CIC in Children
A Rationale Approach

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The Joy of bathroom
CIC in children

- Neurogenic bladder
- Severe voiding dysfunction
- PUV with VBS
- After bladder augmentation/
  Urinary diversion
Morbidity

Quote:
“People always think that the worst part about spinal cord injury is being in a wheel chair...but it is not..... the worst part is the bladder problem....the constant wetness and smell rob me of all my dignity”

-Patient
Mortality

• 1700 BC
• Edwin Smith Surgical Papyrus:
  “One having a dislocation in a vertebra of his neck while his is unconscious of his two legs and his two arms, and his urine dribbles. An ailment not to be treated.”
Agenda

• NB in children
• Advantages of Early CIC
• Protocol of CIC in children
• CIC with low friction cath
• Surveillance
Neurogenic Bladder (NB) in Children

• NB ≈ 25% of the more severe clinical problems in pediatric urology.

• 2 factors dramatically changed the way these children were managed:
  1. CIC (Lapides, early 1970s)
  2. Refinements in urodynamic studies of children
COMMON AETIOLOGY

- MMC
- Occult Spinal Dysraphism
- Sacral agenesis
- Cerebral palsy
- SCI (rare)
Myelomeningocele

- Incidence decreasing!!!
  - Folic acid supplements
  - Prenatal ultrasound

- At birth $\geq 95\%$ normal upper tracts

- Without proper management:
  - $< 5$ years: $\geq 60\%$ have upper tract damage
  - Reflux / hydrenephrosis / renal scarring
SCI

• 85% of patients with spinal cord injury are male
• Most are young and single
• 60% of injuries are between the ages of 16-30
• Coincidence?
Typical Findings in Myelomeningocele

• **Bladder - Areflexia “A Balloon”**

• **Internal Sphincter Open**

• **External Sphincter Fixed Resistance**

Ritchy M, Urology, 1995
Initial Evaluation and Management

- Lab: MSU, Baseline BUSC
- Upper Tract imaging
  - Renal Ultrasound, KUB, VCUG, Renal DMSA
- Urodynamics
- Catheter decompression (if UUT changes)
  - Indwelling foley
  - Suprapubic tube
  - CIC
Leak Point Pressure > 40 cm H₂O

- **40% deterioration** if untreated at 5 y.o.
  - University of Michigan
    - (McGuire: J Urol, 1983)

- **71% deterioration** -
  - 90% within first 2 years
  - Boston Children’s Hospital
    - (Bauer, 1988)
Patients at risk

1. US: HUN, high PVR
2. VCUG: VUR, Christmas tree bladder
3. UDS: EFP > 40 cmH₂O, DSD
4. Rec / Febrile UTI – constipation
5. RI (GFR > 60)
6. Neurological deficit, UMNL
7. Unreliable family
The Hostile Bladder

Bauer SB, Clin Ped Urology, 1985
Overall NB Complications

• Incontinence > 95%
• UTI – 94% (at least one), Pyelonephritis – 3.5%
• Upper tract stone – 35.1%, Bladder stones – 14.6%
• Upper tract abnormalities – 26.3%,
• Epididymitis – 16.1%, Urethral stricture – 11.7%, Periurethral Abscess – 2.8%
• Sexual dysfunction / Fertility issues
Primary objective: preserve renal function
- eliminate high pressures
- prevent secondary changes bladder wall

→ empty bladder regularly → CIC
→ treat detrusor overactivity → drugs
→ promote bowel emptying

Prevent UTI

1st year: kidneys susceptible to back-pressure and infections
Drug therapy in neuropathic bladder dysfunction

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum dosage</th>
<th>Maximum dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cholinergic</strong></td>
<td></td>
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<tr>
<td>Bethanechol (Urecholine)</td>
<td>0.7 mg/kg t.i.d.</td>
<td>0.8 mg/kg q.i.d.</td>
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<tr>
<td><strong>Anticholinergic</strong></td>
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<tr>
<td>Propantheline (Pro-Banthine)</td>
<td>0.5 mg/kg b.i.d.</td>
<td>0.5 mg/kg q.i.d.</td>
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<tr>
<td>Glycopyrrolate (Robinul)</td>
<td>0.01 mg/kg b.i.d.</td>
<td>0.03 mg/kg t.i.d.</td>
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<tr>
<td>Hyoscyamine (Levsin)</td>
<td>0.03 mg/kg b.i.d.</td>
<td>0.1 mg/kg q.i.d.</td>
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<tr>
<td>Tolterodine (Detrol)</td>
<td>0.01 mg/kg b.i.d.</td>
<td>0.04 mg/kg b.i.d.</td>
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<tr>
<td>Tropium (Sanctura)</td>
<td>0.1 mg/kg b.i.d.</td>
<td>0.3 mg/kg b.i.d.</td>
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<tr>
<td><strong>Sympathomimetic</strong></td>
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<tr>
<td>Phenylpropanolamine (alpha) (Ornade)</td>
<td>2.5 mg/kg t.i.d.</td>
<td>2.5 mg/kg b.i.d.</td>
</tr>
<tr>
<td>Ephedrine (alpha) (Ephedrine)</td>
<td>0.5 mg/kg b.i.d.</td>
<td>1.0 mg/kg t.i.d.</td>
</tr>
<tr>
<td>Pseudoephedrine (alpha) (Sudafed)</td>
<td>0.4 mg/kg b.i.d.</td>
<td>0.9 mg/kg t.i.d.</td>
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<tr>
<td><strong>Sympatholytic</strong></td>
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<tr>
<td>Prazosin (alpha) (Minipress)</td>
<td>0.05 mg/kg b.i.d.</td>
<td>0.1 mg/kg t.i.d.</td>
</tr>
<tr>
<td>Phenoxybenzamine (alpha)</td>
<td>0.3 mg/kg b.i.d.</td>
<td>0.5 mg/kg t.i.d.</td>
</tr>
<tr>
<td>Propranolol (beta)</td>
<td>0.25 mg/kg b.i.d.</td>
<td>0.5 mg/kg b.i.d.</td>
</tr>
<tr>
<td>Doxazosin (alpha) (Cardura)</td>
<td>0.01 mg/kg q.d.</td>
<td>0.02 mg/kg q.d.</td>
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<tr>
<td><strong>Smooth muscle relaxant</strong></td>
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<tr>
<td>Flavoxate (Urispas)</td>
<td>3.0 mg/kg b.i.d.</td>
<td>3.0 mg/kg t.i.d.</td>
</tr>
<tr>
<td>Dicyclomine (Bentyl)</td>
<td>0.1 mg/kg t.i.d.</td>
<td>0.3 mg/kg t.i.d.</td>
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<tr>
<td><strong>Other</strong></td>
<td></td>
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<tr>
<td>Imipramine (Tofranil)</td>
<td>0.7 mg/kg b.i.d.</td>
<td>1.2 mg/kg t.i.d.</td>
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</table>
Timing of Surgical Intervention

• For refractory Hostile Bladder
  ➡️ When Medically Indicated

• For Continence
  ➡️ Patient Motivation
  ➡️ Optimized Social Environment
MIS for neurogenic bladder:

• Botox injection
  – Endoscopic procedure/outpatient
  – Onset within 2 weeks after treatment
  – Effect lasts ~ 6 months
  – Side effects rare and minor (<10%)
  – Efficacy:
    • Reduction from baseline incontinence: 40%-80%
    • 65%-87% of patients became completely continent (between caths) after Botox
  – Main issue is cost/insurance coverage...
Surgical Intervention

- Last resort when medical therapy fails:
  - Augmentation +/-
  - BN procedure +/-
  - Mitrofanoff- Monti-Yang +/-
  - Reimplant +/-
  - Malone ACE
Bladder Augmentation

- Bowel Augmentation
- For patients with:
  - High pressure, noncompliant bladders
  - Persistent Incontinence
- Must be able to CIC
- +/- Continent catheterizable stoma
  - Unable to cath urethra
  - +/- Bladder neck closure
Catheterizable channel

Monti-Yang

Mitrofanoff

Appendicovesicostomy
BN Management Options

• Men
  – AUS
  – Male sling

• Women
  – Minimally invasive slings
  – AUS

• BN injection
  – Deflux
  – Collagen
Ileal Conduit

- Unable to CIC
- Incontinent diversion
How to reduce surgery

2. Early CIC
Neonatal vs. Childhood Treatment of Spina Bifida

- Fewer bladder augmentation needed in those treated *neonatally* (11% vs. 27%)
- Psychological benefits ???

(Wu, Baskin and Kogan, 1997)
Catheter Drainage

• Weld et al – 316 male SCI patients
  – Indwelling Foley (114) - changed q month
  – Clean intermittent Catheterization (92)
  – Spontaneous Void (74)
    • PVR < 100, <40 cmH20
  – Suprapubic tube (36)
Why CIC is gold standard?

Weld et al, J Urol 2000
Overtime Results by Method of Drainage

- 398 Complications (Mean F/U 18 years +/- 12)
  - Indwelling Foley – 236 complications (53.5% pts)
  - Suprapubic Tube – 48 complications (44% patients)
  - Spontaneous Void – 57 complications (32.4% pts)
  - CIC – 57 complications (27.2% patients)
Bladder Cancer

• Incidence 2-10%
• Squamous cell carcinoma
  – Tends to be aggressive
• Associated with chronic indwelling foley
  – > 10 years consider cysto, cytology, and imaging
• Gross hematuria or Recurrent UTI’s
  – Cystoscopy, Cytology, and Upper tract imaging
International guidelines recommend CIC in NB

**Most favorable safety profile**

**Offers independence**
(Geedis et al 2009)

**Intermittent catheterisation 4-6 time daily**

**Improves quality of life**
(Pannek et al 2009)

**Improves sexuality**
3. Protocol of CIC
Problem…

Finding a urologist / Nurse who understands your problems!!!
Who can do CIC?

All patients with adequate hand function or willing carer to perform intermittent catheterisation

Contra-indications
- Abnormal urethral anatomy
- Small Bladder capacity.
- Poor cognition
- Inability or unwillingness to adhere to the catheterization time schedule
Teaching Plan for CIC

• PROTOCOL: Prepare the equipment:
  – Disposable urethral catheter (Nelaton catheter) size for patient.
  – Soap and water.
  – Gauze.
  – Container for urine.
  – Lubricant.
Teaching Plan for CIC (cont.)

• **FEMALE CHILDREN**
  
  – Keeping the labia apart, pick up a clean catheter 3 inches from the tip.
  
  – If the catheter won't go, ask your child to take a deep breath (to relax the muscles) rotate the catheter and with a gentle firm pressure advance the catheter until the urine flows.
Teaching Plan for CIC (cont.)

• **MALE CHILDREN**
  - Hold the penis with one hand, retract the skin if uncircumcised.
  - Holding penis erect with one hand, pick a clean catheter three inches from the tip.
  - If the catheter won't go in, ask your child to take a deep breath (to relax the muscles) rotate the catheter and with gentle firm pressure advance the catheter until the urine flows.
CIC through a catheterizable channel
Teaching Plan for CIC (cont.)

• Wash Genital area
• Wash equipment
• Wash hands
طريق عمل الفستورة المتكررة للذكور

1. اغسل اليدين بالبلاء والصابون
2. جهز الأدوات الطبية وهي الفستورة المرتبطة فلمساط الشظايا المبللة أو ماء صباغ وعاء تجميع السول
3. يتم إمساك القضيب بواسطة أذرع اليد اليمنى (- اليسرى) و بواسطة اليد الأخرى يتم تنظيف القضيب بواسطة المشط المبللة أو بواسطة اللاء والصابون بحكة دائرية تبدأ من فتحة البول حول رأس الذكر
4. يتم استعمال الرطب على طرف الفستورة الذي سوف يتم إدخاله إلى المهارة عن طريق مجرى البول
5. يتم إمساك القضيب بطريقة طولية بيوايا 90 دورًا و يتم إدخال الفستورة بهدوء أن يبدأ خروج البول و ساعد في ذلك عند شبه القضيب. بعد ذلك أكمل إدخال الفستورة في قطرة حوالي 5 سو واسسط الفستورة الآن أن ينتمي خروج البول
6. عندما ينتهي خروج البول يتم بدو إخراج الفستورة مع خروج الظلال الأخرى من السول
7. في حالة الخروج من البول يتم بغسل الفستورة جيدا بلاء والعصا و تم تفيفها جيدا ووضعها في كيس تخزين جاف
8. في النهاية اغسل جيدا بلاء والعصا
## Follow-up for CIC patients

**Patient Name:**

**Patient Number:**

**Date & Time:**

**Patient T:**

**Reason:**

<table>
<thead>
<tr>
<th>STEPS</th>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Wash hands well with soap and water</td>
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<tr>
<td>2 Spread legs</td>
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<tr>
<td>3 Use one hand to move the labia far apart</td>
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<tr>
<td>4 The other hand wash front to back</td>
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<tr>
<td>5 Keeping the labia apart, pick catheter 3 inches from the tip</td>
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<tr>
<td>6 Place catheter tip in lubricant as needed</td>
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<tr>
<td>7 Ask your child to take a deep breath</td>
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<tr>
<td>8 Once the urine has stopped, remove the catheter slowly</td>
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<tr>
<td>9 Wash the perineal area with soap and water</td>
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<tr>
<td>10 Wash catheter with mild soap and water</td>
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<tr>
<td>11 Rinse thoroughly letting water flow through the catheter</td>
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<tr>
<td>12 Wash equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Change a new catheter every 3 days</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14 Evaluation of patient’s condition</td>
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</table>
CIC for neurogenic bladder:

- **LONG TERM RISKS**
  - STRicture
    - 0-20%
  - TRAUMA
  - EPIDIDYMITIS

- **ACCESS**

- **SUPPLIES**
Urinary Tract Infection

• To Reduce risk:

→ Use A New Catheter Each Time
→ Irrigate Bladder with H₂O QD
→ Consider Gentamicin Irrigation
  (480 mg/l with 200 mg NaHCO₃)
4. Clinical rationale for hydrophilic IC
Typical weak points - Catheters

- Coating
  - Insufficiently smooth lubrication
  - Uneven lubrication
    - >>> friction
  - Short dry-out time
  - Not coated eyelets

- Catheter stiffness

- Convenience of use
  - Packaging
  - Need for ‘extras’ (water, gel)
hydrophilic IC

- A range of hydrophilic coated catheters where the coating needs to be activated by adding water.
- Ready to use in 30s
- Available in different varieties
  - Female
  - Male
  - From Ch/Fr 6 to Ch/Fr 18
Safety aspects of hydrophilic coated catheters being the preferred choice...

• Compared to uncoated catheters coated catheters reduces the risk of urinary tract infections (21% reduction per month)
  – Cindolo et al 2003
  – De Ridder et al 2005
  – Cardenas et al 2011

• Compared to uncoated catheters coated catheters reduces risk of urethral trauma (11% reduction of hematuria)
  – Fader et al 2001
  – Stensballe et al 2005
  – Cardenas et al 2011

Patients prefers hydrophilic coated catheters over uncoated catheters

Cardenas et al PM&R 2011 May;3(5):408-17
Bjerklund Johansen et al; Eur Urol 2007
Sutherland et al; J Urol 1996
5. Surveillance
Birth

Prevent renal injury

Ensure social fecal & urinary continence

Enable self care

Enhance image/confidence

School

Prevent injury to bladder (or bowel) that could compromise future treatment or necessitate more extensive future surgery.

Maximize socialization & entry into workforce

Young Adult

Sexuality & fertility
Basic Follow-up

- MSU (every 6-12 months)
- RUS (every 6-12 months)
- ??? UDS (every 12 months)
- BUSC (optional)
- KUB (optional)
- VCUG (optional)
- Renal scan (optional)
Treatment of Infection

- Asymptomatic Bacilluria (ABU)

- Treatment of ABU Selects for Resistant Bacteria (Shlaeger: J Ped, 1998)

- Treat Symptomatic UTI Only
Long-term CIC

• 14 FR soft catheter

• Should pass without force
  – Lidocaine jelly for spasm of the ext sphincter
  – Coude tip for patients with BPH
Conclusion

– NB is a Major source of morbidity
– CIC is a safe and effective way to empty the bladder
– PRESERVE the upper tracts!
– Routine follow-up will keep these patients out of trouble and minimize complications
– Many surgical options exist
– Goals/priorities of the patient change
Guidelines
Disclosure

I have never been smart enough to establish a lucrative relationship with a business establishment of any sort. However, Coloplast did support my department conference.

Furthermore, I take no responsibility for the Truth. I am certain, however, that the rest of my life will be spent looking for it.
THANK YOU

Being overcautious saves lives