

Diagnosing Bladder Problems. What is normal and what is not.

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Thanks to Mr O'Flynn
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Overview

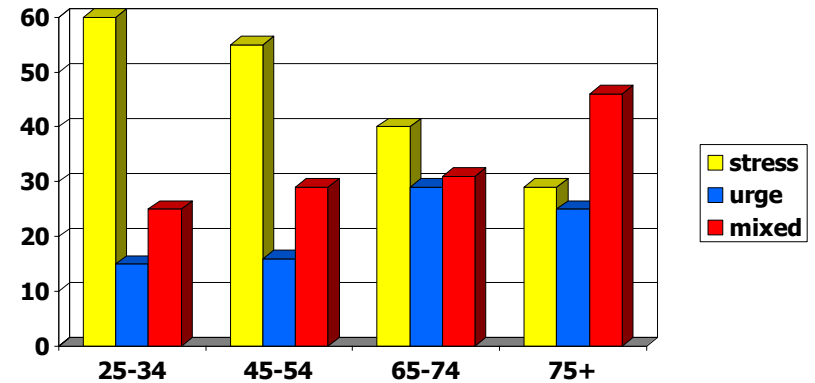
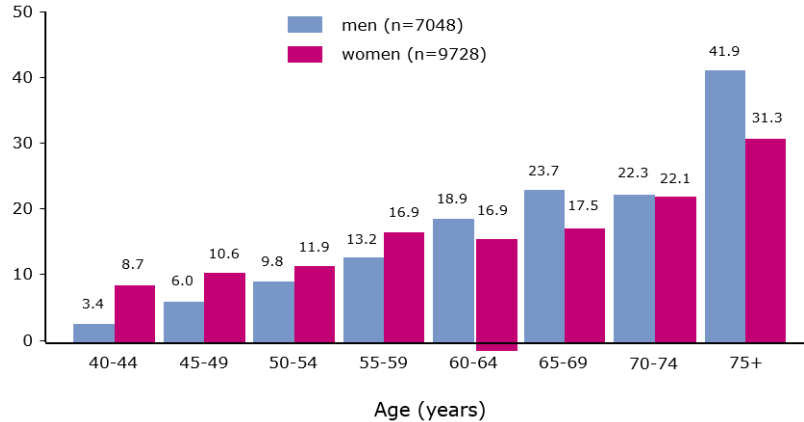
- Anatomy of lower urinary tract
- Physiology of micturition
- Bladder conditions
 - definitions
- Assessment of the patient
- The use of specialist tests

Why?

- Urinary incontinence (UI) is a common problem at all ages
- 1 in 4 women and 1 in 9 men will suffer UI that at some point will affect their quality of life
- OAB affects more people than many other chronic diseases in Europe
- 70% of UI sufferers do not seek medical attention
- Takes up to 4 years for UI sufferers to seek help
- SUI affects 13 million women in US

Why?

% prevalence

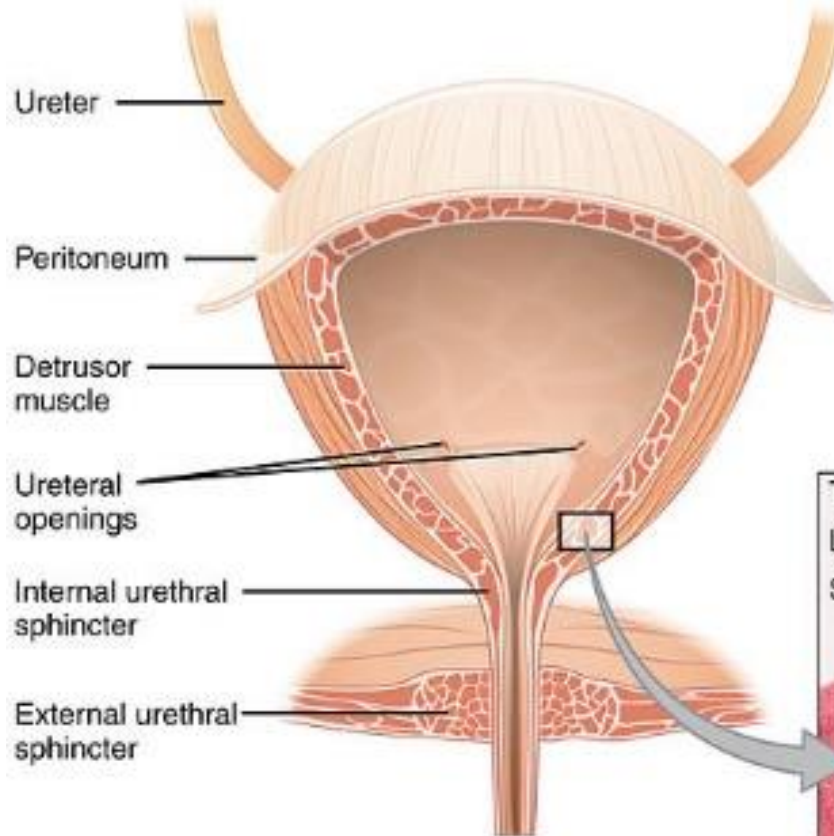


Prevalence of OAB in different age groups

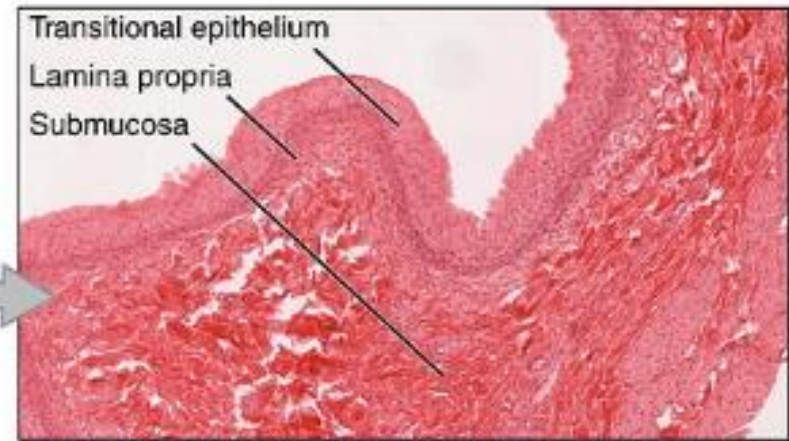
Milsom, Eur Urol, 2007

Prevalence of incontinence in women

Bladder Anatomy



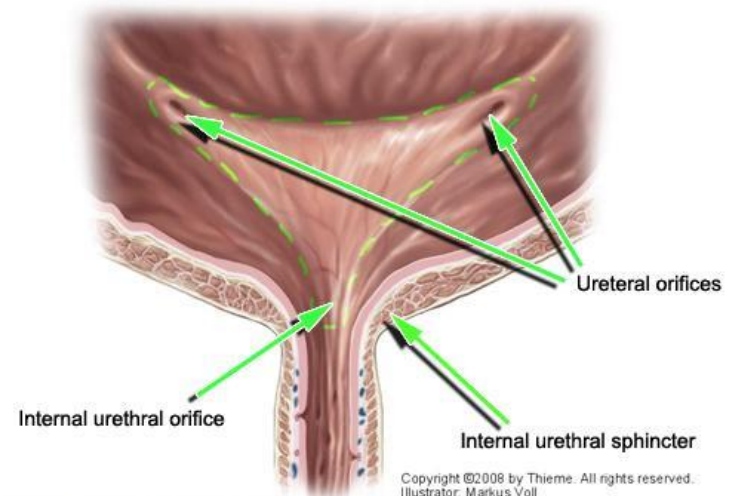
(a)



(b)

The Trigone

- Small, muscular triangular area at the posterior wall of bladder
- 2 ureters enter bladder at supero-lateral angles, lowermost apex is opening of bladder neck



Female Urethra

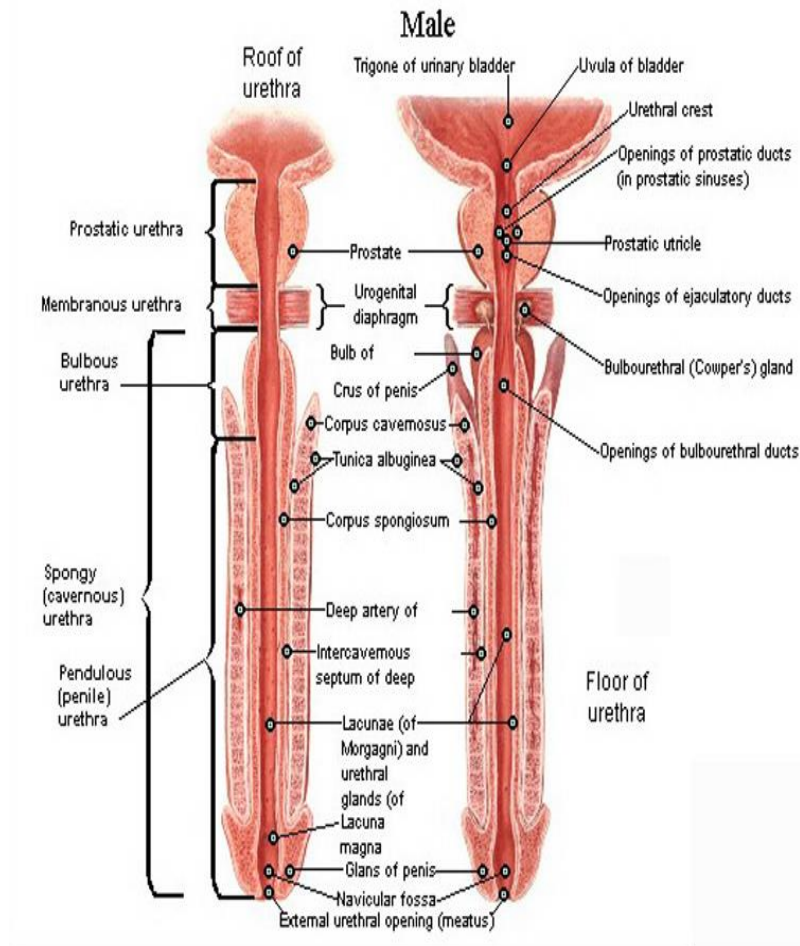
- Fibromuscular tube
- ~3.5cm long
- Outer striated muscle fibres
- Inner smooth muscle fibres lined by mucosa
- Urethral meatus between clitoris and vaginal opening



Female Urethral Sphincter

- Smooth muscle sphincter (bladder neck and urethra)
 - Physiological but not anatomical sphincter
 - Involuntary control
- Proximal striated muscle sphincter (rhabdosphincter)
 - Voluntary control

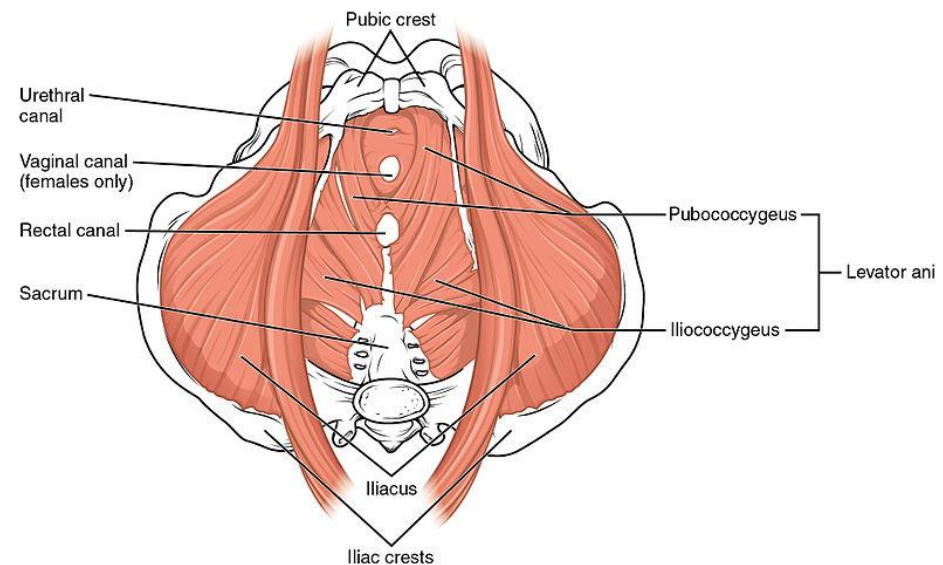
Male Urethra



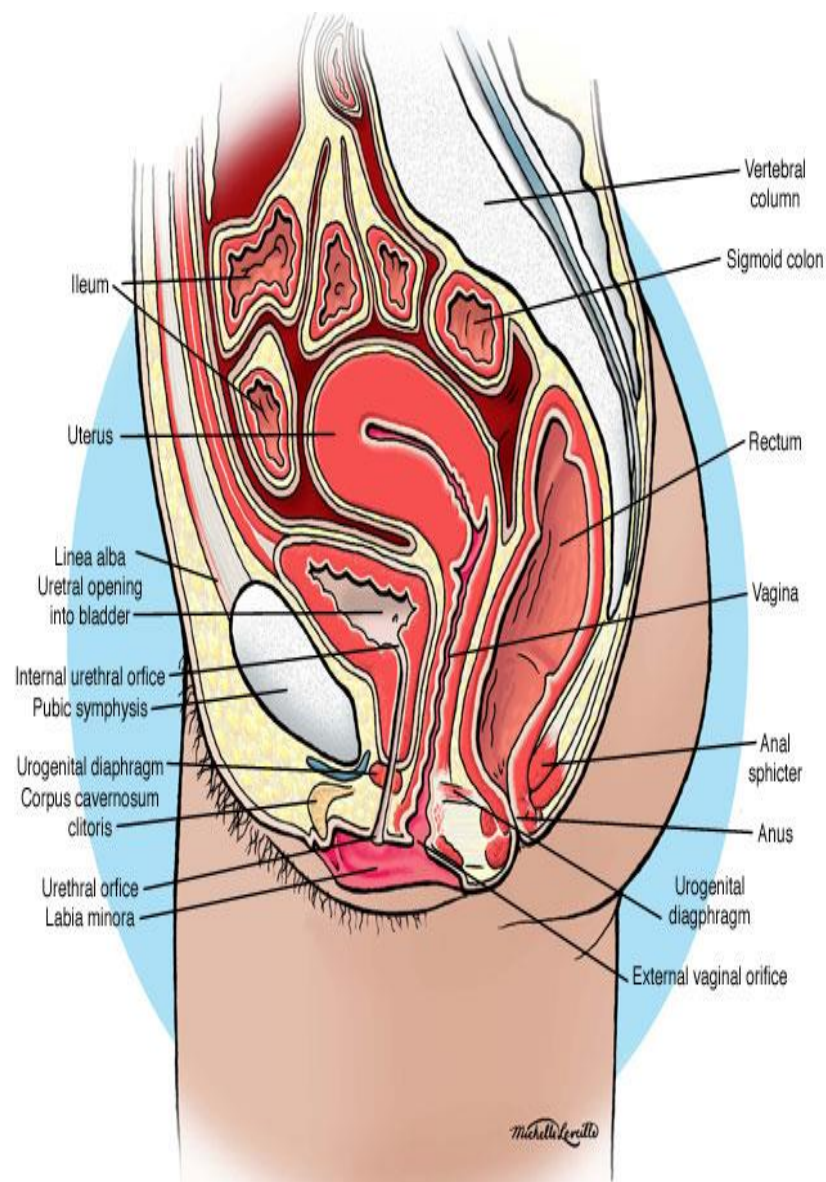
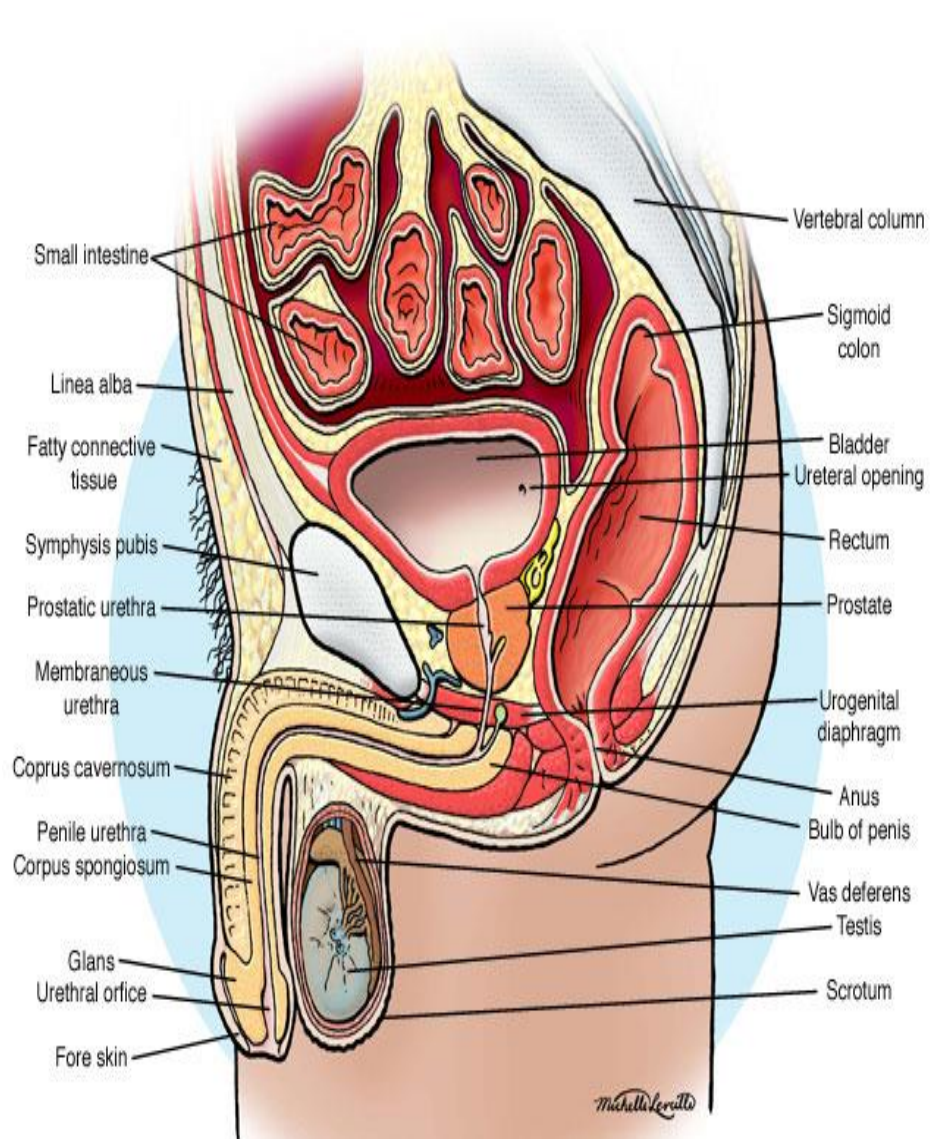
- ~20cm
- Prostatic, membranous, bulbar, spongy / penile
- Navicular fossa
- Prostatic lined by transitional epithelium, distal penile – squamous
- External sphincter surrounds membranous urethra

The Pelvic Floor Muscles

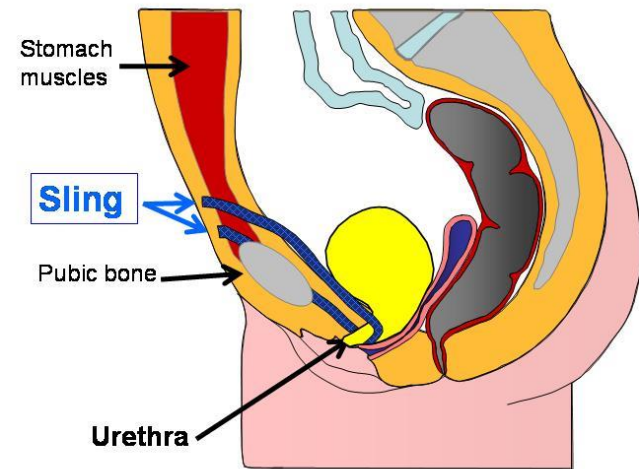
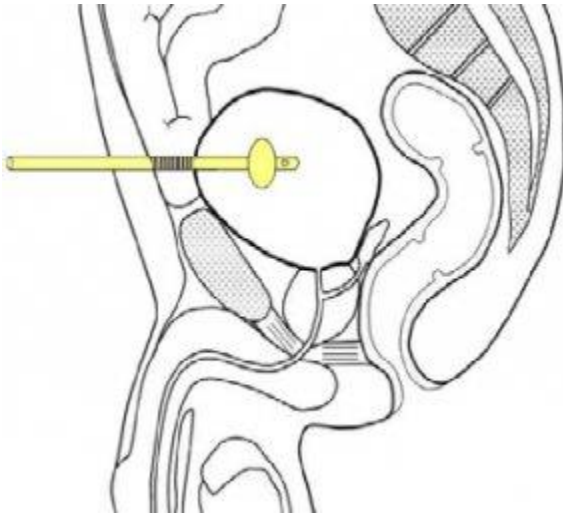
- Pelvic organs supported + maintained in correct position by pelvic floor
- Composed mainly of levator ani group of muscles and covered by endopelvic fascia
- Levator ani muscles have constant activity



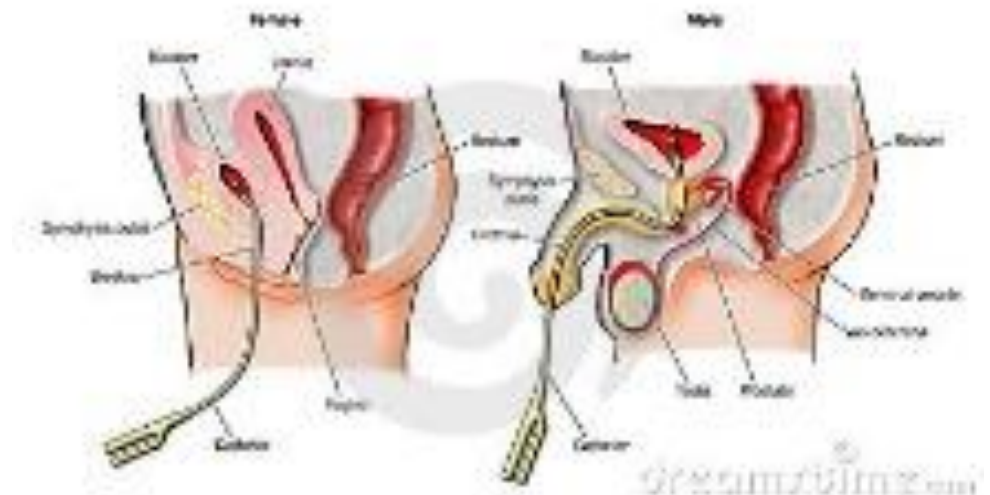
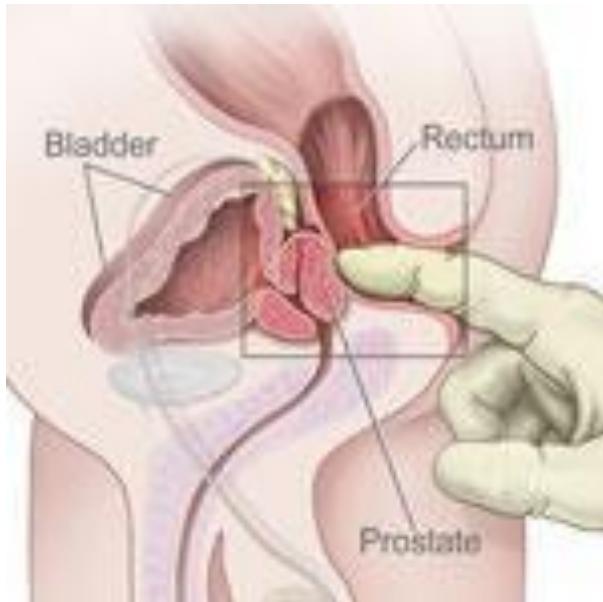
Pelvic diaphragm (superior view)



Why is anatomy important?



JP Theofrastous 2004



Lower Urinary Tract Physiology

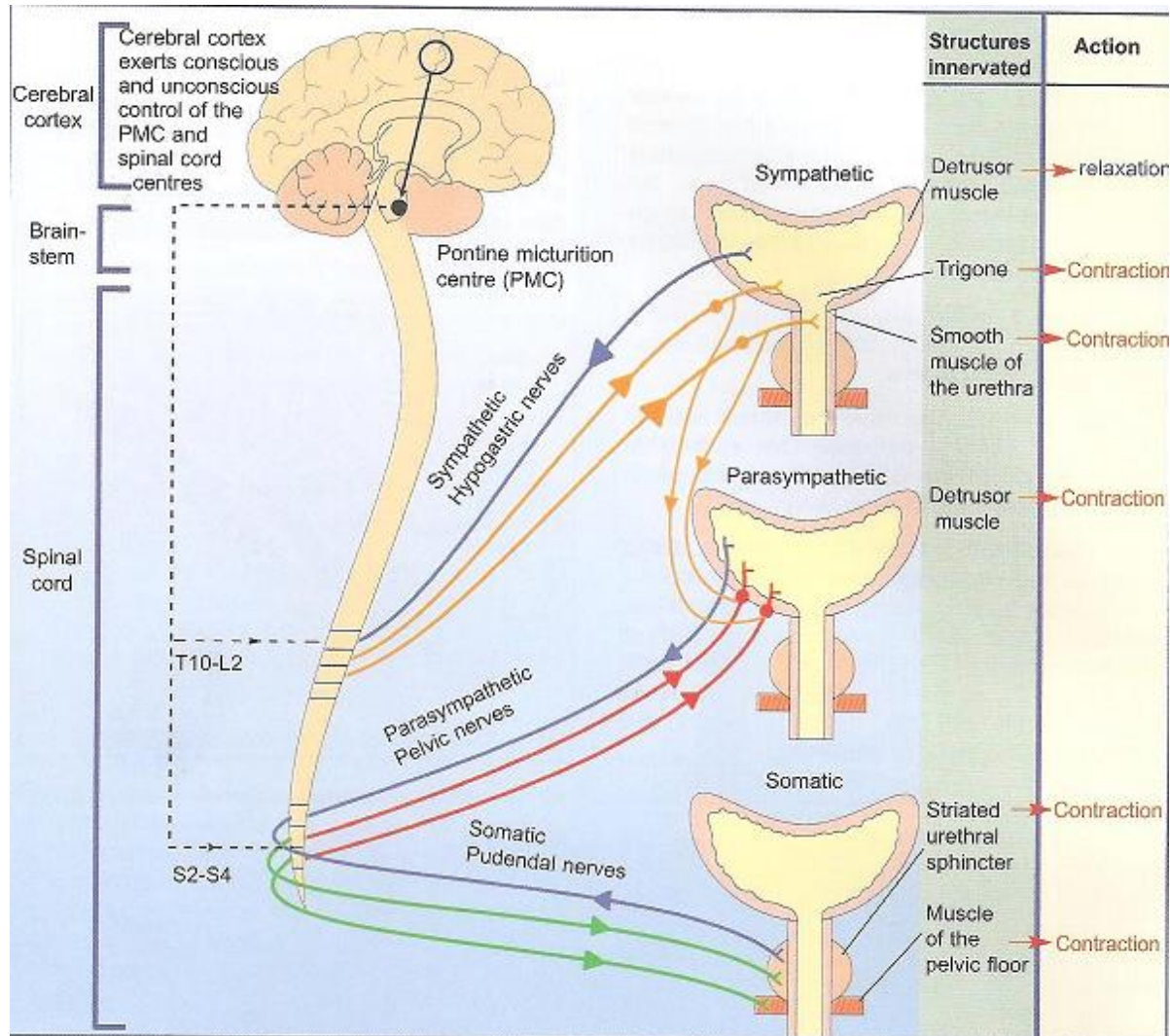
Purpose of control

- Low pressure storage of urine
- Expulsion of urine at an appropriate time and place

Mechanisms which allow this

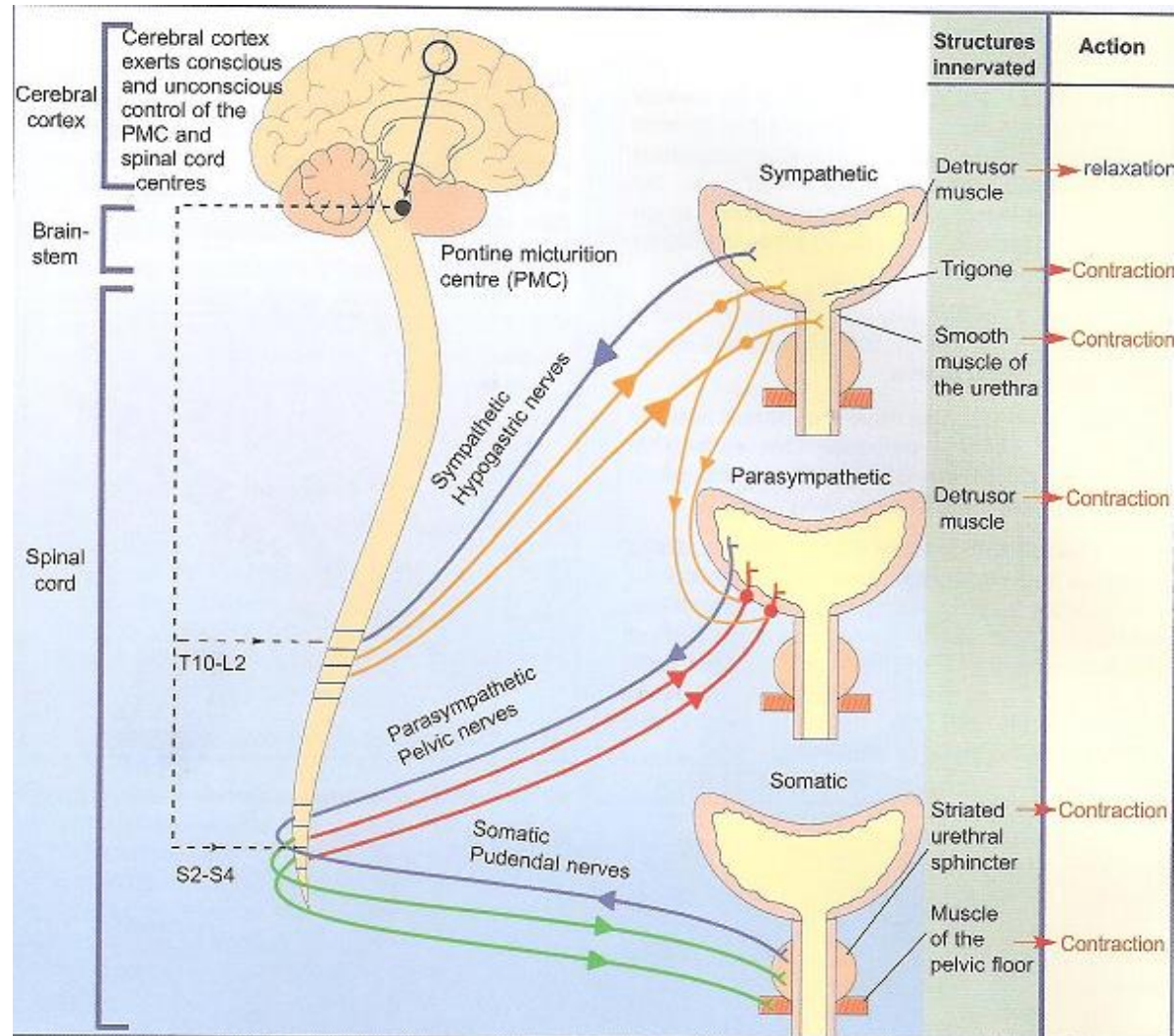
- Receptive relaxation
- Sense of fullness
- Maintenance of continence
- Voluntary initiation of voiding

Innervation of the LUT



- Sympathetic nerves originate in thoracolumbar spinal cord, travel through hypogastric nerves
 - Contraction of smooth muscle of urethra + bladder base, inhibition of detrusor contraction
- Parasymp. nerves from sacral spinal cord (S2-4), spinal micturition centre
 - Contraction of detrusor
- Somatic motor innervation from Onuf's nucleus, travels in pudendal nerve
 - Contraction of urethral external sphincter

Innervation of LUT

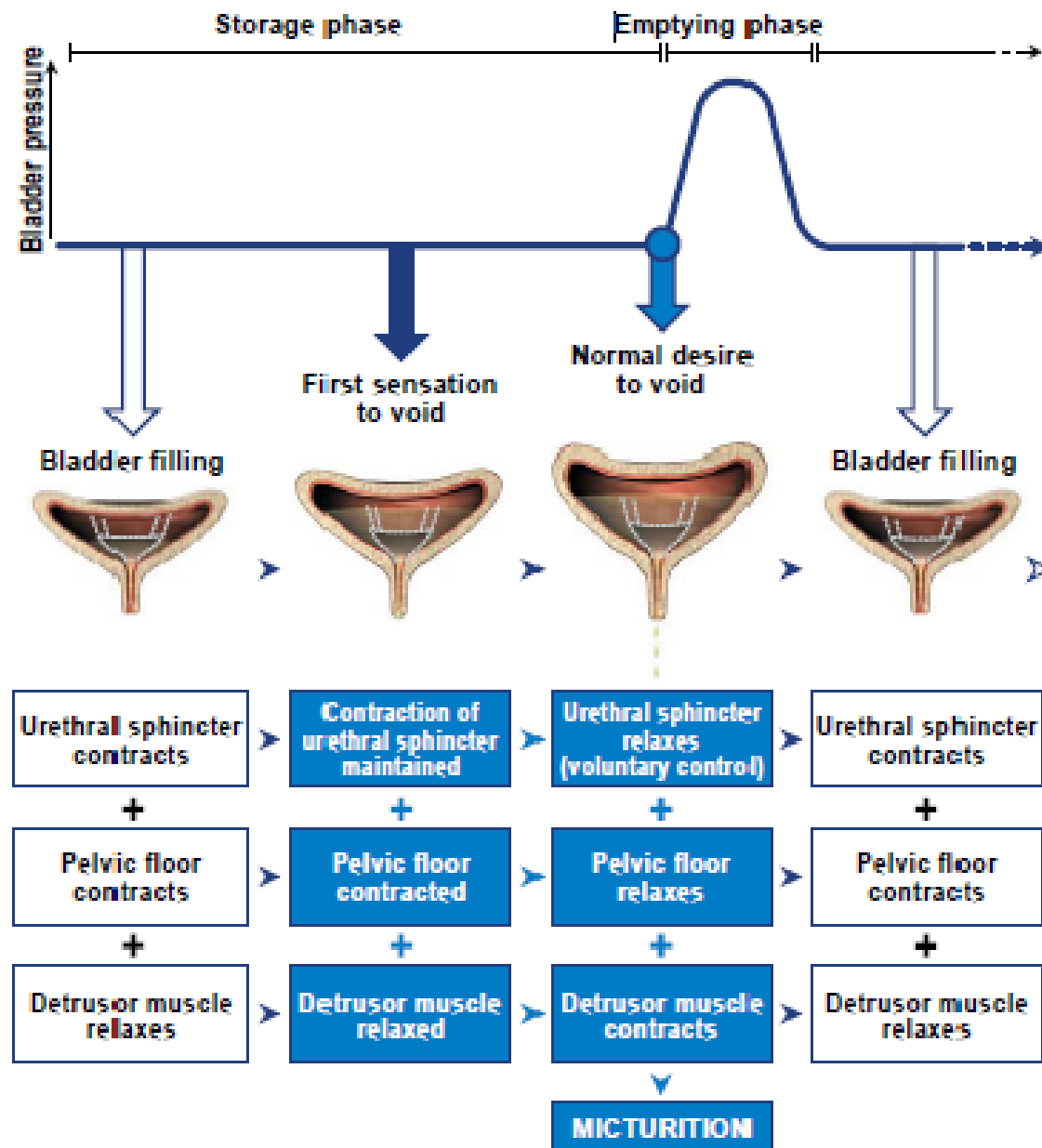


Higher Central Innervation

- Pontine micturition centre (PMC) in brainstem co-ordinates micturition process
 - Storage mode – inhibition of parasymp innervation + activation of somatic nerves
 - Micturition mode – activation of parasymp innervation and inhibition of somatic nerves
- Higher brain centres exert conscious + unconscious control of PMC + spinal centres. Critical to delay voiding until socially acceptable

Neurotransmitters

- Glutamate, serotonin, noradrenaline + acetylcholine – all act centrally, NA + ACh also act peripherally
- ACh is major peripheral neurotransmitter
- Storage phase mediated peripherally by NA + ACh ($\beta 3$ and $\alpha 1$ adrenoreceptors)
- Voiding phase mediated peripherally by ACh
- Storage / micturition cycle co-ordinated by spinal + supraspinal centres mediated by the 4 neurotransmitters (glutamate)



The Micturition Cycle

THE STANDARDISATION OF TERMINOLOGY IN LOWER URINARY TRACT FUNCTION: REPORT FROM THE STANDARDISATION SUB-COMMITTEE OF THE INTERNATIONAL CONTINENCE SOCIETY

PAUL ABRAMS, LINDA CARDOZO, MAGNUS FALL, DEREK GRIFFITHS, PETER ROSIER,
ULF ULMSTEN, PHILIP VAN KERREBROECK, ARNE VICTOR, AND ALAN WEIN

Bladder problem definitions

Definitions – LUTS - storage

- **Urinary incontinence** – a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrated
- **Urgency** – a sudden compelling desire to pass urine which cannot be deferred
- **Urge incontinence** – involuntary leakage of urine with a feeling of urgency
- **Stress urinary incontinence** – involuntary leakage of urine on exertion
- **Mixed incontinence** – involuntary leakage of urine associated with urgency and also with exertion

Definitions – LUTS – storage 2

- **Frequency** – the complaint by the patient who considers he/she voids too frequently during the day
- **Nocturia** – the complaint that the individual has to wake one or more times at night to void
- **Nocturnal enuresis** - any involuntary loss of urine occurring during sleep

Definitions – LUTS - voiding

- **Slow stream** – reported by the individual as their perception of reduced urine flow, usually compared to previous performance or others
- **Splitting / spraying of urine**
- **Intermittent stream** – urine flow which stops and starts on one or more occasions during micturition

Definitions – Urodynamic Diagnosis

- **Detrusor Overactivity** – involuntary detrusor contractions during the filling phase which may be spontaneous or provoked
 - Idiopathic – no clear cause
 - Neurogenic – due to a relevant neurological condition
- **Urodynamic stress incontinence** – involuntary leakage of urine during increased abdominal pressure in the absence of a detrusor contraction

Definitions

- **Bladder pain syndrome** – complaint of an unpleasant sensation (pain, pressure) perceived to be related to bladder filling accompanied by other LUTS in the absence of proven UTI or other obvious pathology

History - Aims

- Determine
 - Nature, onset and progression of symptoms
 - Impact on quality of life
- Guide investigation and management
- Assist counselling
 - Assess patient expectations
 - Potential complications
- Evaluate response to treatment

History

- LUTS
- Gynaecological / obstetric history
- Medical / surgical history
- Systemic enquiry
- Current drugs and previous treatments
- Quality of life

LUTS

- Storage symptoms
 - Frequency, nocturia, urgency, nocturnal enuresis, urinary incontinence, bladder sensation
- Voiding symptoms
 - Hesitancy, straining, slow / intermittent stream
- Post-micturition symptoms
 - Incomplete emptying, post micturition dribbling

Gynaecological History

- Menstrual history
- Obstetric history
- Menopause
- Symptoms associated with sexual intercourse
- Symptoms of pelvic organ prolapse
- Previous continence or prolapse surgery
- Radical hysterectomy, radiotherapy

Past Medical History

- Major abdominal / pelvic surgery
- Surgery to spine, large bowel (neurological injury)
- Neurological diseases
- Chronic cough, constipation (↑ intra-abdominal pressure)
- Cardiac / renal failure (polyuria)
- Metabolic conditions eg diabetes
- Psychiatric morbidity
- UTI

Systemic Enquiry / Other

- Neurological symptoms
- Bowel disturbance
- Chronic cough
- Fluid intake
- Pain

- Social history
 - Occupational, domestic, social, psychological

Drug History

- Diuretics
- Sedatives
- Autonomically active drugs
- Antimuscarinic agents



Quality of Life

- Generic questionnaires
 - Nottingham Health Profile
- Condition specific questionnaires
 - King's health questionnaire
 - Urogenital distress Inventory (UDI)
 - ICI Modular Questionnaires (ICI-Q)

ICIQ-SF

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
DAY		MONTH		YEAR	

Initial number

CONFIDENTIAL

Today's date

Many people leak urine some of the time. We are trying to find out how many people leak urine, and how much this bothers them. We would be grateful if you could answer the following questions, thinking about how you have been, on average, over the PAST FOUR WEEKS.

1 Please write in your date of birth:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
DAY		MONTH		YEAR	

2 Are you (tick one):

Female ☐ Male ☐

3 How often do you leak urine? (Tick one box)

- | | | |
|---------------------------------|--------------------------|---|
| never | <input type="checkbox"/> | 0 |
| about once a week or less often | <input type="checkbox"/> | 1 |
| two or three times a week | <input type="checkbox"/> | 2 |
| about once a day | <input type="checkbox"/> | 3 |
| several times a day | <input type="checkbox"/> | 4 |
| all the time | <input type="checkbox"/> | 5 |

4 We would like to know how much urine you think leaks.How much urine do you usually leak (whether you wear protection or not)?

(Tick one box)

- | | | |
|-------------------|--------------------------|---|
| none | <input type="checkbox"/> | 0 |
| a small amount | <input type="checkbox"/> | 2 |
| a moderate amount | <input type="checkbox"/> | 4 |
| a large amount | <input type="checkbox"/> | 6 |

5 Overall, how much does leaking urine interfere with your everyday life?

Please ring a number between 0 (not at all) and 10 (a great deal)

0	1	2	3	4	5	6	7	8	9	10
not at all										a great deal

ICIQ score: sum scores 3+4+5

6 When does urine leak? (Please tick all that apply to you)

- | | |
|--|--------------------------|
| never – urine does not leak | <input type="checkbox"/> |
| leaks before you can get to the toilet | <input type="checkbox"/> |
| leaks when you cough or sneeze | <input type="checkbox"/> |
| leaks when you are asleep | <input type="checkbox"/> |
| leaks when you are physically active/exercising | <input type="checkbox"/> |
| leaks when you have finished urinating and are dressed | <input type="checkbox"/> |
| leaks for no obvious reason | <input type="checkbox"/> |
| leaks all the time | <input type="checkbox"/> |

Thank you very much for answering these questions.

Physical Examination

- Correlate history with physical findings
- Identify systemic factors
- Evaluate pelvic floor supports
- Develop a management plan
- Assess outcome after treatment

Physical Examination

- General examination
 - Mental state
 - Dexterity
 - Overall health
- Abdominal examination
- Gynaecological examination
- Neurological assessment



Abdominal Exam

- Hernia / surgical scars
- Loin / suprapubic tenderness
- Palpable bladder
- Abdominal masses
- Rectal / vaginal examination



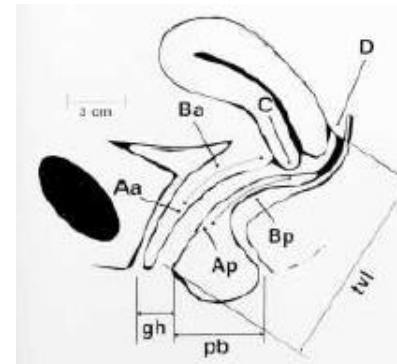
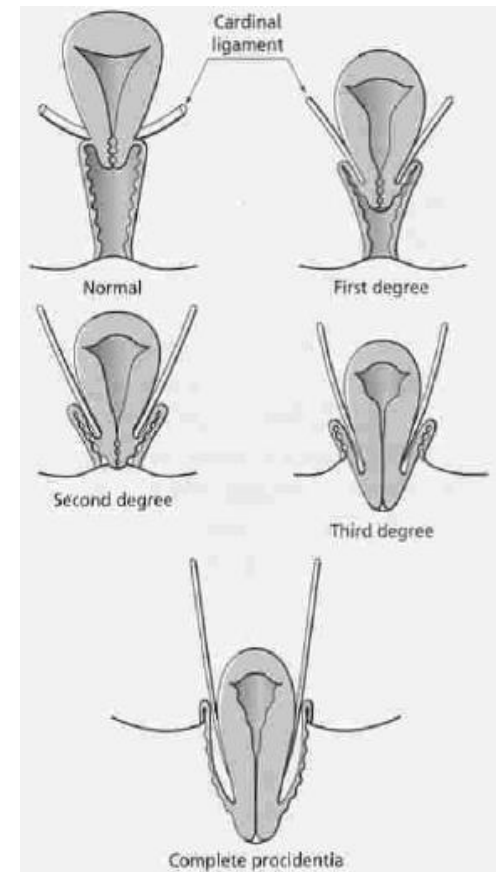
Gynaecological Examination

- Vulval skin
 - Excoriation, erythema, atrophy / oestrogenisation
- Cough Test
 - Stress incontinence
- Valsalva manoeuvre
 - Vaginal prolapse
- Pelvic floor tone
 - Oxford scale (0-5)



Vaginal Prolapse

- Anterior compartment
 - Urethrocele
 - Cystocele
- Superior compartment
 - Uterine
 - Vault
- Posterior compartment
 - Enterocoele
 - Rectocele



anterior wall	anterior wall	cervix or cuff
Aa	Ba	C
genital hiatus	perineal body	total vaginal length
gh	pb	TVL
posterior wall	posterior wall	posterior fornix
Ap	Bp	D

Pelvic Floor Tone

Oxford Score

0 – nil

1 – flicker

2 – weak

3 – moderate

4 – good

5 - strong

Oslo

- Absent
- Weak
- Strong



History + Examination Summary

- May not give accurate diagnosis in many cases
- Does not give an assessment of severity of the problem
- Starting point for initial management
- Guide to need for further investigation

Initial Investigations

- Urine testing
- Flow rate and assessment of residual urine
- Bladder charts

Urine Testing

- Urine dipstick
 - Blood, glucose, leucocytes, nitrites, protein
- Microscopy, culture and sensitivity

Bladder Diaries + Frequency Volume Charts

- Adjunct to history
- Unbiased by patient recall
- Allows evaluation of
 - Urine output
 - Frequency of micturition and nocturia
 - Mean and variance of voided volumes
 - Severity of incontinence (frequency, pad use)
 - Represents variations in activity

This diary will help you and your health care team figure out the causes of your bladder control trouble. The “sample” line shows you how to use the diary.

Date: _____

Time	Drinks		Trips to the Bathroom			Accidental Leaks			Did you feel a strong urge to go?	What were you doing at the time?	
	What kind?	How much?	How many times?	How much urine? (circle one)			How much? (circle one)			Circle one	Sneezing, exercising, having sex, lifting, etc.
Sample	Coffee	2 cups	✓✓	<input checked="" type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input checked="" type="radio"/> med	<input type="radio"/> lg	Yes <input checked="" type="radio"/> No	Running
6-7 a.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
7-8 a.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
8-9 a.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
9-10 a.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
10-11 a.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
11-12 noon				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
12-1 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
1-2 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
2-3 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
3-4 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
4-5 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
5-6 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	
6-7 p.m.				<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	<input type="radio"/> sm	<input type="radio"/> med	<input type="radio"/> lg	Yes No	

[illegible]

Uroflowmetry

- “non-invasive determination of the characteristics of urine flow”
- Simplest UD technique
- Equipment - several flowmeters available
 - Gravimetric
 - Rotating disc
 - Capacitance

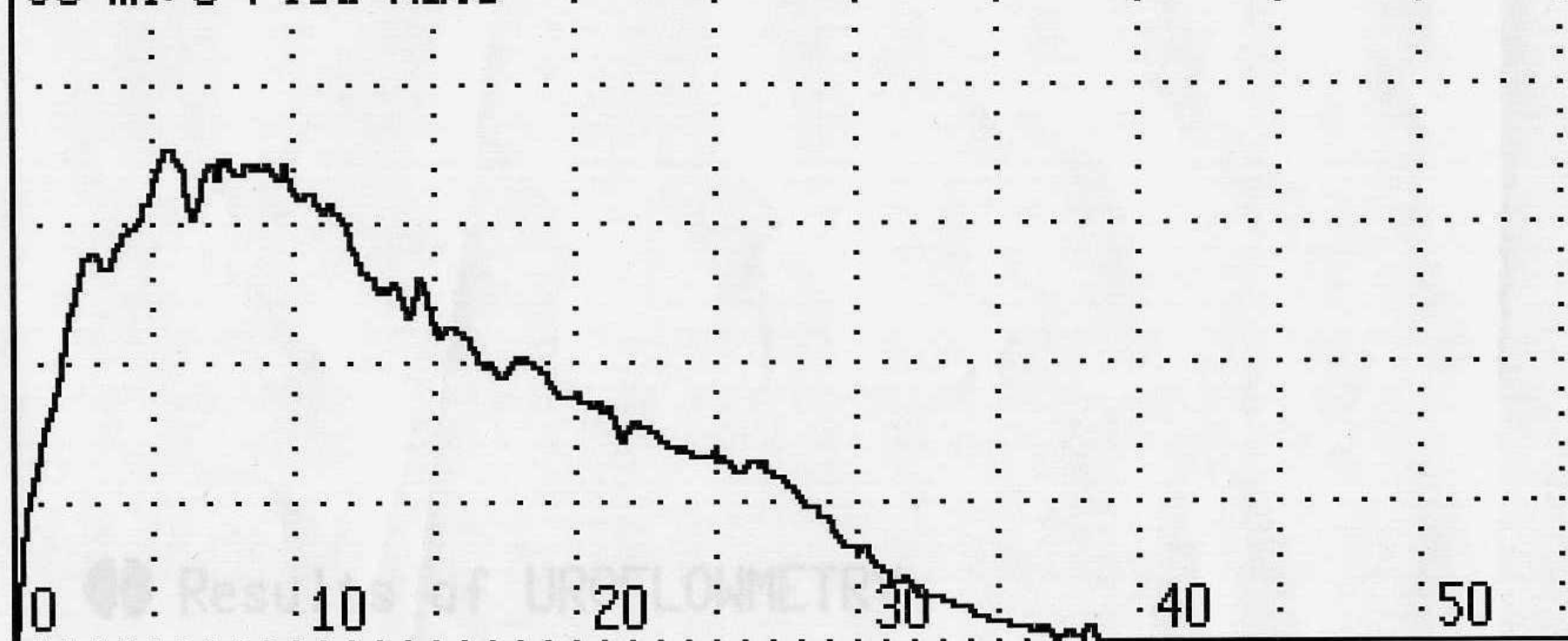
Uroflowmetry Definitions

- Flow rate - 'volume expelled per urethra per unit time'
- Q_{max} - 'maximum flow rate'
- VV - 'total volume expelled per urethra'
- Flow time - 'time over which measurable flow occurs'
- Time to maximum flow
- Voiding time - 'total duration of micturition'

Uroflowmetry Interpretation

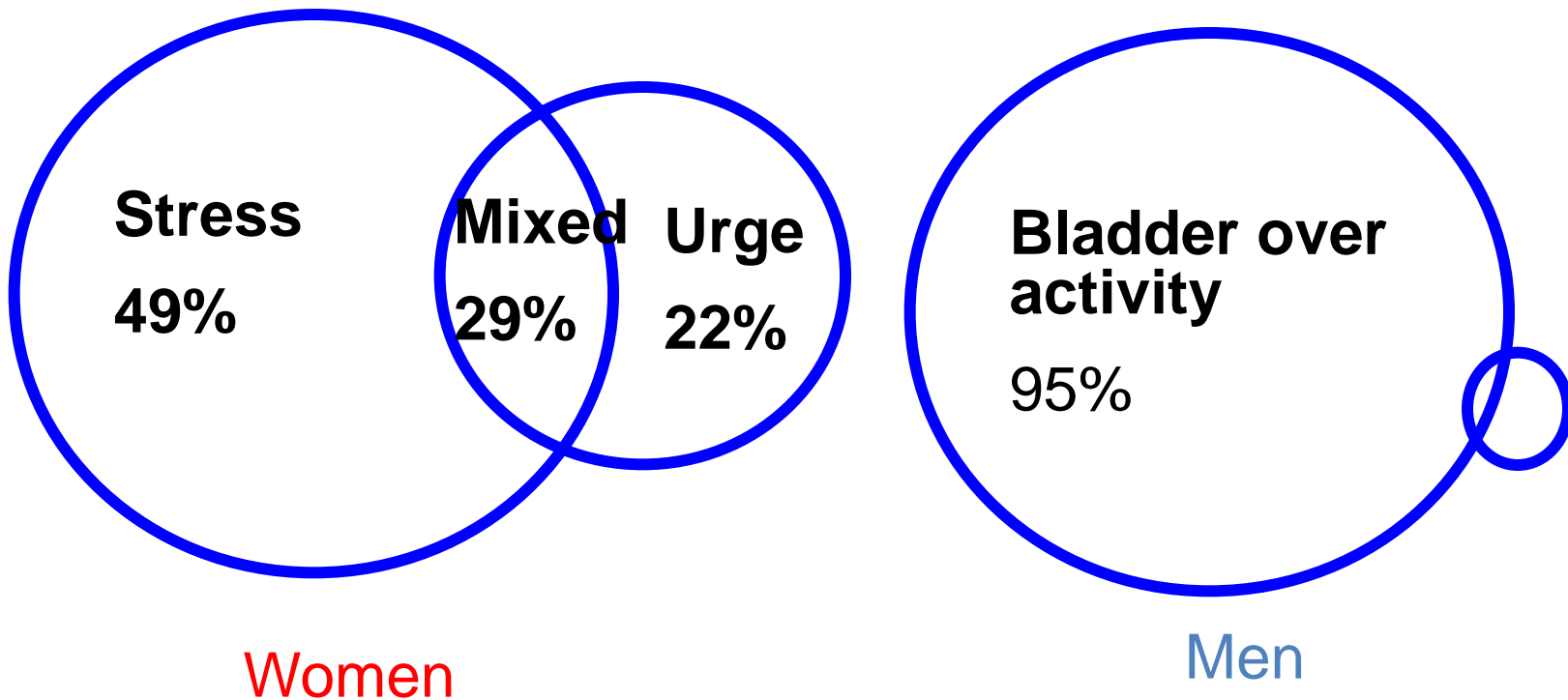
- Age, sex and voided volume accounted for
- Bell shaped
- Qmax reached within 5 secs or first 30% of void
- Shape of trace varies with voided volume but initial and terminal phases similar
- Qmax most reliable variable

50 ml/s Flow Rate



Voiding Time	T100	38	s
Flow Time	TQ	38	s
Time to max Flow	TQmax	5	s
Max Flow Rate	Qmax	35.4	ml/s
Average Flow Rate	Qave	17.7	ml/s
Voided Volume	Vcomp	669	ml

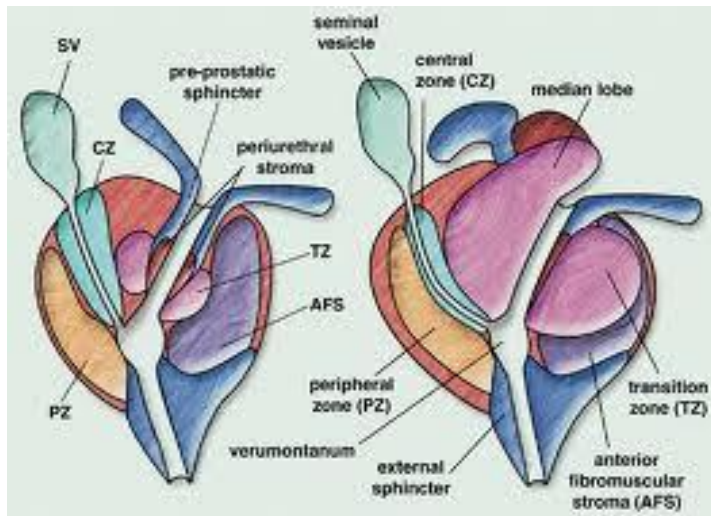
Urinary Incontinence



Hampel C, et al, Urology
1997;50(suppl 6A);4-14.

Men

- International Prostate Symptom Score (IPSS)
- Severe LUTS considerably affect QoL
- ? Check PSA



International Prostate Symptom Score (I-PSS)

Patient Name: _____ Date of birth: _____ Date completed: _____

In the past month:	Not at All	Less than 1 in 5 Times	Less than Half the Time	About Half the Time	More than Half the Time	Almost Always	Your score
1. Incomplete Emptying How often have you had the sensation of not emptying your bladder?	0	1	2	3	4	5	
2. Frequency How often have you had to urinate less than every two hours?	0	1	2	3	4	5	
3. Intermitteency How often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
4. Urgency How often have you found it difficult to postpone urination?	0	1	2	3	4	5	
5. Weak Stream How often have you had a weak urinary stream?	0	1	2	3	4	5	
6. Straining How often have you had to strain to start urination?	0	1	2	3	4	5	
	None	1 Time	2 Times	3 Times	4 Times	5 Times	
7. Nocturia How many times did you typically get up at night to urinate?	0	1	2	3	4	5	
Total I-PSS Score							

Score: 1-7: Mild 8-19: Moderate 20-35: Severe

Quality of Life Due to Urinary Symptoms	Delighted	Pleased	Mostly Satisfied	Mixed	Mostly Dissatisfied	Unhappy	Terrible
If you were to spend the rest of your life with your urinary:							

Further Investigations

- Urodynamics
- Cystoscopy
- Renal function

Urodynamics

- ‘a functional assessment of the lower urinary tract’
- Aims
 - Reproduce patients symptoms
 - Provide a pathophysiological explanation
- Aim is to... *reproduce symptoms* whilst making *precise measurements* in order to identify the underlying causes for the symptoms and to *quantify the related pathophysiological processes*

Good Practice in Urodynamics

- A clear indication for and appropriate selection of relevant tests, measures and procedures
- Precise measurement with data quality control and complete documentation
- Accurate analysis and critical reporting of results

Indications for Urodynamics

- Poor response to conservative treatments
- Prior to primary surgery if
 - Mixed incontinence
 - Voiding dysfunction
 - Not pure SUI (NICE guidelines)
- All secondary SUI surgery
- Equivocal / uninterpretable flow rates
- Neuropaths
- Extremes of age
- Things just don't add up

Urodynamic Techniques

- Simple urodynamics
- Video urodynamics
 - + grading of SUI, demonstration of anatomy
 - radiation
- Ambulatory urodynamics
 - Conventional CMG does not reproduce symptoms and treatment will be affected
 - Stress incontinence on CMG bu history also suggestive of detrusor overactivity
- Urethral pressure profilometry
- Electromyography

Pad Tests

- Objective measure of urinary leakage
- Weighing pads worn over a specified period of time (1hr or 24hrs)
- Defined as 1g/hour or 9-10g/24hours (ICS)
- Unreliable and not currently recommended



Indications for Urgent Referral

- Visible haematuria
- Non-visible haematuria
>50yrs
- Suspected malignancy
- Persistent pyuria
- Recurrent / persistent
UTI
- Abnormal DRE



Thankyou

Any Questions?