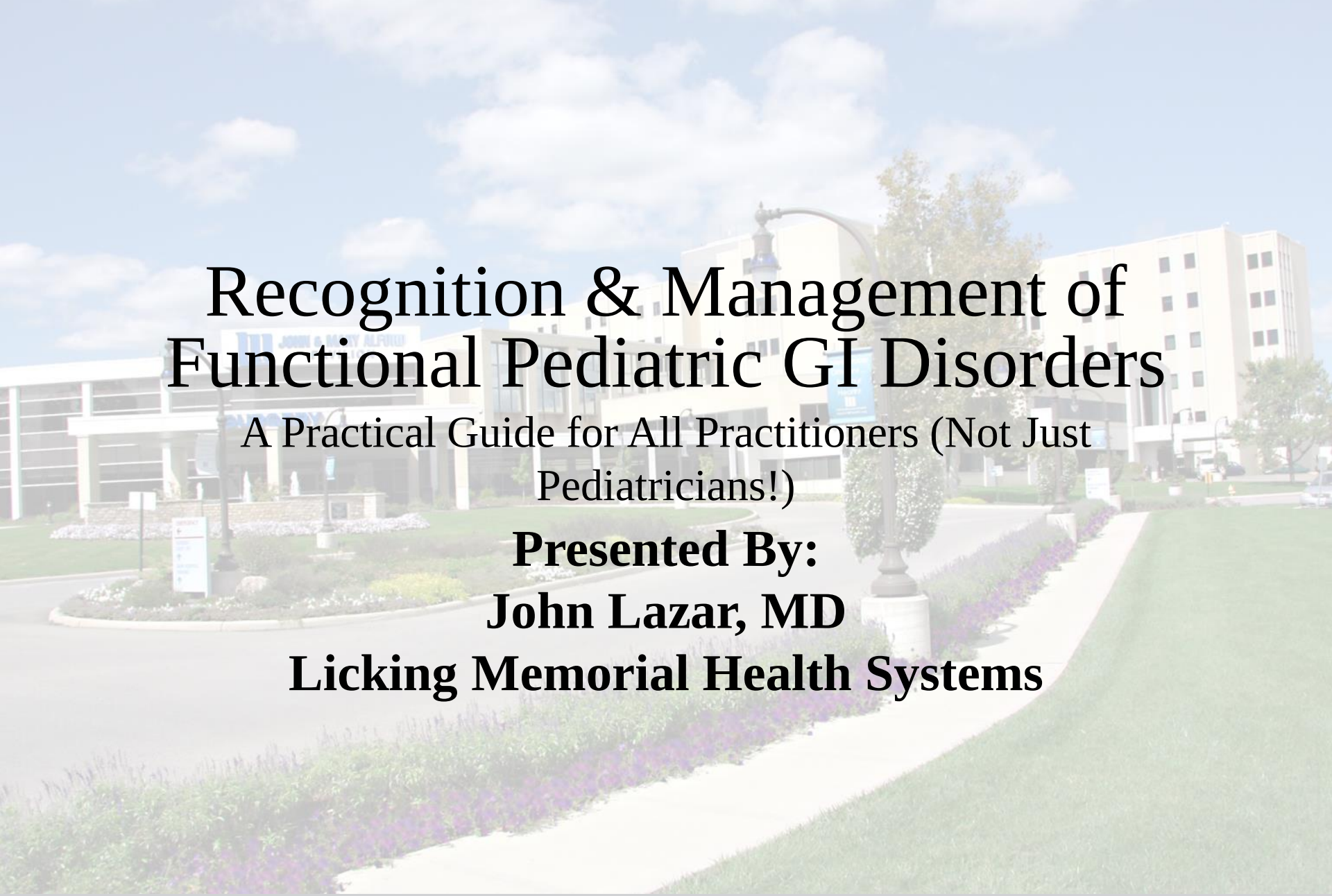

Recognition & Management of Functional Pediatric GI Disorders

A Practical Guide for All Practitioners (Not Just Pediatricians!)

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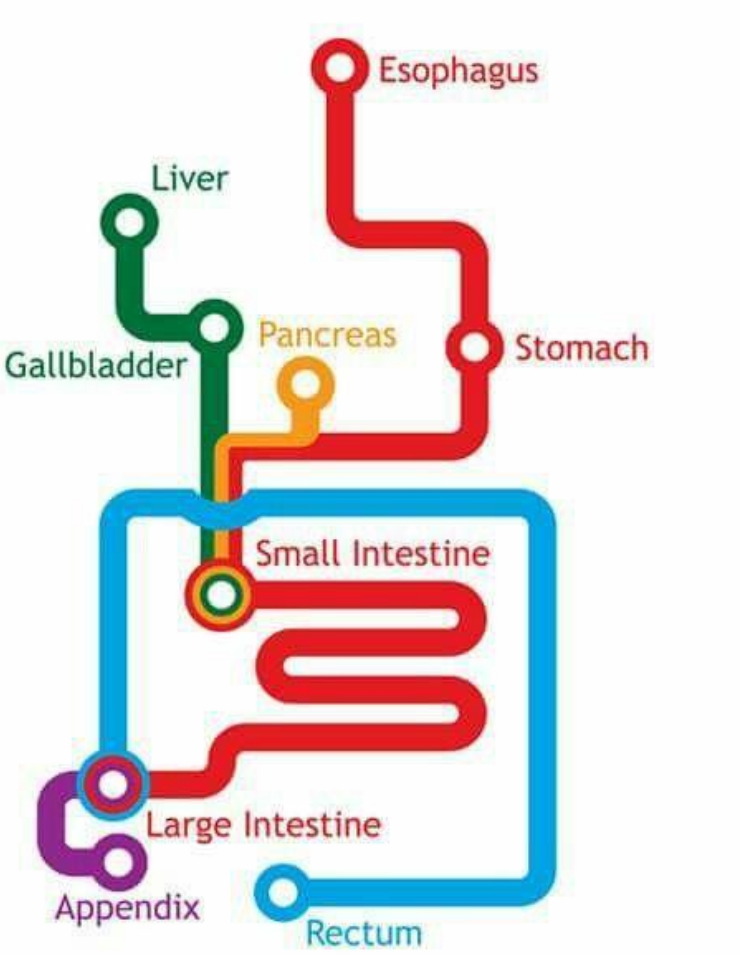
Licking Memorial Health Systems

Disclosures: Nothing To Declare!

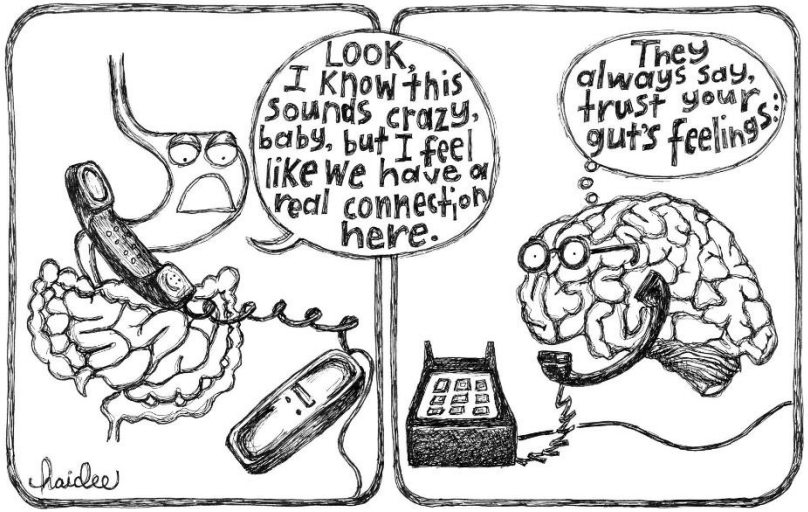
Today's Road Map

- Functional GI Disorder (FGID) Basics
- Constipation
- Colic
- Irritable Bowel Syndrome (IBS)



Functional GI Disorders (FGID's): What They Are

- GI disorders where primary problem is physiologic (as opposed to structural or biochemical)
- Often symptoms-based
- Rome IV Foundation (2016) updated definition: disorders of gut-brain interaction classified by GI symptoms relating to any combination of:
  - Motility
  - Visceral hypersensitivity
  - Altered mucosal/immune function
  - Altered gut microbiota
  - Altered CNS processing
- Not "all in their head"



Lots of Examples

Anatomical classification

- Esophageal
- Gastroduodenal
- Bowel/abdominal
- CNS-mediated disorders of GI pain
- Gallbladder and sphincter of Oddi (SO) disorders
- Anorectal disorders

Age-based classification

- Neonatal/toddler
  - Infant regurgitation
  - Infant rumination syndrome
  - Cyclic vomiting syndrome
  - Infant colic
  - Functional diarrhea
  - Functional constipation
- Children/adolescents
  - Functional nausea/vomiting
  - Functional abdominal pain (IBS, ab migraine)
  - Functional defecation: functional constipation, non-retentive fecal soiling

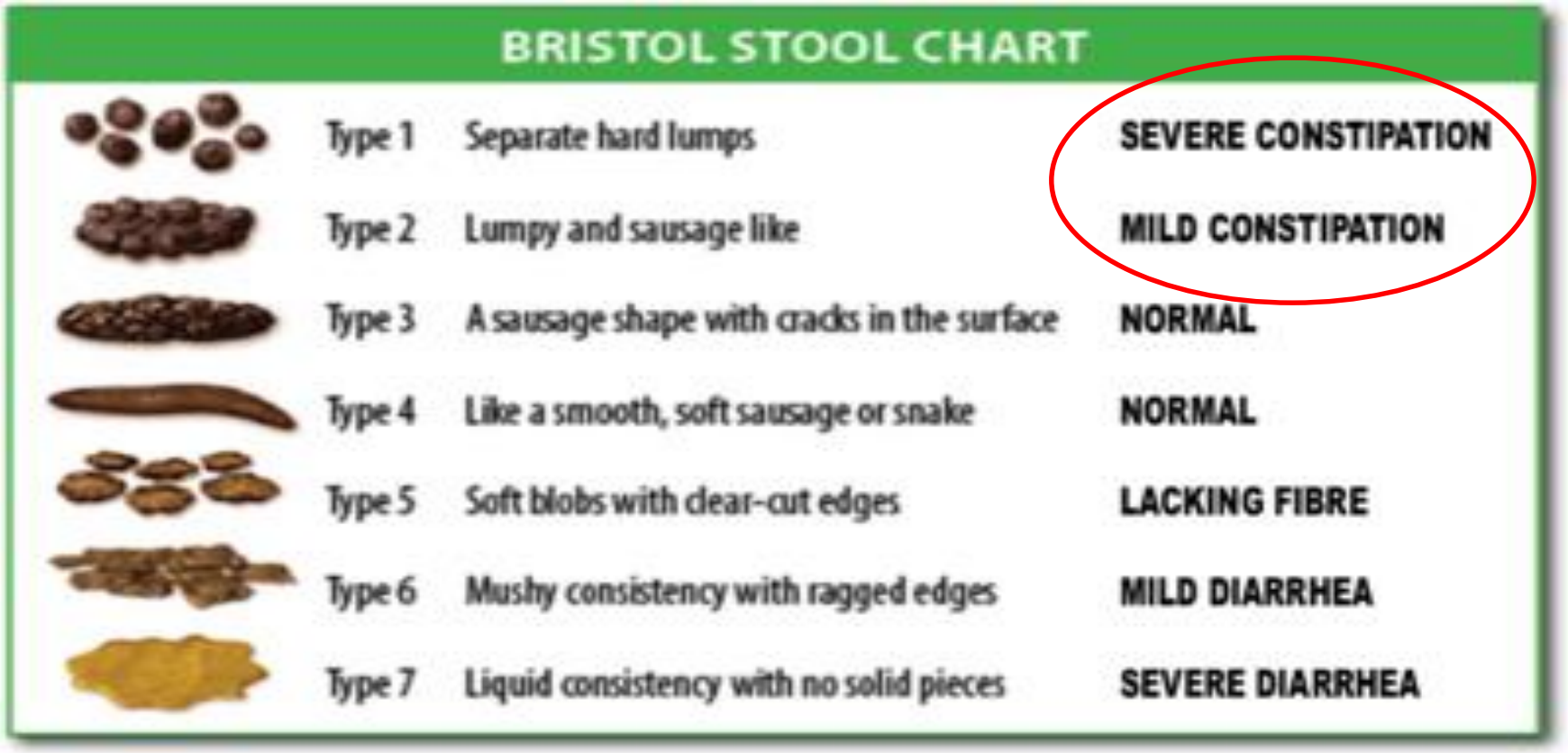
Why You Should Care

- QOL
- Healthcare resources
- Cost- £72 million in England per year *in infants alone* (~$100 million)

Phew, the Boring Stuff Is Over!

Let’s Jump In

Constipation



Constipation- Why Do I Care?

- 5% of pediatric office visits
- Drain on families and providers
- Quality of Life
- $$ and resources
- Morbidity/complications-
  - Enuresis
  - UTI
  - Rectal prolapse
  - Pelvic dysfunction
  - Psychosocial

Constipation- Definitions

- Rome Foundation IV has set definitions

- Constipation rough definition- **infrequent** passage of **hard**, **uncomfortable** stools that are **distressing**.
- Encopresis (aka overflow incontinence)- repeated passage of stool (usually *small, liquid, involuntary*) at inappropriate times

Constipation- Your Mission

Look for underlying cause

- Neurological
- Anatomic/obstructive
- Medications
- Endocrine/systemic illness

Educate

Early intervention:

- Disimpaction (when suspected)
- Maintenance/behavior modification
- Weaning

Constipation- Physiology & Pathophysiology

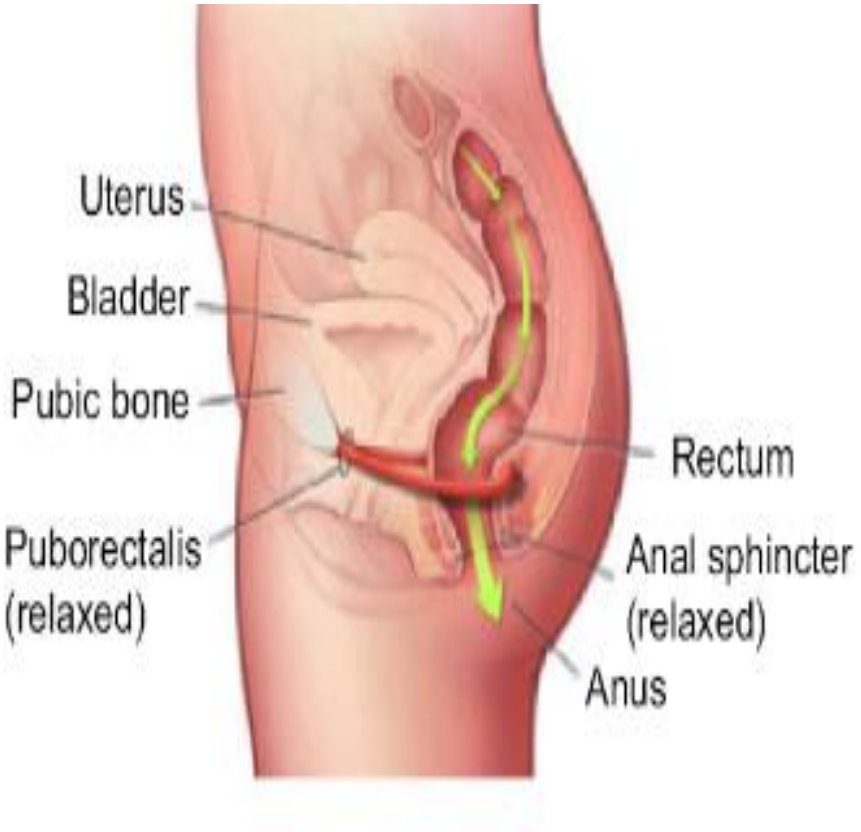
Parts involved

- Involuntary: Rectum and internal anal sphincter
- Voluntary: External anal sphincter and puborectalis

The Process

Stool in the rectum → smooth muscle relaxation and skeletal muscle contraction → 2 outcomes:

1. Bowel movement: posture, abdominal pressure, skeletal muscle relaxation
2. Retention: stool moves retrograde, alleviating urge
   - Uh-oh! → larger burden, harder, drier, more impacted.
   - Double uh-oh! Peristalsis → encopresis
   - Triple uh-oh! → Pelvic dysfunction → vicious cycle



Constipation- The Movie

Constipation- The Good News: You Can Prevent Complications and Bad Outcomes

- Early and effective treatment is key
- 60% will be symptom-free 6-12 months
- About 25% carry into adulthood

Constipation- Is Angie Constipated? Some Clues

- Different than infant dyschezia
- Red flags (underlying conditions)
- Toilet training review
- Key questions:
  - **Frequency**
  - **Hard to push out**
  - **Time spent producing BM**
  - **Painful BM's. Abdominal pain.**
  - **Withholding behavior**
    - Extending/crossing legs
    - Clenching gluteal muscles
    - Avoiding squatting position
  - **Encopresis**
  - **Blood on toilet paper or stool**
  - Other: early satiety, decreased appetite

Constipation- Exam Pointers

Obvious elements: Palpation, distention, firmness

Anal inspection

- Fissures, anal placement, external hemorrhoids
- DRE not routinely recommended
  - Can reaffirm fearful/painful anal associations
  - Consider if suspicion of HD, anal stenosis, neuro condition
  - May be appropriate if dx is in question or if alarm signs exist

Back-

- Sacral dimples, hair tuft

Neuro

- Leg DTRs, sensation, strength, tone

Skin/hair-

- Brittle hair, dry skin

Constipation- Underlying Conditions Main Systems

- Anatomic/obstructive
- Endocrine/systemic
- Medications
- Neurologic

Constipation- Underlying Condition Red Flags

Main points: Exam, Age, Obstructive Signs, Caliber

Anatomic/Obstructive

- Hirschsprung disease
  - Meconium in first 48 hours
  - Intermittent distention or obstructive signs
  - Growth delay
  - Encopresis is unusual
  - Physical exam- tight anus
  - Thin, ribbon-like stools
  - Onset < 1 month old
- Anal stenosis & anterior anus
  - Physical exam
  - Ribbon stools

Anatomic/Obstructive (continued)

- Meconium-ileus
  - Birth-few days of life
  - Personal/fam hx suggesting CF
- Stricture (congenital or acquired)
  - H/o ab surgery, NEC, IBD
  - Perianal fistula
  - Symptoms of obstruction (in distal stricture)
- Small left colon syndrome
  - Association with diabetic mom
  - Birth-few days of life

Constipation- Underlying Condition Red Flags (continued)

Endocrine/systemic illness

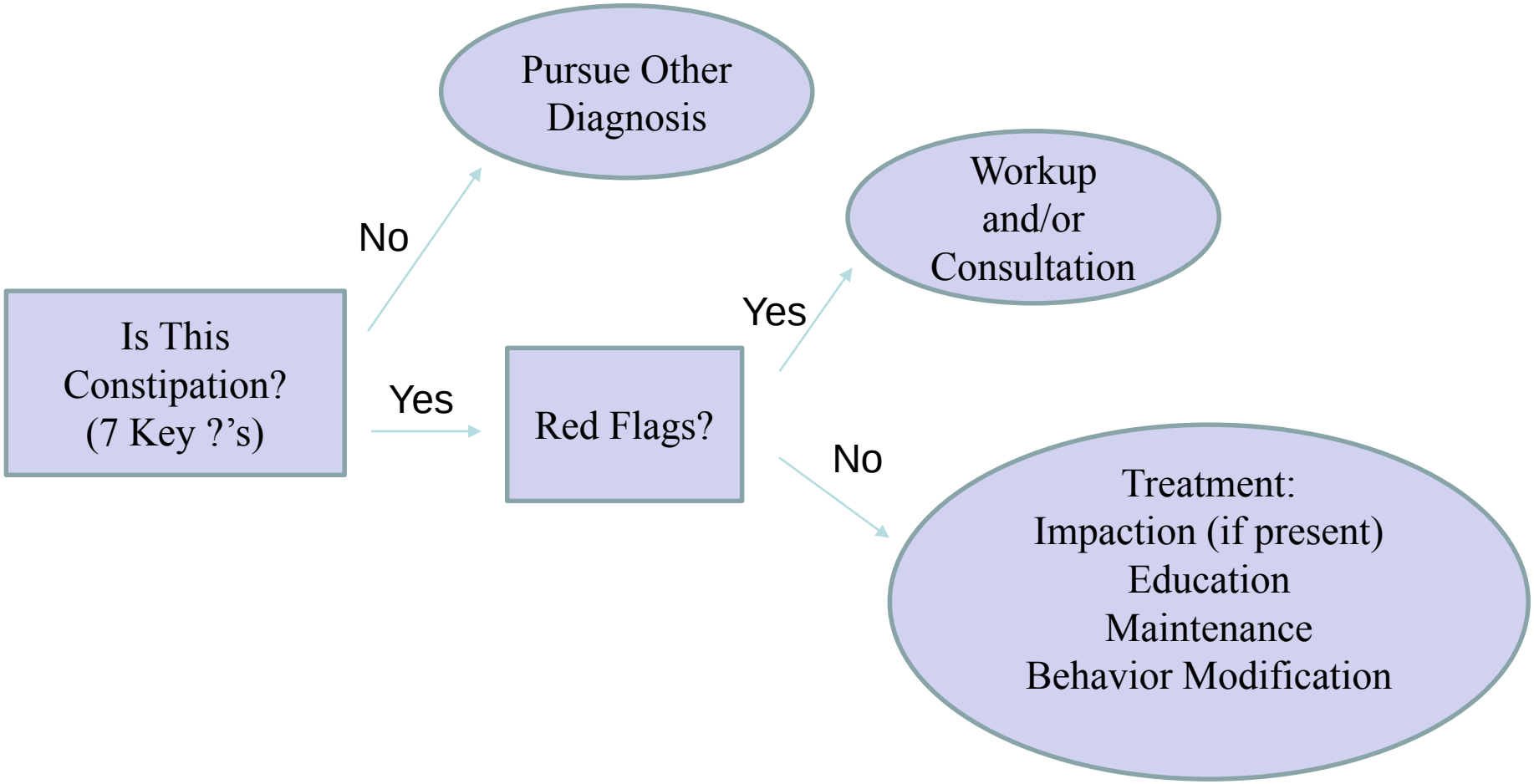
- Hypothyroidism
  - Personal of fam h/o hypothyroid dz or features
- Celiac
  - History: bloating, diarrhea, FTT, short stature, rash, anemia, ab pain
- FTT- Growth curve
- Electrolytes- hypoK, hyperCa
- Milk protein allergy- a matter of debate

Medications- opioid, TCA, anticholinergics, lead

Neurologic

- Spinal cord pathology
  - Absence of anal reflex
  - Sacral dimple
  - Abnormal neuro exam
  - H/o trauma
  - Signs of infection/cancer
- Botulism signs/sx's

Constipation- Basic Management



Constipation- On to the Big Event: Disimpaction (When Impaction Suspected)

Treatment will fail if disimpaction is inadequate

Do I have an impaction?

- **Abdominal firmness**
- **DRE finds impaction**
- **Severe symptoms**
- **Encopresis**

Key concepts:

- At home
- Oral (preferred over enema)
- Not manual
- Big doses/combinations sometimes required
- Suppositories only as addition
- Goal: liquid clear stools

More rapid cleanout:
- 20-40 kg: 7 caps (119 g) = 6 g/kg for 20 kg pt
- >40 kg: 14 caps (238g) = 6 g/kg for 40 kg pt

TABLE 3. Medical Therapy for

- Oral (preferred)
  - Polyethylene glycol solution 1–1.5 g/kg/day x 3–6 consecutive days
  - Magnesium citrate 4 mL/kg/day x 2 consecutive days
- Rectal
  - Normal saline enema 10 mL/kg x 3 consecutive days
  - Sodium phosphate enema x 3 consecutive days
    - 2–4 years: one-half contents of a 2.25-oz pediatric enema
    - 5–11 years: 2.25-oz pediatric enema
    - >12 years: 4.5-oz enema
  - Mineral oil enema x 3 consecutive days
    - 2–11 years: one-half contents of a 4.5-oz bottle
    - >12 years: 4.5-oz bottle
- Nasogastric (requires hospital admission)
  - Polyethylene glycol solution 25–40 mL/kg/hr until rectal effluent is clear (24–48 hr)

Constipation- Maintenance

PCP follow-up is crucial

Goal: minimum 1 soft, easy BM per day

Can last months/years

<u>Treatments</u>-

- **PEG 3350 is the cornerstone. Superior to lactulose, MoM, mineral oil. Home titration is OK.**
- **Lactulose OK if PEG 3350 not available**
- **Additives:**
  - **1st choice: Stimulant- e.g. senna, bisacodyl, esp if withholding or encopresis**
  - **2nd: mineral oil**
- **Enema addition not recommended**
- **No evidence on: fiber supplements (especially monotherapy), increased water intake**
- Jury is out for: prebiotics and probiotics

Toileting habits- rewards, gradual toilet desensitization, step-stool, post-meals potty time

School considerations

TABLE 4. Maintenance Therapy for Chronic Constipation

- Osmotic laxatives
  - Polyethylene glycol 1 g/kg/day
  - Lactulose 1–3 mL/kg/day divided into 2 doses
  - Magnesium hydroxide
    - <2 years: 0.5 mL/kg/dose
    - 2–5 years: 5–15 mL/day once before bedtime or in divided doses
    - 6–11 years: 15–30 mL/day once before bedtime or in divided doses
    - ≥12 years: 30–60 mL/day once before bedtime or in divided doses
- Stool Softeners/Lubricants
  - Docusate 5 mg/kg/day (up to 400 mg/day)
  - Mineral oil 1–3 mL/kg/day divided into 2 doses
- Stimulant Laxatives (can be used for rescue therapy)
  - Senna
    - 1 month-2 years: 2.2–4.4 mg/day at bedtime or in 2 divided doses
    - 2–6 years: 4.4–6.6 mg/day at bedtime or in 2 divided doses
    - 6–12 years: 8.8–13.2 mg/day at bedtime or in 2 divided doses
    - >12 years: 17.6–26.4 mg/day at bedtime or in 2 divided doses
  - Bisacodyl
    - 3–12 years: 5–10 mg/day
    - >12 years: 5–15 mg/day

Mineral oil max: 90 ml/day

Constipation- Case Study: Martin

10 y/o 100 lb AA male with 3 week h/o intermittent abdominal pain.

What do you want to know?

Additional history:

- No h/o disorders involving anatomic issue, endo problem, neuro problem
- No family history of above issues
- Growing well
- Not taking meds
- Has had these issues previously in his life

Exam:

- Generalized mild ab tenderness
- Mild firmness in lower quadrants
- No other “red flags”
- DRE not done

Constipation- Case Study (continued)

- Is this constipation? 7 Questions:
  - Frequency?- **1-2 BM/week**
  - Hard to push out?- **Yes**
  - Time spent producing BM?- **5-20 min**
  - Painful BM's? Abdominal pain?- **No and Yes**
  - Withholding behavior- **Dad unsure**
  - Encopresis- **Yes, about 1x/week**
  - Blood on toilet paper or stool- **No**

- Is there an impaction? 4 Aspects:
  - Abdominal firmness- **Yes**
  - DRE finds impaction- **Not done**
  - Severe symptoms- I'd say **moderate**
  - Encopresis- Yes, about **1x/week**

Constipation- Case Study (continued)

- Next Step?
  - Educate (of course)
  - Treat the impaction!
  - 1 day disimpaction:
    - Clear diet
    - 14 caps (238g) in two 32 oz Gatorade bottles
    - Drink over 4-5 hours
    - Goal: clear stool

Martin: 100 lb = 45kg:

Martin's sister Kim (20-40 kg):

1  = 17g

Constipation- Maintenance Examples

Start with 0.4 g/kg/day: 18g QD

Roughly 1 cap

Can increase to (roughly) 1 g/kg/day

Roughly 1 cap TID

At 1 g/kg/day, do your gut check:

- Compliance?
- Underlying conditions?
- Remember adjuncts

Constipation- Weaning

- Premature weaning associated with relapse with rebooting of vicious cycle
- **Consider this only when going perfectly for 1-2 months**
- Vigilance for early signs of relapse

Constipation- Will PEG 3350 Make Jimmy Crazy (and other concerns)?!

- Osmotics
  - Diarrhea most common
  - Others: bloating, n/v, gas, cramping
  - Recent concerns of PEG 3350 and neuropsychiatric SE's- no scientific reports corroborate
  - PEG 3350: serum ethylene glycol levels same in chronic users vs controls
  - MoM- theoretical risk of hypermagnesemia
- Stimulant
  - Cramping most common (just decrease dose)
- Other concerns
  - Lack of chronic use studies
  - Electrolyte abnormalities?
  - Not FDA approved in kids
- Bottom line:
  - **All available evidence points to favorable benefit/risk profile**

Constipation- Age-Based Considerations

- Good for all ages:
  - PEG 3350- probably OK for older infants: requires higher volume than others (4 oz per 17 g)
  - Lactulose- 0.5-1.5 ml/kg BID
  - MoM- Infant dose 1-3 ml/kg in single dose or divided BID
  - Pear or prune juice (osmotic effect)
- Not for infants:
  - Mineral oil (also contraindicated if suspicion for aspiration or DD)- aspiration pneumonitis risk

Constipation- Referral Indications

- Medical red flags
- Trouble with disimpaction
- Trouble with maintenance
- Lack of improvement after 6 months *adequate* therapy
- When thinking about specialized tests (barium enema, colonic transit time, biopsy, etc)

Constipation- Summary

- Red flags- H&P
- Is this constipation? Your 7 Key Questions
- Is impaction present? Your 4 Key Concepts
- Failure is certain if you don't treat impaction
- Miralax is safe
  - Cleanout dose:
    - Multi-day regimen: 1-1.5 g/kg/day x 3-6d
    - 1 day regimen: 20-40 kg: 7 caps (119g) once; > 40 kg: 14 caps (238 g) once
  - Maintenance dose: 0.4-1 g/kg/day
- Maintenance adjuncts: stimulant, occasional suppository, mineral oil, softener

Infant Colic

Colic- The Basics

- **Definition of 3's**
  - **3 hours per day**
  - **3 days per week**
  - **> 3 weeks**
- **Peaks around 6 weeks**
- **Resolves usually by 3-6 months**
- Diagnosis of exclusion
- Can be associated w infant dyschezia
- Associated with postpartum depression and shaken baby syndrome
- Again, cost and resources
- No association with feeding type, gestational age, SES, seasonality

Three's
and
Six's

Colic- Pathophysiology & Proposed Mechanisms

- Gut microflora alterations
- Milk protein/carb intolerance
- Hormonal
- GI immaturity/inflammation
- Increased serotonin secretion

Colic- Treatment

Good:

- Support and reassurance
- **Breast-fed infants:**
  - **Probiotic (lactobacillus reuteri strain DSM 17938)**
    - **Dose: 10^8 cfu per day**
  - **Mom trying low allergen diet**
- **Formula-fed infants:**
  - **Can try hydrolyzed formula**

Bad:

- PPI (equivalent to placebo)
- Simethicone (equivalent to placebo)
- Dicyclomine (drowsiness, constipation, diarrhea, apnea are side effects)

Colic- Summary

- Definition of 3's; usually resolves by 3-6 months
- Assess for causes/red flags (H&P)
- Evidence-based treatment differ between formula vs. breast-fed
  - Breast-fed-
    - Probiotic (lactobacillus reuteri strain DSM 17938) at 10^8 cfu per day
    - Maternal low allergen diet
  - Formula-fed- trial of hydrolyzed formula

Irritable Bowel Syndrome (IBS)

IBS- Basics

Rome IV Update Definition:

- Recurrent abdominal pain, on average, at least 1 day/week in the last 3 months, associated with two or more of the following criteria:
  - Related to defecation
  - Associated with a change in frequency of stool
  - Associated with a change in form (appearance) of stool.
- Criteria fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis.

- Subtypes:
  - Constipation predominant
  - Diarrhea predominant
  - Mixed bowel habits
- Epidemiology:
  - Affects 6-14% of kids
  - Girls > boys

IBS- Management

- **Goal: Improve function, not necessarily eliminate pain**
- Main principles
  - Education
  - Therapeutic alliance
  - Behavior modification
  - Improve pain tolerance and coping
  - Trigger avoidance

IBS- Management: Meds, Etc.

Probiotics

- **Lactobacillus ramnosus GG (LGG)**- pain reduction or resolution
  - **Dose: 1 x 10^{10} CFU BID**
  - Pediatric meta-analysis
  - NNT = 4

Herbs- OK preliminary adult/peds literature

- Best evidence for turmeric, peppermint, Iberogast
- **Peppermint** 2014 adult meta-analysis
  - **Dose: 0.2-0.4 ml enteric coated capsule TID**
  - Improved global symptoms and pain
  - SE- reflux/heartburn

Antispasmodics

- Pediatric literature not convincing

Antidepressants

- **Probably only if coincident mood d/o**

Cyproheptadine

- OK peds evidence for safety/efficacy in FAPD's

Antidiarrheals

- Not recommended

Constipation

- Treat it
- You all are now experts!

IBS- Management: Diet

- Common culprits: large meals, fatty meals, dairy
- **Smaller meals may help dyspepsia**
- **Soluble fiber (psyllium, wheat dextrin)**
  - Global improvement
  - Daily fiber need rule of thumb: age + 5-10g QD
- Gluten role? Jury still out
- Low FODMAP (fermentable oligosaccharide, disaccharide, monosaccharide, polyols) shows *early potential*
  - 2017 review- evidence not convincing in FADP's
- KEY: tread lightly in diet restriction and consider dietician

- What the heck is a FODMAP?
  - FO: fructans (e.g. wheat)
  - D: e.g. lactose
  - M: e.g. fructose
  - P: e.g. sorbitol
  - Practical: eliminates certain fruits/vegetables, high-fructose corn syrup, legumes, lactose
    - May target highest FODMAP foods with gradual re-challenge

IBS- Management: Psychological

- CBT- most established
- Yoga- helps mostly with disability/functioning
- Hypnotherapy- helps with stress/somatization
- Biofeedback
- Relaxation/distraction

IBS- Indications for Referral

- Dietician- If Deep into dietary modification
- Behavioral Health- If comorbid mental illness or for CBT/biofeedback
- GI- if excessive diarrhea or constipation refractory to treatment or other red flags

IBS- Summary

- Goal: improve function and symptoms
- *Cautious* food avoidance; consider dietician
- Psychological
- Lactobacillus ramnosus GG (LGG)- 1 x 10^{10} CFU BID
- Peppermint: 0.2-0.4 ml enteric coated capsule TID
- Treat comorbid depression and/or constipation
- Smaller meals if dyspepsia
- Soluble fiber (psyllium, wheat dextrin)- age + 5-10g/day

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Thanks So Much. Any Questions?