Paramedic Pediatric Medication Errors and High Reliability Solutions

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Background

Reducing pediatric medication errors made by paramedics working under time sensitive and stressful circumstances is an on-going challenge.

Various strategies have demonstrated positive results though serious mistakes still prevail.

One method that offers immediate substantial improvement is to completely eliminate math and provide clinicians with the exact answers they need at the point of care.

Objectives

To demonstrate paramedic potential for pediatric medication errors.

To demonstrate a method for significantly improving performance by providing the answers to each possible equation.

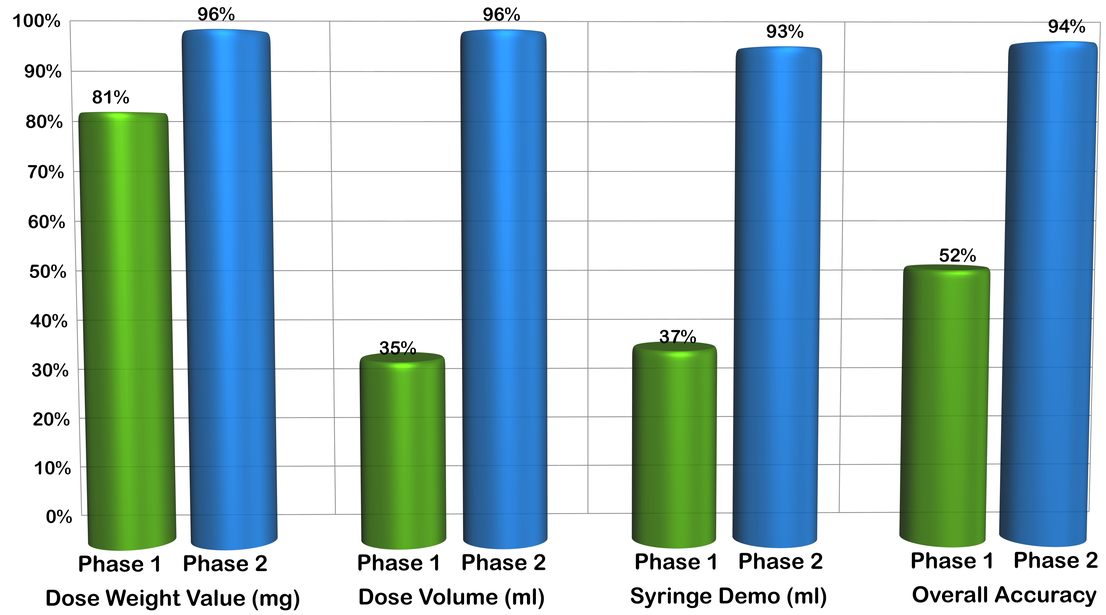
Methods

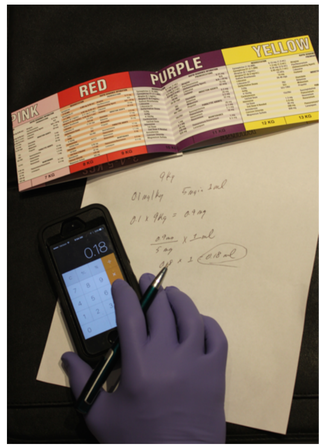
This Quantitative research was designed to study errors made determining weight based pediatric drug doses by currently practicing EMS clinicians with at least 2 years of experience at the paramedic level.

- Study called for minimum of 30 to 80 subjects, representing all eight Tennessee EMS regions
- Participants recruited through Tennessee Department of Health - Office of EMS and all eight regional ambulance service director's associations.
- Written informed consent was obtained from all participants.
- Dosing errors were defined as ≥20% deviation from the precise weight based calculation or Broselow™ Pediatric Emergency Tape equivalent.
- Clinicians were placed in a testing environment and challenged to determine doses in milligrams (mg), milliliters (ml) and physically demonstrate the correct (ml) with a syringe.

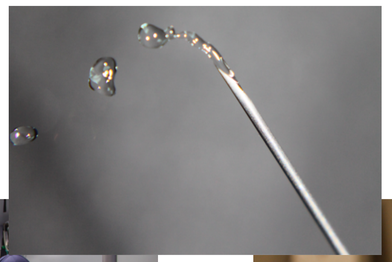
Assumptions & Limitations

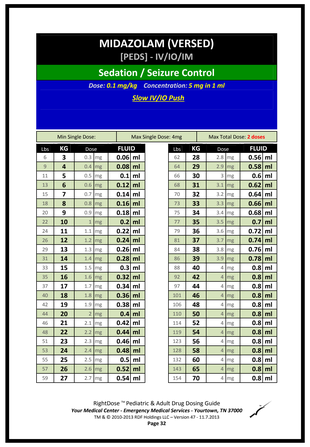
- Participants were limited to paramedics currently practicing in Tennessee representing all regions.
- No pretest competency assessments performed.
- To simulate the time sensitivity and stress of the EMS environment a constraint of 2 minutes was given to achieve each medication dose.
- Broselow™ Tape familiarity was assumed given it is a required tool for every ALS ambulance in Tennessee.





Phase 1
Traditional Methods





MIDAZOLAM (VERSED)
[PEDS] - IV/IO/IM
Sedation / Seizure Control
Dose: 0.1 mg/kg Concentration: 1 mg in 1 ml
Slow IV/IO Push

Min Single Dose: Max Single Dose: 4mg Max Total Dose: 3 doses

Lbs	KG	Dose	FLUID
6	3	0.3 mg	0.06 ml
9	4	0.4 mg	0.08 ml
11	5	0.5 mg	0.1 ml
13	6	0.6 mg	0.12 ml
15	7	0.7 mg	0.14 ml
18	8	0.8 mg	0.16 ml
20	9	0.9 mg	0.18 ml
22	10	1 mg	0.2 ml
24	11	1.1 mg	0.22 ml
26	12	1.2 mg	0.24 ml
29	13	1.3 mg	0.26 ml
31	14	1.4 mg	0.28 ml
33	15	1.5 mg	0.3 ml
35	16	1.6 mg	0.32 ml
37	17	1.7 mg	0.34 ml
40	18	1.8 mg	0.36 ml
42	19	1.9 mg	0.38 ml
44	20	2 mg	0.4 ml
46	21	2.1 mg	0.42 ml
48	22	2.2 mg	0.44 ml
51	23	2.3 mg	0.46 ml
53	24	2.4 mg	0.48 ml
55	25	2.5 mg	0.5 ml
57	26	2.6 mg	0.52 ml
59	27	2.7 mg	0.54 ml
62	28	2.8 mg	0.56 ml
64	29	2.9 mg	0.58 ml
66	30	3 mg	0.6 ml
68	31	3.1 mg	0.62 ml
70	32	3.2 mg	0.64 ml
73	33	3.3 mg	0.66 ml
75	34	3.4 mg	0.68 ml
77	35	3.5 mg	0.7 ml
79	36	3.6 mg	0.72 ml
81	37	3.7 mg	0.74 ml
84	38	3.8 mg	0.76 ml
86	39	3.9 mg	0.78 ml
88	40	4 mg	0.8 ml
92	42	4 mg	0.8 ml
97	44	4 mg	0.8 ml
101	46	4 mg	0.8 ml
106	48	4 mg	0.8 ml
110	50	4 mg	0.8 ml
114	52	4 mg	0.8 ml
119	54	4 mg	0.8 ml
123	56	4 mg	0.8 ml
128	58	4 mg	0.8 ml
132	60	4 mg	0.8 ml
143	65	4 mg	0.8 ml
154	70	4 mg	0.8 ml

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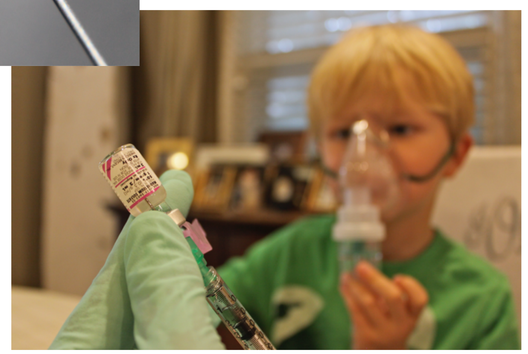
Phase 2
RightDose© Chart



Results

- **114 participants - 14.3 years avg. experience**
- **5 common medications and doses assessed**

  Epinephrine 1:1000 & 1:10,000, Dextrose, Magnesium & Adenosine
- **Phase 1 - Pen, Paper, Calculator and Broselow Tape**
  - 81% accurate dose weight value (mg)
  - 35% accurate dose volume (ml)
  - 37% accurate syringe demonstration (ml)

  Overall Phase 1 accuracy 52%
  - 16% over-dose and 33% under-dose error rate
- **Phase 2 - RightDose Pre-calculated chart method**
  - 96% accurate dose weight value (mg)
  - 96% accurate dose volume (ml)
  - 93% accurate syringe demonstration (ml)

  Overall Phase 2 accuracy 94%
  - 1% over-dose rate and 5% under-dose rate

Conclusions

Traditional calculation methods and incomplete resources produce substantial error rates.

Providing the exact answer to each possible dosing equation in a reliable, easy to use resource significantly improves accuracy.

Giving each clinician a meaningful training experience revealing their potential to err with existing methods and the capacity for accuracy with proper tools reduces stress, improves confidence and increases precision.

Acknowledgments

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