



Rich Kaplan MD, MS, FACEP  
Allegheny General Hospital  
Adjunct Clinical Professor of Emergency Medicine

## **MORE GREAT SAVES**

STRIVE TO REVIVE  
HILTON GARDEN INN, SOUTHPOINTE  
FRIDAY, OCTOBER 4, 2019

**UNDER PRESSURE**

# Five Cases

- **My Headache is getting worse**
- I just had a baby and I **cannot breath**
- **My Chest Hurts and I am SOB**
- I have an LVAD, and I am Sick
- **I have Diabetes, and I Do Not Feel Well**

# Case #1 ED Visit#2

- 25 y.o. white female
- ED - 2 days of a worsening headache
- **Seen by Neurology- 3 days ago**
  - **MRI – Negative**
  - **To the ED for an LP( ED visit #1)**

# Case #1 ED visit #2

- Forehead pain
- Dizziness worse when standing

# Vitals

- Temp 36.8
- RR 22
- HR 86
- BP 124/79

# Exam #1

- Patient walked into the room
- **Headache and "Dizziness"**
- Light sensitivity
- No meningeal signs
- **No neuro deficits**

# Treatment

- Toradol 15 mg IV
- Compazine 10 mg IV
- Benadryl 25 mg IV



# Exam #2 - Attending

- **Altered Mental Status**
- Difficult to arouse

# Exam #2

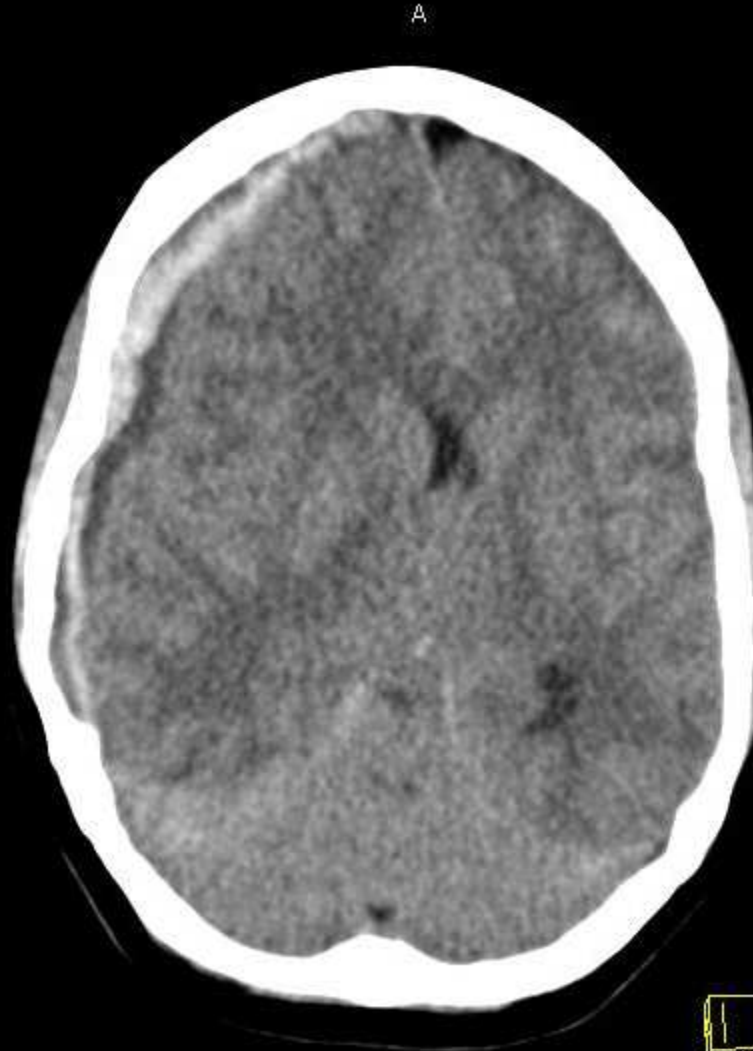
- Eye exam
  - **Right pupil 5 mm**
  - Left pupil 2-3 mm

# Case #1

- STAT CT scan

CT head

Right Subdural Hematoma  
Effacement of right lateral ventricle



# Case #1 After CT scan

- GCS – 8
  - Eye Open to command 3
  - **Verbal Incomprehensible words 2**
  - Motor ? Flexion 3
- STAT Intubation

# Decompressive Craniectomy



# Case #1 Pearls

- Full exam
- **Do not forget about the eye exam**
- **Patients can “herniate” after an LP**
- **DO NOT** always attribute altered mental status to medications

## Case #2- Pregnancy

- 19 y.o. white female
- **Induction and Vaginal delivery**
- **Hypertensive**
- Discharged home on a antihypertensive



# Case #2 Post-delivery day #3

- EMERGENCY DEPARTMENT
  - HR 111,
  - BP 192/120
  - Tachypneic

## Case #2- ED visit

- **Frothy sputum**
- **Right sided pleuritic pain**
- **Short of breath**

## Case #2

- EKG
  - **No acute abnormalities**
- CXR-
  - **Right lower lobe infiltrate**
- CT
  - **Patchy infiltrates**
  - **NO PE**

## Case #2

- Worsening respiratory distress
- **Intubated in ED**
- Started on antibiotics

LINE PLACEMENT

SUPINE

LEFT

PORTABLE



▼ | n.a.

▼ | 30%

## Case #2- ICU

- Post- Delivery day #4
  - Bradycardic
  - **PEA**
- **CPR for 40-45 minutes**
- **ROSC**



## Case #2 ICU

- Dobutamine
- Epi
- Solumedrol

## Case #2- ICU

- EF 15-20%
- VA ECMO
  - Right femoral artery
  - Right femoral vein
- **Lifeflighted to AGH**



# NORMAL

Parasternal long axis:



# SEVERELY REDUCED

Parasternal long axis:



# UNIVERSITY OF UTAH EMERGENCY DEPARTMENT ECMO (ED ECMO)

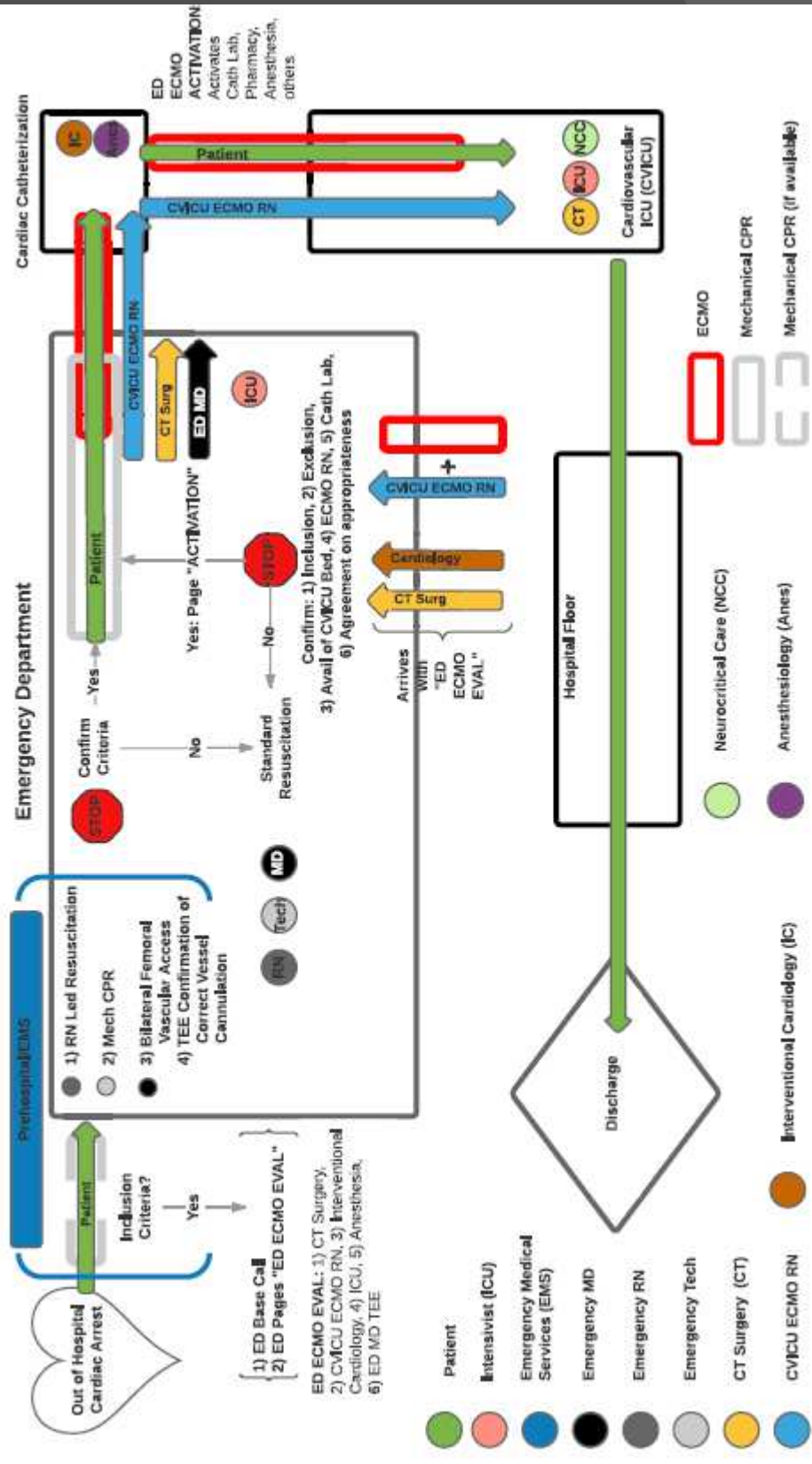


Figure 2. ED ECMO process map.

# ECMO cart /E- CPR cart



- ECMO Cart  
long Box
- Arterial Cannula  
○ 18 F x 2
  - Venous Cannula  
○ 24 F x 3
  - Arterial Wire x 2
  - Venous Wire x 2
  - ECMO Tray
  - Sterile Drape Packs x 2 (full packs and half sheets)
  - Blue Towels x 2
  - Lap Pads x 2
  - Prep Sticks x 6
  - 4x4 Boat x 4
  - Basin (sterile blue bowl) x 2
  - Sterile Water x 2
  - Bulb Syringe x 2
  - Gowns – 3 Large, 3 XL
  - Sterile Gloves  
○ 3 of each size (6 1/2, 7, 7 1/2, 8)
  - Hats
  - Masks
  - Suture - #0 silk x 8
  - Foley Catheter Holders
  - Scalpels (2 each #10 and #11)
  - Skin Stapler x 2



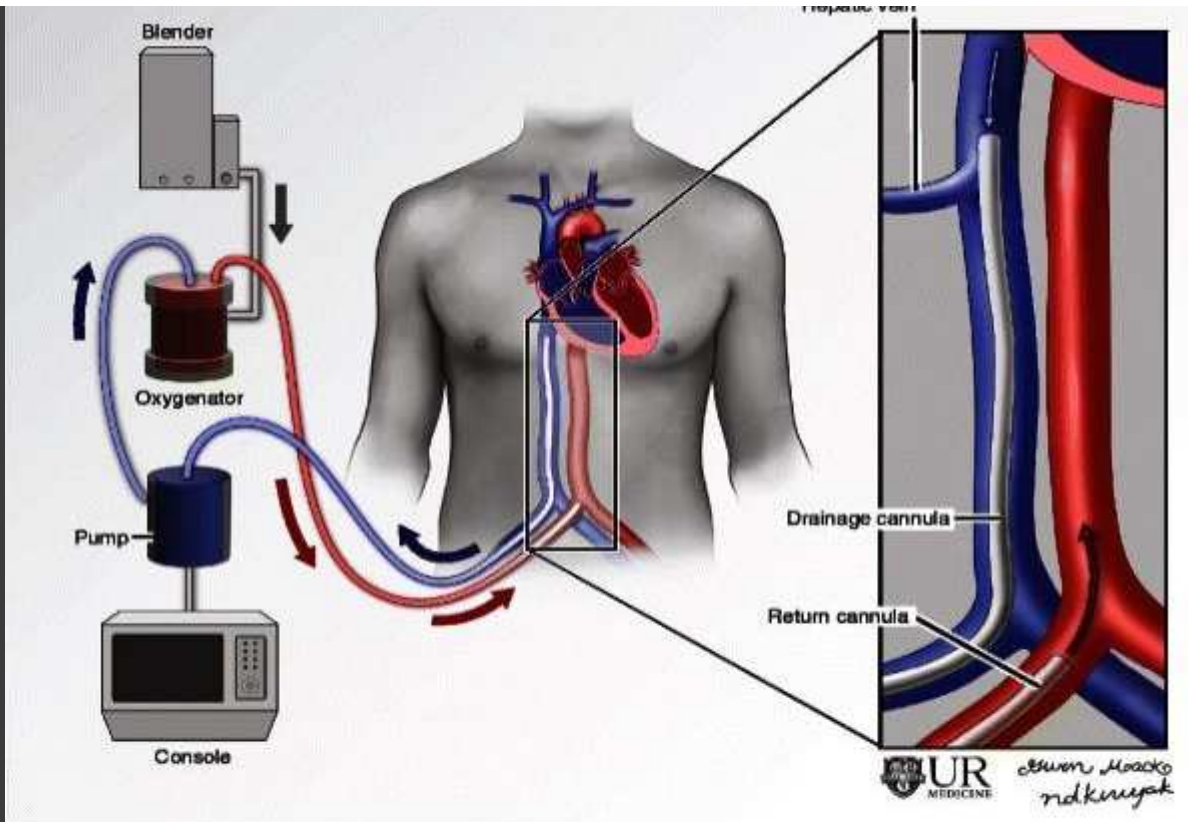
**VA ECMO**

**Venous  
Blood**

**Gas  
exchanger**

Remove CO<sub>2</sub>  
Add oxygen

**Blood  
returns**



(17-27F) femoral vein- ( advance 40-50 cm)  
(15-19F) femoral artery( to the hub)

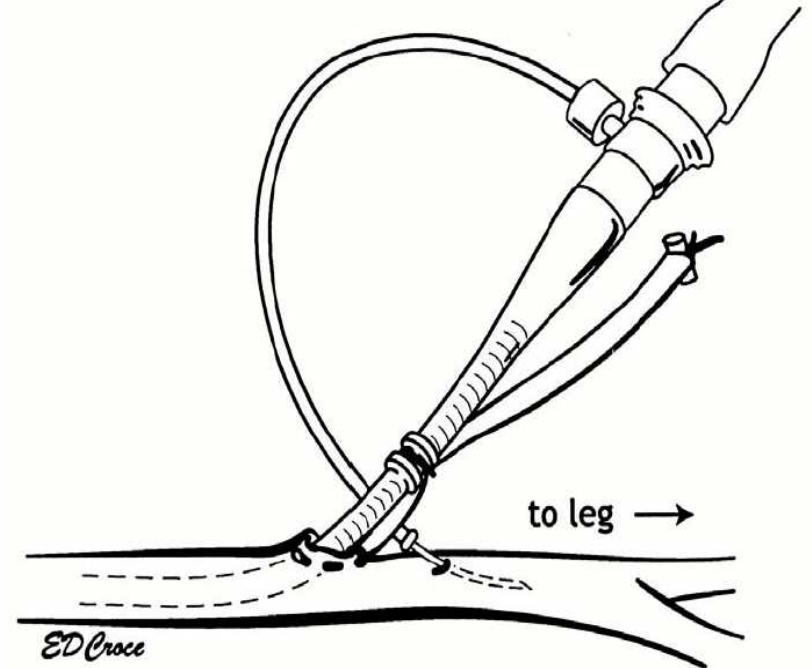
# ECMO: Cannulas



femoral  
artery  
cannulation  
site



from ECMO



# CARDIOHELP

## Connections and components

**Front View**



**Rear View**



## Case #2- AGH SICU

- 36.3
- 112
- 170/120
- 97% saturation



# Diagnoses

- **Hypertensive emergency**
- Pulmonary edema
- **Postpartum cardiomyopathy**
- Chorioamnionitis
- Possible pneumonia

## Case #2- AGH SICU

- VA ECMO
- Antibiotics
- Transfused
- Mom and baby did well

## Case #2 Pearls

- **Watch the BP in pregnant and postpartum women**
- **Watch for Postpartum**
  - **Cardiomyopathy**
  - **PE**
- **Do not forget about ECMO**

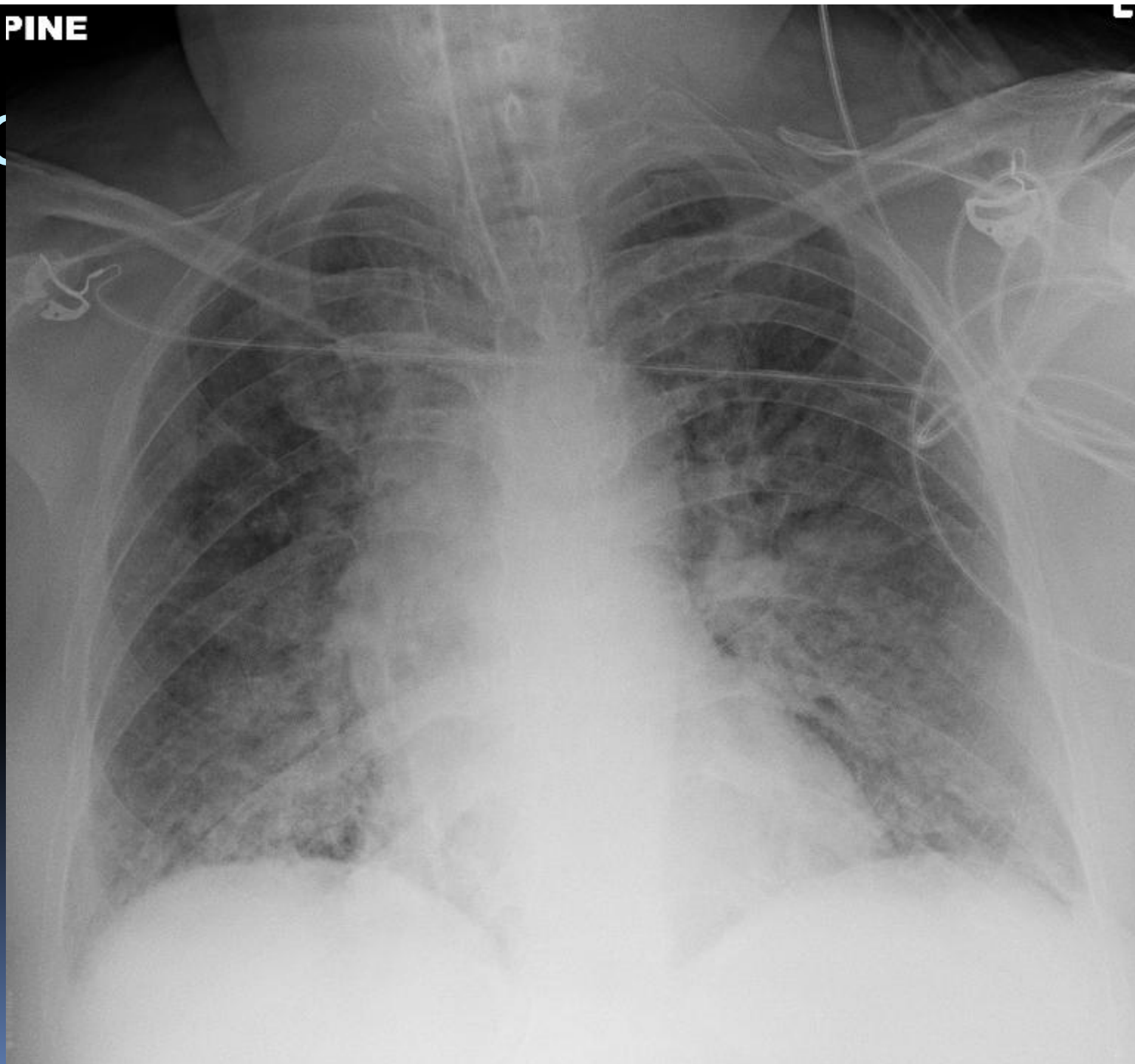
## Case #3- CP and SOB

- 67 y.o. WF
- **Severe shortness of breath**
- **Chest pain**
- Medic transport
- Screaming, **then quiet**
- **111, 142/91, 15**

# Case #3- Exam

- **Severe respiratory distress**
- High flow oxygen

PINE



CRITICAL

AGH NAME:

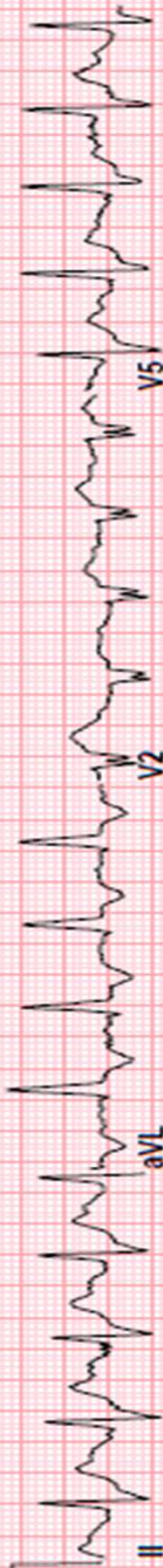


I

aVR

V4

V1

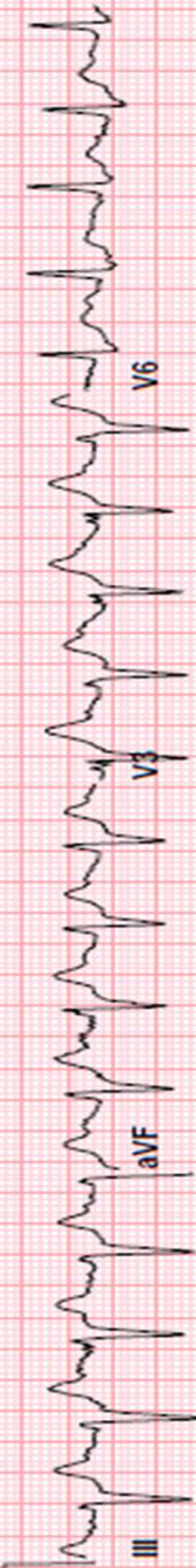


II

aVL

V5

V2

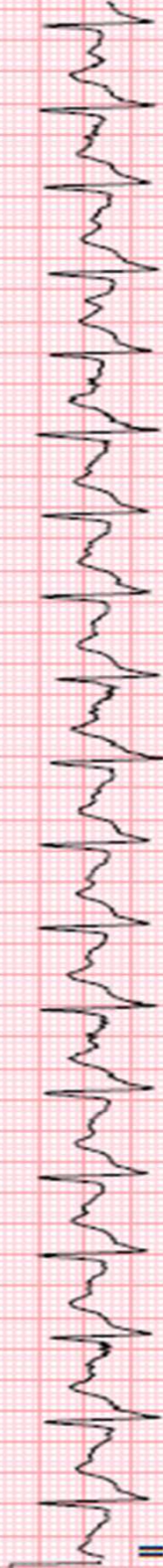


III

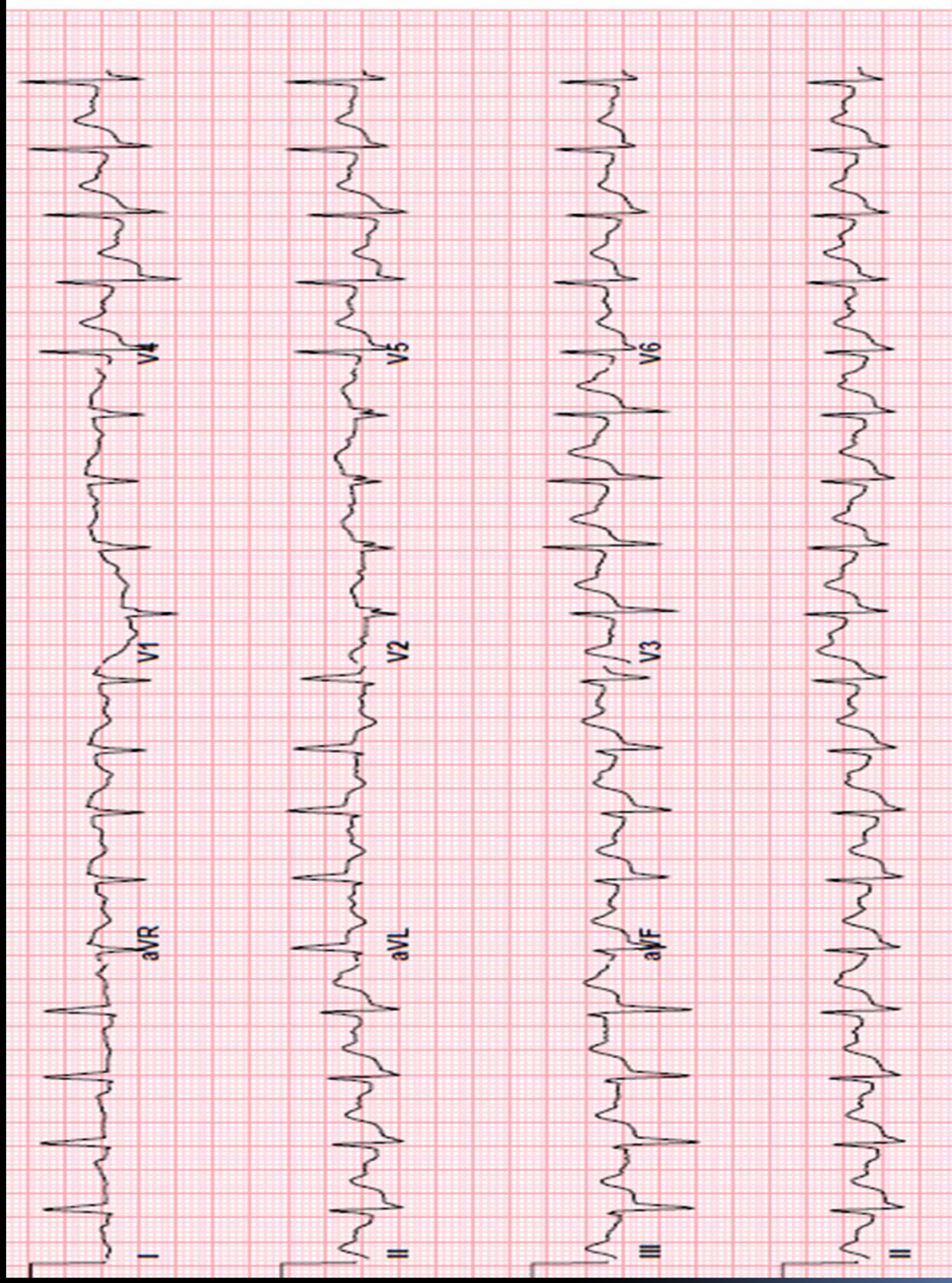
aVF

V6

V3



II





# Case #3- ED course

- **NSTEMI**
- **CHF**
- Hyperglycemia



## Case #3

- ECHO: Apical hypokinesis
- 

# Case #3- Cath lab

- Subtotal left main
- Ostial LAD, Left circumflex
- Severe disease
- Cardiogenic shock

# CASE #3 Cath Lab

- **IABP with 2 pressors**
- **CT Surgeon to Cath Lab**
  - Taken to Operating Room

## Case #3 Pearls

- Watch out for ST elevation in aVR and ST depression in other leads
- You can have severe disease without a STEMI

## Case #4

- 69 y.o. male
- **LVAD**
- Weakness
- **No appetite x 2 days**

Caucasian

PR interval 90 ms  
QRS duration 20 ms  
QT/QTc 178/298 ms  
P-R-T axes -60 0 74

N

Undetermined rhythm  
Indeterminate axis

Pulmonary disease pattern  
ST elevation, consider inferior injury or acute infarct  
\*\*\* ACUTE MI / STEMI \*\*\*

Consider right ventricular involvement in acute inferior infarct  
Abnormal ECG

When compared with ECG of 25-NOV-2016 16:35,

Current undetermined rhythm precludes rhythm comparison, needs review  
Questionable change in QRS duration

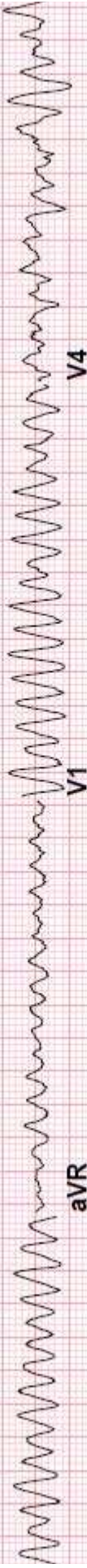
Technician: SML  
Test ind: LVAD TACHY

Referred by: AMRESH RAINA

Electronically Signed by: EKG EMERC

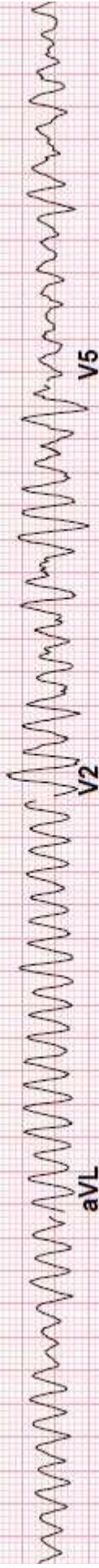
AGH NAME:

L:



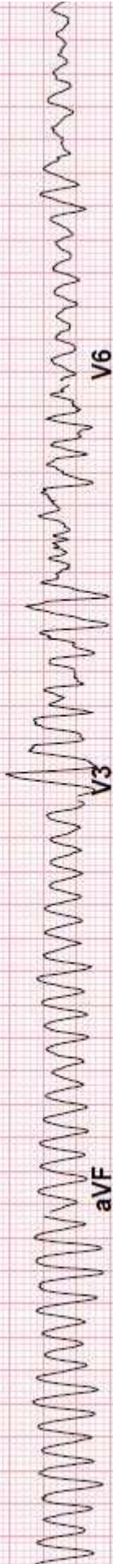
V1

V4



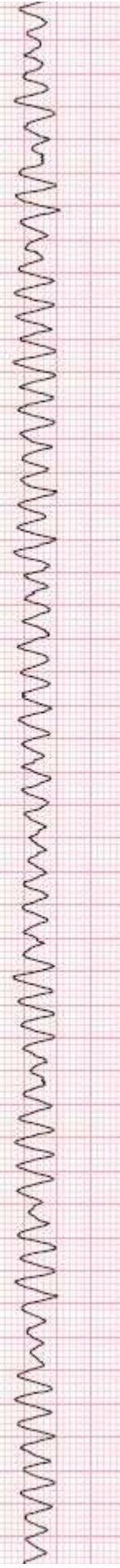
V2

V5



V3

V6



**THUNDERSTRUCK**



## Case #4

- **Mechanical roar noted on LVAD**
- **Doppler pressure 45**
- IVF increased Doppler pressure to about 70
- EKG-
  - **VF?**
  - **VT?**
  - **Torsades?????**

## Case #4


- Heart failure team
- Procedural Sedation
- **Countershock for "VF"**

## Case #4 Then What????

- **Asystole**
- Patient was awake
- MAP about 50



## Case #4

- Transvenous pacer placed
  - Pacer spikes
    - No mechanical capture
- 

aucasian

PR interval  
QRS duration  
QT/QTc  
P-R-T axes

ms  
4 ms  
174/303 ms  
\* 0 262

Undetermined rhythm  
Indeterminate axis  
Pulmonary disease pattern  
Nonspecific ST and T wave abnormality  
Abnormal ECG

When compared with ECG of 08-FEB-2017 20:13, (Unconfirmed)  
Current undetermined rhythm precludes rhythm comparison, needs review  
ST no longer elevated in Inferior leads  
ST no longer depressed in Anterolateral leads  
Nonspecific T wave abnormality, worse in Inferior leads

Technician: SML  
Test ind: VTAC

Referred by: AMRESH RAINA  
DATE/TIME: Electronically Signed by: EKG EMERGE

AGH NAME:



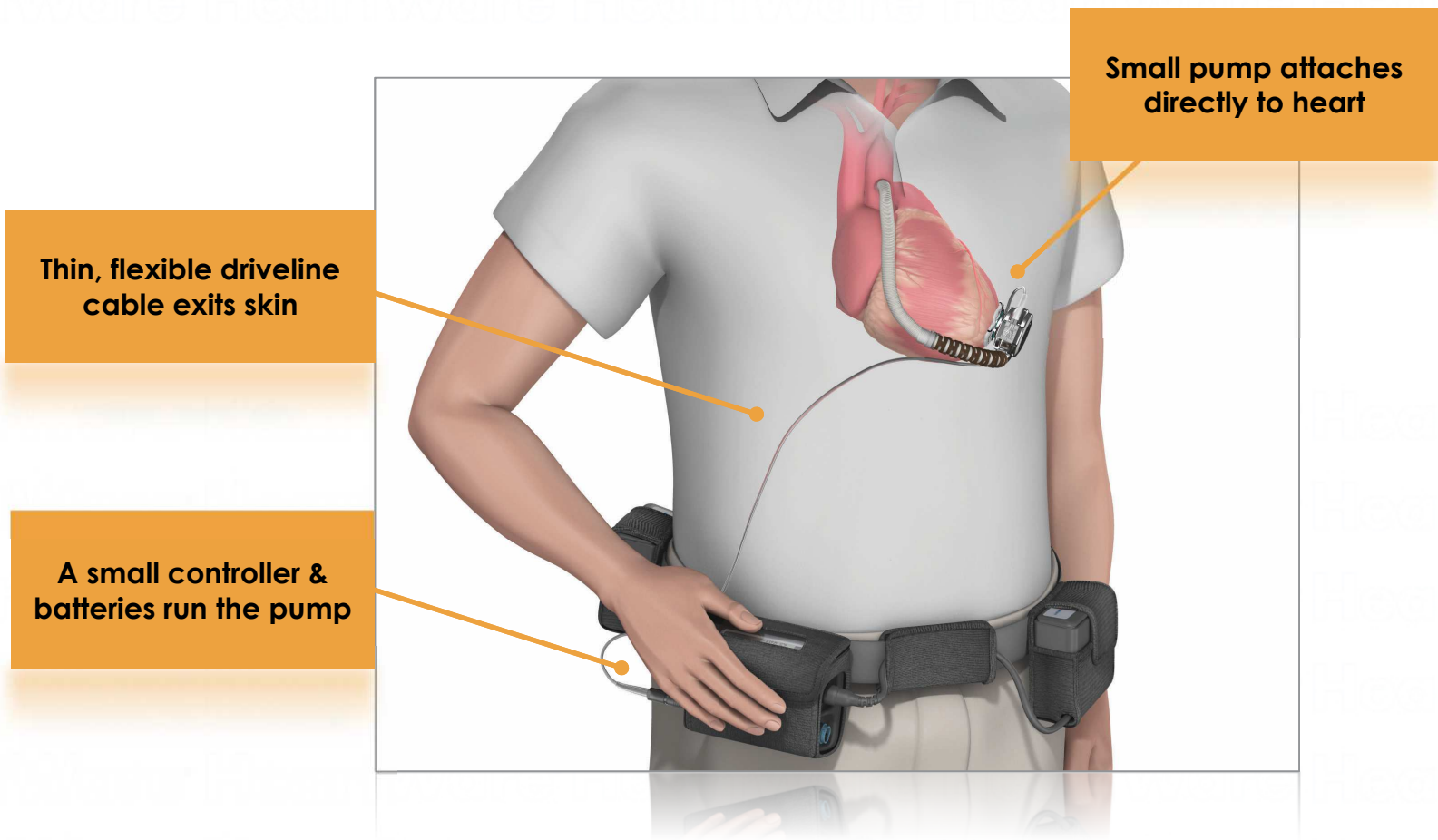
## Case #4

- **Countershock again for presumed VF**
- Lidocaine bolus and infusion

## Case #4 CCU and Cath Lab

- **RV failure** noted on Echo
- **Impella placed percutaneously**
- **New pacer placed with RV capture**
  - LVAD flow rates doubled

# HeartWare® System



CAUTION: Federal Law (USA) restricts this device to sale by or on the order of a physician. Refer to the "Instructions For Use" for complete Indications for Use, Contraindications, Warnings, Precautions, Adverse Events and Instructions prior to using this device.

HeartWare®



# HVAD<sup>®</sup> Pump

## Durable Driveline

Thin and flexible cable  
with durable wires



## Miniature Pump

1.60g centrifugal pump with  
integrated inflow cannula  
that provides full support



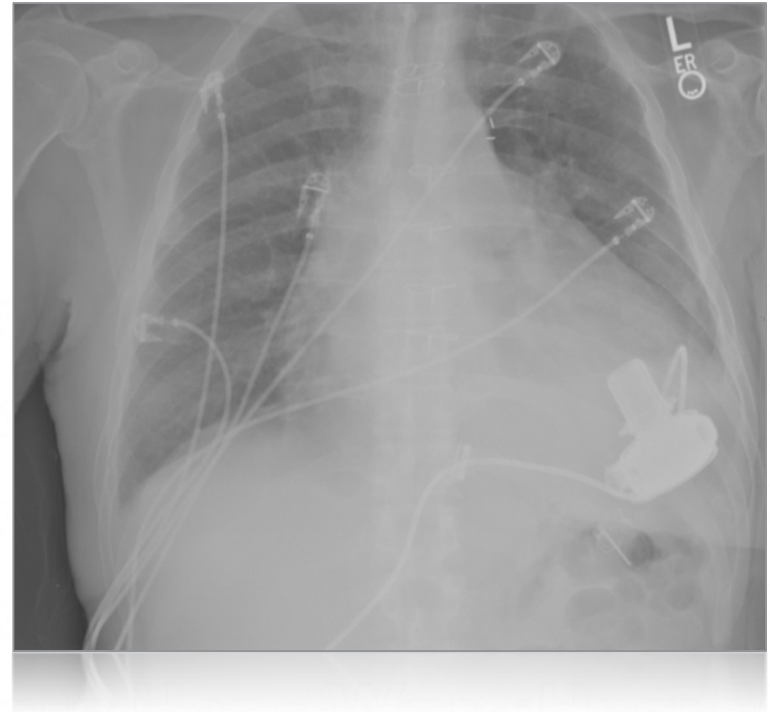
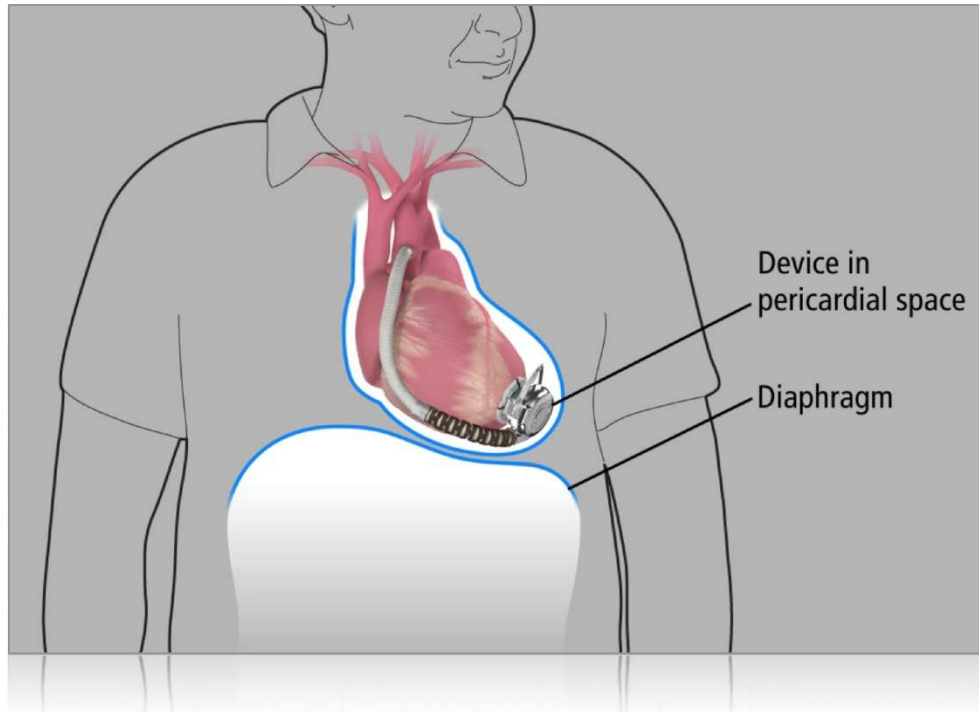
## Only One Moving Part

No contact within pump when running

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HeartWare<sup>®</sup>

# Pericardial Placement



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HeartWare®

# HeartWare Patient Peripheral Components

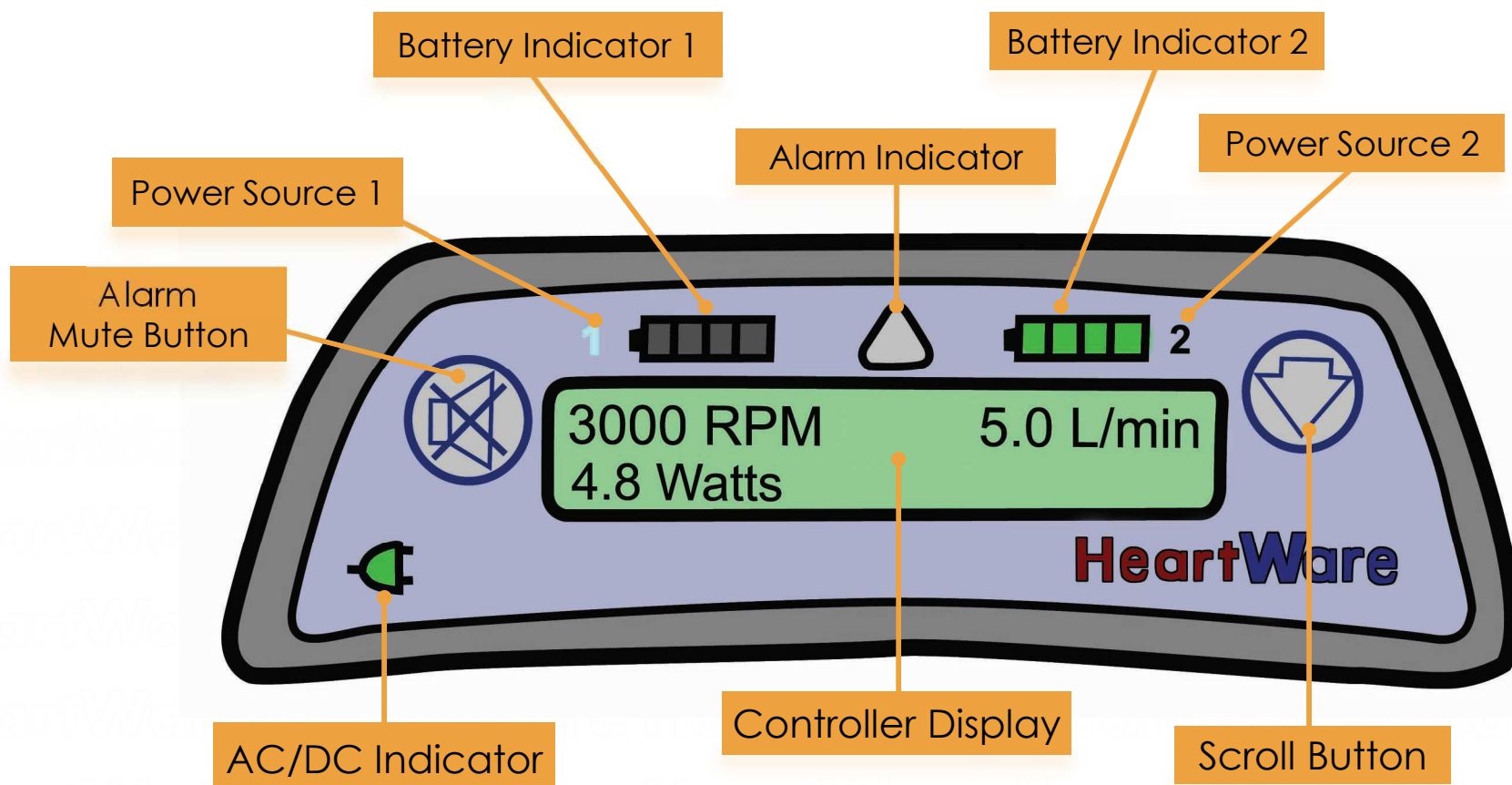
- **HeartWare® Controller:**  
Controls and manages VAD operation
- **HeartWare® Power Sources:**  
Power the controller and pump
  - Batteries
  - AC adapter (plugs into wall outlet)
  - DC adapter (plugs into car outlet)
- **Patient Pack:**  
Holds a controller & 2 batteries; may be worn around waist or over the shoulder
- **HeartWare® Shower Bag:**  
Holds a controller & 2 batteries while showering
- **HeartWare® Battery Charger:**  
Can simultaneously charge up to 4 batteries



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HeartWare®

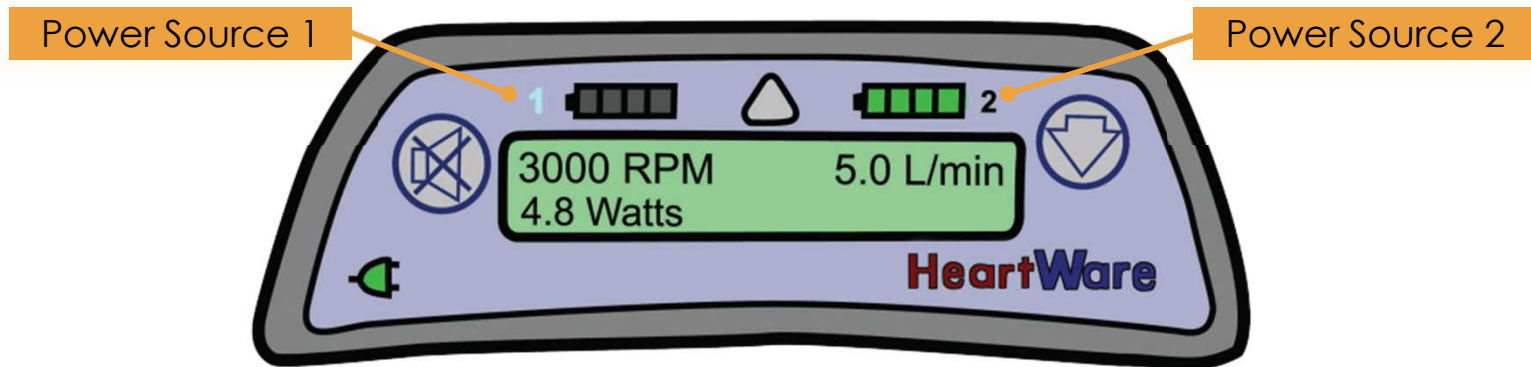
# HeartWare® Controller Display Overview



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HeartWare®


# HeartWare® Controller: Power Source Indicators



- One power source indicator (labeled "1" or "2") will light up based on which port is providing primary power (e.g. "1" in this case)

- Two battery indicators:

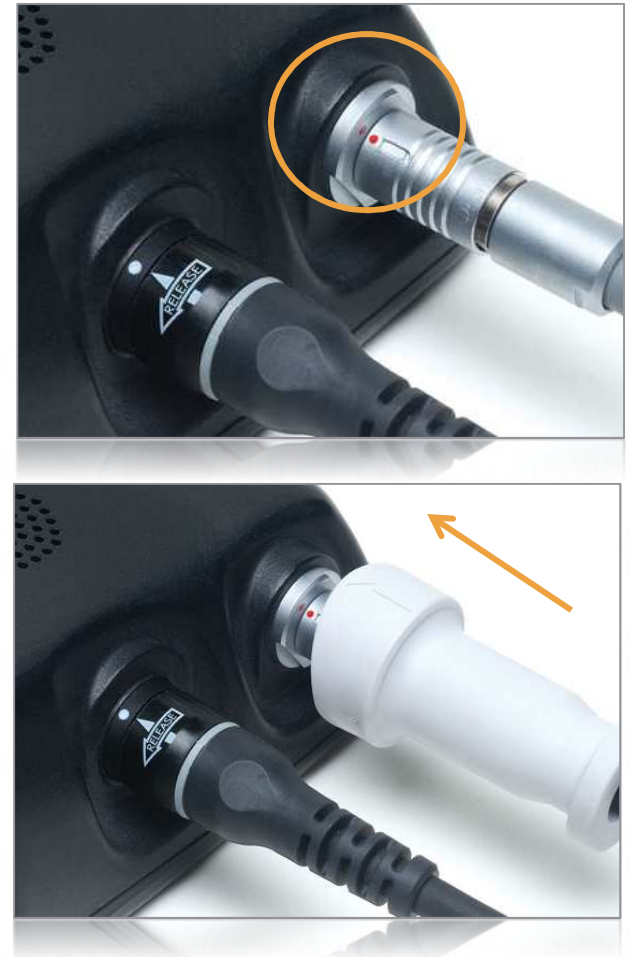
Battery Capacity	Battery Indicator
75-100%	4 GREEN lights 
50-74%	3 GREEN lights 
25-49%	2 YELLOW lights 
≤24%	1 RED light 

- AC/DC symbol  turns green when connected to an AC or DC adapter
- The AC/DC adapter will always be the primary source of power if connected

# Connecting the Driveline (Pump) to the HeartWare® Controller

## To Connect Driveline (Pump) to Controller:

- **Align the two red marks and push together** on the silver driveline connector
- An **audible click will be heard** confirming proper connection
- Completely **cover the controller's silver driveline connector** with the driveline cover



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HeartWare®

# Case #4 Pearls

- **Know how to assess the LVAD**
- **Watch out for dysrhythmias**

## Case #5- Last Case!!

- 47 y.o. male
- Vomiting
- Neck pain
- Shoulder pain
- **Had been working outside the previous day**



# Case #5- History

- **Insulin pump**
- Depression
- HTN
- Smokes

# Case #5 Exam

- SBP 101/52
- HR 112
- RR 16
- Temp 36.4C
- RA sat 96%
- Glucose 261

# Case #5 Complaints

- Dehydrated
- **Anxious**
- Tachycardic
- No chest pain

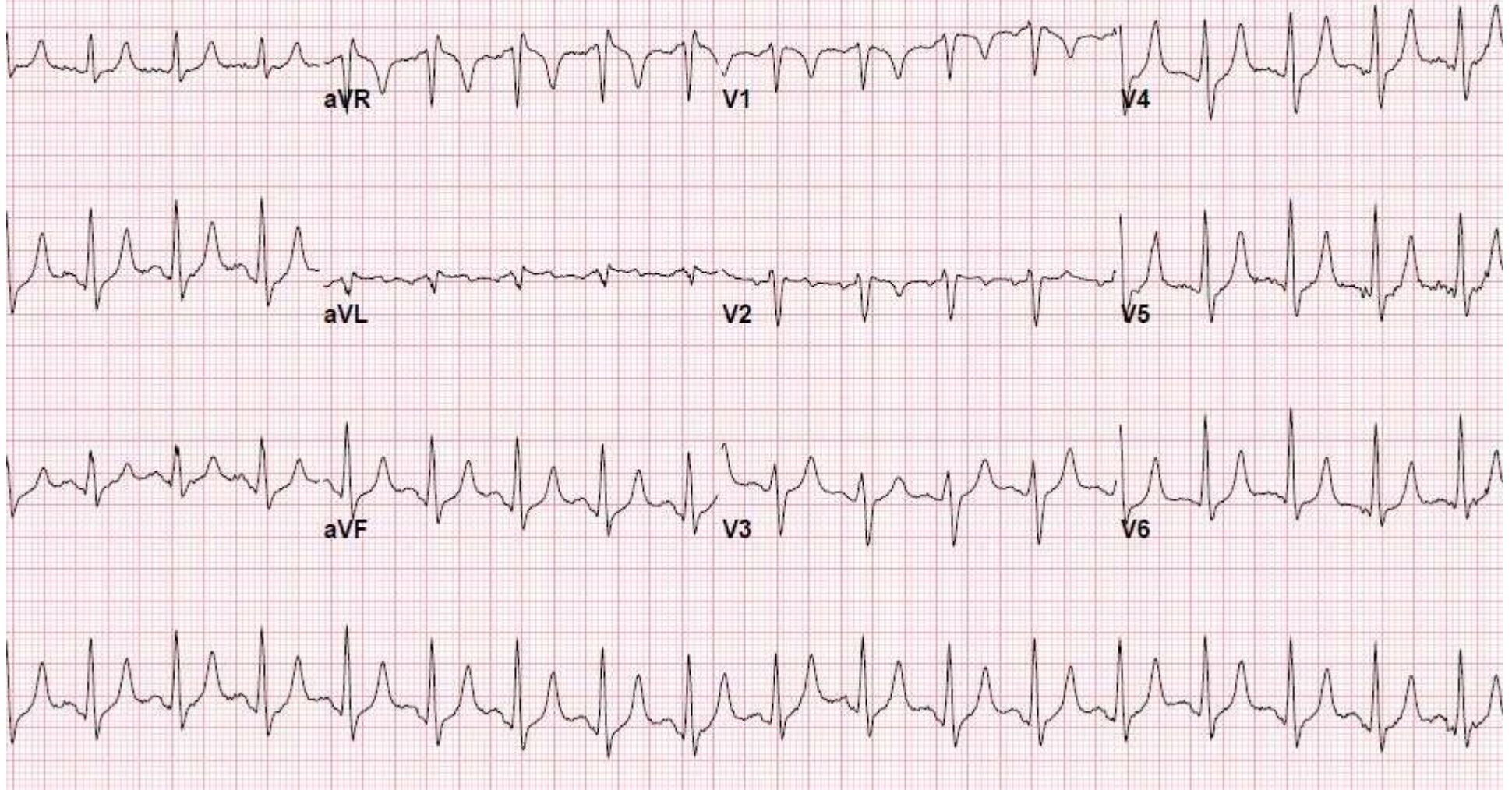
QT/QTc 352/480 ms  
P-R-T axes 87 64 61

Technician: EA  
Test ind:

AGH NAME:

Referred by: BRADLEY DUKE

Electronically Signed by: EKG EMERGE



# Case #5 Abnormal Labs

- Glucose 261
- Venous blood gas
  - PH 7.077
  - Bicarb 17
- K 6.3
- Cn 2.31
- Gap 39

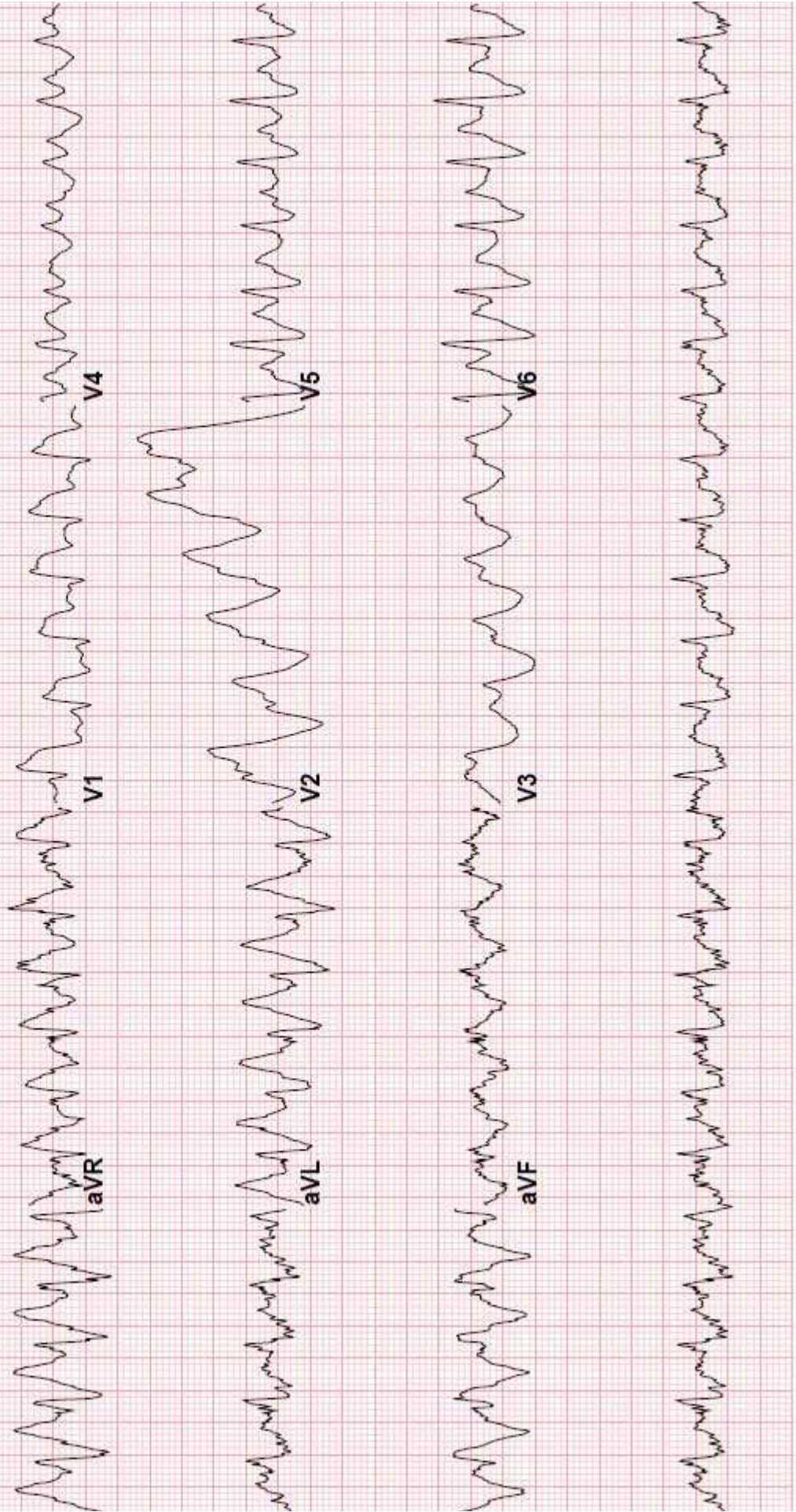
Atrial fibrillation with rapid ventricular response with premature ventricular or aberrantly conducted complex  
 Low voltage QRS  
 Inferior infarct, new  
 Anterior injury pattern  
 \*\*\* ACUTE MI / STEMI \*\*\*  
 Consider right ventricular involvement in acute inferior infarct  
 Abnormal ECG  
 When compared with ECG of 05-AUG-2019 16:10,  
 Atrial fibrillation has replaced Sinus rhythm  
 Questionable change in QRS duration  
 Acute Inferior infarct is now present

QRS duration 92 ms  
 QT/QTc 324/531 ms  
 P-R-T axes \* 7 -43

Technician: EA  
 Test ind:

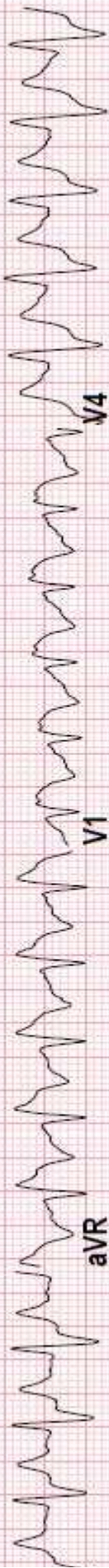
Referred by: RICHARD KAPLAN      Electronically Signed by: EKG EMERGEN  
 DATE/TIME:

AGH NAME:



AGH NAME:

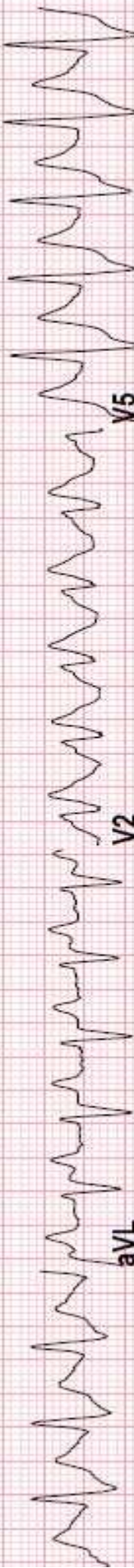
DATE/TIME:



aVR

V1

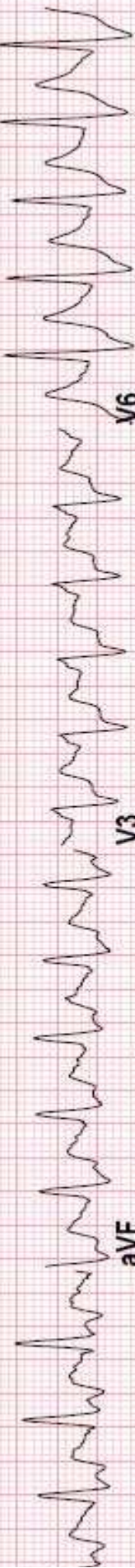
V4



aVL

V2

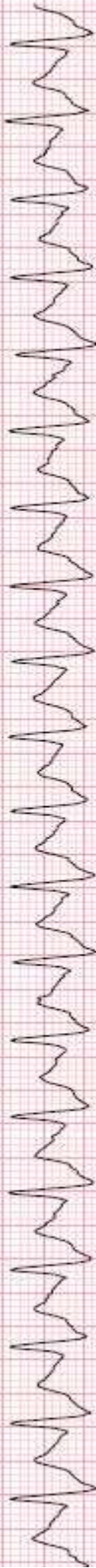
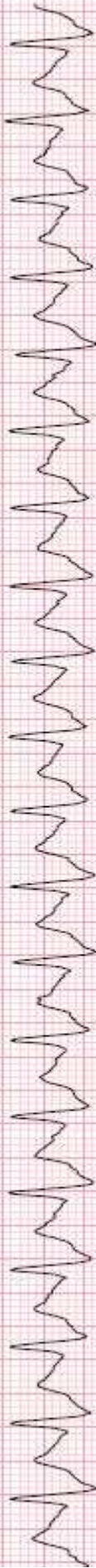
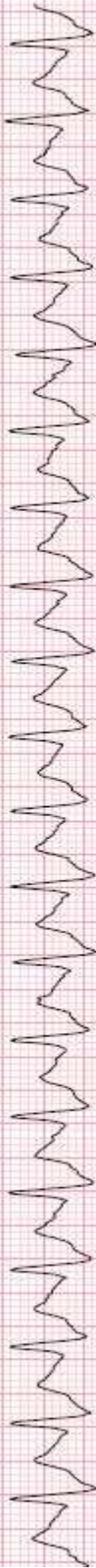
V5



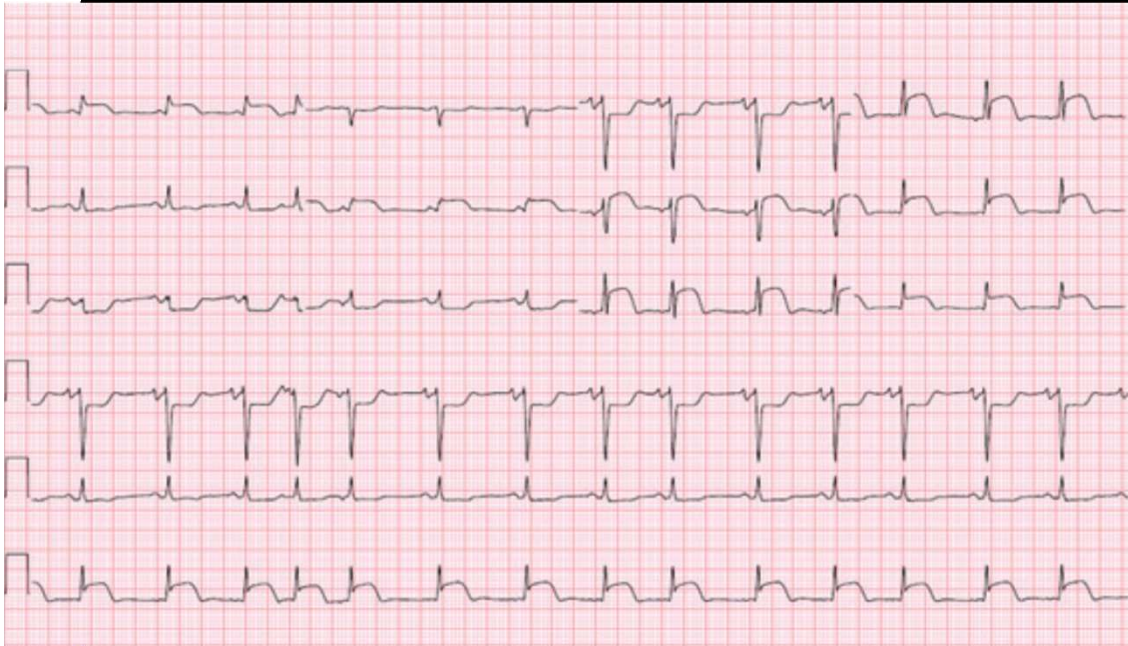
aVF

V3

V6



# A STEMI MIMIC





## Case #5

- **Hyperkalemia**
- Renal failure
- EKG changes

# Case #5 Treatment

- IVF boluses
- **Calcium**
- **Insulin bolus and drip**
- Bicarbonate

No

AGH NAME:

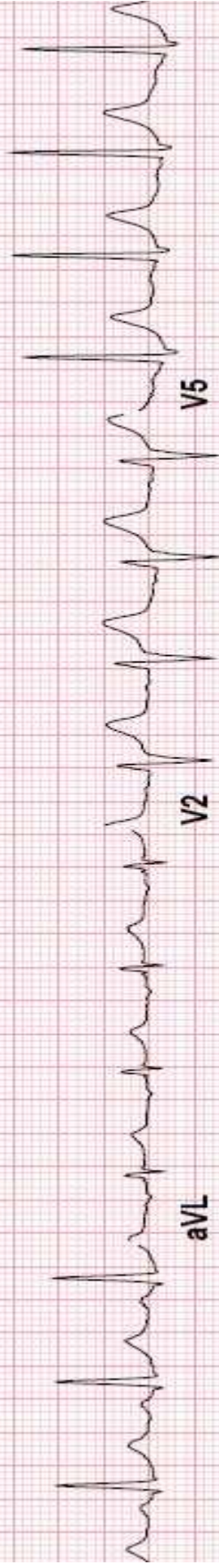
DATE/TIME:



aVR

V1

V4



aVL

V2

V5



aVF

V3

V6



# Case #5 Pearls

- **Watch out for DKA**
- **Know how to treat Severe Hyperkalemia**

EVERY BREATH YOU TAKE