Urinary Incontinence in the Elderly: Considerations Beyond the Bladder
Workshop 18
August 23, 2010, 14:00-17:00

Time	Time	Topic	Speaker
14:00	14:15	Opening remarks	Mary H Palmer
14:15	14:45	Central nervous system and bladder control	George Kuchel
14:45	15:15	Affect and motivational factors in incontinence	Catherine Du Beau
15:15	15:30	Discussion with the audience	
15:30	16:00	Break	
16:00	16:20	Mobility and bladder control	Mary H Palmer
16:20	16:50	Medications affecting bladder control and used in its treatment	Cara Tannenbaum
16:50	17:00	Discussion with the audience: Multidimensional components to assessment, treatment and management of geriatric incontinence.	All

Aims of course/workshop

Despite evidence based practices to treat and manage incontinence, it remains a prevalent condition in older adults. This educational course explores non genitourinary contributors to urinary incontinence from an interdisciplinary perspective. Diseases, dysfunctions, and conditions affecting cognition, affect, and mobility will be discussed in the context of their impact on assessment and treatment of geriatric incontinence. Medications that affect genitourinary function and that are used to treat urinary incontinence will also be discussed. The speakers will address the latest evidence regarding prevention and treatment of urinary incontinence in this population.

Key Learning Points: Factors outside the GU tract must be considered when diagnosing, assessing, and treating urinary incontinence in older adults. Geriatric principles must be included in continence care for older adults.

Take Home Messages: Interdisciplinary assessment and treatment are essential with incontinent older adults.

Educational Objectives

At the end of the workshop the participant will be able to:

1. Discuss geriatric principles relevant to assessment, treatment and management of urinary incontinence.
2. Describe conditions and diseases of the central nervous system that affect bladder control.
3. Discuss the role of affect and motivational factors in the treatment of urinary incontinence.
4. Explore role of mobility and toilet access in prevention and treatment of urinary incontinence.
5. Identify medications that affect bladder function and those used in the treatment of geriatric incontinence.
6. Participate in discussions about the multidimensional components to the promotion of urinary continence and the assessment and treatment of urinary incontinence.

George A Kuchel, MD, FRCP, AGSF

Educational Course

Urinary Incontinence in the Elderly: Considerations Beyond the Bladder

Workshop 18, August 23, 2010, 1400

Central nervous system and bladder control

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ROLE OF NERVOUS SYSTEM IN BLADDER STORAGE AND VOIDING

- Role of CNS in bladder control has long been appreciated through clinical observation which has highlighted impact of specific areas when affected by a stroke or space occupying lesions
- Lesion, tracer and electrophysiological studies conducted in animals have provided key insights into the potential role played by specific brain regions and circuits
- Animal studies do not permit an assessment of urgency, or other relevant symptoms and higher cortical functions
- Major advances in our understanding of the role played by the nervous system in the control of voiding have arisen from 2 recent research developments involving basic biology/pharmacology and neuroimaging:
    1. Cell Biology/Pharmacology: There has been a growing awareness of the role played by non-neuronal bladder cells including urothelial cells and myofibroblasts in mediating the sensation of bladder filling and distension via a variety of mediators including ATP, nitric oxide, acetylcholine and others(1)
    2. Neuroimaging: Developments in functional brain imaging (e.g. PET, fMRI) have permitted human studies in which it is possible to attempt localizing given sensations (e.g. bladder filling) or perceptions (e.g. urgency) to specific brain regions(1;2). Also the proliferation of high resolution MRI scans has resulted in a dramatic increase in the diagnosis of incidental findings during neuroimaging(3). The development of standardized brain maps has allowed investigators to explore the possibility that brain white matter abnormalities discovered on MRI

may disrupt key neural tracts connecting different brain regions(4). Finally, diffuse tension imaging (DTI) provides clinical investigators with a tool for evaluating brain white matter in a manner which can define the orientation and integrity of specific brain white matter tracts(5).

- In the most current view of neural bladder control, bladder and urethral afferents provide sensory signals to the periaqueductal gray (PAG) regions in the brainstem. These signals ultimately project to the insula, a region of the cerebral cortex which lies in the fissure between temporal and frontal lobes, playing a role in emotion and body homeostasis. These sensory functions are closely monitored and regulated by the anterior cingulate cortex (ACG) which provides monitoring and control functions and the prefrontal cortex which makes ultimate decisions(2). The interactions between these regions and the pontine micturition center (PMC) appear to be altered in subjects with urge incontinence(2).

Stroke

- Urinary incontinence (UI) has been reported in one-half of individuals during the acute stroke phase and in 19% at 6 months follow-up(6).
- UI represents an important risk factor for poor outcomes after stroke, yet reasons for this excess risk are unclear(7)
- In the past, it was felt that stroke resulted in UI via “loss of central inhibition”
- Recent studies indicate that subjects with post-stroke UI are less attentive on behavioral testing than other post-stroke individuals who remain continent(7).
- Post-stroke individuals who are incontinent and also demonstrate a decreased awareness of the need to void have especially poor outcomes(7;8)
- Detrusor underactivity and elevated PVRs are quite common in the post-stroke population(9), yet this may be reflective of the presence of other underlying comorbidity and frailty.
- In one series, prevalence of DO was higher following ischemic stroke, while DU was more common after hemorrhagic events(6).
- Given paucity of evidence-based interventions, even rehabilitation nurses may evaluate post-stroke UI superficially and pursue palliative strategies(10).

Parkinson’s Disease (PD)

- Bladder and bowel dysfunctions are common in Parkinson’s disease(11;12)
- Unlike motor manifestations, these often do not respond to levodopa(11;12)
- Altered dopamine-basal ganglia circuits are felt to contribute to presence of DO(11;12)
- Subset of PD subjects (19%) have DO during storage, but exhibit weak detrusor activity during voiding(13)

- Some subjects also demonstrate evidence of functional bladder outlet obstruction with increased EMG activity during voiding which has been attributed to detrusor sphincter dyssynergia (DSS) (14)
- Other studies have suggested that DSS and elevated PVRs are rare in the setting of PD, yet are much more common in individuals with multiple combined atrophy (MCA)(15)

Normal Pressure Hydrocephalus (NPH)

- NPH is one of the few potentially treatable causes of dementia(16)
- It was described in 1965 as a triad of gait disturbance, UI and dementia(17)
- It is very rare. Following a massive advertising campaign in Norway, incidence was found to be only 5.5 per 100,000 with a prevalence of 21.9 per 100,000. Even among individuals 70-79 years of age rate was only 181.7 per 100,000(18)
- 15% of nursing home residents have gait impairment, dementia and UI(19)
- While mobility and cognitive problems may contribute to UI in NPH, DO was demonstrated in most subjects with possible NPH(20)
- Treatment decisions need to be made on an individual basis since no one test has been validates as being predictive of a favorable response to surgery(16)

CNS White Matter Hyperintensities (WMH)

- Formerly known as leukoaraiosis(21)
- Cerebral white matter contains fiber pathways which include axons linking cortical areas to each other and to subcortical structures(22)
- White matter hyperintensities are very common on MRI scans conducted in older adults
- Depending on extent and localization, individuals may be asymptomatic or may suffer from specific deficits
- Individuals are especially vulnerable to developing disconnection syndromes involving frontal/subcortical pathways which result in declines in mobility, affect, executive function and incontinence (23;24)
- Presence of WMH in the right inferior frontal regions and selected WM tracts were found to predict UI, UI severity and degree of bother in 100 community-dwelling older adults(4). Total volume of WMH was also found to be a sensitive predictor of declines in voiding, mobility and cognition in these individuals(24), with WMD representing a shared risk factor for these conditions
- In another study, regional activation on fMRI was more prominent in individuals with increased WMD burden, suggesting that activity targeted at suppressing urgency was increased(25).

- Hypertension(26), diminished nocturnal dip in BP(26) and proteinuria(27) have been associated with WMD raising the possibility that aggressive hypertension treatment might delay the onset and progression of WMD and its related disability

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Affect and Motivational Factors in Urinary Incontinence in Older Persons

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Relevance

Urinary incontinence (UI) in older persons is multifactoral both in etiology and impact. Failure to recognize this salient fact limits not only clinical care and research, but also important opportunities to improve function and quality of life.

UI and Depression in Older Persons

Increased risk. Older persons with UI have an increased risk of depression, a finding that has been replicated across cultures. Studies of the association of depression and UI in older persons have been consistent across several depression measures:

- The Center for Epidemiologic Studies-Depression: used in two U.S. studies, a cross-sectional analysis of nearly 10,000 community-based persons (adjusted risk ratio for depression with UI 1.39 [95% CI 1.24, 1.55]), and a large community-based study of older Mexican Americans (adjusted OR for depression 1.94 [95% CI 1.46-2.59])
- Beck Depression index
- Social isolation subscales of the Nottingham Health Profile Questionnaire,[130] and have included studies in Asia.[131]

However, such consistency has not been found with other measures, such as self-report of sadness. Psychological distress, assessed by the General Health Questionnaire, was associated with UI in African Americans (adjusted OR 5.60 [95% CI 1.88–16.67]), but not in whites, in a cross-sectional study of community based older persons with mean age 67. However, a longitudinal analysis of the same population over 13 years found that persons with UI and psychological distress were more likely to report UI-specific functional impairment (e.g., avoidance of social activities, shopping, and physical activities) (adjusted OR 6.55 [95% CI 1.94-22.12]).

Association between depression, function, and UI. The direction of the causal relationship between UI and depression in older persons is unclear, as the majority of studies are cross-sectional. The close association between depression and functional impairment interacts with the relationship between depression and UI, itself closely associated with functional impairment, especially in older persons with a higher burden of comorbid conditions. One longitudinal study suggested that it is not UI itself but UI-specific functional loss (e.g., avoidance of social activities, attending church, etc.) that is most closely associated with psychological distress, even after controlling for important covariates (OR 3.66 [95% CI 1.61–8.33]).
Impact: UI may add to the burden of depression by decreasing life satisfaction and self-rated health.

Underdiagnosed. Little is known about the recognition of depression among older persons with UI in the clinical setting. There is one study among homebound adults with UI and severe depression; the investigators found that only 35% carried a previous diagnosis of depression

and only 34% had been prescribed an antidepressant. No studies have looked at the relationship between depression and UI in older men other than with post-prostatectomy UI. Because of such likely under-detection in the face of the strong evidence of the association between UI and depression, the Frail Elderly Committee of the 4th International Consultation on Incontinence recommended that all older persons with UI be screened for depression.

Quality of life impact.

Importance. Quality of life (QoL) is one of the key patient-centered impacts of UI and an important outcome measure of treatment. QoL had special relevance in frail older persons with limited remaining life expectancy/

Validated measures of UI-related QoL in older persons. Despite the importance of QoL in UI, none of the ICI-endorsed UI-related QoL measures have been validated in the older-old or persons with cognitive and/or functionally impairment. Only one validated UI-related QoL measure was derived specifically from patient-based data among persons older than 65, and these subjects were community-dwelling and relatively healthy. Traditional UI QoL domains—e.g., impact on instrumental activities of daily living, travel, sexual relations—may not be relevant to frailer or vulnerable older persons. Moreover, there could be significant "floor effects" for social and role function domains in persons with such impairments.

One QoL domain that may be relevant for frailer older persons, particularly nursing home residents, is social interaction. An analysis of cross sectional and longitudinal data from over 100,000 US nursing home residents found that prevalent and especially incident UI had negative impact on social interactions, particularly among persons with moderate functional impairment.

Use as outcome measures in treatment trials. Although QoL patient-reported outcomes are widely used now in drug treatment trials for UI, such patient-reported outcomes **(**PROs) are uncommon in trials for other types of treatment. For example, very few randomized trials of estrogen (oral or topical) for urogenital symptoms use PROs in addition to physiological measures, or evaluate QoL outcomes specifically. The same is true for many studies of UI surgery in older-old and/or frailer older women. Vulnerable and frail elderly, especially those considered to have "intractable" UI, have been excluded from nearly all UI drug treatment trials. However, even among such persons UI is amenable to interventions that may improve the patient's and caregiver's QoL.

PROs which are single item measures of perceived benefit or satisfaction with treatment are unlikely to be generalizable across the heterogenous older population. Moreover, it should not be assumed that perceived benefit of treatment can be measured with the same tools across cultures and health systems, unless such tools are sensitive to differences in such things as reimbursement for continence services and supplies. There are very few studies of the associations between expectations, preferences, and outcomes in older persons. One study that examined the relationship in an RCT between subjects' beliefs whether they received active drug or placebo found that those who thought they were on active drug had better QoL outcomes, regardless of their actual randomization. New approaches are needed to evaluate potential interactions between UI PROs and depression, function and cognition. When QALYs are included as an outcome in UI treatment trials in older persons, they should be specifically analyzed by age and also possibly health status.

Very little is known about the utilities older patients and caregivers assign to varying degrees of UI (with or without treatment intervention) versus "dryness." While several cost-effectiveness studies of UI treatment have included older persons, there has been no breakdown by age.

Impact on Caregivers.

UI has profound effects on the caregivers of affected older persons. Family caregivers report embarrassment and social isolation as their most frequent emotional responses to UI. They also report high levels of fatigue. Caregivers dealing with different levels of UI (mild, moderate, catheter managed) have different educational needs and require different levels of support from healthcare professionals. For example, carers of frail persons with mild UI expressed the greatest need for professional care, but those of persons with moderate UI or catheters spent the highest number of daily hours providing care. Caregivers may feel that the requirements of toileting regimens are more than they can manage. Costs to caregivers include lost wages, decreased productivity (both within and outside of the home), the additional number of caretaking hours when a frail person develops UI, and the cumulative effect of increased strain and burden, along with any resultant illness.

Given this association with caregiver burden, UI is a risk factor for nursing home admission, despite global variation in services and temporal changes in elder care. Studies showing a significant association between UI and institutionalization have been done in Finland, Germany; New Zealand, the US and Japan. It is estimated that the fraction of US NH admissions attributable to UI in men is 0.10 (95% CI 0.08–0.13) and in women 0.06 (95% CI 0.05–0.09). The prevalence of UI at NH admission in the U.S. shows small area variation of almost 50% and differs by race, suggesting that patient and caregiver factors and local resources affect the role UI plays in institutionalization.

Nursing home staff caregivers also are affected by resident UI. Although they may believe that toileting improves resident QoL, the realities of long-term care made them difficult to implement.

Preferences for Care

Motivation to initiate and persist with treatment may be mediated by patient preferences for care. Three studies have directly addressed patient and caregiver preferences for UI care.

- Nursing home residents preferred an average of 2 pad changes, 1.5 toilet assists, and 2 walking assists more than they actually received, yet even these levels were lower than guidelines recommend suggesting that residents may have reduced expectations based on their experience.
- Residents of US board-and-care facilities and nursing homes, their family members, and facility nursing staff were given definitions of and information about five UI treatment options (indwelling catheter, prompted voiding, adult diapers [sic], electrical stimulation, and medications). Respondents were asked their preferences between pairs of treatment options (e.g., "diapers" versus prompted voiding). 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" and "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

- A similar German study with geriatric hospital patients and family members found that most patients preferred diapers (79%), medications (78%), and scheduled toileting (79%) over urinary catheters, and 64% preferred scheduled toileting. When choosing between diapers and medication, equal proportions preferred each option. Patients with greater functional dependence were more likely to prefer catheters, and those with experience with diapers were more likely to prefer medications and toileting. Spouses showed moderate to almost perfect agreement with patient preferences, but those of other family proxies had only slight to fair agreement.

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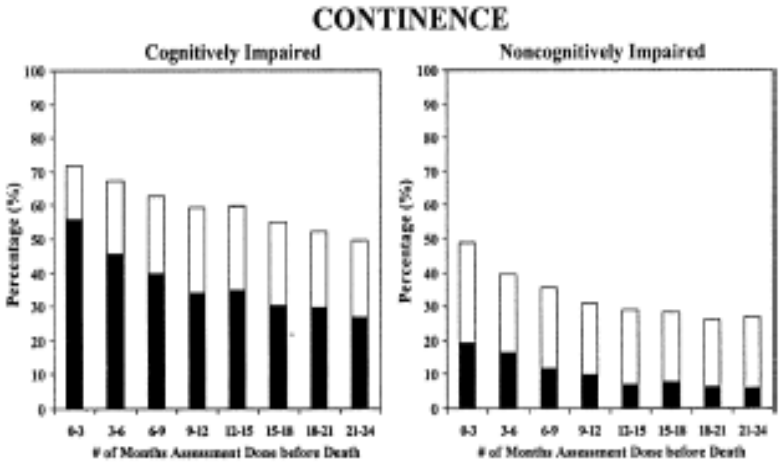
Palmer, Mary H.

Workshop 18: Urinary Incontinence in the Elderly: Considerations Beyond the Bladder

Introduction

Urinary incontinence imposes physical, psychological, and cognitive demands on affected older adults and their informal and formal caregivers. The prevalence of urinary incontinence increases with age and it is associated with co-morbidities such as mobility impairment and dementia. Urinary incontinence has been viewed as an indicator of frailty (Coll-Planas et al., 2008). In 2004, 36. 3 million Americans were 65 years and over and the number of older people is expected to increase to 86.7 million in 2050 (source: http://usgovinfo.about.com/od/censusandstatistics/a/olderstats.htm). An estimated 6.1% of older adults are considered frail (du Beau et al., 2009). Therefore using this estimate, the number of frail elderly in the United States will increase from 2.2 million in 2004 to 5.2 million in 2050.

Incontinence in the frail elderly may occur through different pathways. For example, it may be a cause of or consequence from functional decline, evidence of neuro-degeneration, part of a geriatric syndrome (i.e., falls, delirium, incontinence) with shared risk factors, or an indicator of frailty (Coll-Planus et al., 2008). Incontinent older adults often experience shame and embarrassment from being incontinent and anxiety over fear of incontinent episodes (Landefeld et al., 2008). Quality of life measures are available, such as the Urogenital Distress Inventory (UDI) and the Incontinence Impact Questionnaire (IIQ), but these instruments need to be validated in frail elderly and cognitively impaired populations. Recent evidence shows that cognitively impaired older adults have significant dependency needs related to continence in the last 24 months of life. See figure entitled, "Continence," from Covinsky et al., 2003. [Note: The white areas in the bar graphs indicate partial dependency while the black areas indicate total dependency.]



Urinary Incontinence as a Cause of Functional Incontinence: In a cohort of frail elders residing in long-term care facilities (n=1082), urinary incontinence was an independent risk factor for recurrent but not injurious falls, adjusted HR 3.07 95%CI 2.05-4.61. A significant association was also found between behavioral symptoms: wandering and agitation, and falls, adjusted HR 2.96 95%CI 1.65-5.33 (Hasegawa et al, 2010). See Figure below.

Functional Decline as Cause of Urinary Incontinence: The abrupt decline in mobility that occurs after hip fracture and its repair affects older adults' abilities to carry out activities of daily living (ADLs), including toileting. Difficulty with toileting may increase the risk of becoming, or staying, incontinent (DuBeau et al., 2010). This difficulty may also lead to lasting disability and may delay or prevent return to pre-fracture residence, level of independence, and quality of life. In one study, incontinent hip fracture patients were more likely to be discharged to a skilled care facility than to their home (Harada, 2000), and unmet activities of daily living needs, including toileting needs, and decline in walking ability placed older adults at increased risk for hospital readmission (Sands et al. 2006).

Interventions for Urinary Incontinence in Older Adults

Older adults should be screened with the Vulnerable Elders Survey to detect frailty (du Beau et al, 2009). Evidence is growing that frailty may be prevented (Gill et al., 2006). Several behavioral

interventions are available for caregivers to use with incontinent older adults, see chapter on urinary incontinence in frail elders in the 4th edition of the International Consultation on Incontinence for a detailed discussion.

Evidence exist that an exercise program for residents and a staff education intervention to promote continence was well-received by residents and staff in UK care homes (Sackley et al, 2008). The residents, including those who had dementia, were encouraged to walk or wheel to the exercise class that focused on practicing standing from a chair and on strength, balance, endurance and flexibility (Sackley et al, 2008). Continence outcomes were not changed but the authors noted that assessment tools that staff can easily use had not been available. The authors also concluded that mobility training should be incorporated into daily care. In another study, an exercise program that included progressive strength training, balance and walking exercises improved walking speed and improved urinary incontinence ((Kim et al, 2010). The authors reported a 43.3% cure rate of urinary incontinence at 3 months and at 26.7% at 6 months follow up.

Figure: Urinary Incontinence and Falls (source: Hasegawa, Kuzuya & Iguchi, see reference list for complete citation).

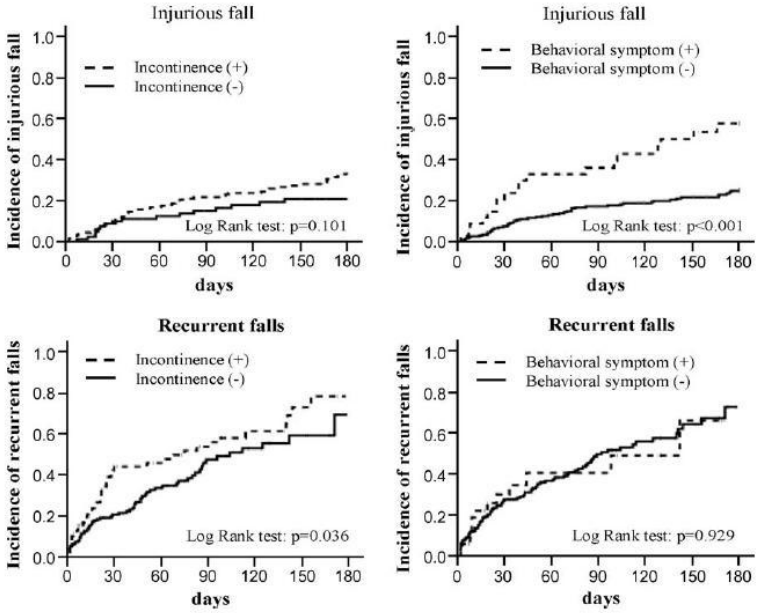


Fig. 1. Kaplan–Meier curves of the cumulative incidence of injurious falls and recurrent falls among fallers (n = 264) during a 180-day period according to participants with or without urinary incontinence or behavioral symptoms.

Behavioral interventions for urinary incontinence include *prompted voiding*, which involves prompts or cues to toilet with contingent social approval. Prompted voiding was designed to increase patient requests for toileting and self-initiated toileting, and to decrease the number of UI episodes. Another intervention, *habit training* requires the identification of the incontinent person's individual toileting pattern, which also includes UI episodes, usually with the aid of a bladder record. With this intervention, caregivers make no attempt to alter an individual's voiding pattern. *Timed voiding* involves a fixed schedule for toileting an individual such as on 3 hour intervals. No attempts are made at patient education or reinforcement of behaviors, or re-establishment of voiding patterns. Other terms used to describe timed voiding are scheduled toileting, routine toileting, and fixed toileting. Functional Intervention Training, developed by Schnelle and his colleagues is a *combined toileting and exercise therapy* that employs strengthening exercises with toileting routines by formal caregivers (du Beau et al, 2009).

In summary: The relationship between urinary incontinence and mobility is complex. Assessment of the type of urinary incontinence and the functional capacity of the individual are required to develop patient-focused interventions. Improvements in mobility and in urinary continence indicate that some

older adults, including frail elders, can benefit from exercise programs that improve their ability to carry out toileting activities.

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Geriatric Principles

- Continuity of care
- Bolstering home and family
- Communication skills
- Knowing the patient
- Thorough assessment and evaluation
- Prevention and health maintenance
- Ethical decision making

Geriatric Principles

- Inter-professional collaboration
- Respect for the usefulness and value of elder
- Compassionate care
- Helping disconnected family
- End of life care

Source: Reichel, Arenson & Scherger (2010)

Mobility and Urinary Incontinence

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Urinary Incontinence Definition

- Urinary incontinence (UI) "is the complaint of any involuntary leakage of urine". (International Continence Society, 2002)

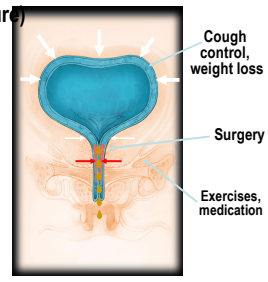
Incidence of Urinary Incontinence

- Incidence – becoming incontinent during a specified period
- Identification of risk factors can help target residents *at-risk* for becoming incontinent
- Over a one year period, 27% of new admissions to 8 nursing homes became incontinent (Palmer et al 1991)
- 4.2 new cases per 100 beds developed over a 12-week period (Watson et al, 2003).

SUI Occurs When Bladder Pressure > Urethral Pressure

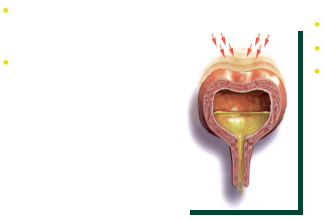
(PTD x stress > urethral pressure)

- Any factor that pushes the equation towards a positive urethral pressure gradient has the potential to be effective



PTD=Pressure transmission deficit.

Urge Incontinence



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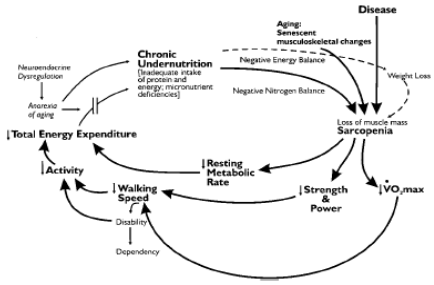
Reversible Causes of Incontinence

- **D**elirium
- **R**estricted mobility (illness, injury, gait disorder, restraint)
- **I**nfection (acute, symptomatic) Inflammation (atrophic vaginitis) *also* **impaction** of stool
- **P**olyuria (DM, caffeine intake, volume overload), **pharmaceuticals** (diuretics, autonomic agents, **psychotrophics**)

Urinary Incontinence and Frailty

- By age 80 years, 40% of older adults have functional impairments
- 6% to 11% are considered frail
  - United States estimate: 6.1% Source: DuBeau et al., 2009
- Psychological effect of transition from robust (independent) to frailty – evolving identity, *"looking glass self"* Source: Fillitt & Butler, 2009



Frailty Phenotype

Source: Fried et al., 2001

Frailty versus Disability

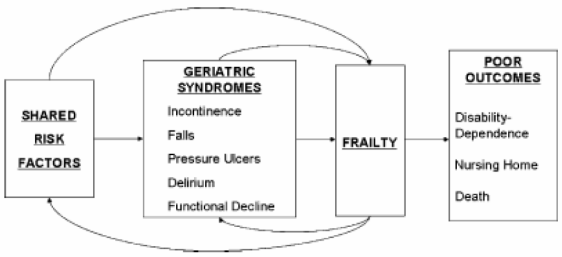
- Frailty – multi-factorial, potentially a downward spiral
- Disability may involve single deficits that may be reversible Source: Fillitt & Butler, 2009

Disablement process Source: Verbrugge & Jette, 1994

Pathology → Impairment → functional limitation → disability

Unifying Model of Shared Risk Factors

Source: Inouye et al., 2007



Urinary Incontinence and Frailty Assessment

What assessment?

See: Du Beau, CE., et al. (2010) Incontinence in the Frail Elderly Report from the 4th International Consultation on Incontinence, *Neurourology & Urodynamics*, 29:165-178.

Clinical assessment – potentially treatable conditions
Assess quality of life, desire for treatment goals, caregiver preferences.
Targeted physical examination includes cognition, mobility, neurological and rectal exams
Urinalysis
Frequency volume chart or wet checks

Functional Decline and Urinary Incontinence

- **Multiple pathways to incontinence:**
  - **UI as risk factor for functional decline**
  - **Functional decline as risk factor for UI**
  - **Shared risk factors for UI and functional decline**
  - **UI as part of unifying framework of geriatric syndromes**
  - **UI as indicator for frailty (Coll-Planas)**

Urinary Incontinence as antecedent

Pathology in urinary tract → UI → reduced activity → disability

- Assessment – urge, frequency, nocturia, environmental factors

Functional Impairment as antecedent

Physical pathology → impaired mobility → UI (as ADL) → Disability

Assessment – functional decline, balance, strength, mobility

Examples

- Hip fracture patients: pre-fracture use of wheelchair, device for walking, dependence on others for ambulation (Palmer et al, 2002)
- Having greater number of serious chronic conditions and functional impairment in lower body mobility increases odds of onset of mild UI (Jenkins & Fultz, 2005)

Prevention and Treatment

- Strength and balance training
- Walking programs
- Environmental modifications
- Disease management (arthritis)

Source: Coll-Planas et al., 2008

Prevention and Treatment

- Transient factors DIAPPERS, DRIP
- Urge suppression exercises
- Lifestyle changes
- Close proximity to toilets
- Cognitive and mobility training
  - Dual attention tasks
  - Postural stability

Source: Coll-Planas et al., 2008

Neuro-degeneration as antecedent

Neuro-degeneration → bladder instability impaired mobility → UI mobility disability → Disability

Assessment: Neurological examination, identify modifiable risk factors to avoid stroke, cognitive decline

Prevention and Treatment

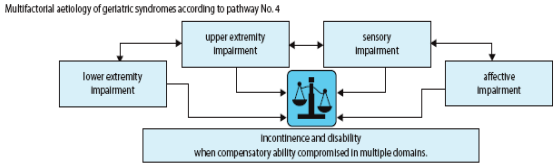
- Screen, identify, and treat modifiable risk factors for stroke and white matter changes.

Source: Coll-Planas et al., 2007

Prevention and Treatment

- Promote and maintain physical exercise
- Treat cardiovascular risk factors
- Prevent further decline:
  - Energy preservation
  - Toileting programs
    - Prompted voiding
    - Habit training

Urinary Incontinence as Geriatric Snydrome



- Source: Coll-Planas et al., 2008
- Assessment – comprehensive geriatric assessment focuses on mobility, cognition, sensory function, psychological function.

Urinary Incontinence as Indicator of frailty

Incident UI assessed and treated aggressively

Prevent frailty onset

Treatment of UI in LTC

- Behavioral interventions: first-line treatment
  - Habit training's proposed mechanism of action: regular emptying of bladder before capacity is reached -- q 2h for example.
  - Bladder retraining or bladder training proposed mechanism of action: delay voiding to increase capacity and to inhibit detrusor contractions -- urge and OAB
  - Prompted voiding proposed mechanism of action: increase self initiated toileting, awareness to toilet and access to toilet

Behavioral Programs

Required skills for residents:

✓Ability to comprehend and follow education and instructions
✓Identify urinary urge sensation
✓Learn to inhibit or control urge to void
✓Pelvic muscle exercises

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Bladder Rehabilitation or Retraining

Resident:

✓ Should be able to resist or inhibit the urge to void
✓ Void according to a timetable
✓ Independent in activities of daily living
✓ Experience occasional incontinent episodes
✓ Aware of need to void
✓ Usually assessed as having urge incontinence

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Prompted Voiding (PV)

Predictors of responsiveness to PV

- **Resident's response to a therapeutic trial of PV**
- **Normal bladder capacity (>200 and <700cc)**
- **Recognizes need to void**
- **Baseline incontinence < 4 times/12hours**
- **Maximum voided volume > 150 cc**
- **Post void residual < 100 cc**
- **Able to void successfully when given toileting assistance**

Evidence from properly designed and implemented controlled trials by University of Iowa Gerontology Nursing Intervention Research Center

Prompted Voiding (PV)

Three components:

- **regular monitoring with encouragement**
- **prompting the resident to toilet on a scheduled basis**
- **praise and positive feedback when the resident is continent and attempts to toilet.**

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Habit Training/Scheduled Voiding

Goal is to prevent incontinence from occurring:

Provide access to the toilet based on the resident's voiding pattern

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Habit Training/Scheduled Voiding

- ✓Requires scheduled toileting, at regular intervals, on a planned basis, and match the resident's voiding habits
- ✓Maintain record of resident's voiding patterns

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Other Behavioral Interventions

- FIT - Functional Incidental Training designed to increase activity and functional ability. This activity is integrated into incontinence care.
- Staffing: 5:1 ratio
- Intervention requires 20.7 minutes to implement
- *Source: Schnelle, Alessi, Simmons, Al-Samarrai, Beck & Ouslander (2002) JAGS 50:1476-1483*

Mobility and Urinary Incontinence

Behavioral continence interventions

- **Prompted voiding versus no treatment (level 1). PV not effective in persons unable to state name or need assistance of >1 person to transfer. Use check and change.**
- **Mobility-continence interventions (level 1) reduced number of wet checks and improves endurance in nursing home residents.**

Source: ICI 4th ed

Rethinking Continence Interventions when mobility issues are present

- **What treatments?**
  - **Behavioral continence interventions**
  - **Mobility-continence interventions**
  - **Combined interventions (medications, surgery, behavioral)**
- **What outcomes? *Whose outcomes?***
  - **Dignity**
  - **Quality of life**
  - **Incontinence impact on daily life**
  - **Wetness/dryness levels**

Assessment For Absorbent Products

- **Assess resident's:**
  - **Functional ability to ambulate, toilet, disrobe, use of assistive devices**
  - **Ease in self-toileting**
- **Assess product for:**
  - **Contain urinary leakage**
  - **Comfort**
  - **Ease of application/removal**

CMS: Survey & Certification Online Course Delivery System. Available at: cms.internetstreaming.com

Cara Tannenbaum

Medications that can affect UI and used in its management

Medications that affect UI

Normal lower urinary tract voiding function results from the coordinated activity of bladder contraction and sphincter relaxation. Social and physiological continence will therefore occur when the bladder and sphincters function well and an individual has neither cognitive nor motor impairments that can interfere with timely access to the toilet or preparation for voiding (i.e. undressing). Unfortunately many commonly used medications inadvertently interfere with bladder and/or sphincter function, and may also indirectly impair the ability to toilet (Ruby et al., 2005).

Table 1: Medications that can affect the bladder or urinary sphincter

Mechanism	*Type of medication*
Polyuria	Diuretics Lithium
Pedal edema/fluid retention that redistributes and causes nocturnal diuresis	Non-steroidal anti-inflammatory drugs Certain calcium channel blockers (i.e. nifedipine XL) Certain oral hypoglycemics (glitazones)
Increased urethral sphincter tone/ obstruction/ retention (esp. men with prostate disease)	Alpha adrenergic agonists (nasal decongestants)
Impaired bladder emptying, retention, overflow incontinence	Anticholinergics: Tricyclic antidepressants, Antihistamines, Antiparkinsonian agents Opioid analgesics
Increased bladder contractility	Cholinesterase inhibitors
Cough	Angiotensin converting enzyme inhibitors
Unknown	Estrogens

Medications that directly affect the bladder or urinary sphincter are listed in Table 1(DuBeau, Kuchel, Johnson, Palmer, & Wagg, 2010). Centrally-acting medications that increase sedation, decrease psychomotor performance, and affect sensory input also indirectly impair voiding function. These include the benzodiazepines, antihistamines and opioid analgesics. Antipsychotic medications increase rigidity, and can cause gait impairment and difficulty undressing. Nocturnal enuresis results when sedation from psychoactive or pain medications exceeds the sensory trigger to wake up and void. Alternate pharmacological agents and/or non-pharmacological therapies should be explored whenever possible to reduce unwanted urinary side effects.

Medications used in the treatment of UI

Pharmacological therapy with antimuscarinic agents should be considered second-line treatment for the management of urinary urge incontinence in the elderly. Available agents include oxybutynin, tolterodine, fesoterodine, propiverine, solifenacin, darifenacin and trospium chloride.

All antimuscarinic agents have similar or slightly reduced efficacy for reducing urinary frequency and urge UI in older adults compared to younger adults. Average reductions in incontinence episodes have been reported variably in the elderly as ranging from 0.7/day (25% reduction

from baseline) to 12/week (55% reduction from baseline) with tolterodine (Malone-Lee, Walsh, & Maugourd, 2001; Zinner, Mattiasson, & Stanton, 2002); and -1.5 or -2/day with solifenacin (Wagg, Wyndaele, & Sieber, 2006). The most common side effects include dry mouth and constipation. Other concerns include the potential for cognitive impairment, tachycardia and drug-drug interactions (Kay et al., 2005; Kay & Granville, 2005).

The 4th International Consultation on Incontinence concluded that there are insufficient data to determine the efficacy, tolerability and safety of duloxetine for the pharmacological management of stress UI in the elderly (DuBeau, et al., 2010).

Desmopressin (DDAVP) should be used with caution for nocturnal UI in the frail elderly and is generally not recommended due to the high risk of hyponatremia (DuBeau, et al., 2010). The use of tricyclic antidepressants and flavoxate for urge incontinence is without a solid evidence base (Andersson et al., 2009).

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Medications:

Can they negatively affect bladder control?
Can they cure or improve UI?

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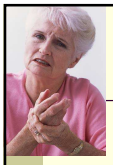
Key questions

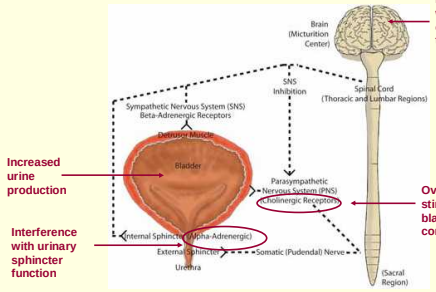
- Which medications predispose an older person to UI?
- Which medications reduce the ability to toilet successfully?
- Which medications can be used to treat UI in older adults?
- What are the different efficacy, safety and tolerability profiles of the medications used to treat UI in older adults?



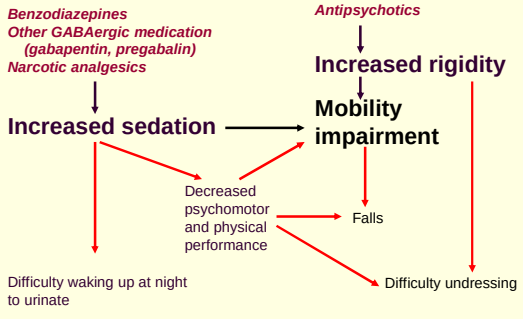
Mrs. S, 74 years old

- Urinary incontinence x 5 years
- Episodes of leakage are associated with urgency, 10x/day, 4x/night
- Type 2 diabetes, high blood pressure, chronic venous insufficiency, chronic pain from osteoarthritis in her hands and knees, difficulty sleeping.
- Medications include:
  - Avandia, Metformin and Diabeta
  - Adalat XL 30 mg po bid
  - Lasix 20 mg po bid
  - Celebrex bid for arthritis pain
  - Xanax 0.5 mg po qhs
  - Oxybutynin ER 10 mg once daily

Four targets whereby medication can affect voiding control



Medications that act via the brain that can affect toileting



Medications that affect bladder control

DuBeau et al. Neurourol Urodynam 2010

	Mechanism	Type of medication
Urine production	Polyuria	Diuretics Lithium
	Pedal edema/fluid retention that redistributes and causes nocturnal diuresis	Non-steroidal anti-inflammatory drugs Certain calcium channel blockers (i.e. nifedipine XL) Certain oral hypoglycemics (glitazones)
Sphincter function	Increased urethral sphincter tone/ obstruction/ retention (esp. men with prostate disease)	Alpha adrenergic agonists (nasal decongestants)
	Decreased sphincter tone (collagen degradation?)	Estrogens/hormone replacement
	Cough	Angiotensin converting enzyme inhibitors
Bladder	Increased bladder contractility	Cholinesterase inhibitors
	Impaired bladder emptying, retention, overflow incontinence	Anticholinergics: Tricyclic antidepressants, Antihistamines, Antiparkinsonian agents Opioid analgesics

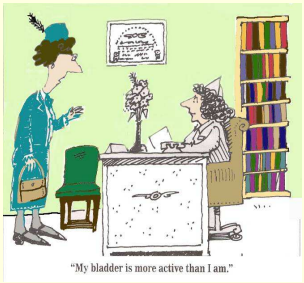
Pharmacological treatment of UI in the elderly

Remove all offending medications that negatively affect the brain, bladder, sphincters and urine production!

- DO NOT USE duloxetine or ephedrine for stress UI *(insufficient efficacy data, too many side effects)*
- DO NOT USE imipramine (TCA), flavoxate or baclofen for urge UI *(insufficient efficacy data, TCA's have too many side effects)*
- DO NOT USE desmopressin (DDAVP) for nocturnal UI *(high rate of hyponatremia in frail elderly)*
- There is NO recommended pharmacological treatment for overflow UI or retention *(insufficient efficacy data)*

4th International Consultation on Incontinence, Paris July 5-8, 2008

Overactive Bladder Syndrome (OAB)



"My bladder is more active than I am."

Non-pharmacologic therapy is first-line treatment for OAB *(Burgio et al. JAMA 1998)*

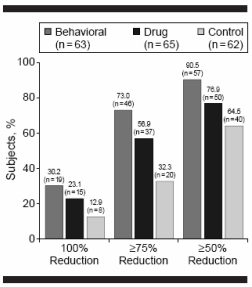


Figure 3.—Proportions of subjects by group who reduced frequency of incontinence by 100%, 75%, and 50%.

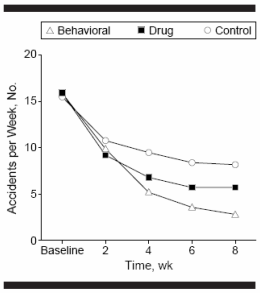
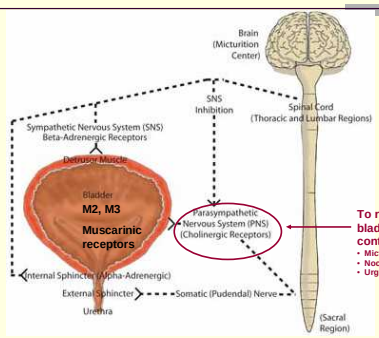


Figure 4.—Mean number of accidents per week across baseline, intervention, and posttreatment periods.

Pharmacologic therapy for OAB



Medications for OAB – all target muscarinic receptors

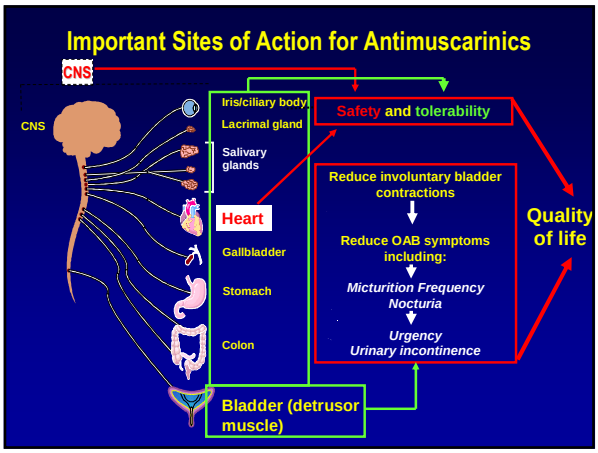
Oxybutynin	Generic immediate release: 2.5-5 mg bid-qid Generic extended release (Ditropan XL, Uromax): 5-30 mg daily Oxytrol® patch: 3.9 mg 2x/week	Non-selective	Potential for drug-drug interactions: Metabolized by cytochrome P450 system
Tolterodine	Immediate release Detrol® 1-2 mg bid Extended release Detrol LA® 2-4 mg daily	More selective for M2 receptors	Metabolized by cytochrome P450 system
Fesoterodine	Toviaz® 4-8 mg daily	More selective for M2 receptors	Not metabolized by the cytochrome system
Solifenacin	Vesicare® 5-10 mg daily	More selective for M3 receptors	Metabolized by cytochrome P450 system
Darifenacin	Enablex® 7.5-15 mg daily	More selective for M3 receptors	Metabolized by cytochrome P450 system
Trospium Chloride	Immediate release Trosec® 20 mg bid Extended release Sanctura XR® 60 mg daily	Non-selective	Excreted by the kidney

Efficacy appears equivalent and is dose-dependent

	Anti-muscarinics	Placebo
Reduction in the number of urgency episodes/24 hours after 12 weeks	66%	49%
Reduction in the number of incontinence episodes/24 hours after 12 weeks	70%	50-60%
Mean augmentation in volume voided per micturition (ml)	20%	5%
Percent of patients achieving continence at endpoint = ↑ quality of life	51%	38%

1-2 episodes per day

Chapple et al. 2005
Chapple et al. 2008



Tolerability vs. safety

Xerostomia = Dry Mouth

- Prevalence >65 years is 30%
- Saliva essential for oral-pharyngeal health
- Coats teeth and mucus membranes
- Speech, eating, swallowing, oral hygeine
- Big impact on QOL

- Causes of xerostomia
  - Systemic disease (DM, SLE, Sjogren's, etc)
  - Medications (most common)
    - Antidepressants
    - Sedatives
    - COPD/asthma inhalers
    - Antihistamines
    - Anti Parkinson's
    - Anti seizure
    - Cytotoxic agents

Relative Rates of Xerostomia Amongst Anticholinergics

Brand	ENABLEX Darifenacin	VESICARE Solifenacin	Ditropan XL Oxybutinin ER	Ditropan Oxybutinin	Detrol LA Tolterodine ER	Toviaz Fesoterodine	Sanctura XR Trospium Chloride
Clinical Trial AE's	7.5 mg 15 mg	5 mg 10 mg	15 mg	5-15 mg	4 mg	4mg 8 mg	60 mg
Dry Mouth	20.2 % 35.5%	10.9 % 27.6%	20.8%	60.8 %	23%	18.8% 34.6%	10.7%

Oxytrol patch = 7%

Novara et al. 2008

Chapple et al. 2008

Complications of Xerostomia

- Dental caries
- Gingivitis
- Halitosis
- Mucositis
- Oral-pharyngeal candidiasis
- Prostheses problems
- Traumatic oral lesions
- Dysgeusia
- Dysphagia
- Taste interference
- Mastication problems
- Sleeping difficulty
- Speech difficulty
- Dry lips/mouth

Management of Xerostomia

- Regular dental evaluation
- Artificial saliva (Mouth Kote, etc)
- Alter medications
- Fluids with eating/water rinses
- Chew gum/hard sugar free candies
- Bedside humidifiers

Constipation

Lowest risk constipation:

- Oxybutynin (OR 1.45, 95% CI .91-2.31)
- Tolterodine (OR 1.24, 95% CI .99-1.56)
- Trospium (OR 2.68, 95% CI .53-13.61)

Higher Risk Constipation:

- Darafenacin (OR 3.00, 95% CI 2.11-4.25)
- Solifenacin (OR 3.79, 95% CI 3.09-4.67)

Brand	ENABLEX Darifenacin	VESICARE Solifenacin	Ditropan XL Oxybutinin ER	Ditropan Oxybutinin	Detrol LA Tolterodine ER	Toviaz Fesoterodine	Sanctura XR Trospium Chloride
Format	7.5 mg 15 mg	5 mg 10 mg	5-15 mg	5-15 mg	2 mg 4 mg	4mg 8mg	60 mg capsule
Clinical Trial AE's Constipation	7.5 mg 15 mg 14.8% 21.3%	5 mg 10 mg 5.4% 13.4%	15 mg 13%	5-15 mg 15.1%	4 mg 6%	4mg 8 mg 4.2% 6.0%	60 mg 8.5%

P Meek et al (abstract Am Assoc GI 2008)

Other side effects

- Blurred vision
- Pruritus (15% with patch)
- Tachycardia
- Dyspepsia
- Flatulence

Safety : QTc Prolongation and Mortality Risk

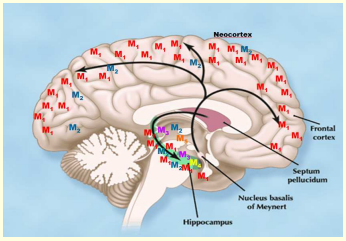
- QTc prolongation predicts risk of torsade
- Drugs that prolong the QT interval should probably not be prescribed for patients with a QTc >460 ms
- Medicare database study: no association between antimuscarinics and ventricular arrythmias
- Concomitant use of other agents (eg amiodarone, sotalol)
- Female sex, heart failure, puts patients more at risk
- Greater problem with Solifenacin & Tolterodine-ER?

Elming H, Cardiac Electrophysiol Rev 2002
Wang PS, J Am Geriatr Soc 2002

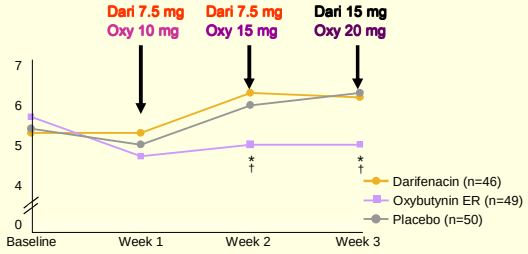
Safety : Cognitive effects

ALL AGENTS HAVE AFFINITY FOR (BIND TO) M_1 RECEPTORS

Oxybutynin
$M_3 \geq M_1 > M_2$
Tolterodine
Non-selective
Solifenacin
$M_3 > M_1 > M_2$
Darifenacin
$M_3 >>>>> M_1$
Trospium
Non-selective

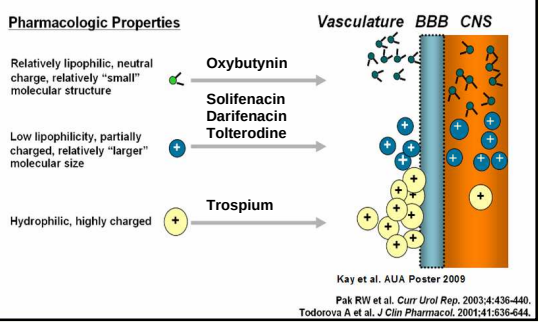


Delayed Recall on the Name-Face Association Test



Kay G et al. Eur Urol. 2006.

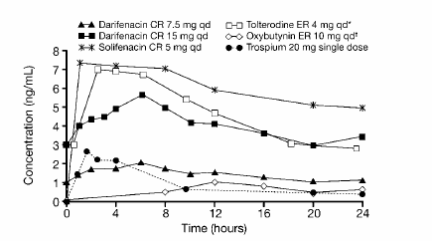
Do all antimuscarinics cross the BBB?



Kay et al. AUA Poster 2009

Pak RW et al. *Curr Urol Rep.* 2003;4:436-440.
Todorova A et al. *J Clin Pharmacol.* 2001;41:636-644.

Mean plasma concentrations of the different antimuscarinics

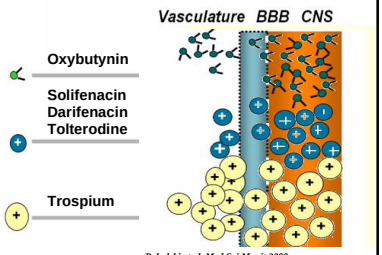


Abrams et al. Br J Pharmacol 2006

Can the integrity of the BBB become compromised?

Conditions

- **Diabetes**
- **Stress**
- **Increasing Age**
- **Cerebrovascular disease**
- **Alzheimer's disease**

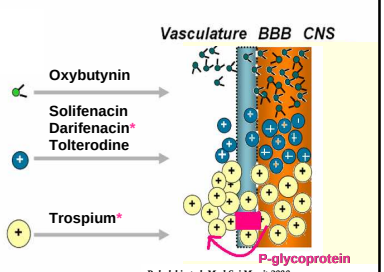


Pakulski et al. Med Sci Monit 2000
Starr et al. J Neurol Neurosurg Psychiatry 2003
Abdel-Rahman A. J Toxicol Environ Health A. 2004
Bowman & Quinn Aging Health 2008

How good is the rescue operation?

Conditions

- **Diabetes**
- **Stress**
- **Increasing Age**
- **Cerebrovascular disease**
- **Alzheimer's disease**



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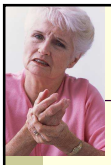
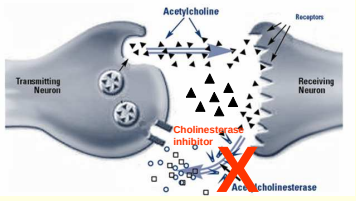


Mrs. S, 77 years old

- Urge urinary incontinence x 5 years
- Type 2 diabetes, high blood pressure, chronic venous insufficiency, chronic pain from osteoarthritis in her hands and knees, difficulty sleeping.
- Medications include:
  - Avandia, Metformin and Diabeta
  - Adalat XL 30 mg po bid
  - Lasix 20 mg po bid
  - Celebrex bid, a low-dose opioid for arthritis pain prn
  - Xanax 0.5 mg po qhs
  - Oxybutynin ER 10 mg once daily
- Reports that her memory is getting worse and she wants to try a cholinesterase inhibitor

Dementia and incontinence treatment: friends or foes?

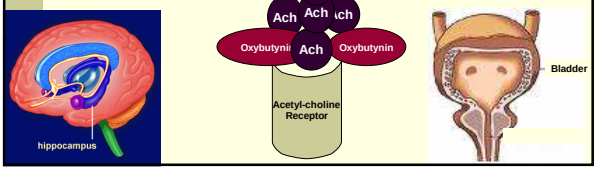
The symptoms of Alzheimer's disease and other dementias are associated with an acetylcholine deficit in the brain.



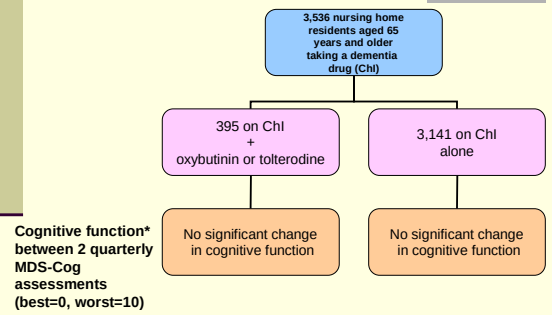
(Acetyl)-Cholinesterase inhibitors block the enzyme acetyl-cholinesterase in the synaptic cleft in order to increase availability of Acetylcholine neurotransmission in the brain

What happens when an anticholinergic drug and a cholinesterase inhibitor are given together?

Potential for opposing cholinergic/anticholinergic activity at target organ cholinergic receptors



Cognitive function may not be affected…



Cognitive function* between 2 quarterly MDS-Cog assessments (best=0, worst=10)

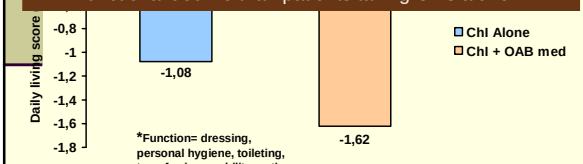
*Cognitive function=long and short-term memory, orientation, communication and dressing

Sink KM, et al. J Am Geriatr Soc. 2008; 56: 847-853.

But combined use of ChI with OAB medications may worsen physical function*

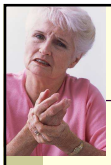
Change in activity of daily living score in fairly independent nursing home residents (little or no dependence)

In high-functioning nursing home residents, dual use of ChIs and OAB medications may result in a 50% faster rate of functional decline than patients taking ChIs alone.



*Function= dressing, personal hygiene, toileting, transferring, mobility, eating (0=best, 28=worst)

Sink KM, et al. J Am Geriatr Soc. 2008; 56: 847-853.



Mrs. S, 74 years old

- Urinary incontinence x 5 years
- Episodes of leakage are associated with urgency, 10x/day, 4x/night
- Type 2 diabetes, high blood pressure, chronic venous insufficiency, chronic pain from osteoarthritis in her hands and knees, difficulty sleeping.
- Medications include:
  - Avandia, Metformin and Diabeta
  - Adalat XL 30 mg po bid
  - Lasix 20 mg po bid
  - Celebrex bid for arthritis pain
  - Xanax 0.5 mg po qhs
  - Oxybutynin ER 10 mg once daily

Affect and Motivational Factors in UI in Older Persons

Catherine E. DuBeau, MD
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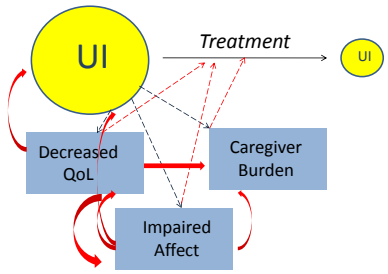
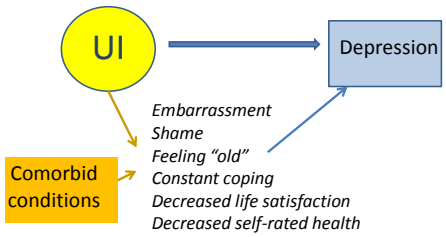
Why Affect and Motivation?



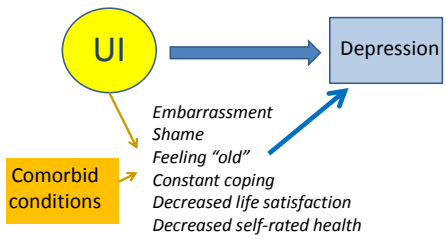
Depression and UI: Evidence

- UI associated with increased risk of depression
  - In US cross sectional studies, odds ratio for depression 1.39 -1.94
  - Association persists across US, European and Asian cultures and nations
  - Association evident with 3 common depression measures
- Increased risk of psychological distress
  - Among community based older person in US
    - Cross-sectional: association seen only in African Americans
    - Longitudinal (13 yrs): persons with UI who developed psychological stress were more likely to report UI-specific functional impairment: avoiding social activities, shopping, and physical activites

Depression and UI: Causation

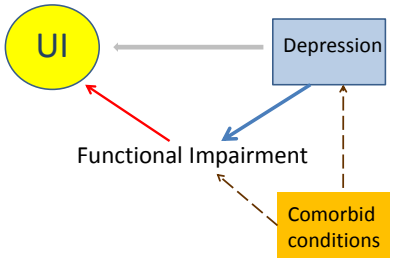


Depression and UI: Causation



Depression and UI: Causation

Depression and UI: Causation



Depression and UI: Often Missed?

- Despite the strong epidemiological association between UI and depression, little is known whether providers recognize/diagnose persons depression in persons with UI, and UI in persons with depression
- Among homebound elderly with UI and severe depression (by formal testing), only 35% carried dx of depression and only 34% on meds for depression
- Due to likely under-detection, 4th ICI Frail Elderly Committee recommended screening for depression in frail elderly with UI (Grade B)

UI and Quality of Life (QoL)

- QoL increasingly recognized as important patient-reported outcome measure for UI treatment
- Issues in measurement of UI-related QoL
  - None of ICI-endorsed QoL measures validated in older old or frail (functional +/- cognitive impairment)
  - Only one measure (URIS) derived from pt-based data in younger-old with urgency UI

UI and Quality of Life (QoL)

- QoL increasingly recognized as important patient-reported outcome (PRO) measure for UI treatment
- Issues in measurement of UI-related QoL
  - None of ICI-endorsed QoL measures validated in older old or frail (functional +/- cognitive impairment)
  - Only one measure (URIS) derived from pt-based data in younger-old with urgency UI

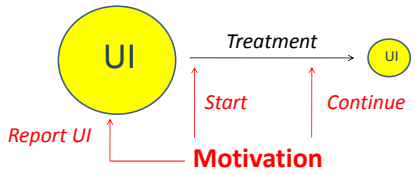
UI and Quality of Life (QoL)

- Traditional QoL domains (eg, activities of daily living, travel, sexual role) may not be relevant to frail or impaired vulnerable elderly
- One alternative domain – social interactions
  - A cross-sectional and longitudinal study among >100,000 US nursing home residents found prevalent and especially incident UI significantly decreased social interactions
  - UI second only to worsening cognition and function in decreasing social interaction
  - Decreased social interaction most marked in persons with moderate functional impairment

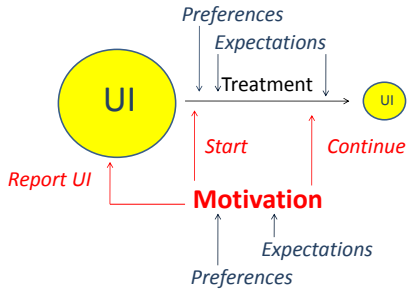
UI, QoL, and PROs: Use in Treatment Outcomes

- QoL PROs used most extensively in drug and behavioral treatment trials, which predominantly include middle-aged or young-old women
- Appropriate QoL PRO for the elderly?
  - Most widely used QoL PROs never validated in older-old or frail
  - Single item PROs (eg, perception of bladder condition/improvement) unlikely generalizable across heterogeneous older population
  - Although most common QoL PROs can be translated and used in culturally diverse younger populations, important cultural differences in QoL/perceived burden of UI may be present amongst older-old

Motivational Factors



Motivational Factors



Expectations and Motivation

- Type of treatment possible
  - Belief that the only treatments are too invasive or don't work can decrease likelihood of seeking treatment
    - Cohort effect in older persons, reflecting family experience with UI in earlier treatment era
    - "I tried those Kegels and it didn't work"

Expectations/Beliefs, Motivation, and Outcomes

- Expectations/Beliefs can confounding outcomes in randomized trials
  - In RCTs of antimuscarinics, belief that one was randomized to active treatment is associated with improved outcomes, regardless of actual randomization
  - Such "unblinding" associated with experience of adverse treatment effects
  - Experience of adverse effects, especially if efficacy moderate, can decrease motivation to continue therapy – as seen with high discontinuation rate with antimuscarinics

Expectations/Beliefs, Motivation, and Outcomes

- Motivation tied to perceived *utility* of treatment – how much is a pt willing to give up (time, cost, adverse effects) versus continuing to live with UI
- Utility usually measured as Quality Adjusted Life Years (QALY)
- Utility and QALYs related to UI and its treatment are likely fundamentally different in frailer elderly with high burden of comorbidity and limited remaining life existence

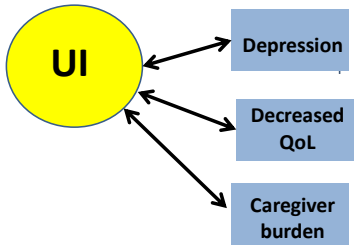
Preferences: What do Older Persons Want?

- Lessons from 3 studies
  - Nursing home residents prefer more frequent care than they actually receive, but their expectations are low (2 pad changes and 1.5 toileting assists per day)
  - Residents of supportive care facilities and their families prefer prompted voiding less than nursing staff. At the same time, residents/families perceive staff as unwilling to *perform* prompted voiding
  - Nursing home residents preferred garments and medications more than prompted voiding. Pts with highest functional dependence actually preferred catheters to other possible treatment

Impact of UI on Caregivers

- Elderly with UI require more hours of caregiving than continent elderly
- Family caregivers of elderly with UI report embarrassment, social isolation, and high levels of fatigue
- Caregiver burden can lead to lost wages, decreased productivity within and outside the home, and cumulative effects of strain
- Increased caregiver burden and strain likely cause of higher rates of nursing home placement in elderly with UI than in continent elderly

Summary



Central nervous system and bladder control

1

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CITICORP CHAIR IN GERIATRICS AND GERONTOLOGY
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No disclosures

Central nervous system and bladder control

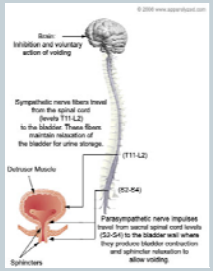
2

- Peripheral nervous system and control of micturition
- Central nervous system and control of micturition
- Impact of neurologic diseases on UI:
  a. Stroke
  b. Parkinson's (PD)
  c. Normal Pressure Hydrocephalus (NPH)
  d. White Matter Hyperintensities (WMH)
  e. Will not be discussing role of affect/depression (DuBeau), mobility problems (Palmer), diabetes or Alzheimer's disease

Traditional views of bladder control

3

- Brain initiates voiding
- Brain inhibits voiding
- Sympathetic activity favors storage of urine
- Parasympathetic activity produces voiding



Limitations of traditional perspectives on bladder control

4

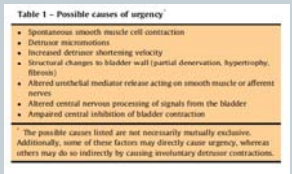


Table 1 – Possible causes of urgency*
- Spontaneous smooth muscle cell contraction
- Detrusor micromotions
- Increased detrusor shortening velocity
- Structural changes to bladder wall (partial denervation, hypertrophy, fibrosis)
- Altered urothelial mediator release acting on smooth muscle or afferent nerves
- Altered central nervous processing of signals from the bladder
- Impaired central inhibition of bladder contraction

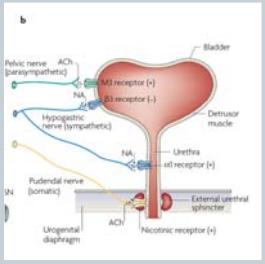
* The possible causes listed are not necessarily mutually exclusive. Additionally, some of these factors may directly cause urgency, whereas others may do so indirectly by causing involuntary detrusor contractions.

Michel & Chapple (2009)

- Role of sensory factors?
- Peripheral or central?
- How can brain both inhibit and initiate voiding?
- Can one speak of functional neuroanatomy of voiding & UI?
- Cellular mechanisms?
- Translation into better Rx?
- Impact on management of multifactorial UI in complex older patients?

Role of peripheral nervous system

5

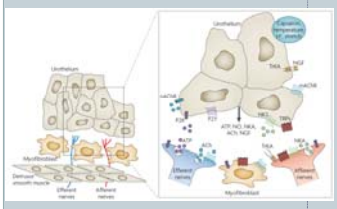


Fowler, Griffiths & de Groat (2008)

- Parasympathetic fibers (green) release acetylcholine which produces detrusor contraction via M3 receptors
- Sympathetic fibers (blue) release noradrenaline which relaxes detrusor via β3 receptors and contracts internal sphincter via α1 adrenergic receptors
- Somatic fibers (yellow) contract external sphincter via acetylcholine and nicotinic receptors

Chemical interactions between bladder and its innervation

6

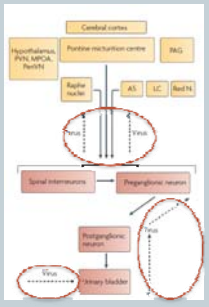


Fowler, Griffiths & de Groat (2008)

- Urothelial cells, afferent nerve fibers (red) and myofibroblasts express relevant receptors
- Through these receptors bladder distension and chemical stimuli can result in the release of urothelial factors which increase the excitability of sensory fibers

Discovery of specific neural connections between defined brain regions, spinal cord and the bladder

7

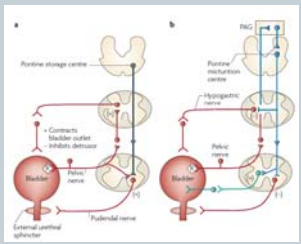


Fowler, Griffiths & de Groat (2008)

- Injection of pseudorabies virus into rat bladder results in its retrograde transport (dashed arrows) indicating which spinal cord and brain regions are part of neural circuits projecting to the bladder which control its function (solid arrows)

Lower neural circuits involved in control of continence and micturition

8

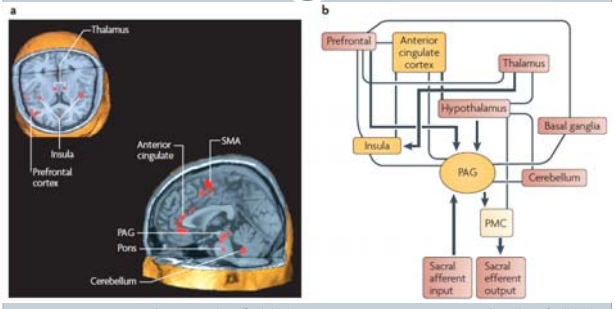


Fowler, Griffiths & de Groat (2008)

- During urine storage (a) bladder distension induces low level afferent firing which activates sympathetic (hypogastric) and somatic (pudendal) outfow which both favor continence
- With voiding (b) more intense afferent firing activates spinobulbal reflexes (blue) which promote parasympathetic outflow (green) and inhibit sympathetic and pudendal outflow (red)

PET and Functional MRI Studies: Higher Brain Regions Involved in Regulation of Urine Storage

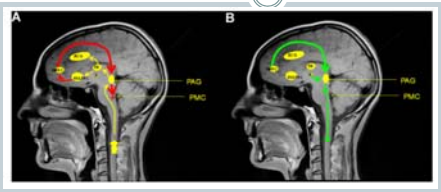
9



DasGupta, Kavia & Fowler (2007) Kavia, DasGupta & Fowler (2005)

Proposed pathways involved in bladder control

10



Fowler & Griffiths (2010)

- Storage: Afferents (yellow) project to prefrontal regions which prevent voiding via inhibition (red) of the PMC (pontine micturition center)
- Voiding: MPFC (Medial Prefrontal Cortex) relaxes its inhibition of PAG and thus PMC (green)

Post-Stroke UI: clinical features

11

- UI in > 50% of individuals during acute stroke phase
- UI in 19% at 6 months follow-up
- Nocturia in 36 %, urge UI in 29% and difficulty in voiding in 25%
- More common in individuals with hemiparesis
- UI is major risk factor for poor outcomes
- UI is stronger predictor of death or disability than decreased level of consciousness...!!
- Post-stroke UI with decreased attention and slowed processing speed represents a profound risk for death or nursing home placement with OR=15.7 (3.6-69.7)...!! Petterson et al., JAGS (2007)
- Reasons for such excess risk remain unclear

Post-Stroke UI: what are the mechanisms?

12

- DO is most common urodynamic finding
- Said to result from "loss of central inhibition"
- Loss of sensation is also common
- Sensory loss is associated with poor outcome and with parietal as opposed to frontal lesions
- Voiding problems (DU) also found in setting of brainstem and anteromedial frontal lesions
- DU more common after hemorrhagic stroke?
- Do associations reflect increased co-morbidity and frailty?
- Attention deficits in subjects with post-stroke UI
- Attention deficit as shared risk factor for UI and delirium?
- Frontal/prefrontal deficits as shared risk factor for declines in executive function, mobility performance and UI?

Post-Stroke UI: management

13

- What is optimum management of post-stroke UI?
- Paucity of well-designed trials
- Role for NMDA antagonists? (animal studies only)
- Stroke as a variable
- Type of stroke ?
- Location of stroke ?
- Time from stroke ?
- Sense of futility even among incontinence experts
- Superficial assessments sometimes even by incontinence nurses

Parkinson's and UI: general issues

14

- Bowel and bladder dysfunction common in PD
- Mostly constipation and urge UI
- DO felt to result from basal ganglion dysfunction
- LUTS common with nocturia in >60%, urgency in 33-54% and daytime frequency in 16-36%
- UI in 26% of males and 28% females with PD
- Voiding symptoms yet PVRs are generally normal

Parkinson's and UI: complicating factors

15

- Role of comorbid conditions, age, frailty? (e.g. BPH, mobility issues, fluid balance)
- Nearly 1/5 have DO with DU (may mimic DHIC)
- Overlap of two problems or a distinct condition?
- Detrusor Sphincter Dyssynergia (DSS)

Parkinson's and UI: Detrusor Sphincter Dyssynergia (DSS)

16

- Increased EMG activity during voiding
- "Functional bladder outlet obstruction"
- Distinct PD-associated clinical entity?
- DSS with elevated PVR not common in typical PD
- More common with Multiple System Atrophy (Shy Drager Syndrome)

Parkinson's and UI: Distinguishing PD from MSA

17

More likely to be MSA if:

- Urinary symptoms preceded or presented with parkinsonism
- Presence of UI
- Elevated PVR
- Erectile failure preceded or presented with parkinsonism
- Evidence of DSS on external sphincter EMG

Chandiramani, Palace and Fowler (1997)

Parkinson's and UI: Management

18

- Unlike motor responses, *l-dopa* benefits in UI less clear
- May improve storage and voiding problems
- May also exacerbate DO
- Anticholinergics remain standard Rx for DO
- Intermittent catheterization Rx for retention
- LUT surgery an option if MSA excluded
- Avoid stress UI surgery if major DO
- Chronic subthalamic nucleus stimulation?
- Rx associated comorbidities and UI contributors!

Normal pressure hydrocephalus (NPH) and UI: General Issues

19

- NPH is one of few potentially treatable causes of dementia
- Described in 1965 as a triad of gait disturbance, UI and dementia
- Gait described as shuffling, magnetic, wide-based or apraxic
- It is extremely rare
- Following a massive ad campaign in Norway, incidence was only 5.5 per 100,000 with prevalence of 21.9 per 100,000. Even among individuals 70-79 years of age rate was only 181.7 per 100,000
- Yet, >15% of nursing home residents have gait issues, dementia & UI
- Mobility and cognitive problems may contribute to UI in NPH
- DO was demonstrated in most subjects with possible NPH

Normal pressure hydrocephalus (NPH) and UI: Management

20

- No single test predictive of response to surgery
- Care decisions must be individualized
- Response to 40-50 ml CSF tap suggests benefit
- Requires objective mobility assessment
- High CSF pressure requires immediate workup
- Consider NPH workup if onset of triad and brain imaging is compatible with diagnosis

White Matter Hyperintensities (WMH) and UI: General Issues

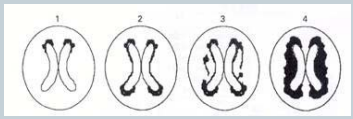
21

- Formerly known as leukoaraiosis or Binswanger's
- CNS white matter contains fibers and axons linking cortical areas to each other and to subcortical structures
- WMHs are very common on MRI scans in elderly
- Individuals may be asymptomatic
- Others suffer from specific deficits
- Vulnerability to disconnection syndromes of frontal/subcortical pathways with declines in mobility, affect, executive function and UI?

White Matter Hyperintensities (WMH) and UI: Challenges

22

- Is it normal aging or disease?
- Does WMH location matter?
- Does amount of WMH matter?



Grades 1-4
(Brand-Zawadzki et al.; AJNR 1985)

White Matter Hyperintensities (WMH) and UI: Some Hypotheses

23

1. WMH in frontal regions will predict UI and related symptoms
   Failure of orbitofrontal activation with poor bladder control
   (Griffiths et al., J Urology 2005)

2. WMH within specific brain regions and tracts will predict UI
   Potential roles for right insula and anterior cingulate gyrus
   (Griffiths *et al.*, Neuroimage 2008)

Cohort of 100 community-dwelling older adults recruited according to mobility performance and undergoing extensive clinical evaluation with quantitative MRI and DTI neuroimaging at baseline and at 4 year follow-up
(Funded by NIH/NIA; L. Wolfson:PI)

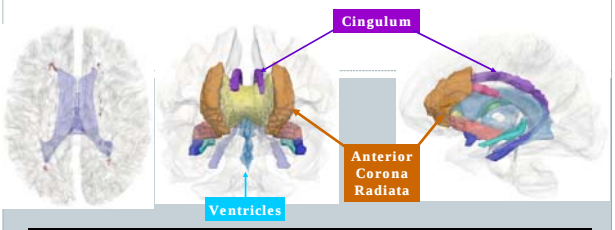
White Matter Hyperintensities (WMH) and UI: Some Hypotheses

24

	FRONTAL REGIONS					
UI MEASURES	**RIGHT**			**LEFT**		
	Superior	**Inferior**	**Total**	**Superior**	**Inferior**	**Total**
Wet vs. Dry	NS	NS	NS	NS	NS	NS
Predominant Urgency	NS	NS	NS	NS	NS	NS
Incontinence Severity	3.8 (p=0.051)	3.8 (p=0.053)	4.3* (p<0.05)	2.7 (p=0.09)	NS	2.8 (p=0.09)

Kuchel *et al.* (2009)

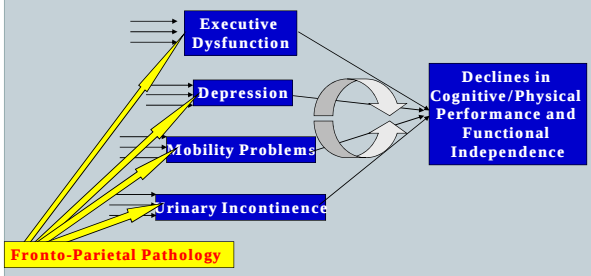
White Matter Hyperintensities (WMH) and UI: Some Hypotheses



Wet vs dry	**Cingulum**	**$\chi^2 = 3.9$**	**p<0.05**
Urge vs other	**-**		
Severity	**Anterior Corona Radiata**	**$\chi^2 = 7.1$**	**p<0.001**

Kuchel *et al.* (2009)

White Matter Hyperintensities (WMH) and UI: Some Hypotheses



White Matter Hyperintensities (WMH) and UI: Some Hypotheses

27

- WMH independently explains 5-11% of variability in mobility, UI severity and executive processing speed
- It is a sensitive (0.7-0.8) predictor of impairment
- Odds of impairment in each of these functional domains increased by 1.5-2.4 x with each 1% increase in total WMH
- 4 year follow-up pending
- DTI data analysis pending

Wakefield *et al.* (2010)

White Matter Hyperintensities (WMH) and UI: Future Directions

28

- Strategies designed to prevent vascular disease and maintain blood brain barrier integrity (e.g. ASA, statins, anti-inflammatory agents) need to be explored for their ability to prevent WMH and delay disability
- Role of shared risk factors for common geriatric syndromes
- Role of shared outcomes among common geriatric syndromes
- Given association of WMH with UI severity rather than presence of UI, may need to move focus away from factors which lead to urgency or OAB and focus more on "homeostatic" mechanisms (e.g. urge suppression, mobility) which enable older individuals to respond to such challenges and thus remain dry

Conclusions:

29

- UI in the frail elderly is a geriatric syndrome
- Non-LUT factors must be evaluated
- Neuro-urological considerations relevant for all UI
- Specific CNS diseases exert definable impact on UI
- Don't attribute everything to one CNS disease
- Always consider co-morbidity, frailty and function

Don't attribute everything to aging

30

Never assume that common "bread and butter" problems cannot be fascinating

31

Educational Course
Urinary Incontinence in the Elderly: Considerations Beyond the Bladder

32

Start	End	Topic	Speaker
14:00	14:15	Opening remarks	Mary H Palmer
14:15	14:45	CNS and bladder control	George Kuchel
14:45	15:15	Affect and motivational factors	Catherine DuBeau
15:15	15:30	Discussion	
15:30	16:00	Break	
16:00	16:20	Mobility and bladder control	Mary H Palmer
16:20	16:50	Medications affecting bladder control	Cara Tannenbaum
16:50	17:00	Discussion	

Urinary Incontinence in the Elderly: Considerations Beyond the Bladder

George Kuchel, MD
Catherine Du Beau, MD
Cara Tannenbaum, MD
Mary H. Palmer, PhD, RN

Objectives

- Discuss geriatric principles
- Describe conditions and diseases of the CNS that affect bladder control
- Discuss the role of affect and motivational factors
- Discuss the role of mobility and toilet access
- Identify medications that affect bladder control
- Participate!

Geriatric Principles

- Continuity of care
- Bolstering home and family
- Communication skills
- Knowing the patient
- Thorough assessment and evaluation
- Prevention and health maintenance
- Ethical decision making

Geriatric Principles

- Inter-professional collaboration
- Respect for the usefulness and value of elder
- Compassionate care
- Helping disconnected family
- End of life care

Source: Reichel, Arenson & Scherger (2010)

Mobility, Toilet Access, and Urinary Incontinence

Mary H. Palmer, PhD, RNC
Umphlet Professor in Aging
Interim, Co-Director Institute on Aging
University of North Carolina at Chapel Hill

Objectives

- Explore the relationship between mobility and urinary incontinence
  - Immobility/dependence on others for ambulation as a risk factor for urinary incontinence
  - Urinary incontinence as a risk factor for falls
  - Interventions to improve mobility: effect on urinary incontinence
  - Toilet access and mobility

Mobility: Relationship to UI

Mobility and prevalence of UI

Mobility and incidence of UI

Mobility and remission of UI

Mobility issues: obesity, balance, vision, environment

Urinary Incontinence and Frailty

- By age 80 years, 40% of older adults have functional impairments
- 6% to 11% are considered frail
  - United States estimate: 6.1% Source: DuBeau et al., 2009
- Psychological effect of transition from robust (independent) to frailty – evolving identity, *"looking glass self"* Source: Fillitt & Butler, 2009

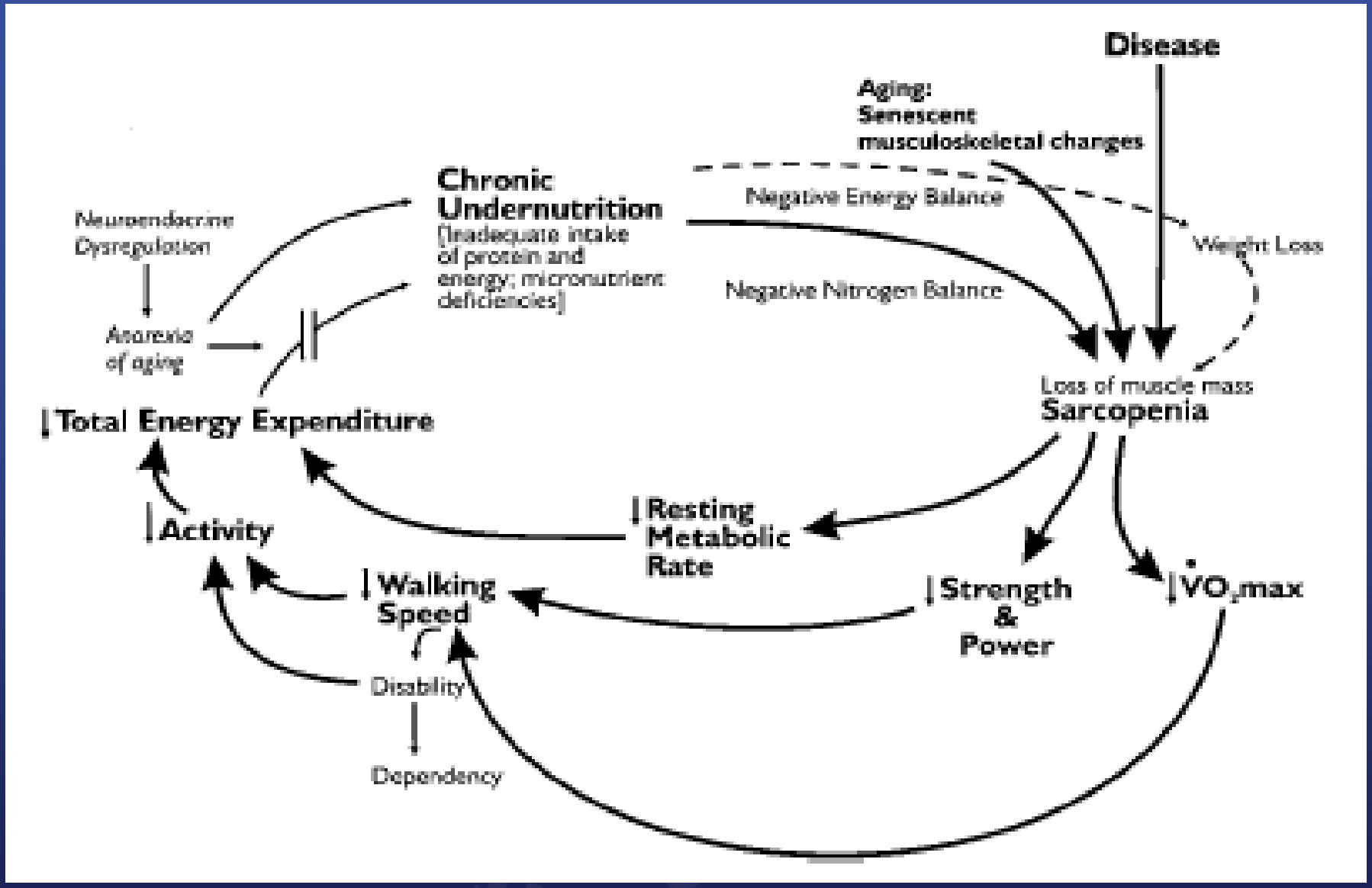
Significance

- Mobility impairments are associated with urinary incontinence
- Obesity and other factors affect mobility
- Mobility affects toilet access
- Lack of toilet access associated with urinary incontinence
- Number of frail elders expected to rise
- Frailty, mobility, toilet access, and continence are international public health issues

Frailty versus Disability

- Frailty – multi-factorial, potentially a downward spiral – phenotype described (Fried et al)

- Disability may involve single deficits that may be reversible Source: Fillitt & Butler, 2009



Frailty Phenotype

Source: Fried et al., 2001

Disablement process

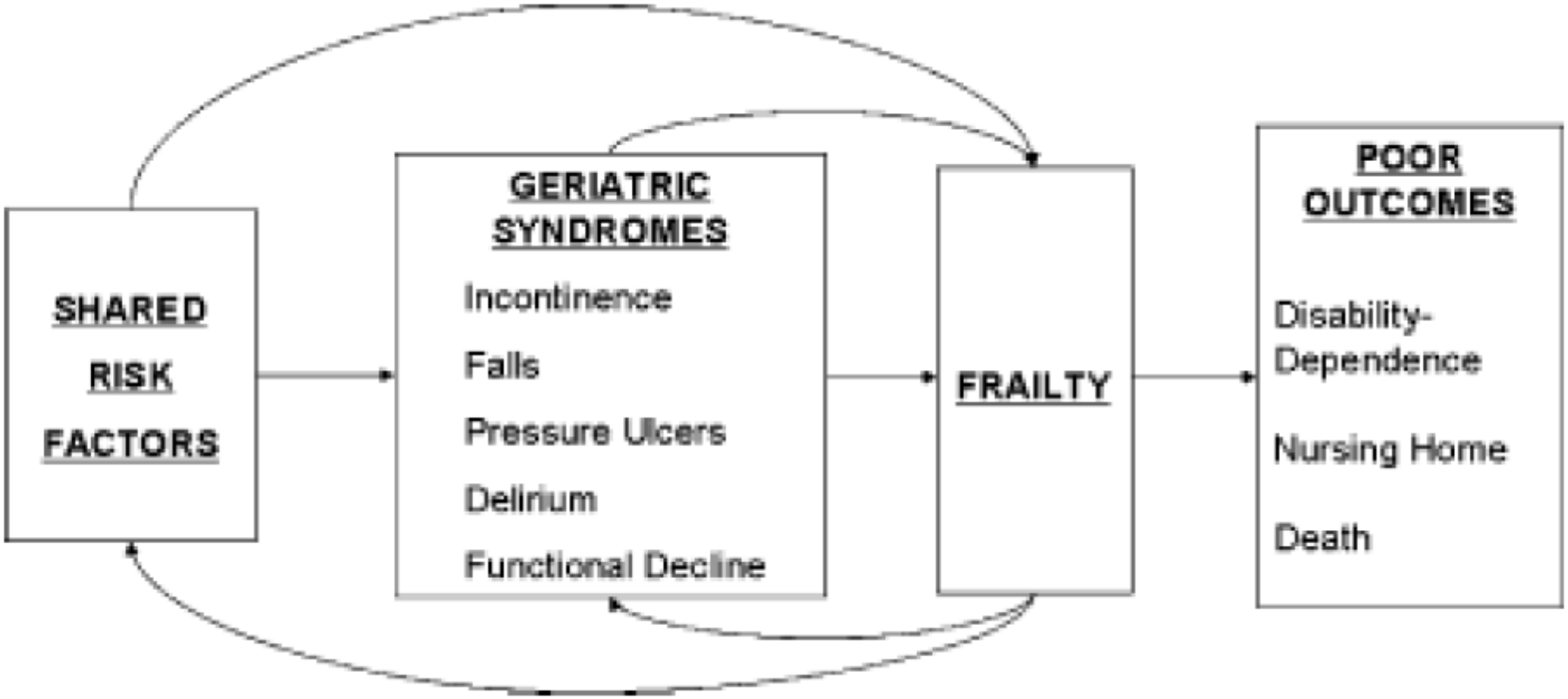
Pathology → Impairment →

Functional limitation → Disability

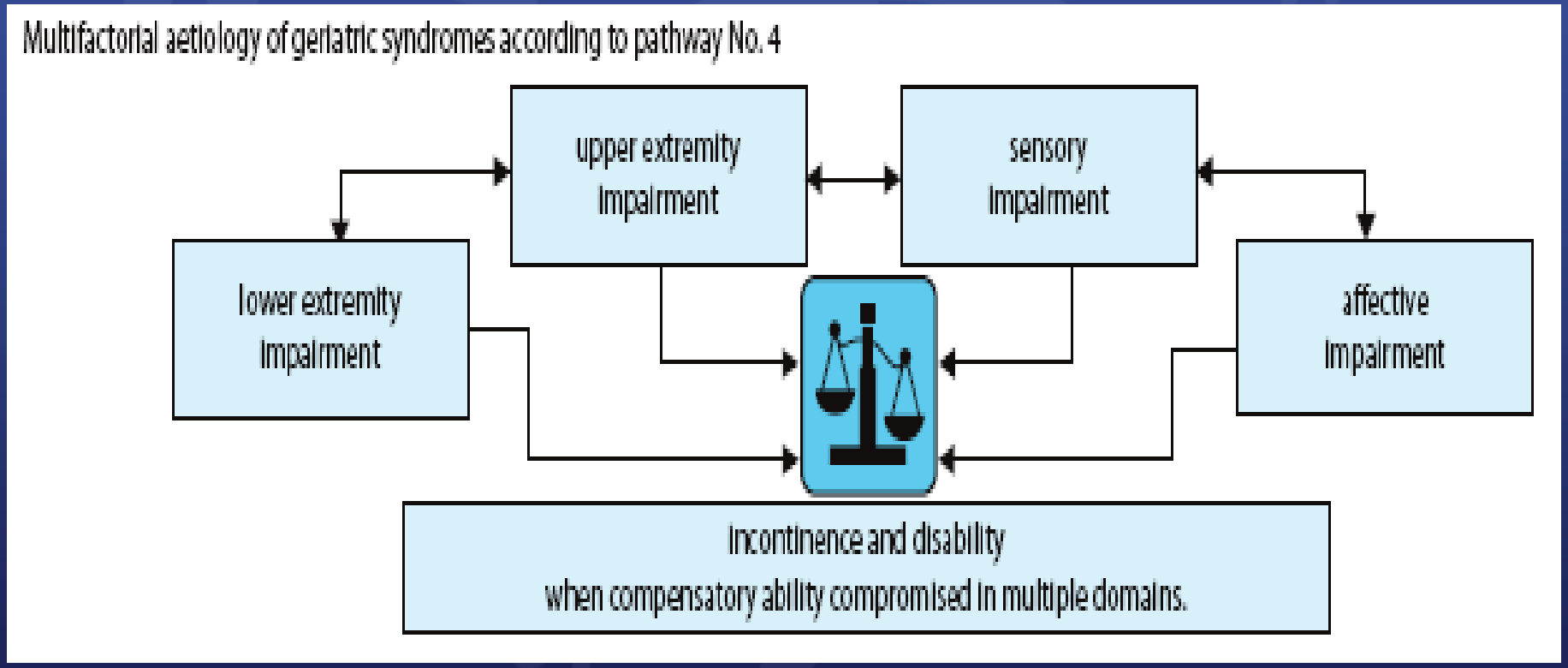
Source: Verbrugge & Jette, 1994

Unifying Model of Shared Risk Factors

Source: Inouye et al., 2007



Urinary Incontinence as Geriatric Syndrome



- Source: Coll-Planas et al., 2008

Vulnerable Elders Survey

- Age
- Self reported health
- Physical activities (stooping, reaching, lifting, writing, heavy housework, etc)
- Shopping, managing money
- Walking across a room
- Light housework
- Bathing or showering

Source: Saliba et al, JAGS 2001

Urinary Incontinence and Frailty Assessment

- **Clinical assessment – potentially treatable conditions**
- **Assess quality of life, desire for treatment goals, caregiver preferences.**
- **Targeted physical examination includes cognition, mobility, neurological and rectal exams**
- **Urinalysis**
- **Frequency volume chart or wet checks**

See: Du Beau, CE., et al. (2010) Incontinence in the Frail Elderly Report from the 4th International Consultation on Incontinence, *Neurourology & Urodynamics*, 29:165-178.

Functional Impairment as antecedent

Physical pathology → Impaired mobility → UI (as ADL) → Disability

Assessment – functional decline, balance, strength, mobility

Examples

- Female hip fracture patients: pre-fracture use of wheelchair, device for walking (OR 1.53 95%CI 1.29-1.83): dependence on others for ambulation (OR 2.51 95%CI 1.64-3.85) (Palmer et al, 2002)
- Having greater number of serious chronic conditions and functional impairment in lower body mobility increases odds of onset of mild UI (OR 1.22 95%CI 1.02-1.45) (Jenkins & Fultz, 2005)

Prevention and Treatment

- Strength and balance training
- Walking programs: group programs feasible (Sackley et al, 2008)
- Environmental modifications
- Disease management (arthritis)

Source: Coll-Planas et al., 2008

Mobility, balance, urine control before and after 4 weeks of daily exercise

	Before	After
Walking distance* feet	50	73
Balance seconds	24	26
Speed inches/second	5.5	7.7
UI (7am-3pm)	2.3	1.0
UI (7am -10pm)	2.8	2.5

Source: Jirovec Int J Nurs Stud 1991

Prevention and Treatment

- Promote and maintain physical exercise
- Prevent further functional decline:
  - Energy preservation
  - Toileting programs
    - Prompted voiding
    - Habit training
    - Functional Incidental Training

Urinary Incontinence as antecedent to mobility disability

Pathology in urinary tract → UI → Reduced activity → Disability

- Assessment – urge, frequency, nocturia, environmental factors

Urinary Incontinence and Falls

Recurrent falls versus non-fallers

	HR	95%CI	p
Unadjusted	3.55	2.41-5.22	<.001
Adjusted*	3.07	2.05-4.61	<.001

Adjusted for: Gender, age, physical function, presence of delirum, use of diuretics, nitrates or antipsychotics.

Source: Hasegawa et al, 2010 *Archives of Gerontology and Geriatrics*

Prevention and Treatment

- UI treatment part of falls prevention programs
- Reversible factors
- Urge suppression exercises
- Lifestyle changes
- *Close proximity to toilets*
- Cognitive and *mobility training*
  - Dual attention tasks
  - Postural stability

Source: Coll-Planas et al., 2008

Behavioral Programs

Required skills for residents:

- ✓ Ability to comprehend and follow education and instructions
- ✓ Identify urinary urge sensation
- ✓ Learn to inhibit or control urge to void

Treatment of UI: Role of Mobility and Toilet Access

Behavioral interventions: first-line treatment

- Prompted voiding proposed mechanism of action: increase self initiated toileting, awareness to toilet and ***access to toilet***
- Habit training's proposed mechanism of action: regular emptying of bladder before capacity is reached -- q 3-4h for example.
- Functional Incidental Training (FIT)

Prompted Voiding (PV)

Three components:

- **Regular monitoring with encouragement**
- **Prompting the resident to toilet on a scheduled basis**
- **Praise and positive feedback when the resident is continent and attempts to toilet.**

Habit Training/Scheduled Voiding

Goal is to prevent incontinence from occurring:

Provide access to the toilet based on the resident's voiding pattern.

Habit Training/Scheduled Voiding

- ✓ Requires scheduled toileting, at regular intervals, on a planned basis, and match the resident's voiding habits
- ✓ Maintain record of resident's voiding patterns

Functional Incidental Training

- Goal: increase activity and functional ability. This activity is integrated into incontinence care.
- Staffing: 5:1 ratio
- Intervention requires 20.7 minutes to implement

Source: Schnelle, Alessi, Simmons, Al-Samarrai, Beck & Ouslander (2002) JAGS 50:1476-1483

Mobility and Urinary Incontinence

Behavioral continence interventions

- **Prompted voiding versus no treatment (level 1). PV not effective in persons unable to state name or need assistance of >1 person to transfer. Use check and change.**

- **Mobility-continence interventions (level 1) reduced number of wet checks and improves endurance in nursing home residents.**

Source: ICI 4th ed

Assessment For Absorbent Products

- **Assess resident's:**
  - **Functional ability to *ambulate, toilet*, disrobe, use of assistive devices**
  - **Ease in self-toileting**
- **Assess product for:**
  - **Contain urinary leakage**
  - **Comfort**
  - **Ease of application/removal for *toilet access***

Rethinking Continence Interventions when mobility issues are present

- **What treatments?**
  - **Behavioral continence interventions**
  - **Mobility-continence interventions**
  - **Combined interventions (medications, surgery, behavioral)**
- **What outcomes? *Whose outcomes?***
  - **Dignity**
  - **Quality of life**
  - **Incontinence impact on daily life**
  - **Wetness/dryness levels**
  - **Access to toilet facilities**