

Yield of neuroimaging in identification of clinically occult intracranial injuries in infants evaluated by subspecialty child protection teams: A multicenter study

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- Children's Hospital of Philadelphia has received payment for my expert testimony when subpoenaed in cases of suspected abuse.

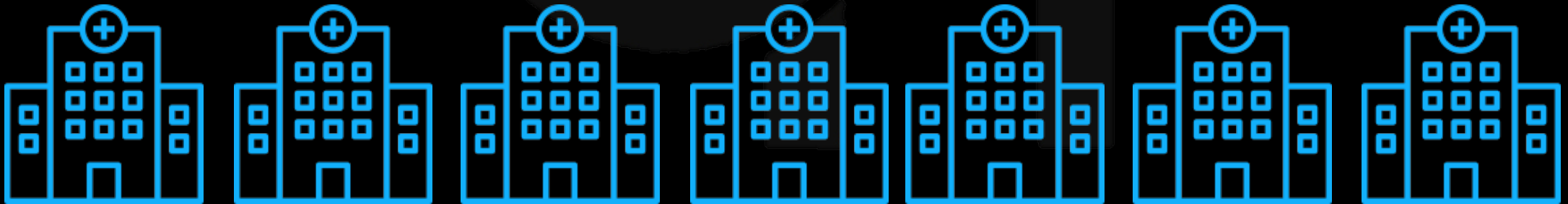
Background

- Infants can be neurologically well yet have clinically occult head trauma
- Neuroimaging Yield: $\frac{N \text{ positive head trauma on neuroimaging}}{N \text{ undergoing neuroimaging}} \times 100$
- Wide ranging neuroimaging yields reported in the literature
 - Early studies: Yield > 30%
 - More recently: Majority with yields < 10%



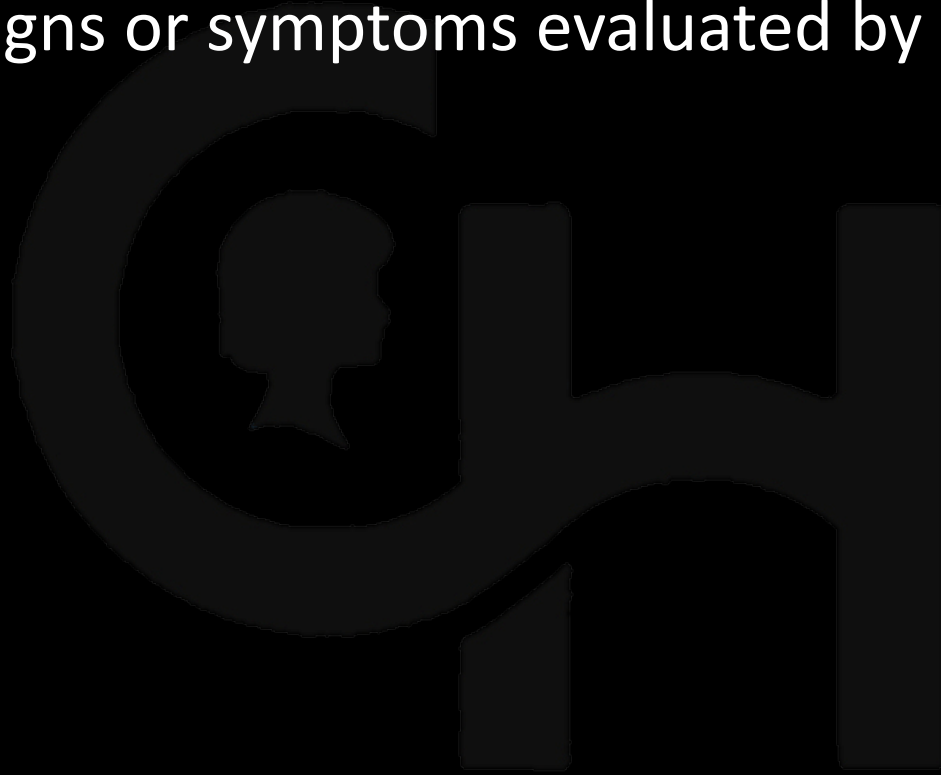
Background

- Why such a range?
 - Varying definitions of clinically occult head trauma
 - Majority are small single center studies
 - Evolving neuroimaging ordering practices over time
- What do we need?
 - Multicenter research to understand current practices and neuroimaging yield when physical abuse is suspected



Aim:

- To describe current neuroimaging performance and findings among infants without neurologic signs or symptoms evaluated by child protection teams



Approach

- Observational Study
- CAPNET
 - Child Abuse Pediatrics research NETwork
 - 11 Child Protection Teams
 - Children < 10 evaluated for physical abuse
 - Data collection launched in 2021
 - Mission Statement:
 - “To make the care of potentially abused children and their families more effective, safe, and fair.”



CAPNET: Data Collection

Domains include:



Presenting symptoms



Imaging performed



History of trauma



Laboratory testing



Physical examination findings



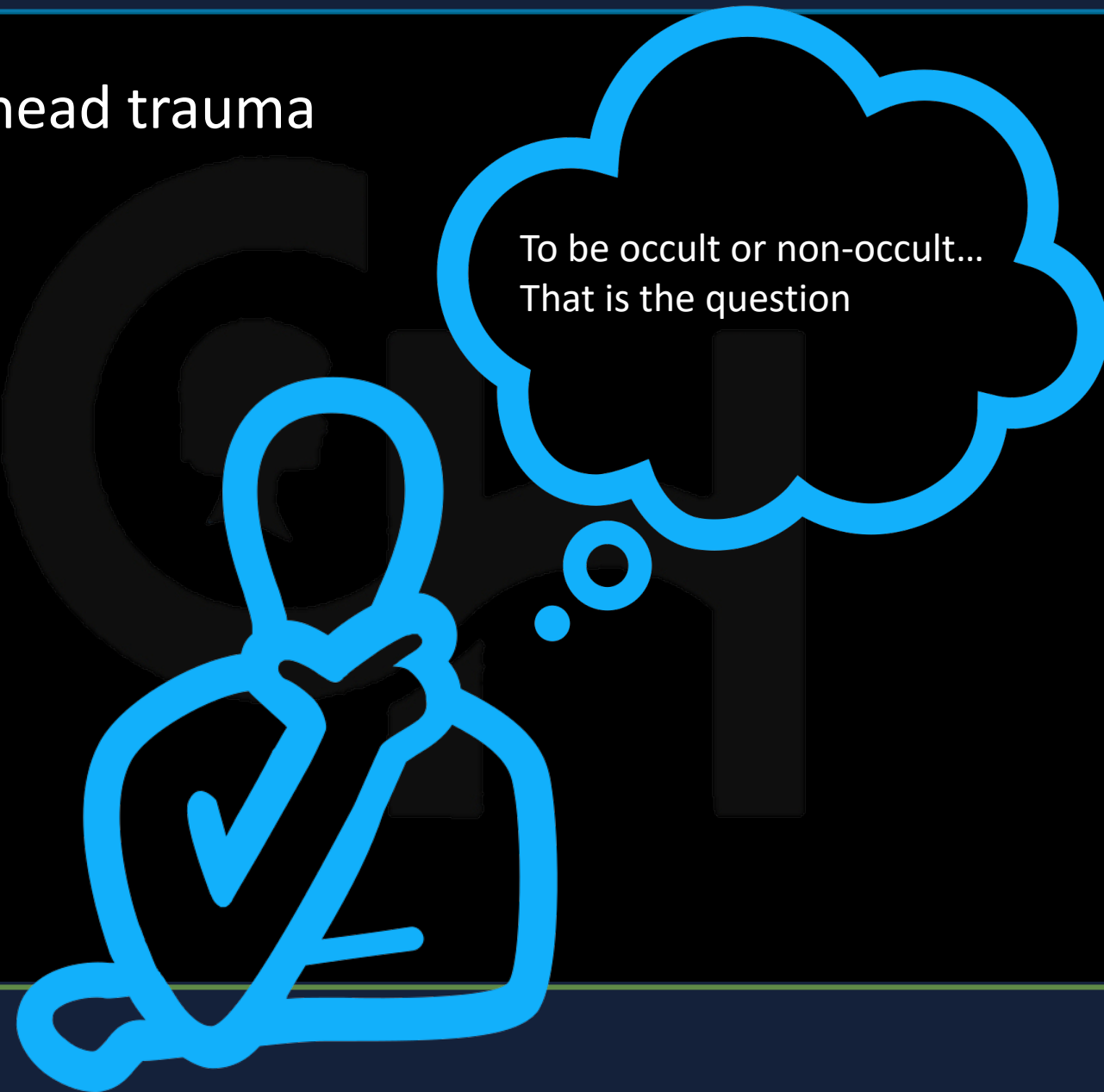
Injuries identified
and diagnoses

Inclusion Criteria

- Age < 12 months
- Presentation from February 2021 through October 2021
- Evaluated by a child protection team (phone, in-person, clinic, hospital)
- Skeletal survey performed
- Injury prompting child abuse concern not due to intracranial findings

Exclusion Criteria

- Non-clinically occult head trauma



To be occult or non-occult...
That is the question

Exclusion Criteria

- Level 1: Overt Symptoms
 - Seizure or seizure-like symptoms
 - Altered mental status
 - Cardiorespiratory collapse
 - Unresponsive/comatose
 - Posturing
 - Intubated/sedated
- Level 2: Scalp Injury / Skull Fracture
 - Skull fracture
 - Scalp soft tissue swelling or bruise
- Level 3: Other neuro signs or symptoms
 - BRUE/resolved event
 - Macrocephaly
 - Bulging fontanelle
 - Listless/lethargic
 - Transient loss or alternation of consciousness
 - Limp/loss of muscle tone
- Level 4: Nonspecific symptoms
 - Irritable/fussy/inconsolable
 - Vomiting

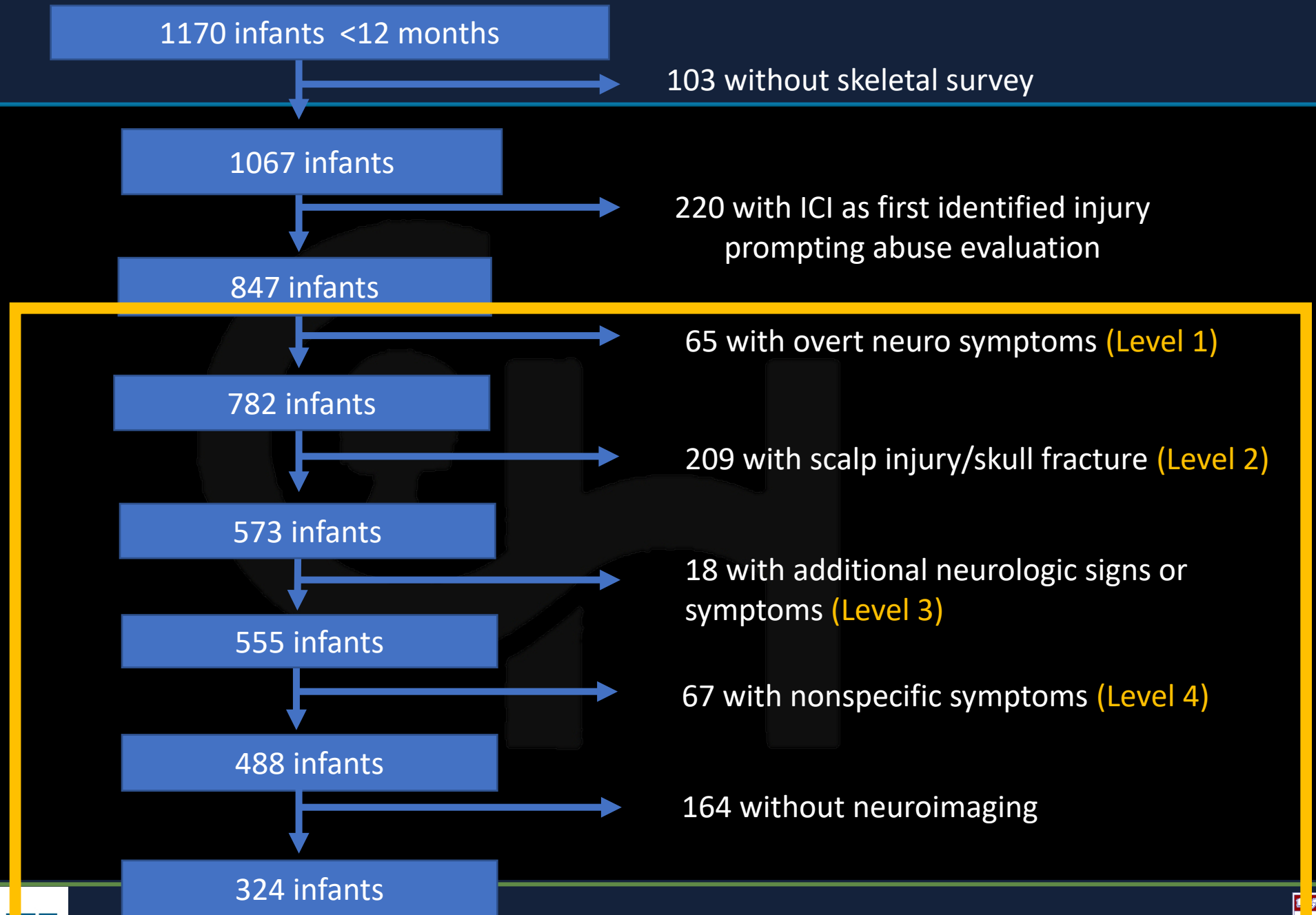
Outcome

- Neuroimaging Performance:
 - CT
 - Standard MRI
 - Fast MRI
- Intracranial injury (ICI):
 - Hemorrhage: SDH, SAH, EDH, IVH, unspecified location
 - Parenchymal: Contusions, lacerations, HIE, midline shift, axonal injury
 - Extra-axial findings: membranes, torn bridging veins, hygroma

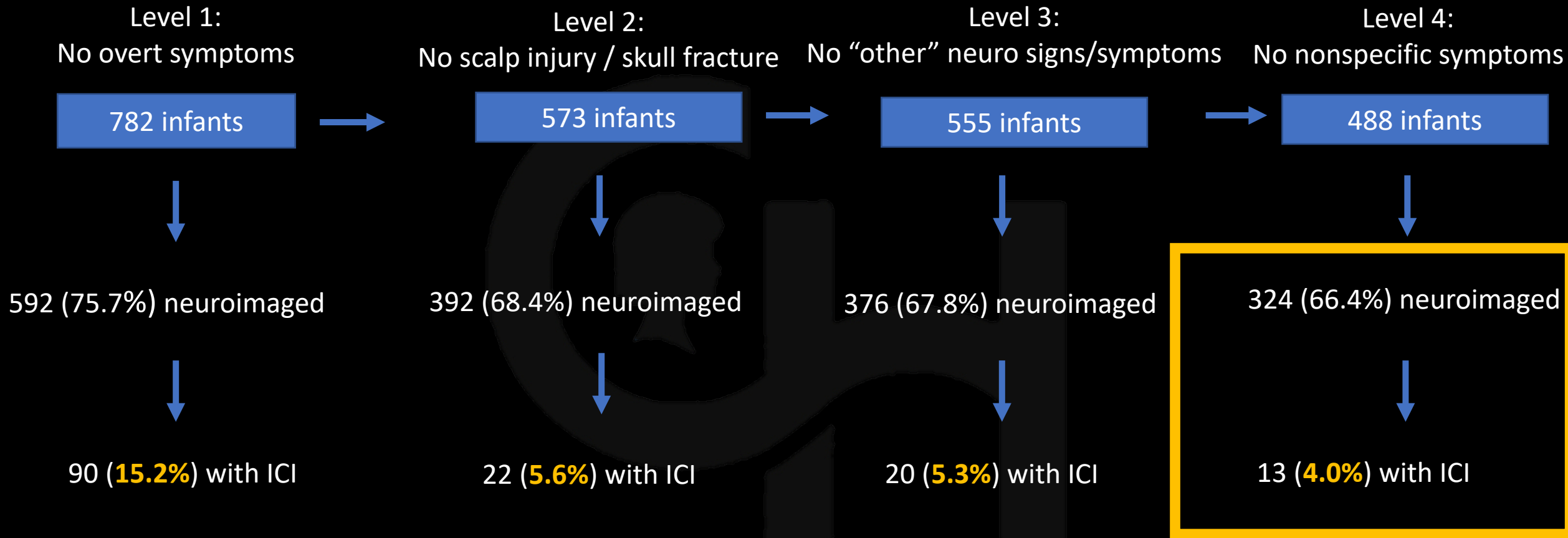
Methods

- Descriptive statistics
- Frequencies and proportions
- Fisher's Exact test to assess for association between age < 6 months and ICI
 - Sensitivity analysis assuming those unimaged had no ICI

Results



Results: Occult Head Injury Over Exclusions



Results: Final Study Population (N=324)

	N (%)
Age	
< 6 months	235 (72.5%)
6 - < 12 months	89 (27.5%)
Injury prompting abuse concern	
Cutaneous	152 (46.9%)
Fracture	99 (30.6%)
Oral finding	12 (3.7%)
Eye finding	16 (4.9%)
No presenting injury	56 (17.3%)

Results: Imaging and Results

	N (%)
Imaging	
CT	237 (73.2%)
Standard MRI	59 (18.2%)
Fast MRI	47 (14.5%)
Intracranial findings	
Any finding	13 (4.0%)
Bleeding	12 (3.7%)
Parenchymal	0 (0%)
Other extra-axial finding	1 (0.3%)

Associations with ICI

- No statistically significant association between age and yield
 - ICI in < 6 months: 11/235 (4.7%)
 - ICI in 6-12 months: 2/89 (2.2%)
 - P = .52
- Note: Differential head imaging by age
 - 72% of < 6 months vs. 37% of 6-12 months underwent neuroimaging
 - Sensitivity analysis:
 - Assume those unimaged have no ICI → still no statistically significant difference.
 - ICI in 3.7% for < 6 months vs 1% for 6 -12 months (P = .09)

Limitations

- Not all eligible infants underwent neuroimaging
- Differential head imaging by age



Discussion / Conclusion

- Neuroimaging yield for clinically occult ICI is definition-dependent
- Due to rarity of outcome, multicenter research essential
- Research needed to determine if patient-level factors can inform a targeted neuroimaging approach

Thank you

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To learn more about CAPNET:

capnetresearch.org

