Virtual Health Grand Rounds

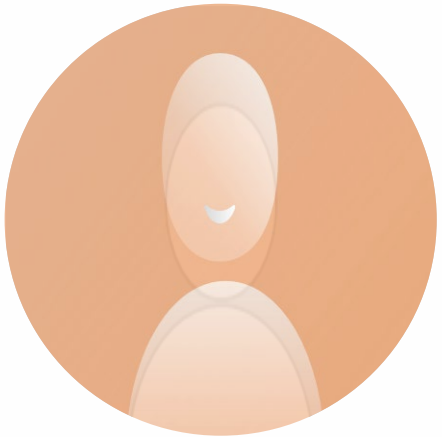
Virtual Pediatric Examinations

Dr. Melissa Paquette, MD, FRCPC

April 14, 2023

THE UNIVERSITY OF BRITISH COLUMBIA
Continuing Professional Development
Faculty of Medicine

Slido.com
code #4157218

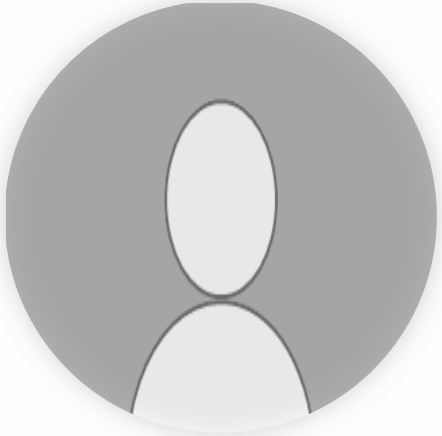


Land Acknowledgement

- I acknowledge that I am presenting from the traditional, ancestral and unceded territory of the Secwépemc people.

Disclosures

- I have no relationships or commercial interests to disclose



Learning Objectives

Explore

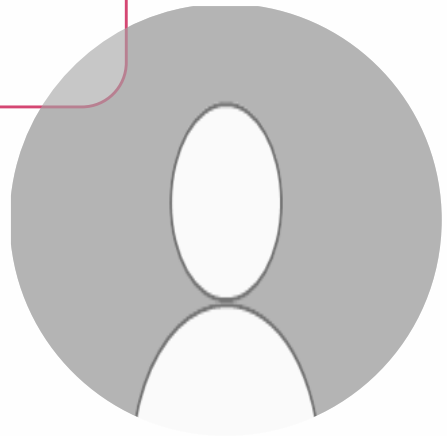
- Explore pediatric virtual physical examination possibilities

Recognize

- Recognize strengths and weakness of virtual assessment to patients, rural and remote peers, and our healthcare system

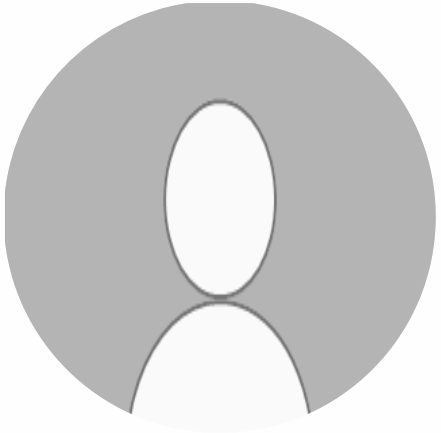
Discuss

- Discuss how pediatric virtual examination can be enhanced



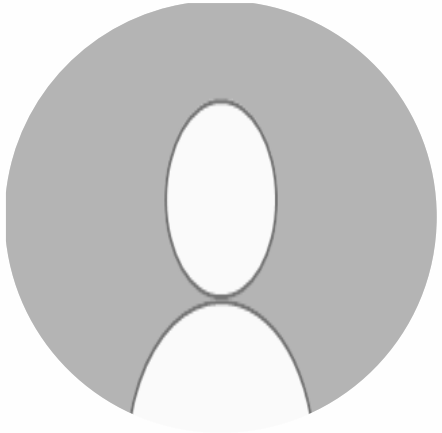
CHARLiE Case: Can a Virtual Exam “Meat” the Need?

- Hx:
  - Neck pain and posturing
  - Unvaccinated
  - Paternal uncle had meningitis as a child with long-term sequelae
- Site exam:
  - Febrile
  - Lethargic, slow to follow directions
  - Petechiae



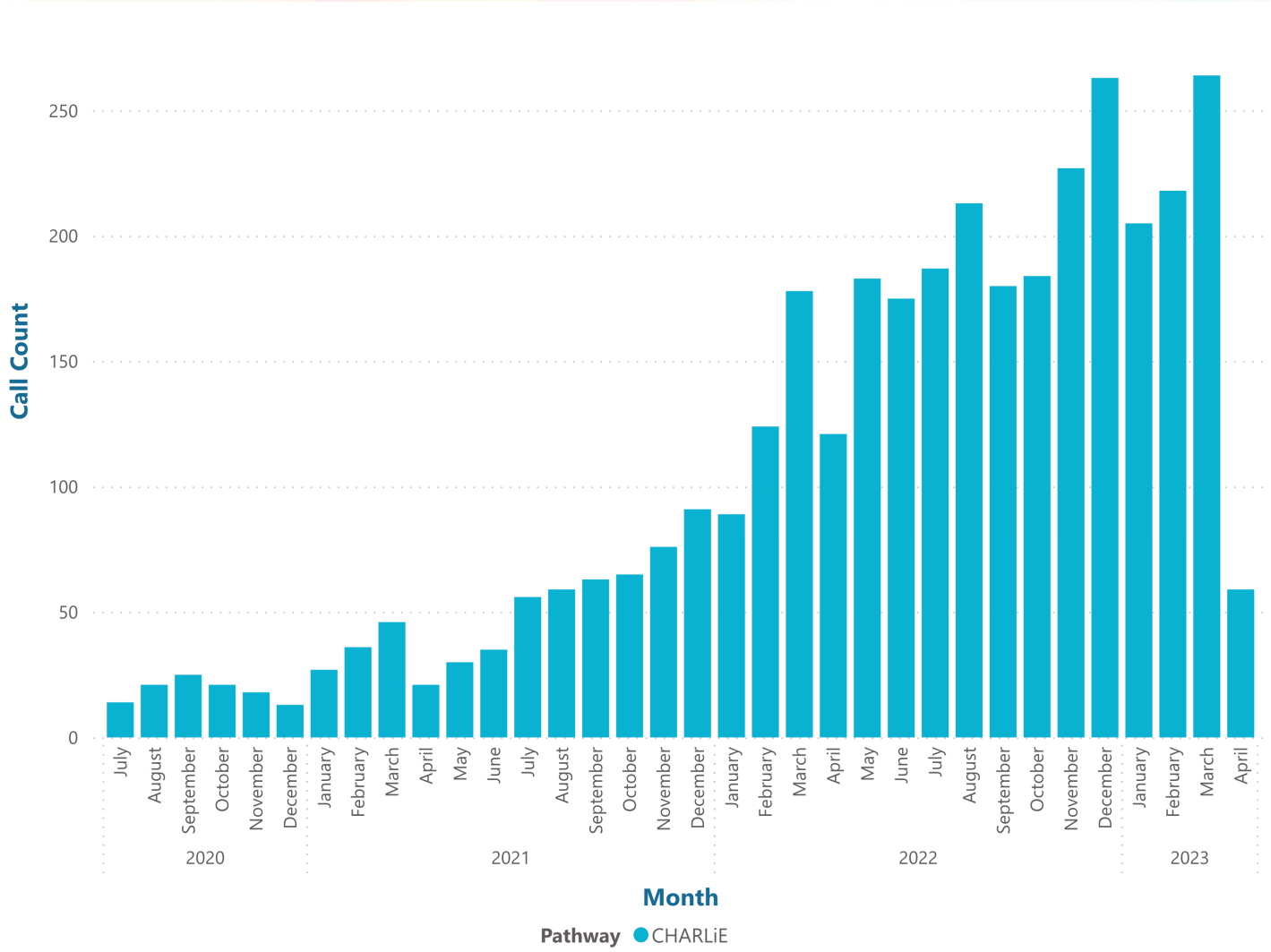
Can Pediatric Emergency Care be Provided Virtually?

- Children's Hospital of Eastern Ontario's Experience
  - 1036 (76%) of the ED visits during spring 2020 were virtual
    - Of those, only 176 (17%) were referred for in person ED assessment
    - 8 (0.8%) required admission

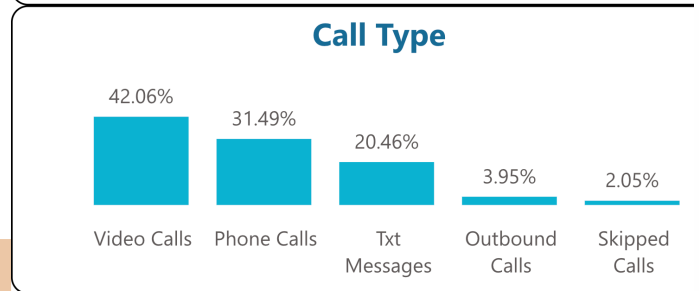


Reid, S., Bhatt, M., Zemek, R. *et al.* Virtual care in the pediatric emergency department: a new way of doing business?. *Can J Emerg Med* **23**, 80–84 (2021). https://doi.org/10.1007/s43678-020-00048-w

CHARLiE Users Think So!

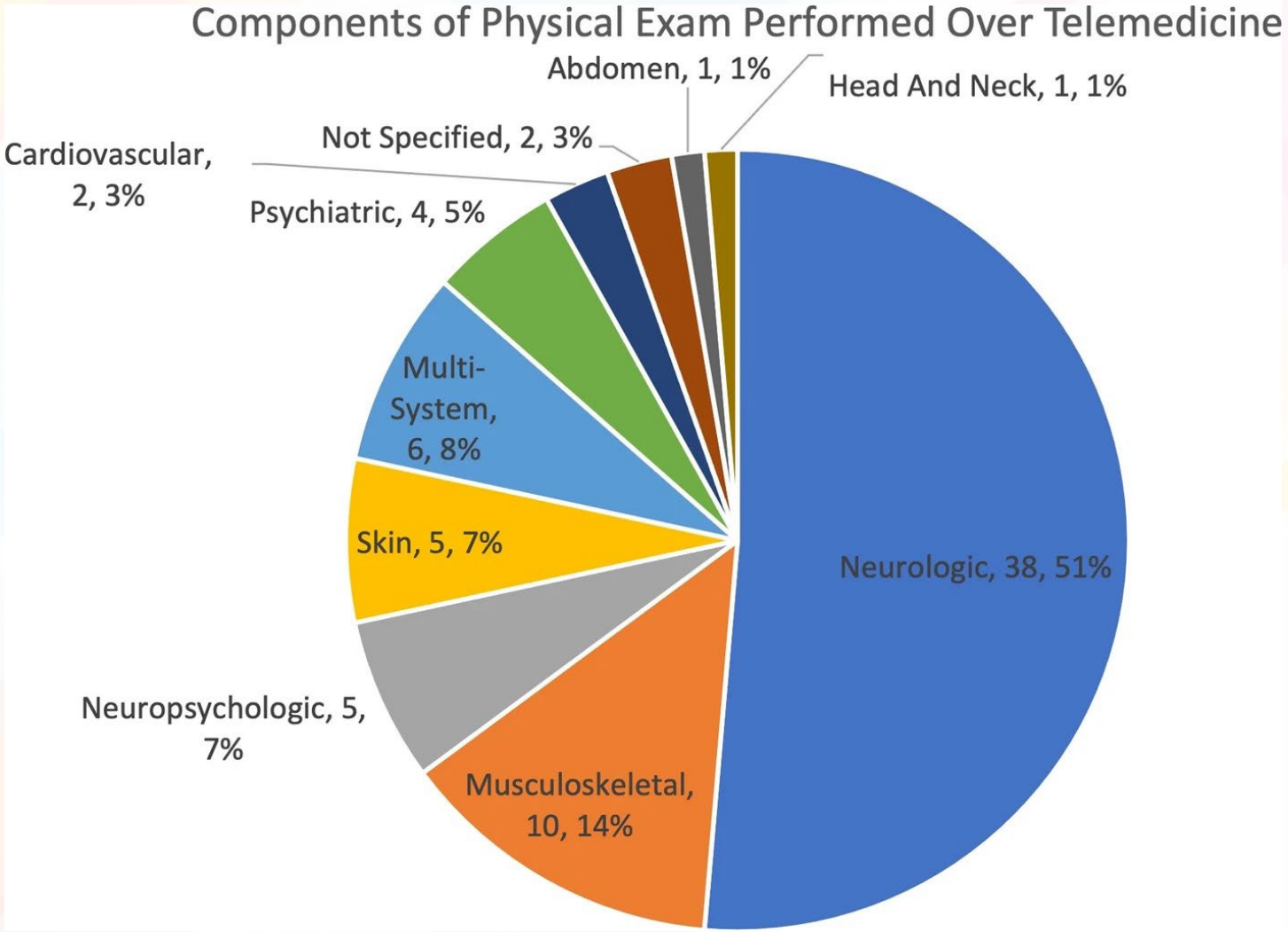


Year	CHARLiE	Total
⊞ **2020**	**112**	**112**
⊞ **2021**	**605**	**605**
⊟ **2022**	**2124**	**2124**
January	89	**89**
February	124	**124**
March	178	**178**
April	121	**121**
May	183	**183**
June	175	**175**
July	187	**187**
August	213	**213**
September	180	**180**
October	184	**184**
November	227	**227**
December	263	**263**
⊟ **2023**	**746**	**746**
January	205	**205**
February	218	**218**
March	264	**264**
April	59	**59**
Total	**3587**	**3587**



Values from post-shift survey, updated daily. Note that 'Call Type' and 'Skipped Calls' were added January 2022.

Equivalency of Telemedicine Physical Exam



Title	Specific exam maneuvers	Outcome measure	Equivalence
Telemedicine versus face-to-face evaluations by respiratory therapists of mechanically ventilated neonates and children: A pilot study	Pressure control, PEEP, mean airway pressure, breathing frequency, FIO2, inspiratory to expiratory time ratio (I-E ratio), tidal volume (VT), minute ventilation, oxygen saturation, presence of patient-triggered breaths, the need for suctioning or increased ventilator support	Comparison against in-person exam	Equivalent
Can Telemedicine Be Used for Adolescent Postoperative Knee Arthroscopy Follow-up?	Knee range of motion, incision color, effusion size	Comparison against in-person exam	Equivalent
Diagnostic accuracy of and patient satisfaction with telemedicine for the follow-up of paediatric burns patients	Scar color, scar thickening, contractures, range of motion, breakdown of the graft site, activity level	Comparison against in-person exam	Equivalent
Reliability of telemedicine in the assessment of seriously ill children	Respiratory Observation Checklist consisting of age-appropriate tachypnea, perioral cyanosis, nasal flaring, tripoding, thoracoabdominal asynchrony, supraclavicular, substernal, and intercostal retractions, mental status, and overall impression of respiratory distress. Yale Observation Scale consisting of quality of cry, reaction to parent stimulation, state variation or ability to be aroused, color, hydration status, and response to social overtures.	Comparison against in-person exam	Equivalent

Yao *et al. Systematic Reviews (2022) 11:219* https://doi.org/10.1186/s13643-022-02085-1

What Do Caregivers and Clinicians Think?

- Spine/Lower Limb Exam Pediatric Review:
  - High levels of patient and caregiver satisfaction
  - Feasible, valid, and reliable for most exam components (adult data)
  - Diagnoses and management decisions similar to those made in-person (adult data)
  - Despite this, Pediatric specialists felt they were unable to gather adequate information

- Caregivers Rate These More Highly Than Medical Team
  - Timely
  - Private
  - Safe
  - Met Clinical Goals

Noutsios, CD, Boisvert-Plante, V, Laberge, E, *et al.* The Telemedicine-Based Pediatric Examination of the Back and Lower limbs: A Narrative Review. *Journal of Pain Research* 2021:14 2959–2979

Theall, L *et al* . Caregiver and Clinician Experience With Virtual Services for Children and Youth With Complex Needs During COVID-19. *Journal of Pediatric Health Care*, Volume 37, Issue 2, 167 – 172

CPSP
CANDIAN PAEDIATRIC SURVEILLANCE PROGRAM

Home | Who we are | What we do | Participants | Apply for a New Study or Survey | Publications

Home > Study > Adverse events related to virtual care

Adverse events related to virtual care

2022 - 2024 - CURRENT

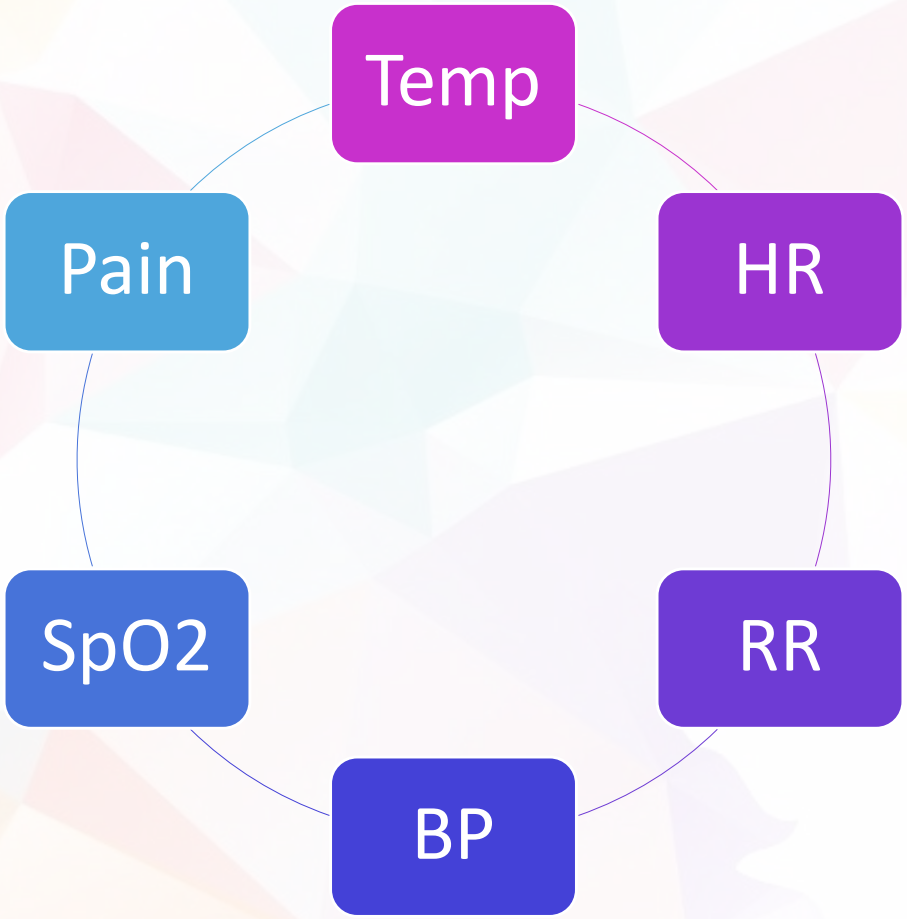
Principal investigators

Ellen Goldbloom, MD, FRCPC, Virtual Care Medical Lead, Deputy Chief Medical Information Officer, Ambulatory Care Medical Director, Paediatric Endocrinologist, Children's Hospital of Eastern Ontario (CHEO), Assistant Professor, Department of Paediatrics, University of Ottawa, Clinical Investigator, CHEO Research Institute

Shelley Vanderhout, RD, PhD, Postdoctoral Fellow, Canadian Institutes of Health Research, Health Systems Impact

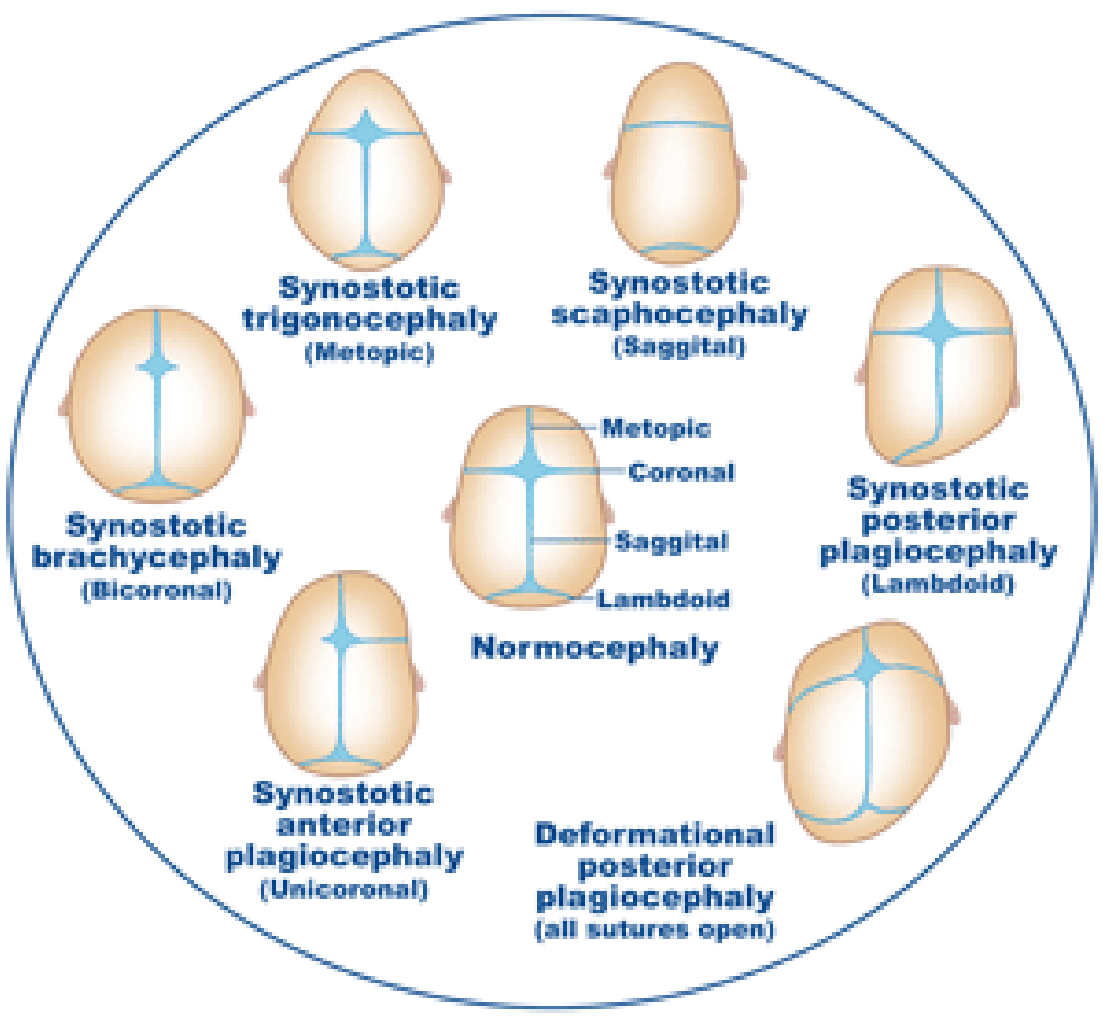
Protocol | Case definition | Questionnaire

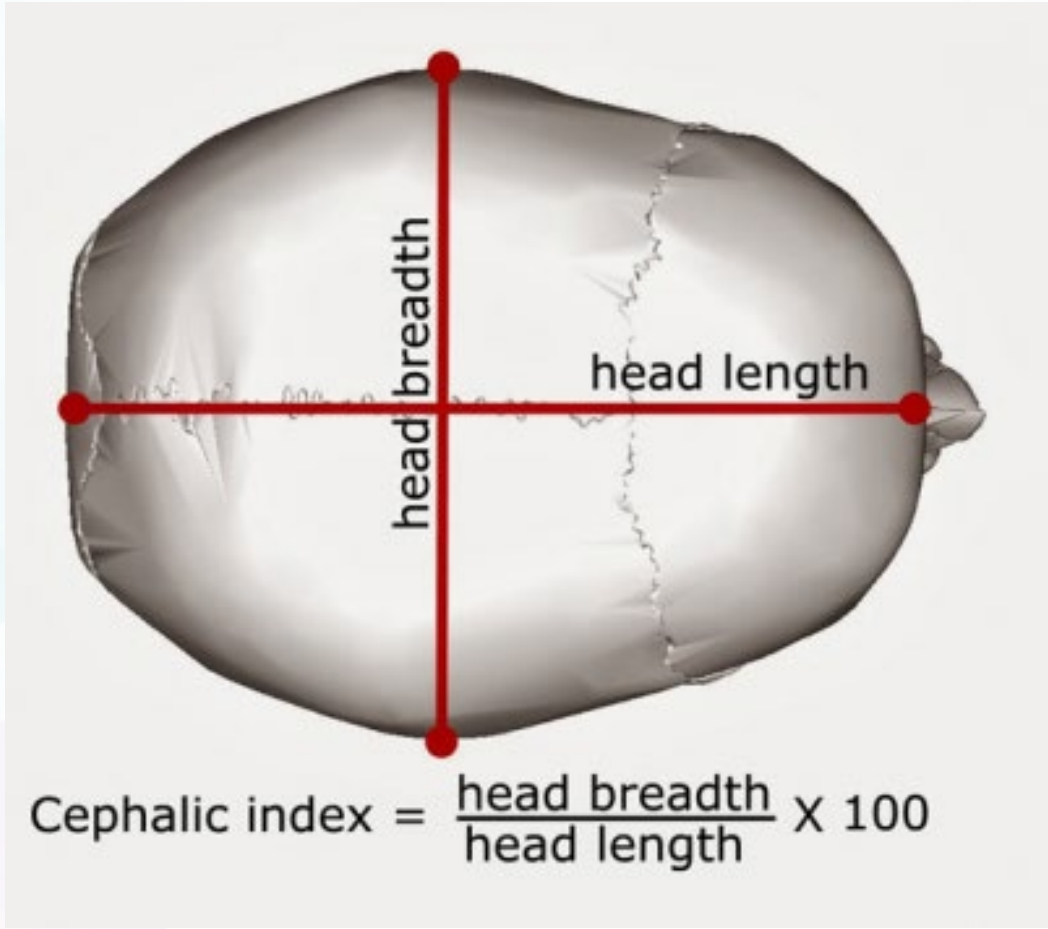
Vitals



Growth Parameters

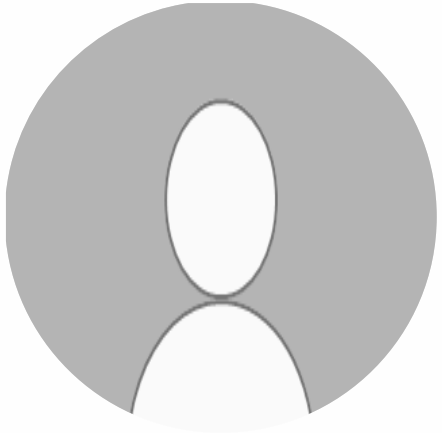
HEENT - Head


Synostotic trigonocephaly (Metopic)
Synostotic scaphocephaly (Saggital)
Synostotic brachycephaly (Bicoronal)
Metopic
Coronal
Saggital
Lambdoid
Normocephaly
Synostotic posterior plagiocephaly (Lambdoid)
Synostotic anterior plagiocephaly (Unicoronal)
Deformational posterior plagiocephaly (all sutures open)


head breadth
head length
Cephalic index = head breadth / head length X 100

HEENT - Eyes

- EOMs
- Pupil size
- Scleral icterus
- Conjunctival Injection
- Ptosis
- Swelling
- Discharge
- Allergic shiners



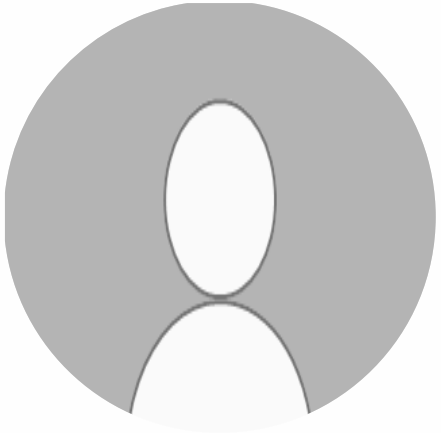
HEENT - Ears

- Observe:
  - Pulling
  - Swelling
  - Redness
  - Drainage
  - Dysmorphology
- Caregiver can place traction on tragus to assess for pain
- Digital otoscope

HEENT – Nose and Throat

- Nose
  - Mouth breathing or nasal flaring when mouth closed/feeding
  - Sniffing/snorting
  - Hyponasal voice

- Throat
  - Flashlight:
    - Handheld
    - Phone
  - Neck exam:
    - Guided ROM
    - Palpate cervical LAD by identifying SCM as landmark



CVS

- Observe:
  - Color, CRT, edema
- Digital stethoscopes
- POCUS

Yager PH, Clark ME, Dapul HR, Murphy S, Zheng H, Noviski N. Reliability of circulatory and neurologic examination by telemedicine in a pediatric intensive care unit. J Pediatr. 2014 Nov;165(5):962-6.e1-5. doi: 10.1016/j.jpeds.2014.07.002. Epub 2014 Aug 8. PMID: 25112695.

Wagner, R, Lima TC, Tavares da Silva, MR et al. Assessment of Pediatric Telemedicine Using Remote Physical Examinations with a Mobile Medical Device. *JAMA Network Open.* 2023;6(2):e2252570. doi:10.1001/jamanetworkopen.2022.52570

CHARLiE Mini Case 1: “Listen" to your patient

- Hx:
  - Alternating mild to significant respiratory distress
  - Nasal congestion for 3 days
  - Feeding and voiding well
- Site Exam:
  - Afebrile, RR 50 - >60, HR 145-190, SpO2 99%
  - Nasal congestion, transmitted UA sounds
  - Normal cardiac exam, palpable femorals
- Synchronous Virtual Exam:
  - Biphasic upper airway (nasal) sounds, tracheal tug, subcostal indrawing
- Asynchronous video review of “an episode”:
  - Similar, but more profound

CHARLiE Mini Case 1: Neonate with Respiratory Distress DDx

Slido.com with the code
#4157218

CHARLiE Mini Case 2: “Watch” your patient

- Hx:
  - 14m with acute onset severe resp distress
  - ?maybe nasal congestion yesterday
- Virtual Exam:
  - Hypoxemic 72% on arrival
  - No crackles, no wheeze
  - Poor A/E bilaterally
  - Normal heart sounds

CHARLiE Mini Case 2: 14m with Hypoxemia and Resp Distress

Slido.com with the code
#4157218

Resp

- Chronic care example:
  - Asthma Care
    - Assess symptom control
    - Observe device technique
    - Teach

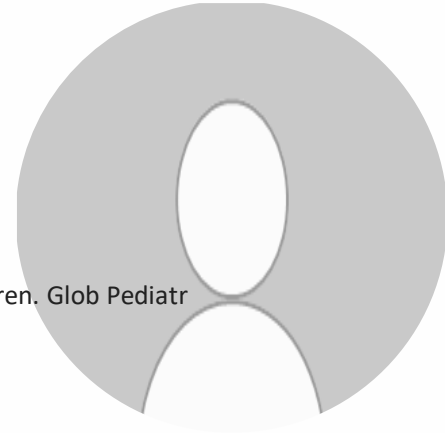
In the past 4 weeks, has the patient had:	Yes [1 point]	No [0 points]
Daytime asthma symptoms more than twice/week?		
Any night symptoms due to asthma?		
Reliever needed for symptoms more than twice/week?		
Any activity limitation due to asthma?		
FEV_1 or peak flow < 80% of personal best?*		
TOTAL POINTS		

* Children aged < 6 years often cannot perform spirometry reliably.

https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/bc-guidelines/asthma-children

GI/GU

- Observe:
  - Distension
  - Pain behaviors
  - Pain localization
  - May be able to guide through some special tests
- Asynchronous submission:
  - Hernias
  - GU/Perirectal pathology with consent, but not ideal
- Increased use of patient disease activity indexes



Tzortzopoulou AK, Giamarelou P, Tsolia M, Spyridis N, Vakaki M, Passalides A, Zavras N. The Jumping Up (J-Up) Test: Making the Diagnosis of Acute Appendicitis Easier in Children. Glob Pediatr Health. 2019 Nov 11;6:2333794X19884824. doi: 10.1177/2333794X19884824. PMID: 31763374; PMCID: PMC6851606.

MSK

- Environment
- Palpation challenging, but can help localize
- Active ROM
- Passive ROM and special testing
  - Caregiver or HCP assistance
- Augment with use of:
  - Virtual ruler
  - Virtual Goniometer
  - Inclinometer app
  - Compass app

Noutsios, CD, Boisvert-Plante, V, Laberge, E, *et al.* The Telemedicine-Based Pediatric Examination of the Back and Lower limbs: A Narrative Review. *Journal of Pain Research* 2021:14 2959–2979

Neuro

- Sensory
- Strength
- Reflexes

Component Examined	How to Examine via Telemedicine
Hip flexor/iliopsoas (L1-L2)	Patient is seated or standing and is asked to flex their hip and maintain this position. Holding with no perceived difficulty can suggest 5/5 strength while lifting without being able to hold denotes 3/5 strength.[17,18,21]
Quadriceps (L3-4)	Patient is asked to perform single sit-to-stand from chair. No difficulty suggests 5/5 strength while only being able to fully extend the knee while sitting denotes 3/5 strength.[17,18] Patient is asked to perform a timed five repetition sit-to-stand (5R-STS) test,[2] shown to be highly reliable when performed at home without supervision.[86] Child is asked to squat and "frog jump".[11] Child is asked to sit cross-legged and stand up (pay attention for Gower sign).[13]
Hip abductors (L5)	Patient is asked to perform a standing Trendelenburg test[12,20,21] and lateral leg raise.
Ankle dorsiflexion/tibialis anterior (L4-5)	Patient is asked to perform heel-walking or standing metatarsal raises. The ability to walk on the heels for 10 paces while clearing the metatarsal heads suggests 5/5 strength.[17,18]
Ankle plantarflexion/ gastrocnemius-soleus (S1)	Patient can perform unipodal heel raises where the ability to perform 10 repetitions indicates 5/5 strength.[17,18] Patient can also be asked to perform toe-walking and the ability to do so indicates at least 4/5 strength.[67,68]
Ankle inversion (L5-S1)	Patient is asked to perform a lateral foot walk.
Ankle eversion (L4-S1)	Patient is asked to perform a medial foot walk.

Noutsios, CD, Boisvert-Plante, V, Laberge, E, *et al.* The Telemedicine-Based Pediatric Examination of the Back and Lower limbs: A Narrative Review. *Journal of Pain Research* 2021:14 2959–2979

Derm and Heme

- Derm:
  - High diagnosis and treatment concordance
- Heme:
  - Guided LN exam
  - Color

CHARLiE Mini Case 3: 2yo with Resp Distress and ?Pallor

- Hx:
  - Non-verbal 2yo with Autism and features of Cerebral Palsy
  - Fatigue
  - Cough
- Site Exam:
  - Afebrile, irritable
  - RR 60, SpO2 94%
  - Moderately increased WOB
  - Crackles bilaterally, no wheeze
  - “shut down”, but CRT 2s
  - Liver at least 1 cm BCM
  - POCUS: Kerley B lines
- Virtual Exam:
  - RR 92
  - Pale

CHARLiE Mini Case 3: 2yo with Resp Distress and ?Pallor

Slido.com with the code
#4157218

Psych/Mental Health:

- Environment
- Interactions
- Safety
- Confidentiality

Developmental

- Motor assessment:
  - Use of toys, books, feeding, active play
  - Movement Assessment Battery of Children-2: MABC-2 – validated for telemedicine
- Language:
  - Ask about favorite toy, pet
- Dysmorphology:
  - Virtual and traditional genetics consultation led to similar molecular diagnosis rates

Nicola K, Waugh J, Charles E, Russell T. The feasibility and con- current validity of performing the movement assessment battery for children–2nd edition via telerehabilitation technology. Res Dev Disabil. 2018;77:40–48. doi:10.1016/j.ridd.2018.04.001
Szigety, KM., Crowley, TB., Gaiser, KB. *et al.* Clinical Effectiveness of Telemedicine-Based Pediatric Genetics Care. *Pediatrics* July 2022; 150 (1): e2021054520. 10.1542/peds.2021-054520

Developmental

- Social-Emotional and Behavioral:
  - Note interaction with parents
  - Consider aspects of tasks in virtual autism assessment research
    - TELE-ASD-Peds
      - Overall diagnostic concordance: 86%
      - Sensitivity: 94%
      - Specificity: 69%
      - Average time: 23 minutes!

Developmental

- 3 point Likert scale:
  - Social directed speech
  - Flexible and frequent eye contact
  - Unusual vocalization
  - Unusual/repetitive play
  - Unusual/repetitive body movements
  - Integrations of eye contact, speech and gestures
  - Unusual sensory exploration or reactions

- Acceptable to families

Corona, L., Hine, J., Nicholson, A., Stone, C., Swanson, A., Wade, J., Wagner, L., Weitlauf, A., & Warren, Z. (2020). TELE-ASD-PEDS: A Telemedicine-based ASD Evaluation Tool for Toddlers and Young Children. Vanderbilt University Medical Center. https://vkc.vumc.org/vkc/triad/tele-asd-peds
Corona LL, Weitlauf AS, Hine J, Berman A, Miceli A, Nicholson A, Stone C, Broderick N, Francis S, Juárez AP, Vehorn A, Wagner L, Warren Z. Parent Perceptions of Caregiver-Mediated Telemedicine Tools for Assessing Autism Risk in Toddlers. J Autism Dev Disord. 2021 Feb;51(2):476-486. doi: 10.1007/s10803-020-04554-9. PMID: 32488583; PMCID: PMC7266386.

CHARLiE Case: Can a Virtual Exam “Meat” the Need?

- Further hx:
  - No headaches
  - Attends karate
- Virtual exam after provision of anti-pyretic:
  - Fully compliant with exam
  - Bilateral non-purulent conjunctivitis
  - Has developed a cough
  - Neck posturing seemed more postural
    - Negative Kernig and Brudzinski
    - Full neck ROM
  - Petechiae only to base of neck on right where he localizes the neck pain

Review of Learning Objectives

Explore

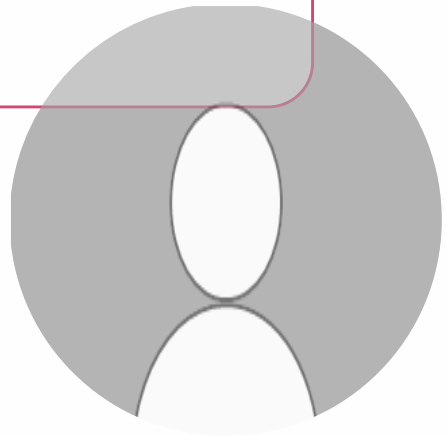
- Explore pediatric virtual physical examination possibilities

Recognize

- Recognize strengths and weakness of virtual assessment to patients, rural and remote peers, and our healthcare system

Discuss

- Discuss how pediatric virtual examination can be enhanced



References

- Reid, S., Bhatt, M., Zemek, R. *et al.* Virtual care in the pediatric emergency department: a new way of doing business?. *Can J Emerg Med* **23**, 80–84 (2021). https://doi.org/10.1007/s43678-020-00048-w
- Brave, L. *Optimize Virtual Visits by Assembling a Telemedicine Kit at Home.* Boulder Medical Center. https://www.bouldermedicalcenter.com/make-the-most-of-your-pediatric-virtual-visit/
- Szigety, KM., Crowley, TB., Gaiser, KB. *et al.* Clinical Effectiveness of Telemedicine-Based Pediatric Genetics Care. *Pediatrics* July 2022; 150 (1): e2021054520. 10.1542/peds.2021-054520
- Noutsios, CD, Boisvert-Plante, V, Laberge, E, *et al.* The Telemedicine-Based Pediatric Examination of the Back and Lower limbs: A Narrative Review. *Journal of Pain Research* 2021:14 2959–2979
- Piche J, Butt BB, Ahmady A, Patel R, Aleem I. Physical examination of the spine using telemedicine: a systematic review. Global Spine J. 2020;10:2192568220960423.
- Lovecchio F, Riew GJ, Samartzis D, et al. Provider confidence in the telemedicine spine evaluation: results from a global study. Eur Spine J. 2020;30:1–15.
- Cottrell MA, O'Leary SP, Swete-Kelly P, et al. Agreement between telehealth and in-person assessment of patients with chronic muscu- loskeletal conditions presenting to an advanced-practice physiother- apy screening clinic. Musculoskeletal Sci Practice. 2018;38:99–105. doi:10.1016/j.msksp.2018.09.014
- Lightsey IVHM, Crawford AM, Xiong GX, Schoenfeld AJ, Simpson AK. Surgical plans generated from telemedicine visits are rarely changed after in person evaluation in spine patients. Spine J. 2020;21:359–398.
- Corona, L., Hine, J., Nicholson, A., Stone, C., Swanson, A., Wade, J., Wagner, L., Weitlauf, A., & Warren, Z. (2020). TELE-ASD-PEDS: A Telemedicine-based ASD Evaluation Tool for Toddlers and Young Children. Vanderbilt University Medical Center. https://vkc.vumc.org/vkc/triad/tele-asd-peds
- Corona LL, Weitlauf AS, Hine J, Berman A, Miceli A, Nicholson A, Stone C, Broderick N, Francis S, Juárez AP, Vehorn A, Wagner L, Warren Z. Parent Perceptions of Caregiver-Mediated Telemedicine Tools for Assessing Autism Risk in Toddlers. J Autism Dev Disord. 2021 Feb;51(2):476-486. doi: 10.1007/s10803-020-04554-9. PMID: 32488583; PMCID: PMC7266386.
- Yao *et al. Systematic Reviews (2022) 11:219* https://doi.org/10.1186/s13643-022-02085-1
- Wagner, R, Lima TC, Tavares da Silva, MR et al. Assessment of Pediatric Telemedicine Using Remote Physical Examinations with a Mobile Medical Device. *JAMA Network Open.* 2023;6(2):e2252570. doi:10.1001/jamanetworkopen.2022.52570
- Theall, L *et al* . Caregiver and Clinician Experience With Virtual Services for Children and Youth With Complex Needs During COVID-19. *Journal of Pediatric Health Care*, Volume 37, Issue 2, 167 – 172
- Stavropoulos KK-M, Bolourian Y, Blacher J (2022) A scoping review of telehealth diagnosis of autism spectrum disorder. PLoS ONE 17(2): e0263062. https://doi.org/10.1371/journal.pone.0263062
- Yager PH, Clark ME, Dapul HR, et al. Reliability of circulatory and neurologic examination by telemedicine in a pediatric intensive care unit. J Pediatr 2014; 165: 962–966.

Thank you!

Contact:

- melis.paquette@gmail.com

- Open Discussion Time

THE UNIVERSITY OF BRITISH COLUMBIA
Continuing Professional Development
Faculty of Medicine

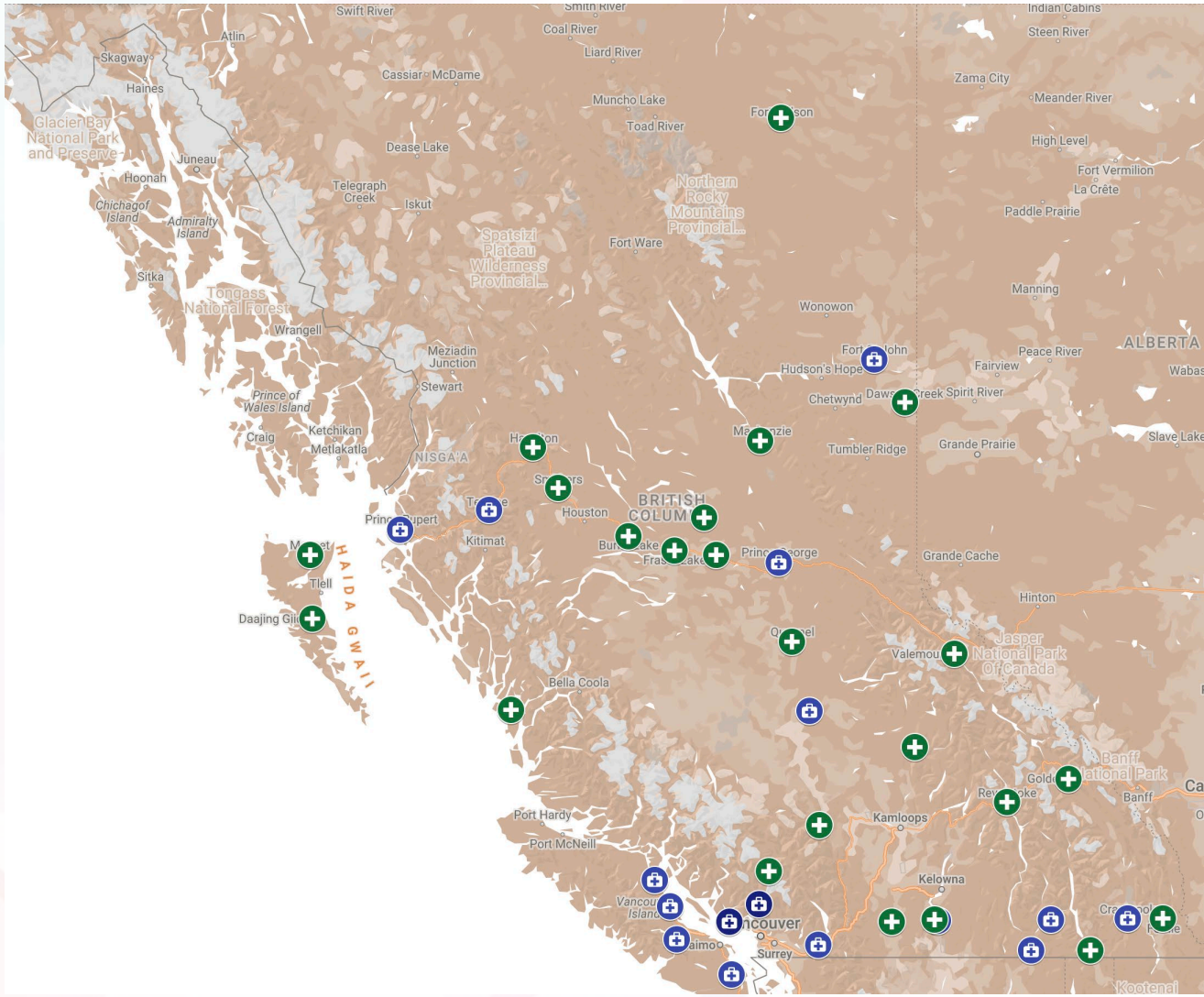
Bonus Topics

- Virtual care resources
- Technology Tips for Pediatrics

Slido.com with the code
#4157218

Virtual Care Resources – Rural Pediatrics

- https://rccbc.ca/initiatives/spruce/



Virtual Care Resources – Mental Health

https://keltymentalhealth.ca

Technology Tips for Pediatrics

- Platform options
- Resource: www.doctorsofbc.ca/doctors-technology-office
- Poor connection?
  - Turn off video
  - Wired over WiFi when needed
  - Have a back-up plan
- Audio
  - Choose the right input/output
  - Headset helps for both video and phone for both sound and documentation

DTO Doctors Technology Office
A GPSC initiative

Technology Tips for Pediatrics

- Efficiency
  - Have the right people present
  - Ask families to come prepared
  - Turn off self-view if easily distracted
- Equity:
  - Provincial Language Services
    - Immediate access video remote interpreting devices in most EDs and within many hospitals
    - Can also pre-book for scheduled appointments

Technology Tips for Pediatrics

- Clarify expectations and concerns
  - FIFE for patients
  - Clarifying impression and concerns with other providers
- Use of technology to break down social barriers to health care
- Bottom Line: In-person assessments when patient/family or clinician feel it is needed