



# Assessing Clinical Utilization of Congenital Syphilis Diagnosis and Management among Pediatric Providers in Chicago

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# Financial Disclosures

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# Background

- Congenital syphilis cases in the **United States** increased **755%** during 2012–2021. (McDonald 2023)
- In 2022, a total of 3,761 cases of congenital syphilis in the United States were reported to CDC, including 231 (6%) stillbirths and 51 (1%) infant deaths. (McDonald 2023)
- In **Chicago**, there was over a **400%** increase from 2019 to 2022. (CDPH HAN Sept. 2023)





# Background – Clinical Manifestations

- **Intrauterine Infection**
  - Still birth,
  - Hydrops fetalis
  - Preterm birth
  - Asymptomatic
- **Post Partum**
  - Liver, Bone, Skin, hematologic, CNS abnormalities
- **Late Manifestations**
  - Interstitial keratitis
  - 8<sup>th</sup> cranial nerve deafness
  - Hutchinson teeth
  - Bowing of shins, frontal bossing, mulberry molars, saddle nose, Clutton joints



# Background – CDC STI Guidelines

- 2021 Center for Diseases Control and Prevention (CDC) Congenital Syphilis Guidelines
- 4 CS Case Definitions
  - Symptomatic/Proven or Highly Probable\*
  - Possible\*
  - Less Likely
  - Unlikely
- \*Recommend Lumbar Puncture, Long Bone Radiograph, Complete Blood Count (CBC) and Liver Function Tests





# Objective of Study

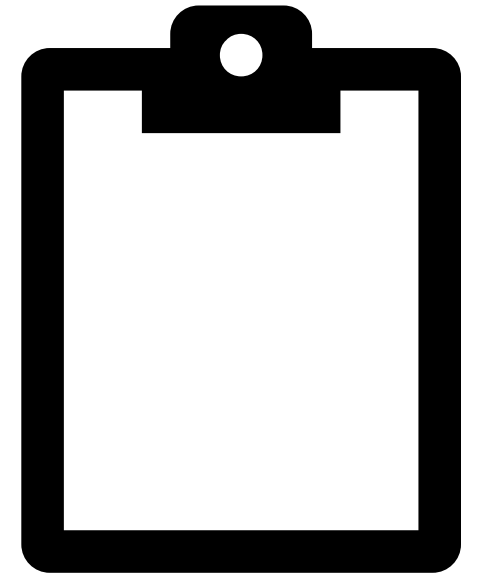
- City-wide Survey
- **Diagnostic & clinical utilization** of CS among primary care and specialty pediatric providers in the City of Chicago
- Determine **therapeutic practices** of penicillin administration regimens





# Survey Instrument

- A REDcap survey - Chicago-based pediatric providers using Health Alert Network (HAN) & direct email communication.
- Demographics
  - Type of provider
  - Name of birthing hospital
  - Type of hospital setting (Academic, Private, Etc.)
  - Qualitative exposure to CS (yes/no)
  - Quantitative exposure to CS (# of infants per year)





# Survey Instrument

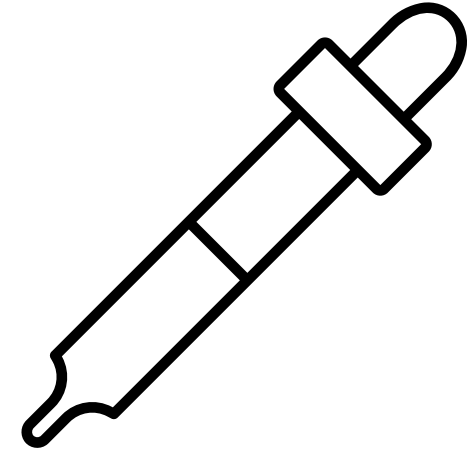
- Case-based questions were developed, based on CDC CS scenario definitions (CDC 2021)
  - Symptomatic or proven/Highly Probable CS
  - Possible CS
  - Less likely congenital syphilis
- Case definitions were described in detail before the question presentations.





# Survey Instrument

- Diagnostic processes
  - Lumbar puncture
  - Long bone radiographs
  - Complete blood cell count (CBC) blood tests
  - Serum alanine transaminase (ALT) or other hepatic function tests (LFT).
- Therapy Choice
  - single dose of intramuscular (IM) Benzathine penicillin (PCN)
  - 10-day course of intravenous (IV) procaine or aqueous G PCN.





# Results

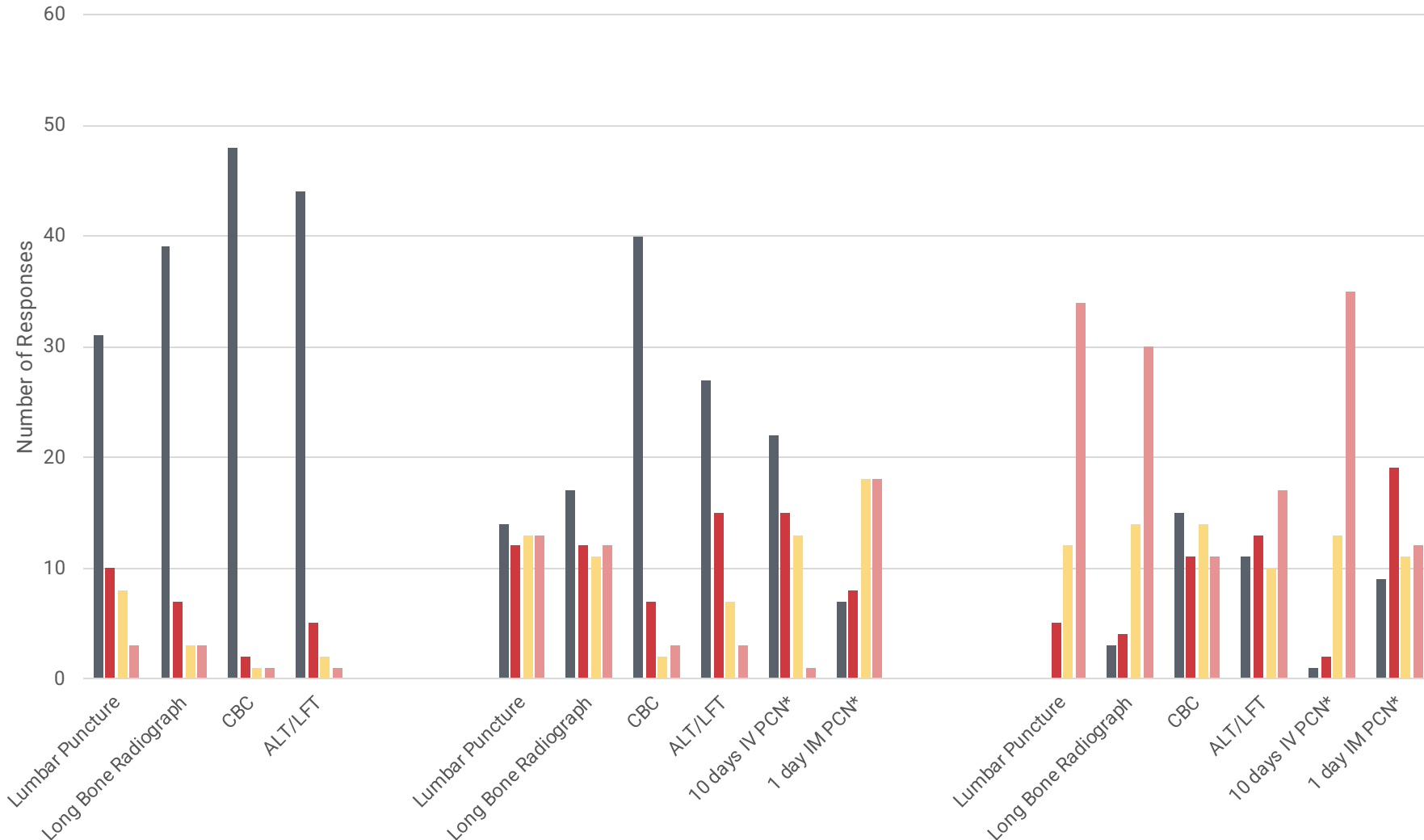
- 61 total initial respondents
  - 12 Pediatric Hospitalists
  - 19 Neonatologists
  - 11 General Pediatricians
  - 11 Pediatric Infectious Diseases
  - 3 Pediatric Advanced Practitioners
  - 5 'Other'
- 57 total completed the survey in its entirety



# Results

- 9 total birthing hospitals represented
- When asked about CS frequency in 2023
  - 5 - none
  - 17 - 1 to 3 infants
  - 12 – 4 to 6 infants
  - 4 – 7 to 10 infants
  - 23 – greater than 10 infants

# Clinical Utilization Among Infants with Various Types of CS



Type of CS: Symptomatic/Proven or Highly Probably (Left), Possible CS (Middle), Less Likely CS (Right)

■ Always ■ Sometimes ■ Rarely ■ Never

# ★ Symptomatic/proven Case (#1)

Any neonate with

- an abnormal physical examination that is consistent with congenital syphilis;
- a serum quantitative nontreponemal serologic titer that is fourfold<sup>§</sup> (or greater) higher than the mother's titer at delivery (e.g., maternal titer = 1:2, neonatal titer  $\geq$ 1:8 or maternal titer = 1:8, neonatal titer  $\geq$ 1:32)<sup>¶</sup>; or
- a positive darkfield test or PCR of placenta, cord, lesions, or body fluids or a positive silver stain of the placenta or cord.

## Recommended Evaluation

- CSF analysis for VDRL, cell count, and protein\*\*
- Complete blood count (CBC) and differential and platelet count
- Long-bone radiographs
- Other tests as clinically indicated (e.g., chest radiograph, liver function tests, neuroimaging, ophthalmologic examination, and auditory brain stem response)

• Centers for Disease Control and Prevention . Sexually transmitted infections treatment guidelines, 2021. *MMWR Recomm Rep*. 2021

# ★ Symptomatic/proven Case (#1)

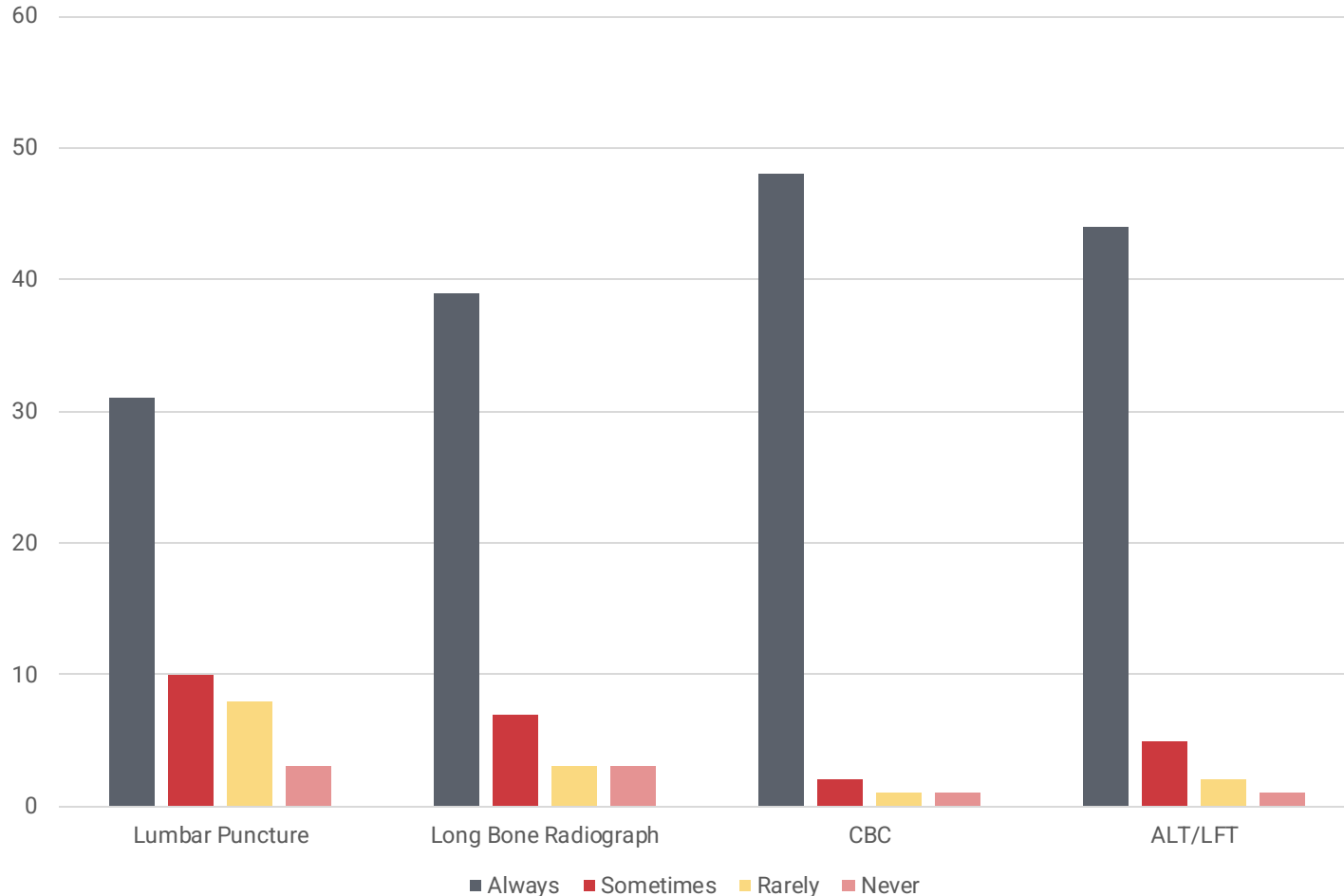
## Recommended Regimens, Confirmed or Highly Probable Congenital Syphilis

**Aqueous crystalline penicillin G** 100,000–150,000 units/kg body weight/day, administered as 50,000 units/kg body weight/dose by IV every 12 hours during the first 7 days of life and every 8 hours thereafter for a total of 10 days

OR

**Procaine penicillin G** 50,000 units/kg body weight/dose IM in a single daily dose for 10 days

# ★ Symptomatic/proven Case (#1)



- Laboratory
  - Lumbar puncture
  - Long Bone Radiograph
  - CBC with Differential
  - ALT (LFT's)

## ★ Possible CS Case (#2)

Any neonate who has a normal physical examination and a serum quantitative nontreponemal serologic titer equal to or less than fourfold of the maternal titer at delivery (e.g., maternal titer = 1:8, neonatal titer  $\leq$ 1:16) and one of the following:

- The mother was not treated, was inadequately treated, or has no documentation of having received treatment.
- The mother was treated with erythromycin or a regimen other than those recommended in these guidelines (i.e., a nonpenicillin G regimen).<sup>††</sup>
- The mother received the recommended regimen but treatment was initiated <30 days before delivery.

### Recommended Evaluation

- CSF analysis for VDRL, cell count, and protein<sup>\*\*</sup>
- CBC, differential, and platelet count
- Long-bone radiographs

• Centers for Disease Control and Prevention . Sexually transmitted infections treatment guidelines, 2021. *MMWR Recomm Rep.* 2021



## ★ Possible CS Case (#2)

### Recommended Regimens, Possible Congenital Syphilis

**Aqueous crystalline penicillin G** 100,000–150,000 units/kg body weight/day, administered as 50,000 units/kg body weight/dose by IV every 12 hours during the first 7 days of life and every 8 hours thereafter for a total of 10 days

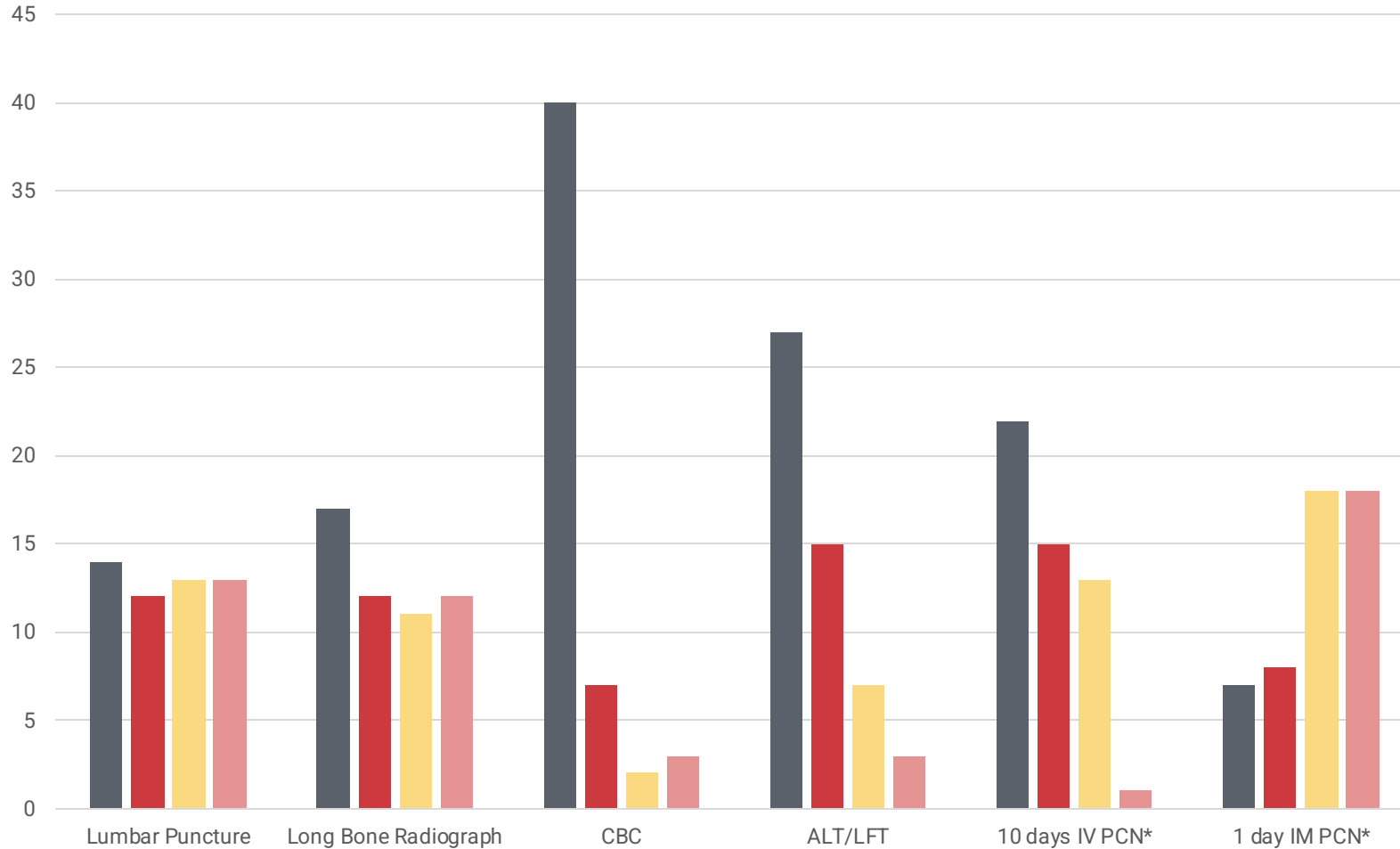
OR

**Procaine penicillin G** 50,000 units/kg body weight/dose IM in a single daily dose for 10 days

OR

**Benzathine penicillin G** 50,000 units/kg body weight/dose IM in a single dose

# ★ Possible CS Case (#2)



- Laboratory
  - Lumbar Puncture
  - CBC w/diff
  - Long bone Radiographs
  - ALT/LFT's
- Treatment
  - 10 days of IV Penicillin
  - 1 day of IM Penicillin

## ★ Less likely CS Case (#3)

### Scenario 3: Congenital Syphilis Less Likely

Any neonate who has a normal physical examination and a serum quantitative nontreponemal serologic titer equal or less than fourfold of the maternal titer at delivery (e.g., maternal titer = 1:8, neonatal titer  $\leq$ 1:16) and both of the following are true:

- The mother was treated during pregnancy, treatment was appropriate for the infection stage, and the treatment regimen was initiated  $\geq$ 30 days before delivery.
- The mother has no evidence of reinfection or relapse.

### Recommended Evaluation

No evaluation is recommended.

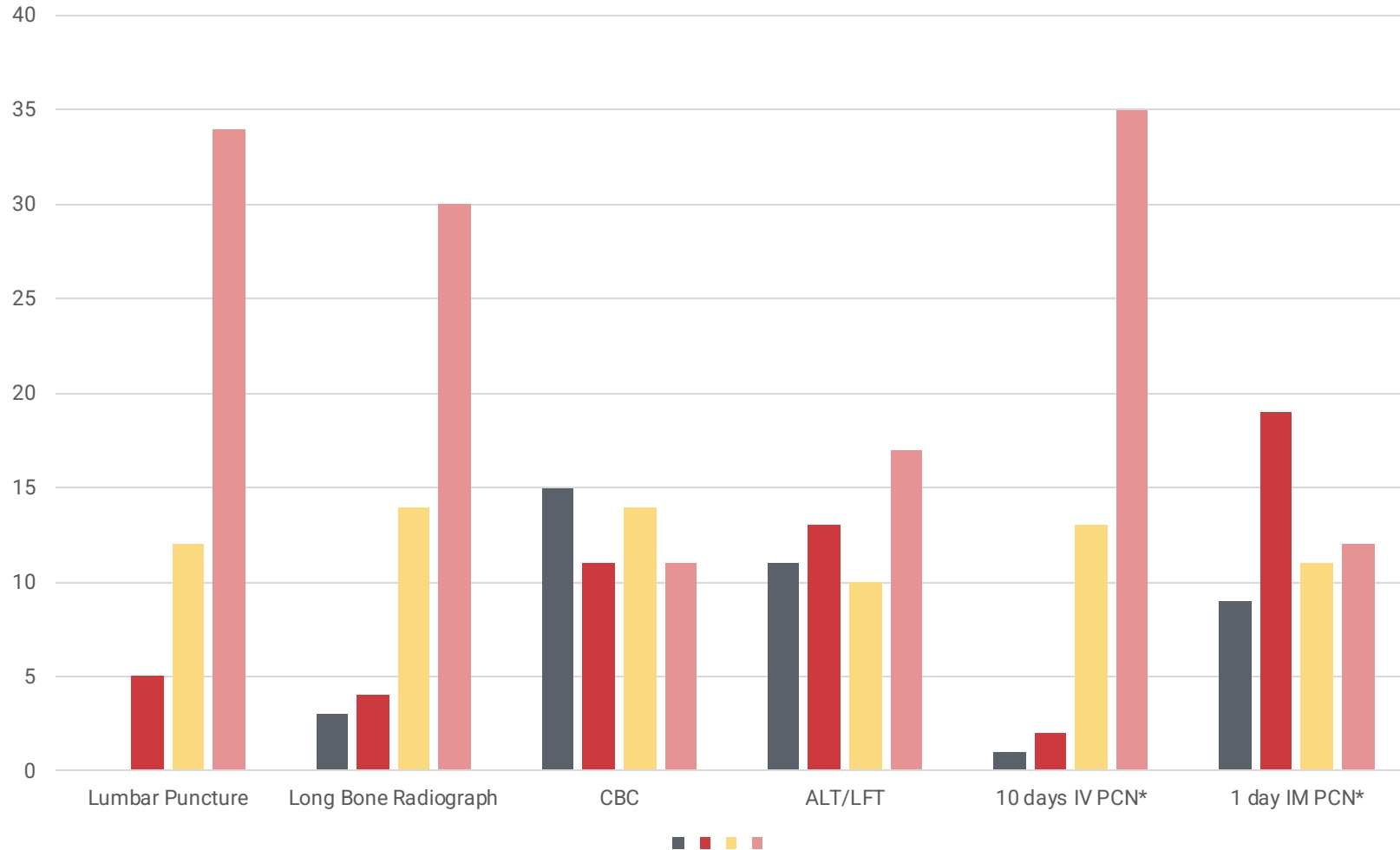
## ★ Less likely CS Case (#3)

### Recommended Regimen, Congenital Syphilis Less Likely

**Benzathine penicillin G** 50,000 units/kg body weight/dose IM in a single dose\*

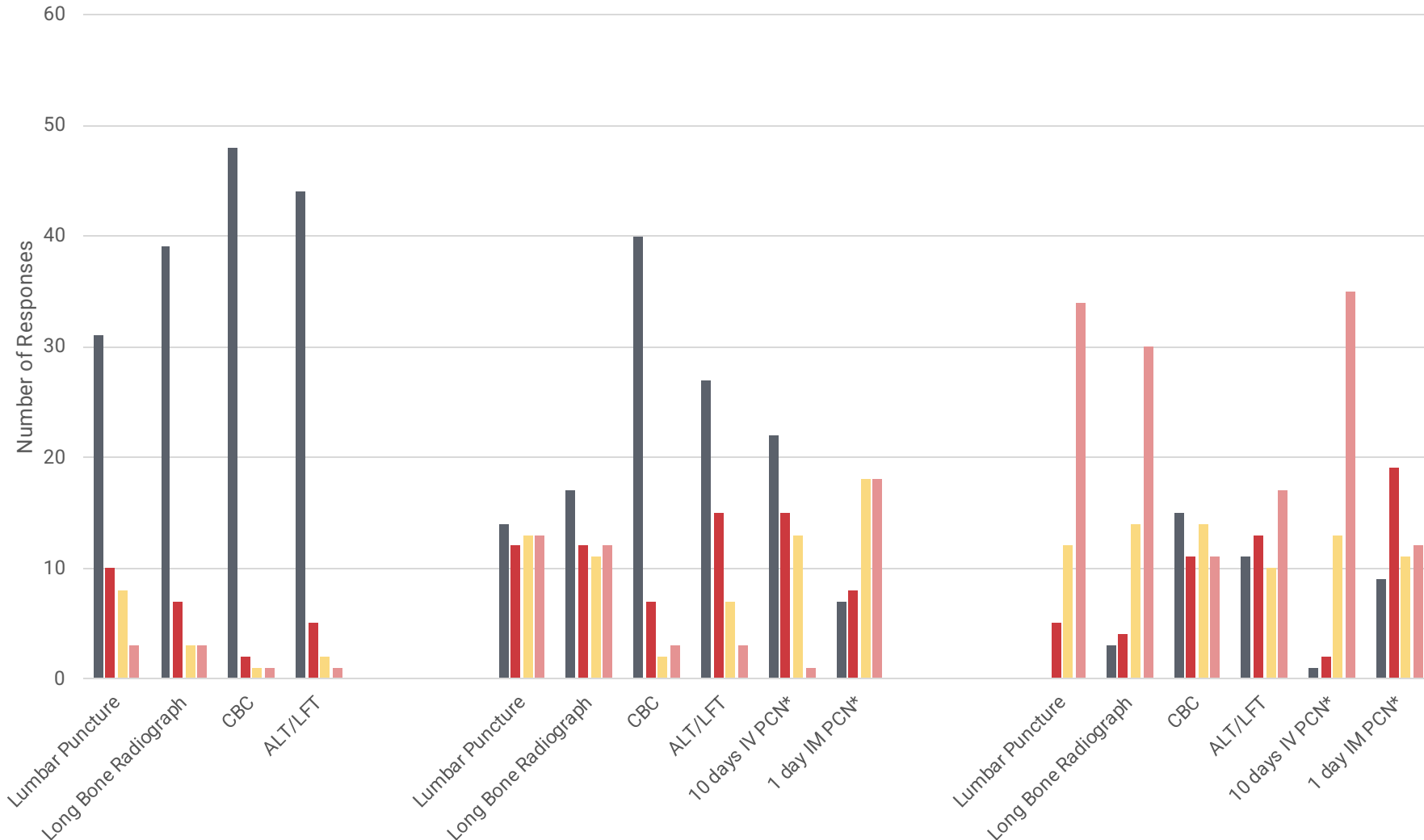
\* Another approach involves not treating the newborn if follow-up is certain but providing close serologic follow-up every 2–3 months for 6 months for infants whose mothers' nontreponemal titers decreased at least fourfold after therapy for early syphilis or remained stable for low-titer, latent syphilis (e.g., VDRL <1:2 or RPR <1:4).

# ★ Less likely CS Case (#3)



- No Evaluation Recommendation
- X1 IM Penicillin

# Clinical Utilization Among Infants with Various Types of CS



Type of CS: Symptomatic/Proven or Highly Probably (Left), Possible CS (Middle), Less Likely CS (Right)

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# Impact and Future Directions

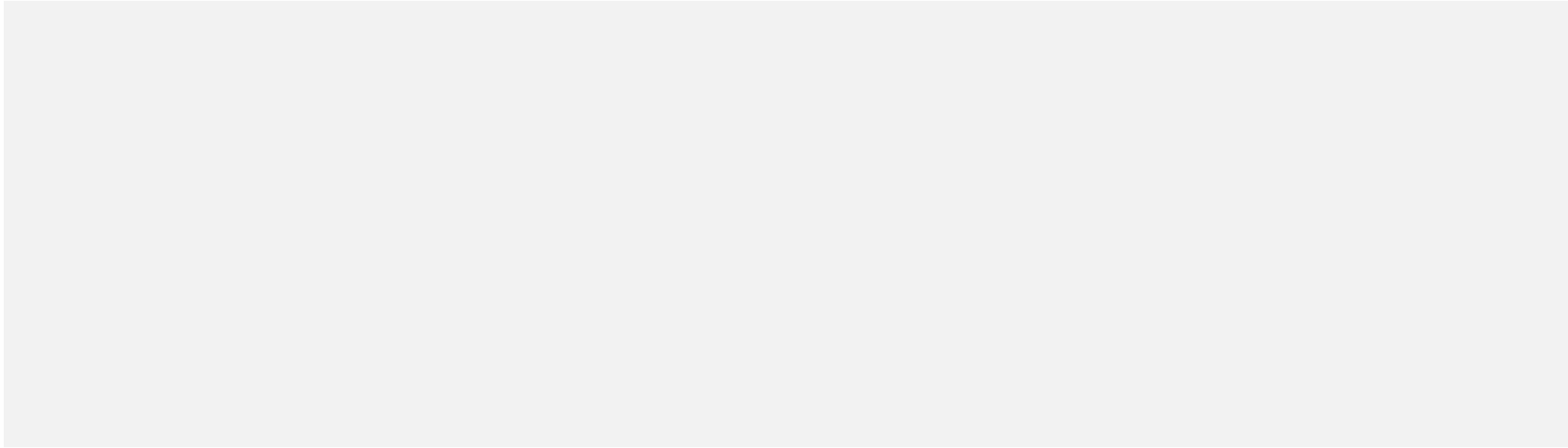
- Ongoing collaborative projects to investigate outcomes among different clinical practices.
- Outreach education for providers on the most up to date guidance per CDC recommendations.
- Bring up to date following 2024 CDC STI Guideline updates in the Fall 2024.



# References

- Centers for Disease Control and Prevention . Sexually transmitted infections treatment guidelines, 2021. *MMWR Recomm Rep*. 2021
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- Provider Survey on Syphilis Reporting. Chicago Health Alert Network, Chicago Department of Public Health. September 15th, 2023.
- "Syphilis", AAP Red Book: 2021-2024
- <https://dermnetz.org/topics/syphilis>
- <https://www.cdc.gov/ncbddd/birthdefects/surveillancemanual/quick-reference-handbook/congenital-syphilis.html>





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