PDTree

A Tool for Prehospital
Pediatric Destination Choice

PDTree: A Prehospital Triage Tool for Pediatric Destination Decision Choice

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Disclosures

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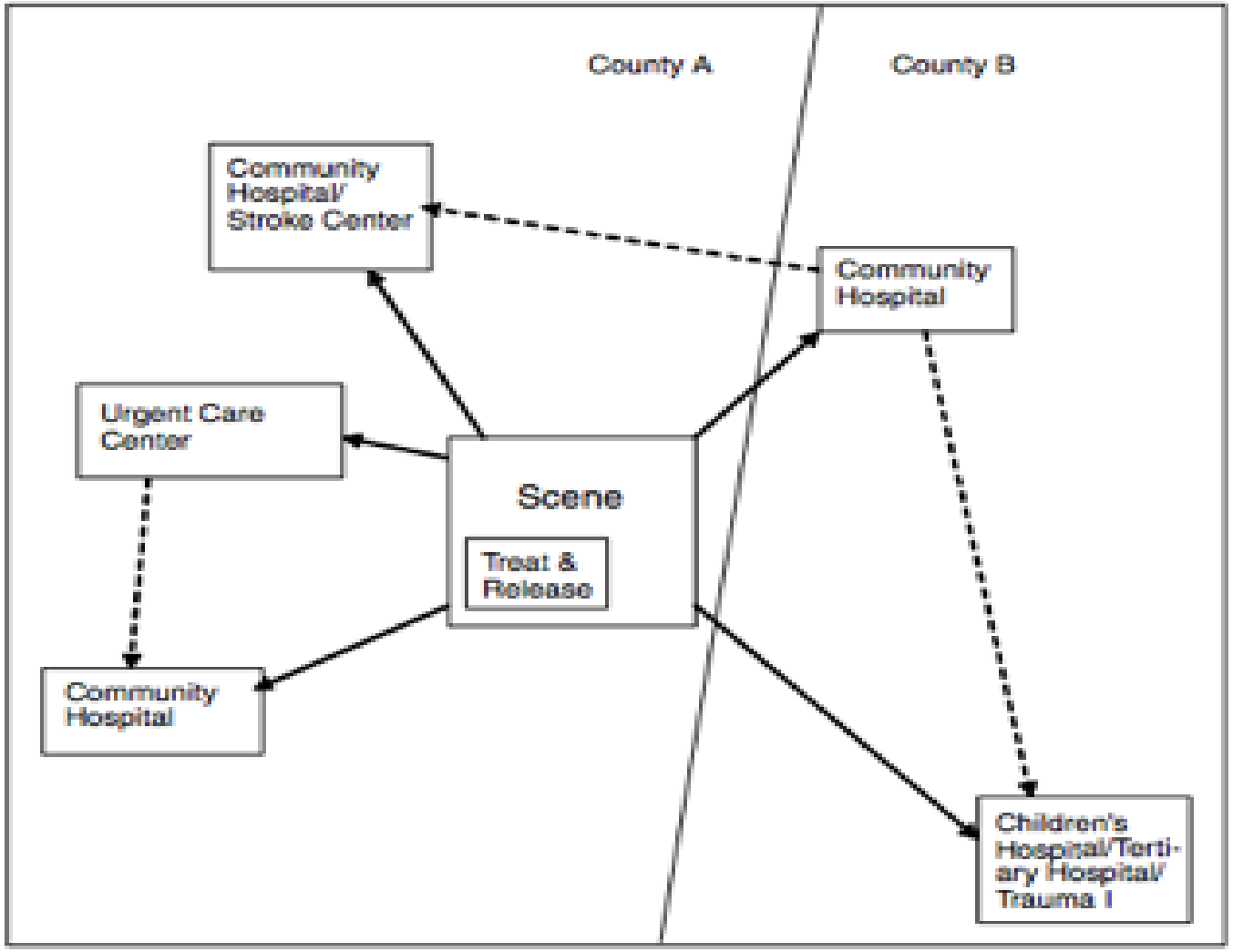
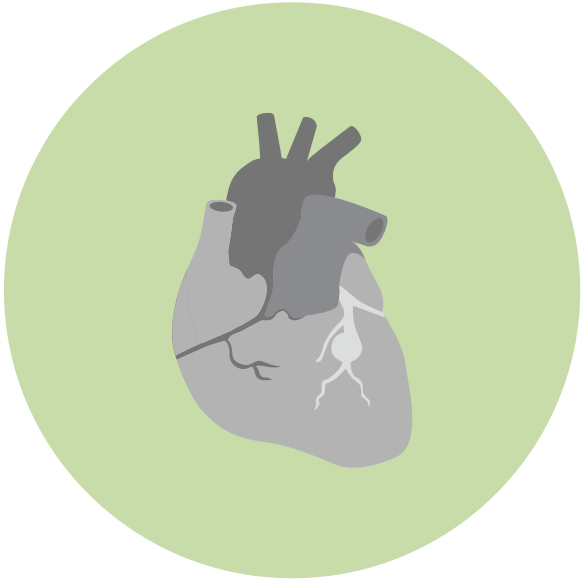
Evolution of EMS
From Transport to Treatment

Role of EMS in a Regionalized System

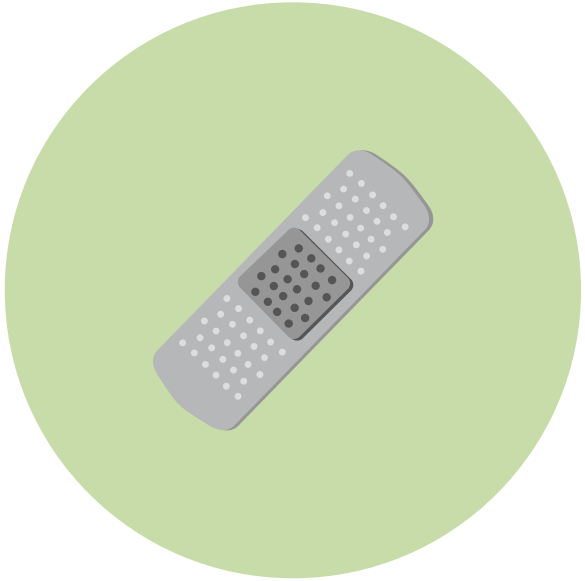


The Importance of EMS Transport Decisions



STEMI

Stroke



Trauma

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The Importance of EMS Transport Decisions

Pediatrics

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The Importance of EMS Transport Decisions

Pediatrics

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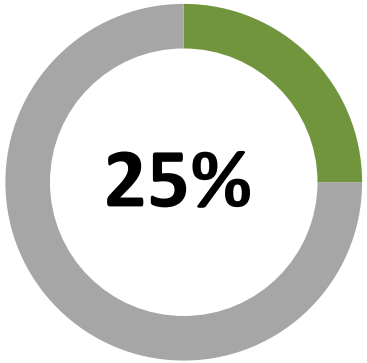
The Most Frequent Pediatric EMS "Procedure"



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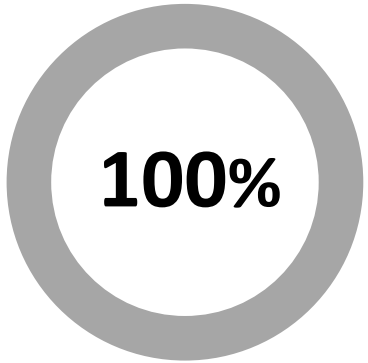

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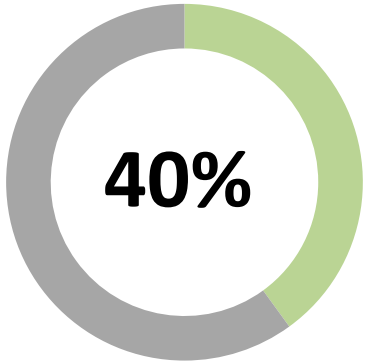

25% of pediatric EMS care involves providing any procedures, oxygen or medication

100% require a destination decision

40% bypass of closest facility

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My Emergency Department Has Great Doctors. Why Shouldn't EMS Take Sick Kids To Them?

Most EDs are ready for emergency stabilization. But definitive hospital care is a different story…..

Secondary Transport

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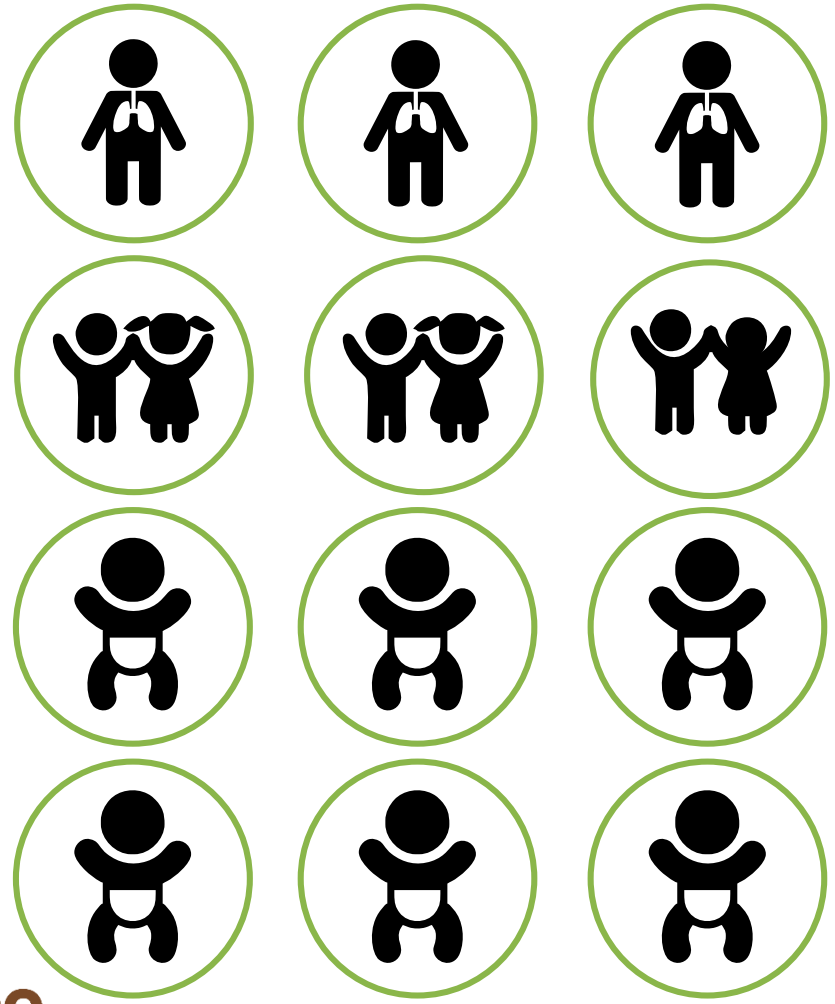
Secondary transport disparity



Children require transfer > 10x the rate of adults.

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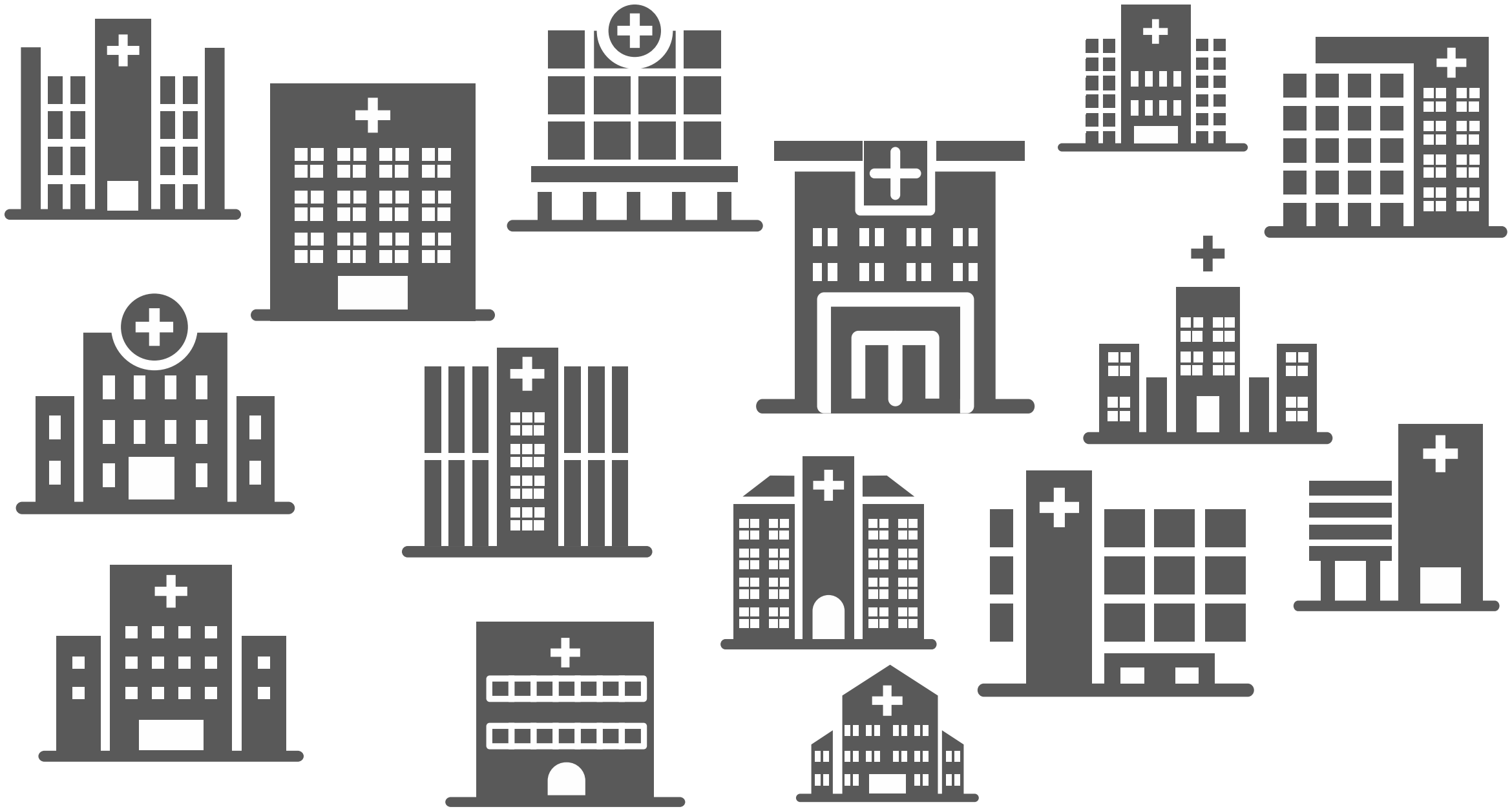
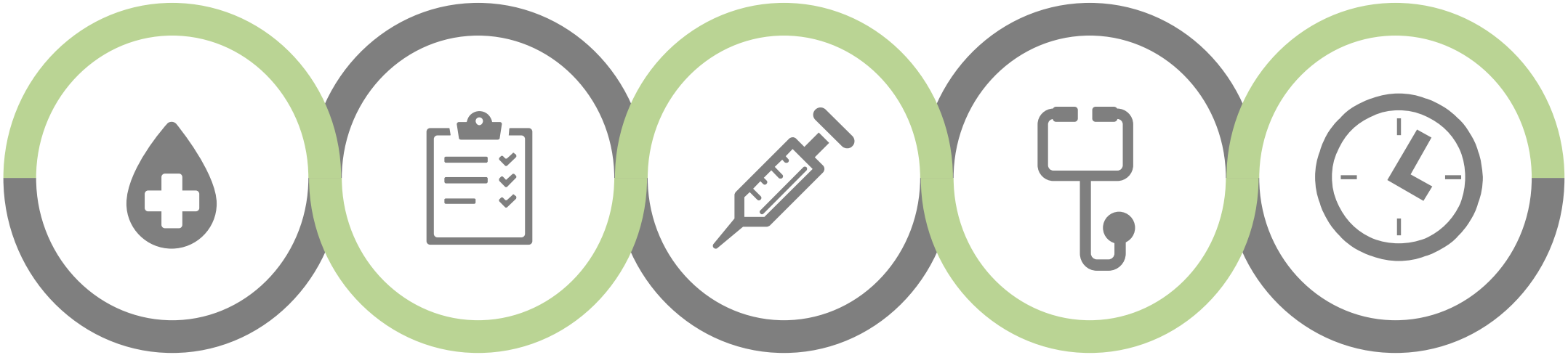


What's wrong with EMS going local? And then interfacility if the child needs it?

There are important harms and costs associated with secondary transport.

Quality Of Care Is Worse When Transfer Required



Increased morbidity

Additional handoffs

Lower utilization of analgesia

Repeat testing

Delays

THIS IS NOT FAMILY CENTERED CARE

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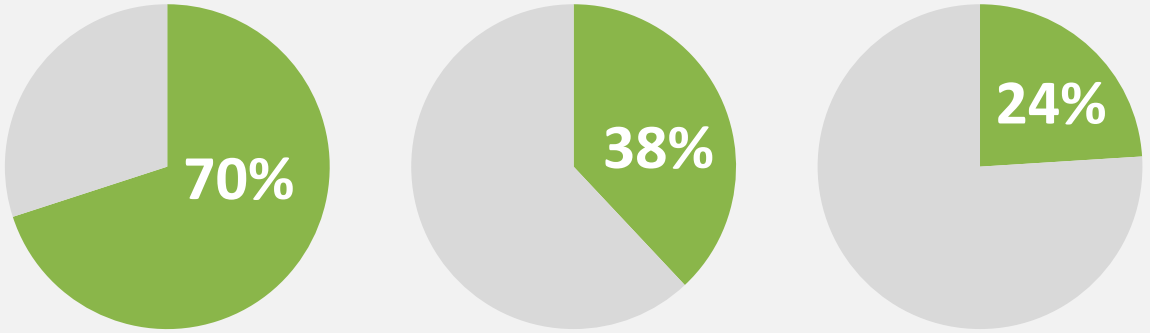
Cost is higher for children who required IFT

Average charges for entire episode of care

Same hospital

IFT to admit

Duplicate charges



Emergency procedures

Phlebotomy

Ionizing radiation

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Aledhaim, Hirshon, Fishe, Anders. Abstracts for the 2018 NAEMSP Scientific Assembly. Prehospital Emergency Care. 2018:22(1);101-150.

EMS professionals want to transport children to definitive care

> If we take our patient to a facility where they're going to have to be transported out…it's just delaying the definitive care for that patient. It's not in our or the patient's best interest

> It really frustrated me. I could have…had the patient more comfortable…one stop instead of settling in one hospital only to be dumped…to another hospital, go through the whole process again

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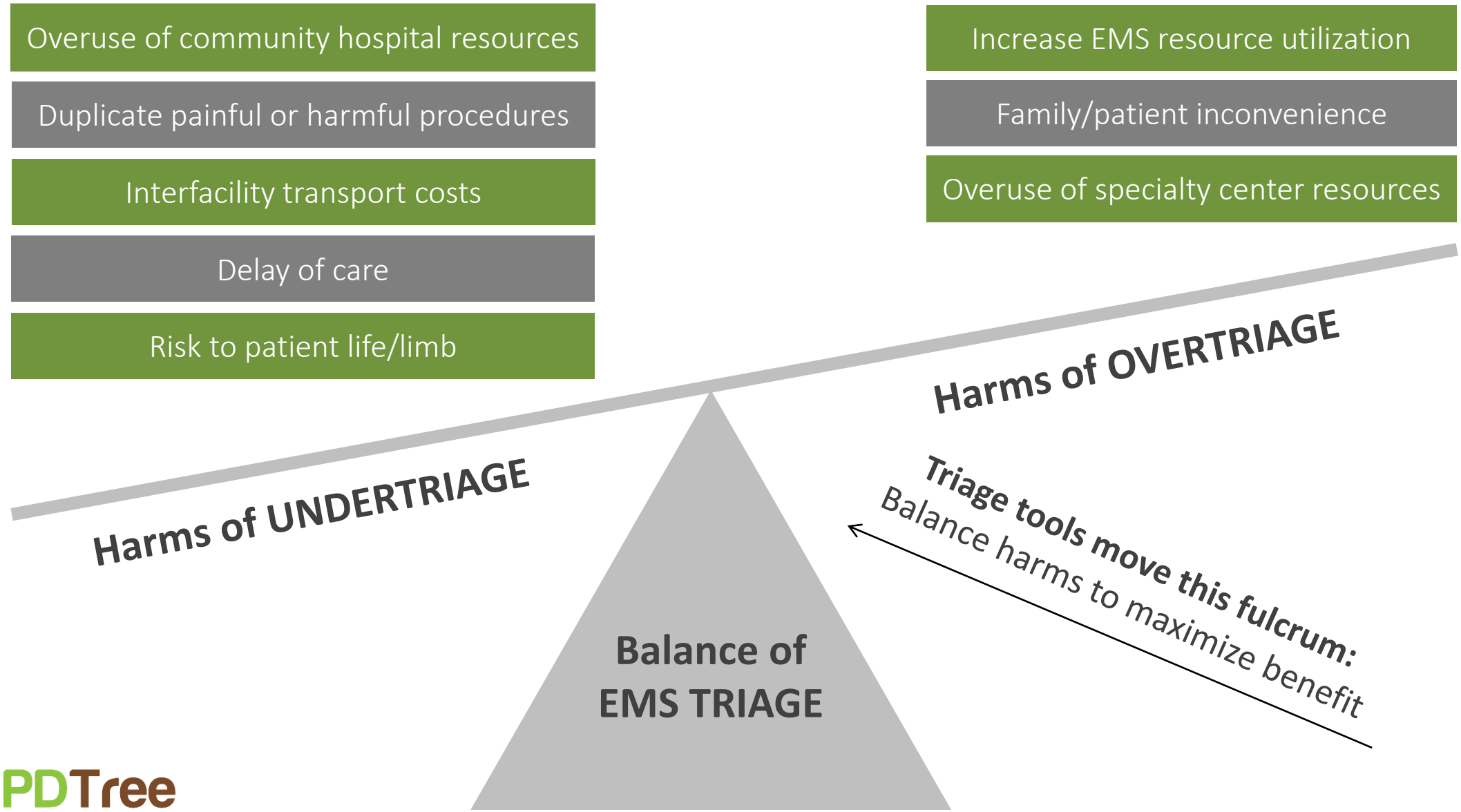
Overuse of community hospital resources
Duplicate painful or harmful procedures
Interfacility transport costs
Delay of care
Risk to patient life/limb
Increase EMS resource utilization
Family/patient inconvenience
Overuse of specialty center resources
Harms of UNDERTRIAGE
Harms of OVERTRIAGE
Balance of EMS TRIAGE
Triage tools move this fulcrum:
Balance harms to maximize benefit

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A Tool for Prehospital
Pediatric Destination Choice

Preliminary Evidence Base

- Literature review
- Preliminary Studies
  - In-depth interviews with EMS professionals
  - Statewide pediatric interfacility transport data
  - Risk factors for secondary transport

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Medical Conditions (9)

- Altered Level of Consciousness (No Trauma)
- ALTE/BRUE
- DKA/Hyperglycemia
- Hypoxia
- Respiratory Distress w/ Oxygen Requirement
- Respiratory Distress w/ Tracheostomy
- Seizure with Medication Administered
- Sepsis Rule-In
- Shock

Trauma Conditions (6)

- Complex wound
- Eye injury
- Femur fracture
- Long bone fracture with deformity
- Suspected cervical spine injury
- Suspected child abuse

Other Conditions (2)

- Special Health Care Needs with exacerbation of problem
- Conditions requiring ongoing treatment

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Iterative Process of Building PDTree

Pre-meeting
Online Voting

Face to Face
Meeting 1

Post-meeting
Online Voting

Face to Face
Meeting 2

Online Voting
Final Product

PDTree

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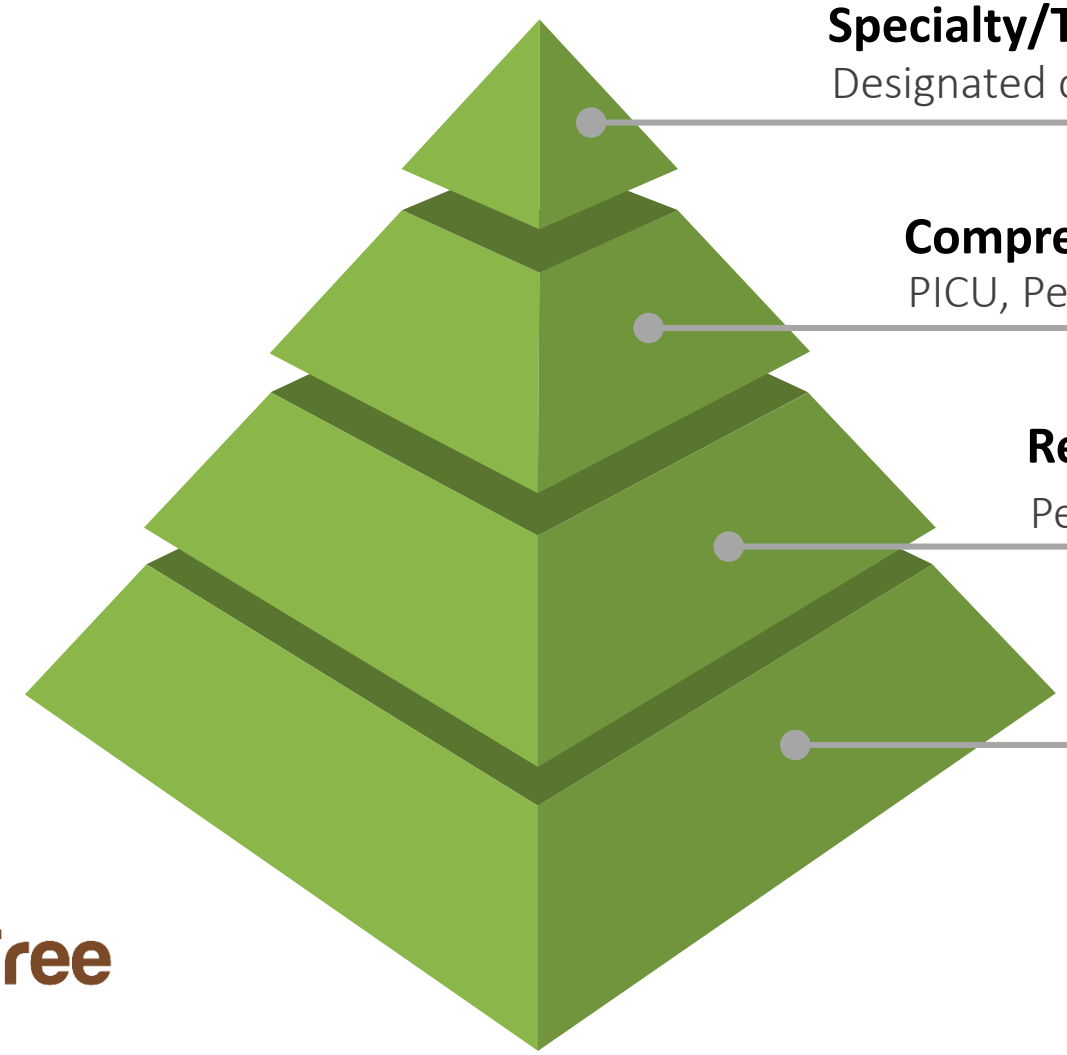
Levels of Pediatric Capability



Specialty/Trauma Center
Designated center for trauma, burn, etc.

Comprehensive Center
PICU, Pediatric OR capable

Regional Center
Pediatric Inpatient or 24/7 Pediatric ED

Pediatric Ready
All other local hospitals or free standing EDs

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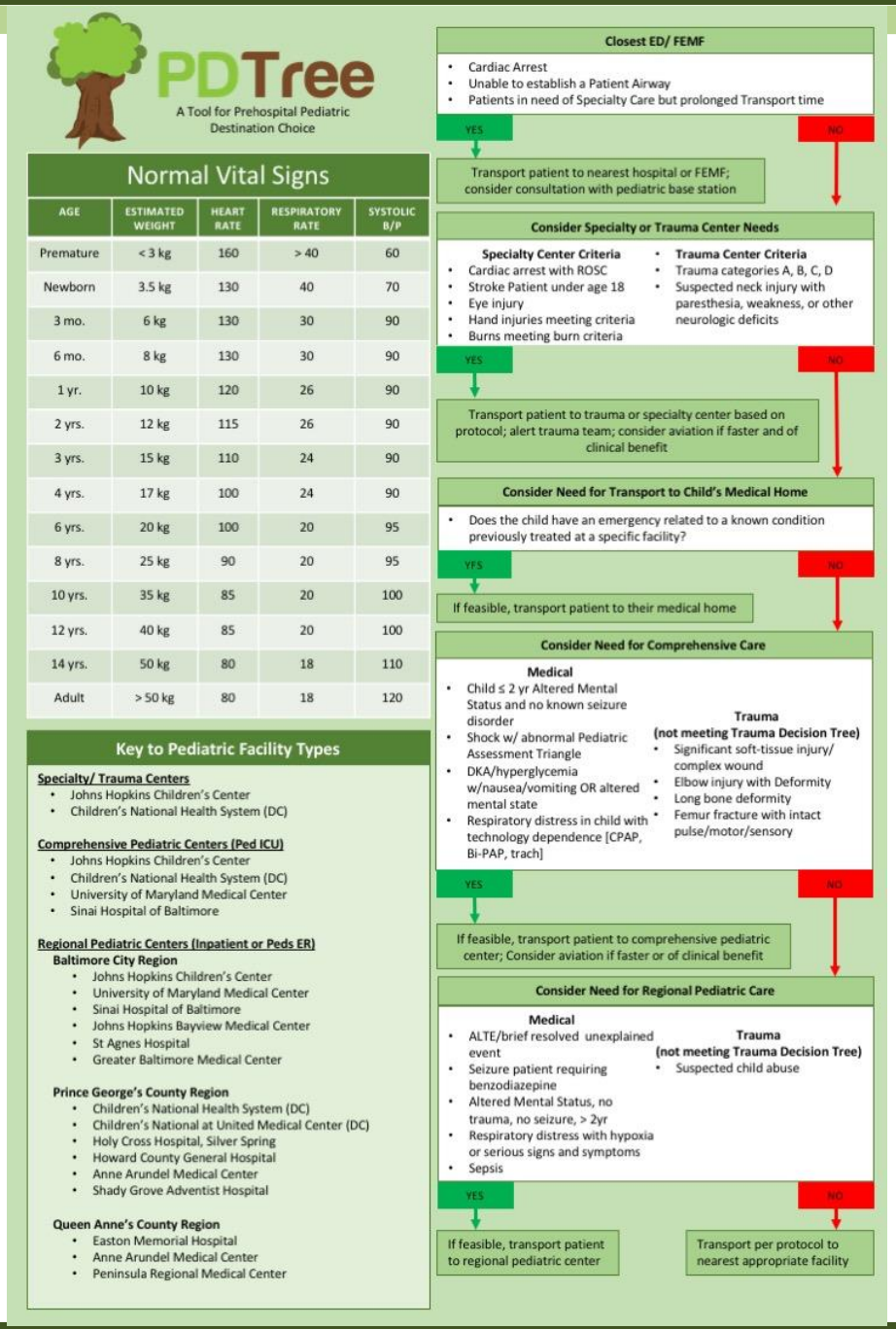
PDTree Pilot Protocol



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A Tool for Prehospital Pediatric Destination Choice

Normal Vital Signs

AGE	ESTIMATED WEIGHT	HEART RATE	RESPIRATORY RATE	SYSTOLIC B/P
Premature	< 3 kg	160	> 40	60
Newborn	3.5 kg	130	40	70
3 mo.	6 kg	130	30	90
6 mo.	8 kg	130	30	90
1 yr.	10 kg	120	26	90
2 yrs.	12 kg	115	26	90
3 yrs.	15 kg	110	24	90
4 yrs.	17 kg	100	24	90
6 yrs.	20 kg	100	20	95
8 yrs.	25 kg	90	20	95
10 yrs.	35 kg	85	20	100
12 yrs.	40 kg	85	20	100
14 yrs.	50 kg	80	18	110
Adult	> 50 kg	80	18	120

Key to Pediatric Facility Types

Specialty/ Trauma Centers
- Johns Hopkins Children's Center
- Children's National Health System (DC)

Comprehensive Pediatric Centers (Ped ICU)
- Johns Hopkins Children's Center
- Children's National Health System (DC)
- University of Maryland Medical Center
- Sinai Hospital of Baltimore

Regional Pediatric Centers (Inpatient or Peds ER)

Baltimore City Region
- Johns Hopkins Children's Center
- University of Maryland Medical Center
- Sinai Hospital of Baltimore
- Johns Hopkins Bayview Medical Center
- St Agnes Hospital
- Greater Baltimore Medical Center

Prince George's County Region
- Children's National Health System (DC)
- Children's National at United Medical Center (DC)
- Holy Cross Hospital, Silver Spring
- Howard County General Hospital
- Anne Arundel Medical Center
- Shady Grove Adventist Hospital

Queen Anne's County Region
- Easton Memorial Hospital
- Anne Arundel Medical Center
- Peninsula Regional Medical Center

Closest ED/ FEMF

- Cardiac Arrest
- Unable to establish a Patient Airway
- Patients in need of Specialty Care but prolonged Transport time

YES → Transport patient to nearest hospital or FEMF; consider consultation with pediatric base station

NO ↓

Consider Specialty or Trauma Center Needs

Specialty Center Criteria
- Cardiac arrest with ROSC
- Stroke Patient under age 18
- Eye injury
- Hand injuries meeting criteria
- Burns meeting burn criteria

Trauma Center Criteria
- Trauma categories A, B, C, D
- Suspected neck injury with paresthesia, weakness, or other neurologic deficits

YES → Transport patient to trauma or specialty center based on protocol; alert trauma team; consider aviation if faster and of clinical benefit

NO ↓

Consider Need for Transport to Child's Medical Home

- Does the child have an emergency related to a known condition previously treated at a specific facility?

YES → If feasible, transport patient to their medical home

NO ↓

Consider Need for Comprehensive Care

Medical
- Child ≤ 2 yr Altered Mental Status and no known seizure disorder
- Shock w/ abnormal Pediatric Assessment Triangle
- DKA/hyperglycemia w/nausea/vomiting OR altered mental state
- Respiratory distress in child with technology dependence [CPAP, Bi-PAP, trach]

Trauma (not meeting Trauma Decision Tree)
- Significant soft-tissue injury/ complex wound
- Elbow injury with Deformity
- Long bone deformity
- Femur fracture with intact pulse/motor/sensory

YES → If feasible, transport patient to comprehensive pediatric center; Consider aviation if faster or of clinical benefit

NO ↓

Consider Need for Regional Pediatric Care

Medical
- ALTE/brief resolved unexplained event
- Seizure patient requiring benzodiazepine
- Altered Mental Status, no trauma, no seizure, > 2yr
- Respiratory distress with hypoxia or serious signs and symptoms
- Sepsis

Trauma (not meeting Trauma Decision Tree)
- Suspected child abuse

YES → If feasible, transport patient to regional pediatric center

NO → Transport per protocol to nearest appropriate facility

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Critical/Closest ED

- Cardiac Arrest
- Emergent Airway Stabilization
- Patients in need of Specialty Care but prolonged transport time

YES

Transport patient to
nearest hospital or free standing ED;
Consider consultation with pediatric base station

NO

Consider Specialty or Trauma Center Needs

Specialty Center Criteria

- Cardiac Arrest with ROSC
- Stroke Patient < 18 years
- Eye injury
- Hand Injuries meeting criteria
- Burn meeting burn center criteria

Trauma Center Criteria

- Trauma Categories A, B, C
- Suspected neck injury with paresthesia, weakness, or other neurologic deficits

YES

Transport patient to trauma or specialty center based on protocol; Alert trauma team; Consider aviation if quicker and of clinical benefit

NO

Consider Need for Transport to Child's Medical Home

- Does the child have an emergency related to a known condition previously treated at a specific facility?

YES

If feasible, transport patient to site of their on-going care

NO

Consider Need for Comprehensive Care

Medical

- Child ≤2 years w/ Altered Mental Status and no known seizure disorder
- Shock w/ abnormal Pediatric Assessment Triangle
- DKA/hyperglycemia w/ nausea/vomiting OR altered mental state
- Respiratory distress in child with technology dependence (CPAP, Bi-PAP, trach)

Trauma (not meeting Trauma Decision Tree)

- Significant soft-tissue injury / complex wound
- Elbow injury with deformity
- Long bone deformity (any age)
- Femur fracture with intact pulse / motor/sensory

YES

If feasible, transport patient to Comprehensive Pediatric Center; Consider aviation if faster and of clinical benefit

NO

Consider Need for Regional Pediatric Care

Medical

- ALTE/BRUE
- Seizure patient requiring benzodiazepine
- Altered Mental Status, no trauma, no seizure
- Respiratory distress with hypoxia or serious signs and symptoms
- Sepsis

Trauma (not meeting Trauma Decision Tree)

- Suspected child abuse

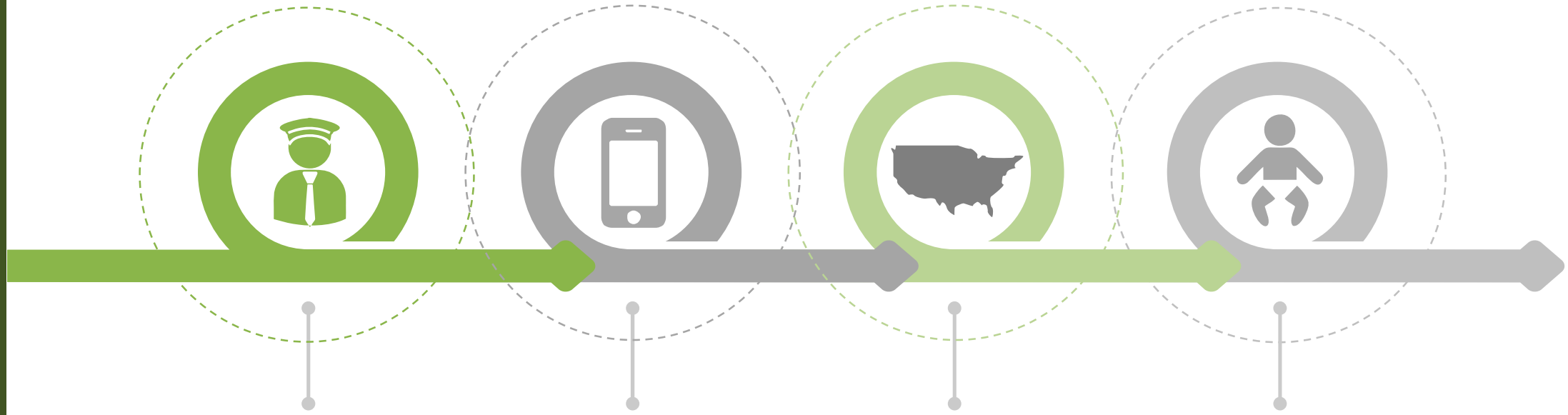
YES

If feasible, transport patient to regional pediatric center

NO

Transport per protocol to closest open facility

Where do we go from here?



Pilot testing the PDTree

Develop mobile application

Adaptation for diverse locations

Pediatric capability designations

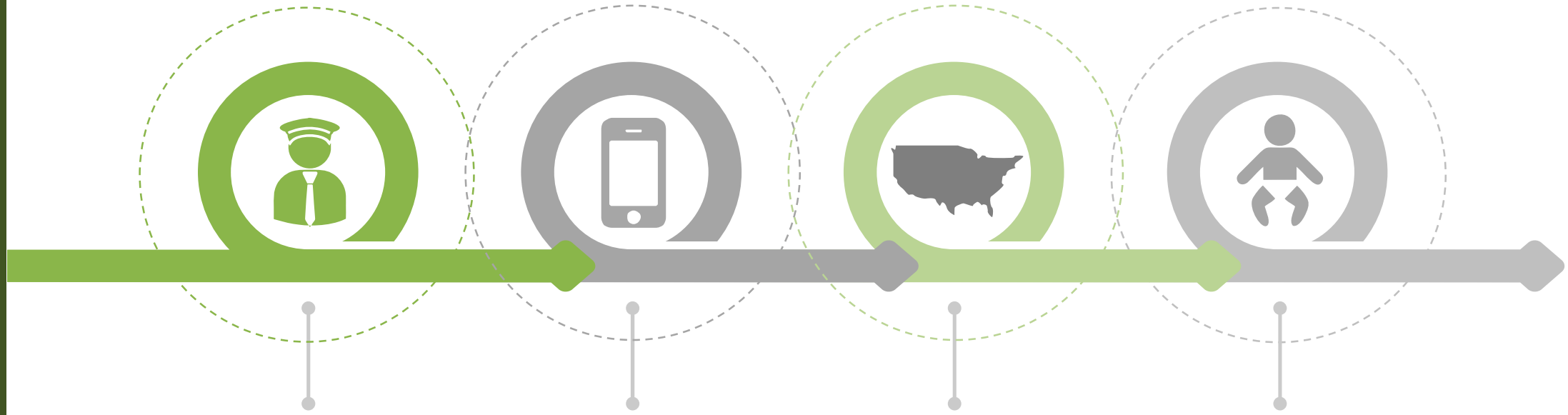
PDTree

Research Protocol Pilot Test

- Three Maryland jurisdictions – urban, suburban, rural – are currently using the protocol

- Data collection for 12 months
  - Usage of PDTree Tool
  - Destination Agreement with PDTree suggested Level

Where do we go from here?



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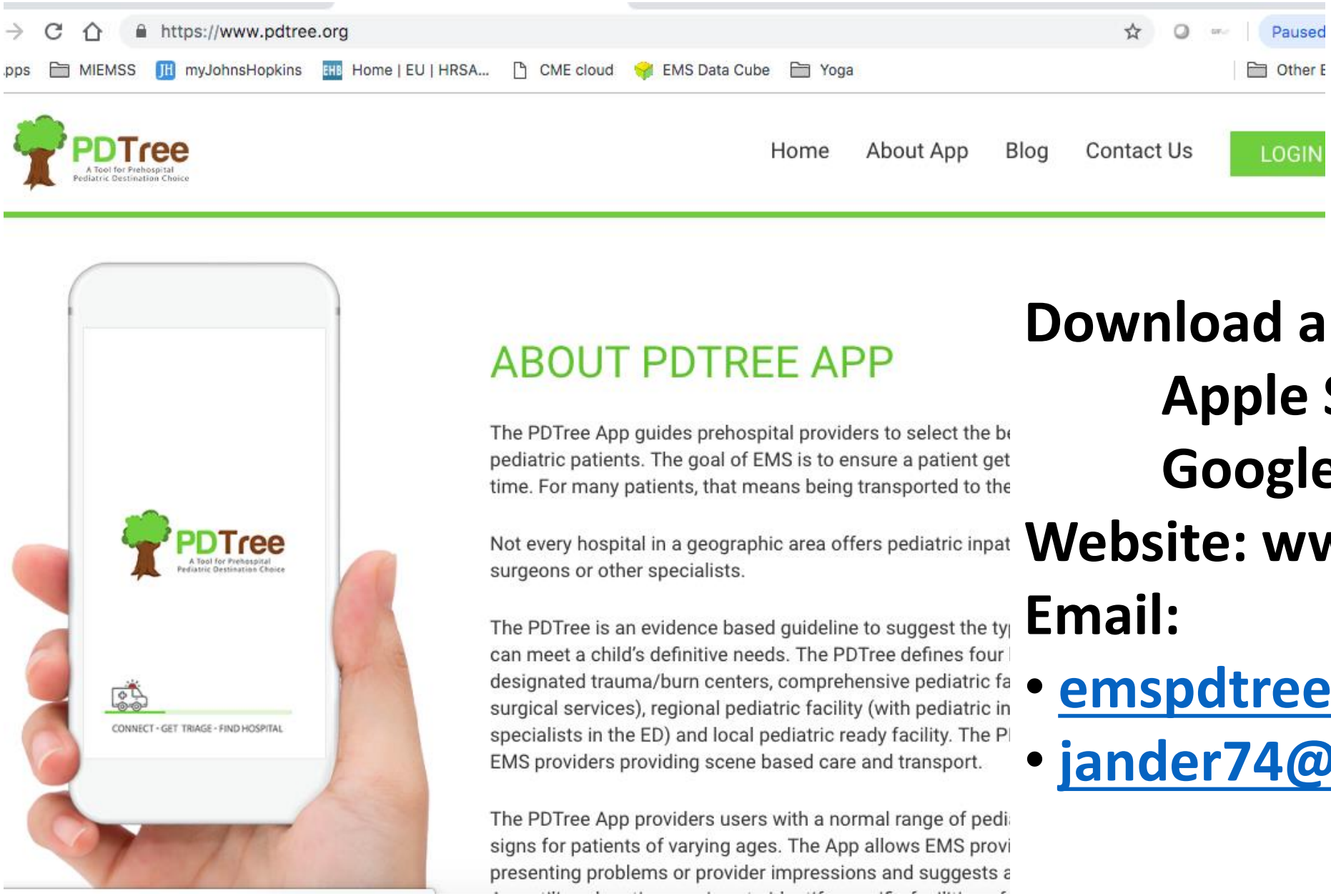

Download app

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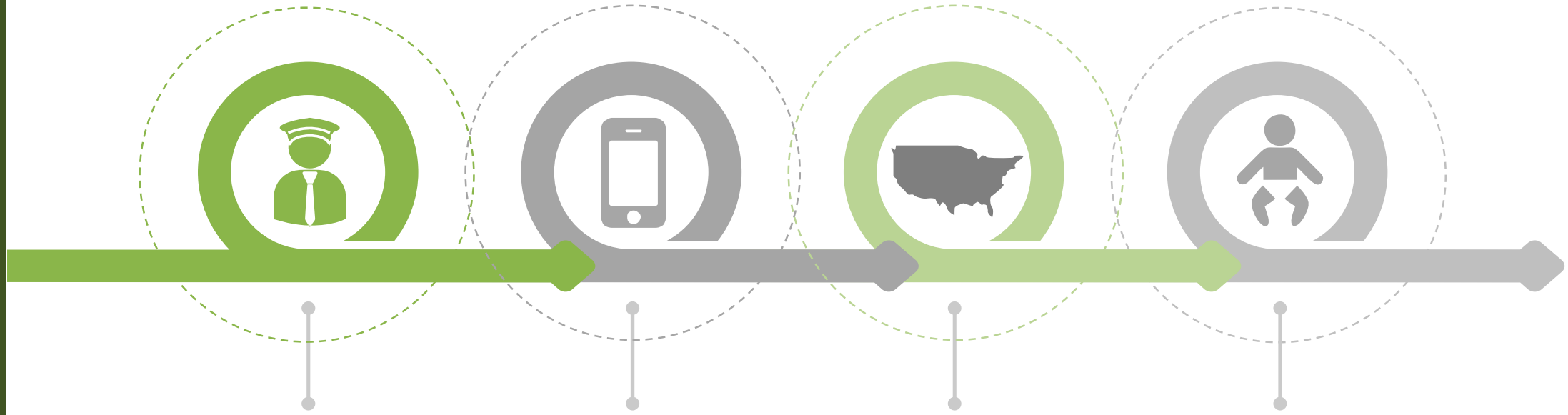

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