Case Study Across the Continuum of Care

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Vail Health: **Mark Brownson, MD**
Children's Hospital Colorado: **Maria Mandt, MD**

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VAIL HEALTH

EAGLE COUNTY
PARAMEDIC SERVICES

Disclosure

Planners, faculty, and others in control of content (either individually or as a group) have no relevant financial relationships with ineligible companies.

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Introducing the Case:
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Eagle County Paramedics

Will Dunn, BA, NRP, FP-C

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Pre-hospital Course

22 month-old girl

EAGLE COUNTY PARAMEDIC SERVICES

Field course

- Chief complaint:
  - Respiratory distress
- History:
  - 2 year old female who was witnessed with abnormal breathing and cyanosis by her parents
  - Parents state she went "limp" and seemed as though she was gasping for approximately one minute
  - Parents state she has still not returned to baseline at time of contact and is still non-verbal and pale

Field course

- History continued:
  - Patient has a history of asthma for which she has been hospitalized in the past
  - Patient's mother administered a dose of her FloVent, but that this episode was not consistent with past asthma or any previous episodes
  - She has not been eating or drinking this afternoon and slightly lethargic, but was otherwise acting appropriately prior
  - No changes to urinary output or stool

Field course

- History continued
  - No chest pain, shortness of breath, headache, nausea, dizziness, and all other complaints related to this incident
  - No recent trauma/illness
- Medical history:
  - Asthma
- Social history:
  - Visiting from California for family gathering

Field course

- Medications
  - Flovent, singulair
- Allergies:
  - None

Field course

- In general:
  - Found patient is in her mothers arms
  - Tracking appropriately but not verbally communicative
- Skin:
  - Warm, pale, dry
- Neuro:
  - Awake, alert and tracking appropriate
  - Interacting with EMS appropriately but lethargy noted

Field course

- Head/ Eyes/ Ears /Nose /Throat
  - Pupils equal and reactive
  - Atrauamtic
- Thorax:
  - Equal rise and fall of the chest, respirations non-labored
  - Breath sounds clear and equal bilaterally
  - No obvious retractions or increased work of breathing
  - Abdomen is soft/non-tender

Field course

- Extremities
  - Movement in all extremities
- Data:
  - P: 150 RR: 30 SPO2: 80% GCS: 15
- Weight:
  - 10 kg

Field course

19:32	Patient contact
Note:	Presentation is concerning for respiratory/pulmonary pathology
	It is impossible to rule this out or other potential pathologies such as breath holding or cardiac without further evaluation
19:34	Oxygen BVM 8L with improvement

Field course

19:50	Transport
20:15	Arrived Vail Health

Summary

Scene time: 18 minutes

Total patient time: 46 minutes

Oxygen

Vail Health

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Vail Health Emergency Department

ED Triage

BIBA due to cyanosis. AMS. Hypoxia. Pt arrives alert and age appropriate.

Vitals:
Pulse: 162
BP: 151/93
RR: 36
O2: Sat 100% RA
Temp: 36C

Vail Health Emergency Department

Exam

Constitutional: Well-nourished well-developed.

Eyes: Pupils equal and round, no pallor or injection

ENT, Mouth: Mucous membranes are moist.

Respiratory: there are no retractions, lungs are clear to auscultation

Cardiovascular: tachycardia rate, regular rhythm

Gastrointestinal: Abdomen is soft and non tender, no masses, bowel sounds normal.

Neurological: Awake, alert, normal behavior, interacting appropriately

Skin: Warm and dry, no rashes

Musculoskeletal: Extremities are symmetrical, full range of motion.

Vail Health Emergency Department

Differential Diagnosis

- Seizure
- Infection (Upper Respiratory, Pneumonia, Meningitis/Encephalitis)
- High Altitude Pulmonary Edema
- Electrolyte Abnormality (Hypoglycemia)
- Congenital Heart Defect
- Non Accidental Trauma

Vail Health Emergency Department

Labs

WBC: 8.8
Hgb: 1.7
Platelet: 388
Sodium: 137
Potassium: 3.4
Chloride: 110
CO2: 12
Glucose: 101
BUN: 11
Creatinine: 0.20
Respiratory Film Array: Human Rhino/Enterovirus

Vail Health Emergency Department

Chest X-ray

Enlarged cardiac silhouette may be due to underlying cardiomegaly and/or pericardial fluid collection. Correlation with echocardiogram recommended. Mild pulmonary vascular prominence/congestion.

Vail Health Emergency Department

ED Course:

Several episodes, non interactive with eyes open, no tonic clonic movements, no eye deviation. Episode lasted approximately 5 to 6 seconds, involved breath-holding and hypoxia, spontaneous resolution, followed by crying. Consolable between episodes.

Transfused 150 mL's of PRBCs

Remained tachycardia, otherwise hemodynamically stable.

Transferred to Children's via ground EMS

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CHCO ED Course

HPI: From sea level. Desats and unresponsive episodes in Vail. No abnormal movements. Enterovirus +

ED Exam:

T 98.4 HR 148 BP 121/73 RR 30 SpO2 100%

General: NAD, irritable but consoles

HEENT: MMM, conjunctivae pale

Chest: CTAB. Tachycardic, II/VI SEM at LSB

Interventions: Pertinent + Labs: Hbg 4.0, MCV 61(⇩), TIBC 543 (⇧), total iron 40(⇩), ferritin < 15mcg/L (⇩)

PRBC infusion 2-4ml/kg over 4 hours

To PICU

CHCO ED Course

Zoom in: 3 2 1

Hbg 4.0(↓), MCV 61(↓), TIBC 543 (↑), total iron 40(↓), ferritin < 15 (↓)

Fe-deficiency anemia is a microcytic, hypochromic, hypoproductive blood state

- Very common globally, up to 15% of toddlers in the US
- Iron is an essential nutrient. Lab changes predictable, but can be challenging to interpret
- Common risk factors: dietary, prematurity, GI disease or special health needs

CHCO PICU Course

- Mental status improved after transfusions
- Cardiomegaly noted on CXR, ECHO done and normal
- Hematology consulted
- Diet history: 18oz/day cow’s milk, minimal iron-enriched foods
- Received total of 19mg/kg PRBCs with discharge Hgb 8.0

Discharged to family

Final Dx

Severe iron-deficiency anemia

Breath-holding spell

Who better to illustrate than Gru?

(Sigh) Another Pediatric Thing . . .

Breath-holding spells

- 6 months to ~6 years
- Pathogenesis? Not completely understood
- Only definitively known association: Iron-deficiency anemia

Photo credit: Hospitalnews.com

(Sigh) Another Pediatric Thing . . .

Common characteristics:

- Frequency varies considerably
- Often increase in frequency over time, peaking at 1-2 years of age

Two types:

1. Cyanotic breath-holding spell
2. Pallid breath-holding spell

Cyanotic Breath-holding Spells

Classic course:

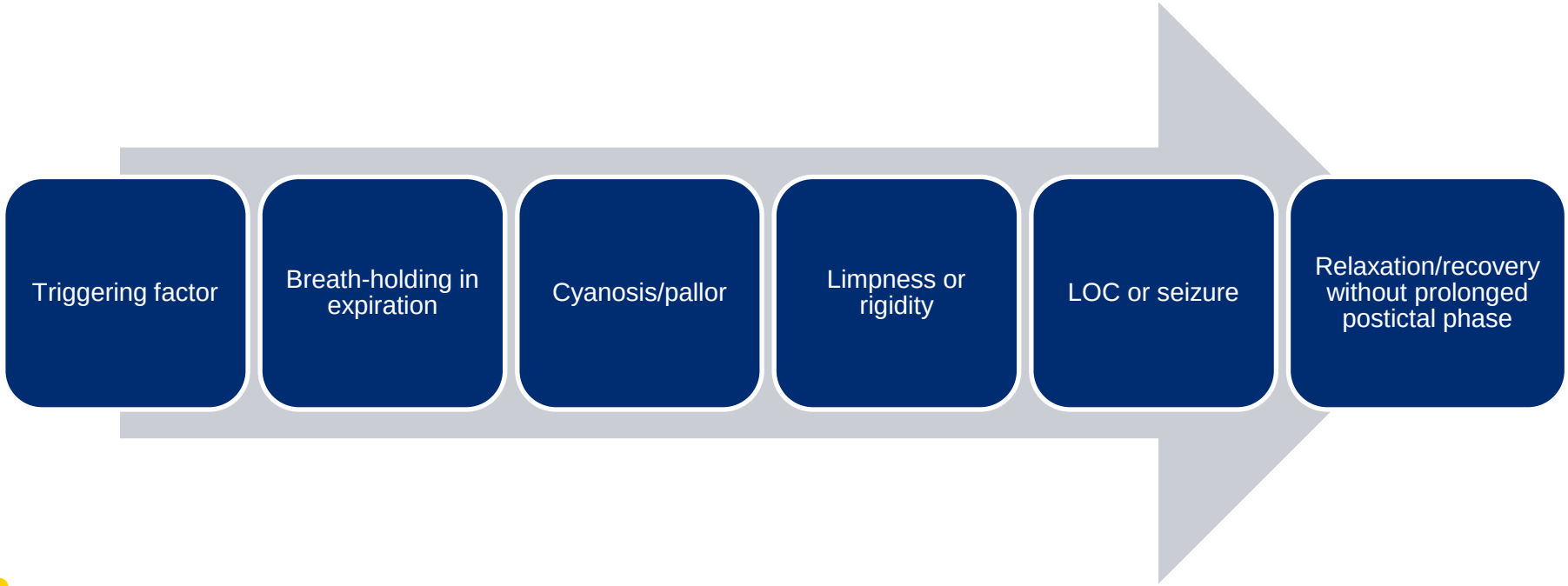
1. Trigger event
2. Child becomes angry/upset. Brief, loud cry
3. Sudden, involuntary holding of breath in forced expiration
4. **Rapidly** cyanotic breath-holding during forced expiration
5. Rigid or limp, LOC
6. If apnea is prolonged, can have decorticate or decerebrate posturing, even seizure-like motions

Pallid Breath-holding Spells

Classic Course:

1. Trigger event -> becomes bradycardic
2. Crying is minimal or “silent”
3. Apnea is brief, often single deep gasp
4. LOC and posturing (can be delayed up to 30 seconds after trauma!)
5. Child becomes pale, diaphoretic, limp, may be incontinent or sleepy afterward
6. Can have brief episodes of asystole (!!)

Bottom Line: Look for the Classic Sequence

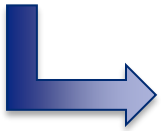


Evaluation & Treatment

- Consider CBC/ferritin
- Consider EKG with frequent breath-holding spells or if pallid breath-holding spell
- Unsure? Involve neurology

Evaluation & Treatment

1. Calm the parents: reassurance and concrete direction
2. In the moment: position patient on side
3. Iron supplementation with (and without?) iron deficiency or iron deficiency anemia
4. For children with severe pallid breath-holding spells associated with asystole or prolonged bradycardia: atropine BID, glycopyrrolate, fluoxetine, cardiac pacemaker



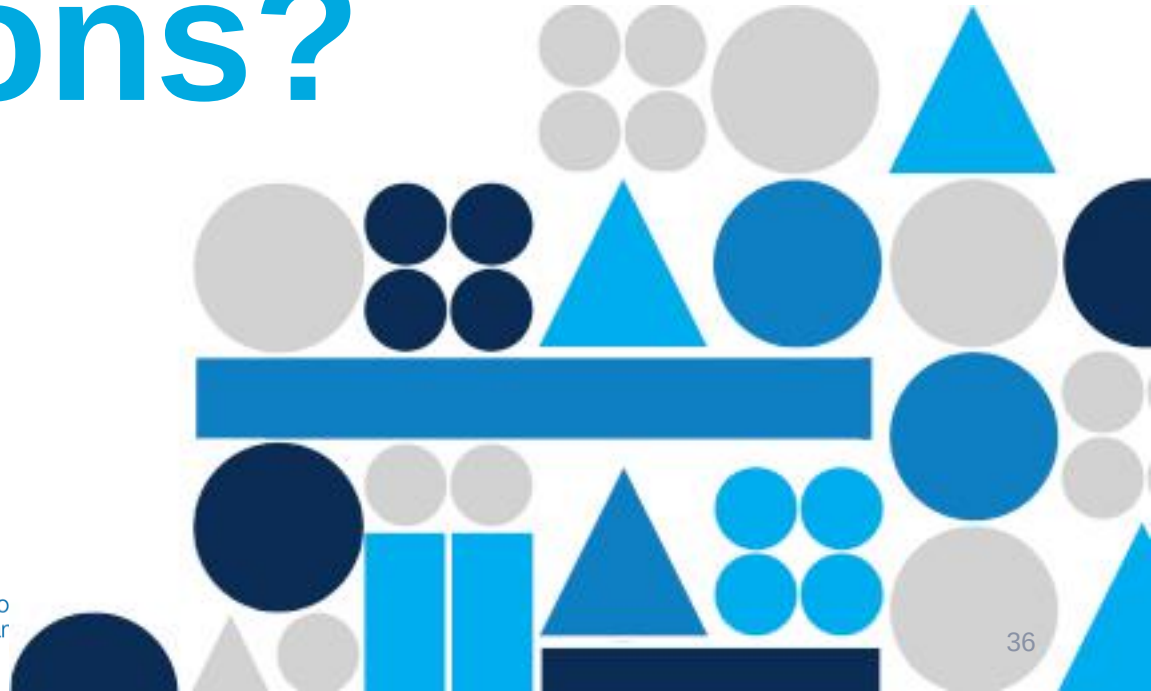
Without consultation?
Ummm. . . . No

In Summary

- Breath-holding spells. It's a thing.
- Often *associated* with iron-deficiency anemia. Iron supplementation resolves most cases
- If iron supplementation doesn't resolve it, aging will

It takes a village. Go team. All of you.

Questions?



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