Suicide and Attempted Suicide Implications for Hospital-based Pediatric-focused Advanced Practice Registered Nurses

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Speaker introductions

• Andrea DeMonbrun has worked in pediatric critical care for 11 years. She received her MSN with certification in pediatric acute care from the University of Alabama at Birmingham. She currently works in the PICU at Children’s Health in Dallas and Plano, Texas. In 2017, her work was recognized with the Advanced Practice Research and Innovation Award. In addition, she has presented at national advanced practice nursing conferences and authored multiple publications on pediatric care. She has presented at numerous international conferences and authored multiple publications on both clinical practice and professional issues in nursing.

• Dr. Kristin HittleGigli has worked in pediatric critical care for 15 years. After earning her PhD in nursing at Vanderbilt University, she assumed a research position at the University of Pittsburgh School of Medicine where she currently works as a post-doctoral fellow in the Department of Critical Care CRISMA Center conducting research in pediatric health policy and APRN outcomes in critical care. She also works as a pediatric nurse practitioner at the Children’s Home in Pittsburgh. She is a past NAPNAP Executive Board member and current member of the Health Policy Committee. She has presented at numerous international conferences and authored multiple publications on both clinical practice and professional issues in nursing.

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• We will not discuss off label use and/or investigational use of any drugs or devices in this presentation

Objectives

• Examine the incidence of attempted suicides and suicides, mechanisms, and diagnoses that result in pediatric patients requiring hospitalization for medical care after an attempted suicide.
• Describe the pathophysiology underlying multisystem diagnoses that require hospitalization for medical care after an attempted suicide.
• Demonstrate application of evidenced-based practice recommendations for care of medical conditions after an attempted suicide in pediatric patients.
• Discuss national practice recommendations for suicide prevention in pediatric patients.

Question

• What do you think is the number one substance ingested by adolescents age 15-19?
  • A. Opioids
  • B. Antidepressants
  • C. OTC medications, supplements
  • D. Antipsychotics

Current Statistics

• In adolescents 15-19 yrs of age, the death rate increased from 1999 to 2007, then decreased slightly until 2014, then increased
  • In 2015, greatest number of deaths were related to opioid overdoses, specifically heroin
  • 772 drug overdose deaths in this age group
  • Most common ingestions: opioids, acetaminophen, anti-depressants (specifically Wellbutrin), diphenhydramine
Intentional self-harm in adolescents

- Between 2004 and 2013:
  - 390,560 poison center calls for intentional self-harm in adolescents age 13-19 yrs
    - Most common substances: Ibuprofen, SSRIs, Tylenol, Atypical antipsychotics, benzodiazepines
    - 30% suffered no clinical effect
    - 3% resulted in death or major clinical effect
    - Atypical antipsychotics and antidepressants were most common causative substances
  - Most calls were for female adolescents
  - More calls for males resulted in death or major clinical effect
  - Prescription drugs in males
  - Over-the-counter drugs in females

Pathophysiology of frequent substances ingested

- Opioids
- Tylenol
- Antidepressants, SSRIs
- Atypical antipsychotics
- Antihistamines
- OTC medications

Opioids

- Mechanism of action
- Common findings
  - Respiratory suppression
  - Sedation
  - Pupillary constriction
  - Hypotension
- Antidote
  - Naloxone

Acetaminophen

- Metabolized via liver so can cause liver necrosis
  - Via glucuronidation, sulfation, and CYP450 2E1 oxidation
- Initial symptoms: Nausea, vomiting
  - As initial symptoms resolve: RUQ pain, hepatomegaly, transaminitis, coagulopathy, encephalopathy
- Treatment
  - N-acetylcysteine
    - PO loading dose followed by DBI treatment PO x 24 hours
    - IV loading dose over 60 minutes, then infusion over 4 hours, then infusion over 18 hours for total of 24 hours
  - Liver failure, encephalopathy
    - Continue NAC, continuous infusion until encephalopathy has resolved, improving transaminitis and coagulopathy

Antidepressants

- SSRIs
  - First-line treatment for depression in children > 8 yrs of age
  - Block the reuptake of serotonin in the brain
    - Celexa, Lexapro, Prozac, Zoloft
- TCAs
  - Block the reabsorption of serotonin and norepinephrine; block muscarinic M1, histamine H1, and alpha-adrenergic receptors
    - Amitriptyline, Nortriptyline
- MAOIs
  - Block the activity of monoamine oxidase which in turn blocks the absorption of serotonin, norepinephrine, and dopamine
    - Nardil, Emsam
- SNRIs
  - Block the reabsorption of serotonin and norepinephrine
    - Pristiq, Cymbalta, Effexor
- Atypicals
  - Each has a unique mechanism of action; will affect level of dopamine, serotonin, and norepinephrine in the brain
    - Wellbutrin, Trazadone, Brintellix
Table 2: SSRI Dosing and Adverse Effects

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Increment</th>
<th>Effective Dose</th>
<th>Maximum Dose</th>
<th>Not to be Used With</th>
<th>Common Adverse Effects</th>
<th>PCV Evidence for Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoxetine</td>
<td>10 mg po qd</td>
<td>10-20 mg</td>
<td>20 mg</td>
<td>60 mg</td>
<td>MAOIs</td>
<td>Headaches, GI upset, insomnia, agitation, anxiety</td>
<td>Y**</td>
</tr>
<tr>
<td>Escitalopram (fast-act. 12 and over)</td>
<td>5 mg po qd</td>
<td>5 mg</td>
<td>10-20 mg</td>
<td>30 mg</td>
<td>MAOIs</td>
<td>Headaches, GI upset, insomnia</td>
<td>Y**</td>
</tr>
<tr>
<td>Citalopram</td>
<td>10 mg po qd</td>
<td>10 mg</td>
<td>20 mg</td>
<td>60 mg</td>
<td>MAOIs</td>
<td>Headaches, GI upset, insomnia</td>
<td>Y</td>
</tr>
<tr>
<td>Sertraline</td>
<td>25 mg po qd</td>
<td>25-50 mg</td>
<td>100 mg</td>
<td>200 mg</td>
<td>MAOIs</td>
<td>Headaches, GI upset</td>
<td>Y</td>
</tr>
</tbody>
</table>

Serotonin syndrome

- Neuromuscular excitation
- Tremor, hyperreflexia, rigidity, clonus
- Autonomic instability
- Mydriasis, diaphoresis, hyperthermia, tachypnea, tachycardia, hypertension
- Altered mental status
- Agitation, confusion, coma

Case study- Ingestion

Kate is a 15 year old hispanic female. She is in 9th grade, has her driver’s permit, and often cares for her two young siblings after school. No significant PMH.
- Mother called EMS due to pt having generalized tonic clonic seizure activity. Vomited and had pill fragments (approximately 11 pills were counted).
- Ingested Bupropion ER 150 mg tablets (total 1650 to 9000 mg)
- Prescribed to recently-deceased grandmother
- Upon arrival to the ED:
  - VS T 38.6, HR 138, RR 24, BP 121/86, O2 sat 98% RA, GCS 11
  - ECG mildly prolonged QTc 461, QRS normal 84
  - VBG 7.02/34/9, anion gap 32
  - Had 2 more seizures and received 2 mg Ativan which ceased activity
- Kate continued to have intermittent seizure activity treated with Benzodiazepines. She was able to be extubated the following day but had incoherent speech and myoclonic jerks
- Given intralipid 1.5 ml/kg and had marked improvement in mental status.
- Day 3 of hospitalization, she again had decreased mental status so was given a repeat IL infusion (1.5 ml/kg). She had rapid and lasting improved mental status

PICU Admission

- What type of treatments do you anticipate?
  - A. Benzodiazepines, sodium bicarb, intralipid therapy, supportive care
  - B. Activated charcoal
  - C. N-acetylcysteine infusion over 21 hours
  - D. Haloparidol PRN psychotic outbursts
Bupropion pharmacology

- Antidepressant
- Inhibits the neuronal uptake of norepinephrine and dopamine
- Hepatic metabolism via CYP2B6, excreted mostly in the urine
- Absorption 12-15 hours in ER tablets
- Half life is approximately 21 hours
- SEs when ingested: seizures (also lowers seizure thresholds at low levels), arrhythmias, hallucinations, AMS, fever, clonus
- Intralipid therapy: widely used to reverse local anesthetic toxicity, now expanded to treat toxidromes

Antipsychotics

- Typical
  - Phenothiazines, butyrophenones, thioxanines
- Atypical
  - Risperdone, Seroquel, Geodon, Abilify, Zyprexa

Antihistamines and other common OTCs ingested

- Diphenhydramine
  - Anticholinergic toxidrome
    - Tachycardia, hyperthermia, delirium, psychosis, parasympathetic, dilated pupils, dry mouth/thirst, urinary retention
- Cough and cold medicines
- Dextromethorphan
- Iron
  - Absorption of iron in duodenum and upper jejunum
  - Can progress to liver failure

Dextromethorphan ingestion

- Metabolized in the liver
  - Dextrorphan: active metabolite that binds to opioid receptors in the medulla
    - Do not bind to mu and delta opioid receptors = NO opioid toxicity at regular dosing
    - Serotonergic mechanisms
      - Inhibits adrenergic neurotransmitter reuptake
      - Tachycardia, hypertension, diaphoresis
  - In large doses, inhibits NMDA receptors
  - Neurobehavioral effects: hallucinations and dissociation

Iron Toxicity

- GI phase
  - Occurs between 30 minutes and 6 hours following ingestion
  - Abdominal pain, vomitting, diarrhea, hematemesis, melena, shock, and metabolic acidosis, shock (from capillary leak)
- Latent phase
  - "Relative stability" occurs from 6-24 hours after ingestion
  - Patient may have poor perfusion, hyperventilation (1/2 metabolic acidosis), and oliguria (1/2 hypovolemia)
  - Cardiovascular toxicity
    - Shock, pallor, tachycardia
  - Coagulopathy (due to liver dysfunction)
  - Multisystem organ failure

Acute iron poisoning: Management

- History of iron ingestion
- Symptoms
- Hematemesis
- Melena
- Shock
- Cardiac arrest
- Seizures
- Coma
- Symptoms of iron intoxication
- Metabolic acidosis
- Hypothermia
- Respiratory failure
- Cardiovascular collapse
- Patient may be in shock
- Coagulopathy
- Multisystem organ failure
- Management by toplical method in the minimal stomach and intestinal contents
PICU admissions

- Retrospective study (2014)
  - Performed to distinguish patient burden to ICU from poisonings and to determine specific substances commonly intentionally-ingested, and to distinguish between intentional and unintentional ingestions and their clinical courses.

Suicide Related Gunshot Wounds

- Approximately 1,000 suicide related GSW per year among 10-19 year olds
- 85% are fatal, 0.4 per 100,000 10-19 year olds
- 10% admitted to the hospital

Poverty Contributes to Pediatric Firearms Suicide

Case Study - Patrick

- 14-year-old boy was found unresponsive in his bedroom by his step-father when he returned home, approximately 20 minutes after his mother left for work. He had blood coming from the center of his forehead and a gun was lying next to him. EMS arrived and documented a GCS of 5 (E: 1, V: 1, M: 3).
  - He was intubated and transferred to the ED.
  - Upon arrival to the ED:
    - Temp: 36.4, HR: 130, RR: 88, O2 Sats: 100%
    - Neuro exam:
      - GCS: 5 (E: 1, V: 1, M: 3)
      - Pupils 2mm NR on right and 4mm and NR on left
      - Flexion of arms, extension or legs
      - No gag
      - Bilateral up-going toes
    - In addition to oozing blood and brain matter in the center of his forehead you note bleeding and a round wound on his left occiput.
  - You consult neurosurgery and after obtaining initial labs and administering a 20ml/kg NS bolus, the team prepares for a trip to CT on the way to the ICU.
Police accompany Patrick to the ED. What should you anticipate they will request as evidence for their investigation?

A) A drug screen and blood alcohol level  
B) His clothing  
C) Protection of his hands  
D) Photographs of body  
E) All of the above

Patrick arrives in the ICU

• His head CT shows a linear pathway of cerebral edema and hemorrhage from the midfrontal area to left occiput, bone fragments in the left frontal lobe, a left occipital fracture and scalp hematoma.  
• Neurosurgery placed a turban dressing around his head and do not plan any interventions. His neurologic exam remains unchanged. The remainder of his examine in benign with the exception of a full bladder on palpation of his abdomen.  
• The nurses place a foley catheter and immediately empty 2L of clear urine.

What is the most likely cause of his large urine output?

A) Normal diuresis after fluid resuscitation  
B) Syndrome of Inappropriate Antidiuretic Hormone  
C) Diabetes Insipidus  
D) Neurogenic diuresis

What is Diabetes Insipidus

• Pathophysiology  
  • Injury to hypothalamus and the posterior pituitary gland (from cerebral edema)  
  • Regulate and secret antidiuretic hormone  
  • Triphasic response  
  • When to suspect DI  
  • Polyuria, hypovolemia, hypernatremia  
  • Onset in the first 3 days, associated with poor prognosis

Testing for Diabetes Insipidus

• Testing  
  • Rule out:  
    • Hyperglycemia  
    • Hypernatremic diuresis  
  • Rule in:  
    • low specific gravity <1.005  
    • low urine osmolality < 200 mOsm/kg  
    • high serum Na >145 mEq/L and  
    • High serum osmolality >295 mOsm/kg
KHG1 Does this head CT read sound vaguely plausible. I completely made it up after googling for reads for a long time.
Kristin Gigli, 1/26/2020
Management of Diabetes Insipidus

- Fluid replacement
  - Correct hypovolemia
    - \( 0.6 \times (\text{weight in kilograms} - 140) \times (\text{serum sodium} - 140) \div 140 = \text{body water deficit (in liters)} \)
  - Replace urine output hourly 0.45% NS
- ADH replacement
  - Vasopressin
    - 0.5 milliunits/kg/hr, double every 30 minutes to max dose of 10 milliunits/kg/hr
    - Taper dose slowly when DI under control
  - Desmopressin (DDAVP)
    - Intranasal: <12 yo 5–30 mcg/day, >12 yo 10–40 mcg/day; doses can be divided
      - Peak effect 1–5 hours
    - Subqor IV: >12 yo 2–4 mcg/day
      - Peak effect 1.5–3 hour
    - Enteral: 0.05 mg/dose – increase and re-doses as needed to effective urine output control
      - Peak effect 2–7 hours

An update on Patrick’s neuro exam

- After 8 hours in the ICU his clinical exam was noted to be consistent with brain death. You explain your findings to your family and they ask if this means he is going to die. You discuss the process of brain death testing. They ask if he can be an organ donor.

- Do you tell them?
  A) Yes, after completing brain death testing
  B) Yes, but he is only eligible for DCD because of his age
  C) No, there is an open police investigation that prevents donation

Note on preventing gun related suicide

- We need to screen for mental health risk factors and gun ownership
- Kids who die by firearm suicide are more likely to live in a house with a gun
- Kids living in a house with a gun stored unsafely have higher risk of firearm suicide than those with safely stored guns
- Firearm storage safety has no association with non-firearm suicide
- Changes in firearm ownership in a region are associated with changes in suicide prevalence in the region

Advocate for firearm suicide prevention

- Some states have enacted suicide prevention policies to limit access to guns during periods of suicidal ideation
  - Smart Guns, Safety Training, and Safe Storage Laws
    - Can keep kids from gaining unsupervised access to guns can meaningfully reduce youth suicide.
    - California, Connecticut, and Delaware
- Healthcare-Based Suicide Prevention Programs
  - Providers make a difference in their patients’ risk of suicide if they have the training and support to effectively counsel their patients about suicide and gun safety.

Suicide by Hanging

- Suicide by hanging or suffocation accounted for ~50% of the increase in suicide.
- Types of hangings
  - Complete hanging: the patient is fully suspended
  - Incomplete hanging: is used for other positions, patient’s weight still on 1 foot or knee
  - Typical hanging: the ligature knot is positioned at the occiput with the greatest ability to cause arterial occlusion
  - Judicial hanging: a fall greater than the body height of the patient.
    - Typically result in cord injury, fracture of the spine, or fracture of the base of the skull
- Death from hanging may be caused by the following mechanisms:
  1) mechanical constriction structures in the neck - airway or arteriovenous compression
  2) a direct neurologic injury, or
  3) a cardiac arrest as a result of stimulation of vasoactive centers in the great vessels

Case Study - Riley

- 14 year-old female found hanging by the neck from a cord in her closet. She was recently discharged from a psychiatric facility after ingesting in a suicide attempt. She was reportedly in her room only approximately 5 minutes before being found, at which point the family cut the cord and guided her to the ground without trauma. EMS was called.
  - Her initial GCS was 4 (E:1 V:1 M:2 with extensor posturing), HR: 159, BP: 115/90, RR: 36, O2 Sat: 72%
    - They placed a c-collar, attempted intubation x2 unsuccessful, so BVM to hospital
  - In the ED, evaluated by trauma team, GCS: 3, HR: 149, BP: 100/79 O2 Sat: 83%
    - RSI Intubation successful, confirmed by CO2 capnography
    - Copious amounts of frothy pink secretions upon intubation. Suctioned with O2 Sats improving to 88% on 100% FiO2
What is the most likely cause for her copious, frothy pink secretions?

A) Airway trauma
B) Acute Respiratory Distress Syndrome (ARDS)
C) Neurogenic pulmonary edema
D) Post-obstructive pulmonary edema

Neurogenic and Post-obstructive Pulmonary Edema

Neurogenic Pulmonary Edema
- A centrally mediated, sympathetic discharge → intense, generalized transient vasoconstriction → blood moves from the high-resistance system to the low-resistance pulmonary circulation
- Increased pressure and pulmonary blood volume + intravascular pressure changes permeability barrier = pulmonary edema secondary to hydrostatic forces

Post-obstructive Pulmonary Edema
- Very negative transpulmonary pressure with a forceful inspiration against a closed upper airway → cascade
- Increased pulmonary blood flow due to an increase in venous return to the right heart + influx of blood to the thorax → decrease flow from the left side
- Increased pressure and pulmonary blood volume = pulmonary edema secondary to hydrostatic forces

Management of Pulmonary Edema


Ventilator Strategies
- Maximize/normalize O2 saturations
- Use FiO2 and PEEP
- Initial vent settings
  - Tv: 6/kg, PEEP: 10, PS: 10, Rate 16, FiO2: 100%
- Next 48 hours, intubated and sedated
  - PEEP was decreased to 5 and FiO2 to 0.5
  - Goal SpO2 91% and 96%
- On the third day of hospitalization, a chest x-ray with resolution of the pulmonary edema.

Other data

- Radiology before ICU: CT head, cervical spine, and angiography head and neck
  - All negative for acute traumatic or vascular injury, including lack of anoxic brain injury
- Held sedation initially in the ICU to obtain a neuro exam
  - Best neuro exam
    - Intermittently triggering ventilator
    - Pupils 4mm and sluggishly reactive bilaterally
    - GCS: 5T (E: 1, V: 1T, M: 3 – flexor posturing)
  - Increasingly dysynchronous with ventilator and Fentanyl infusion stated

Neurologic Testing

- EEG may be beneficial in rule out seizures in patient with posturing
  - 20% of patients have seizures on EEG after near-hanging
  - Seizures have increased association with poor neurologic prognosis
- EEG monitoring for 24 hours
  - Diffuse slowing without epileptiform discharge

Case Study - Riley

- On ICU day 5 she had no significant improvement in her level of consciousness, but had a gag reflex and was triggering the ventilator.
- MRI obtained which showed diffuse anoxic brain injury
- Weaned to Pressure Support /CPAP that afternoon
- Multidisciplinary care conference to review imaging, discussed prognosis, and determine families wishes for care.
- Her family wanted to proceed with a trial extubation with plans to reintubate if she developed respiratory failure
**Case Study - Riley**

- Morning Rounds Day 6
  - She was on PS/CPAP all night
  - CXR clear
  - Fentanyl stopped at 0600
  - Extubated to BiPAP at 1000
  - Required suctioning for oral secretions, positioning to stent open airway – ultimately an oral airway was placed, O2 Sat: 91-94%
  - BiPap settings increased
  - Decision was made to reintubate

- Ongoing discussions with family day 6 – 14 of ICU stay
  - Lots of family disagreement about what was best for Riley
  - Palliative care and PM & R consults
  - Repeated MRI at family’s request – no new findings, evolution of anoxic injury
  - Day 15 family asked to proceed with trach and g-tube as there was no improvement in her neurologic condition.

**What would you do next?**

A) Start robinul and plan for the next extubation attempt in 48 hours

B) Encourage Riley’s family to consider her quality of life in decision making

C) Palliative Care consult

D) Ethics consult

**Moral Distress**

- Staff grew weary caring for Riley, after trach and g-tube:
  - Family became less engaged in caring for her
  - She developed VAP and sepsis post-operatively
  - Autonomic dysregulation – requiring multiple medications

- Managing Moral Distress
  - Encourage debates about moral issues within healthcare settings
  - Nurses should be involved in interdisciplinary discussions and in developing organizational policies and guidelines
  - Nursing leadership should respond to moral distress in a consistent way – offer work-based programs for those most at risk
  - Seek education about ethical issues, sharing personal stories, and ensure that the public is fully aware of the issues
  - Nurses must find reliable ways to more effectively support each other.

**Hospital admission criteria**

- Need for monitoring
- Psychiatric consultation
- Potential transfer to inpatient facility
- Unsafe for discharge home

**APRN Recommendations**

- Suicide assessment screening of all patients upon admission
- Safe home environment
- QI project
References