HARD WIRED SYSTEMS OF THINKING
The Root of Pediatric Errors

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Davie Fire Rescue, Medical Director
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American Ambulance, Medical Director
SW Ranches Fire Rescue, Medical Director
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Palm Beach County Fire Rescue, Asst. Medical Director
JDCH, Pediatric Emergency Medicine

Disclosure
• Handtevy - Pediatric Emergency Standards, Inc.
  – Founder and CMO
  – Pediatric Resuscitation System

100 Deaths in 1 Year

Behavioral Economics

Nudge
Improving Decisions About Health, Wealth, and Happiness
by Nudge Research Group and Daniel Kahneman

The New York Times Best Seller List
Perspective

Pediatric Cardiac Arrest Statistics

Out of Hospital 2015
Infants 3%
Children 10.5%
Adolescents 15.8%

Perspective

Pediatric Arrest

In-hospital Survival
Pre-hospital Survival

Perspective

Pediatric Cardiac Arrest Statistics

Out of Hospital 2015
Infants 3%
Children 10.5%
Adolescents 15.8%

Perspective

Adult Cardiac Arrest

Recent Advances

Palm Beach County

Adult ROSC Rates

Florida 2015: 16
PBCFR 2015: 16
PBCFR 2016: 43
PBCFR Sept 16: 53
Test Your Brain

65 year old in cardiac arrest
65 year old in anaphylaxis

5 year old in cardiac arrest
5 year old in anaphylaxis

The Arrest Lifecycle

En Route
On Scene
Debrief
Closure

Lt. Jonathan Robbins

The Arrest Lifecycle

En Route

65 YR old Arrest

2 YR old Arrest
The Arrest Lifecycle

On Scene

65 YR old Arrest

2 YR old Arrest

Debrief

“What Could We Have Done Better”

The Arrest Lifecycle

Pediatric “Seizure”

The 911 Call

3 - Months Ago
One Night in Bangkok

A Few Months Ago

15 Compressions : 2 LAPS

Resuscitation Psychology

Social Psychologist
Nobel Prize Winner

Your Brain
Quiz Question #1

System 1
Rapid Assessment

Testing System 1

How many animals of each kind did Moses take on the ark?

System 1
The Tables Have Turned

Moses Illusion
More System 1

2B14

ABC

More System 1

2B14

ABC

---

27

28
DOES IT ADD UP?

SURVEY SAYS?

6000

= 5100

Resuscitation Psychology

System 2

Resuscitation Psychology

System 2

Central Line Size
Norepi Drip
ETT Size
Foley Size
NG Size

2 Year Old
Severe Sepsis

NIH Stroke Scale
“Pay Attention”
System 2 Has a Cost

- Medication Dosages
- Mathematical Calculations
- Drawing up Medications

The Dichotomy
Adult v. Peds

60 Year Old Male
- Hypoglycemia
- Asystole
- Allergic Reaction

5 Year Old Male
- Hypoglycemia
- Asystole
- Allergic Reaction

System 1
System 2
Conclusions

<table>
<thead>
<tr>
<th>System 1</th>
<th>Benefits</th>
<th>Dangers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Decisions</td>
<td>Error Prone</td>
<td></td>
</tr>
</tbody>
</table>

| System 2       | Information Resource | Cannot Function During Stress |

Bread and Butter

Anaphylaxis

Femur Fracture

Seizure

Epi 1:1000 IM

Fentanyl IN

Midazolam IN

What We’ve Learned

Variability in the Treatment of Prehospital Hypoglycemia: A Structured Review of EMS Protocols in the United States

Paul Rostykus, MD, MPH, Jamie Kenkel, MS, Kristian Adair, EMT, Micah Fillingen, EMT, Ryan Palmberg, EMT, Amy Quinn, EMT, Jonathan Ripley, EMT, Mohammad Daya, MD, MS

Prehospital Emergency Care, Published online: 01 Mar 2016.

Peds

<5-15 kg

10

21

13

21%

<5-15 kg

8

3

3

2%

<5-15 kg

16

5

5

77%

<5-15 kg

17

5

5

2%

<5-15 kg

16

5

5

4%

<5-15 kg

23

8

6

3%

Not needed

12

3%

12

99%

Percentage may not total 100% due rounding.
A Comparison of Medications in 38 Pediatric EMS Protocols to Those Listed on the Broselow™ Length-Based Tape

Caroline Epstein EMT-B, Peter Antevy MD, Patrick Hardigan PhD
Joe DiMaggio Children’s Hospital, Hollywood, FL, Nova Southeastern University, Davie, FL

BACKGROUND

• Pediatric medication errors are common.¹
• PALS 2015 recommends the use of a length-based tape with precalculated doses.²

This study seeks to compare pediatric drug dosages from large and small EMS agencies to those listed on the Broselow LBT and determine discordance rates.

• Determine the percentage of medications on the Broselow LBT found at incongruent dosages compared to the EMS protocols.
• Determine the total number of medications from each EMS protocol that were not present on the Broselow LBT.

METHODS

• Determine the frequency of each of the medications in each EMS protocol that were missing from the Broselow LBT, as well as those that were listed at incongruent dosages.

RESULTS

A significant discrepancy exists between the pediatric drug dosages found in 38 EMS protocols and those listed on the Broselow LBT.

Table 1. Missing and Incorrect Dosages

<table>
<thead>
<tr>
<th>Incorrect Dose</th>
<th>MED</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing Medications</td>
<td>10%</td>
<td>6%</td>
<td>6%</td>
<td>20%</td>
</tr>
<tr>
<td>Missing Medication + Incorrect Dose</td>
<td>38%</td>
<td>7%</td>
<td>23%</td>
<td>50%</td>
</tr>
</tbody>
</table>

CONCLUSION

A significant discrepancy exists between the pediatric drug dosages found in 38 EMS protocols and those listed on the Broselow LBT.

REFERENCES

Pedi-STEPPs Training for EMS at Texas Children’s Hospital

- 8 Hours
- Peds Specific
- EMS Providers

Only 58% received medication
49% received incorrect dose

Does Training Help?

EMS Timeline

- Dispatch
- On Scene
- Depart Scene
- Hospital Arrival
A Comparison of On-Scene Times for Out-Of-Hospital Pediatric Versus Adult Cardiac Arrest Patients in a Statewide EMS Information System
Emily Kraft, Emily Jonas, Kevin Putman, Colleen MacCallum, William Fales. Western Michigan University

Background: Compare on-scene times of transported out-of-hospital non-traumatic cardiac arrest (CA) pediatric versus adult patients using a statewide EMS information system (EMSIS).

Methods: A statewide EMSIS was used to conduct the retrospective, observational study. The study period was from 1/1/2010 to 12/31/2013. Data were filtered from EMSIS based on criteria previously found to maximally identify CA cases (e.g., impression of CA, CPR procedure, etc.). Pediatric cases were considered those <13 years old. Only patients transported to hospitals were selected. Scene time was calculated by subtracting the scene departure from the scene arrival time. Further comparisons were made of public locations, initial shockable rhythm, and return of spontaneous circulation (ROSC) reported upon ED arrival. Cases were excluded for trauma, CA at healthcare facilities, or those missing initial EKG, scene time, or ROSC data. Standard statistical analysis was performed.

Results: There were a total of 5,060,339 records in the EMSIS, with 33,080 meeting initial criteria for CA. After exclusions, there were 10,240 cases remaining for final analysis, 266 (2.6%) pediatric and 9,974 (97.4%) adult. The median age for pediatric and adult patients was 80 months (IQR:2.0, 36.0) and 64.0 years (IQR:52.0, 77.0), respectively. There were 12.8% of pediatric versus 22.0% of adult arrests reported in public venues (p = 0.0005). Eight (3.0%) pediatric arrests were reported with an initial shockable rhythm versus 2,020 (20.3%) of adults (p < 0.0001). The median time on scene for pediatric and adults were 12.0 minutes (IQR:5.3, 21.8) and 23.0 minutes (IQR:16.0, 33.7), respectively (p < 0.0001). The number of pediatric and adult arrests reported to have ROSC upon ED arrival were 30 (11.3%) and 2,473 (24.8%), respectively (p < 0.0001).

Conclusion: This study demonstrates significantly shorter on-scene times of pediatric versus adult cardiac arrest patients. Adults were much more likely to have an arrest in a public location, have an initial shockable rhythm, and have ROSC upon ED arrival. Further studies are needed to assess any causal relationship between scene time duration and outcomes. Important limitations in this study include exclusive reliance on unverified data from a statewide EMSIS, large numbers of excluded cases including non-transported patients, and lack of hospital outcome data.

Poster Presentation NAEMSP; January 2015
Prehospital Emergency Care 2015;19:164
Age Vs. Length?

### Table

<table>
<thead>
<tr>
<th>Method</th>
<th>Proportion within 10% (95% CI)</th>
<th>Proportion within 20% (95% CI)</th>
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<tbody>
<tr>
<td>Finger counting</td>
<td>59% (52%-65%)</td>
<td>87% (81%-91%)</td>
</tr>
<tr>
<td>Broselow tape</td>
<td>56% (49%-63%)</td>
<td>81% (75%-86%)</td>
</tr>
<tr>
<td>Parental estimate</td>
<td>54% (47%-61%)</td>
<td>79% (73%-84%)</td>
</tr>
<tr>
<td>Luscombe formula</td>
<td>52% (45%-59%)</td>
<td>84% (78%-89%)</td>
</tr>
<tr>
<td>APLS formula</td>
<td>33% (27%-40%)</td>
<td>72% (66%-78%)</td>
</tr>
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If a 7 Year Old Can Do It

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Rapid Medication Dosing

### The Basics

- System 1 Thinking

1 3 5 7 9
10 15 20 25 30

---

Poster Presentation
- Clincon 2014
- ACEP 2014
- NAEMSP 2015

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Annals of Emergency Medicine
Volume 64, Issue 4, Supplement, Page S107, October 2014
Rapid Medication Dosing
Cardiac Arrest

Epinephrine 1:10,000 & Amiodarone

1 3 5 7 9

1.0 15 20 25 30

1 mL 1.5 mL 2 mL 2.5 mL 3 mL

Restart The Heart
On Scene
5 STEPS
2 Minutes

ARRIVE
VM
OMPRESS
RILL
PINEPHRINE

Miami-Dade Fire Rescue

Alejandro
Polk County Fire Rescue Pediatric Arrest

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tbody>
<tr>
<td>Arrests</td>
<td>20</td>
<td>18</td>
<td>21</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td>ROSC (Pulses)</td>
<td>0%</td>
<td>11%</td>
<td>33%</td>
<td>29%</td>
<td>56%</td>
</tr>
<tr>
<td>Survivors</td>
<td>0%</td>
<td>0%</td>
<td>71%</td>
<td>70%</td>
<td>87%</td>
</tr>
</tbody>
</table>

8 Years Later

Lt. Jonathan Robbins

1 Year Old Chokes on Grape – Found in Cardiac Arrest - Saved by Coral Springs Paramedics
Lt. Jonathan Robbins

5 Months Ago in Florida

ACLS vs. PALS

Outcomes

Adult

Peds

Algorithms

Advanced Life Support
Let’s Build a New Road

1. Lay Person & T-CPR - Change needed
2. Use Age Primarily - Length secondary
3. Treat Kids Like Adults
4. Culture Change → Outcomes

Contact Information

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Twitter: @Handtevy

COX AIR CARE CONFERENCE 2017

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