W4: Are we meeting the needs of older people with nocturnal LUTS?

Workshop Chair: Karel Everaert, Belgium
28 August 2018 09:00 - 10:30

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**Aims of Workshop**
Nocturnal LUTS in older people is prevalent and bothersome symptoms however underdiagnosed. Clinicians lack confidence in how evaluating and treating the symptoms resulting in catheters and briefs. As nocturnal LUTS cannot be considered as benign a more stringent diagnostic workout is needed. Increasing clinicians their confidence will help them in starting up therapy and improving general health and comfort to patients. The focus of this workshop is improving diagnosis of nocturnal LUTS with a blink of the eye toward therapy.

**Learning Objectives**
- Application of the 2017 standardisation of terminology report on nocturnal LUTS and understand the gaps and restrictions in older people.
- Learn how to diagnose heart failure and explain how blood pressure can influence nocturnal urine output.
- Understand the consequences of treatment.
- Understand the different aspects of Nocturia, Falls and multi-morbidity.
- Learn to recognise heart failure in the diagnostic workout of nocturia.
- Better understand how blood pressure and edema can influence nocturnal LUTS and how this can affect the therapy.

**Learning Outcomes**
After the course students will be able to diagnose nocturnal LUTS in a holistic manner and start treatment with confidence.

**Target Audience**
Clinicians, nurses

**Advanced/Basic**
Advanced

**Conditions for Learning**
Interactive workshop restricted to 40 people. We will use modern educational techniques like microteaching and case report discussion.

**Suggested Learning before Workshop Attendance**
This workshop is partially based on microteaching, so reading the articles summarised below (suggested reading = must read) is mandatory for a good workshop development.

**Suggested Reading**


Nocturnal LUTS, what, when, standardisation of terminology
An-Sofie Goessaert

In this part, we will discuss the current terminology regarding nocturnal LUTS applied on older patients, based on the ICS report on the terminology for nocturia and nocturnal lower urinary tract function of 2018. (1)

Nocturia can be looked at as a sign (a term that applies to an objective observation apparent to the patient, physician and others; this can include observations from a frequency voiding chart, questionnaire, etc.), a condition (defined by the presence of urodynamic observations associated with characteristic signs and symptoms and/or non-urodynamic evidence of relevant pathologies), or a symptom (any subjective evidence of disease apparent to the patient).

The current definition of nocturia is “waking to pass urine during the main sleep period”. Although this definition has changed recently (no mention of “each void being preceded and followed by sleep), making it more clinically applicable, this definition does not take bother into account and therefore might select patients who do not consider their nocturia as bothersome. Also, in an older population, where the prevalence of nocturia (1x) goes up to 70%, one can wonder if nocturia should be considered as a pathological sign, condition or symptom rather than an aging process.

Nocturia is a multifactorial condition, it can be based on reduced bladder capacity, nocturnal polyuria or 24hr polyuria. With aging, it is known that the bladder capacity decreases due to change in collagen-muscle ratio and increased fibrosis. (2) Due to a loss of circadian rhythm of hormones such as vasopressin, nocturnal polyuria can also be considered a consequence of aging to certain extent. Also underlying factors for development of nocturnal polyuria, such as peripheral edema and hypertension have a higher prevalence with aging. (3) The ICS definition of nocturnal polyuria is “excessive production of urine during the individual’s main sleep period”. The former definition assumed an increased urine production during a night of 8 hours. However, duration of sleep is highly variable, not only inter- but also intra-individually. Besides, sleep quality and duration changes with age, so a fixed time frame was debatable. With the current definition the meaning of “excessive” urine production is not defined, as there are many different ways to classify nocturnal polyuria depending on the clinical or research setting.

As there have been made considerable changes to the definitions that are not yet common knowledge, these changes will be discussed based on the case of an older patient suffering from nocturnal lower urinary tract symptoms.


Waking from sleep to void is not benign, focus on falls
Wendy Bower

How are falls related to nLUTS?
The temporal relationship of falls and nocturia has been poorly investigated. Patients with nocturia have a markedly increased risk of injurious falls compared to people who sleep through the night (OR 2.2 for any fracture, 1.4 for hip fracture) (1). Nocturia can fluctuate night to night (2). This is likely due to changes in medical status and fluid displacement.

Patients who fall in hospital are more likely to have a longer stay and display reduced confidence and functional ability on discharge (3). An Australian study showed that more in-hospital falls occurred between 2 and 4am than at any other time interval, mostly in the patients’ bedrooms or en route to the toilet. A recent Belgian audit in the aged care context suggested
that at least 36% of all falls are related to toileting. Of these falls, 75% occurred during the night. Clearly falling may be related to nocturia.

It may be that people make extraordinary efforts to avoid an incontinent episode, including placing themselves at increased risk of falling. More likely, the common causal link between voiding at night and falling is multifactorial and includes frailty, multimorbidity, polypharmacy or cognitive and gait changes seen on awaking unrefreshed or from insufficient sleep (4).

**Look for nLUTS in a person at high risk of falls**

The multi-factorial presentation of illness impacts the range of incontinence and bladder problems. Our experience is that patients admitted to hospital wards are generally screened for incontinence and the need for assistance with toileting but not specifically for bladder symptoms at night. First line intervention for nocturnal lower urinary tract symptoms while hospitalized is not standard. Pads are commonly used even for patients who have nocturia but are not incontinent (5).

The various Falls Risk tools screen for generic elimination symptoms but do not necessarily differentiate between occurrence during the day or night (e.g. Falls Risk Assessment and Management Plan asks about constipation, urinary or faecal frequency or urgency or nocturia in a single question). Some protocols support prevention of falls by suggesting that patients be woken every two hours to check whether they need help toileting.

**Impact of sleep parameters on falls risk and nLUTS**

One of the main drivers of nocturia is an increase in nocturnal diuresis. This can reflect a disorder of solute or free water excretion, systemic illness, injury-related oedema or result from an acute condition (6,7). Waking after a short time asleep is associated with impaired standing balance and step length when walking; changes which are a risk for falls and not corrected by adequate lighting (8).

Deterioration of the sleep-wake cycle and sleep disruption (irrespective of the cause) can itself induce nocturnal polyuria (9). The sleep disturbance associated with nLUTS contributes to poor in-hospital outcomes, increases the risk of falls and fracture and adds considerably to health care resource use. Decreasing nocturia by even one episode per night can result in improved restorative sleep, increased safety at night, reduced daytime fatigue and earlier return to health (10).

**References**


**Leg edema, obvious?**

Karel Everaert

Prescriptions for nocturia are given in progressively more frequent older people with rising safety concerns. Even though medication becomes safer (low dose, gender specific), a certain risk has to be dealt with. This might become a problem for surgical disciplines (Urology, Gynaecology) who treat most of the nocturia patients as they are not used to diagnose the comorbidities related to an increased risk of hyponatremia. Some basic knowledge of leg edema and heart failure is a strong example and actually little knowledge is needed to increase the feeling of safety for the clinician and actual safety for the patient.
Edema and specially leg edema causes nocturnal polyuria and nocturia through resorption of the fluid when supine resulting in an immediate excess in urine output and a delayed increase in ANP related salt diuresis. Combining water retention due to desmopressin and increasing salt loss due to these comorbidities, explains the increased risk for complications like hyponatremia. Leg edema are seen with liver, heart or kidney disease or following varices of the legs, lack of physical activity or muscle paralysis. Concomitant medication that can cause edema are antidepressants (MOA-inhibitors), antihypertensives (mainly Calcium channel blockers), antivirals, chemotherapeutics, cytokines, hormones (sex hormones and glucocorticoids) and NSAID. Diagnosis is based on expert opinion rather than science and the available guideline documents do not mention nocturia. Heart failure has to be suspected when there is a history of heart disease, when edema and/or weight gain with rapid onset is, exertional dyspnea or orthopnea. Normal serum BNP concentration rules out uncontrolled heart failure. Desmopressin for nocturia is contraindicated in patients with congestive heart failure (New York Heart Association Class II to IV) or uncontrolled hypertension and should be used with caution (e.g., monitoring of volume status) in patients with New York Heart Association Class I congestive heart failure because of the risk of fluid overload and electrolyte abnormalities, patients with heart failure may also be at increased risk for low sodium concentrations.

Leg edema due to varicose veins or lack of physical activity (elderly, wheelchair bound patients) can be prevented with stockings or treated with pressotherapy or daytime diuretics and leg elevation with low levels of evidence and certain complications like pressure sores and discomfort. Drug induced edema can be treated by switching medication.

Conclusion: some basic knowledge of leg edema, its causes and its diagnosis is needed to treat nocturia in older people. The diagnosis is based on history taking, physical examination (pitting edema, blood pressure if not known ) and serum analysis (creatinine, sodium, liver tests, osmolality and BNP) and is perfectly possible within a surgical consultation.

References

Blood Pressure and nocturnal LUTS
Michael Whishaw

Systemic disease

Voiding at night is a common symptom of systemic disease. For example, nocturia is seen with poorly controlled diabetes, impaired circulation, congestive heart failure, hypertension, metabolic syndrome, anxiety and autonomic dysfunction, airway occlusion during sleep and renal and malignant disease (Bower 2016). The final common pathway is usually increased urine production during the night (nocturnal polyuria – NP) due to a change in vascular resistance, clearance of third space fluid or osmotic or free water diuresis. Intrinsic is the absolute, and variable level of blood pressure.

Hypertension

Hypertension per se is associated with nocturia with an OR 1.30-2.68 in those with at least 2 voids per night, with a significant association in 11 of 14 identified studies in a systematic review. There is a small amount of evidence that hypertension may be independently associated with nocturia in the absence of any co-existent morbidity (Victor 2017), although there is likely to be some contribution to NP as a side-effect of the BP drugs. The link is multifactorial, including effect on glomerular filtration, and hormonal mechanisms including the renin-angiotensin-aldosterone system. In most cases of NP in hypertensives though, there will be a contribution from a co-existent comorbidity

Non-dipping and nocturnal hypertension

It is normal for nocturnal BP to drop by at least 10% (a circadian rhythm). A drop of less than 10% is referred to as a “non-dipping” BP profile or non-dipping hypertension. It may occur in many conditions, and is commonly associated with NP. The corollary also holds in that nocturia is associated with higher nocturnal systolic BP, and lower dipping (Obayashi 2015). A higher than normal nocturnal BP is understood to result in NP through heightened renal perfusion. Non-dipping hypertension occurs in about 25% of hypertensives and is probably associated with renal disease progression, greater end-organ damage and increased cardiovascular morbidity (Pickering 2001).

Related to this, nocturia is an independent predictive factor of prevalent hypertension in obstructive sleep apnoea (Destors 2015). What is more, morning hypertension may predict sleep disordered breathing - SDB (Hongyo 2016).
SDB is usually best managed with CPAP. Otherwise non-dipping hypertension should be treated with carefully tailored hypotensive therapy.

**Orthostatic hypotension**

Orthostatic (postural) hypotension is a feature of autonomic dysfunction, seen in a number of conditions including Parkinson’s Disease. The postural hypotension limits renal perfusion in the upright state, which then increases sometimes markedly when assuming the supine state at night and resulting in NP. A case presentation will highlight how challenging this can be to treat effectively.

**Hypertensive drugs**

Drugs to treat hypertension may cause NP through different mechanisms including postural hypotension. Calcium blockers, especially amlodipine, may cause fluid retention with peripheral oedema. Thiazide diuretics have 24 hour action promoting a small nocturnal diuresis.

**References**

An-Sofie Goessaert

Affiliations to disclose:

None

Funding for speaker to attend:

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☐ Institution (non-industry) funded
☐ Sponsored by: Astellas

CASE

Female, 78 years old

Medical history: diabetes mellitus type II, arterial hypertension

Problem: fall during nocturnal toilet visit, urological work-up to prevent future nocturnal falls

History: nocturia 3–4x, high voiding frequency during daytime, urinary incontinence from time to time

Terminology

Symptom:

Any abnormal phenomenon or departure from the normal in structure, function or sensation, experienced by the person and indicative of disease or a health problem.

Symptoms are either volunteered by, or elicited from the person or may be described by the person’s caregiver.

CASE

Symptom:

- Nocturia
Terminology

Symptom case:
- Nocturia:
  - 2010: complaint of interruption of sleep one or more times because of the need to micturate. Each void is preceded and followed by sleep.
  - 2018: waking to pass urine during the main sleep period.


Nocturia

Changes:
- No longer defined as a “complaint” (getting up once may not be bothersome)
- With the new definition following is included:
  - Patients who need to void multiple times at the night after falling asleep, often several times in a row, and may not be able to get back to sleep again.
  - Patients whose bladder does not empty fully and who consequently need to void again soon.
  - Patients who suffer from insomnia or difficulty in sleeping from causes other than their bladder problem.
  - Patients who wake up and are unable to sleep due to painful or oversensitive bladders.

CASE

Urinalysis: negative

Abdominal ultrasound: normal kidneys, normal bladder wall, no lithiasis, no renal or bladder masses.

Postvoid residual (ultrasound): 20ml

CASE

- Daytime frequency: 8x
- Nocturia episodes: 3x
- Maximum voided volume: 160ml
- 24h urine volume: 840 + 320 = 1160ml
- Nocturnal urine volume: 320ml
- NPI: 28%
- N: 320/160 = 2

Terminology

Sign:
Any abnormality indicative of disease or a health problem, discoverable on examination of the patient; an objective indication of disease or a health problem. These can be quantified by a questionnaire or bladder diary.
Terminology

Sign case:

- Nocturia:
  - 2010: not specifically defined
  - 2018: the number of times an individual passes urine during their main sleep period. This is derived from the bladder diary.
  - Measurement of the frequency of nocturia begins after sleep and concludes before the first void following intention of getting up for the day.


Other signs assessed with bladder diary or frequency volume chart:

- Nocturnal urine volume:
  - 2010: cumulative urine volume from voids after going to bed with the intention of sleeping to include the first void at the time of waking with the intention of rising (excludes last void before sleep).
  - 2018: total volume of urine produced during the individual’s main sleep period including the first morning void.

- Best to advise individuals who are filling out a bladder diary or FVC to void before going to sleep to make assessment of volumes passed easier by the healthcare provider.


- 24-hour voided volume:
  - 2010: summation of all urine volumes voided in 24 hours.
  - 2018: total volume of urine passed during a 24-hour period excluding the first morning void of the period; the first void after rising is discarded. The 24-hour period begins at the time of the first void and is completed by including the first void after rising, the following day.

- No longer confusion with regard to when the 24-hour period begins and when it ends.


- 24-hour polyuria:
  - 2010: excessive excretion of urine resulting in profuse and frequent micturition. It has been defined as over 40 ml/kg body weight during 24 hours or 2.8 l urine for an individual weighing 70 kg.
  - 2018: the previous definitions have not been changed.
  - no new research or information on defining polyuria.
  - Volumes passed daily vary considerably, and are influenced by environmental, physiological and pathological factors, and the amount of fluid intake.


CASE

Based on the results:

- Diagnosis: Nocturia due to small bladder capacity/overactive bladder
Case

Female, 78 years old

Medical history: diabetes mellitus type II, arterial hypertension

Problem: fall during nocturnal toilet visit after urinary incontinence episode, urological work-up to prevent future nocturnal falls

History: 2-3 nights per week nocturnal urinary incontinence, large volumes; if no incontinence at night, large voided volumes in the morning

Case

Symptoms:

- Enuresis
- Nocturnal Polyuria

Terminology

Symptoms case:

- Enuresis:
  - 2010: complaint of involuntary loss of urine which occurs during sleep
  - 2016: complaint of intermittent incontinence that occurs during periods of sleep; if it occurs during the main sleep period, then it could be qualified by the adjective «nocturnal»

Enuresis

Changes:

- Previously believed to be a complete emptying of the bladder
- Later identified as both complete and incomplete emptying of the bladder
- Previously wetting in discrete portions while asleep after the age of five
- Changed to be considered with the ICDS definition

Terminology

Symptoms case:

- Nocturnal polyuria:
  - 2010: not defined as a symptom
  - 2016: passing large volumes of urine at night

- Previously only considered as a sign, however, patients can report passing large volumes of urine at night, especially relative to the day

Case (ambulatory)

- Daytime frequency: 5x
- Nocturia episodes: Dx
- Maximum voided volume: 570ml
- 24h urine volume: 1250ml
- Nocturnal urine volume: 570ml + ??
- NPI at least 46%
CASE (hospitalisation)
- Daytime frequency: 5x
- Nocturia episodes: 0x
- Maximum voided volume: 570ml
- 24h urine volume: 1430ml
- Nocturnal urine volume: 570ml+280ml=850ml
- NPI 59%

<table>
<thead>
<tr>
<th>Time</th>
<th>Voided Volume</th>
<th>Residual Volume</th>
<th>Incontinence Volume</th>
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<tbody>
<tr>
<td>7:30 AM</td>
<td>200ml</td>
<td>80ml</td>
<td></td>
</tr>
<tr>
<td>2:30 PM</td>
<td>120ml</td>
<td>130ml</td>
<td></td>
</tr>
<tr>
<td>7:55 PM</td>
<td>250ml</td>
<td>90ml</td>
<td></td>
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<tr>
<td>10:30 PM</td>
<td>110ml</td>
<td>110ml</td>
<td></td>
</tr>
<tr>
<td>3:10 AM</td>
<td>280ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:30 AM</td>
<td>570ml</td>
<td>10ml</td>
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Signs:
- Enuresis
- Nocturnal Polyuria

Terminology
Signs case:
- Enuresis
  - Not defined as a sign in previous terminology documents
  - 2018: «wetting» while asleep

2018: «wetting» while asleep


Nocturnal Polyuria
Changes:
- Numerous ways of classifying nocturnal polyuria:
  - Congestive heart failure
  - Diabetes mellitus
  - Obstructive sleep apnoea
  - Peripheral oedema
  - Excessive night-time fluid intake
  - Abnormality in nocturnal secretion or action of arginine vasopressin
  - Oedema-forming states (heart failure, chronic renal disease, liver failure)
  - Autonomic nervous system dysfunction, Alzheimer’s disease, multisystem atrophy, stroke, parkinsonism
  - Normal aging

CASE

Based on the results:
- Enuresis due to overdistension of the bladder with overflow + reduced bladder sensation
- Further exploration underlying causes of nocturnal polyuria

CASES background

Abnormal filling or emptying of the bladder can be linked to intermittent overdistension of the bladder, especially in older patients with nocturnal polyuria

CONCLUSION

Using a standardized terminology is important both clinically and in research
In older people it is not always easy to get a correct view on the symptoms and signs (unreliable history / voiding diary), which might have implications on treatment
In case of doubt regarding nocturnal LUTS, hospitalisation to get a good frequency-volume chart can be helpful
Thank you!

An-Sofie Goessaert
Urology Department, Ghent University Hospital, Belgium
an-sofie.goessaert@ugent.be
Falls and Nocturnal LUTS

Workshop 4 ICS 2018
Wendy Bower FACP, PhD

Affiliations to disclose†:
Ferring Australia
Ferring International

Funding for speaker to attend:

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Falls ∞ nLUTS

= intersection of ageing and co-existing disease
= vulnerabilities versus reserves

Common Geriatric Syndromes*

- Delirium (cognitive issues)
- Sleep and circadian rhythm
- Fall
  - 1:3 >65 yrs fall once/year
- Urinary Incontinence (Vaughan et al 2018)
  - complete and irreversible
  - ranked least important by physicians, nurses and nursing executives
- Interact with each other; common comorbidities

Bidirectional relationship: disease & bladder function

* Interferes with ADL, ↓ life expectancy

nLUTS

- Multiple interacting contributing conditions
  - Mobility limitations
  - Bladder changes
  - Physiological redundancy
  - Circadian rhythm disruption
  - Sleep disturbance
  - Cognitive changes
  - Acute disease and pharmacotherapy
  - Other Geriatric Syndromes

Exacerbates impaired detrusor innervation, function and control + NUV and sleep changes

Ur-Vulnerabilities?

Neurological: innervation, sensory dysfunction
CVD: oedema; NP; white matter; hypertension, oxidative stress
DM: UAB; polyuria; sensory changes
Obesity: UUI; SUI
Vascular: change in blood flow to bladder and brain

Nocturnal influences

- Ageing kidneys (Andersson 2017)
  - ↓ creatinine clearance
  - ↓ response to ADH
  - low aldosterone → Na wasting
  - ↑ rate of nocturnal urine production
    • ± extremity oedema / DM / non-dipping hypertension
- Sleep disturbance → excess diuresis (Mahler & Kamperis 2012)
- Balance and gait impairments significantly and independently associated with urgency UI (Fritel 2013)
  - Standing balance and step length ↓ after arousal from SW sleep (McBean 2016)

Balance

- Static vs Dynamic: leg strength important
  - 7.5 weaker dorsiflexors in fallers vs non fallers
  - Weak leg muscles= slower speed, > tripping
- Systems
  - Visual: environment, location, direction, speed
    • Age → loss of spatial information, depth perception and peripheral vision
  - Vestibular: information about head movement
    • Age → loss of sensory cells
  - Somatosensory: body contact and position
    • Age → ↓ cutaneous sensation
- Fear of falling changes posture: to protect head
  - Avoid movement → weakness, inefficient gait

Falls in the community

N=92,660 Korean men; slip / fall over last 1 year (Kim 2017)
- Falls prevalence 14.6%
- OR falls in elderly adults significantly ↑ in all age groups as the frequency of nocturia ↑
  - AOR 1.26 n=1 [1.12±1.41]
  - AOR 1.36 n=2 [1.20±1.54]
  - AOR 1.34 n=3 [1.15±1.56]
  - AOR 1.59 n=4 [1.29±1.95]
  - AOR 1.73 n= 5 [1.41±2.11]

Falls in the community

- Excessive Daytime Sleepiness (using ESS) (Hayley et al 2015)
  - Signif ↑ risk of falls both genders
  - Signif assoc nocturia and EDS (F: p<0.03; M p< 0.01)
- Medication use and falls
  - 25% in no medications group
  - 48% in x5 medication group (Blake 1988)
  - Diuretics 3x more common in fallers than non fallers
  - Mechanisms: dizziness, confusion, withdrawal insomnia, ataxia, reversible dementia, ↓ blood pressure
- Environment, footwear and non-use of prescription glasses

Esther: 84 year old female

Med History:
- Normal pressure hydrocephalus; shunt off
- IHD; dyslipidaemia; AF
- Depression
- GORD
- Previous SDH
- Asthma
- RUTI
- Unilateral knee pain
- SDB

Falls risk high
- Dizzy, impulsive, tired
- 4 wheel frame
- Lives alone
- X5 admissions for a fall

LUTS
- N=8 last 1 year
- NP
- UDI with standing up
- Day frequency 7-9
- SUI with cough
- Nil PVR
- Recent fall at night – family “forbidden” night toileting

UDI / DO, SUI, no DV or BOO

Falls as a GS: at least 3/ month or the fear of falling prevents regular activities

Nocturia, Falls and Mortality in elderly

A NOCTURIA - no B NOCTURIA - yes

Nocturia & falls: HR 1.6 (1.01-2.57)
No nocturia and falls: HR 1.27 (1.81-1.99) (Galizia 2012)
Esther in the Hall with UI

- FVC: NUP1600mL; day VV<200mL
- Sleeps 9 hours
- FUST 2 hours

Points of dysfunction → nLUTS

- Afferent information
  - Late sensation; ? white matter disease
- Reception and integration of CNS information
  - Cognitive changes
- Appropriate efferent output
  - Lumbar spine narrowing; sciatic nerve compression
- Mobility
  - Gait speed; stride length; wider base of support;
    - Requires gait aid; wears glasses
- End-organ ability to respond
  - OAB: blood flow changes; post-UTI inflammation
- Other age-related change
  - ADH; small capacity bladder

How likely do you consider the following causes of nLUTS?

- Geriatric syndrome UI
  - ? complete and irreversible
- OAB: hypoperfusion, hypoxia and oxidative stress
- Geriatric syndrome SCR / Sleep disorder / Falls
- Idiopathic nocturnal polyuria (NP)
- NP related to cardiovascular condition
- Pain from knee and lumbar spine
- Frailty

Which diagnostic evaluations?

- Extensive clinical examination
- Cause of dizziness
- Pain management
- Sleep study
- Estimate of NUV
- Falls and Balance evaluation

Falls review

(Appropriate treatment options?)

- Adaptive reserves?
- Treatment of
  - Sleep disordered breathing
  - Mobility and balance
  - Voiding mechanics
  - OAB: Bladder training and beta 3 agonist
  - PFM rehabilitation for SUI
- "For most geriatric syndromes single-component interventions are less effective than multicomponent interventions..."
  (Vaughan et al 2018)
In-Hospital Falls

- Multifactorial
- Associated with comorbidities, function and cognition (Lim 2018)
- Older patients have a poor recognition of their own falls risk (Lim 2018)
  - 18% under-aware
  - 51% over-estimate risk
- Falls risk factors
  - Age & gender
  - History of falls
  - Slow gait ± poor balance
  - Muscle weakness
  - Dizziness
  - Vision limitation
  - Medication for DM, epilepsy, mood/ behaviour
- Significant predictor: benzodiazepine within 12 hours (Domingue et al 2018)

In-patient falls

- Incidence: 3.1-6.1 / 1000 patient days
- Falls in hospital →
  - longer admission
  - ↓ confidence
  - ↓ function at discharge
  - ↑ healthcare needs (Morello 2015)
- Severity of injury unrelated to falls risk classification
- After CVA 46% chance of falling in hospital

Falls during Night

- 32% of falls (127/402 incidents)
- Falls related to toileting
  - Belgium: 36%; Australia: 34%
  - No category for falls related to toileting (RiskMan)
- Falls related to toileting at night
  - Australia: 15% all falls; Belgium: 27%
  - 46% all night falls
- Night toileting falls injuries
  - 22/59 no harm
  - 34/59 minor injuries
  - 3/59 fractures (5%)

Toilet-related falls at night

- Most falls 23:00-23:59hrs or 5:00-5:59hrs
- Toileting-related night falls:
  - Half occur before 1am
  - *most Nocturnal Polyuria within 2-3 hours of sleep
- Location of toileting-related night falls
  - 46% bedside
  - 27% in bathroom
  - 20% in middle of room
- Activity before toileting-related night fall
  - 36% going to toilet
  - 32% getting out of bed
  - 10% returning from toilet

Toileting-related Falls at night (RMH)

- 88% in patients not considered independent
- 80% patient not using recommended assistance level
- Falls Risk Management Plan
  - 48% no strategies selected
  - 48% “encouraged to use bell for toileting”
- Diagnoses and co-morbidities
  - 58% cognitive compromise
  - 19% using diuretics at time of fall
  - LL fracture 17%; delirium/dementia 8.5%

Esther in the Hospital

- Admitted for rehab
- Fall in bathroom
  - 12.30am
  - Lost balance; hit head
  - En route to toilet
  - Dizzy at the time
  - Using frame; no assistance requested
  - Lacerations and rib pain
- Associated factors
  - Early sleep disruption
  - Effort to avoid incontinence
  - Cognition
  - Strength
  - Emotional state
  - Motivation
  - Nutrition
  - Sleep
  - Medication
  - Health attitude
  - Communication
Is in-patient management different?

- Overactive bladder
- Dizziness
- Sleep disorder
- Nocturnal polyuria
  - NUV; type of diuresis; related to CVD / shunt / ankle
  - Intervention
- Other?
  - Individualised care plan for toileting
  - Sleep strategies: reduce disturbance

First treat

- Environmental factors
- Unmanaged medical issues (dizziness, DO, shunt)
- Modifiable factors
  - Immediate (sleep, SDB, pm plan)
  - Longer term (CVD, NP)
  - Multidisciplinary input
- Post-discharge referral
  - Falls, Continence, Sleep services

Summary: Falls and nLUTS bi-directional

Gaps in Evidence

- Unclear how to evaluate types of nLUTS
  - Is overflow UI back?
  - Does type of incontinence change management?
- No current treatment algorithms for nLUTS
  - In-patients & community dwelling older people
  - Which system / comorbidities to target first?
- Awaiting trials of multicomponent therapies
Leg Oedema, Obvious?
Karel Everaert
NOPIA research group
Ghent University Hospital
Belgium

Causes
• Acute unilateral edema: deep vein thrombosis, ruptured Baker’s cyst, compartment syndrome
• Chronic unilateral edema: venous insufficiency, lymphedema, pelvic tumour, reflex sympathetic dystrophy (CRPS).
• Acute bilateral edema: deep vein thrombosis, sudden deterioration of heart failure or renal disease.
• Chronic bilateral edema: venous insufficiency, heart failure, drugs, idiopathic edema, lymphedema, premenstrual oedema, pregnancy, pre-eclampsia, pulmonary hypertension, obesity, kidney disease (nephrotic syndrome, glomerulonephritis), liver disease, pelvic tumour, continuous sitting with the legs bent (elderly patients who sit for prolonged periods and paralysed patients), anaemia, hypoalbuminaemia, severe hypothyroidism.

History
• Was the onset of leg edema acute or chronic (more than or less than 3 days)? If sudden, be aware of DVT.
• Current medication: It should be checked whether the patient is using medication with the potential of causing edema:
  - calcium-channel blockers and other antihypertensive drugs
  - anti-inflammatory drugs
  - pioglitazone and rosiglitazone (anti-diabetic)
  - corticosteroids
  - sex hormones.
• Systemic diseases (heart, liver and kidney disease)
• Does the patient have a history of pelvic or abdominal cancer or radiotherapy (lymphedema)?
• Does the swelling reduce during the night (reduction occurs in venous insufficiency, but not in lymphedema)?

Physical examination
• Does the patient have pitting edema evidenced by an indent in the skin following finger pressure, most marked over the tibia?
  • Pitting = deep vein thrombosis, venous insufficiency, early stages of lymphedema.
  • Non-pitting = that remains unchanged overnight is rare = disturbance lymph flow.
• Does the edema cause pain?
  • DVT, erysipelas, reflex sympathetic dystrophy (CRPS) are painful conditions.
  • Lymphedema is usually painless.
  • Chronic venous insufficiency may cause some aching.
• Any asymmetry of the edema should be determined by measuring the circumference of both calves at their thickest point.
• Skin discoloration may be noted as well as visible varicose veins, in erysipelas, local edema is often present in addition to skin redness and tenderness.

Case
• Female, 77 years old, good general health, no significant daytime LUTS
• Complains about heavy and swollen legs in the evening, no pain since 3 months
• Some dyspnea at exercise
• Complains about nocturia 3x per night

How likely do you consider the following causes of nocturia in this case?
• Overactive bladder
• Sleep disorder
• Idiopathic nocturnal polyuria
• Nocturnal polyuria related to cardiovascular condition
DELPHI PANEL

How likely is female 77yo cause of nocturia in this case?

- Oedema in the evening

Q26

- Nocturia 2
- OAB

1 Totally inappropriate
2
3
4
5 UNCERTAIN
6
7
8
9 Totally appropriate

How likely is cause of nocturia a sleep disorder?

Q27

1 Totally inappropriate
2
3
4
5 UNCERTAIN
6
7
8
9 Totally appropriate

How likely is cause of nocturia in this case idiopathic NP?

Q28

1 Totally inappropriate
2
3
4
5 UNCERTAIN
6
7
8
9 Totally appropriate

How likely is cause of nocturia in this case NP related to CV condition?

Q29

1 Totally inappropriate
2
3
4
5 UNCERTAIN
6
7
8
9 Totally appropriate

How appropriate do you consider following diagnostic evaluations?

- Clinical examination focused on cardiovascular pathology
- Bladder diary
- Postvoid residual volume

DELPHI PANEL

Case – clinical evaluation

- Cardiovascular evaluation: moderate cardiac failure
- Bladder diary: nocturnal polyuria, normal bladder capacity
- No postvoid residual volume

BNP: The negative predictive values are very similar and high (0.94–0.96) in both the non-acute and acute setting, but the positive predictive values are lower both in the non-acute setting (0.44–0.57) and in the acute setting (0.66–0.67). Therefore, the use of BNP is recommended for ruling out HF, but not to establish the diagnosis.


For screening:
- Dyspnea/orthopnea
- Fatigue
- Ankle swelling
Classifying heart failure

<table>
<thead>
<tr>
<th>NYHA Class</th>
<th>Patients with Cardiac Disease (Distinction of HF-Related Symptoms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (New)</td>
<td>Patients with cardiac disease who are able to perform physical activity without limitation. Blood pressure normal, or minimally elevated. Physical activity does not cause signs or symptoms. No history of heart failure.</td>
</tr>
<tr>
<td>II (New)</td>
<td>Patients with cardiac disease who are able to perform physical activity without limitation. Blood pressure normal, or minimally elevated. Physical activity does not cause signs or symptoms. No history of heart failure.</td>
</tr>
<tr>
<td>III (New)</td>
<td>Patients with cardiac disease requiring minimal limitation of physical activity. Blood pressure normal, or minimally elevated. Physical activity does not cause signs or symptoms.</td>
</tr>
<tr>
<td>IV (New)</td>
<td>Patients with cardiac disease requiring marked limitation of physical activity. Blood pressure normal, or minimally elevated. Physical activity does not cause signs or symptoms.</td>
</tr>
<tr>
<td>NYHA Class</td>
<td>Patients with cardiac disease requiring marked limitation of physical activity. Blood pressure normal, or minimally elevated. Physical activity does not cause signs or symptoms.</td>
</tr>
</tbody>
</table>

How appropriate are the following options?

- First treat cardiac failure
- First treat nocturnal polyuria with desmopressin
- First treat nocturnal polyuria with daytime furosemide

DELPHI PANEL

Desmopressin and heart failure

Desmopressin for nocturia is contraindicated in patients with congestive heart failure (New York Heart Association Class II to IV) or uncontrolled hypertension.

Desmopressin should be used with caution (e.g., monitoring of volume status) in patients with New York Heart Association Class I congestive heart failure because of the risk of fluid overload and electrolyte abnormalities, patients with heart failure may also be at increased risk for low sodium concentrations.

Strength of Recommendations

<table>
<thead>
<tr>
<th>Strength of Recommendation</th>
<th>Level</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment of edema with an angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker should be considered in patients with chronic heart failure and reduced ejection fraction</td>
<td>A</td>
<td>28, 45</td>
</tr>
<tr>
<td>Sodium restriction should be used to decrease morbidity and mortality in patients with heart failure</td>
<td>B</td>
<td>15</td>
</tr>
<tr>
<td>The use of nonpharmacological interventions that may be appropriate to reduce sodium intake in patients with congestive heart failure</td>
<td>C</td>
<td>22, 22</td>
</tr>
<tr>
<td>Natriuresis is the treatment of choice in patients with grade 2 or 3 heart failure and sodium retention</td>
<td>B</td>
<td>27</td>
</tr>
<tr>
<td>Long-term use of combination therapy in conjunction with individualized dose and avoidance of fluid and sodium management and other considerations should be continued in patients with hypertension</td>
<td>C</td>
<td>34</td>
</tr>
</tbody>
</table>

What if...

- Cardiovascular evaluation: no cardiac failure but uses calcium channel blocker for hypertension
- Bladder diary: nocturnal polyuria, normal bladder capacity
- No postvoid residual volume

Treatment of Edema, JAMES G. O’BRIEN, M.D., and SHOBHA A. CHENUBHOTLA, M.D., RAMESHA V. CHENUBHOTLA, M.D., American Family Physician, June 1, 2005, Volume 71, Number 11, 2111-7
What if...

• Cardiovascular evaluation: no cardiac failure but varicose veins at lower limbs
• Bladder diary: nocturnal polyuria, normal bladder capacity
• No postvoid residual volume

What if? No cardiac pathology, but varicose veins

• First treat varicose veins
• First treat nocturnal polyuria with desmopressin
• First treat nocturnal polyuria with daytime furosemide

Summary

• Oedema and specially leg oedema causes nocturnal polyuria and nocturia through resorption of the fluid when supine resulting in an immediate excess in urine output and a delayed increase in ANP related salt diuresis
• Leg oedema are seen with liver, heart or kidney disease or following varices of the legs, lack of physical activity or muscle paralysis
• Medications can cause leg edema
• Diagnosis/therapy are based on expert opinion rather than science and the available guideline documents do not mention nocturia.
• Normal BNP excludes heart failure
• Desmopressin is contraindicated from class 2 HF or higher and careful monitoring needed if class 1
Blood Pressure and nocturnal LUTS

Dr Michael Whishaw, FRACP
RMH Continence & Urology Services
ICS Philadelphia 28 August, 2018

Nocturia
Many papers

- Associated with many systemic disease
  - (Poorly controlled) diabetes and metabolic syndrome
  - Hypertension and congestive heart failure
  - Autonomic dysfunction
  - Impaired circulation
  - Renal
  - Malignant disease
  - Sleep disordered breathing
  - Anxiety

Nocturia – causal inter-relationships: outcome of a literature review Bower 2017

Targeting Aetiology of Nocturia Guides Outcomes
Targeting Aetiology of Nocturia

Guides Outcomes

• 22 item questionnaire
• Patient-completed
• Fully validated
• Red flags for all-cause nocturia

Nocturia - pathophysiology

- Low volume voids
- Polyuria
- Sleep disorder

Nocturia - pathophysiology

• Small volume voids
  • Detrusor overactivity
  • Impaired emptying
• Nocturnal polyuria
• Combination of these – common
  • $1^\circ$ sleep disturbance
• Defined on a bladder diary

TANGO Nocturia Screening Tool


Rose GE et al. Reliability testing of the TANGO Short Form nocturia screening tool. ANZJ. 2017; 23(3):68-74.
Bladder diary

72yo M: No surgery; PVR 20 ml
OAB – detrusor overactivity
NPI = 1335mL/1960mL = 68%

Hypertension and nocturia

• Clear association
  • In 11 of 15 identified papers
  • OR 1.30-2.68 with nocturia
  • Likely contribution from coexistent comorbidity

• As independent variable
  • Absence of comorbidity
  • No evidence nocturia predicts hypertension

Hypertension and nocturia

• Mechanisms
  • Mainly promoting nocturnal polyuria
  • Effects on glomerular filtration and tubular transport causing natriuresis (renin-angiotensin and prostaglandin systems)
  • Glomerular hyperfiltration
  • 2° related to hypertensive comorbidities

Circadian rhythm and BP

• Normal ↓ in nocturnal BP by at >=10 mm Hg
  • Mainly due to ↓ heart rate – physical activity, autonomic function, sodium sensitivity
  • Its absence = "non-dipping hypertension"
  • Occurs in 25% of hypertensives
  • Mechanism multifactorial

• Non-dipping hypertension
  • Definite association with nocturia
  • Possible mechanisms
    • ↑ renal perfusion
    • ↑ in nocturnal physical activity

Non-dipping hypertension

• Equates to nocturnal hypertension

• Associations
  • Chronic kidney disease
  • OSA
  • Heart failure
  • Metabolic syndrome

• Implications
  • Renal disease progression
  • Greater end-organ damage
  • ↑ cardiovascular mortality

Hypertension and SDB

• Obstructive sleep apnoea (OSA) associations
  • Obesity
  • ↑ SNS activity
  • Hypertension
  • Nocturia

• Nocturia predicts hypertension in OSA
  • Early morning hypertension predicts OSA
  • Rx for OSA is usually CPAP
  • ↓ in nocturia is then common

• In 11 of 15 identified papers
  • OR 1.30-2.68 with nocturia
  • Likely contribution from coexistent comorbidity

• As independent variable
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  • No evidence nocturia predicts hypertension
OSA and nocturia – proposed mechanisms

Orthostatic (postural) hypotension

- Feature of autonomic dysfunction
- Parkinson’s Disease a common cause
- Nocturnal polyuria very common
  - ↓renal perfusion when upright
  - ↑renal perfusion when supine

90yo Male

- Past History
  - Rheumatoid arthritis 1998
  - TURP 2004
  - Low-grade lymphoproliferative disorder – no Rx
  - Severe postural hypotension
  - Subsequent Dx of Parkinson’s Disease, and (later) dementia
  - Medications
    - Salazopyrine, sertraline.
    - Later levodopa

- LUTS
  - Daytime 6 - 10
  - Nocturia 4 - 8
  - Urgency usual
  - Urgency leakage >once a day
  - Voiding "normal"

Examination

- Blood pressure
  - Supine 180/95mmHg
  - Standing 120/80mmHg
  - No ankle oedema
- Void 135 mL
  - PFR 8 mL/s
  - PVR 25 mL
- Poor balance

Investigations

- Bladder diary
  - Voids 50-150mL daytime, up to 300mL nocte
  - Overnight output 780mL
  - NPi 61%
  - FUST as low as 1 hour
- Urinary tract US
  - Prostate volume 93ml
- Urodynamics
  - Detrusor overactivity
  - No obstruction

Formulation

- Nocturia
  - Detrusor overactivity
  - Nocturnal polyuria (due to postural hypotension)
- Poor balance
- (Dementia)
- Wife assisting with toileting

Management

- Detrusor overactivity
  - Caffeine limitation
  - Oxybutynin
  - Changed later to mirabegron because of cognitive decline
    - (Limit nocte fluid intake)
- Postural hypotension
  - Fludrocortisone
  - Midodrine
  - Below-knee compression
- Overall limited success re nocturia
Blood pressure profile 21/2/18

Values above the limit

Management

• Formulation
  • Nocturnal hypertension

• Treatment
  • Glyceryl trinitrate 25-50 mg transdermal patch
  • Overnight while in bed

• Outcome
  • ↓Nocturia
    • February 4-7 voids, average 5
    • May 0-6 voids, average 2

Blood pressure profile 28/5/18

Values above the limit

Hypotensives and nocturia

• Many studies show correlation

• Drug groups
  • diuretics
    • thiazides – long half life
    • loop diuretics – timing may be relevant
    • furosemide 6hrs before bed ↓nocturia
  • calcium channel blockers
    • fluid-retaining (especially amlodipine)
Hypertension and nocturia - Proposed mechanisms

Summary

- Are we meeting the needs of older people with nLUTS?
  - Nocturia is a marker for poor health
  - Blood pressure clearly associated with nocturia
  - Consider nocturnal hypertension in persisting nocturia
  - Review hypertension Rx regimen in persisting nocturia

References

Available on request:

michael.whishaw@mh.org.au

Hypertension and nocturia are linked by -

- Common causal pathways
- Peripheral oedema
- Increased glomerular filtration
- Pharmacotherapy effects

Hypertension and nocturia are linked by -

- Common causal pathways
- Peripheral oedema
- Increased glomerular filtration
- Pharmacotherapy effects
Postural hypotension should be actively identified in patients with nocturia because -

• Balance is related to nocturia
• It is often not clinically obvious
• It is a nocturnal phenomenon
• It is caused by hypovolemia

It is important to evaluate sleep quality in someone with nocturnal LUTS because -

• Sleep disruption means people toilet when their bladder is not full
• Sleep disruption can increase diuresis
• Needing to void early in the night is an important diagnostic marker
• There may be an environmental issue disrupting sleep