

Weighing Pediatric Patients in Kilograms

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Melinda Hartenstein BSN, RN, CEN, CPEN



Agenda

- Common Medication Errors
- Common Weight-Based Errors
- Overview of the ENA Position Statement
- 2 Case Presentations
- Breaking the Cycle of Errors
- Process Map & Standard Work to Avoid Errors
- EMR Alerts
- Emergency Tools





Pediatric Medication Errors 3 x More Likely

Among children, the rate of potentially dangerous medication errors is *three times* that of adults and wrong dose ordering errors are common because of the *complexity of weight-based dosing*.



Common Medication Errors

- ✓ Prescribing Errors
 - ✓ Wrong Dose
 - ✓ Wrong Form
 - ✓ Wrong Frequency

- ✓ Dosing Calculation Errors
 - ✓ Weight-based dosing complexities

- ✓ Mixing/Concentration Errors

- ✓ Administration Errors
 - ✓ Wrong Route
 - ✓ Wrong Timing
 - ✓ Wrong Patient

The ENA Position Statement



Patients should have weights measured, recorded, communicated, and documented in kilograms only.

- ✓ Inaccurate weight documentation varies: incorrect unit of measure entry, failure to enter the unit of measure, erroneous estimation of patient weight, use of a historical weight, and failure to convert between pounds and kilograms correctly.
- ✓ Converting from pounds to kilograms is an error-prone process and can result in more than two-fold dosing errors (Hoffman et al., 2018).
- ✓ Medication errors due to an incorrect weight recorded in the ED can easily be passed on to other units throughout the patient's hospital stay and continue after discharge if prescriptions are written based on an erroneous weight (Condren & Desselle, 2015).



Case 1

Stated Weights—

18-month-old arrived as trauma from scene of injury. Pt with declining GCS en route and required emergency intubation upon arrival to the trauma room. Pt then rapidly sent to the OR for a decompressive craniotomy.

In the chaotic trauma bay, the *family had verbalized a weight of 24 pounds however the patient's weight had been recorded in Epic as 24 kg and the verbalized weight was not double checked* by a second RN and *no validation by length-based tape*.

The patient was admitted to the PICU from the OR and a *weight on admission was not completed*.

2 days later, the patient returned to the OR and upon return to the PICU the admission weight was 13 kg.

Patient had received the following medications at inappropriate doses: Tylenol, Ancef, Calcium Gluconate, Vancomycin.

Tylenol levels and a Vancomycin trough were obtained, and the patient required no further interventions.

Policy Deviation/Near miss event.

Case 2



Transcribing Weights—

3-year-old transferred from an urgent care clinic for fever and abdominal pain.

Gastrostomy tube dependent.

Patient not wanting to stand on the scale due to pain.

Urgent care paperwork with a weight of 33 lbs.

Weight entered into EPIC as 33 kg, rather than 15 kg.

Weight transcription not validated by second RN.

Pt medicated with Tylenol for fever.

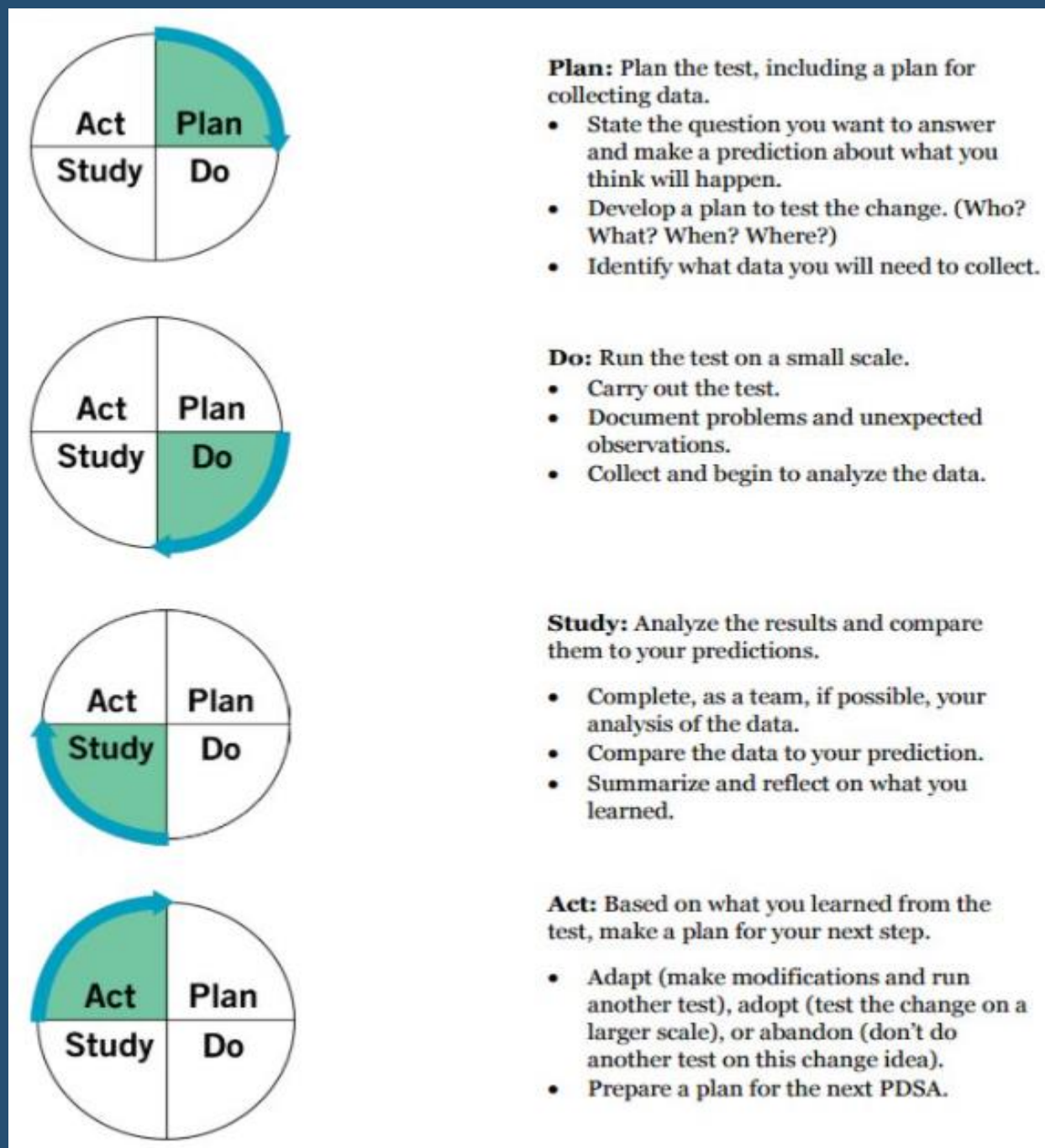
Weight not interpreted to be incorrect until second RN went to re-dose patient with Tylenol and noted dose size did not match patient size and then noted on the MAR that the symbol notating that the patient's weight had changed significantly out of range for age and growth chart.



Pt actual weight: 14.6 kg

acetaminophen (aka TYLENOL) oral suspension 400 mg
Freq: EVERY 4 HOURS AS NEEDED
Route: Oral
Order Dose: 12.5 mg/kg × 33 kg
Admin Amount: 12.5 mL = 400 mg of 400 mg/12.5 mL
Order Start Time: 01/01/12 0951
Order End Time: 01/01/12 2027
Admin Instruction: Maximum daily dose: Infants and children - not to exceed 90 mg/kg/day (mg/day)

Breaking the Cycle of Error



✓ Process Map—Current State

✓ Standard Work—

✓ Nursing Expectations of Care

✓ Standard Process for assuring weights are done in kilograms every time and all language around weights is in kilograms.

✓ Educate—

✓ Start with the Why

✓ Implement and educate to the process—teach to it in at least 3 different formats

✓ Tracking—

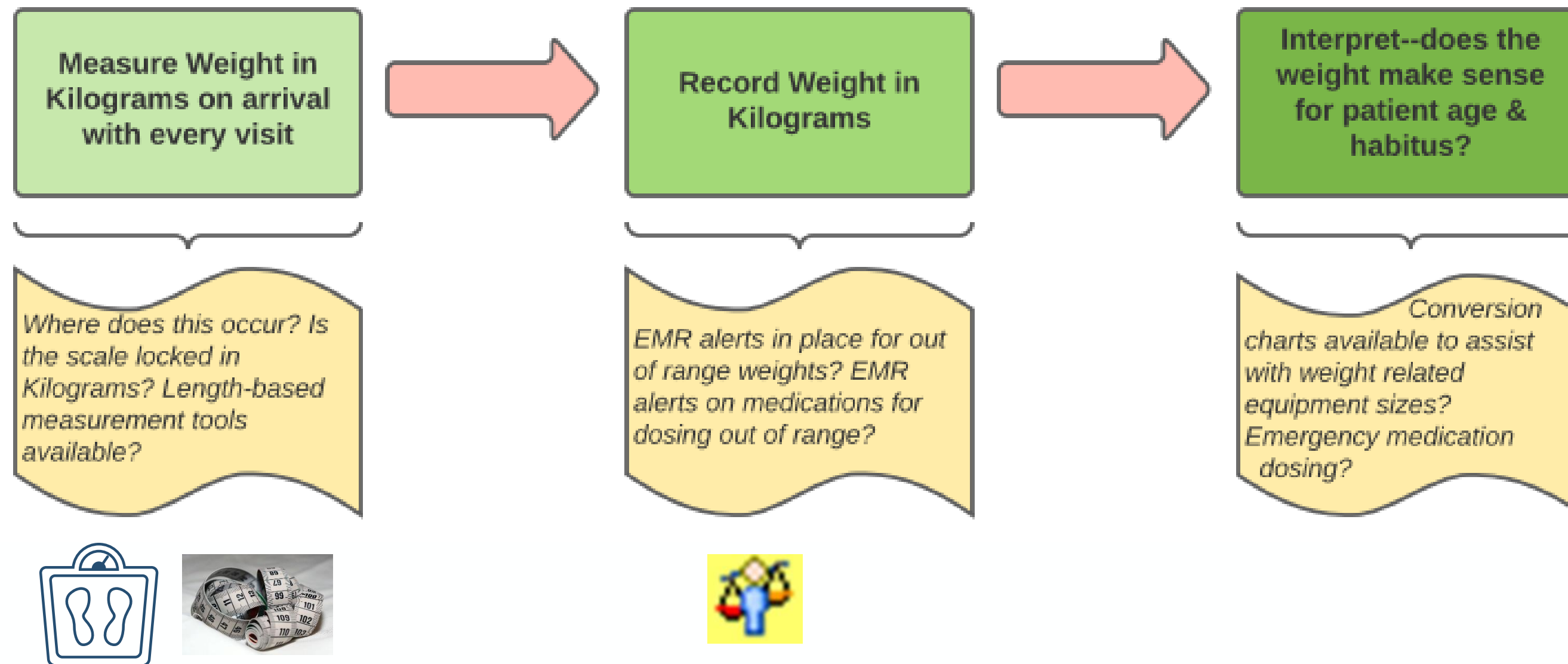
✓ Track the consistency

✓ Look for barriers to the process

✓ Implement new tests of change as countermeasures to identified barriers.

✓ Celebrate the wins!

Standard Weight Process Map



Standard Work- Weight in Kilograms

Standard Work

Job/Role: RN/Tech/MD	Process: Obtaining Pediatric Emergency Weights
Department: Pediatric Emergency Services	Owner: PEM Section/Peds ED UBNPC
Job Aids: None	Equipment/Supplies: Scale, Broselow tape
Notes:	

Major Step – “What”	Key Points – “How”	Reasons – “Why”
1. If possible weigh patient on age appropriate scale	1.1. Patient’s that are able to stand should be weighed on the standing scale 1.2. Infants should be weighed on the infant scale 1.3. Infants <28 days old will have a naked weight recorded 1.4. Trauma patients should be weighed on the trauma stretcher 1.5. Weights will only be recorded in kilograms 1.6. Patient’s will be re-weighed from transferring facility to assure accuracy 1.7. If unable, to be re-weighed from a receiving facility a double RN check will be performed or the weight checked with a Broselow tape	<ul style="list-style-type: none"> All pediatric medication dosing is weight based and to assure appropriate weight-based dosing we need accurate weights. Standard 1 of Peds ED NPEOC

Major Step – “What”	Key Points – “How”	Reasons – “Why”
2. Known Incoming code white or trauma patient with unknown weight	2.1. Estimate patient’s weight prior to arrival using the ‘Best Guess’ method: <12 months: $Weight (kg) = (age \text{ in months} + 9)/2$ 1-5 years: $Weight (kg) = (2 \times age \text{ in years}) + 10$ 5-14 years: $Weight (kg) = 4 \times age \text{ in years}$ <u>OR</u> Use the Handtevy Method: 1,3,5,7,9 age “finger count” and corresponds with 10,15,20,25,30 kg weights 2.2. Upon arrival, double check estimated weight by either: 2.2.1. weighing on trauma stretcher in resus 1; if congruent continue with estimated weight, if discrepant, correct weight and use trauma bed weight. 2.2.2. using the Broselow tape located in the room. If congruent, continue with estimated weight. 2.3. If Broselow tape not immediately available or seemingly inaccurate, MD may alter estimated weight based upon patient’s size and habitus 2.4. Only RN can document an estimated weight. CNAs cannot document an estimated weight.	<ul style="list-style-type: none"> Pre-arrival weights are critical for having medications and weight/size-appropriate supplies ready prior to arrival for critical patients
3. Emergency Situation (code white, Tier 1, code blue) not known prior to patient arrival	3.1. Use Broselow tape to measure patient and go with Broselow weight. 3.2. MD may alter estimated weight based upon patient’s size and habitus	<ul style="list-style-type: none">

Standard Work- Weight in Kilograms



Bed & Standing Scales
Locked to Kilograms



Infant Scale Locked to
Kilograms—Naked Weights



Length-Based Tape



Emergency Weight Calculations,
Emergency Medication Charts,
Emergency Equipment Charts by
Weight

Standard Work

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Electronic Medical Record Aids

- **Only able to record weight in kilograms.**

Keeps all weight related conversions in kilograms to avoid confusion.

- **Out of range growth chart or age for weight alerts.**

Hard stop to acknowledge that the weight is out of range to help you rethink the weight entered.

- **MAR Alerts.**



Emergency Weight Calculation & Tools

EMR Weight-Based Code Sheets

Current Weights

Recorded: 37 kg (81 lb 9.1 oz) 3 days ago

Dosing: None

Code Medications	Dose/kg	Dose	Volume	Notes
Adenosine 3 mg/mL	0.1 mg/kg	3.7 mg	1.23 mL	Max: 6mg Subsequent dose: 0.2mg/kg (Max:12mg)
Amiodarone 50 mg/mL	5 mg/kg	185 mg	3.7 mL	
Atropine 0.1 mg/mL	0.02 mg/kg	0.74 mg	7.4 mL	
Calcium Chloride 100 mg/mL	20 mg/kg	740 mg	7.4 mL	
Calcium Gluconate 100 mg/mL	100 mg/kg	3,000 mg	30 mL	
Epinephrine 0.1 mg/mL	0.01 mg/kg	0.37 mg	3.7 mL	
Epinephrine 1 mg/mL ETT	0.1 mg/kg	2.5 mg	2.5 mL	
Lidocaine 20 mg/mL	1 mg/kg	37 mg	1.85 mL	
Magnesium Sulfate 500 mg/mL	50 mg/kg	1,850 mg	3.7 mL	
Sodium Bicarbonate < 30 days old and all NICU pt. 0.5 mEq/mL	1 mEq/kg	10 mEq	20 mL	Max: 10mEq
Sodium Bicarbonate 1 mEq/mL	1 mEq/kg	37 mEq	37 mL	

Electricity	Joules/kg	Joules	Notes
Cardioversion	0.5 J/kg	19 Joules	May double and repeat Max: 200 Joules
Defibrillation	2 J/kg	74 Joules	May double and repeat Max: 200 Joules

Color Coded Weight-Based Code Sheets

Broselow color: GREY/PINK

Kg range: < 8 kg Approx Kg: 5 kg
 Approximate LBS: 10 lbs Defib: 1st 10 J 2nd 20 J 3rd 20 J
 ET uncuffed tube size: 3.5 Cardiovert: 5 J 10 J 10 J
 ET cuffed tube size: 3.0 (or clinically equivalent biphasic energy dose)
 NG tube size: 5 Fr

VOL	MEDICATION	DOSE	CONCENTRATION
0.2 ml	Adenosine IV 1st	0.5 mg	6 mg/2 ml
0.4 ml	Adenosine IV 2 nd /3 rd	1 mg	6 mg/2 ml
6 ml	Albuterol-Nebulized	5 mg	2.5 mg/3 ml
1.25 ml	Atrovent-Nebulized	0.25 mg	0.5 mg/2.5 ml
1 ml	Atropine (Bradycardia) IV/IO	0.1 mg	1 mg/10 ml
0.3 ml *	Atropine (OPP) IV/IM	0.1 mg	0.4 mg/1 ml
0.5 ml	Atropine ET	0.2 mg	0.4 mg/1 ml
0.1 ml	Benadryl IV/IM	5 mg	50 mg/1 ml
24 ml	Charcoal PO	5 GM	50 GM/240 ml
10 ml	Dextrose 25% IV	2.5 GM	12.5 GM/50 ml
0.5 ml	Epinephrine IV/IO	0.05 mg	1:10,000 1mg/10ml
0.5 ml	Epinephrine ET	0.5 mg	1:1,000 1mg/1ml
0.1 ml *	Epinephrine SC/IM	0.05 mg	1:1,000 1mg/1ml
2.5 ml	Epinephrine-Nebulized	2.5 mg	1:1,000 1mg/1ml
0.3 ml *	Glucagon IM	0.25 mg	1 unit (mg)/1 ml
0.3 ml *	Lidocaine 2% IV/IO	5 mg	100 mg/5 ml
0.5 ml	Lidocaine 2% ET	10 mg	100 mg/5 ml
NONE	Morphine Sulfate IV/IM	NONE	10 mg/1 ml
0.8 ml *	Morphine PO	1.5 mg	10 mg/5 ml
0.5 ml	Narcan IN/IM/IV	0.5 mg	1 mg/1 ml
5 ml	Narcan IV titrated increments	0.5 mg	Diluted to 1 mg/10 ml
100 ml	Normal Saline Fluid Bolus		Standard
5 ml	Sodium Bicarb IV	5 meq	1 meq/1 ml
0.1 ml	Versed IV	0.5 mg	5 mg/1 ml
0.2 ml	Versed IN/IM	1 mg	5 mg/1 ml



Best Guess Weight Estimate

<12 months:

$$\text{Weight (kg)} = (\text{age in months} + 9) / 2$$

1-5 years:

$$\text{Weight (kg)} = (2 \times \text{age in years}) + 10$$

5-14 years:

$$\text{Weight (kg)} = 4 \times \text{age in years}$$

Handtevy Method

1,3,5,7,9 age "finger count"

Corresponds with 10,15,20,25,30 kg weights

THANK YOU



Melinda Hartenstein
Assistant Nurse Manager



hartenst@ohsu.edu

