Decade 1:
"A Seizing Child"

Catherine Burger, M.D.
Duy Tran, D.O.

Rocket City Emergency
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Decade 1: “A Seizing Child”

Catherine Burger, M.D.

VANDERBILT

Duy Tran, D.O.

Women & Children
HUNTSVILLE HOSPITAL

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EMS Dispatch

ALS ambulance is dispatched E-1 to “4-year-old accidental ingestion”

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On Scene

RR	HR	BP	SpO_2
38	166	---	98%

- **Ill-appearing 4yo male, in mom's arms**
- **Wide eyes, tachypneic**
- **Color normal for ethnicity**
- **Skin very warm to touch**

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On Scene

RR	HR	BP	SpO_2
38	166	---	98%

Per Mom: Child found with an old antidepressant prescription bottle

No idea how many pills were in the bottle…

…or if he took any

On Scene

RR	HR	BP	SpO_2
38	166	---	98%

PMHx: No significant PMH

UTD on vaccinations

No meds

On Scene

RR	HR	BP	SpO_2
38	166	---	98%

What to obtain prior to transport from the scene?

On Scene

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Antidepressant toxicity:

TCA (amitriptyline) – Coma, seizures, hypotension, arrhythmia, fever

SSRI (fluoxetine, citalopram) – Coma, seizures, tremor, agitation, fever, rigid muscles

SNRI (duloxetine) – Coma, seizures, hypotension

SARI (trazadone) – Confusion, seizures, hypotension

MAOI (phenelzine) – Coma, seizures, fever, rigid muscles

Children under 6 years of age account for over half of all ingestion cases called to poison centers each year

1.Watson WA, Litovitz TL, Rodgers GC, et al. 2004 Annual report of the American Association of Poison Control Centers Toxic Exposure Surveillance System. *Am J Emerg Med*. 2005;23(5):589-666.

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Everyone (parents, EMS, hospital staff) can call the poison center for help:

800-222-1222

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On Scene

RR	HR	BP	SpO_2
38	166	---	98%

- **Ill-appearing 4yo male, in mom's arms**
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Enroute

RR	HR	BP	SpO_2
44	188	---	66%

Greatest concerns in pediatric ingestion cases?

- **Airway and mental status**
- **Circulation and arrhythmia**
- **Hypoglycemia**

Enroute

RR	HR	BP	SpO_2
44	188	---	99% 15l NRB

- **Watch for decreased mentation and/or breathing**
- **Consider ECG/telemetry, monitor HR and BP**
- **Check blood sugar**

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Enroute

RR	HR	BP	SpO_2
44	188	---	99% 15l NRB

Child starts seizing

Enroute

RR	HR	BP	SpO_2
44	188	---	99% 15l NRB

- **Turn patient on side, give oxygen**
- **Try to obtain IV access**
- **Estimate weight – Broselow tape, parent report**
- **For seizures >5 minutes – give medication**

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Enroute

Midazolam (Versed):
- **IV/IO 0.1mg/kg**
- **IM/IN 0.2mg/kg**
- **Buccal 0.5mg/kg**

Lorazepam (Ativan):
- **IV/IO 0.1mg/kg**

Diazepam (Valium):
- **IV/IO 0.3mg/kg**
- **PR 0.5mg/kg**

Zhao ZY, Wang HY, Wen B, Yang ZB, Feng K, Fan JC. A Comparison of Midazolam, Lorazepam, and Diazepam for the Treatment of Status Epilepticus in Children: A Network Meta-analysis. J Child Neurol. 2016 Aug;31(9):1093-107. doi: 10.1177/0883073816638757. Epub 2016 Mar 28. PMID: 27021145.

Enroute

Current evidence suggests that fosphenytoin, phenytoin, levetiracetam, and valproate are all equally effective for managing seizures that are refractory to benzodiazepines

McKenzie KC, Hahn CD, Friedman JN. Emergency management of the paediatric patient with convulsive status epilepticus. Paediatr Child Health. 2021 Jan 21;26(1):50-66. doi: 10.1093/pch/pxaa127. PMID: 33552322; PMCID: PMC7850284.

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Enroute

Febrile seizures lasting greater than 5 minutes need treatment

Pediatric patients with status epilepticus frequently experience delays in treatment and underdosing of medication

Carey JM, Studnek JR, Browne LR, Ostermayer DG, Grawey T, Schroter S, Lerner EB, Shah MI. Paramedic-Identified Enablers of and Barriers to Pediatric Seizure Management: A Multicenter, Qualitative Study. Prehosp Emerg Care. 2019 Nov-Dec;23(6):870-881. doi: 10.1080/10903127.2019.1595234. Epub 2019 May 13. PMID: 30917730.

EMS Report

RR	HR	BP	SpO_2
44	188	---	99% 15l NRB

- **Healthy 4-year-old boy w/ suspected ingestion**
- **Seizures in route**
- **Febrile, tachycardic, hypoxic off O_2**
- **Still seizing despite Midazolam IM X 2**

FSBG
135mg%

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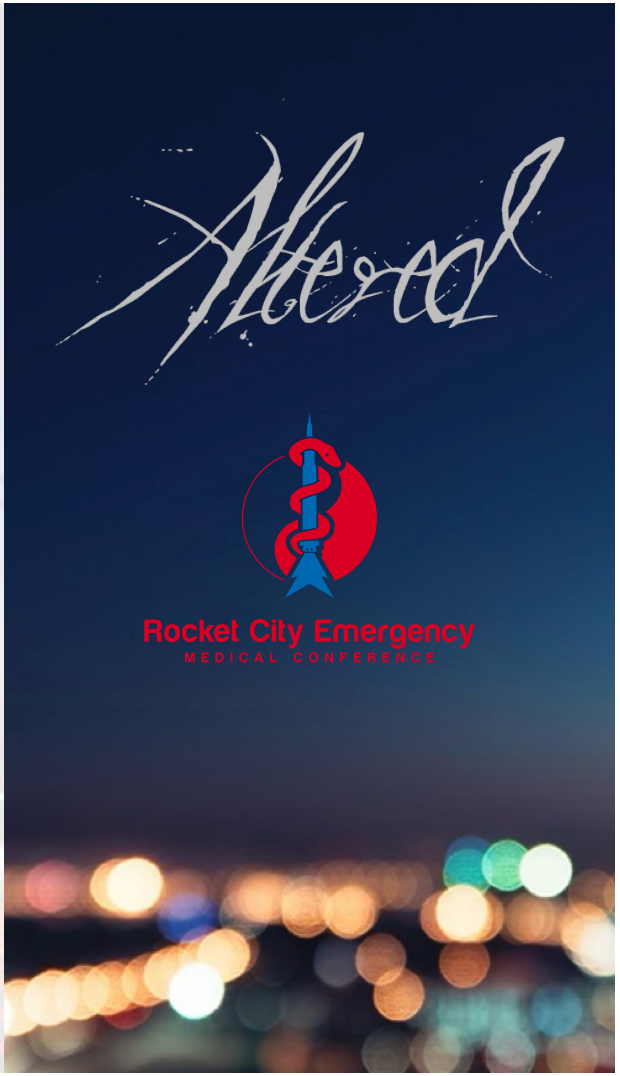
Meanwhile,
In the ED....



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https://www.flickr.com/photos/alvericemoon/

(Prior to) EMS Arrival

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

- Importance of prepping the room for the patient
  - Identify roles
  - Review what you know has been done so far
  - Discuss possible plans of action
- If weight is known, discuss meds and doses
  - If not, have color-coded resuscitation tape ready
- Prep equipment: suction (x2), O2, airway equipment
- Ensure backup modes of access are available (IO).

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https://www.flickr.com/photos/alvericemoon/

ED Arrival

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

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https://www.flickr.com/photos/alvericemoon/

ED Arrival

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

- Immediately brought into resuscitation bay (still seizing)
- ABCs
- Non-invasive airway protection (head positioning/jaw thrust)
- Ensure 2 functioning peripheral IV's (if unsuccessful, then IO)
- Cardiovascular monitoring, EtCO2
- Benzos, benzos, benzos!
- First-line anti-epileptic medications:
  - Lorazepam 0.1mg/kg **IV**/IM/IN (max dose 4mg)
  - Midazolam 0.1mg/kg **IV/IM/IN** (max dose 10mg)
  - Diazepam 0.2-0.5mg/kg **PR** (max dose 20mg)

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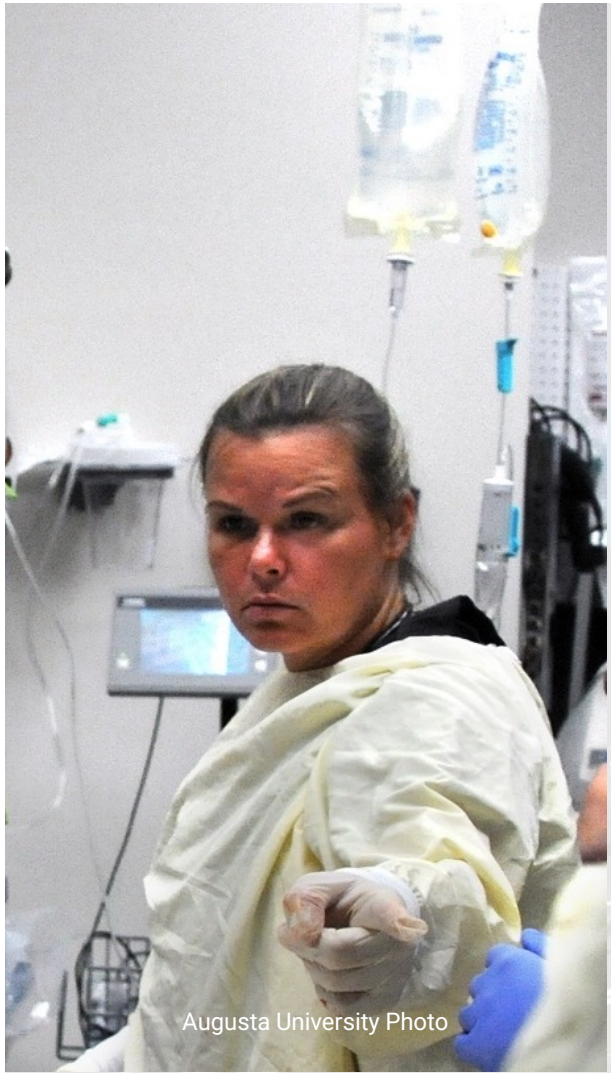
ED Arrival

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

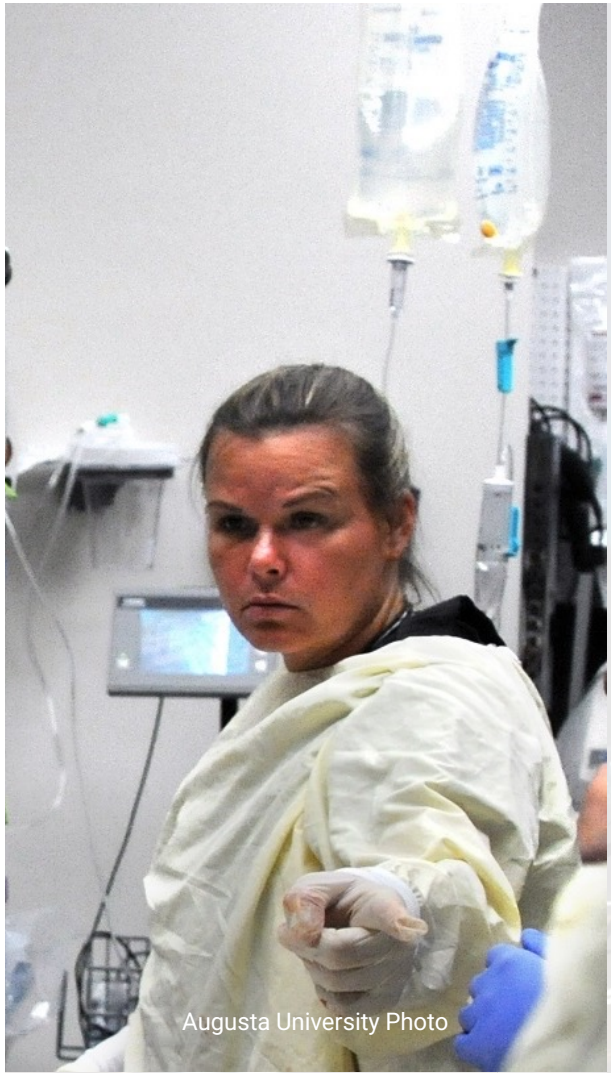
- Obtain all necessary labs if possible:
  - Blood sugar
  - VBG
  - Chemistries (CMP, Lactate, CK)
  - Infectious (Blood/urine culture, CBC, Inflammatory markers)
  - Toxicology (Tylenol, ASA, Ethanol, UDS)
  - Anti-epileptic levels (if currently taking)
- Consider 20cc/kg IV fluid bolus of crystalloid fluid
- ECG



Reassessment

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

Still seizing!



Reassessment

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

- Treat fevers with antipyretics or external cooling measures
- Treat any identifiable underlying causes:
  - Hypoglycemia, hypo/hypernatremia, hypo/hyperthermia, hypoxia, intoxication, increased ICP, ICH, CNS infection
- What did this child ingest?

Bupropion (Wellbutrin)

- Aminoketone antidepressant (NDRI)
- Structurally similar to cathinones (bath salts) and methamphetamine
- FDA approved (1985) for depression, SAD, tobacco cessation, many off-label uses
  - Taken off market in 1986 due to seizures (reported in bulimic patients)
  - Reintroduced in 1989 contraindicated with seizure history, eating disorders, ethanol or CHS depressant withdrawal.
- Lowers seizure threshold (mechanism unclear)
  - In adults, even a double dose can cause seizures
- Cardiovascular toxicity (widened QRS, prolonged QT, shock)

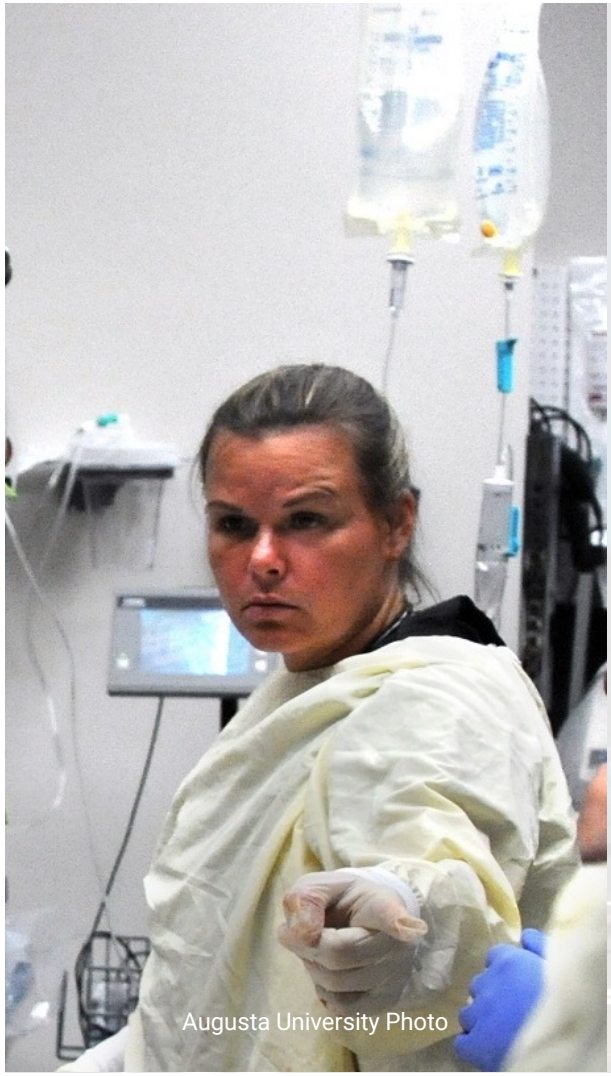
Alberter AA, Chambers AJ, Wills BK. Bupropion Toxicity. [Updated 2022 Dec 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-.

Bupropion (Wellbutrin)

- In children, doses >10mg/kg can become toxic
- Most common symptoms include:
  - Tachycardia, nausea/vomiting, irritability/agitation, seizure, hallucinations, hypertension
- Extended release (XL) has been associated with seizures up to 24 hours post-ingestion, may warrant further monitoring

Starr P, Klein-Schwartz W, Spiller H, Kern P, Ekleberry SE, Kunkel S. Incidence and onset of delayed seizures after overdoses of extended-release bupropion. Am J Emerg Med. 2009 Oct;27(8):911-5.

Beuhler MC, Spiller HA, Sasser HC. The outcome of unintentional pediatric bupropion ingestions: a NPDS database review. J Med Toxicol. 2010 Mar;6(1):4-8.



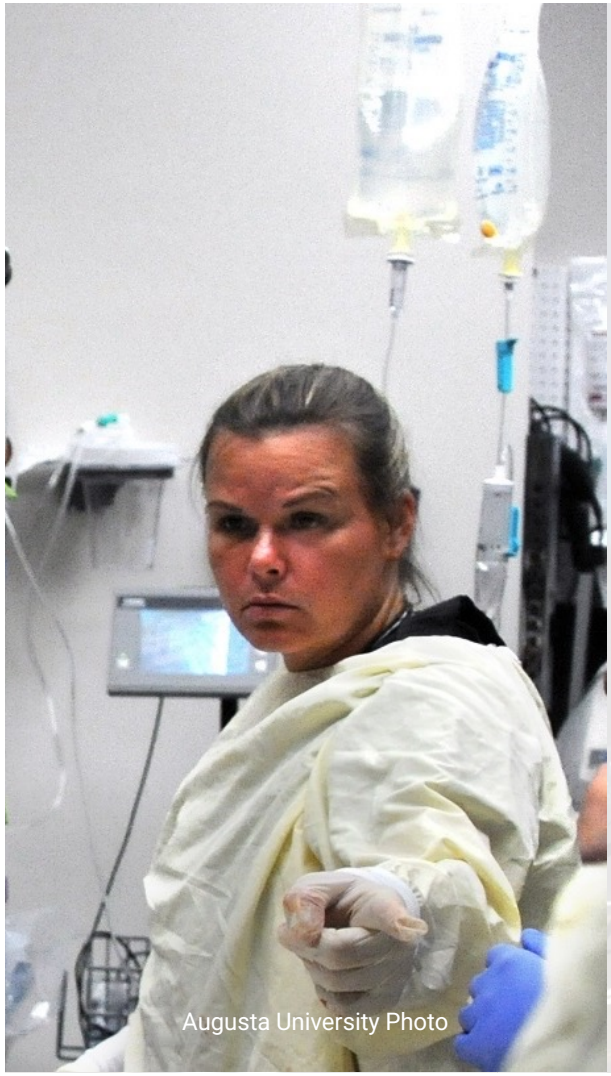
Reassessment

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

Still seizing!

More AEDs = more hypotension, respiratory depression, sedation

Constantly reassess airway, breathing, hemodynamics – support as needed.

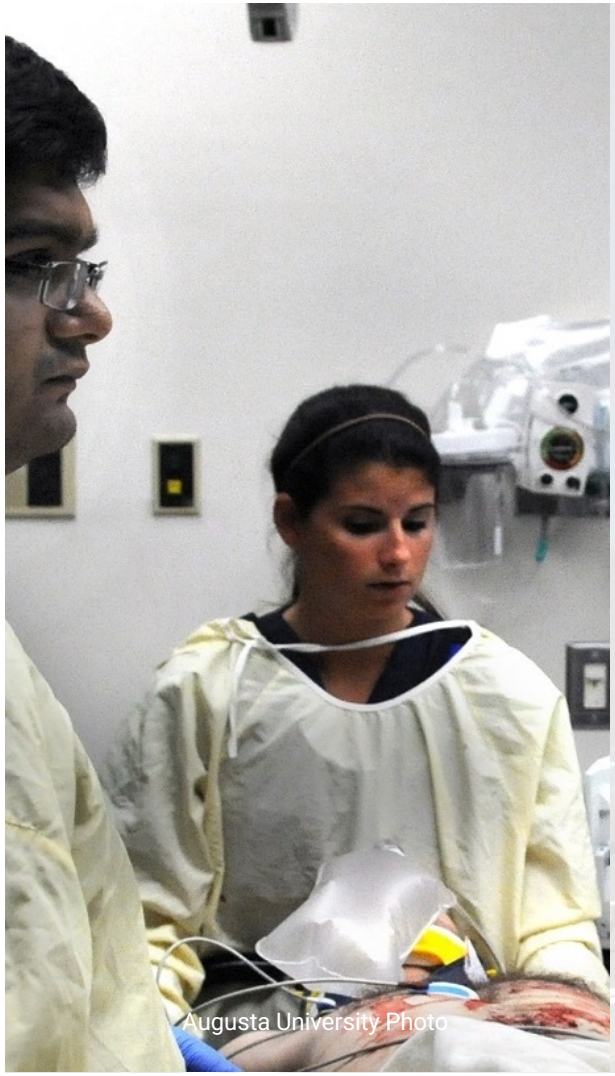


Reassessment

RR	HR	BP	SpO_2	Temp
44	188	---	99% 15l NRB	38.1C

- Second-line anti-epileptic medications:
  - Levitiracetam (Keppra) 40-60mg/kg IV (max dose 3000mg)
  - Fosphenytoin 20mg PE/kg IV (max dose 2000mg PE)
  - Valproic Acid 20mg/kg IV (max dose 2000mg)
  - Neonates: Phenobarbital 20mg/kg

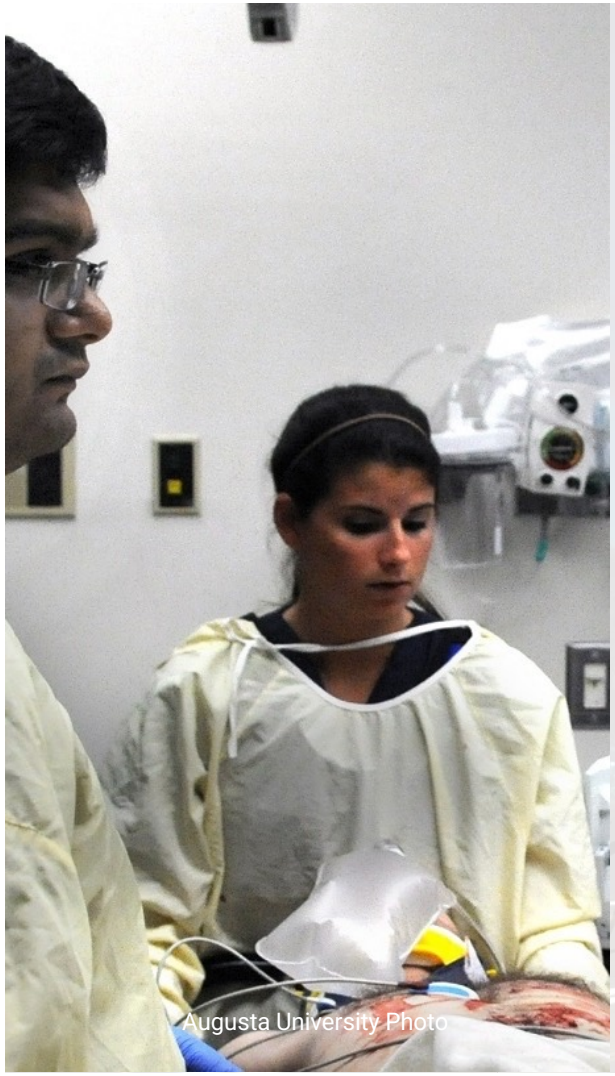
  - *Phenytoin/fosphenytoin less likely to benefit in bupropion overdose as has known drug-drug interactions.*



Reassessment

RR	HR	BP	SpO_2	Temp
--	190	---	99% 15l NRB	38.7c

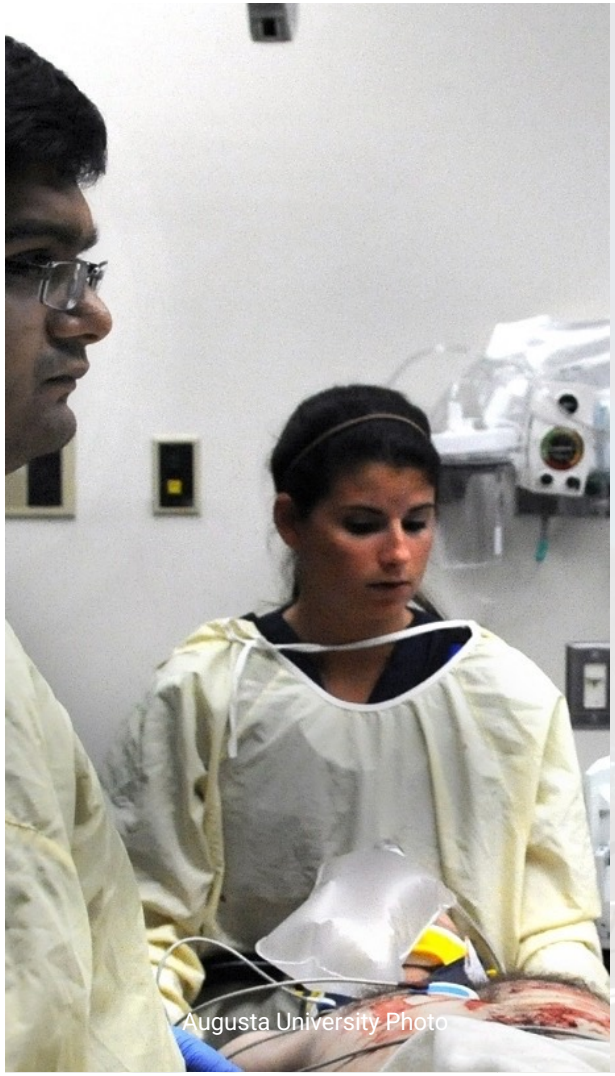
Still seizing!



Reassessment

RR	HR	BP	SpO_2	Temp
--	190	---	99% 15l NRB	38.7C

- Now considered **refractory status epilepticus**
- Goal is not just to stop seizures, but to reduce the metabolic stress at cellular level, maintain adequate cerebral perfusion pressure, prevent hyperthermia, provide adequate oxygenation
- Consider 3rd anti-epileptic medication
  - Speak with neurology (if available)
- If concern about hemodynamic or airway instability
  - Plan to secure airway and support hemodynamics



Reassessment

RR	HR	BP	SpO_2	Temp
--	190	---	99% 15l NRB	38.7C

- RSI: Any induction and paralytic agent will work, but keep in mind that paralyzing the patient will only stop the physical seizures, patient may remain in sub-clinical status epilepticus.
- Supplementary/adjunct anti-epileptic medications:
  - Ketamine, topiramate, lacosamide, propofol, acetazolamide, pulse steroids
- Ensure ability for continuous EEG monitoring in an ICU setting is available and ready.

Steve Wood UAB Photo

Resolution

RR	HR	BP	SpO_2	Temp
12	108	104/52	100% FiO_2 1.0	37.3C

- Seizures have *appeared* to stop.
- Whatever medication stopped the seizure, should be continued to prevent them from coming back.
- Speak to neurologist and PICU if you haven't already
  - If these services are not available, arrange for transport/transfer
- Children (and adults) refractory to most anti-epileptic medications should get a trial of high-dose Vitamin B6

Chandra SR, Issac TG, Deepak S, Teja R, Kuruthukulangara S. Pyridoxine-dependent convulsions among children with refractory seizures: A 3-year follow-up study. J Pediatr Neurosci. 2016 Jul-Sep;11(3):188-192.

Panel Discussion and Q&A

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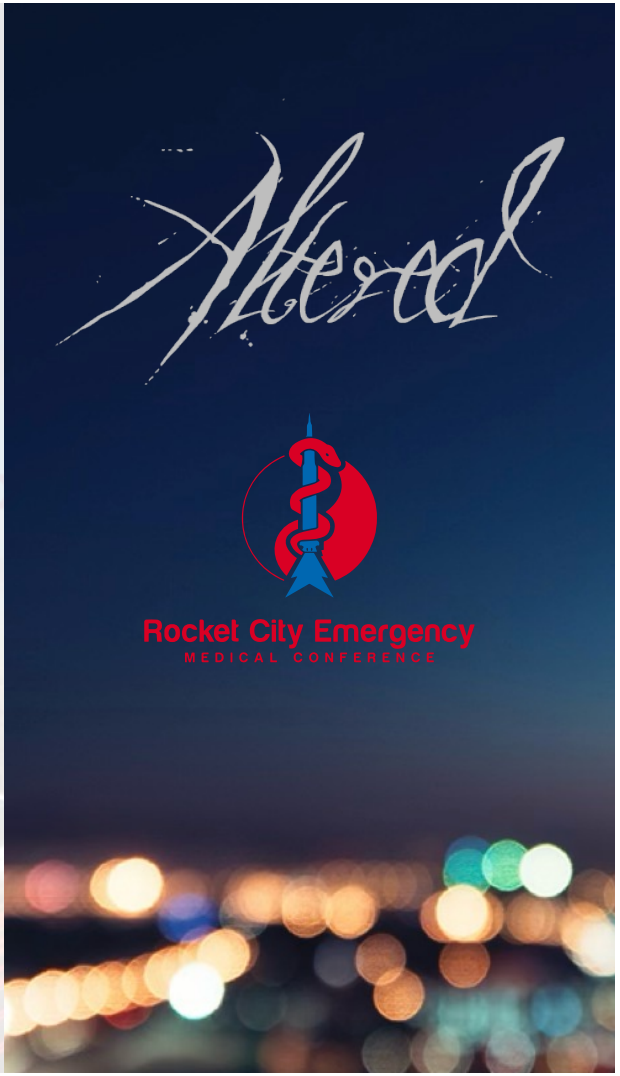

COMING IN 2026!

Thank you!

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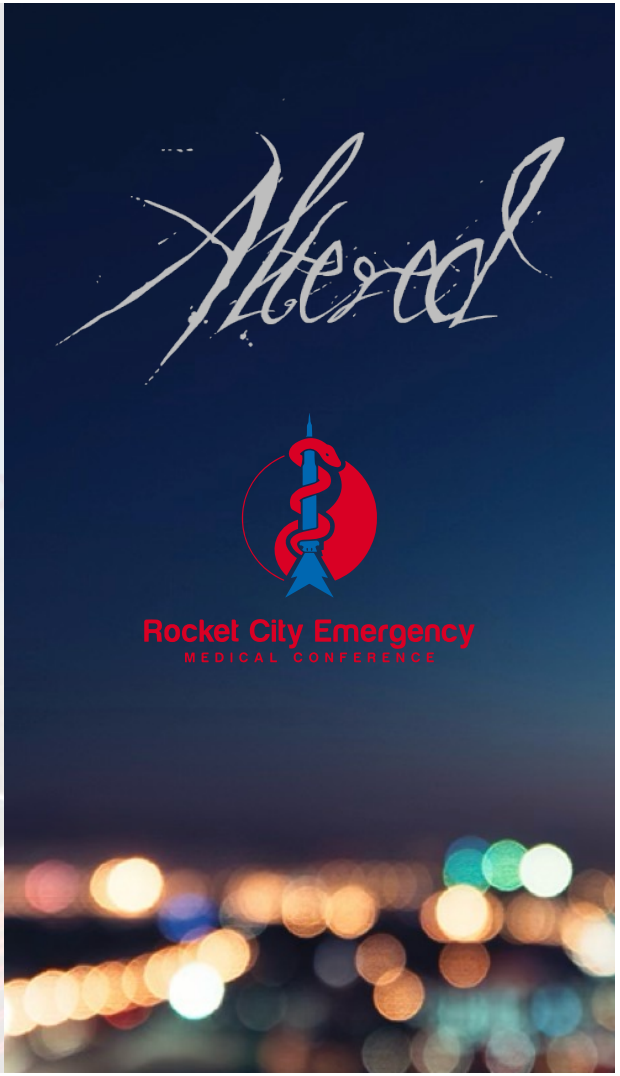


COMING IN 2026!
A major case of the
BLUES
Rocket City Emergency Medicine Conference