men) stated that they would like to do so. [274] Even in a younger cohort of patients with FI (mean age 53), most cases were unrecognised by primary care physicians/GP's. [293] Similar findings were seen among women in the United Arab Emirates, with FI under-reporting resulting from cultural attitudes and public misperceptions about FI. [294]

Among acutely hospitalised patients of all ages in Australia, only 1 in 6 of those reporting FI had the symptom documented by ward nursing staff. [288]

In U.S. nursing homes, nursing staff were aware of FI in only 53% of residents self-reporting the condition (concordance between resident and nurse kappa = 0.34, 95% CI 0.24-0.43). [290] In another study, only 15% of residents with UI and/or FI had a physician mention it in the nursing home record. [295] In the U.K., only 4% of residents with long-standing FI had been referred to their general practitioner for further assessment. [289] A recent audit suggests that FI documentation has improved, but is still suboptimal. [296]

## 4. Summary of evidence

a. The prevalence of FI increases with age, particularly in the 8th decade and beyond. (Level 2)

b. The prevalence of FI is higher in acute hospitals and nursing homes than in the community, making frail older people the group most affected. (Level 2)

c. Unlike in younger populations, the prevalence of FI in frail older people is equal to or greater in men than women (Level 2). This predominance of older men is most striking among nursing home residents. The pathophysiology underlying these findings in men have yet to be explored.

d. The prevalence of FI varies dramatically between nursing homes. (Level 3)

e. FI is often coexists with UI in frail older people. (Level 2)

f. Aside from age, impaired mobility, dementia, neurological disease, and loose stool are primary risk factors for FI in older people. (Level 2)

g. Physicians and nurses in primary care, acute hospitals, and long term care have poor awareness of FI in their patients. (Level 2)

h. Nursing homes staff infrequently refer residents with FI to their primary physicians for further assessment (Level 3), which may reflect a tendency toward passive management (e.g. pad use).

i. Older people may be reluctant to volunteer FI symptoms to their health care provider for social or cultural reasons, or due to misperceptions that FI is part of the ageing process and therefore untreatable. (Level 2)

j. National and global significant geographic variations in specialist medical and nursing expertise in bowel care may affect FI case-finding in older people. (Level 3)

## 5. Recommendations for management-

- Bowel continence status should be established by direct questioning, direct observation, and/or systematic case finding instruments in:
  - nursing and residential home residents (Grade A),
  - hospital inpatients aged ≥ 65 (Grade C),
  - people aged ≥ 80 living at home (Grade B),
  - frail older people with UI (Grade A),
  - frail older people with impaired mobility and/or impaired cognition (Grade B),
  - frail elderly with neurological disease (Grade B).
- Primary care physicians/general practitioners, community nurses, hospital staff, and long-term care staff should routinely enquire about FI in frail older patients. (Grade B)
- Health care providers should be sensitive to cultural and social barriers discouraging patients from talking about FI. (Grade B)
- Implement systematic outreach programmes to make it easier for frail older people and their carers to discuss FI with their primary care provider. (Grade C)
- Because UI and FI often coexist; continence care workers should be trained in identification and management of both types of incontinence. (Grade C)

## 6. Research recommendations

- Develop models for overcoming barriers to FI reporting and detection.
- Examine underlying reasons for variation in FI prevalence between nursing homes (such as standards of care, patient case-mix, reporting). (Grade C)

# III. THE AGEING LOWER BOWEL AND PATHOPHYSIOLOGY IN OLDER ADULTS WITH FAECAL INCONTINENCE

## 1. Quality of data

The findings from physiological studies of the lower bowel in older adults tend to be variable due to: a) different techniques used in measuring anorectal function; b) unclear definition of the normative range of manometric measures for older people; c) poor matching between cases and controls of clinical factors which may affect gut function (e.g. level of mobility), or inadequate clinical information; [297,298] and d) small subject numbers in some cases. [298-300] Studies reviewed are cohort case-control to evaluate age-effect, [301-303] young-old healthy subject comparisons, [300,301] and age- and sex-matched case-control studies of continent versus incontinent patients. [297,298,304]

## 2. Results

### *a) Anorectal function in healthy older adults*

Studies of age effect in healthy volunteers have shown a linear reduction with ageing in squeeze pressures (external anal sphincter tone) in women after the age of 70, and in men from the 9th decade onwards. [301,302] Age beyond 70 years was associated with reduction in basal pressures (internal anal sphincter tone) in both genders, but to a greater degree in women. [301,302] A study of healthy adults in early old age showed no differences in sphincter pressures when compared with healthy young people. [300]

Rectal motility appears to be unaffected by healthy ageing, [299] but an age-related increase in anorectal sensitivity thresholds has been observed, starting at an earlier age in women than men. [303]

### *b) Anorectal function in older adults with faecal incontinence*

Two studies demonstrated prolonged pudendal nerve terminal motor latency (>2.2ms) in 34% of women aged over 50 with FI, though no relationship was observed between pudendal neuropathy and basal or squeeze pressures. [305,306] Advancing age was related however to declining basal pressures. [305] Single-fibre EMG in patients with FI ≥ 70 years showed increased fibre density in the external anal sphincter muscles compared with continent subjects, suggesting local reinnervation of these muscles following neurogenic damage. [298]

Medically-frail elderly persons with FI have reduced internal anal sphincter pressures, and a lower threshold for expulsion of a rectal balloon compared with continent age-and sex-matched controls. [297] Persons with FI and dementia were more likely to exhibit multiple rectal contractions in response to rectal distension, though the role of these "uninhibited" contractions in causing FI was unclear. [297,307]

A similar matched case-control study showed that elderly patients with rectal impaction and soiling had impaired rectal sensation (needing a larger volume before feeling the presence of a rectal balloon and the urge to defecate), lower rectal pressures during rectal distension, and impaired anal and perianal sensation ('rectal dyschezia'). [304] Basal and squeeze pressures however were unimpaired in FI patients, and their rectoanal inhibitory response was well-preserved. The authors concluded that overflow FI is primarily due to leakage of locally secreted mucus around an irritative rectal faecal mass despite well-preserved anal sphincter integrity.

### 3. Summary of evidence

1. Anorectal function in healthy older persons is characterised by a tendency towards an age-related reduction in internal anal tone (Level 3), and a more definite decline in external anal sphincter tone, especially in older women. (Level 3)
2. An age-related decline in anorectal sensitivity in women has been observed (Level 3), but rectal motility is well-preserved. (Level 3)
3. Ageing alone appears to have little impact on anorectal function until later old age: from the 7th decade onwards in women and even later in men. (Level 2)
4. Age-related internal anal sphincter dysfunction is an important factor in FI in later old age. (Level 3)
5. Although pudendal neuropathy is an age-related phenomenon in women with FI, its significance as a predisposing factor for FI is unclear. (Level 2)
6. Stool impaction predisposing to overflow FI in frail older adults is related to rectal dyschezia characterised by reduced anorectal tone, increased compliance, and impaired sensation. (Level 3)
7. Overflow FI is due primarily to mucus secretion from around a rectal faecal bolus, rather than to impaired sphincter function. (Level 3)

### 4. Recommendations for management

- FI should not be considered an inevitable consequence of ageing. (Grade B)
- Evaluation should include a digital examination to identify rectal stool impaction causing overflow. (Grade B)
- Patients who are unaware of the presence of a large faecal bolus in the rectum may have rectal dyschezia, and should be considered at risk of recurrent impaction with overflow. (Grade C)

## IV. CAUSES OF FAECAL INCONTINENCE IN OLDER PEOPLE

The causes of FI in older people, unlike in younger adults, are often multifactorial, making comprehensive assessment key. [308-310] The aim of this section is to categorise the causes of FI in frail older adult in a clinically meaningful way, emphasising the identification of potentially reversible factors.

### 1. Overflow incontinence secondary to constipation and stool impaction

Constipation is the most important cause of FI in frail older people, and is prevalent, treatable, preventable, and frequently overlooked. In a UK hospital, faecal impaction was a primary diagnosis in 27% of acutely hospitalised geriatric patients. [304] Continuous faecal soiling and faecal impaction on rectal examination was the underlying problem in 52% of nursing home residents with long-standing FI. [289] Constipation (defined as self-reported difficult evacuation or infrequent bowel movements) has been found in 57% of women and 64% of men in residential homes, and 79% and 81% respectively in nursing homes. [311] The high prevalence of constipation in nursing homes is striking because 50-74% of long-term care residents use one or more daily laxatives. [282,290,311-313]

A prospective U.S. study looked at baseline characteristics predictive of new-onset constipation in elderly nursing home patients, using the Minimum Data Set. [291] Over three months, 7% developed constipation (i.e., two or fewer bowel movements per week or straining on more than 25% of occasions) with independent predictors being white race, poor fluid consumption, pneumonia, Parkinson's disease, allergies, poor ability to move in a bed,

arthritis, taking more than 5 medications, dementia, hypothyroidism, and hypertension. It was postulated that allergies, arthritis, and hypertension were associated primarily because of the constipating effect of drugs used to treat these conditions. Other epidemiological data regarding risk factors for constipation (and their supporting level of evidence) are given in **Table 10**.

***Table 10. Risk factors for constipation in older people***

| RISK FACTORS |
|---|
| Polypharmacy (Level 2) |
| Anticholinergic drugs (Level 2) |
| Opiates (Level 3) |
| Iron supplements (Level 3) |
| Calcium channel antagonists (Level 3) |
| Nonsteroidal anti-inflammatory drugs (Level 2) |
| Immobility (Level 2) |
| Institutionalisation (Level 3) |
| Parkinson's disease (Level 2) |
| Diabetes mellitus (Level 2) |
| Low fluid intake (Level 2) |
| Low dietary fibre (Level 3) |
| Dementia (Level 2) |
| Depression (Level 3) |

## 2. SUMMARY OF EVIDENCE

1. The prevalence of both self-reported and symptomatic constipation are high in frail older people. (Level 2)
2. Older women have higher rates of self-reported constipation and related symptoms than older men, although this gender difference is less marked beyond age 80. (Level 2)
3. Nursing home residents have a higher prevalence of all constipation-related symptoms than community-dwelling individuals, including infrequent bowel movements, straining, and hard stool. (Level 2)
4. Advancing age increases the risk for heavy laxative use and symptom-based constipation among nursing home patients. (Level 3)
5. The prevalence of constipation in nursing homes is high despite heavy laxative usage (Level 2), implying that a) laxative prescribing may be ineffective, and b) non-pharmacological approaches to treatment are under-utilised in this setting.
6. Frail older people are at greater risk of faecal impaction, overflow FI, and other complications of constipation. (Level 3)
7. There are numerous potentially modifiable risk factors for symptomatic constipation in frail older people. (Level 2)

## 3. OTHER CAUSES

### *a) Functional faecal incontinence*

Functional FI occurs in individuals who are unable to access the toilet in time due to impairments in mobility, dexterity, and/or vision. These patients may have normal lower gut function. Epidemiological studies of nursing home residents (see above) have repeatedly shown that poor mobility is a strong risk factor for FI. [273,276,281,287] and constipation in older people. [311,314,315] While these studies primarily examined immobility, it is likely that sensory and dexterity impairment also contribute to FI.

### *b) Comorbidity-related incontinence*

The following diseases may cause FI, and are more common in older people:

1. DEMENTIA-RELATED FI

Patients with advanced dementia may have a cortically disinhibited bowel pattern, with a tendency to void formed stool once or twice daily following mass peristaltic movements. One study identified dementia as the primary cause of FI in 46% of nursing home residents, [289] and dementia has been identified as an independent risk factor in epidemiological studies. [276,281,287] Persons with dementia very commonly also have UI. [287]

2. STROKE

After stroke, the prevalence of FI is 30-56% in the acute stage, 11% at 3 months, and 11-22% at 12 months. [316,317] FI may develop months after acute stroke and can be transient, consistent with constipation with overflow as one possible cause. [310,314,318] Epidemiological data suggest that FI is associated more with disability-related factors (particularly functional difficulties using the toilet and antimuscarinic medications) than stroke-related factors (e.g., severity and lesion location). [318,319]

3. DIABETES MELLITUS

FI may occur in people with diabetic neuropathy

affecting the gut through the dual mechanisms of nocturnal diarrhoea due to bacterial overgrowth from severe prolongation of gut transit[320] and multifactorial anorectal dysfunction. Case-control studies show that diabetic patients with FI have reduced basal and squeeze pressures, spontaneous relaxation of the internal anal sphincter, reduced rectal compliance, and abnormal rectal sensation. [321,322] Diabetic anorectal dysfunction predisposing to FI can be further exacerbated by acute hyperglycaemia. [323]

4. Sacral cord dysfunction

Diminished parasympathetic outflow from the sacral cord may cause rectal dyschezia. [304] Rectal dyschezia is characterised by impaired rectal sensation, lower rectal pressures during rectal distention, and impaired anal and perianal sensation. It is associated clinically with recurrent rectal impaction and soiling. Common conditions in older people that could impair sacral cord function are ischaemia and spinal stenosis.

***c) Anorectal incontinence***

Studies of older people with FI suggest that age-related internal anal sphincter dysfunction is an important contributing factor, [297,305] as it lowers the threshold for balloon (stimulated stool) expulsion. [297] Childbearing is linked to later-life FI via structural damage to the external anal sphincter and pelvic musculature. [324] Uterovaginal prolapse and rectocoele are independent risk factors for FI in women attending urogynaecology clinics. [315,325] Rectal prolapse, which occurs more commonly in older adults, also is associated with FI. [302]

***d) Loose stools***

Loose stool increases the risk of FI in normally continent older adults by overwhelming a functional but age-compromised sphincter mechanism. Frail older individuals are particularly susceptible to bowel leakage in the context of loose stools. [276,289] In a prospective nursing home study, 44% of FI cases were related primarily to acute diarrhoea. [276]

Potentially reversible causes of loose stools in frail older adults include:

• *Excessive use of laxatives:* One-third of community-dwelling people aged ≥ 65 regularly take laxatives, far exceeding the prevalence of constipation in this population. [326] In the nursing home, laxative use (in particular 'Codanthramer,' a docusate-stimulant combination agent) has been linked to FI. [282]

• *Drug side-effects:* e.g., protein-pump inhibitors, selective serotonin re-uptake inhibitors, magnesium-containing antacids, cholinesterase inhibitors

• *Lactose intolerance* (an age- and ethnicity-related condition): One study found lactose malabsorption in 50% in healthy women aged 60-79, versus 15% in those aged 40-59. [320]

• *Antibiotic-related diarrhoea:* Among hospitalised patients, age, female gender, and nursing home residency significantly increases the risk for *Clostridium difficile*-associated diarrhoea from antibiotic use. [322] *C. difficile*-related diarrhoea takes longer to resolve following treatment in frailer older patients[327] In addition, FI has been found to be a risk factor for recurrent *C. difficile* (53% of patients studied), in addition to prolonging fever during the initial episode. [328]

Loose stools should also be considered a possible indicator of serious underlying disease such as neoplasm and colitis, and all patients with this symptom should be screened clinically for systemic illness; colonoscopy should be considered to rule out colorectal cancers in appropriate patients. [329]

## 4. Summary of evidence

1. Overflow FI secondary to stool impaction is the primary cause of FI in frail older people. (Level 3)
2. The multiple potentially-modifiable causes of constipation in older people (Level 2) are likely also risk factors for overflow FI. (Level 3)
3. Frail older people (particularly those with neurological disability) may have FI because of functional impairment. (Level 2)
4. Dementia is an important cause of FI in frail older people. (Level 2)
5. FI is a common following stroke (Level 2), but factors other than stroke status itself may contribute to FI in stroke survivors. (Level 2)
6. Loose stools predispose frail elderly people to soiling (Level 2), have numerous potentially reversible causes (Level 3), and could be indicative of underlying colonic disease (e.g., colorectal cancer or colitis). (Level 2)

### 5. Recommendations for management

- All older frail persons with FI should be evaluated for the following potentially modifiable risk factors:
  - Constipation causing impaction and overflow (Grade B)
  - Loose stool (Grade B)
  - Impaired mobility Grade B)
  - Difficulty with using the toilet (acute or chronic) (Grade B)
  - Delirium (Grade C)
  - Anal sphincter weakness (Grade B)
  - Impaired vision and/or manual dexterity (Grade C)
  - Medications (Grade C)
- All frail older people with overflow FI should be assessed for potentially modifiable causes of constipation. (Grade B)
- In frail older persons, evaluation for colorectal carcinoma as a cause of loose stools should be predicated on the patient's goals of care, comorbidity, and life expectancy, and whether the diagnosis would change management. (Grade B).

## V. EVALUATION OF FAECAL INCONTINENCE IN OLDER ADULTS

The algorithm summarises the clinical evaluation of FI in this population (**Figure 2**). It emphasises a structured comprehensive clinical approach, which can be undertaken by doctor or nurse specialist. [309] In most cases the clinical evaluation will provide sufficient diagnostic information on which to base a feasible management plan without resorting to more specialised tests and assessments. The clinical usefulness of anorectal function tests and defecography in assessing older people with FI is limited by: a lack of normative data from healthy elderly; few standardised test protocols; and poor association between detected abnormalities and symptoms. [318,330,331]

There is, however, room for improvement in this clinical area, as current surveys indicate a lack of thoroughness by doctors and nurses in assessing FI in older people in all settings (community, acute hospital, and nursing home), [296] including failure to obtain an accurate symptom history or perform rectal examinations.

### 1. Results

***Symptoms.*** Self-report of bowel symptoms relating to FI are reliable and reproducible in older persons, including long-term care residents. [332-334] Responses to questions concerning FI by proxies nominated by the patient concord well with patients' index responses. [335]

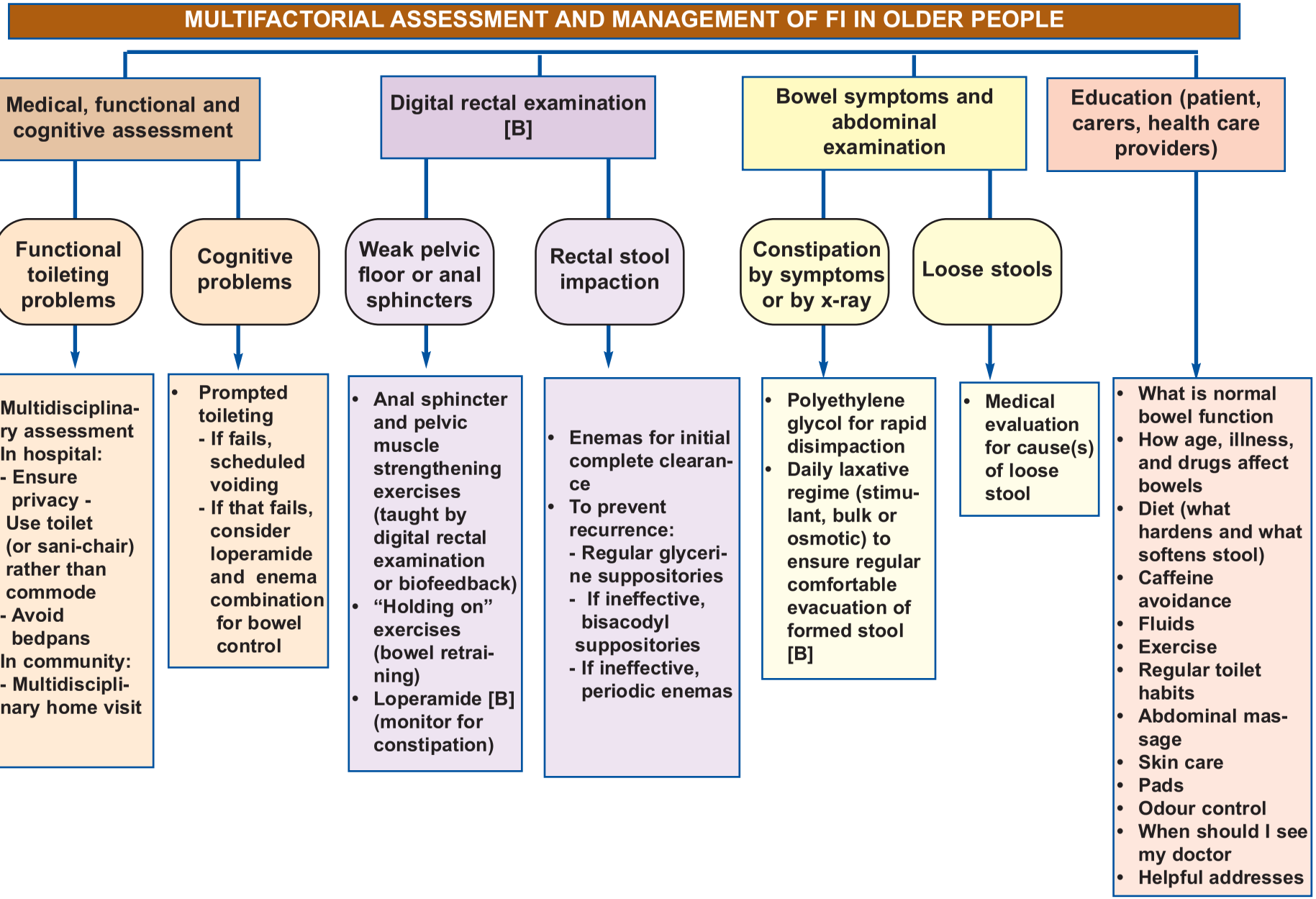
Documentation of the type of FI is diagnostically helpful. Constant leakage of loose stool or stool-stained mucus is characteristic of overflow around an impaction, while small amounts of leakage suggests anal sphincter dysfunction. If external anal sphincter weakness predominates, patients often report urgency prior to leaking (urge FI), while those with internal sphincter dysfunction tend to have unconscious leakage of stool (passive FI). [336] Patients with dementia-related FI often pass complete bowel movements, especially in response to the gastrocolic reflex after meals.

Assessment of FI must include an assessment for constipation. Based on recently updated international consensus, constipation is now defined according to self-report of more specific bowel-related symptoms ( 'Rome II criteria'). [337] Another definition useful both in practice and in clinical research is two or more of the following symptoms on more than 25% of occasions in the prior 3 months: ≤2 bowel movements per week; hard stool; straining; feeling of incomplete evacuation. [324]

It is important to identify the constipation subtype *rectal outlet delay* in older people, defined as the feeling of anal blockage during evacuation and prolonged defaecation (more than 10 minutes) and/or need for manual evacuation. [338] It affects 21% of people living in the community aged 65 and over[324] and may lead to rectal impaction and FI. Constipated older people tend to suffer primarily from difficulties with rectal evacuation and symptoms of straining and hard stool rather than from reduction in stool frequency. [339]

Objectively, however, the clinical definition of constipation relies on evidence of excessive stool retention in the rectum and/or colon. Such objective assessment is particularly important in frail older people who may:

*Figure 2. Multifactorial assessment and management of faecal incontinence in older people*



- be unable to report bowel-related symptoms due to communication or cognitive difficulties;
- have regular bowel movements despite rectal or colonic stool impaction;
- have impaired rectal sensation and rectal dyschezia and be unaware of a large rectal faecal bolus; [304]
- have non-specific symptoms and signs (such as delirium, leucocytosis, anorexia, functional decline) in association with severe faecal impaction.

A digital rectal examination is essential for identifying stool impaction, although an empty rectum does not exclude constipation. [315] Patients with FI without evidence of rectal impaction ideally should undergo a plain abdominal radiograph in order to assess the existence, extent and severity of faecal loading and evaluate for any bowel obstruction, sigmoid volvulus, or stercoral perforation secondary to impaction. [327,340]

Digital assessment of squeeze and basal tone may be as sensitive and specific as manometry in discriminating sphincter function between continent and FI patients aged over 50. [341] Easy finger insertion with gaping of the anus on finger removal indicates poor internal sphincter tone, while reduced squeeze pressure around the finger when asking the patient to "squeeze and pull up" suggests external sphincter weakness.

Because FI is a primary independent risk factor for pressure ulcers in frail older people, [342] evaluation of skin integrity and ulcer risk assessment are important. Pelvic examination also is relevant in view of the association between pelvic organ prolapse (particularly rectocoele) and FI in older women. [336,337]

Abdominal pain, rectal bleeding, recent change in bowel habit, weight loss, and anaemia should prompt consideration of underlying neoplasm. [343] Colorectal cancer is associated with both constipation and laxative use, although the risk likely is confounded in underlying habits. [343] Chronic constipation alone is generally not an appropriate indication for colonoscopy. [344] However, because colorectal cancer prevalence increases with age, index of suspicion should be higher in older adults. [343] Bowel preparation for colonoscopy or barium enema may itself cause FI in frail older people; at the same time, dementia and stroke are independent predictors of inadequate colonic preparation. [345]

Evaluation of toilet access should be multidisciplinary, and include assessments of functional status (e.g. Barthel Index), mobility (e.g. 'up and go' test), visual acuity (count fingers), upper limb dexterity (undoing buttons), and cognition (e.g. Abbreviated Mental Test Score). An even more practical assessment is to watch someone transfer and manage clothing. If a commode is used, the appropriateness of its design for the individual should be considered (e.g. trunk support, adaptability, mobility, foot support etc.)[308,346] (See Chapter 18: on Conservative Management of Faecal Incontinence). For community patients, the health care provider should be aware of the physical layout of the patient's home, especially bathroom details (location, distance from main living area, width of doorway for accommodating walking aids, presence of grab rails or raised toilet seat, low lighting levels, high degree of clutter) and hard to manage clothing.

No bowel-specific quality of life scores have been developed for or evaluated in older persons with FI.

A recent RCT evaluated a multi-component assessment and treatment intervention for bowel problems in frail older stroke patients who self-reported constipation or FI (**Figure 2**). [310] The assessment was done in the home, outpatient clinic, or hospital wards by a non-specialist nurse who had received simple training in bowel care. The structured assessment found that the majority of patients had more than one bowel problem: 66% had constipation, 56% rectal outlet delay, 22% rectal impaction, 30% FI (of whom 12/22 had constipation with overflow) 41% had reduced internal sphincter tone; 55% weak external sphincter tone, 7% excessive pelvic floor descent, and 47% had difficulties with toilet access.

## 2. Summary of evidence - assessment of faecal incontinence in older people

1. Current assessment of FI in older adults in routine healthcare settings is suboptimal. (Level 3)
2. Structured assessment of frail older people with bowel problems demonstrate multifactorial causes for FI and constipation. (Level 2)
3. Structured nurse-led assessment is a feasible approach to bowel assessment in various healthcare settings. (Level 2)
4. Documentation of the type of FI and related bowel symptoms by self-report, proxy report, or observation is feasible (Level 2) and diagnostically helpful. (Level 3)

5. Constipation can be characterised clinically according to standardised symptom-based definitions in patients able to give a history. (Level 2)

6. Rectal examination should be done regarding faecal impaction in patients with overflow FI. (Level 2)

7. Digital assessment of sphincter tone can effectively estimate anal sphincter function in adults with FI. (Level 3)

8. Anorectal function tests and defecography are poorly associated with symptoms in older people with FI. (Level 3)

9. There are no FI-specific quality of life measures for frail older people.

### 3. Recommendations for management

- A standardized, structured assessment (including cognitive and functional measures) by nurses or physicians is necessary to identify the multiple causes of FI (Grades B-C). These assessments can be done by in patients' homes, the hospital, or institutions. (Grade B)
- Physicians should prioritise FI assessment in frail older people (especially in nursing homes) (Grade C). Nurses may be more aware of the problem, but should be specifically trained to look for underlying causes (Grade C), using approaches such as targeted training of non-specialist nurses. (Grade B)
- Hospital wards, primary care practices, and long-term care institutions internationally should have appropriate multidisciplinary protocols for FI case-finding and risk assessment. (Grade C)
- Nurses should be trained to perform routine rectal examinations to evaluate stool retention. (Grade C)
- A careful bowel symptom history (FI and constipation) (Grade B), and assessment of bowel pattern (e.g., with a bowel chart) (Grade C), should be part of FI assessment.
- Digital assessment of sphincter tone should be performed in all older people with FI. (Grade C)
- Ano-rectal physiology tests are not generally required in the frail elderly, as they often do not alter the clinical assessment or management plan. (Grade C)
- In the initial assessment, older persons with FI without evidence of rectal stool impaction should undergo a plain abdominal radiograph to rule out higher impaction and other problems. (Grade C)
- FI can be the presenting symptom of colorectal cancer and may require investigation by colonoscopy or barium enema (Grade C). Bowel preparation should be carefully planned in frail older people to avoid causing acute diarrhoea (Grade C), and inadequate clear out. (Grade B)
- Pelvic examination should be done to identify pelvic organ prolapse (especially rectocele). (Grade B)
- The impact of FI on patient and carer quality of life, usual activities, and attitude should be qualitatively assessed. (Grade C)
- Evaluation of toilet accessibility and usage /should be multidisciplinary. (Grade C)

## VI. TREATMENT OF FAECAL INCONTINENCE IN OLDER ADULTS

### 1. Quality of data

There are very few published trials of FI treatment in older people, and no trials on FI prevention. The studies reviewed had small numbers, [289,347] problematic methodology (e.g. not applying intent-to-treat rule, unclear reporting of drop-outs), [289,348] and all were non-blinded. There are Level 2 data that FI in older stroke patients relates more to frailty than to stroke-related factors, [318,332] so a recent RCT of multi-component treatment of bowel problems in stroke has been included. [310] A recent Cochrane review highlighted the limited evidence on drug therapy for FI in adults. [349] Randomised controlled trials examining effective laxative treatment for constipation in older adults generally lack power to detect treatment effects. [338] Surgery, biofeedback, containment (pads and anal plugs), and skin care are covered in Chapter 18: Conservative Management of Faecal Incontinence.

### 2. Treatment of faecal impaction and overflow FI in older people

One trial evaluated a therapeutic intervention in 52 nursing home residents with FI, based on treatment recommendations to general practitioners. [289]

Patients with rectal impaction and continuous faecal soiling were classified as having overflow, and treated with enemas followed by lactulose, with complete resolution of FI in 94% of those with full treatment compliance (67% of enrollees).

In a French study of 206 frail elderly nursing home residents, treatment of constipation using daily lactulose plus daily suppositories and weekly tap-water enemas was effective in improving overflow FI (incontinence at least once weekly associated with impaired rectal emptying) only when long-lasting and complete rectal emptying (monitored by weekly rectal examinations) was achieved. [350] However, complete rectal emptying was only achieved in only 40%. FI episodes were reduced by 35% and staff workload (based on soiled laundry counts) fell by 42% in those with effective bowel clearance.

A systematic review of laxative treatment in elderly people commented that significant increases in bowel movement frequency have been observed with cascara and lactulose, while bulk laxative psyllium and lactulose to improve stool consistency and related symptoms [353]. Observational studies of nursing home residents and hospital inpatients suggest that stimulant and osmotic laxatives (lactulose and polyethylene glycol) may be effective. [338, 351, 352]

Although enemas are considered useful in the clinical setting for acute disimpaction and treatment of overflow, the only efficacy data are case-reports. Suppositories (bisacodyl with polyethylene glycol) may initiate faster evacuation in patients with spinal cord injury, who suffer from an extreme form of rectal outlet delay. [353] Acarbose and higher fiber intake reduced the very prolonged colonic transit time in a case series of elderly long-term care patients with type 2 diabetes, [354] but bowel symptoms were not measured.

## 3. Treatment of dementia-related faecal incontinence

Prompted toileting programmes significantly increased the number of continent bowel movements in an uncontrolled study of nursing home residents with dementia-related FI, but no impact was seen on FI frequency. [355] A RCT found that prompted toileting of frail nursing home residents significantly reduced FI frequency and increased the rate of appropriate toilet use, but did not effect the primary outcome measure of pressure ulcers. [114] A trial of daily codeine phosphate and twice weekly enemas in 25 nursing home residents with dementia-related FI achieved continence in 75% of those fully treated. [289]

## 4. Treatment of anorectal incontinence in older adults

There is no evidence to suggest that frail older people without significant cognitive problems are any less able to adhere to pelvic floor muscle retraining programmes.

Loperamide is recommended for treatment of anorectal incontinence, [356] though there is little research data on its efficacy in older people.

In one small placebo-drug crossover trial in older adults, loperamide significantly reduced visual analogue scores for incontinence and urgency, and both prolonged colonic transit and increased basal tone. [357] For prevention of *C. difficile* in frail older hospital inpatients (and consequent loose stool with FI in those with weak sphincters), strict antibiotic policies and hand washing by all staff before and after contact with patients have been shown to reduce the risk.

## 5. Multi-component treatment of FI in frail older people

In a UK RCT, 146 frail older stroke patients with constipation and/or FI were randomised to intervention or routine care. [310] The intervention consisted of a structured nurse assessment (history and rectal examination), leading to targeted patient/carer education with a booklet, and provision of diagnostic summary and treatment recommendations to the patient's routine health care provider.

After one year, intervention subjects were more likely to be altering their diet and fluid intake to control their bowel problem, and were receiving different primary care physician/general practitioner prescribed patterns of bowel agents. Although they also reported an improvement in number and 'normality' of bowel movements at 6 months, the effect was no longer significant at 12 months, possibly due to the small numbers of reported FI episodes.

Bowel problems were often multifactorial. While this evaluation of a multi-component intervention did not define any one action that had an effect on bowel dysfunction, it did demonstrate the feasibility and efficacy of a structured modular approach that non-specialist doctors and nurses can use in various settings.

## 6. Summary of evidence - treatment of faecal incontinence in frail older people

1. There is insufficient data to determine what constitutes effective laxative treatment of faecal impaction with overflow FI.
2. Stimulant and osmotic laxatives may be effective in treating constipation in older people at risk of overflow. (Level 2)
3. Complete rectal clearance is required to reduce overflow FI (Level 2), but may be hard to achieve in frail older patients (Level 2).
4. Weekly digital rectal examination is helpful in monitoring the effectiveness of a bowel clearance programme. (Level 2)
5. Structured approaches to bowel care (including prompted toileting) can reduce the frequency of FI in the nursing home setting. (Level 2)
6. Loperamide may reduce frequency of FI, particularly when associated with loose stool. (Level 3)
7. Multi-component structured nurse-led assessment and intervention can improve bowel symptoms and alter bowel-related habits in older stroke patients. (Level 2)

## 7. Recommendations for management

- Patients with constipation with overflow should have effective bowel clearance (using a combination of laxatives and enemas) (Grade C), and then maintenance therapy with stimulant or osmotic laxatives. (Grade B)
- Regular digital rectal examinations should be performed to assess the effectiveness of a bowel clearance programme in frail older people with overflow. (Grade B)
- Suppositories are useful in treating rectal outlet delay (Grade C) and preventing recurrent rectal impaction with regular use. (Grade C)
- Loperamide is a useful in anorectal FI, in the absence of constipation (Grade B).
- Causes of loose stool should be identified and treated (Grade B).
- In patients with loose stools due to *C. difficile* infection, preventive measures against recurrent infection should be taken (Grade C)
- All frail older people with FI should have structured multidisciplinary assessment and treatment of their bowel problem (Grade C). **Figure 2** summarises a structured approach that can be used in multiple heath care settings. Patient and carer education (using verbal and written materials) should be undertaken to promote self-efficacy and other coping mechanisms, and where appropriate self-management (e.g. reducing risk of constipation and impaction through dietary and lifestyle measures, advice on how to take loperamide) (Grade C).
- Advice on skin care, odour control, and continence aids is also important. (Grade C)
- Greater emphasis needs to be placed on systematic and effective management of faecal incontinence in older people, including sound communications between all health care providers, especially in the nursing home and acute hospital setting (Grade C)
- Education of health care providers with regards to heightening awareness of FI plus methods of identification, assessment and management of FI in older people should be broad-ranging and include geriatricians, primary care physicians/general practitioners, hospital physicians, hospital and community nurses, long-term care nurses, and related disciplines (physiotherapists, occupational therapists, dieticians, pharmacists). (Grade C)

## 8. Recommendations for research

- RCT's of laxative and non-pharmacological treatment and prevention of faecal impaction and overflow are needed to optimise standards of prescribing and care.
- Multi-component interventions to treat FI in frail older people should be evaluated as applied research to assess effective ways of delivering this type of intervention within routine health care settings.
- A multidisciplinary RCT assessing a step-wise approach to management of dementia-related FI in nursing home residents (prompted toileting in those with mild to moderate dementia, scheduled toileting plus suppositories next step, bowel programme of controlled evacuation in those with persistent incontinence) would be of great value.

- It is important to balance feasibility and practicality versus "high strength" interventions (i.e., a team of specialist continence nurses in nursing homes are likely to have an impact, but at what cost, and will care continue when they are gone)
- Processes for the identification of FI in older primary care patients should be determined via audits of current methods of case finding in primary care (by primary care physicians/general practitioners, practice nurses and continence nurse specialists).
- Feasibility studies of ways of providing an integrative approach to assessment of FI in frail older people, including a range of health and social care providers and different health care settings (acute, intermediate or sub-acute, long-term care, community).
- Evaluation of the variability of FI rates between nursing homes within single nation states, taking into consideration case-mix issues and in exploring different institutional standards of care that may impact prevalence.
- National audit of current practice in long-term care is needed to lay the groundwork for standardised care. Such audit tools should be developed using standardised consensus methodologies.
- Further epidemiological studies are required to document causes of FI in frail older people in different health care settings. Such studies should include evaluation of unmet need for patients and carers.
- Evaluation of aetiologies, and in particular the pathophysiological basis for the high prevalence of FI in older men.
- Evaluation of potentially preventable causes of loose stools in institutionalised older people, and impact of their treatment on FI.
- Nurse-led initiatives are needed to develop care pathways for assessing of bowel problems in frail older people with a view establishing integrated service delivery.

**Annex 1**

# Summary fo Urinary Incontinence in Frail Older Men and Women

Older persons in general should receive a similar range of treatment options as younger persons. However, frail older persons present different problems and challenges compared with other fitter older patient populations. Implicit in the term "frail" is that such individuals may neither wish nor be fit enough to be considered for the full range of therapies likely to be offered to healthier or younger persons. The extent of investigation and management in frail older people should take into account the degree of bother to the patient and/or carer, their motivation and level of cooperation / compliance as well as the overall prognosis and life expectancy. At the same time, management effective to meet their goals is possible for many frail persons [C].

## I. HISTORY AND SYMPTOM ASSESSMENT

This algorithm applies to the evaluation of urinary incontinence in frail persons. Many of the same principles (especially assessment and treatment of potentially treatable or modifiable conditions and medications that may cause or worsen incontinence) apply to faecal incontinence in frail elderly as well.

### *Clinical assessment*

Treatable or potentially reversible conditions should be addressed first, followed by a physical examination targeted to comorbidity and functional assessment. The "DIAPPERS" mnemonic covers some of these conditions. Bowel symptom history, rectal examination, and stool diary should be considered. While most cases of faecal incontinence are multifactoral, the primary goal of assessment is to distinguish overflow faecal incontinence associated with constipation from other causes.

While post-void residual urine (PVR) measurement is recommended because it could influence the choice of treatment, it is recognized that PVR often is impractical to obtain and in many cases may not change overall management. Impaired bladder emptying may occur in older men and women for various reasons including bladder outlet obstruction and detrusor underactivity. Treatment of coexisting conditions may reduce PVR, e.g. treatment of constipation and stopping drugs with antimuscarinic action. There is no specific "cut off" in this population, although PVR over 100 ml (men) and 200ml (women) are considered elevated, and a low PVR does not exclude outlet obstruction.

### *Clinical diagnosis*

Mixed UI (stress UI and urge UI symptoms) is common in older women. A cough stress test is appropriate if the diagnosis is likely to influence treatment choice (e.g., consideration of surgery). Combined urge UI and high PVR (without obstruction), known as detrusor hyperactivity with impaired contractility (DHIC), also is common in the frail elderly.

## II. INITIAL MANAGEMENT

Initial treatment should be individualised and influenced by the most likely clinical diagnosis. Conservative and behavioural therapy for UI and FI include lifestyle changes [C], bladder training in the more fit or alert patient [B], assisted voiding for more disabled patients [C] and prompted voiding for frailer and more cognitively impaired patients [B]. For select, cognitively intact frail persons, pelvic muscle exercises may be considered, but they have not been well studied in this population [C]. A cautious trial of antimuscarinic drugs may be considered as an adjunct to conservative treatment of urge UI [C]. Similarly, a-blockers may be cautiously considered to assist bladder emptying in frail men with an elevated PVR [C], and topical oestrogens considered for women with vaginal/urethral atrophy [C]. With all drug treatment, it is important to start with a low dose, and titrate with regular review of efficacy and tolerability until desired effect or unwanted side effects occur. For constipation with overflow FI, bowel clear-out with combined suppositories/enemas and laxatives is recommended [C]. Loperamide can be used for FI in the absence of constipation [B].

## III. SPECIALIZED MANAGEMENT

If after initial assessment a frail older person with UI is found to have other significant factors (e.g., pain, haematuria, rectal bleeding, persistent diarrhoea), then referral for specialist investigation should be considered.

Referral to specialists also may be appropriate for individuals who have not responded adequately to initial management and if further investigation/treatment is desirable which could improve continence and quality of life.

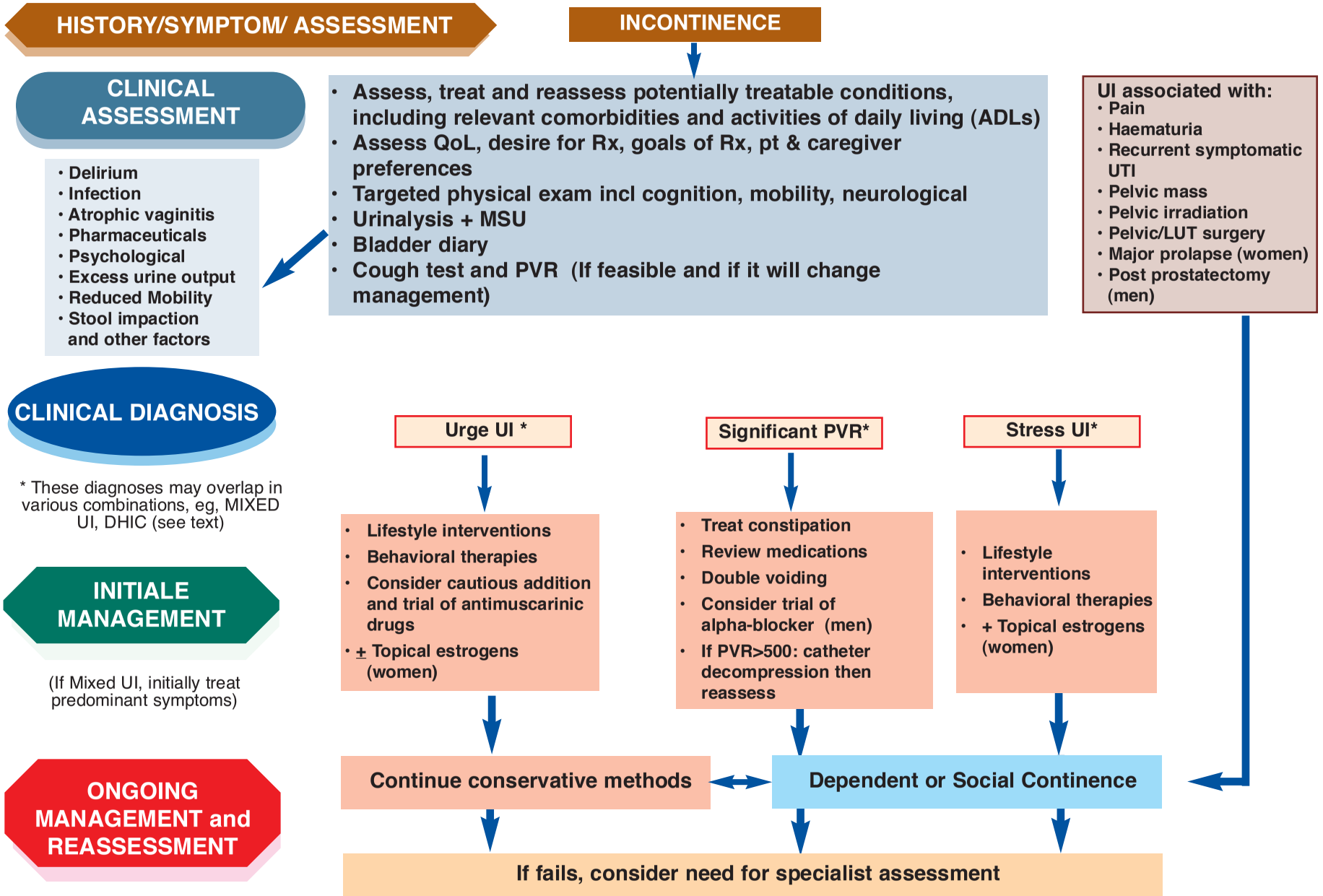
Age per se is not a contraindication to incontinence surgery [C], but before surgery:

- All modifiable comorbidity should be addressed [C];
- An adequate trial of conservative therapy should be followed by reassessment of the need for surgery [C];
- Urodynamic testing should be done because clinical diagnosis may be inaccurate [A]; and
- Preoperative assessment plus careful perioperative care is essential to minimise geriatric complications such as delirium, infection, dehydration and falls [A].

## IV. ONGOING MANAGEMENT AND REASSESSMENT

If the patient cannot achieve Independent Continence (dry, not dependent on ongoing treatment) or Dependent Continence (dry with assistance, behavioral treatment, and/or medications) then "Contained Incontinence" (incontinence contained with use of appropriate aids and/or appliances) should be the treatment goal.. Importantly, optimal care can usually be achieved by a combination of the above approaches [C].

# MANAGEMENT OF URINARY INCONTINENCE IN FRAIL OLDER PERSONS



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