

The Conundrum....

Non-neuropaths with daytime urinary
incontinence -who needs Urodynamic Studies
(UDS)?

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Daytime wetting (non-neuropathic)

- Social embarrassment
- Frustration
- Exclusion
- Parental intolerance +/- anger (even punishing)
- Longer term psychological morbidity
- Cost

Controversy of UDS in wetters

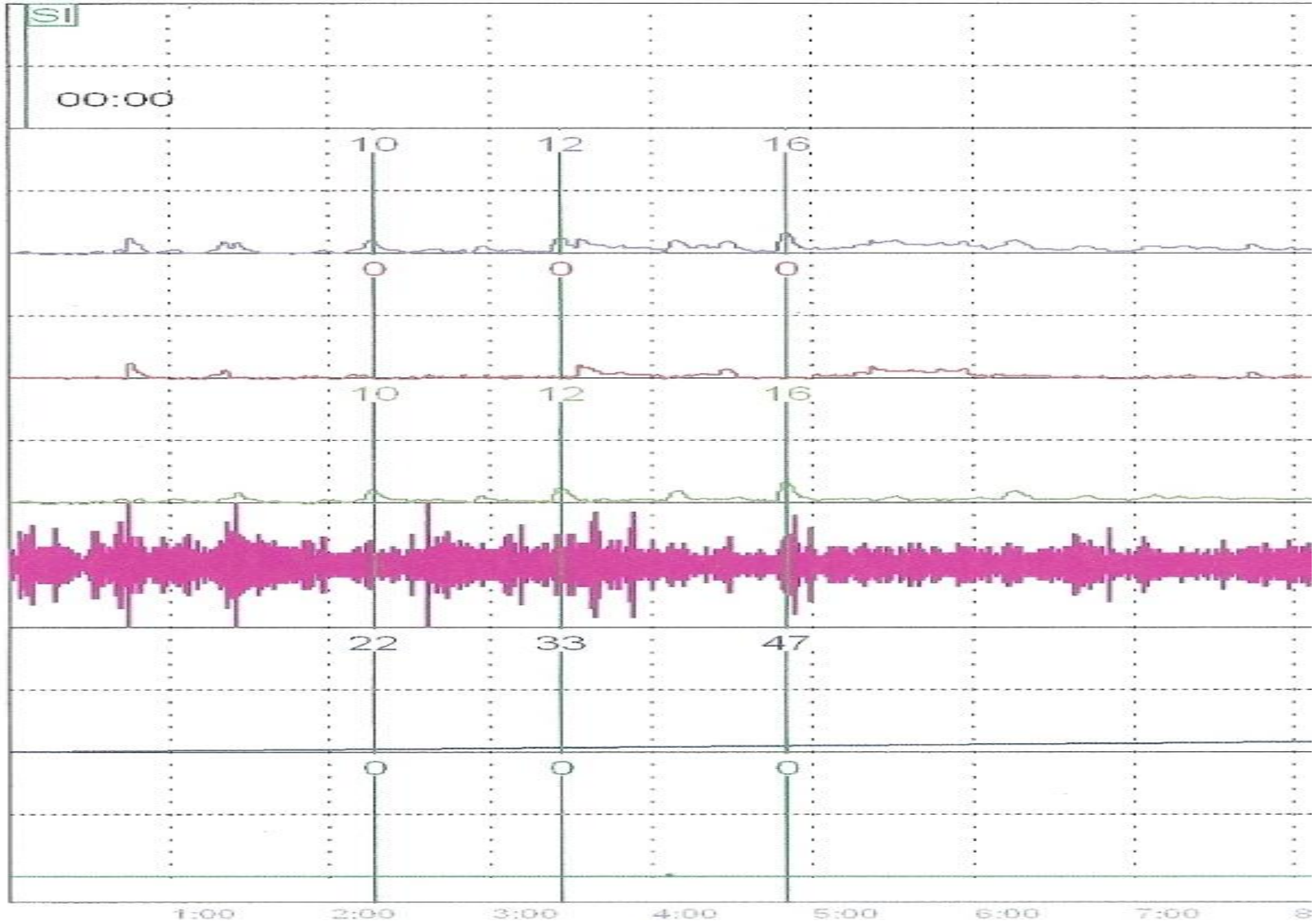
- UDS is an **invasive test**
- Urethral and rectally inserted transducer catheters, surface EMG
- Bladder filled with contrast
- Pressure measurements during fill (filling phase) and voiding (voiding phase)
- Repeats
- Radiation

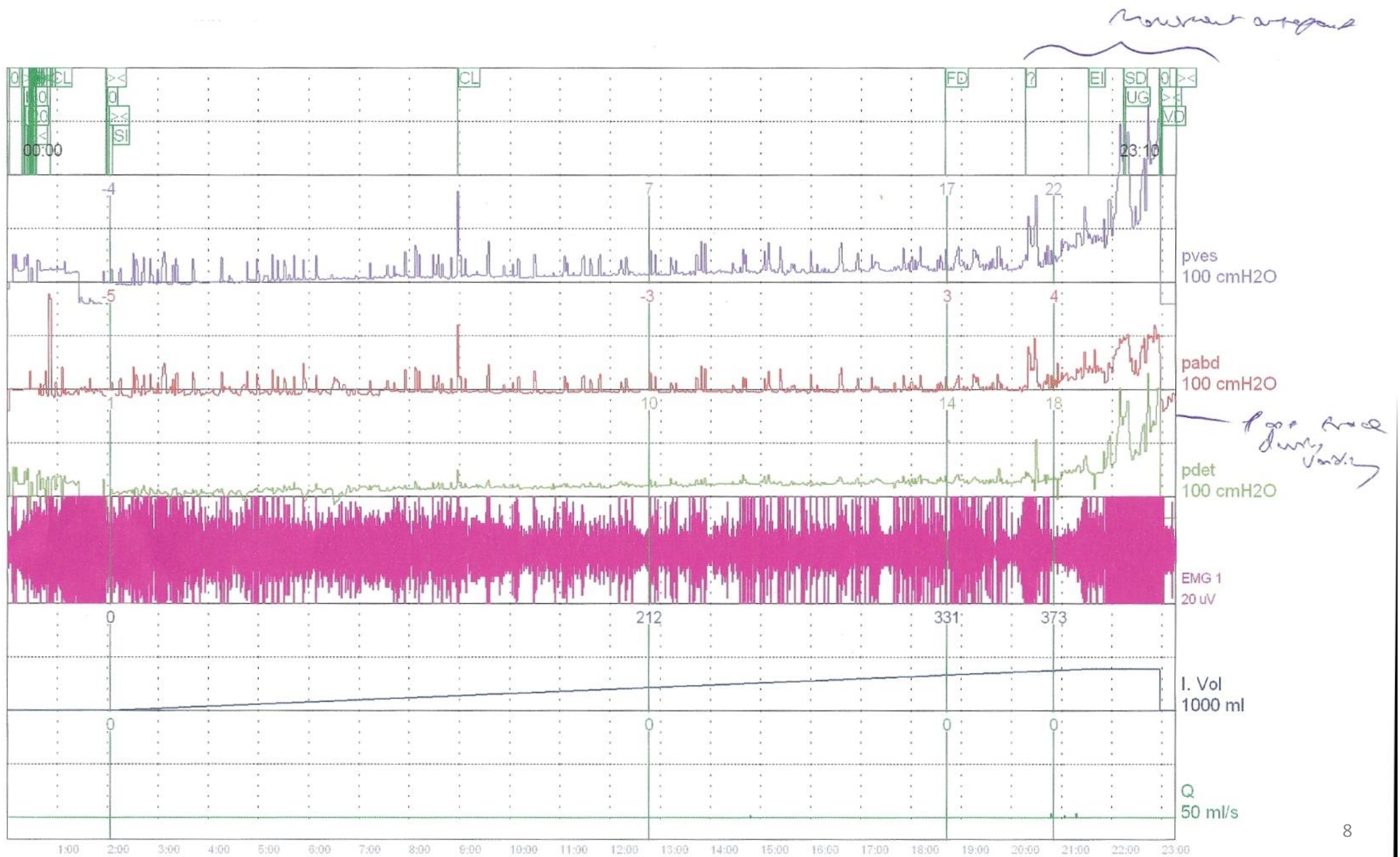
Not a perfect test

- Pitfalls
- Artifacts
- May not reproduce symptoms - none the wiser
- User-dependant
- Variation in interpretation of the UDS trace

UDS - historically useful

- Helped understand a whole range of bladder dysfunctions
- Observation of discrete, aberrant detrusor pressure patterns
- Create new meaningful descriptive terms
- Radiological findings: VUR, shape of bladder, bladder neck





What might the study pick up?

Storage

- Overactive Bladder / Urge Syndrome:
 - Detrusor overactivity during fill
 - Reduced compliance
- Sensory dysfunction (reduced or increased bladder sensations experienced)

Voiding

- Dysfunctional Voiding
 - Voiding abnormality with sphincter dyscoordination impeding normal voiding
- Incomplete bladder emptying

K Glassberg et al. J Urol 2010. Non-neurogenic voiding disorders in children and adolescents: clinical and videourodynamic findings in four specific conditions

4 distinct groups identifiable:

1. dysfunctional voiding
2. detrusor overactivity
3. detrusor underutilisation syndrome
4. primary bladder neck dysfunction

Hypothesised why the children with detrusor underutilisation syndrome are incontinent – likely intermittent DO not duplicated at time of UDS

Literature

- Data on similar groups of girls
- Do newer modalities obviate the need for UDS?
- Guidelines about patient selection for UDS
- Current thinking which may influence our current practice

One thousand video-urodynamic studies in children with non-neurogenic bladder sphincter dysfunction.

BJU Int (2001),87,575-80 [Hoebeke P¹](#), [Van Laecke E](#), [Van Camp C](#), [Raes A](#), [Van De Walle J](#).

Selection for UDS (over 4 year period): UTI, small capacity bladder not responding to training, dysfunctional uroflow, abnormal USS, resistance to therapy

- Largest group were UTI/VUR, nocturnal enuresis - n= 183
- Daytime urinary incontinence in girls: n=41 (mean age 8 yrs)

Results specific to female daytime incontinence:

- UDS normal in 10, urge 7, DV 8, “lazy bladder” 20

Conclusions:

- Age distribution of the different primary diseases provides evidence against progressive dysfunctional voiding sequence (DO eventually leading to lazy bladder – M Borzyskowski and R Mundy in 1987 - Archives)
- The risk of UTI is only greater in girls with NNBSD

Multicentre randomised controlled trial of cognitive treatment, placebo, oxybutynin, bladder training, and pelvic floor training in children with functional urinary incontinence.

Van Gool, de Jong, Winkler-Seinstra, Tamminen-Mobius, Nijman, Hoebeke, Walle, Bael, et al. Neurourol Urodyn 2014

Prospective study – children **already received standard therapy**

Group 1: Urge (69)

- Randomised - placebo, oxybutynin, biofeedback

Group 2: DV (82)

- Randomised - standard therapy alone or biofeedback

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Results:

Poor correlation between symptoms / UDS findings

Group 1: 33% had detrusor overactivity

Group 2: 53% had increased pelvic floor activity

Not much difference between the various therapies

Conclusion:

- **Cognitive therapy** is the key to success, not the added interventions

Conundrum:

UDS in older girls with daytime urinary incontinence

- Yes
- No
- In select groups?

UDS: Yes

Reason	Reference / Author	Date
To identify underlying cause of wetting To guide appropriate management Reassure family if normal	P Malone, Weerasingh	1993
If UTIs with voiding dysfunction (NB but no prior bladder/bowel management)	DB Glazier	1997
To raise possibility of neuropathic bladder and get “compelling” quantitative data used to expand management options	Kaufman	2006
“Almost mandatory” for severe or therapy resistant urinary tract dysfunction / VUR, but not for overactive bladder	BA Drzewiecki, SB Bauer	2011

UDS: No

Reason	Reference	Date
“Do not recommend” in children with voiding disorders as does not change therapy or influence final outcome	DJ Parekh, JW Brock	J Urol 2001
“Do not recommend” in children with non-neurogenic voiding dysfunction as does not change management or treatment. Time-consuming and not cost effective (correct diagnosis can be reached non-invasively)	T Soygur BJU Int	2004

UDS: Maybe?

Reason	Reference	Date
“Helpful in distinguishing the large number of children with normal findings whose problem was motivational”	Mayo B J Urol	1990
Only after excluding infravesical obstruction and emotional disturbances	G Passerini-Glazel	1992
“We might refrain from investigating children with non-neurogenic bladder-sphincter dysfunction urodynamically at least until standard therapy has been administered by trained urotherapist”	European Bladder Dysfunction Study	2010
Refractory only (treatment of choice standard therapy)	A Bael, T De Jong, P Hoebeke, RJ Nijman (EBDS)	2014
Only if outcome is likely to affect treatment or when treatment does not lead to intended outcome. For when surgical interventions are planned	ICCS standardization document Neurourol Urodyn	2015

Clues to the final answer to Conundrum:

- Constructed by experts (ICCS standardization committee 2015)
 - Reviewed all literature, pieced together best evidence
 - Assembled document
 - Suggested UDS in following groups of non-neuropaths (boys and girls):
 - Straining, manual expression to void
 - Weak stream
 - Urge incontinence unresponsive to proper elimination / +/- treatment
 - New or worsening VUR
 - In child who had MCUG showing abnormal ? Neuropathic bladder contour
 - Voiding frequency < 3 per day

Personal view

- Selective use only for **refractory** incontinence
- If surgical interventions planned and **acceptable** to child and family
- Role of Paediatric Urology Nurse:
 - Demystification of the problem - detailed explanations / counselling
 - non invasive studies with detailed assessment of flow rates with EMG, bladder neck opening times
- Search for comorbidities
 - The bladder – brain pathway signalling?
 - Major target area for future therapies – treating the underlying cause, not just symptom

UDS in older girls with Daytime Urinary Incontinence – Nottingham data

- Methods
 - Retrospective cohort (2008 – 2015) on prospective UDS database
 - All girls undergoing (first) UDS age > 10yr
 - Pure daytime wetting
 - Excluded: Neuropathic, VUR or predominantly UTI history, CP, anatomic anomalies
- Data collected (DHR / NOTIS)
 - Age at onset symptoms, other symptoms / factors
 - NIBA –
 - Results of UDS
 - Interventions and treatments based on UDS results
 - Outcome

Results

- Total 267 girls underwent UDS over last 8 years
- 53/276 (19.2%) UDS for refractory incontinence
- **20/267 (7.5%)** pure daytime wetting

- Age onset symptoms:
 - Median 11 years [5 – 15 years]

- Age at UDS
 - Median 14.7 years [10 – 17.6 years]

Results: other urinary symptoms and NIBA

- Urge symptoms
 - 8/16 had urgency (4 data not obtainable)
- Constipation
 - 13/20 data about bowels
 - 2/13 constipated
- NIBA
 - Not always done prior to UDS
 - 13 available

NIBA : n=13

- 2 were normal
- 4/13 normal bladder capacity, residual +
- 3/13 small bladder
- 3/13 large capacity bladder, 2 residual +, 1 fully emptying
- 1/13 ? capacity, residual +
- Altogether: 7 with post-void residuals

Results of UDS: Filling phase

- Filling Pressures:
 - 16/20 (80%) normal
 - 3/20 marginally impaired compliance (end-fill pressures < 20cm water)
 - 1/20 single episode detrusor overactivity (DO)
- Symptoms of wetting reproduced in study:
 - No: 15/20 (75%)
 - Yes: 5/20
 - 2 spontaneous with normal pressures, 3 with cough (ie SUI)

Results of UDS: Filling phase

- Sensory abnormality:
 - 7/20 (35%) had abnormal sensation during fill (2 increased sensation in absence of DO, 5 decreased)
- Cystometric capacity
 - 13/20 normal
 - 6 large capacity
 - 1 small bladder

Results of UDS: Voiding phase

- Very prolonged void / poor detrusor (2/20)
- 7/8 EMG active during void (all where available had large bladder +/- residuals on NIBA, or history of infrequent voiding)
- Bladder emptied to completion:
 - 18/20

Cystogram

- 18/20 normal
- 2/20: findings
 - 1 with left grade 2 VUR
 - 1 with open-looking bladder neck but not leaking

Follow up and outcomes

- Length follow up:
 - Median 25 months [2 – 82]
- 7 ongoing (3 PU, 2 PN, 2 transition / adult)
- 3 unsure (1 lost to FU, 2 moved elsewhere)

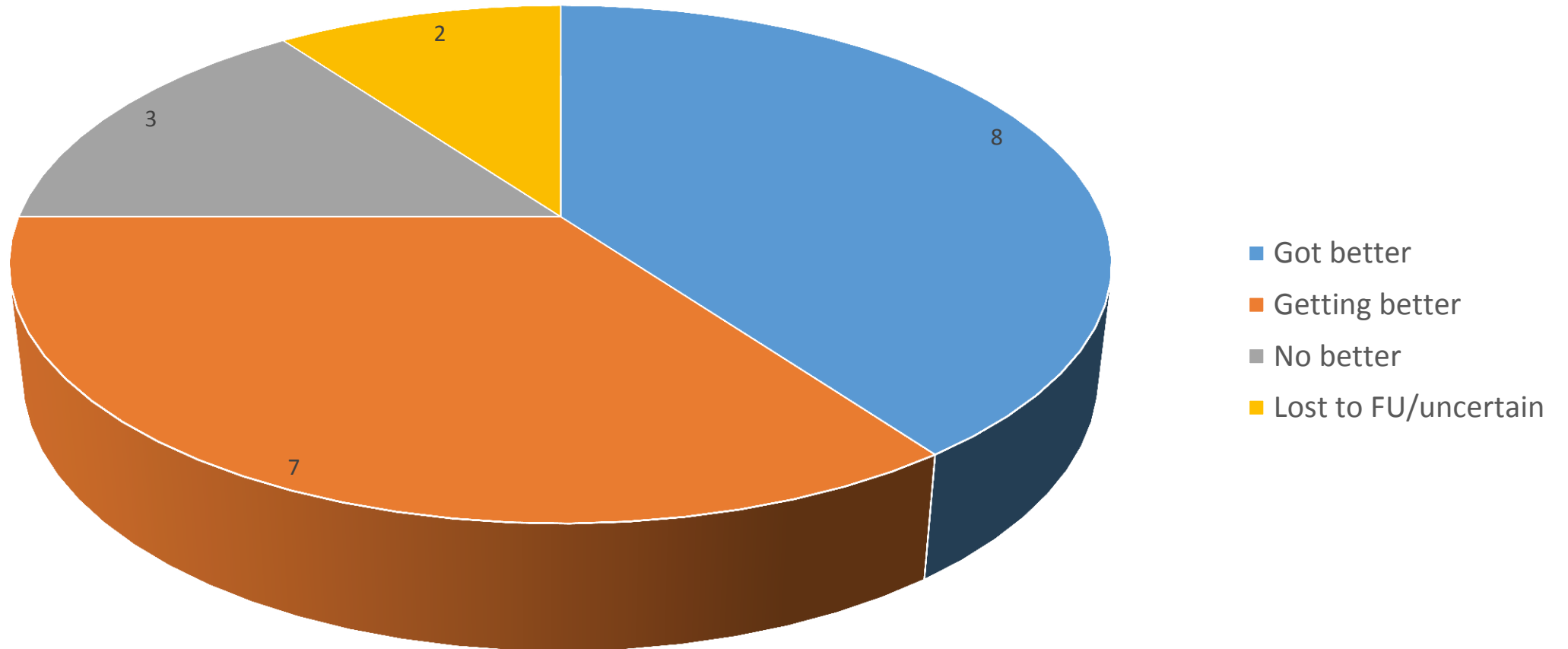
Surgical interventions and outcomes (n=4)

Patient (age at procedure)	Urodynamic Finding	Procedure	Outcome (length FU)
Case 1 (15 yr) (16 yr)	Stress urinary incontinence	1) Cystoscopy, injection of bulking agent to bladder neck 2) Autologous bladder neck sling	Voiding difficulty – residuals -CIC Improvement, UTIs under adult urologist UDS post sling: no leak on cough (5 yr)
Case 2 (16.5 yr)	Normal	Cystoscopy and injection bulking agent to bladder neck	DNAs Wet during exercise DNA NIBA (1 yr)
Case 3 (14.5 yr)	Spontaneous urinary incontinence + stress urinary incontinence	Cystoscopy (normal findings)	At 1 yr much better Small volume tolerable wetting (6 yr)
Case 4 (17 ^{3/4} yr)	Increased pressure during stand-otherwise normal pressures, poor detrusor contraction	Cystoscopy and intradetrusor Botulinum Toxin injection	2 week improvement; solifenacin, reduced bladder sensation, CIC No longer FU (moved) (2.5 yr)

Outcomes: treatments

- Oral medications (n=13)
- Biofeedback (n=6)
- Pelvic Floor training (n=6)
- TENS (n=2)
- CIC (n=1)
- No treatments (n=2, 1 overdrinker, 1 lost to FU)

Outcomes: overall



Summary of Nottingham data:

Older girls with refractory daytime urinary incontinence undergoing UDS (n=20)

- 80% normal pressures
- Wetting not demonstrated in 75% girls
- Good correlation between NIBA finding of large bladder +/- residuals, (or history of infrequent voiding), and UDS finding of DV (active EMG)
- In half (or more), there is problem with voiding (DV)
- Surgical intervention in 4/20
- At least 75% better / getting better at > 2 year FU

Current thinking: Importance of the bladder-brain connection

Social stress-induced bladder dysfunction with potential role for Corticotropin Releasing Factor. Am J Physiol Integr Comp 2009

- Resident-intruder rat model
- CRF upregulation at pontine micturition centre (PMC)
- CRF is inhibitory to spinal projections from the PMC which regulate the micturition reflex
- Intruder rats became subordinate and over time found to have dribbling incontinence, urodynamic changes (non-micturition detrusor contractions, urinary retention)
- Bladder became thickened
- CNS changes

Bladder-brain connection in humans?

- Evidence for psychiatric or psychological comorbidities in children (and adults) in voiding postponement + other disorders
- Social stimuli can ultimately cause neuronal and structural change
- Coping style area found in the periaqueductal grey neurons which feed into the PMC
- Central factors (arousal, focus and attention) can affect switch off focus towards elimination behaviours
- Children susceptible to certain stressors may develop abnormal bladder function
- ADHD
- We need to look for it

Reinventing the wheel

- Importance of the CNS
- Corticocentric vs Vesicocentric approach (I Franco)
- Treating underlying abnormality, not just symptoms
- Behaviour, attention, hyperactivity, anxiety, depression
- CNS can be modified by cognitive therapy
 - High cure with few relapse after 5 day inpatient intensive urotherapy including behavioural

?