Community of Practice: Choosing Wisely in Paediatrics

Moderator:

Dr. Olivia Ostrow
Director of Quality & Safety, Paediatric Emergency Medicine
Department of Pediatrics, The Hospital for Sick Children
Associate Director, SickKids Choosing Wisely Program

Choosing Wisely Canada
Children's Healthcare Canada | Santé des enfants Canada

Welcome (and welcome back)!

The Choosing Wisely in Paediatrics Community of Practice (CoP) mandate is to foster knowledge sharing and collaborative learning to promote high-quality, value-added care by focusing on the overuse of certain tests and therapies in children.

Since launching in 2019:

- Reach is North American with **>250 members**
- **12 webinars and 27 presentations have been held to date**
- Presentation topics involve both **paediatric acute-care centres** and **community sites**

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A snapshot…Webinar Topics to Date

Bronchiolitis	UTIs	*Antibiotics Wisely*	ADHD Dx, Rx, and Misinformation
Planetary health	Respiratory infections	Iron deficiency	Pneumonia & CXRs
Engaging trainees in stewardship	Febrile neutropenia	*Blood Wisely*	HHFNC
Urine collection methods	Peripheral IVs (saline vs TKO)	Family partnerships in Choosing Wisely	Allergy de-labelling

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Children's Healthcare Canada

- **Established the Choosing Wisely in Paediatrics Health Hub**
  - Leveraged existing CHC online network
  - Goal – to connect individuals with "like" peers across Canada to share information and exchange resources
  - Currently houses materials and recordings from past webinars and relevant publications

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Community of Practice – Participating Sites

Children's Mercy Hospital, KC
Mayo Clinic
Dartmouth Health
UTHealth

Choosing Wisely Canada

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Future Webinars

Fall 2024 – date TBC

Featuring a ‘rapid fire’ of new Choosing Wisely in Paediatrics recommendations at SickKids (4th wave)

Suggested topics are always welcome!

If you are interested in presenting, have resources you wish to share, or would like to be added to the mailing list, please complete the webinar feedback survey or email lauren.whitney@sickkids.ca

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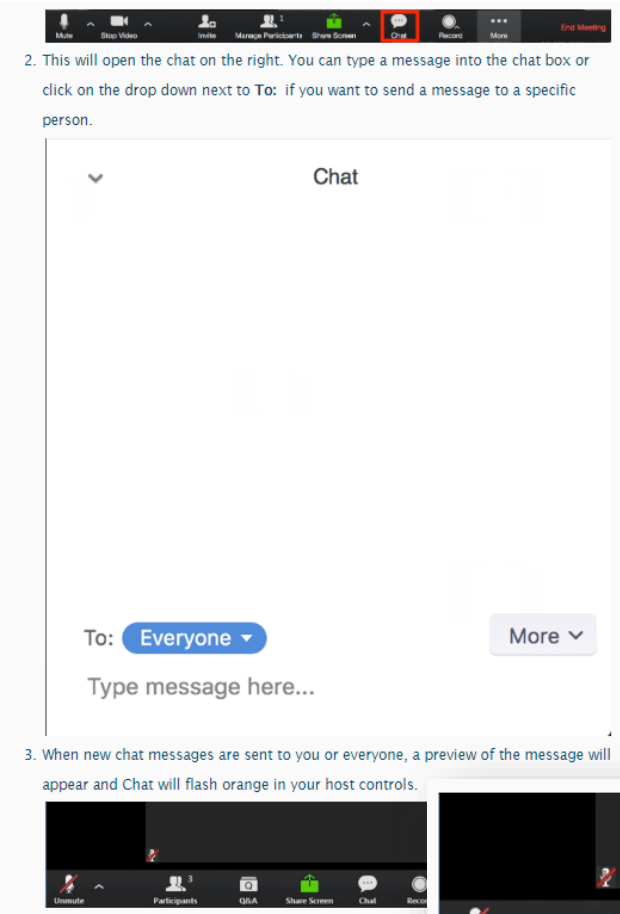
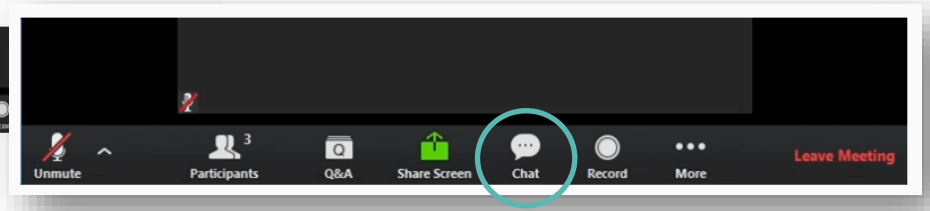
Agenda

1:00 – 1:05 PM	**Welcome and Introductions**
1:05 – 1:45 PM	**<u>Management of periorbital and orbital cellulitis in Canadian children and youth</u>** **Peter Gill, MD, DPhil, MSc, FRCPC,** Staff Paediatrician, The Hospital for Sick Children Assistant Professor, Department of Paediatrics and IHPME, University of Toronto **Carsten Krueger, MD, FRCPC**, Infectious Diseases Consultant, Alberta Children's Hospital Child Health & Wellness Researcher, Alberta Children's Hospital Research Institute Clinical Assistant Professor, Department of Pediatrics, University of Calgary Medical Lead, Pediatric Antimicrobial Stewardship Southern Alberta Sector **<u>Overuse in the inpatient evaluation of growth faltering</u>** **Elise Lu, MD, PhD**, Paediatric Hospitalist, Children's Hospital London Health Sciences Centre Assistant Professor, Department of Paediatrics, Western University
1:45 – 2:00 PM	**Q&A**



Q&A

- Please enter your questions using the **chat function**
- If you wish to contribute to the conversation, be sure to **un-mute** on the Zoom dashboard
- Note: *we will moderate the Q&A after all presentations have been completed*



Choosing Wisely Canada

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Choosing Wisely in Paediatrics Community of Practice
June 12, 2024

Management of periorbital and orbital cellulitis in Canadian children and youth

Peter J Gill, MD, DPhil, MSc, FRCPC
Staff Physician, Hospital for Sick Children
Scientist, SickKids Research Institute
Assistant Professor, Dept of Paediatrics and IHPME, UofT
Co-Founder and Vice-Chair, PIRN

Carsten Krueger, MD, FRCPC
Infectious Diseases Consultant, Alberta Children's Hospital
Child Health & Wellness Researcher, ACHRI
Clinical Assistant Professor, Department of Pediatrics, University of Calgary
Medical Lead, Pediatric Antimicrobial Stewardship Southern Alberta Sector

PIRN PAEDIATRIC INPATIENT RESEARCH NETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

Conflicts of interest

- None

Objectives

- Describe the Canadian Paediatric Inpatient Research Network (PIRN), including examples of on-going studies

- Review the management of periorbital and orbital cellulitis with a focus on hospitalized patients, specifically
  - Describe indications for **diagnostic imaging**
  - Outline evidence for judicious **antimicrobial prescribing**

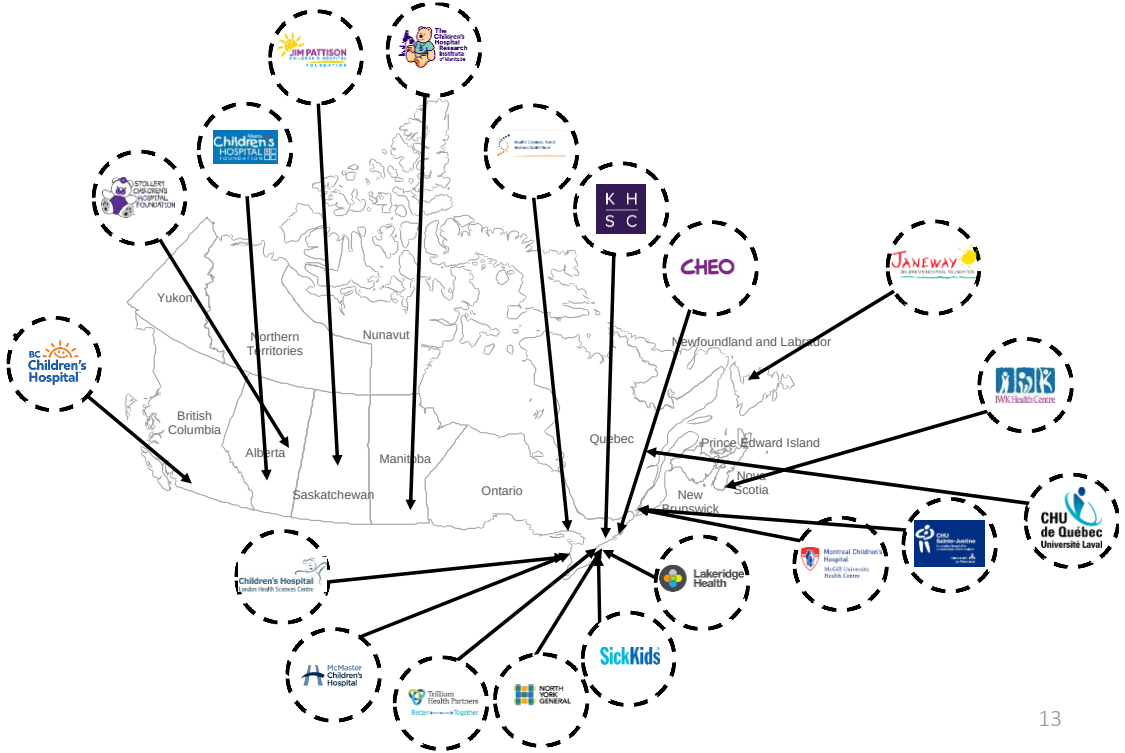
General Paediatric Inpatient Unit (GPIU)

- ✓ **~20%** of all admissions in Canada
- ✓ **Largest** inpatient unit at many children's hospitals
- ✓ **>65%** of children are cared for in community hospitals
- ✗ Lack of high-quality research focused on GPIUs
- ✗ Few randomized controlled trials
- ✗ Low quality studies
- ✗ Fewer clinician-researchers in general pediatrics
- ✗ Lack of multi-centre studies in GPIU

Launched in 2019 to generate scientific knowledge to improve the outcomes of hospitalized children on the General Paediatric Inpatient Unit (GPIU)

PIRN PAEDIATRICINPATIENTRESEARCHNETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

Inaugural Annual Meeting 2019, Toronto



SickKids

OCHSU ONTARIO CHILD HEALTH SUPPORT UNIT

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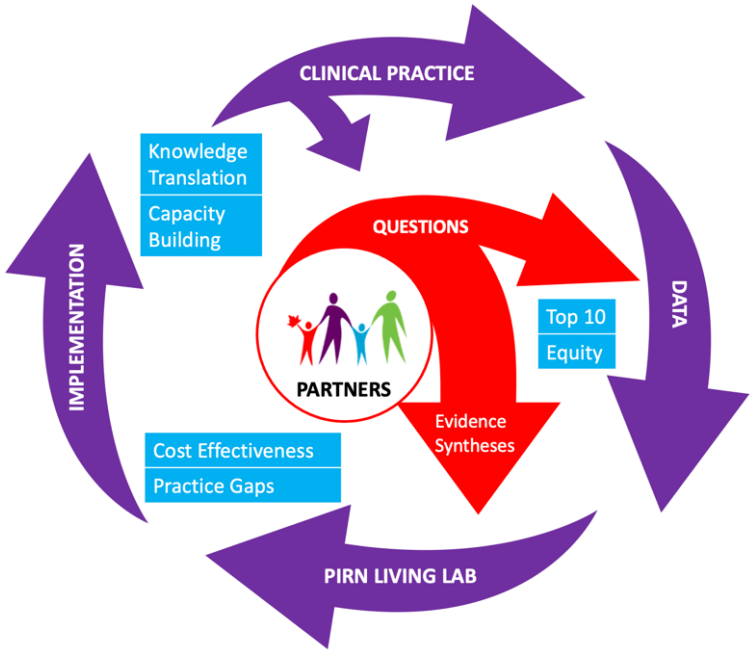


Mission

We work with children and families to generate evidence that improves care and outcomes for hospitalized children in general paediatric settings. We build research capacity through mentorship and collaboration.

Vision

We achieve the best quality of care and health outcomes for children hospitalized in general paediatric settings.

Values

Excellence
Child and family centred care
Pragmatism
Inclusivity and collaboration
Capacity building

2019-2024

Governance
Established Governance Structure, Portfolio Leads, Term limits

Research
Grant Funding (CIHR/PSI/Local), Publications, KT

Site Engagement
Monthly Meetings, Reviewing new protocols, Invited Speakers,
Annual Meetings: *2023 Calgary*
Nov 14-15, 2024 Montreal

Partnership
Patient Partnership, MICYRN, SPOR, CHC, PCC, CPS, CAPTen, International (US, UK, AUS)

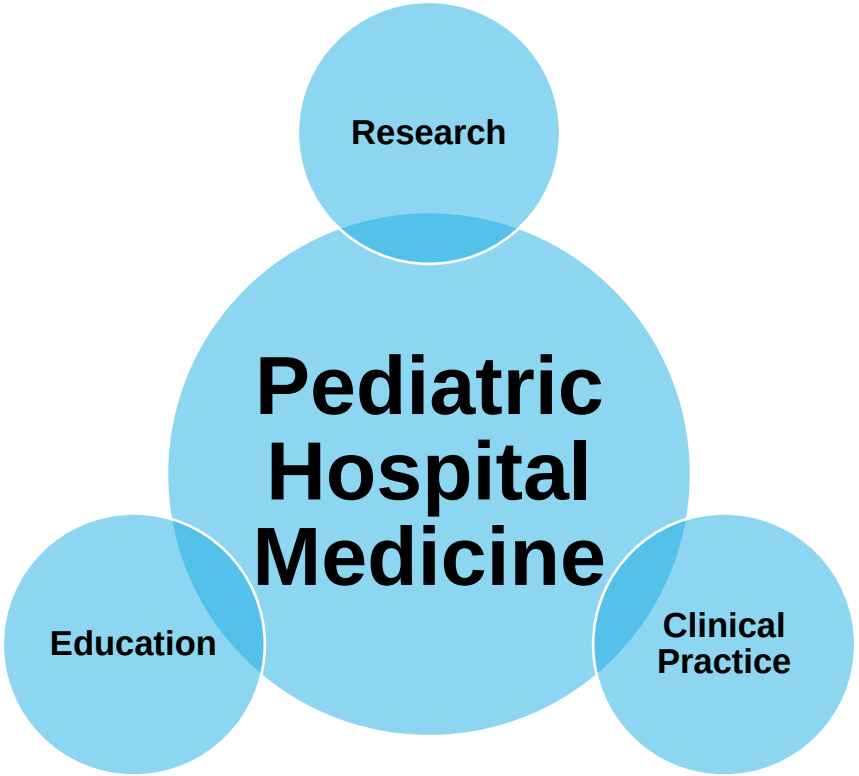
Trainee Integration & Advisory Committee
Core Residents and Fellows

PIRN PAEDIATRIC INPATIENT RESEARCH NETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

Building Capacity: Pediatric Hospital Medicine

PIRN PAEDIATRIC INPATIENT RESEARCH NETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

CaPTEN Canadian PHM Training and Education Network



Canadian Paediatric Society

Section of Hospital Pediatrics

Building Capacity & Collaboration: Canadian Networks

perc
Pediatric Emergency Research Canada

CCCTG
Canadian Critical Care Trials Group

PICNIC
Paediatric Investigators Collaborative Network on Infections in Canada

POPCORN

PIRN
PAEDIATRICINPATIENTRESEARCHNETWORK

RRPH
RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

SPRINT-KIDS

Building Capacity & Collaboration: International Networks

Active Studies

PREFER
Shared-Decision Making Study

CARE BEST

ROUTINE

BMJ Open **Canadian infants presenting with Brief Resolved Unexplained Events (BRUEs) and validation of clinical prediction rules for risk stratification: a protocol for a multicentre, retrospective cohort study**

PIRN PAEDIATRIC INPATIENT RESEARCH NETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

https://www.pirncanada.com

Periorbital and orbital cellulitis

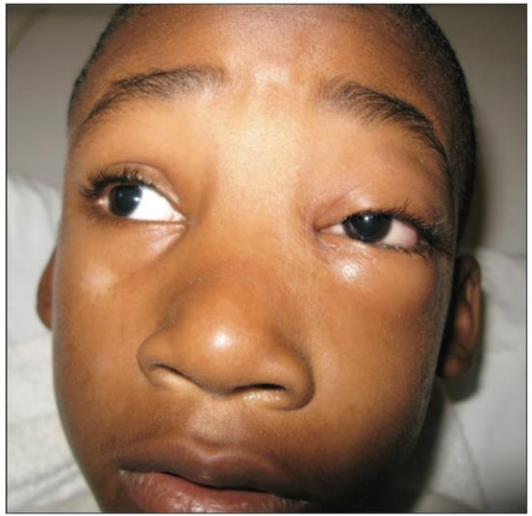
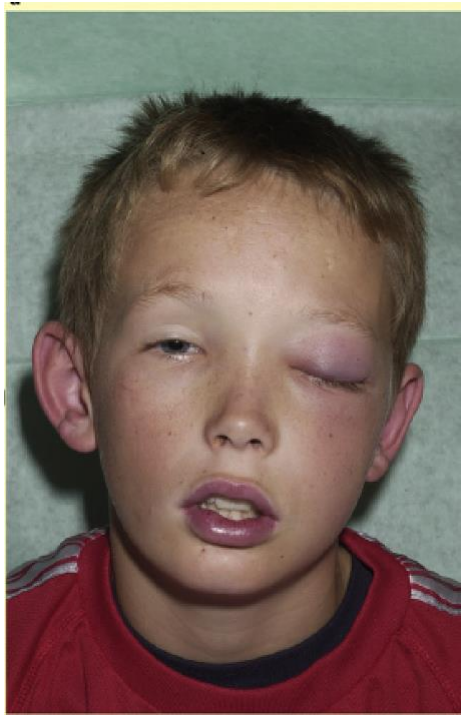


Figure 5. An 11-year-old boy who has pan-sinusitis and left orbital cellulitis and presented with fever, severe left eye pain, proptosis, chemosis, and limitation of extraocular movements. Note that he has limited adduction of his left eye.



Hauser A, Fogarasi S. *Pediatr Rev* 2010; 31(6): 242-249.
Watts P. *Paediatrics and Child Health*: 2015; 26:1; pp1 – 8
UpToDate. “Orbital cellulitis”

Epidemiology

2500 hospitalizations/yr (US)

- 2-6/100,000 in children <18
- 17-36/100,000 in children <5

Health system burden

- $10 million/year (US)
- Mean $22K/hospitalization (US)
- Median length of stay 3.7 days

Capra G et al. *JAMA Otolaryngol Head Neck Surg*. 2015;141(1):12-17.
Seltz LB et al. *Pediatrics*. 2011;127(3):e566-572.

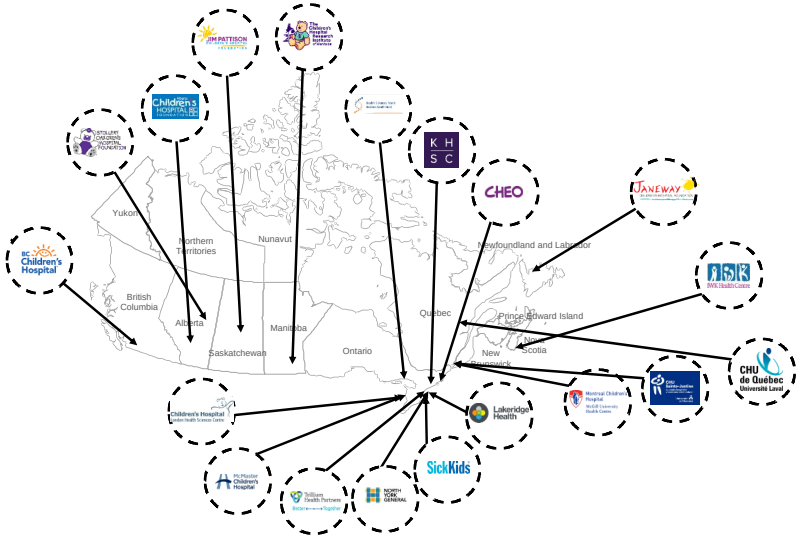
Dennison et al. *Int J Pediatr Otorhinolaryngol 2019*; 121: 50-4.
Scholin Ask et al. *Acta Paediatr* 2017; 106(2): 268-73.
Nguyen et al. *Hosp Pediatr*. 2023;13(5):375-80.

RESEARCH ARTICLE

Changes in the Management of Severe Orbital Infections Over Seventeen Years

RESEARCH ARTICLE

Variation in the Management of Hospitalized Children With Orbital Cellulitis Over 10 Years



Krueger et al. *Hosp Pediatr.* 2021;11(6):613–621
Nguyen et al. *Hosp Pediatr.* 2023;13(5):375-80.

Variables	Total, *n* = 1304 (%)	Hospital-level median, % (IQR)	Site 1 (*n* = 346)	Site 2 (*n* = 190)	Site 3 (*n* = 179)	Site 4 (*n* = 309)	Site 5 (*n* = 123)	Site 6 (*n* = 157)	*P*-value
CBC, *n* (%)	1290 (98.9)	99.1 (97.8-99.9)	346 (100.0)	187 (98.4)	172 (96.1)	308 (99.7)	120 (97.6)	157 (100.0)	0.99
Electrolytes, *n* (%)	1098 (84.2)	84.6 (78.0-88.7)	307 (88.7)	138 (73.0)	167 (93.3)	253 (81.9)	96 (78.0)	137 (87.3)	0.25
CRP, *n* (%)	796 (61.0)	58.1 (50.8-66.0)	196 (56.6)	113 (59.8)	84 (46.9)	236 (76.4)	60 (48.8)	107 (68.2)	<0.001
ESR, *n* (%)	419 (32.1)	36.3 (16.1-37.7)	128 (37.0)	87 (46.0)	16 (8.9)	117 (37.9)	15 (12.2)	56 (35.7)	<0.001
CRP or ESR, *n* (%)	837 (64.2)	62.3 (52.0-73.2)	205 (59.2)	124 (65.6)	86 (48.0)	242 (78.3)	61 (49.6)	119 (75.8)	<0.001
CRP and ESR, *n* (%)	378 (29.0)	31.3 (15.5-35.5)	119 (34.4)	76 (40.2)	14 (7.8)	111 (35.9)	14 (11.4)	44 (28.0)	<0.001
Cultures, *n* (%)									
Blood	1057 (81.1)	80.7 (75.6-86.1)	270 (78.0)	164 (86.8)	133 (74.3)	266 (86.1)	93 (75.6)	131 (83.4)	0.61
Ocular Discharge	177 (13.6)	11.6 (7.6-15.1)	44 (12.7)	20 (10.5)	12 (6.7)	68 (22.0)	8 (6.5)	25 (15.9)	<0.001
CT Scan, *n* (%)	882 (67.6)	68.5 (62.7-78.9)	239 (69.1)	91 (47.9)	109 (60.9)	210 (68.0)	104 (84.6)	129 (82.2)	0.004
MRI Scan, *n* (%)	103 (7.9)	8.7 (7.0-10.2)	41 (11.8)	13 (6.8)	18 (10.1)	6 (1.9)	9 (7.3)	16 (10.2)	0.003
CT or MRI scan, *n* (%)	898 (68.9)	70.0 (64.3-79.6)	249 (72.0)	93 (48.9)	113 (63.1)	210 (68.0)	104 (84.6)	129 (82.2)	0.008
CT and MRI scan, *n* (%)	87 (6.7)	7.6 (6.2-8.7)	31 (9.0)	11 (5.8)	14 (7.8)	6 (1.9)	9 (7.3)	16 (10.2)	0.034
Subspecialty consults									
Otolaryngology	692 (53.1)	55.7 (35.8-64.5)	223 (64.5)	57 (30.0)	64 (35.8)	179 (57.9)	85 (69.1)	84 (53.5)	<0.001
Ophthalmology	957 (73.4)	71.9 (68.3-82.4)	285 (82.4)	140 (73.7)	75 (41.9)	263 (85.1)	84 (68.3)	110 (70.1)	<0.001
Infectious diseases	446 (34.2)	21.9 (21.6-55.4)	75 (21.7)	41 (21.6)	37 (20.7)	179 (57.9)	27 (22.0)	87 (55.4)	<0.001
Neurosurgery	51 (3.9)	4.1 (2.8-5.1)	18 (5.2)	4 (2.1)	5 (2.8)	10 (3.2)	6 (4.9)	8 (5.1)	0.44

>20% under median	10-20% under median	Within 10% of median	10-20% over median	>20% over median

Nguyen et al. *Hosp Pediatr.* 2023;13(5):375-

Diagnostic imaging

Gold standard = CT with and without contrast

- Fast, easily available
- Ionizing radiation (1/1000-5000 lethal malignancies per CT scan)

Rates of CT scan in US

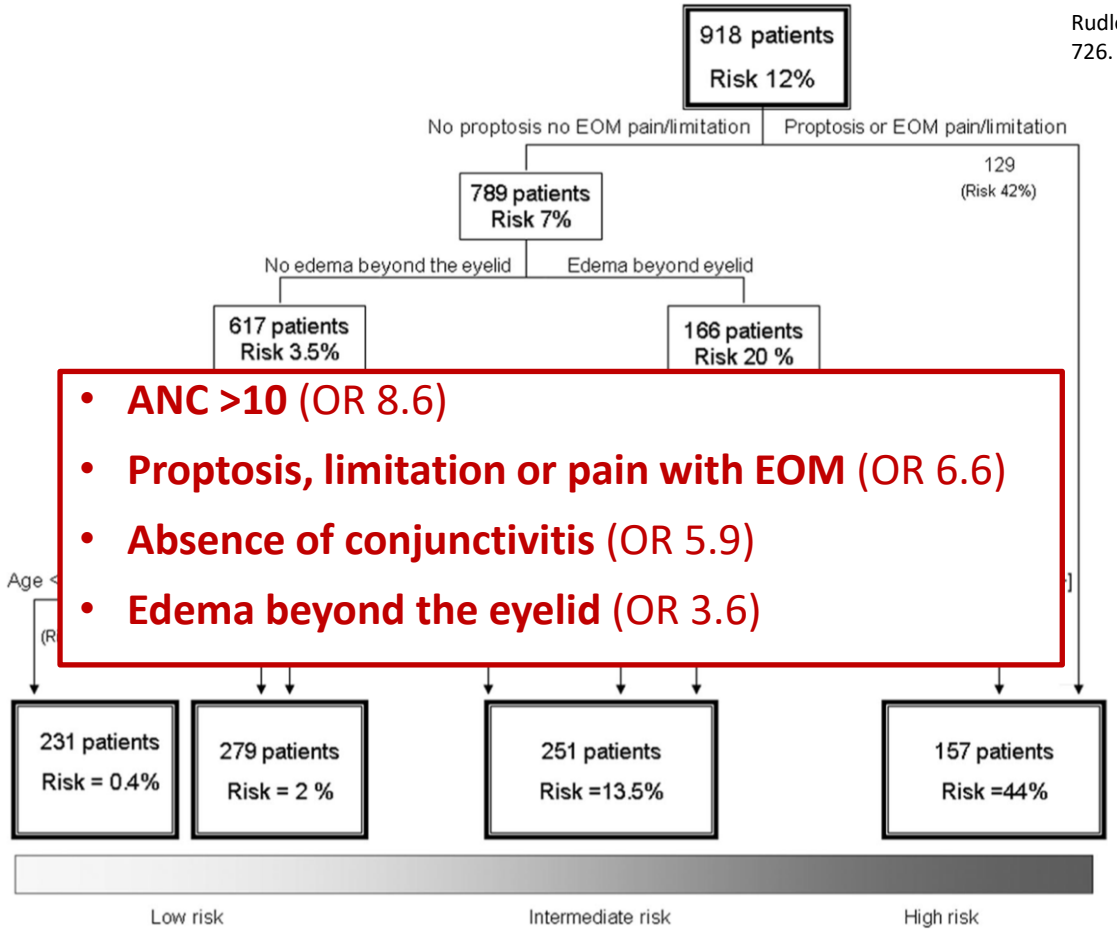
- 12-13% in ED vs 75% in hospitalized children

Rates of CT scan in Canada

- 14% in ED (Montreal)
- 59% in hospitalized children (68% children's hospitals vs 20% community hospitals)

Markham J. *Hosp Pediatr.* 2018;8(1):28-35.
Rudloe TF. *Pediatrics*. 2010;125(4):e719-726.
Tritt A. *Clin Otolaryngol* 2019; 44(3): 273-8.
Nguyen et al. *Hosp Pediatr.* 2023;13(5):375-80.

Rudloe TF. *Pediatrics*. 2010;125(4):e719-726.

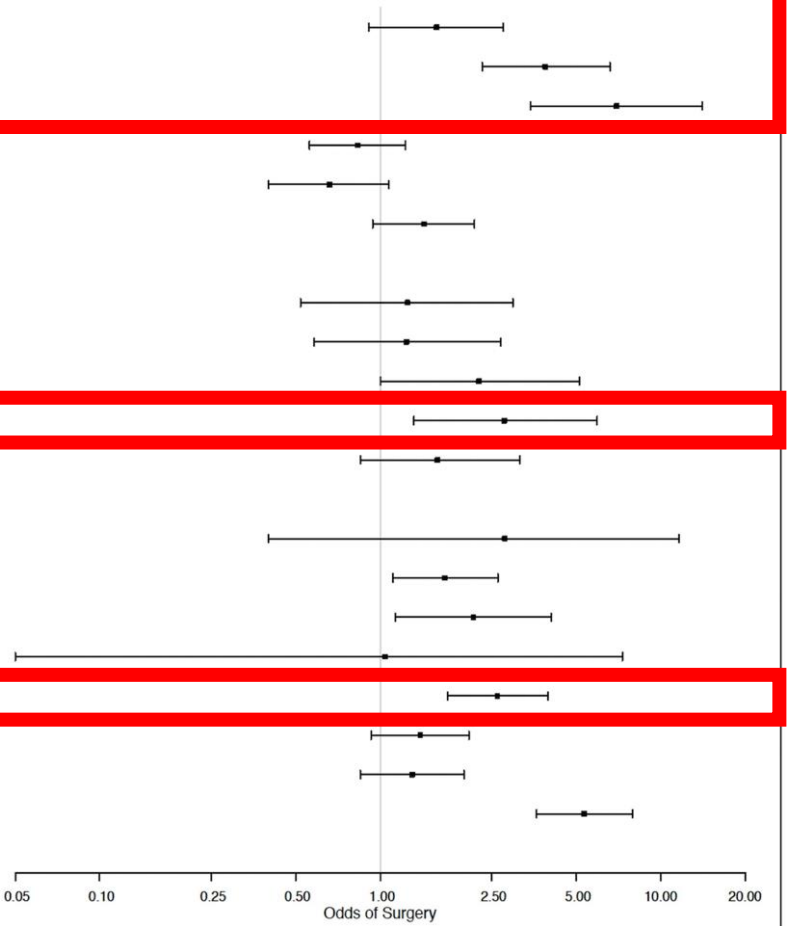


- **ANC >10** (OR 8.6)
- **Proptosis, limitation or pain with EOM** (OR 6.6)
- **Absence of conjunctivitis** (OR 5.9)
- **Edema beyond the eyelid** (OR 3.6)

FIGURE 2
Recursive partitioning model stratifying the risk for orbital abscess. A, Patients with proptosis, ophthalmoplegia, or pain with EOM were at high risk. B, Those with edema beyond the eyelid had a risk of 20%, whereas patients with no edema beyond the eyelid had a risk of 3.5%. C, The risk can be further stratified by adding ANC, age, previous antibiotics (shown), and previous conjunctivitis (not shown).

Figure 2. Predictors of surgical intervention in children hospitalized with severe orbital infections from 2009-2018.

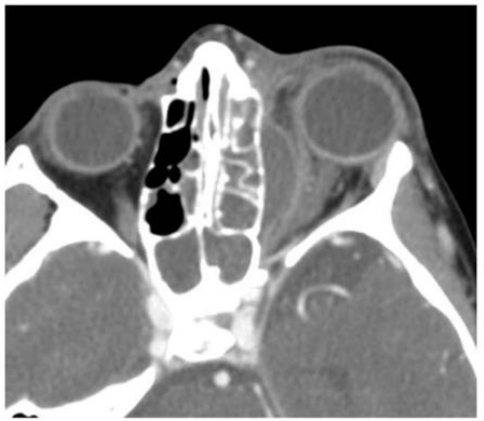
	OR (95% CI)	p–value
Age (Years) (Ref: <5)		
5 – <9	1.59 (0.91, 2.75)	0.1
9 – <14	3.88 (2.31, 6.59)	<0.001
14 – 18	6.96 (3.44, 14.1)	<0.001
Gender (Male)	0.83 (0.56, 1.23)	0.4
Chronic Disease	0.66 (0.40, 1.07)	0.1
Prior Antibiotics	1.43 (0.94, 2.17)	0.094
CRP Level (Ref: <20)		
20 – 40	1.25 (0.52, 2.97)	0.6
40 – 80	1.24 (0.58, 2.69)	0.6
80 – 120	2.25 (1.00, 5.13)	0.051
>120	2.77 (1.32, 5.94)	0.008
Not Done	1.60 (0.85, 3.15)	0.2
WBC Level (Ref: 5–12)		
<5	2.78 (0.40, 11.6)	0.2
12 – 20	1.70 (1.11, 2.63)	0.016
>20	2.15 (1.13, 4.07)	0.019
Not Done	1.04 (0.05, 7.30)	>0.9
Proptosis	2.62 (1.74, 3.96)	<0.001
Eye Swollen Shut	1.39 (0.93, 2.07)	0.011
Fever (T> 38)	1.30 (0.85, 1.99)	0.2
Significant CT Scan	5.33 (3.61, 7.93)	<0.001



Who needs imaging?

- **Toxic** appearance
- Findings suggestive of **optic nerve involvement** (i.e. proptosis, ophthalmoplegia, abnormal vision)
- Features of **intracranial extension** (i.e. neurological deficits, seizures)
- Prominent forehead swelling (i.e. Pott's puffy tumour)
- Factors associated with surgical intervention (CRP>120)
- Poor response to treatment in first 24-48 hours

*In cases without these features, imaging can be **delayed** pending clinical response to antimicrobial therapy.*



e 1 CT scan showing a medial orbital subperiosteal absc
e left side associated with ethmoid and sphenoid sinusitis

Lee S. *Saudi J Ophthalmol*. 2011;25(1):21-29.

Microbiology

- Specific bacteria involved are often not identified (non-surgical cases)
- The microbiology informs empiric antimicrobial selection

Traumatic Periorbital Cellulitis

- Group A Streptococcus
- Staphylococcus aureus

Harris. Subperiosteal Abscess of the Orbit: Age as a Factor in the Bacteriology and Response to Treatment. Ophthalmology. 1994;101(3):585-595.
Seltz LB, Smith J, Durairaj VD, Enzenauer R, Todd J. Microbiology and Antibiotic Management of Orbital Cellulitis. Pediatrics. 2011;127(3):e566.
Sharma A, Liu ES, Le TD, et al. Pediatric orbital cellulitis in the Haemophilus influenzae vaccine era. Journal of American Association for Pediatric Ophthalmology and Strabismus {JAAPOS}. 2015;19(3):206-210.

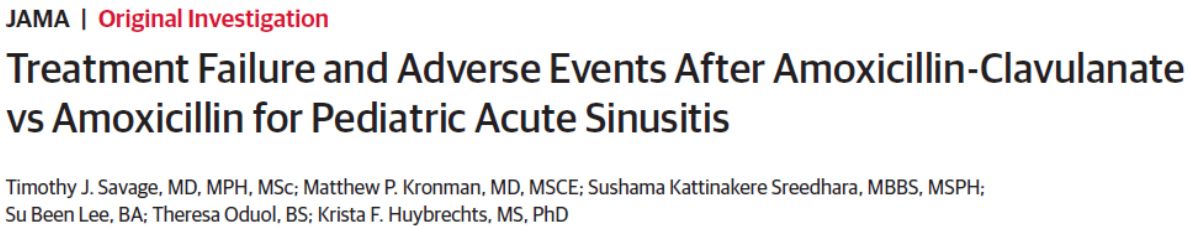
Microbiology

- Specific bacteria involved are often not identified (non-surgical cases)
- The microbiology informs empiric antimicrobial selection

Atraumatic Periorbital or Orbital Cellulitis from **ACUTE SINUSITIS**

- Streptococcus anginosus
- Group A Streptococcus
- Streptococcus pneumoniae

- Haemophilus influenzae*
- *Moraxella catarrhalis**


JAMA | Original Investigation

Treatment Failure and Adverse Events After Amoxicillin-Clavulanate vs Amoxicillin for Pediatric Acute Sinusitis

Timothy J. Savage, MD, MPH, MSc; Matthew P. Kronman, MD, MSCE; Sushama Kattinakere Sreedhara, MBBS, MSPH; Su Been Lee, BA; Theresa Oduol, BS; Krista F. Huybrechts, MS, PhD

Harris. Subperiosteal Abscess of the Orbit: Age as a Factor in the Bacteriology and Response to Treatment. Ophthalmology. 1994;101(3):585-595.
Seltz LB, Smith J, Durairaj VD, Enzenauer R, Todd J. Microbiology and Antibiotic Management of Orbital Cellulitis. Pediatrics. 2011;127(3):e566.
Sharma A, Liu ES, Le TD, et al. Pediatric orbital cellulitis in the Haemophilus influenzae vaccine era. Journal of American Association for Pediatric Ophthalmology and Strabismus {JAAPOS}. 2015;19(3):206-210.

Microbiology

- Specific bacteria involved are often not identified (non-surgical cases)
- The microbiology informs empiric antimicrobial selection

Atraumatic Periorbital or Orbital Cellulitis from **CHRONIC SINUSITIS**

- Streptococcus anginosus
- Group A Streptococcus
- Streptococcus pneumoniae
- Staphylococcus Aureus
- "Oral Anaerobes"

- Haemophilus influenzae*
- *Moraxella catarrhalis**

*Increased risk of polymicrobial infections and anaerobic infections in Age >9y.

Penicillin/ampicillin susceptible **Oral** Anaerobes - porphyromonas, parvimonas, peptoniphilus, veillonella, most (77-96%) Fusobacterium

Penicillin resistant **Oral** Anaerobes – Prevotella melaninogenica (68% beta-lactamase producing*)

Harris. Subperiosteal Abscess of the Orbit: Age as a Factor in the Bacteriology and Response to Treatment. Ophthalmology. 1994;101(3):585-595.
Seltz LB, Smith J, Durairaj VD, Enzenauer R, Todd J. Microbiology and Antibiotic Management of Orbital Cellulitis. Pediatrics. 2011;127(3):e566.
Sharma A, Liu ES, Le TD, et al. Pediatric orbital cellulitis in the Haemophilus influenzae vaccine era. Journal of American Association for Pediatric Ophthalmology and Strabismus {JAAPOS}. 2015;19(3):206-210.

Microbiology Summary

Traumatic Periorbital Cellulitis

- Group A Streptococcus
- Staphylococcus aureus

Atraumatic Periorbital or Orbital Cellulitis from **ACUTE SINUSITIS**

- Streptococcus anginosus
- Group A Streptococcus
- Streptococcus pneumoniae

- Haemophilus influenzae*
- *Moraxella catarrhalis**

Atraumatic Periorbital or Orbital Cellulitis from **CHRONIC SINUSITIS**

- Streptococcus anginosus
- Group A Streptococcus
- Streptococcus pneumoniae
- Staphylococcus Aureus
- "Oral Anaerobes"

- Haemophilus influenzae*
- *Moraxella catarrhalis**

Special Populations:

- Un-/under-immunized for HiB and S.pneumoniae – Increased risk of these organisms
- North American Arctic ("Northern Canada") –Increased risk of H.influenzae A
- Odontogenic Sinusitis – Increased risk of penicillin resistant oral anaerobes
- High risk population* for MRSA – Increased risk of MRSA

Microbiology of Orbital Abscesses

› Arch Dis Child. 2024 Apr 8:archdischild-2023-326175. doi: 10.1136/archdischild-2023-326175. Online ahead of print.

Association of empiric antibiotic selection and clinical outcomes in hospitalised children with severe orbital infections: a retrospective cohort study

Carsten Krueger [1], Emily Lan-Vy Nguyen [2], Sanjay Mahant [2 3 4 5], Cornelia M Borkhoff [2 3 4 5], Jessica Cichon [4], Olivier Drouin [6 7 8], Catherine Pound [9 10], Julie Quet [9 10], Gita Wahi [11], Ann Bayliss [12], Gemma Vomiero [1], Jessica Foulds [13 14], Ronik Kanani [15], Mahmoud Sakran [16], Anupam Sehgal [17], Eleanor Pullenayegum [4 18], Elysa Widjaja [2], Arun Reginald [2 19], Nikolaus Wolter [2 20], Patricia Parkin [2 3 4 5], Peter J Gill [21 3 4 5];
Periorbital and Orbital Cellulitis (POC) Multicenter Study Group and the Canadian Paediatric Inpatient Research Network (PIRN);
Periorbital and Orbital Cellulitis (POC) Multicenter Study Group and Canadian Pediatric Inpatient Research Network (PIRN)

Table 3 Pathogens isolated in blood and surgical culture specimens of children hospitalised with orbital cellulitis

Organism	Total patients (n=175)	Total organisms (n=198)	Blood culture (n=61)	Sinus fluid culture (n=45)	Abscess aspirate culture (n=57)	Surgical ocular fluid culture (n=10)	Subdural empyema culture (n=1)
Streptococcus anginosus	64	74	13	28	29	4	0
Group A streptococcus	40	47	28	8	9	2	0
Methicillin-sensitive *Staphylococcus aureus*	20	21	2	7	9	3	0
Streptococcus pneumoniae	15	15	11	0	3	1	0
Haemophilus influenzae	6	6	4	0	2	0	0
Methicillin-resistant *Staphylococcus aureus*	5	5	2	0	2	0	1
Prevotella group*	5	4	0	2	2	0	0
Gram-positive cocci	4	4	0	1	3	0	0
*Eikenella corrodens**	3	4	0	1	2	1	0
*Parvimonas micra**	3	4	1	1	1	1	0
Mixed anaerobes*	2	2	0	1	1	0	0

N.b. – we did not delineate chronicity of sinusitis in this study

Empiric Antibiotics are getting broader

Arch Dis Child. 2024 Apr 8:archdischild-2023-326175. doi: 10.1136/archdischild-2023-326175. Online ahead of print.

Association of empiric antibiotic selection and clinical outcomes in hospitalised children with severe orbital infections: a retrospective cohort study

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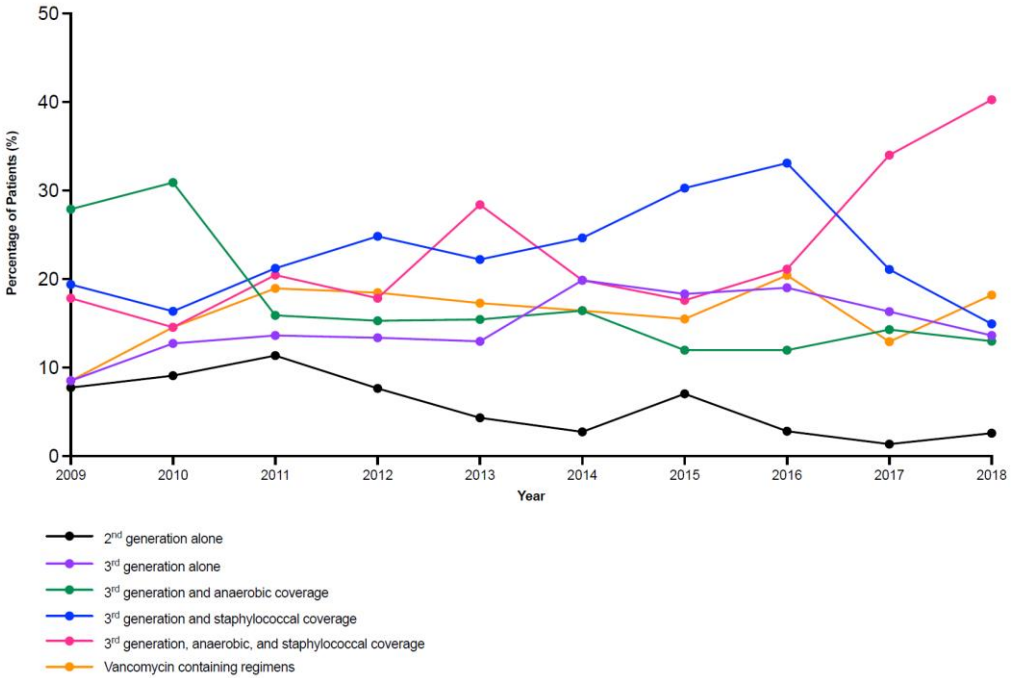

... But outcomes are no better (perhaps worse)

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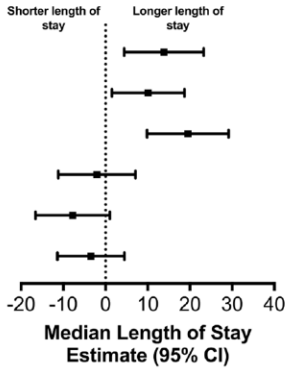
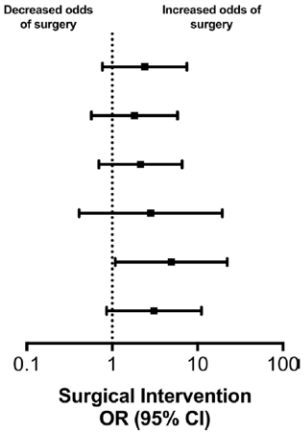
Group A – 3rd Generation Cephalosporin
Group B – 3GC + Anaerobic Coverage
Group C – 3GC + Anti-MSSA coverage
Group D – 3GC+Anaerobic and MSSA coverage
Group E – 2nd Generation Cephalosporin
Group F – Anti-Stapylococcal Only

Group	Estimate (95% CI)	*P*-value
B	13.8 (4.41, 23.3)	0.004
C	10.1 (1.48, 18.7)	0.02
D	19.5 (9.85, 29.2)	<.001
E	-2.03 (-11.2, 7.12)	0.66
F	-7.79 (-16.6, 1.00)	0.08
G	-3.46 (-11.4, 4.45)	0.39



Group	OR (95% CI)	*P*-value
B	2.40 (0.77, 7.49)	0.13
C	1.82 (0.57, 5.81)	0.31
D	2.15 (0.70, 6.60)	0.18
E	2.82 (0.41, 19.5)	0.29
F	4.94 (1.09, 22.3)	0.04
G	3.09 (0.86, 11.1)	0.08



... But outcomes are no better (perhaps worse)

- Markham et al 2018 – Multicenter Study in USA (42 sites)
  - 1828 children with OC, increased LOS and cost when the hospital reported higher therapeutics usage

- Broad spectrum antibiotic has been associated with worse clinical outcomes (longer LOS, increased costs, higher mortality, more adverse events) – Gerber et al 2017, Webb et al 2019

Recommendations

- “Triple” Antibiotic therapy (3GC, Anti-Staphyloccus, anaerobes) **not** routinely needed
  - Reserve for systemically unwell, concern for intracranial extension, optic nerve compromise

- Orbital cellulitis following acute sinusitis: **Ampicillin** or **Cefazolin**
  - Following chronic sinusitis: **Amoxicillin-Clavulanate** or **Ceftriaxone**

- Even in the above cases, once more information is known (imaging, cultures, clinical evolution) you can often narrow.

Questions?


OILERS
PIRN
PAEDIATRICINPATIENTRESEARCHNETWORK
RRPH
RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

PIRN PAEDIATRIC INPATIENT RESEARCH NETWORK | RRPH RÉSEAU DE RECHERCHE EN PÉDIATRIE HOSPITALIÈRE

Institute of Health Policy, Management & Evaluation
UNIVERSITY OF TORONTO

OCHSU
ONTARIO CHILD HEALTH SUPPORT UNIT

SickKids

OVERUSE IN THE INPATIENT MANAGEMENT OF GROWTH FALTERING

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Western
UNIVERSITY · CANADA

Children's Hospital
London Health Sciences Centre

CONFLICT OF INTEREST

- I have no conflicts of interest to disclose

OBJECTIVES

- Describe the underlying etiologies of growth faltering
- Examine the available literature on the utility of laboratory and imaging studies
- Identify strategies to reduce overuse

GROWTH FALTERING

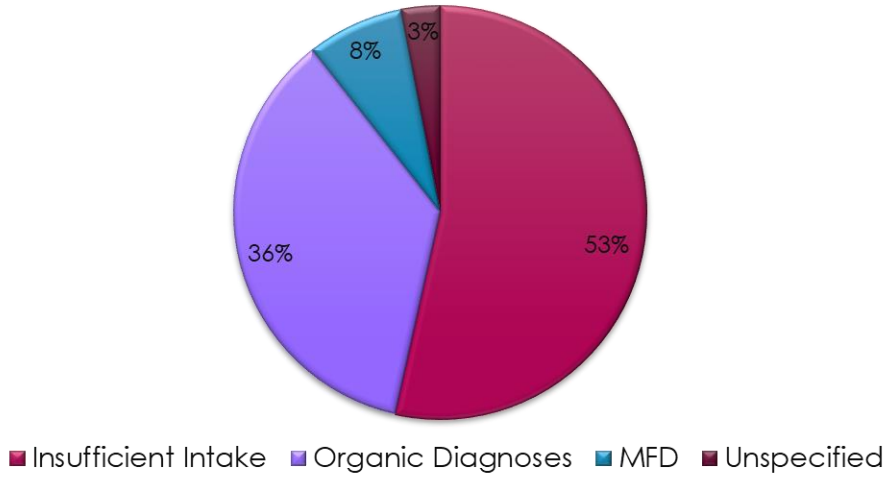
- It's a description, not a diagnosis
- No standard-of-care for evaluation and management
- Inpatient management focuses on identifying cause of poor weight gain
  - Laboratory and imaging work-up geared to identify or rule out disease

ETIOLOGIES

- Insufficient caloric intake
- Mechanical feeding difficulties
- Organic disease
  - GI – reflux, CMPA, EOE
  - Genetic – chromosomal anomalies, metabolic disorders
  - Endocrine – thyroid disease, adrenal insufficiency, growth hormone deficiency
  - Cardiac – congenital heart disease
  - Neurologic – tumors, epilepsy, congenital anomalies
- Mixed etiologies

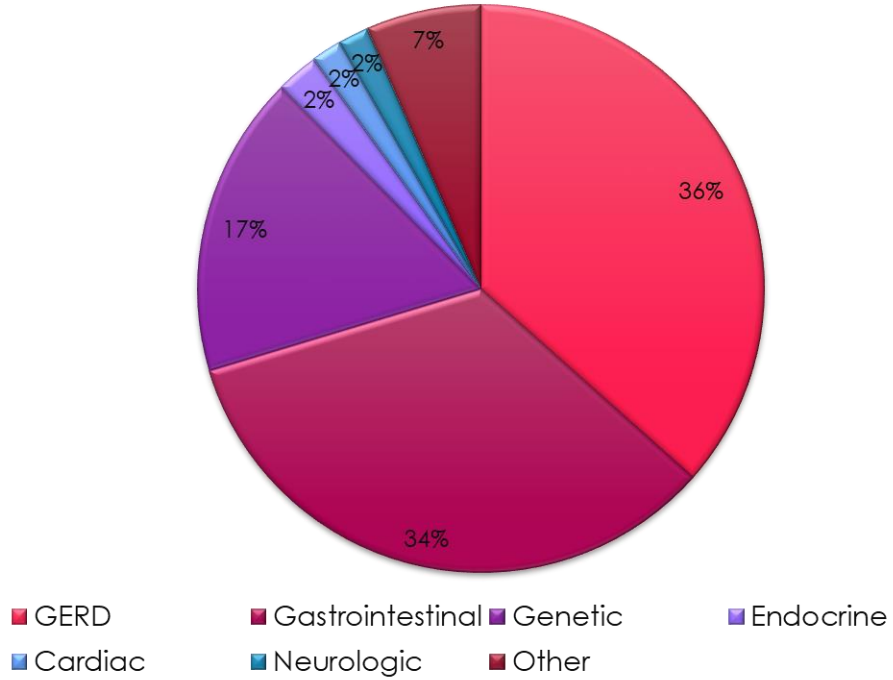
HOW COMMON IS SIGNIFICANT UNDERLYING DISEASE?

- Well, that depends…
  - On how you define your population
  - On how you study patients with known diagnoses
  - On how you define underlying disease



ORGANIC DISEASES

- GERD
- Gastrointestinal
  - Cow's Milk Protein Allergy
  - Eosinophilic Esophagitis
  - Protein-losing enteropathy
  - Celiac Disease
- Genetic
  - Chromosomal anomalies
  - Metabolic disorders
- Endocrine
- Cardiac
- Neurologic



INPATIENT EVALUATION - FREQUENCY

- Larson-Nath et al 2018
  - 92 patients admitted for growth faltering
  - 90% of patients had labs obtained
    - 88% of these were done on admission
  - 64% had imaging studies
  - 12% had endoscopy

- Lu et al – ongoing
  - 497 patients admitted for growth faltering
  - 90% had labs obtained
    - 94% had labs within the first 24 hours of admission
  - 65% had imaging studies
  - 3% had endoscopy

INPATIENT EVALUATION - TYPES

Most common labs

- Electrolytes
  - Basic Metabolic Panel (lytes + urea, Cr)
  - Magnesium
  - Phosphorus
- CBC
- Liver function tests
- TSH
- Urinalysis

Most common imaging

- Abdominal ultrasound
- Chest xray
- Abdominal xray
- Renal ultrasound
- Upper GI
- Modified barium swallow

INPATIENT EVALUATION - UTILITY

	Sills et al 1978	Berwick et al 1982	Larson-Nath et al 2018
N	185	122	92
Rate of organic disease N(%)	24 (18%)	38 (31%)	29 (31%)*
Tests sent	2607	4827	374
Utility N(%)	36 (1.4%)	39 (0.8%)	8 (2.1%)*

*Only one lab test revealed a diagnosis not otherwise suspected on H&P

- BMP diagnosing Bartter's Syndrome

INPATIENT EVALUATION - UTILITY

- Coe et al 2020
  - Multicenter retrospective study of refeeding syndrome in GF
  - 179 patients included, 0 cases of refeeding syndrome

INTERPRET LAB RESULTS WITH CAUTION

- Marten et al (2022)
  - 39 patients with GF due to insufficient intake
  - 11 (27%) had elevated AST or ALT
    - AST 70.2 +/- 15.5 U/L
    - ALT 65.9 +/- 38.6 U/L
  - “Trend toward additional investigations” in infants with elevated AST or ALT

INTERPRET LAB RESULTS WITH CAUTION

	Acylcarnitine Profile	Urine Organic Acids	Serum Amino Acids
Tests sent, n	61	70	94
Unique patients, n	57	65	86
Sent per Genetics, n, (%)	16 (26)	16 (22.9)	18 (18.9)
Normal Result, n (%)	55 (90)	33 (47)	86 (91.5)
Abnormal Result			
Clinically Irrelevant, n (%)	6 (10)	36 (51)	7 (7.4)
Clinically relevant, n (%)	0	1 (1.4)	1 (1)

WHAT SHOULD WE DO INSTEAD?

- Avoid general screening labs
- Check the newborn screen first!
  - Tandem Mass Spectrometry amino acid and acylcarnitine analysis
- Use history and physical exam findings to guide work-up
- Consider monitoring for 24-48 hours to ensure adequate nutrition prior to laboratory work-up

IT'S ALL IN THE HISTORY

- History and physical exam are the best diagnostic tools in growth faltering

TABLE 4 Components of the History and Physical Exam and Features of the Hospital Stay Are Associated With Ultimate Diagnosis

Patient Characteristics	Insufficient Intake	Malabsorption	Genetic Disease	MFD
Past medical history				
None	1.81 (1.22–2.70)	—	—	—
Reflux	—	—	—	2.33 (1.22–4.44)
Neonatal history	—	—	2.50 (1.16–5.42)	—
Symptoms				
Vomiting	—	2.73 (1.33–5.63)	—	—
Diarrhea	—	6.75 (3.11–14.66)	—	—
Dysphagia	—	—	2.28 (1.06–4.93)	2.63 (1.37–5.06)
Aversion	—	—	—	3.19 (1.62–6.29)
Physical exam findings				
No abnormality	2.94 (1.98–4.39)	—	—	—
Eczema/rash	—	3.31 (1.45–7.55)	—	—
Stridor	—	—	—	7.11 (2.48–20.43)
Hypotonia/dysmorphism	—	—	12.19 (5.63–26.39)	—

TARGETED LAB TESTING

If you are worried about…	Consider sending…
• Mitochondrial or metabolic disease	• Lytes, lactate, ammonia
• Malabsorption	• Albumin, IgE, CBC (eosinophils, anemia)

CONCLUSION

- Organic disease is relatively common, but it's not detected by indiscriminate testing
- Frequency and futility of laboratory testing hasn't changed in 45 years
- History and physical exam are the best diagnostic tools
- We need a standardized approach to reduce overuse

“THE INDISCRIMINATE “RULING OUT” OF ONE OCCULT POSSIBILITY AFTER ANOTHER ASSURES ONLY HIGH COST, IATROGENIC COMPLICATIONS, PERSISTENT ANXIETY, AND, IN MOST CASES, DIAGNOSTIC FAILURE.”

Berwick - 1980