# COVID-19 Considerations in High-risk Pediatric Populations

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# Learning Objectives

- Identify various unique populations that present in outpatient settings and are in need of access to COVID-19 prevention and prompt treatment.
- Follow a case of a high-risk patients as their health progresses across the care continuum, from primary care presentation to urgent care/emergency department to in-patient intensive care and through to outpatient follow up care.
- Prescribe appropriate treatment to prevent negative outcomes from COVID-19 illness in children with high-risk health conditions.
- Address unique health care access issues present today, including vaccine and treatment coverage, lack of vaccine availability, finding a vaccine source, and advocating for patients that require high-risk attention.





# COVID-19 Landscape/2024-2025 Season[1]

COVID-19 causes significant impacts on healthcare settings and substantial disease burden on the population

Most children with COVID-19 hospitalized had pre-existing chronic condition

During August 29, 2024–September 2, 2025, within a multisite network including nine states, vaccine effectiveness of 2024–2025 COVID-19 vaccination was an estimated 76% against COVID-19–associated emergency department or urgent care (ED/UC) visits among immunocompetent children aged 9 months–4 years and an estimated 56% among children and adolescents aged 5–17 years, compared with those who did not receive a 2024–2025 vaccine

Kids who get vaccinated against COVID-19 are less likely to have acute complications and long COVID.

## RSV & Respiratory Illness Office Poster[2]

| Signs & Symptoms | RSV | FLU | COLD | COVID-19 |
|---|---|---|---|---|
| Aches | | Common | | Occasional |
| Chills | | Occasional | | Occasional |
| Cough | Common | Common | Common | Common |
| Diarrhea | | Occasional | | Occasional |
| Difficulty Breathing | Common | Occasional | | Occasional |
| Fatigue | Occasional | Common | Occasional | Occasional |
| Fever | Common | Common | Occasional | Common |
| Headache | | Common | | Occasional |
| Loss of Taste or Smell | | | | Common |
| Nausea/Vomiting | | Occasional | | Occasional |
| Sneezing | Occasional | Occasional | Common | |
| Sore Throat | Occasional | Common | Occasional | Occasional |
| Stuffy/Running Nose | Common | Common | Occasional | Occasional |
| Wheezing | Common | | | |

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# Section I

Who is High Risk and what unique considerations/complications could they encounter?

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# High-risk Pediatric Populations

Conditions with high risk for acute and long-term complications of COVID-19:

- Obesity
- Diabetes
- Cardiac issues
  - those with neurological and cardiac comorbidities had the greatest increase in odds of severe disease and death
- Chronic lung disease
- Seizures
- Immunocompromise
- Prematurity
- Genetic conditions
- Developmental disabilities
- Lower income families

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# Acute COVID-19 Complications[3,4,5,6]

- Severe lower respiratory illness requiring oxygen or ventilatory support
- Sepsis or shock with hypotension and multi-organ involvement
- Exacerbation of chronic conditions (e.g. heart failure, seizures)
- Fatigue
  - School/Work Absences
- Pediatric patients who had COVID-19 twice were more than 3.5 times as likely to develop myocarditis
- Cardiovascular disease seen in about 11.2%
  - Myocardial dysfunction, pancarditis and arrhythmias
- Multisystem Inflammatory Syndrome in Children (MIS-C)
  - High incidence during pandemic
  - Numbers declining over time
- Risk for long COVID even if asymptomatic

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# Section II

Do they work?
COVID Vaccines and Reduction of Hospitalization and Mortality





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## Recommendation for COVID-19 Vaccine

**Age:** 6 months+

**Number of Doses:** 6 to 23 months = 2 doses, everyone else one yearly

**Frequency:** Every year now due to variant mutation

**Counseling:** You can get the COVID-19 vaccine at the same time as other vaccines, like the yearly flu vaccine.

Coming soon…flu + COVID vaccine?





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# COVID-19 Vaccine Recommendations for High-risk Children[7]

Pediatric COVID-19 Vaccine Dosing Quick Reference Guide

- Moderna, Pfizer-BioNTech, and Novavax COVID-19 Vaccine Products for Individuals who are Moderately or Severely Immunocompromised

Dosing Reference Guide

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## Contraindications and Precautions to COVID-19 Vaccination[8]

| Medical Condition or History | Guidance | Recommended Action |
|---|---|---|
| History of a severe allergic reaction* (e.g., anaphylaxis†) after a previous dose or to a component of the COVID-19 vaccine‡ | Contraindication | Do not vaccinate with the same COVID-19 vaccine type.§ May administer the alternate COVID-19 vaccine type.§ See Considerations for people with a history of allergies and allergic reactions for additional information. |
| History of a diagnosed non-severe allergy* to a component of the COVID-19 vaccine‡ | Precaution | May administer the alternate COVID-19 vaccine type.§ |
| History of a non-severe, immediate (onset less than 4 hours) allergic reaction* after administration of a previous dose of one COVID-19 vaccine type§ | Precaution | For additional information, see Considerations for people with a history of allergies and allergic reactions. |
| Moderate or severe acute illness, with or without fever | Precaution | Defer vaccination until the illness has improved. |
| History of MIS-C or MIS-A | Precaution | See COVID-19 vaccination and MIS-C and MIS-A. |
| History of myocarditis or pericarditis within 3 weeks after a dose of any COVID-19 vaccine | Precaution | A subsequent dose of any COVID-19 vaccine should generally be avoided. See COVID-19 vaccination and myocarditis and pericarditis. |

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## Make a Strong COVID-19 Vaccine Recommendation

- Personal examples
- Offer with regular vaccines
- Offer at every visit if possible
- Vaccines due today…..and list COVID with these
- Tone matters – a lot
- Take a collaborative stance
- Explain and contextualize evidence

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## Disease + Vaccination[9,10,11,12,13]

A prior infection provided enhanced protection against subsequent infection with Omicron (59%; 95% CI 47–69), higher than vaccination alone (30%, 95% CI 25–34) at 15–24 weeks after dose two. The combination of previous infection and vaccination provided the highest protection, irrespective of primary infecting SARS-CoV-2 variant, at the same interval of 15–24 weeks after dose two: 76%, (95% CI 66–82) after prior delta infection and 64% (95% CI 52–73) after prior alpha infection.[74]

The highest protection against symptomatic Omicron infection was observed in those with Omicron infection after vaccination, reaching 96.4% (95% CI, 84.4–99.1%) at 15–24 weeks after two doses. This is consistent with studies in adults and in laboratory studies showing that hybrid immunity provides the most robust protection against symptomatic infection. [75, 76, 77]

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## COVID-19 vaccine can be lifesaving in children[9,14,15,16]

- COVID vaccines reduced the risk of ED visits by 76% in kids under age 4 and by 56% in kids ages 5 to 17 during the first six months after vaccination.
- When compared to unvaccinated populations in 2022, we observe an 8–15-fold reduction in cumulative death rates for pediatric populations vaccinated with 1 or more doses, and a 16–18-fold reduction for those vaccinated with 2 or more doses in Argentina
- Vaccination of children 5–11 years old was associated with reductions in all-age cumulative cases (7.2%, mean incidence ratio [IR] 0.928, 95% confidence interval [CI] 0.880–0.977), hospitalizations (8.7%, mean IR 0.913, 95% CI 0.834–0.992), and deaths (9.2%, mean IR 0.908, 95% CI 0.797–1.020) compared with scenarios where children were not vaccinated
- 81/185 (44%) deaths were due to COVID-19; of these, 61 (75.3%) had an underlying condition, most commonly severe neurodisability (n = 27) and other immunocompromising conditions (n = 12) England

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## COVID-19 vaccine can be lifesaving in children[9,14,15,16]

- On-going analysis found that, despite a large number of Omicron infections in children, the infection fatality rate during the Omicron wave was substantially lower than previous variant waves at 0.2/100,000 cases compared to 0.7/100,000 during March 2020 to December 2021.
- One US study calculated a risk of 19.1 hospitalisations per 100,000 infections in unvaccinated compared to 9.2 hospitalisations per 100,000 infections among vaccinated 5–11-year-olds during December 2021 to February 2022, when Omicron was predominant
- 12–18 year-olds during the Omicron period, vaccine effectiveness was 40% (95% CI, 9–60%) against hospitalisation for COVID-19, being 79% (95% CI, 51–91%) against critical COVID-19 compared to 20% (95% CI, −25 to 49%) against noncritical COVID-19.
- A Canadian study involving 62 hospitalised and 27,674 non-hospitalised SARS-CoV-2 cases found that two mRNA vaccine doses resulted in an 85% (aOR = 0.15; 95% CI%, 0.04–0.53) lower likelihood of hospitalisation in 12–17 year-olds, and a 79% (aOR = 0.21; 95%CI, 0.03–0.77) lower likelihood of hospitalisation after one dose in 4–11 year-olds

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# COVID-19 Vaccine Counseling

- Mild side effects mean your body is building protection against the virus.
- Common side effects
  - Pain, swelling, and redness on the arm where the shot was given
  - Tiredness, headache, muscle pain
  - Chills
  - Nausea
  - Fever
- Kids' side effects from the COVID-19 vaccine are usually mild and go away in a day or two
- If they are significant, can use OTC pain relievers PRN
- Adverse events are rare

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# Section III

Diagnosis and Treatment

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# Special Considerations for Children with COVID-19 in Primary Care[17]

- Indications for hospitalization/higher level of care
  - When is it serious
  - When is close follow up appropriate
  - When is the presentation mild versus progressing
- MIS-C presenting to PC – identification and referral

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# MISC – Clinical Criteria[17]

Illness characterized by **all of the following**, in the absence of a more likely alternative diagnosis:

1. Subjective or documented fever, T ≥ 38.0°C
2. Clinical severity requiring hospitalization or resulting in death
3. Evidence of systemic inflammation indicated by CRP ≥ 3.0 mg/dL

**AND**

**New onset manifestations in at least two of the following categories:**

1. Cardiac involvement indicated by
   1. Left ventricular ejection fraction < 55% **or**
   2. Coronary artery dilation or aneurysm **or**
   3. Elevated troponin level
2. Mucocutaneous involvement indicated by
   1. Rash **or**
   2. Inflammation of the oral mucosa
      1. e.g., mucosal erythema or swelling, drying or fissuring of the lips, strawberry tongue **or**
   3. Conjunctival injection **or**
   4. Extremity findings
      1. e.g., erythema or edema of the hands or feet
3. Shock
4. Gastrointestinal involvement indicated by
   1. Abdominal pain **or** vomiting **or** diarrhea
5. Hematologic involvement indicated by
   1. Platelet count < 150,000 cells/μL **or**
   2. Absolute lymphocyte count (ALC) < 1,000 cells/μL

- MIS-C occurs approximately 2-6 wks after the initial SARS-CoV-2 infection.
- Review the following clinical and laboratory criteria when there is concern for diagnosis of MIS-C.
- When the disease is suspected, consult local experts in rheumatology, infectious disease, and cardiology to guide laboratory testing, diagnosis, and treatment.

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## MISC - Laboratory Criteria[17]

- Detection of SARS-CoV-2 **RNA** in a clinical specimen up to 60 days prior to or during hospitalization or in a post-mortem specimen using a diagnostic molecular amplification test
  - e.g., polymerase chain reaction (PCR)

**or**

- Detection of SARS-CoV-2 **specific antigen** in a clinical specimen up to 60 days prior to or during hospitalization or in a post-mortem specimen

**or**

- Detection of SARS-CoV-2 **specific antibodies** in serum, plasma or whole blood associated with current illness resulting in or during hospitalization

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## Current Guidelines for Treatment[18]

### Paxlovid for outpatient

- 12+ (and > 40kg) for patient with mild to moderate COVID infections
  - Treat even if symptoms are mild to prevent further issues
  - Standard dose pack: Days 1 to 5 = 2 x150 nirmatrelvir and 1x 100 ritonavir tablet BID
  - Must start within 5 days of symptom onset

### Future Medications?

- Clinical trials for ages 6 to 11 and even younger, particularly those with underlying health conditions or severe/critical COVID-19. These smaller studies suggest Paxlovid is generally well-tolerated and may offer benefits in symptom recovery and viral clearance.

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# Does Paxlovid Work?[18]

Paxlovid group showed a significantly shorter time to viral clearance, fever resolution, and symptom recovery compared to controls

This effect was most noticeable in children with underlying conditions or those treated early. No significant differences were observed in ICU transfers or mortality ($P > 0.05$).

Regarding ICU admissions during hospitalization, one patient in the Paxlovid group and five patients in the control group were transferred (3.3% vs. 8.3%, $P = 0.66$).

Mortality rates were similar between the groups during hospitalization, with 2 deaths (6.7%) in the Paxlovid group and 4 deaths (6.7%) in the control group.



# Special Considerations for Children with COVID-19 in Urgent Care/Emergency Department

- Early diagnostic testing
  - Rapid Viral testing
- Isolation, use of PPE
- Prompt admission, when available, with isolation room

## Special Considerations for Children with COVID-19 in In-patient Care[19]

- Respiratory supportive care
  - Non-Invasive mechanical support
    - High Flow Nasal Cannula
    - BiPAP
    - CPAP
  - Mechanical ventilation support
  - Airway clearance
- Nutritional Support
- Symptom Management
  - Supportive Care
- MIS-C
  - Rheumatology Consults
  - Cardiology Consult
  - Neurology Consult
  - Medication such as IVIG, glucorticosteroids, low dose aspirin, anakinra, infliximab, tocilizumab
- Immunocompromised children

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## Special Considerations for Children with COVID-19 in Outpatient Follow-up Care[20]

- Affects about 10-20% of children (~6 million)
  - Worse in children with asthma
- There is no blood or diagnostic studies to identify Long COVID
- Requires following history and symptoms of Long COVID
  - Parents encouraged to monitor and log symptoms
- There is no cure for Long COVID 19
- Symptoms can last up to 3 months
- Management is directed toward treating symptoms and supportive care.

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# Special Considerations for Children with COVID-19 in Outpatient Follow-up Care[20]

Signs and symptoms of long COVID are variable in children of different ages.

| Infants and toddlers (0-2 y) | Preschool-aged children (3-5 y) |
|---|---|
| Trouble sleeping<br>Poor appetite<br>Stuffy nose<br>Dry or wet cough | Daytime tiredness or sleepiness<br>Low energy<br>Dry cough |
| **School-aged children (6-11 y)** | **Adolescents (12-17 y)** |
| Trouble with memory or focusing<br>Feeling lightheaded or dizzy<br>Back or neck pain<br>Headaches<br>Trouble sleeping<br>Stomach pain<br>Nausea or vomiting<br>Fear of specific things<br>Refusing to go to school<br>Itchy skin or rash | Trouble with memory or focusing<br>Feeling lightheaded or dizzy<br>Back or neck pain<br>Headaches<br>Change or loss in smell or taste<br>Body, muscle, or joint pain<br>Daytime tiredness or sleepiness<br>Low energy<br>Tired after walking |

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# Long COVID[9,21,22,23]

- Long COVID occurs after SARS-CoV-2 infection and is present for at least 3 months as a continuous, relapsing and remitting, or progressive disease state that affects one or more organ systems
- Can happen even with a mild or asymptomatic case
- Can be a continuous problem or come and go over time
- Can affect different parts of the body
- Can affect children of all ages including infants and toddlers
- Can be new onset following initial recovery or can persist from the initial illness
- Study in UK: The ONS reported that 15% of young adults aged 16–29 years experience long COVID symptoms, with at least 35% reporting it affecting their work or education beyond 3 months
- Kids with high-risk conditions are more at risk for long covid and long-term symptoms

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# Long-term COVID-19 Complications[23,24]

- Chronic fatigue and reduced exercise intolerance
- Headaches/dizziness
- Abdominal Pain
- Arrhythmias and increased clotting risk
- Cognitive impairment (“brain fog”) and recurrent headaches
- Persistent cough, chest pain or palpitations
- Second and further infections increase risk (get vaccinated!)

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# Section IV

Vaccine Guidelines, Availability and Where to Find Vaccines

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# CDC versus AAP

- CDC as of 5/2025 now “shared decision making”
- AAP recommended 6 months+
- West Coast Health Alliance (CA, WA, OR) 6 months+



# Vaccine Availability[25,26,27]

- Coverage for COVID-19 vaccines
  - Some states are no longer covering
- Cost of COVID-19 vaccines
  - Without insurance can be $100+
- Some states pharmacists can administer, others no
- Some states insurance not covering COVID vaccines

# Where to find your COVID-19 vaccine

- Primary care provider office
- Pharmacy
- Health department
- Urgent Care
- Mobile vaccine clinics
- Student health centers (colleges/schools)
- Workplace





# Patient Advocacy

- Offer COVID-19 vaccine in your office, if possible
- Discuss how patients can access in your community, if not available in office
- Encourage lawmakers to continue access to COVID-19 vaccines
- Transparency with patients - AAP versus CDC schedule

# Case Study







# Primary Care - First Stop

- 15-year-old patient presents to primary care with low grade temp, headache, cough, runny nose and vomiting x 3 days
- Patient has history of mild persistent asthma and BMI of 99%
- Using Flovent BID and albuterol q4 hours PRN
- COVID test + in office today
- O2 is 96% on RA and exam is normal except for + URI findings
- Shared decision making - declines Paxlovid

## 2 days later….

- Back to primary care, still coughing
  - Getting worse, at night especially
- Still having URI symptoms but not worsening
- Taking medications as directed
- Decide to start Paxlovid due to comorbidities after discussion with family (within 5 day window)



## 2 more days later…

- Presents to ER in the middle of the night
- O2 now 92% on RA
- Coughing has increased despite asthma medications and addition of Paxlovid
- Feeling like he can’t breathe

# Admitted to ICU

- Admitted to PICU
- Contact and Droplet precautions
  - Use of N95 mask
  - Gown
  - Gloves
  - Face shield
- Airway support
  - Non-invasive initially with HFNC which then progressed to mechanical ventilation due to hypercapnic and hypoxemic respiratory failure
  - Airway clearance with IPV and hypertonic saline every 4 hours
- Nutritional support
  - Post pyloric feeding tube placed on enteric formula
- Diagnostics
  - ECG
  - Blood gas for vent management
  - Inflammatory markers





# Outpatient Follow-up Care

- Consults
  - Pulmonology to follow up for concerns with long COVID
  - Cardiology follow up, if development of cardiovascular involvement
  - Rheumatology follow up, if development of MIS-C
  - Primary care follow up to evaluate improvement following admission

## Back to PCP

Reviews all admit notes and updates all medications

Patient is still having coughing and activity intolerance but is much improved

Follow up visits depending on progression and med management

At 2-month mark if still symptomatic will consider Long COVID



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# Section V

Address concerns in conversations with families about COVID-19 and COVID-19 vaccination and treatment




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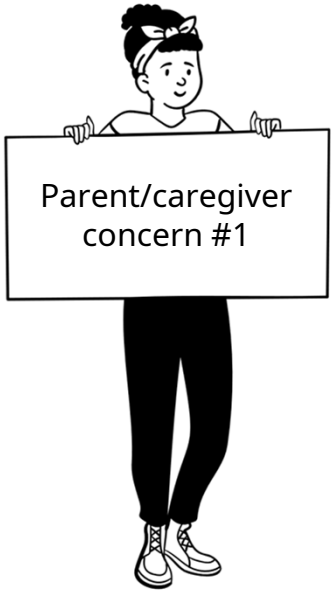


# Scenario #1… Will an mRNA vaccine change my child's DNA?[28]

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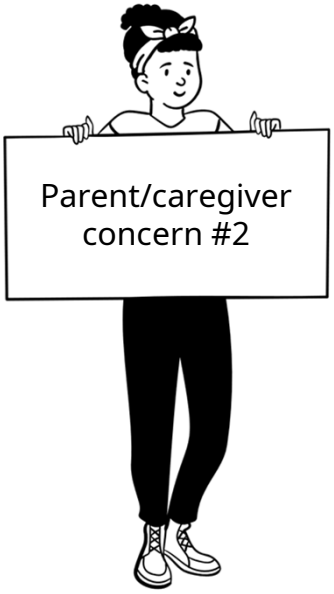


# Scenario #2…What is Long COVID and why is it so risky for children?

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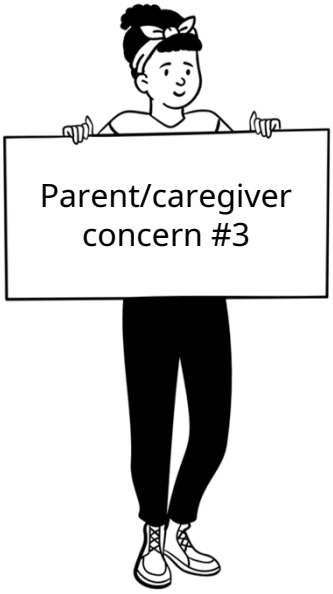


# Scenario #3...Why is COVID-19 treatment so important for my child with a high-risk condition?

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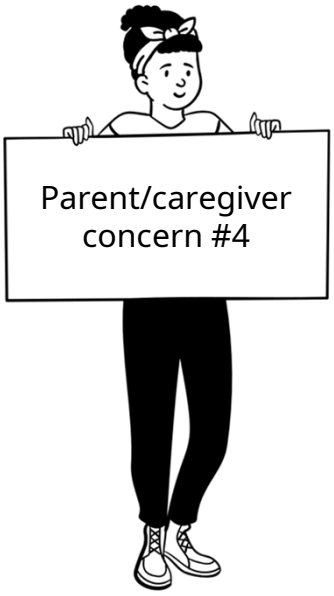


# Scenario #4...CDC doesn't recommend the vaccine! What now?

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# Resources and References





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## Resources

- https://www.napnap.org/covid-provider-resources/
- https://www.napnap.org/covid-resources-for-families/
- https://www.cdc.gov/covid/index.html
- https://www.aap.org/en/patient-care/covid-19/
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# Thank you!

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