Tales from the Blips
Telemetry and Arrhythmias
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Disclosures

• No financial disclosures
• No off label drugs or therapies
Objectives

1. Review guideline to rhythm interpretation.
2. Review common arrhythmias and possible treatments
3. Describe monitor tracings that may suggest a more sinister underlying condition
4. Compose a "price of admission" for cardiology consultation

Roadmap

• Introductions and Housekeeping
• Know your System
• How to interpret ECG tracings at the bedside
• Clinical Cases
• Data for Cardiology Consultation
This is an Interactive Session

• Will use TurningPoint ARS® to collect answers to various questions and demographic information
• Responses are 100% de-identified, so please answer honestly

Grab a clicker…
Segue…
What best describes your practice setting?

A. A Community Hospital
B. Children’s Hospital within a hospital
C. Stand alone Children’s Hospital
D. Other

What best describes your job?

0% A. Pediatric Hospitalist
0% B. Pediatrician who does outpt and inpt
0% C. Family Physician
0% D. NP
0% E. RN
0% F. Other
How many years has it been since you graduated professional school?

A. <3
B. 3-5
C. 6-8
D. 9-11
E. 12 or more

Do you have 24/7 access to a pediatric cardiologist?

A. Yes
B. No
Do you know what kind of telemetry system you have?

A. Yes
B. No
C. No clue!

Do you have in-house, centrally monitored telemetry?

A. Yes, via a central monitoring station for the whole hospital
B. Yes, at the nursing station for the unit
C. Yes, but not all units monitored centrally
D. No
E. No clue!
What area of the country are you from?

A. Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT
B. Midwest: IA, IL, IN, KS, MN, MO, NE, ND, OH, MI, SD, WI
C. South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV
D. West: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY
E. Other

I feel confident in my ability to diagnose arrhythmias

A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree
I feel confident in my ability to treat arrhythmias

A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

Physician... know thy Equipment
The Hardware

The Software

• How to print strips
• How to archive strips
• How to use the software tools
• How to set alarms and how to assure no one turns off what you set
The Users & The System

• What training is involved?
  • For using hardware
  • Competencies for nurses
  • Competencies for monitoring technicians
• Who gets called?
• What gets called?
• Who can set alarms/change alarms?
• Policies and procedures

A system of interpretation
Basic Approach to Dysrhythmias

1. Is your patient unstable? → PALS/APLS/PFCCS
   • Hypotension, AMS, shock
   • VF, pulseless VT, asystole
2. Is the rate fast or slow for age
3. Is the QRS wide or narrow?
   • QRS > 0.09 sec
4. Is the rhythm regular or irregular?
5. Document your arrhythmia for your consultant
6. Don’t forget your system to interpret 12 lead ECG’s as well

On-call freak-out

Case 1
Case 1

- You are quietly charting near RN station. RN grabs you to assess telemetry alarm for a child…
What do you do?

A. Keep drinking your coffee
B. Get more history from the RN
C. Drop what you are doing and check the kid
D. Transfer to PICU for further monitoring
E. Order amiodarone
F. I don’t know
Asystole poor telemetry

Let’s modify this a bit...

• 6 m/o with HCP and VPS admitted with SBO from adhesions; been on TPN via CVC, now PICC
• POD#8, has a fever to 40°C
Take home point…

• Treat the patient not the monitor

Can we please turn off the @#$%^&* monitor!?!?

Case 2
Case 2

• Called by Step-down Unit RN to come check a kid who central telemetry monitoring keeps alarming for bradycardia
• The RN asks: “Please take this kid off the @#$%in’ monitor, it’s killing me!”

Case 2

• When you arrive on the unit, you stop to see the patient.
• 16 year old girl, admitted by one of your partners for “near-syncpe.”
• Patient is sleeping comfortably.
• HR 45, RR 12, BP 110/70
Case 2

What is wrong with the ECG?

A. 1\textsuperscript{st} degree AV block
B. \underline{2\textsuperscript{nd} degree type I AV block}
C. 2\textsuperscript{nd} degree type II AV block
D. 3\textsuperscript{rd} degree AV block
E. I don’t know
2nd degree AV block at a glance

- 2nd degree type I = Wenckebach, normal characteristic of the AV node.
- 2nd degree type II is NOT normal
- How do you know if it’s 2nd degree I vs II?
  - Variable PR interval is the key.
  - Normal (vagal dominance), myocarditis, cardiomyopathy, MI, CHD, post-op cardiac, dig toxicity

Case #3

- 16 year old athlete evaluated by PMD for sports clearance; you get a call for admission for bradycardia
- HR 38bpm, BP 110/75mmHg, RR 12bpm, O2 sat 100% on room air.
After reviewing the ECG, what do you do?

A. Call the on call cardiologist  
B. Contact the PMD for more information  
C. Admit to telemetry  
D. Reassure the patient and send them home  
E. I don’t know
16 year old HR 41bpm

After reviewing the ECG, what do you do?

A. Call the on call cardiologist
B. Contact the PMD for more information
C. Admit to telemetry
D. Reassure the patient and send them home
E. I don’t know
Another ECG Pearl…

• Don’t interpret ECG without context
• Case 3 is a 16 y/o male athlete who has had a 15kg intended weight loss and BMI is 14.4!
Case 4  3 year old girl

- 3 year old girl seen by PMD for well child visit, asymptomatic
- HR 60bpm, BP 95/65mmHg, RR 20, O2 sat 100% on RA
- Active and playing with siblings. Parents with no complaint
- PMD sends to ED for evaluation
- ED calls peds hospitalist to admit patient.

3 year old girl asymptomatic bradycardia
What is this rhythm?

A. Sinus Bradycardia
B. 2:1 AV Block
C. 3\textsuperscript{o} AV Block
D. Long QT
E. Atrial flutter
F. I don’t know

3 year old girl asymptomatic bradycardia
What is this rhythm?

A. Sinus Bradycardia  
B. 2:1 AV Block  
C. 3° AV Block  
D. Long QT  
E. Atrial flutter  
F. I don’t know

3 year old girl
Complete heart block

• Evaluation by Pediatric Cardiology, including Holter and echo
• Consideration of pacemaker
  • Structurally normal heart
    • Neonate heart rate <55bpm
    • Hydrops in fetal life
    • Ventricular dysfunction
    • Symptomatic/poor growth
    • Age >15 years
• Associated structural heart disease
  • Neonate heart rate <70bpm
  • Surgical heart block

Case 5

• Called by ED physician for 16 year old with frequent ectopy
  • Told to go to ED after seen by PMD for sports screening exam demonstrated irregular rhythm.
  • HR 70, BP 110/70, RR 12, O2 sat 100% on RA
Case 5

What does this ECGs show?

A. Movement artifact
B. Myocarditis
C. PACs
D. PVCs
E. I don’t know
What does this ECGs show?

A. Movement artifact
B. Myocarditis
C. PACs
D. **PVCs**
E. I don’t know
Case 5 – Same patient...it’s worse...or is it?

Evaluation of PVCs

- Referral to Pediatric Cardiology
- History and Physical
- Echo
- 24-48hr Holter to assess burden and morphology of PVCs
- Consider exercise test
Evaluation of PVCs

**Benign**
- Monomorphic
- Low burden (<20%)
- Structurally normal heart
- Suppress with exertion

**Malignant**
- Multiple morphologies
- Structural heart disease
- Syncope
- Increase with exercise

Asymptomatic Ectopy: PVCs – for comparison
Case 6-8 mos old boy

- Called by ED physician for 8 mos old boy with frequent ectopy.
- Sent to ED by PMD for evaluation after ectopy heard on well child visit.
- HR 120, BP 90/60, RR 24, O2 sat 100% on RA. Playful and interactive.

8 mo old boy

Rhythm strip from ECG
You decide to admit to telemetry
8 mo old boy Admit to Telemetry Unit

What is the diagnosis?

A. SVT  
B. VT  
C. Junctional tach  
D. Artifact  
E. I don’t know
8 mo old boy

What is the diagnosis?

A. SVT
B. VT
C. Junctional tach
D. Artifact
E. I don’t know
Infantile Idiopathic Ventricular Tachycardia

• Idiopathic VT with structurally normal heart is rare.
• Always evaluated and followed by pediatric cardiology
• If no other electrical cause, it is usually benign
• Anti-arrhythmic therapy: propranolol, procainamide, amiodarone, none
• Resolves with time
• **Different considerations if associated with myocarditis

Can we shock him, can we shock him, can we shock him?
Case 8: 5 year old boy

- Called to ED to see 5 year old boy
- Asymptomatic, to ED because PMD noted fast heart rate on well child exam.
- HR 150bpm, BP 95/65mmHg, RR 18bpm, 100% on room air
- Afebrile. Normal BMP, CBC, TSH.

5 year old boy 150bpm
What’s the rhythm?

A. Ectopic atrial tachycardia
B. Junctional tachycardia
C. Reentrant SVT
D. Sinus tachycardia
E. I don’t know

5 year old boy 150bpm
What’s the rhythm?

A. Ectopic atrial tachycardia
B. Junctional tachycardia
C. Reentrant SVT
D. Sinus tachycardia
E. I don’t know

Asymptomatic tachycardia
5 year old boy 150bpm
Case 9

• On call at a community hospital and called to the ED for a consult
• The case is a 3 y/o boy who has been fussy all day the ED can’t figure out what to do
• The only thing the history reveals is that for the past 6 hours, he has been crying “non-stop” and he has been slightly tachypneic and sweaty

Case 9

• PE reveals a heart rate >200
• BP = 88/43, RR = 38, Sat = 95% RA
• CR = 2sec
• What next?
Case 9: Fussy 3 y/o

- Bedside monitor 280bpm

What is wrong with him?

A. Atrial flutter
B. Junctional tachycardia
C. SVT
D. VT
E. I don’t know
Case 9  Fussy 3 y/o

• Bedside monitor 280bpm

What is wrong with him?

A. Atrial flutter
B. Junctional tachycardia
C. **SVT**
D. VT
E. I don’t know
What do you do for treatment?

A. Defibrillation  
B. Synchronized cardioversion  
C. Vagal maneuvers  
D. Adenosine rapid IV push  
E. I don’t know

3 y/o ECG after adenosine
What is wrong with the child?

A. Atrial fibrillation
B. Ectopic atrial rhythm
C. Sinus with left bundle branch block
D. ST-T wave changes concerning for coronary anomaly
E. WPW
F. I don’t know

3 y/o ECG after adenosine
What is wrong with the child?

A. Atrial fibrillation
B. Ectopic atrial rhythm
C. Sinus with left bundle branch block
D. ST-T wave changes concerning for coronary anomaly
E. WPW
F. I don’t know

3 y/o ECG after adenosine

![ECG Image]
Next bed: 15 year old boy with palpitations

- Bedside monitor 220bpm
- BP 98/42, RR 28, Sats 97%

What do you do for treatment?

A. Synchronized cardioversion
B. Defibrillation
C. Vagal maneuvers
D. Adenosine rapid IV push
E. Ice to his face
F. I don’t know
Next bed: 15 year old boy with palpitations

- Bedside monitor 220bpm
- BP 98/42, RR 28, Sats 97%

What do you do for treatment?

A. Synchronized cardioversion
B. Defibrillation
C. Vagal maneuvers
D. Adenosine rapid IV push
E. Ice to his face
F. I don’t know
15 year old boy ECG after adenosine

SVT and WPW are not the same both are accessory pathways

Wolff-Parkinson-White
- Accessory pathway evident in sinus rhythm (pathway conducts antegrade from A to V)
- Can present with narrow complex tachycardia (SVT – pathway conducts retrograde from V to A)
- Can present with wide complex tachycardia (antidromic tachycardia)
- Can present in atrial fibrillation
- Risk of sudden death

Reentrant SVT
- Concealed pathway
- Normal resting ECG - accessory pathway is “concealed” in sinus rhythm (no antegrade conduction)
- Can present with wide complex tachycardia (SVT with bundle branch block)
- No risk of sudden death
Case 10: 16 year old girl

- Called to ED for 16 year old with palpitations and dyspnea
- Patient reports acute onset of symptoms
- HR 170bpm, BP 100/70mmHg, RR 22bpm, O₂sat 98% on room air
- No other medical history.
What is the diagnosis?

A. Atrial fibrillation
B. Atrial flutter
C. Junctional tach
D. Polymorphie VT
E. SVT
F. I don’t know
What is the diagnosis?

A. **Atrial fibrillation**
B. Atrial flutter
C. Junctional tach
D. Polymorphic VT
E. SVT
F. I don’t know
Case 10 16 year old
OMG, this kid is having an MI!
Yes, this is a real case from my days as an AF pediatrician in the middle of nowhere

Case 11

• Called by ED to facilitate transfer of a 17 y/o boy who “had CP for 3 days and he’s having a STEMI.”
• You think this sounds weird, so you say you’ll be right down.
• What are your thoughts on the elevator ride down?
Case 11

• A panicked ER doc who hates dealing with kids tells you: “the troponins are pending, but he’s killing heart muscle; the helo is ready to fly him to where ever you say, just remember, time is muscle!”
• You walk in and find the child sitting up in bed, complaining of a headache that started after they made him take some pills under his tongue.

Case 11

• T: 37.4, HR: 68, RR: 18, BP: 94/40, S: 99%
• Troponin-I is pending
• You look at the bedside monitor and see the following
What do you do next?

A. Expedite the air transfer
B. Contact local children’s hospital for transfer by ground
C. Get more history and 12 lead ECG
D. Activate adult cath lab
E. I don’t know

Case 11

• T: 37.4, HR: 68, RR: 18, BP: 94/40, S: 99%
• Troponin-I is pending
• You look at the bedside monitor and see the following
What do you do next?

A. Expedite the air transfer
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C. Get more history and 12 lead ECG
D. Activate adult cath lab
E. I don’t know

17 yo with resting CP elevated troponin
ST Segments in Kids

- True pathology
  - Pericarditis
  - Rare, coronary anomalies
- Repaired congenital surgery patients should be considered differently
- Compare to prior ECG
- J point elevation

Before you say “it ain’t the heart…”

The Price of Consultation
Before you call…

- Have a good H&P
  - Especially FHx
- Have a good tracing
- Have a question you want answered

So what will you change when you go back to your hospital?
I feel more confident in my ability to diagnose arrhythmias

A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

I feel more confident in my ability to treat arrhythmias

A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree
Summary

• Know your hardware and software
• Know who is looking at the monitors when you are not
• Have a system to interpret
• Correlate your monitor with your patient’s clinical data

Questions, Comments, Complaints, Dirty Looks?