Post-COVID Conditions Among Children 90 Days after SARS-CoV-2 Testing in Pediatric Emergency Departments: the Multinational PERN-COVID-19 Study

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WHO Webinar on Post-COVID-19 Condition in Children
Disclosures and Funding

Disclosures: Stephen Freedman has no financial relationships to disclose or Conflicts of Interest (COIs) to resolve.

Off-label: Stephen Freedman has documented this presentation will not involve discussion of unapproved or off-label, experimental or investigational use of a drug or device.

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Post-COVID-19 Condition (PCC)

• Definition
  • Persistent, new or returning symptoms or health problems 3 months from onset of COVID-19 with symptoms lasting ≥ 2 months

• Frequency in children is variable and unclear
  • Studies to date have limitation precluding accurate estimate

• Accurate estimate needed to inform:
  • Public health policies
  • Individual decisions (e.g. vaccination, masking)
  • Care of high-risk children
PERN-COVID-19 Prospective Cohort

- Pediatric Emergency Research Network
  - Association of 8 pediatric emergency research networks

- PERN-COVID-19 Prospective Cohort Study
  - March 2020 – January 2021
  - 39 emergency departments (ED)
  - 8 countries
  - Follow-up of children tested for SARS-CoV-2 infection
    - Both test-positive & -negative children
Objectives

• To determine the proportion of children with PCCs 90 days following SARS-CoV-2 testing

• To identify risk factors for PCCs among SARS-CoV-2 positive children

• To compare the prevalence of PCCs between SARS-CoV-2 positive and negative children
Participants

• < 18 years old
• Tested for SARS-CoV-2 in a participating ED
  • Due to symptoms or epidemiological risk factors
• Enrollment
  • Initially was consecutive based on timing of testing
    • Maximum of 5/site/day
    • Led to over-enrollment of test-negative participants
  • Modified in September 2020
    • Enrolled as many test-positive children as possible plus 2 test-negative controls per positive enrolled
Definitions

• SARS-CoV-2 test categorization
  • Based on nucleic acid testing (nares, naso/oropharyngeal)
  • Included index visit and other testing performed in subsequent 14 days

• Acute symptoms
  • Any symptoms between symptom onset and index ED visit

• Hospitalization and illness severity
  • Classified based on events until 14 days post-index ED visit
Definitions

• Post-COVID-19 Condition **Present**
  • If caregiver indicated ‘yes’ to questions about any persistent, new or returning symptoms or health problems at the 90-day interview

• Post-COVID-19 Condition **Absent**
  • Symptoms were not persistent (i.e. completely recovered)
  • Symptoms were not novel (i.e. underlying condition without exacerbation)

• Could respond via checkbox or free text
  • Free text was analyzed and grouped blinded to SARS-CoV-2 test result
Statistical Analysis

• Primary Outcome (PCC)
  • Stratified by hospitalization status
  • Combined countries with few positives
  • Multiple logistic regression to identify associated factors
    • Covariates: country, sex, age, chronic conditions, # of acute symptoms, hospitalization, calendar month

• Secondary Outcomes
  • Frequency-matched positive and negative participants
    • Based on country and calendar month
  • Multiple logistic regression as per above with inclusion of SARS-CoV-2 test result in model
Results

SARS-CoV-2 positive children tested at EDs by January 20th 2021
2368

- Acute outcome unknown: 3

Not hospitalized
1801
- Follow-up not attempted*: 134 (7.4%)
- Lost to follow-up: 230 (12.8%)
- Complete 90-day follow-up
  1437 (79.8%)

Hospitalized
564
- Follow-up not attempted*: 58 (10.3%)
- Lost to follow-up: 59 (10.5%)
- Complete 90-day follow-up
  447 (79.3%)

ED=Emergency Department *In a few sites, consistent 90-day follow-up was not feasible amid human resource constraints during the COVID-19 pandemic
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**Day 0-14**

- Follow-up not attempted*: 134 (7.4%)
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**Day 90**

- Follow-up not attempted*: 58 (10.3%)
- Lost to follow-up: 59 (10.5%)

**Complete 90-day follow-up**

- 1437 (79.8%)
- 447 (79.3%)

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Participant Characteristics

Of 1884 children:
- 1771 (94%) symptomatic
- 994 (53%) male
- 270 (14%) chronic illness

Country / region of enrolment:
- 1204 (64%) United States
- 331 (18%) Costa Rica
- 172 (9%) Canada
- 177 (9%) Other

Median Age: 3 years (0, 10)
Results: Index ED Visit Symptoms

Number of acute symptoms

Median: 4 (2, 6)
SARS-CoV-2 Positive Participants

90-Day PCCs

Overall: 5.8% (95%CI: 4.8, 7.0)
Hospitalized: 9.8%
Discharged: 4.6%
  Difference: 5.3% (95%CI: 2.5, 8.5)
Hospitalized – severe outcome: 18.6%
Hospitalized – no severe outcome: 8.2%
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Results: # of PCC Symptoms
Results: Types of PCC Symptoms
## Results: Risk Factors for PCCs

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**Notes on multiple logistic regression model:**

- Also adjusted for: Country / region of enrolment
- Initial model also included: Chronic conditions, calendar month.
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Initial model also included:
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SARS-CoV-2 Pos (N=474) vs Neg (N=1626)

• Discharged SARS-CoV-2 positive vs. negative
  • 4.2% (95%CI: 3.2, 5.5) vs. 2.7% (95%CI: 1.9, 3.7)
  • Difference: 1.6% (95%CI: 0.2, 3.0)

• Hospitalized SARS-CoV-2 positive vs. negative
  • 10.2% (95%CI: 7.4, 13.7) vs. 5.0% (95%CI: 3.0, 7.7)
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• Logistic regression model predicting PCC
  • SARS-CoV-2 positive: OR: 1.6 (95%CI: 1.1, 2.3)
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Limitations

• Unmeasured/residual confounding is possible

• Knowledge of test status

• Control group contamination

• Emerging variants of concern
Conclusions

• PCCs at 90 days
  • ~10% of children hospitalized
  • ~5% of those discharged

• Risk factors for reporting PCCs
  • Number of acute symptoms
  • Hospitalization
  • Older age

• SARS-CoV-2 test positivity was associated with PCCs
Thank you!

Site Investigators
Yaron Finkelstein, Adriana Yock-Corrales, Kristen Breslin, Pradip Chaudhari, Kelly Bergmann, Michael Gardiner, Jasmine Nebhrajani, Carmen Campos, Fahd Ahmad, Laura Sartori, Nidhya Navanandan, Nirupama Kannikeswaran, Kerry Caperell, Claudia Morris, Iker Gangoiti, Vikram Sabhaney, Usha Avva, Nipam Shah, Andrew Dixon, Maren Lunoe, Sarah Becker, Alexander Rogers, Viviana Pavlicich, Meredith Borland, Andrea Morrison, Maala Bhatt, Pedro Rino, Isabel Beneyto Ferre, Michelle Eckerle, April Kam, Shu-Ling Chong, Laura Palumbo, Maria Kwok, Jonathan Cherry, Naveen Poonai, Muhammad Wassem

PERN-COVID-19 Leadership
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