Pediatric Vital Signs *What are we missing?*

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| | <u>No</u> Event | Event |
|------------------|-----------------|-------|
| | 45% | 29% |
| HR | 56% | 67% |
| | 9% | 17% |
| SpO ₂ | 15% | 29% |

Winter J et al. Pediatric Patients Discharged from the Emergency Department with Abnormal Vital Signs. West J Emerg Med. 2017



20-30



Tired HA

5 yo F

"I think it's her asthma"

128 $1^{\text{m}} + 1^{\text{m}} + 1^{\text{m}}$ SpO₂ ² mm 46

NBP 102/64 (72)

89/61 (66) 92/64 (65) 90/60 (66) Pulse





Preschool age

Especially on Diagnosis

Konstantinov NK et al. Respiratory failure in diabetic ketoacidosis. *World J Diabetes*. 2015



90-120

14 yo M

Tired HA

"We need a drug test"





108/70 (66) 102/68 (65) 106/70 (66)

Pulse

138



Myocarditis

HR out of proportion

Especially Teens

Putschoegl A et al. Diagnosis, Evaluation, and Treatment of Myocarditis in Children. *Pediatr Clin North Am*. 2020





4 mo M

Vomiting

"I think it's his formula"



2

NBP 88/60 (66)

88/60 (66) 88/60 (66) 88/60 (66)



Pulse



Hypothermia

Infants < 60 days

Sepsis

Perry MC et al. Hypothermia in Young Infants: Frequency and Yield of Sepsis Workup. *Pediatr Emerg Care*. 2018





3 yo F

Vomiting

"Cousin was sick too"



NBP 154/88 (108)

160/88 (108) 158/82 (106) 158/80 (102)



Systolic Hypertension

100 + Age

$3 yo \equiv 103$ $5 yo \equiv 105$ $7 yo \equiv 107$





Auto v. Skateboard

10 yo M

Pulse HR -l-l-l-l 9 1 mV -SpO₂ $\bigwedge \land \land$ RR 2

NBP 110/90 (96)

112/92 (97) 112/90 (96) <u>108/92 (97)</u> 9(



Pulse Pressure

SBP – DBP

Narrow Pulse Pressure

Cardiogenic

Obstructive

Hypovolemic

Narrow Pulse Pressure



Wide Pulse Pressure

Distributive Shock

Wide Pulse Pressure







7 mo F

"Breathing Fast"



NBP 88/60 (66)

89/60 (66) 90/62 (67) 88/58 (66)



Bronchiolitis

Modified* n=307 *showed "94%" down to SpO₂ 90%



Cunningham S et al. Oxygen saturation targets in infants with bronchiolitis (BIDS). *Lancet*. 2015.

Bronchiolitis

Well Appearing

Non-hypoxic*

Euvolemic





EtCO₂



35-45

30





8 yo F

BBFA

Gotta lotta propofol







Muscular Activity Fever

Paralysis Hypothermia



Resuscitation Tourniquet Release

Low CO Pulmonary Embolism



Bronchorelaxation Decreased MV

Bronchospasm Increased MV

Sedation

Great Adjunct Better Data in: Adults Hypnotics

Selby ST et al. An Update on End-Tidal CO2 Monitoring. Pediatr Emerg Care. 2018.





DKA

Myocarditis

HR out of proportion

Especially Teens

Hypothermia

Infants < 60 days

Sepsis

Systolic Hypertension

Pulse Pressure

100 + Age

Younger, think: renal

SBP – DBP

Narrows as SVR increases

Bronchiolitis Well Appearing Non-hypoxic* Euvolemic Sedation Great Adjunct

Better Data in:

- Adults
- Hypnotics



Selected References: Respiratory Rate

Ramgopal S et al. Differences in Prehospital Patient Assessments for Pediatric Versus Adult Patients. *J Pediatr.* 2018 Aug;199:200-205.e6.

Sepanski RJ et al. Pediatric Vital Sign Distribution Derived From a Multi-Centered Emergency Department Database. *Front Pediatr.* 2018 Mar 23;6:66.

Selected References: Heart Rate

Bonafide CP et al. Development of heart and respiratory rate percentile curves for hospitalized children. *Pediatrics*. 2013 Apr;131(4):e1150-7.

van de Maat J et al. Measuring vital signs in children with fever at the emergency department: an observational study on adherence to the NICE recommendations in Europe. *Eur J Pediatr.* 2020 Jul;179(7):1097-1106.

Selected References: Temperature

Bae W et al. Distribution of Pediatric Vital Signs in the Emergency Department: A Nationwide Study. *Children* (Basel). 2020 Aug 5;7(8):89.

Nijman RG et al. Management of Children With Fever at Risk for Pediatric Sepsis: A Prospective Study in Pediatric Emergency Care. *Front Pediatr.* 2020 Sep 17;8:548154.

Selected References: Hypertension

Brady TM et al. Management of high blood pressure in children: similarities and differences between US and European guidelines. *Pediatr Nephrol*. 2019 Mar;34(3):405-412.

Flynn JT et al. SUBCOMMITTEE ON SCREENING AND MANAGEMENT OF HIGH BLOOD PRESSURE IN CHILDREN. Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics.* 2017 Sep;140(3):e20171904

Selected References: Pulse Pressure

DeRoss AL, Vane DW. Early evaluation and resuscitation of the pediatric trauma patient. *Semin Pediatr Surg* 2004; 13: 74–79

Duke T. New WHO guidelines on emergency triage assessment and treatment. *Lancet* 2016; 387: 721–24.

Goldstein B et al. International Consensus Conference on Pediatric Sepsis. International pediatric sepsis consensus conference: definitions for sepsis and organ dysfunction in pediatrics. *Pediatr Crit Care Med.* 2005 Jan;6(1):2-8.

Selected References: Pulse Oximetry

Cunningham S et al. Bronchiolitis of Infancy Discharge Study (BIDS) group. Oxygen saturation targets in infants with bronchiolitis (BIDS): a doubleblind, randomised, equivalence trial. *Lancet.* 2015 Sep 12;386(9998):1041-8.

G Krishnan S et al. Oximetry-detected pulsus paradoxus predicts for severity in paediatric asthma. *Arch Dis Child.* 2020 Jun;105(6):533-538

Schondelmeyer AC et al. Cardiorespiratory and Pulse Oximetry Monitoring in Hospitalized Children: A Delphi Process. *Pediatrics.* 2020 Aug;146(2):e20193336.

Selected References: Capnography

Flores S, Loomba RS, Bronicki RA. Capnography as a Hemodynamic Indicator: Another Heart Lung Interaction. *Pediatr Crit Care Med*. 2020 Apr;21(4):403-404.

Langhan ML et al. The impact of capnography monitoring among children and adolescents in the postanesthesia care unit: a randomized controlled trial. *Paediatr Anaesth.* 2017 Apr;27(4):385-393.

Saunders R et al. Patient safety during procedural sedation using capnography monitoring: a systematic review and meta-analysis. *BMJ Open*. 2017 Jun 30;7(6):e013402.

Selby ST et al. An Update on End-Tidal CO2 Monitoring. *Pediatr Emerg Care*. 2018.

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