COVID-19 Seminar Series: Pediatric Cases

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Disclosures

- Nothing to disclose

- Note: Very little pediatric literature to date, evolving topic; most of the literature has come from China
Objectives:

Discuss COVID-19 from the pediatric perspective:
- Transmission
- Clinical Characteristics
- Infection-Prevention Control Considerations
- Lab Testing
- Anti-virals and other medications
- Supportive Care in Hospital
- And any other questions you may have along the way
Transmission¹,²

- **Droplet**: Person-to-person spread when an infected individual coughs, speaks, or sneezes > droplets make contact with mucous membranes (eyes, nose, mouth)
- **Contact**: from contaminated surfaces to self (auto-inoculation)
- **Possible airborne transmission?**
- **Virus is present in other body fluids (i.e. feces)**

- **Limited information about transmission patterns (2-3 published reports)**
- **What is available suggests that most transmission occurs within the household**
- **Predominantly transmission occurs from infected adults to children**
- **The reason for this is not clear... weaker cough? Staying at home more? Receptors?**

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Clinical Characteristics

- Approximately ~1-2% of cases will be among children\(^1\).
- Overlap with other common viral respiratory tract infections.
- Symptoms reported among confirmed cases\(^1,3\):
  - Fever (50%), 1-3 days, longest up to 16 days.
  - Cough (42%), mostly non-productive.
  - Pharyngeal redness/congestion (32%).
  - Shortness of breath (14%).
  - Rhinorrhea (6%).
  - Diarrhea, vomiting (5%).
- Other non-specific s/s: headache, fatigue, myalgia, poor appetite.
- Note: A large proportion of children will be asymptomatic.

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Case Categories: Asymptomatic\textsuperscript{1,4}

Positive nucleic acid test for SARS-CoV-2

No signs of symptoms of COVID-19

Normal chest imaging

Younger age group less likely to be asymptomatic

Overall predict this to be \(~4.4\%\) of pediatric cases

\textsuperscript{1} https://www.cdc.gov/coronavirus/2019-ncov/hcp/pediatric-hcp.html, Accessed June 15/2020

Case Categories: Mild\(^1,4\)

- Symptoms of upper respiratory tract infection (i.e. cough, sore throat, runny nose etc.) or mild gastrointestinal symptoms (diarrhea, vomiting etc.)\(^3\)
- Normal auscultation of chest
- Largest proportion of patients, around half of all pediatric cases

Management considerations: Oral fluids (electrolyte) and fever/pain control?

Case Categories: Moderate\textsuperscript{1,4}

Signs/symptoms of pneumonia\textsuperscript{1,3}: coughing (productive and non-productive), fever, possible wheezing

Not hypoxic

Auscultation of chest abnormal

Abnormal chest imaging

Second largest group of patients (~40%)

Management considerations: Hydration status of child, underlying co-morbid conditions, distance to medical attention, trajectory of illness (getting worse or getting better?)

Case Categories: Severe¹,⁴

Respiratory symptoms (fever, cough) +/- gastrointestinal symptoms
Central cyanosis and shortness of breath
Oxygen saturation < 92%
Abnormal chest imaging
Highest proportion in the youngest age groups

Management considerations: in-patient admission, more details to come...

Case Categories: Critical\(^1\),\(^4\)

- Acute respiratory distress syndrome, respiratory failure
- Other possible manifestations: shock, end-organ failure (acute kidney injury, encephalopathy etc.)
- Abnormal chest imaging
- Highest proportion in the youngest age group

- Management considerations: in-patient admission, more details to come...

Multisystem Inflammatory Syndrome in Children: “MIS-C”

Case definition:

- Age <= 21 yo
- Fever
- Lab evidence of inflammation (CRP, ESR, ferritin, LDH etc.)
- Need for hospitalization for severe illness and >= end organ systems involved
- No other alternative diagnosis
- Positive for SARS-CoV-2 infection OR exposure to confirmed or suspected COVID-19 case within the previous four weeks
- **Can look similar to and fulfill criteria for Kawasaki Disease**

Infection Prevention Control

- Safest assumption is that everyone is infected = Standard Precautions
- Overall Goals:
  - Quick diagnosis of those who are infected - appropriate triage and isolation
  - Protection of healthcare workers
- Children will need a caregiver to accompany them, always assume both are infected (safest)
- If possible both the child and the caregiver should be masked
  - Limitations: young age, altered mental status, PPE availability
- Patients often don’t realize they’re sick, do not be falsely reassured by them
- If a sick patient needs to come into your facility, try to limit movement and contact prevent nosocomial spread
  - Ward and room restrictions
  - Limit number of personnel contacts in contact with this group

Laboratory Testing for COVID-19

- Basic labs

- SARS-CoV-2/COVID-19 specific testing:
  - RT-PCR
  - Point of Care Testing (POCT)
  - Serology
Basic Labs

- CBC, electrolytes, renal function all appropriate for more sick patients
- May observe lymphopenia/leukopenia, mild hepatitis, elevated inflammatory markers:
  - None are specific to COVID-19 (can be seen in many different viral processes)
Several different genes from SARS-CoV-2 to target; all targets very similar sensitivity and specificity

So what IS the sensitivity/specificity of these tests?

It depends on:

- quality of specimen
- NP vs throat vs LRT
- When specimen is taken in disease course
- Community prevalence of COVID-19

Ideally, Sensitivity 95-99%, Specificity 99-100%

Does RT-PCR positivity predict SARS-CoV-2 infectivity?

- Positivity does not equal infectivity!
- Viral transmission is unlikely beyond 8-10 days of symptoms in mild to moderate disease; may be longer in more severe disease
- Ct value from RT-PCR may help predict infectious SARS-CoV-2:
  - Ct values >24 are increasingly less likely to represent infectiousness

SARS-CoV-2 POCT
Key points of COVID-19 POCT

Pros:

- Excellent performance when compared to laboratory developed tests (LDTs) and commercial assays
- Excellent turnaround time (results in under an hour)
- Dead sexy looking!

Cons:

- Typically more expensive
- Considered low throughput
Serology

- All target a few key SARS-CoV-2 viral proteins
- Some viral proteins predict neutralization (Spike/S protein) better than others (Nucleocapsid/N protein)
- Many options through the FDA!!
- Fairly good specificity (~80-100%)
- Sensitivity varies by timing symptom onset:
  - 3-7 days: ~25-50%
  - 8-14 days: ~50-80%
  - >14 days: ~65-90%
Important points about SARS-CoV-2 serology

What it’s likely good for:
- Seroprevalence studies
- MIS-C

What it’s likely **NOT** good for:
- Predicting immunity
- Acute clinical diagnostics
Treatment Options

- Supportive care will be the normal for almost all cases of COVID-19 in children!
  - Mild/moderate disease (no oxygen required)
- Antivirals rarely recommended but can be determined on a case-by-case basis in those with confirmed virological COVID-19 AND if enrolled in a clinical trial
  - Severe/Critical (oxygen required +/- mechanical ventilation support)
- Suggest use of remdesivir (targets RdRP) if available
- Lopinavir-Ritonavir (Kaletra)
- Please don’t use hydroxychloroquine...