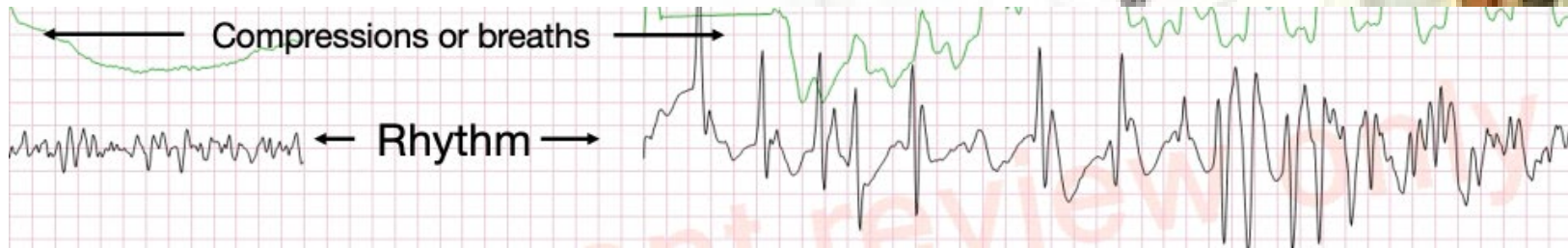


Recurrent VF

*Dr Mickey Eisenberg has NOT endorsed this

A Shocking Protocol*



Michael Levy, MD FAEMS

Immediate Past President NAEMSP

CMO Anchorage Areawide EMS

Medical Director State of AK Emergency Programs

Michael Levy MD Disclosures

- Celebrate Trial: Co-PI, Advisory Board
- Chief Medical Advisor Stryker Emergency Care
- Advisory Council Sudden Cardiac Arrest Foundation

For consideration...

- What is the metabolic burden of VF?
- Is "refractory VF" really a thing?
- ...or are we seeing **refractory resuscitation?**
- Is chest compression fraction THE paramount concern in VF resuscitation?
- Are two-minute CPR cycles sacrosanct?



Step 10 Culture



Culture of Excellence

- **How we do our job matters** –
 - *failure is unacceptable...*
- **“BLS owns CPR”** - taking ownership of the resuscitation and outcomes
- **Patient focused**, real-time peer feedback
- **“Nobody dies in my rig”**
- **Everyone** in a shockable rhythm survives (and some in asystole/PEA survive too!)
- ***Expect improvement!***

Michael K. Cobass, MD



“What you believe determines how you perform”

Refractory VF is rare.

Recurrent VF is common.

- **A common misperception:** “My system sees 800 patients per year initially in VF, and 400 are in refractory VF (still in VF after 3 shocks).”
- **Reality:**
 - Initial VF → 1st shock → 90% out of VF → 48% in VF after 2 minutes of CPR
 - Only ~0.5% stay in VF through 3 shocks (200, 300, 360 J)
- **A city of 1 million people has ~550 EMS-treated cardiac arrests per year.**
How many will remain in VF through 3 shocks

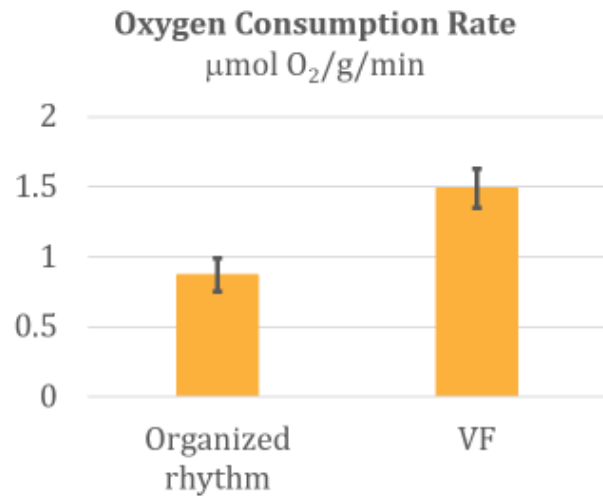
Koster, Rudolph W., Robert G. Walker, and Fred W. Chapman.

"Recurrent ventricular fibrillation during advanced life support care of patients with prehospital cardiac arrest." *Resuscitation* 78.3 (2008): 252-257.

~ 1-2 (!)

Slide compliments of Fred Chapman, PhD

During simulated CPR conditions, hearts in VF consume more oxygen



? 71%

M Hoogendijk, *Europace*. 2012; 14: 1518-23
doi:10.1093/europace/eus078

© 2022 Stryker

11

Ventricular fibrillation hampers the restoration of creatine-phosphate levels during simulated cardiopulmonary resuscitations

Mark G. Hoogendijk^{1*}, Cees A. Schumacher¹, Charly N.W. Belterman¹, Bas J. Boukens¹, Jocelyn Berdowski², Jacques M.T. de Bakker^{1,3}, Rudolph W. Koster², and Ruben Coronel¹

Europace doi:10.1093/europace/eus078

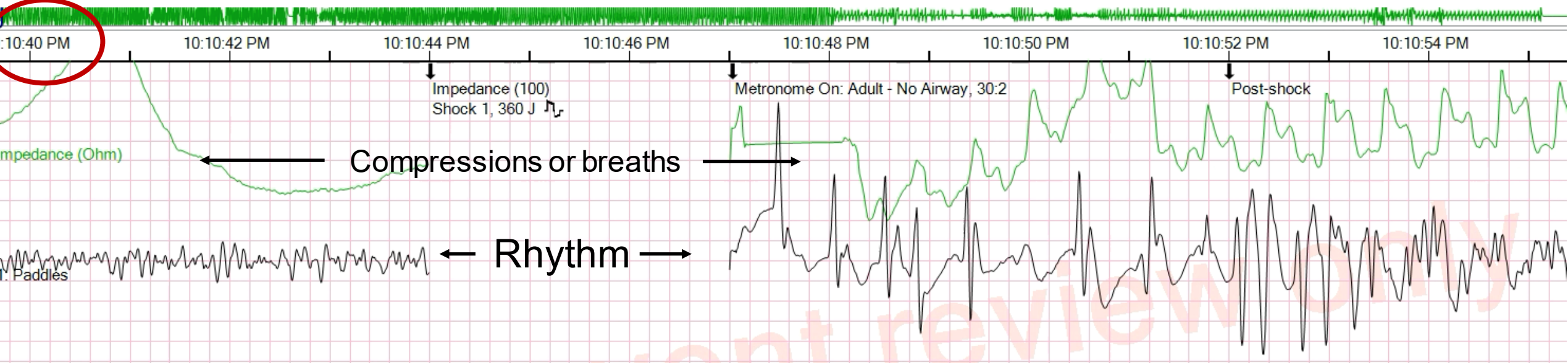
Conclusions:

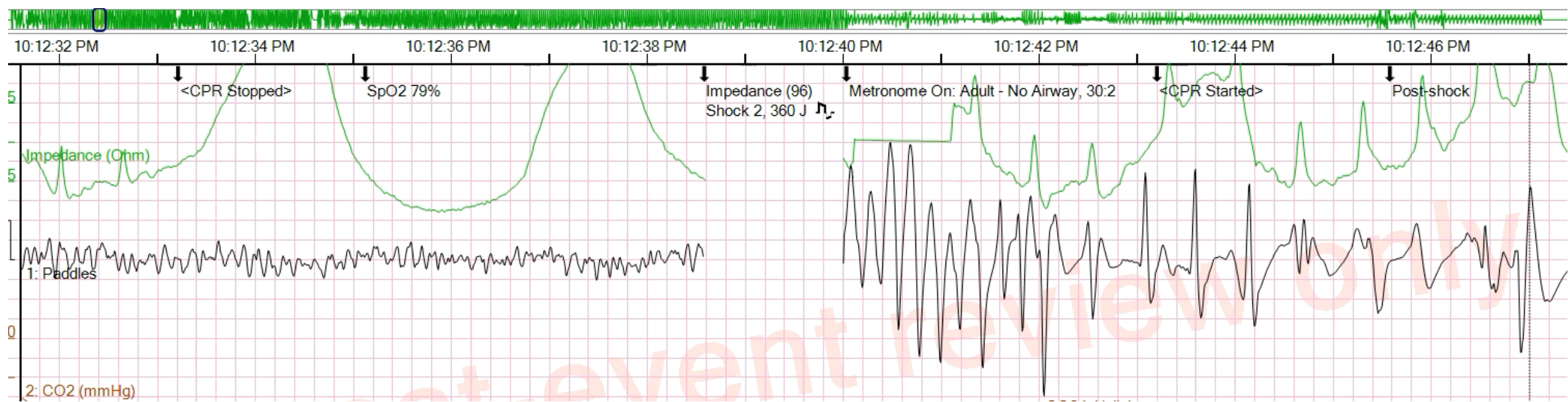
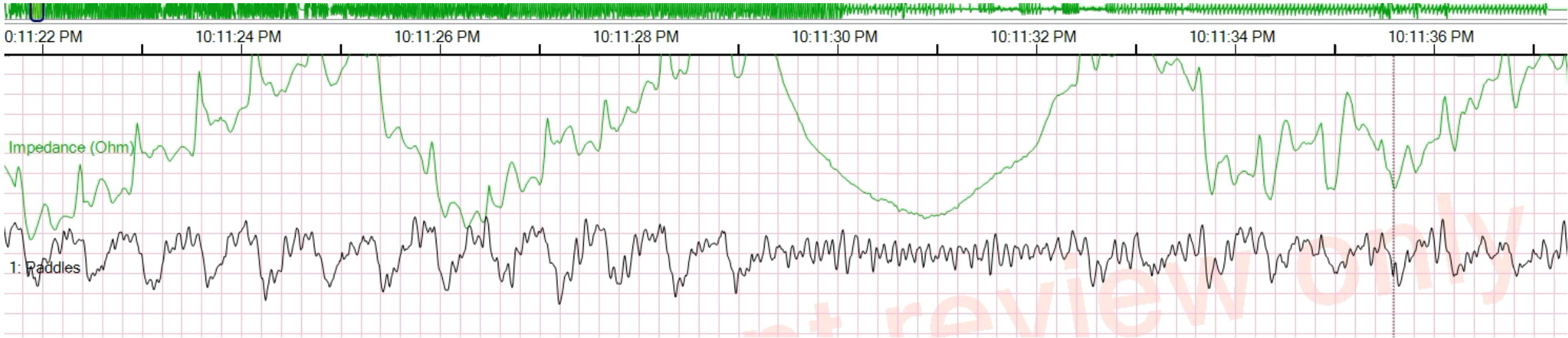
These data demonstrate that the cardiac oxygen consumption is increased by VF and that the presence of VF during CPR hampers the restoration of the myocardial energy state and contractility. Strategies that reduce VF duration without disrupting chest compressions will benefit the restoration of the cardiac energy state during resuscitations.

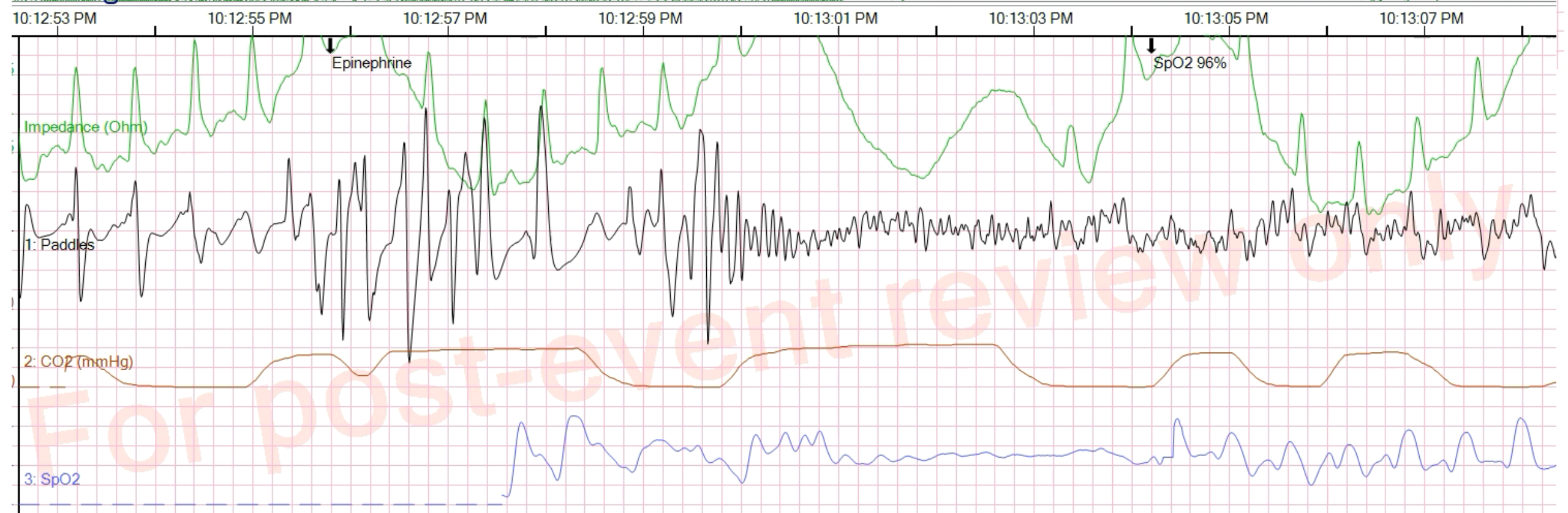
Slide compliments of Fred Chapman, PhD

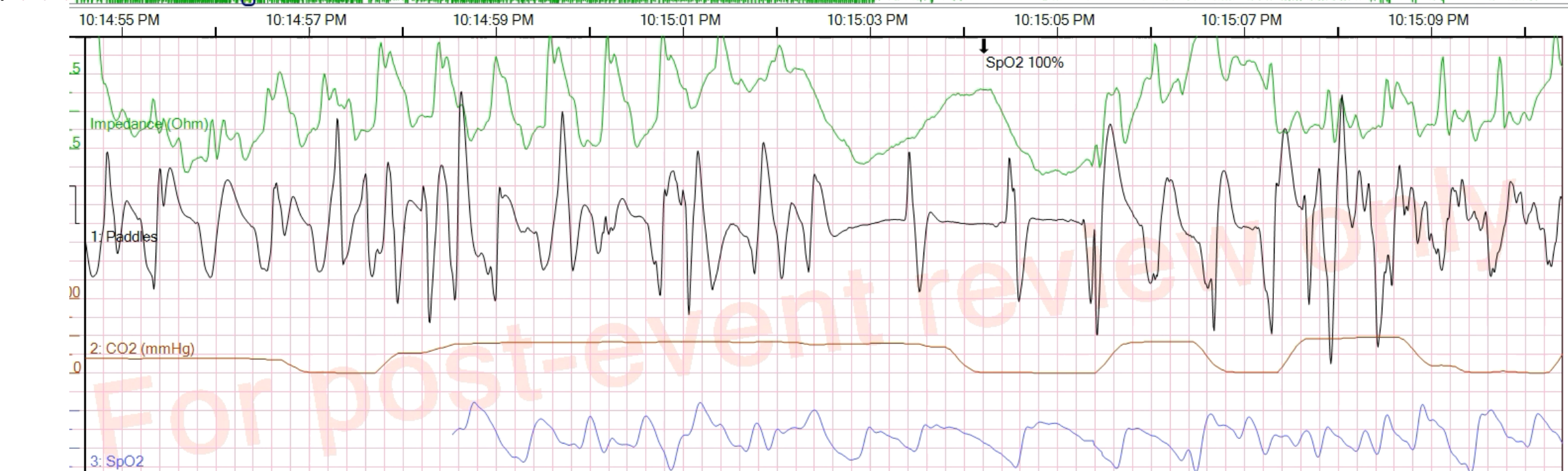
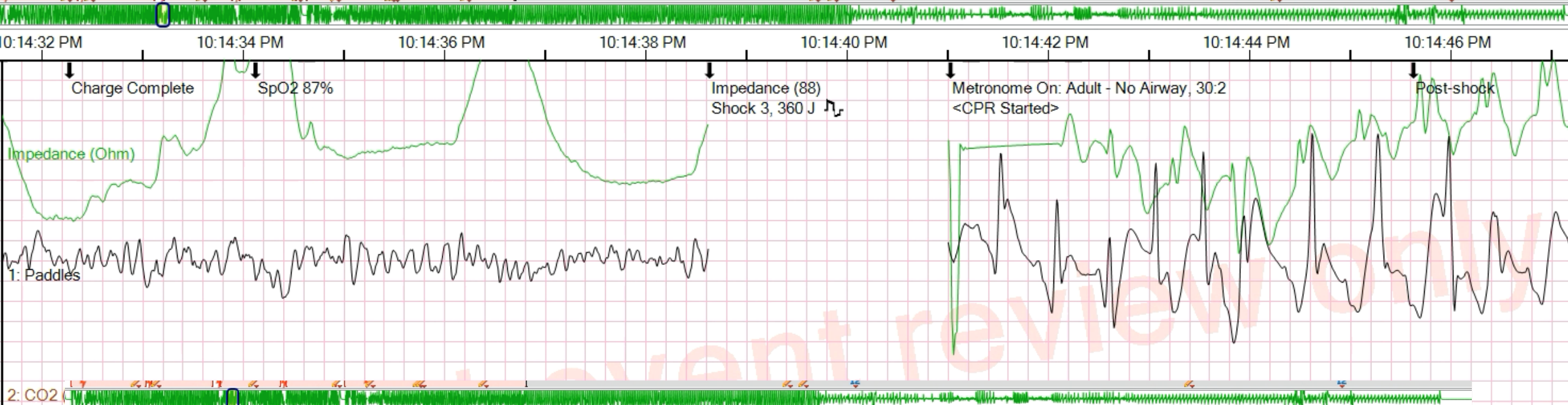
32 yo OHCA

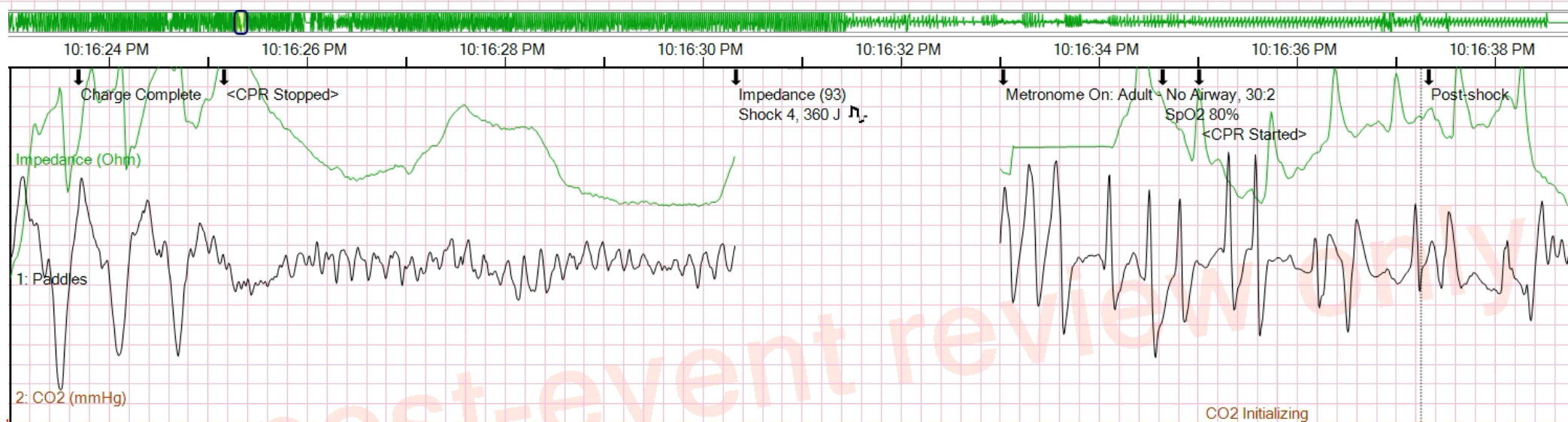
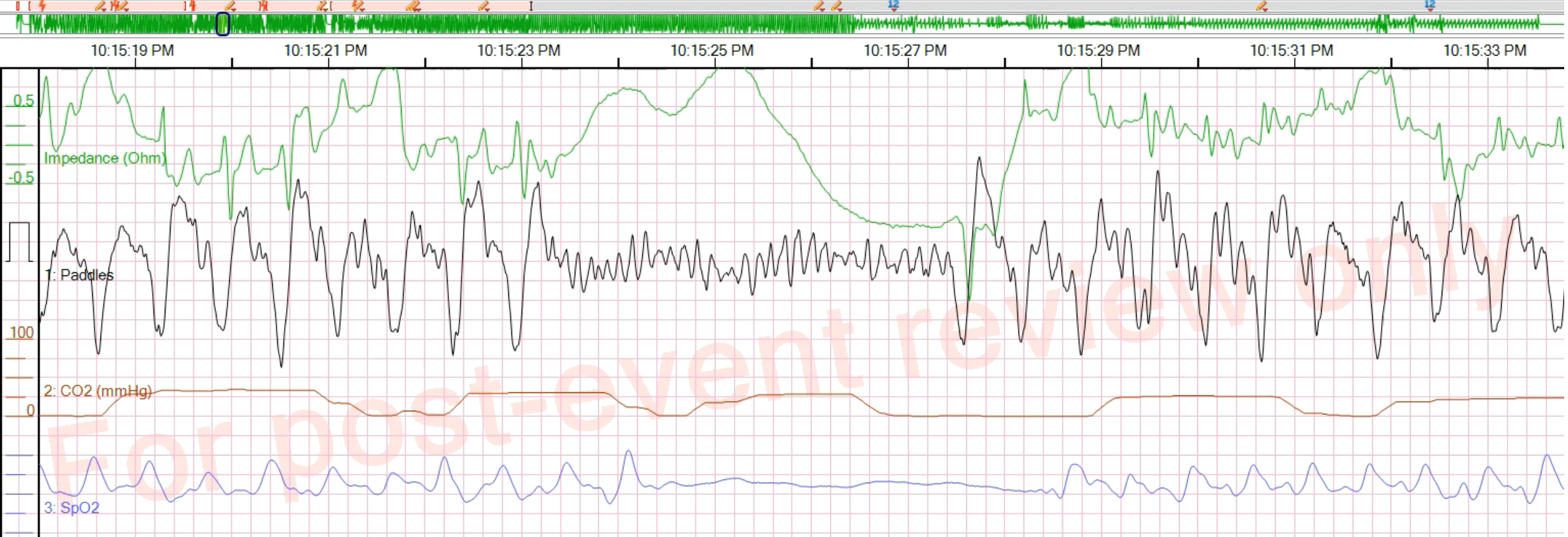
- S: Watching TV w girlfriend and mother, suddenly "went out". Dental extraction earlier, uses energy drinks no other hx
- O: 220lb M in cardiac arrest. Girlfriend performing TCPR on arrival. First rhythm VF
- A: Witnessed VF arrest
- P: 5 shocks for persistent VF on monitor, ROSC

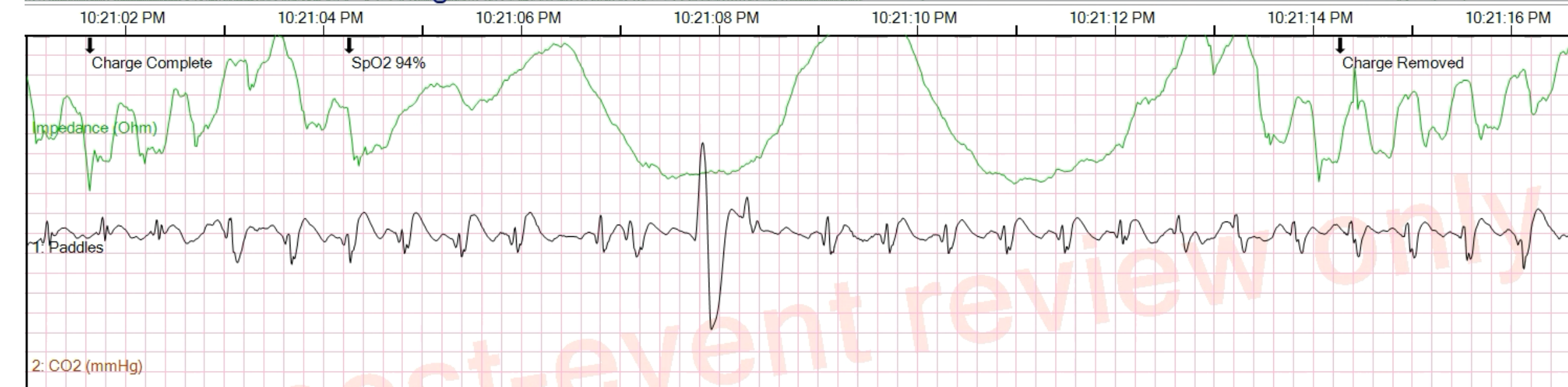
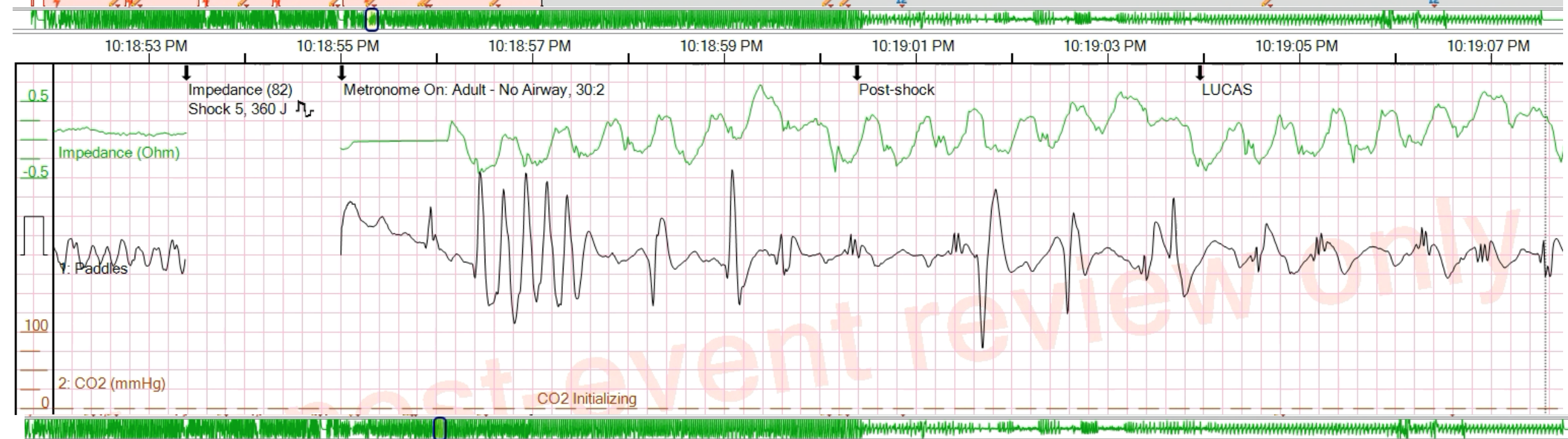


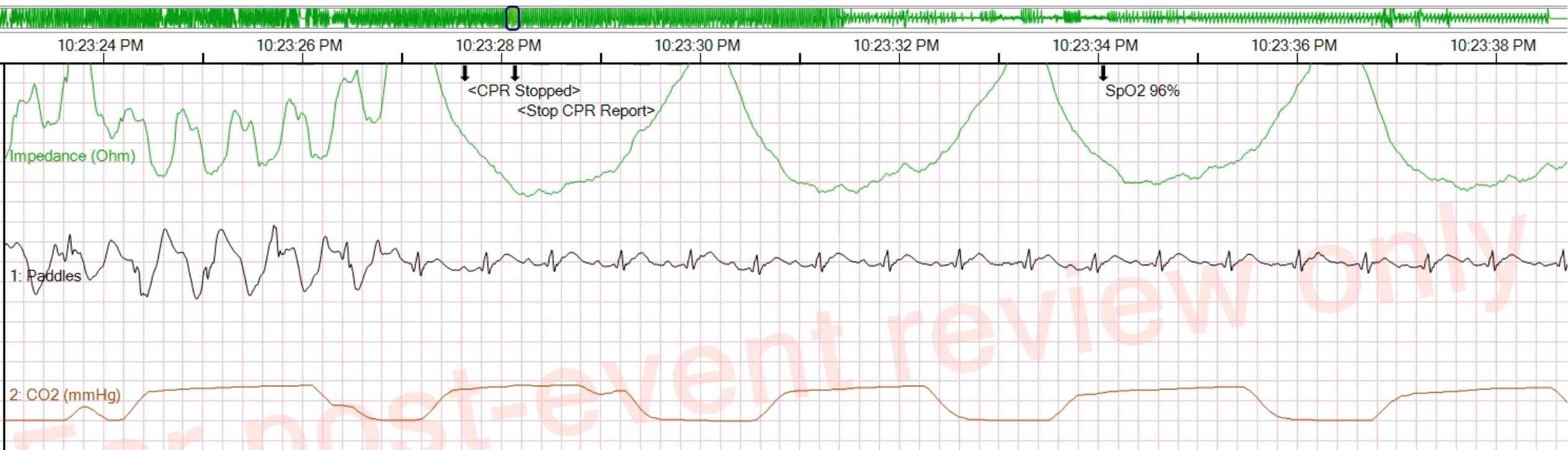










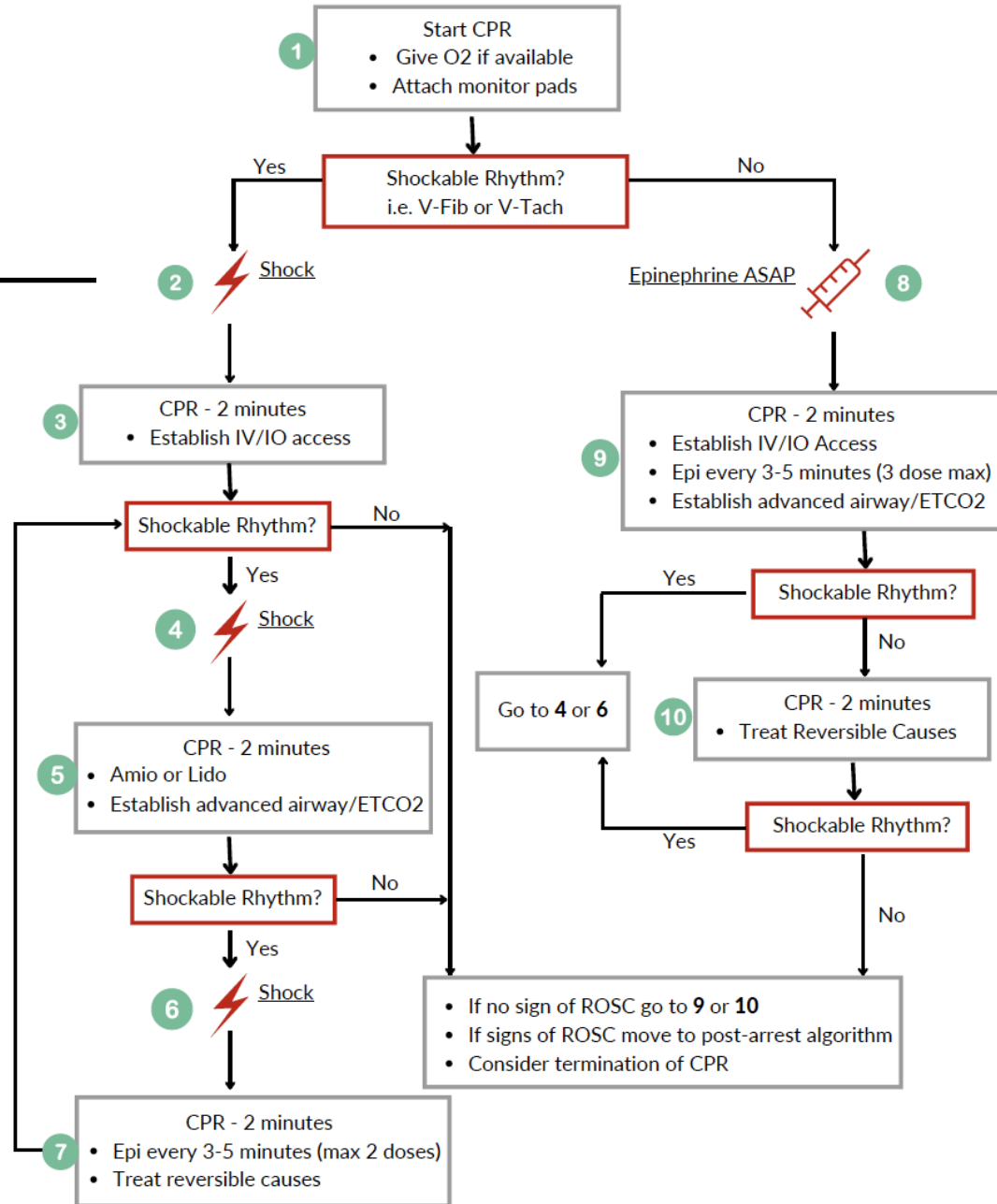


9 min

Start time	Device	Device ID	New	Report
4/4/2022 10:09:35 PM	LIFEPAK 15	LP157698	✓	Continuous Complete 🍏
4/4/2022 10:09:35 PM	LIFEPAK 15	LP157698	✓	Start Trend Data
4/4/2022 10:10:03 PM	LIFEPAK 15	LP157698	✓	Initial Rhythm
4/4/2022 10:10:44 PM	LIFEPAK 15	LP157698	✓	Shock 1, 360 J
4/4/2022 10:12:38 PM	LIFEPAK 15	LP157698	✓	Shock 2, 360 J
4/4/2022 10:14:38 PM	LIFEPAK 15	LP157698	✓	Shock 3, 360 J
4/4/2022 10:16:30 PM	LIFEPAK 15	LP157698	✓	Shock 4, 360 J
4/4/2022 10:18:53 PM	LIFEPAK 15	LP157698	✓	Shock 5, 360 J
4/4/2022 10:32:55 PM	LIFEPAK 15	LP157698	✓	12-Lead 1

Adult Cardiac Arrest Algorithm

Go to next page ←



Note - perform CPR at a 30:2 ratio - run a strip during each pause for breaths

CPR

Charge

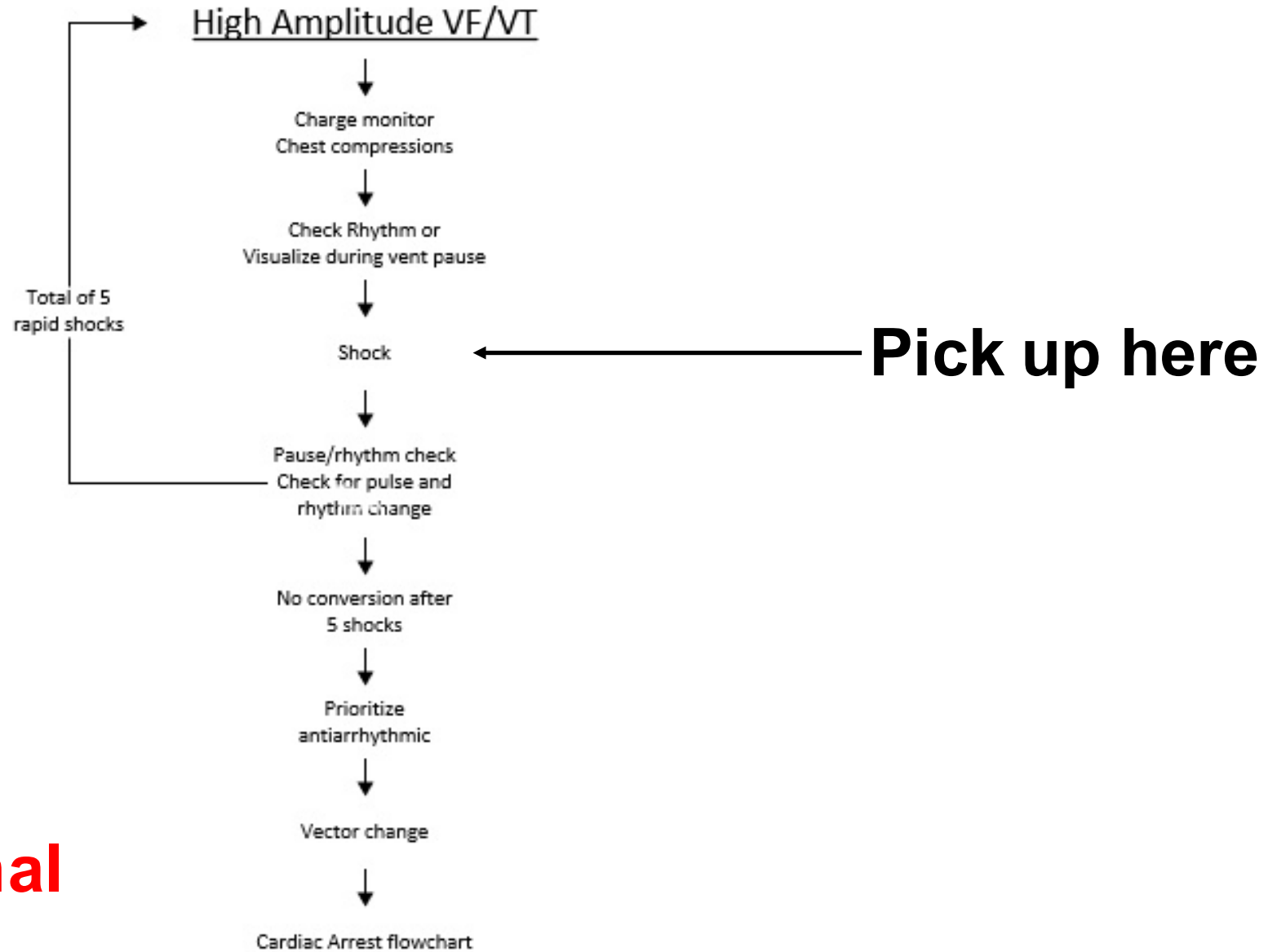
Shock

Pause and Look

Repeat

X5 if needed

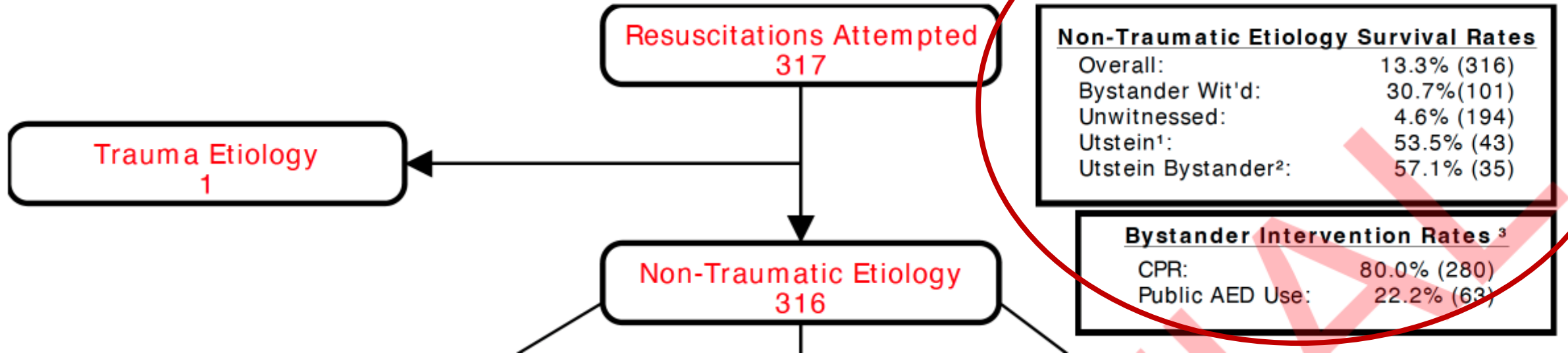
Then back to normal



Utstein Survival Report

Anchorage Fire Department

Date of Arrest: 01/01/22 - 12/31/22



Step 10 Culture



Culture of Excellence

- **How we do our job matters** –
 - *failure is unacceptable...*
- **“BLS owns CPR”** - taking ownership of the resuscitation and outcomes
- **Patient focused**, real-time peer feedback
- **“Nobody dies in my rig”**
- **Everyone** in a shockable rhythm survives (and some in asystole/PEA survive too!)
- ***Expect improvement!***

Michael K. Cobass, MD



“What you believe determines how you perform”

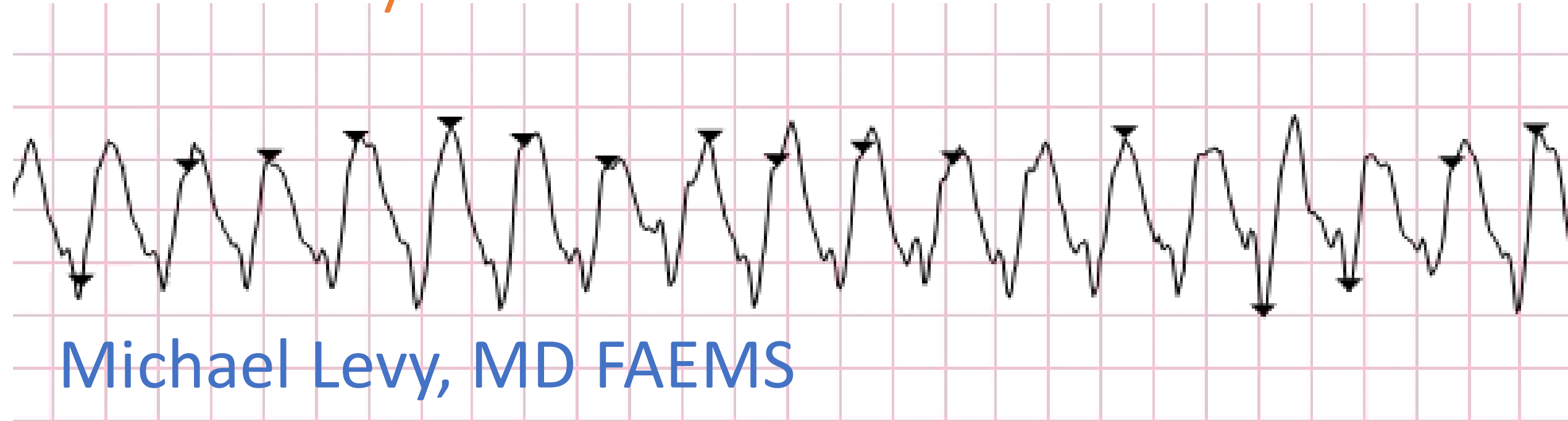
Summary: Time for a Change?

- VF is our most salvageable rhythm and yet we lose patients
- Recurrent VF is common
- In the field, we don't know how often we have recurrent VF because we don't look (Shock: back on the chest)
- Being in VF is not as good as being out of it. Only electricity fixes it
- Opportunity w VF: one round of short pause after shock and recheck every 20 seconds x 5 (if needed)
- Monitor results case by case

Refractory Resuscitation: Take Home

- Electricity gets you out of VF but CANNOT keep you out
- Aggressively treat VF with defibrillation
- Then...work on keeping the patient OUT of VF (not electricity's job)
 - Antiarrhythmic?
 - Less epi?
 - Off to ECMO/cath

Synchronized Cardioversion -OR- Synchronized Fibrillation?



Michael Levy, MD FAEMS

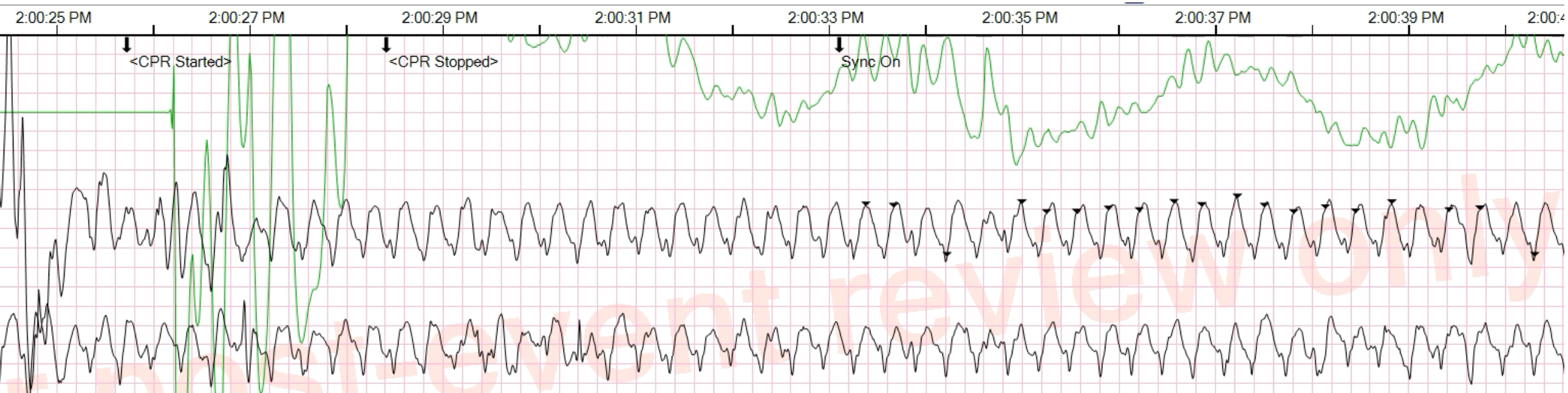
Immediate Past President NAEMSP
CMO Anchorage Areawide EMS
Medical Director State of AK Emergency Programs

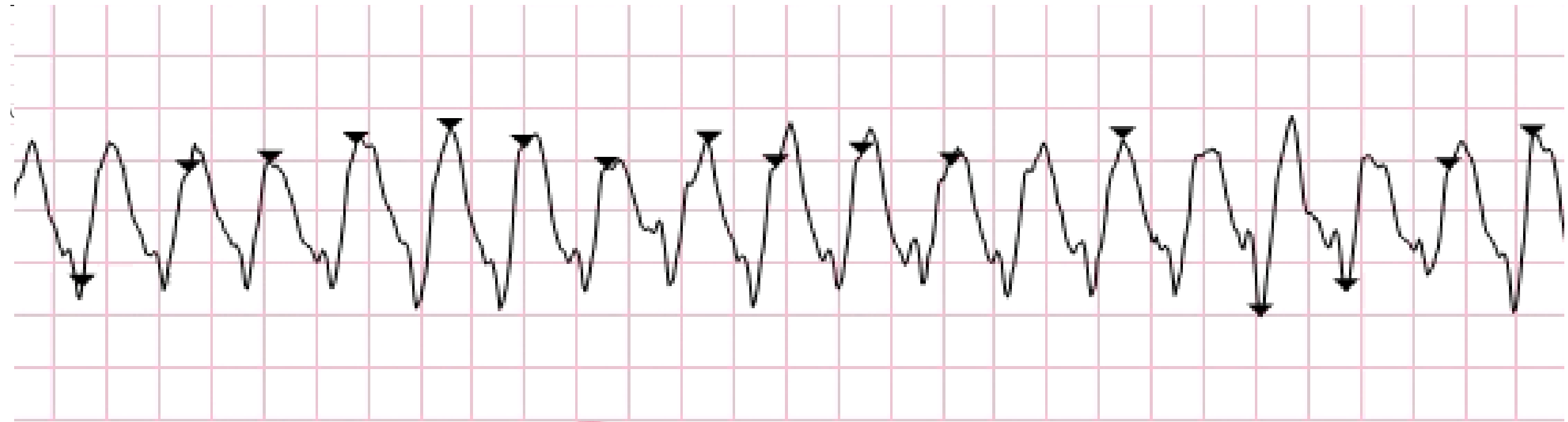
Synchronized Cardioversion

- Are you refreshing periodically on this technique?
- Do you ALWAYS look to see where on the QRS the machine is sensing
- Do you know how to change your settings to have the machine appropriately sense the QRS?
- What is the best first dose of energy? Why?

Focus on Cardioversion

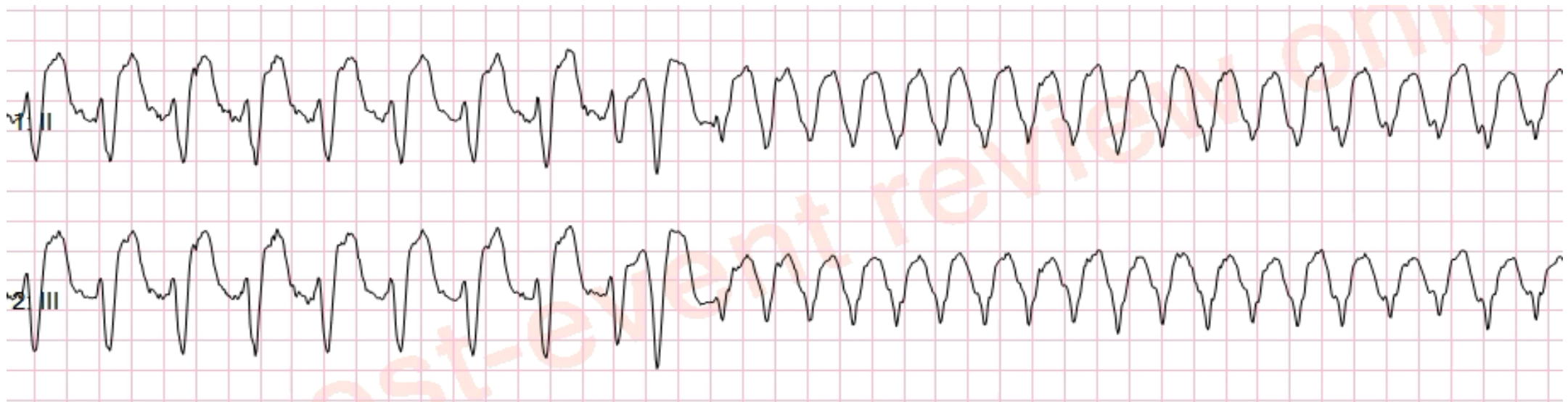
What is the LP-15 Sensing?






STEMI

- **S:** y.o, 10 min pta 10/10 chest pain radiating to the back
- **O:** HR 130 BP 143/102 looks ill, diaphoretic, otherwise normal exam
- **A:** STEMI
- **P:** ASA, nitro, fentanyl, STEMI alert
- Pt became dizzy during transport...(BP 120/80, mentation normal)

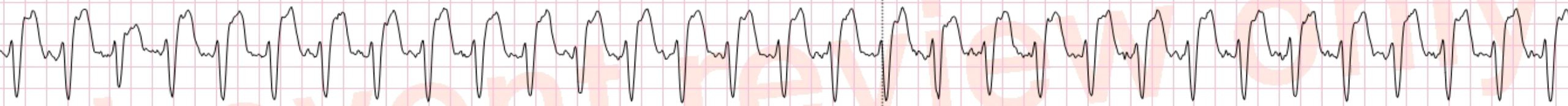
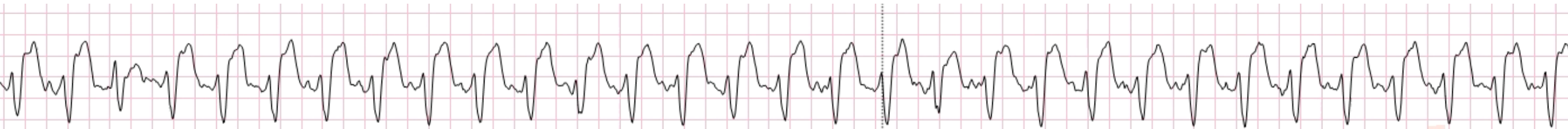
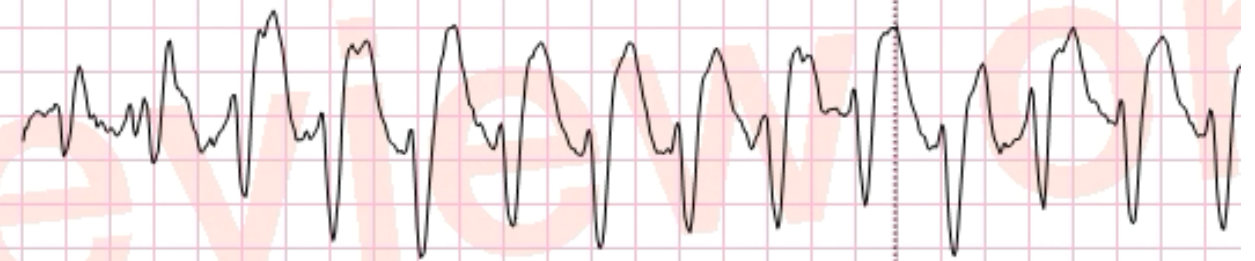
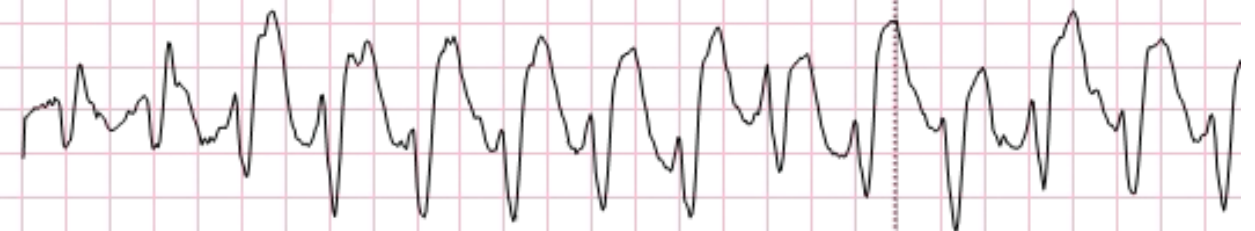
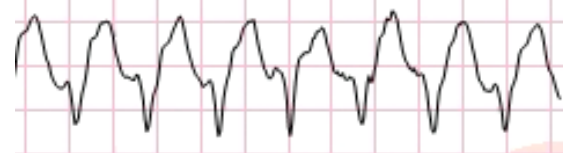
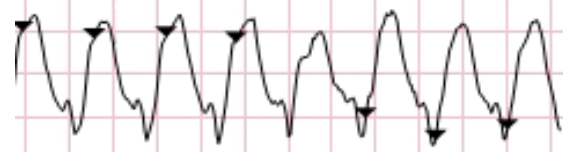




Impedance (137)
Shock 1, 125 J 

<CPR Started>

Post-shock



T wave sync

Dispatched to a ABD pain

S: Pt was a 40 yo M CC back pain. Pt was upstairs in his apartment. Pt states that he was released from the hospital approx 2 days ago after a short stay due to his heart failure and his kidney failure. Pt states that yesterday he was helping his brother work on his vehicle and this morning he was having back and ABD pain. Pt states that he cant get up without feeling pain and sick. Pt Is compliant with his medications. Pt denies any CP, SOB, or trauma. Pt states he as going to have his wife take him to the ED but that he an not walk on his own without possibly passing out so he called for 911.

O: pt was an approx 450lb M GCS 15 sitting on the floor next to his couch alert and oriented

A: patent

B: RR 28

C: strong radial pulse

HEENT: no obvious injury, PERRL

NECK: no obvious injury, no JVD or tracheal deviation

CHEST: equal chest rise and fall, no obvious injury, No CP

LS: clear

ABD: no obvious injury on and off pain

BACK: no obvious injury, no step off or crepitus, lower back pain

PELVIS: stable

GI/GU: continent

EXTREM: good pulses, +4 edema in lower extremities

SKIN: WDP

NEURO: alert

BEFAST/VAN: Negative

On Scene VS:

HR:84

BP:120/p

SPO2: 95 on home O2

T wave sync

Post-Movement

HR: 200

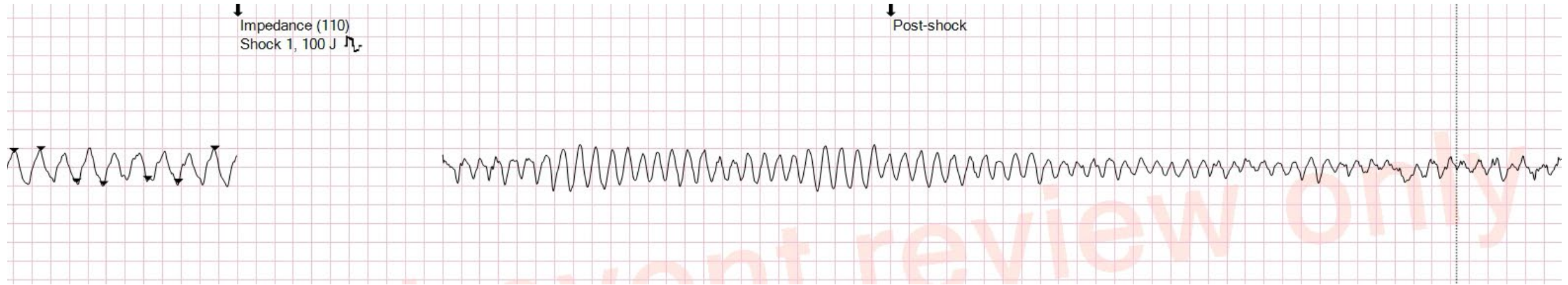
BP: 88/p

SPO2: <80

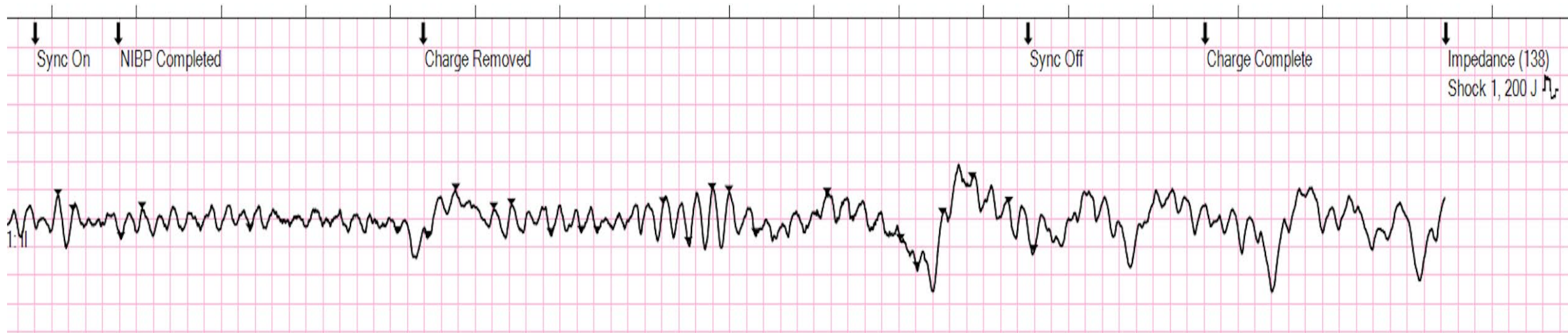
EKG: Vtach

A: cardiac arrest

P: See flow chart, Pt was alert and oriented and was able to help EMS get himself onto the stair chair, patient did not demonstrate and instances of distress, discomfort, or decompensation, pt was moved from the second floor of his building to the ground floor and within 20 feet of the gurney, due to the ground, snow, and ice there was no way to move the pt without him walking to the gurney based off of the pt weight, pt was able to take a few steps to the gurney with assistance and secured in a position of comfort, moved to ambulance, once in ambulance patient began to exhibit worsening symptoms after instance of exertion with movement, pt was placed on 4 lead and found to be in V tach with a rate of approx 200bpm, pt was now more short of breath, sweating, and complaining of CP, due to symptoms decompensating BP as well as pts overall appearance pt was synchronize cardioverted at 100j, after cardioversion pt began to lose consciousness and rate began to slow, pt became unresponsive and Code 99 was called, CPR was started and pt was ventilated with mask ventilations at a rate of 14 per minute, confirmed with good ETCO2, 5 rounds of CPR was performed at a rate of 30:2 and continued for the duration of the cardiac arrest, M3 and ALS 1 was requested, IO was attempted in his right humoral head but due to the size of the pt was unsuccessful, tibial IO successful, 2 rounds of Epi 1:10000 given, and 300mg of amiodarone followed by 150mg given, pt was shocked 2 times, after the second shock pt had a organized v tach with a pulse with a rate over 200, he was breathing on his own with labored respirations, still minimally responsive, cardioverted at 150j, pt went back into a ventricular rythmn, CPR continued, Airway was considered stable due to positive ETCO2 waveform, pt was transported to Regional as a code 99, enroute CPR was continued, upon arrival to the hospital pt was transferred to the ED bed with assistance and airway was taken over by the staff, the last 4 shocks on this monitor were due to the regional MD wanting to do double sequential defibrillation, ROSC was achieved in the ED and EMS was placed in service.



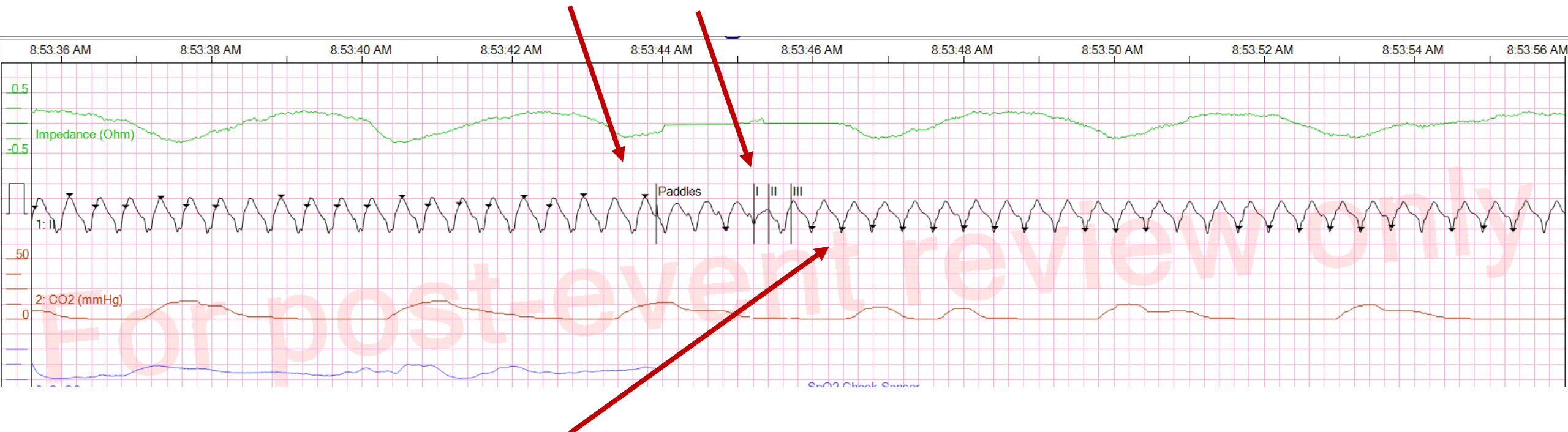
Confirm "Sync" is Off!

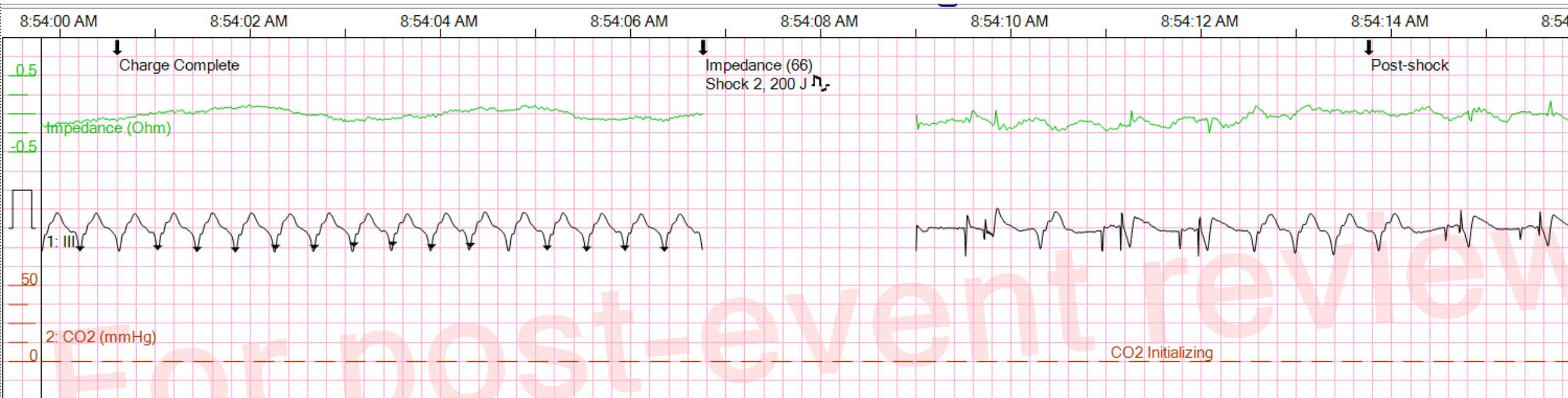


Dispatch Code Red Chest Pain

- **S:** woke w cp, weakness and dizziness. Feels heart fluttering. Has AICD, hx 9 stents
- **O:** BP 79/49 HR 145. Pt appears weak, slow to answer questions, exam otherwise wnl
- **A:** VT w pulse
- **P:** Sync cardioversion







AHA Recommended Energy for VT wPulse

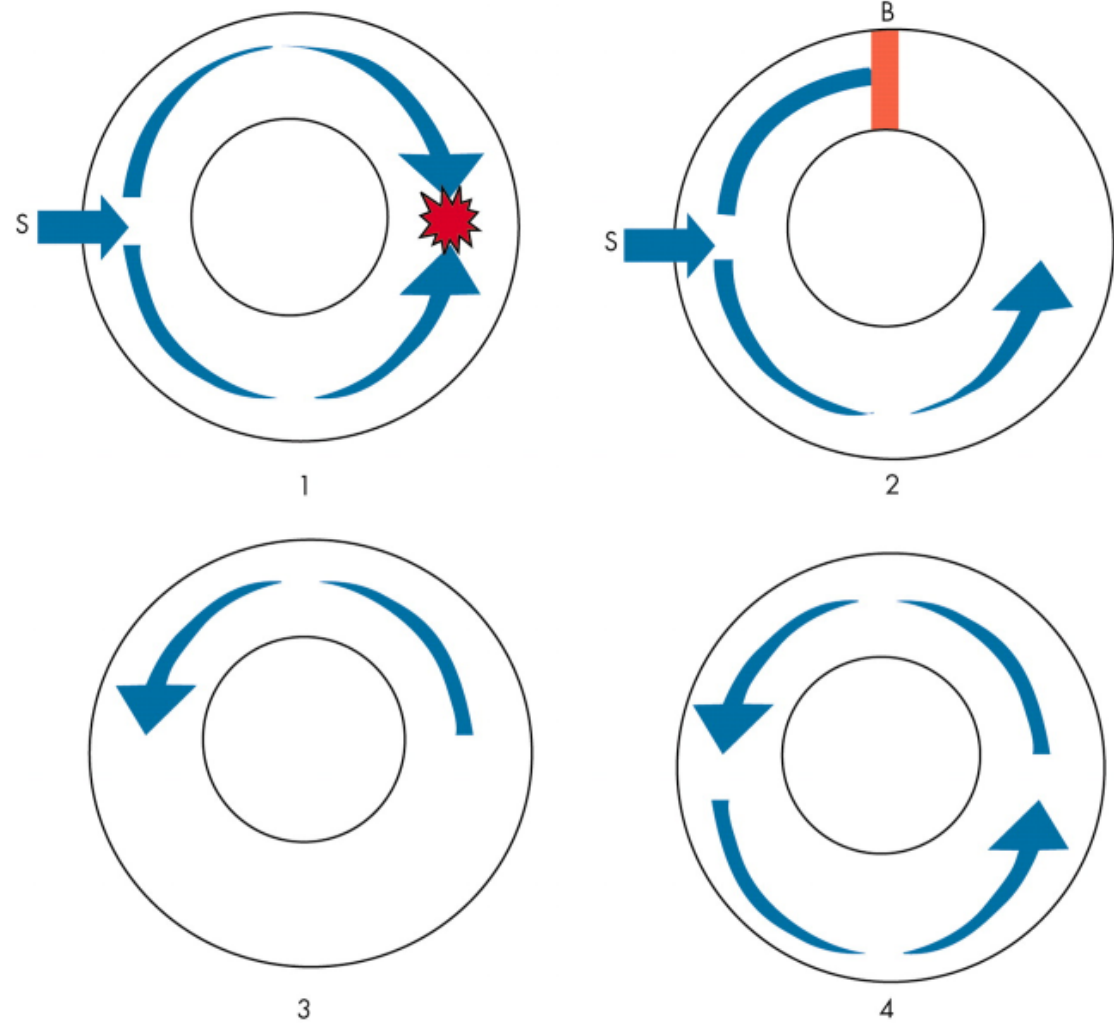
Ventricular Tachycardia

The amount of energy required for cardioversion of VT depends on the morphological characteristics and rate of the arrhythmia.²⁷ Monomorphic VT (regular form and rate) with or without a pulse responds well to cardioversion shocks at initial energies of 100 J MDS. Polymorphic VT (irregular morphology and rate) responds similarly to VF. The initial shock energy should be 200 J MDS. Give stepwise increases if the first shock fails to cardiovert.²⁷

https://www.ahajournals.org/doi/10.1161/circ.102.suppl_1.I-90#d3e244

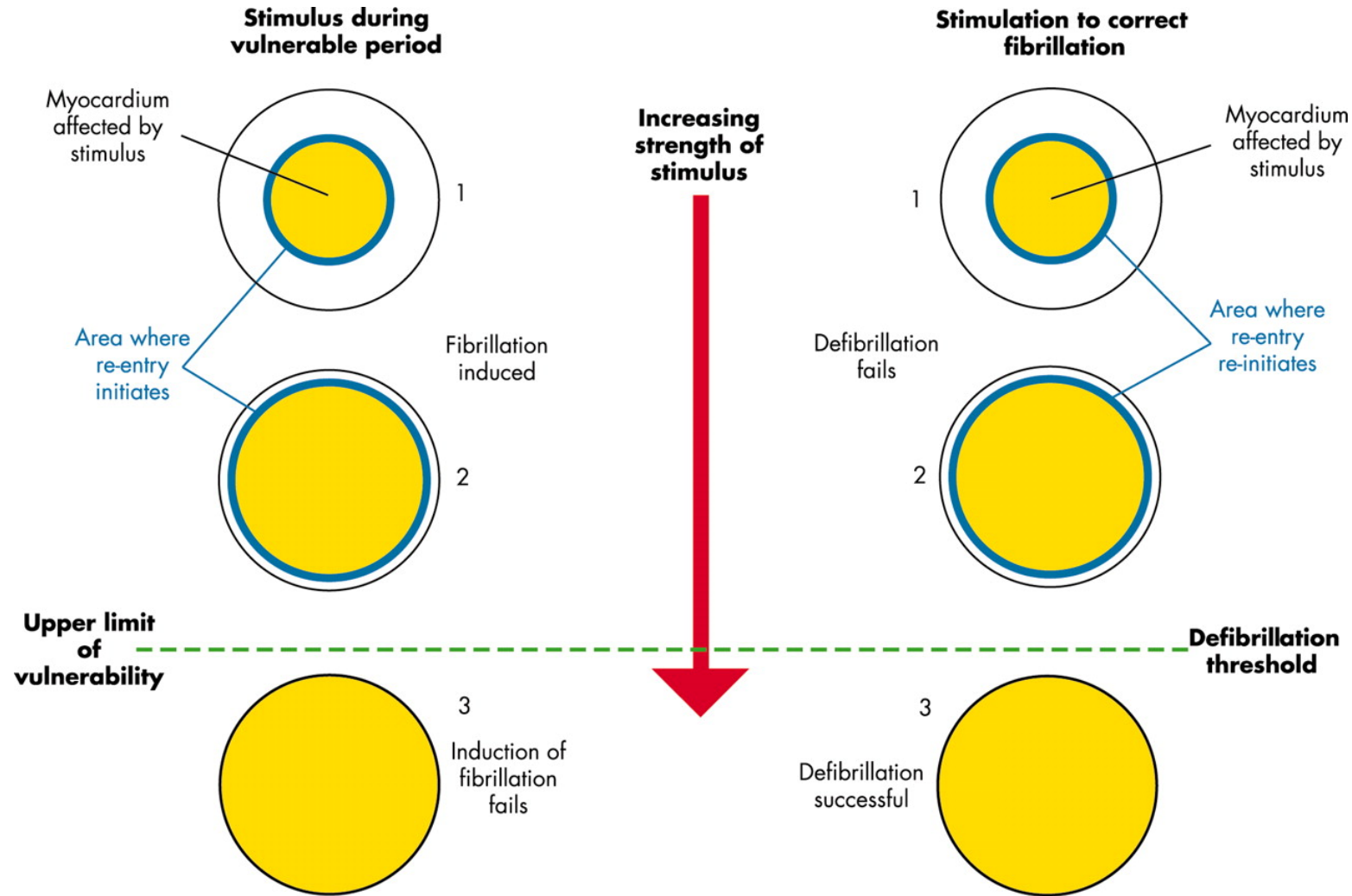


Re-entry.



A A J Adgey et al. Heart 2005;91:118-125

Relation between the upper limit of vulnerability and defibrillation threshold.



A A J Adgey et al. Heart 2005;91:118-125

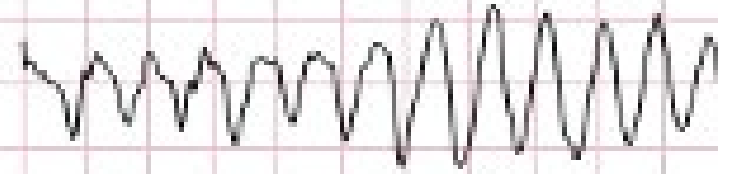
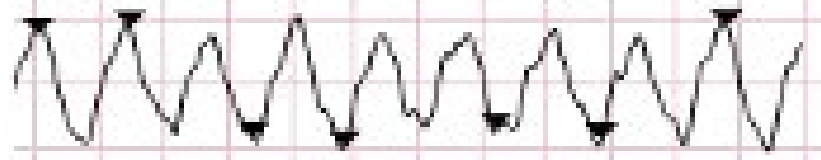
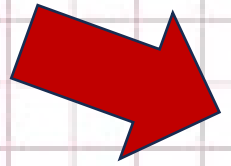


Energy < Defib Threshold

↓ Impedance (110)
Shock 1, 100 J

+

Energy Delivered in Vulnerable Period



Take Home Messages

- Synchrony Cardioversion is a relatively infrequent but important event
 - Review your monitor settings and do recurrent training
- Look at the sensing marker: change leads if it is sensing the T wave!
- Consider mandatory minimum energy
 - Exceed the Upper Limit of vulnerability and Reach the Defibrillation Threshold
 - Consider **200J** as starting dose

Thank You

Happy Successful Synching