

OMD Podcast: Transcutaneous Pacing

Summary Points:

- The Causes of Bradycardia
- When to Think About Pacing
- How to Pace Patients
- Assessing Capture
- Hypotension Despite Pacing
- What to Do If Pacing Fails
- Pacing and Peri-Code Patients
- After-care
- The Handoff at the ED

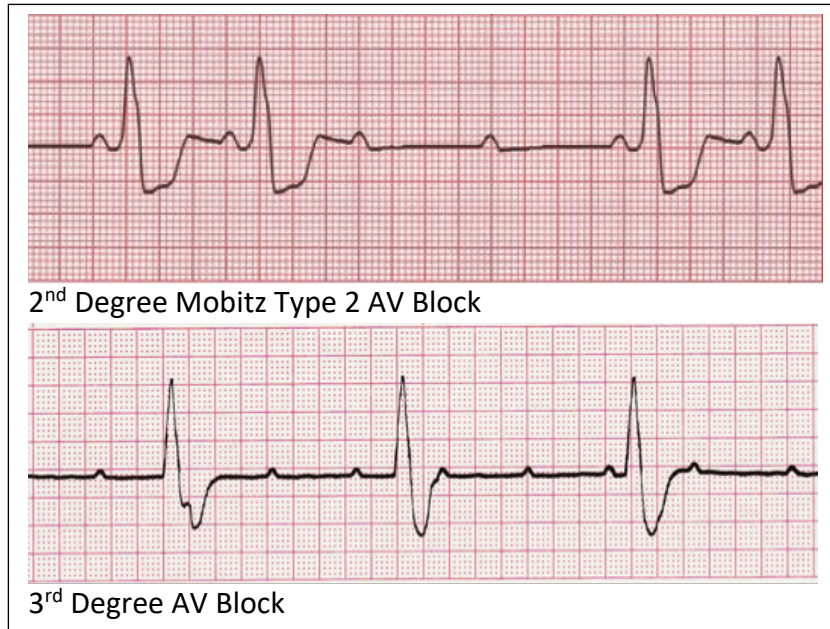


• The Causes of Bradycardia

- Number one cause of bradycardia is HYPOXIA
 - If patient is becoming bradycardic, assess their respiratory status to ensure this is not due to hypoxia or hypoventilation
- Severe electrolyte derangements can lead to symptomatic bradycardia
 - Hyperkalemia especially
- Ischemia of the heart (MI)
 - Can break the electrical system within the heart leading to low heart rate
- Effects of a medication or toxin
 - Especially CCB or beta-blocker OD, which will be resistant to pacing

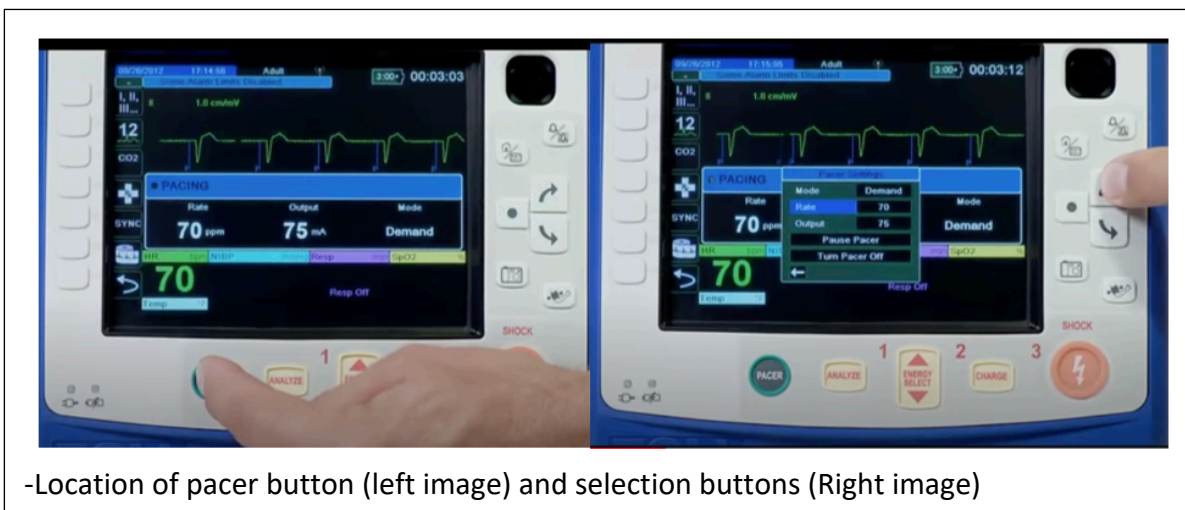
• When to think about Pacing

- Pacing is NOT for isolated bradycardia
 - The requirement is bradycardia with HYPOTENSION
 - A heart rate of 60 is less likely to be the cause of hypotension
 - Consider other causes (sepsis, pneumothorax)
 - A heart rate UNDER 60 WITH hypotension
 - An awake and comfortable patient does NOT need immediate pacing
- Is this a truly symptomatic and unstable bradycardia as is indicated by signs or symptoms of poor perfusion or end organ dysfunction.
 - Hypotension is going to be your #1 marker for unstable bradycardia
 - Additionally, if there is hypotension or relative hypotension (define relative) and:
 - New onset altered mental status OR
 - ACS (like tons of ST depressions) or 12-lead showing STEMI OR
 - Acute Pulmonary Edema/fluid overload
 - High degree heart block (2nd Degree Type 2 or 3rd degree)
- Pacing is NOT necessary in patients with asymptomatic bradycardia, or STABLE symptomatic bradycardia (without above criteria) – SOB/Palpitations/Weakness.
 - In these patients, can consider atropine HOWEVER if there is ischemia or a heart block, this can lead to worsening
 - If it isn't broke, don't fix it



- **How to Pace Patients**

- In an UNCONSCIOUS Unstable patient
 - Get pads on and get capture
 - If there is a delay which prevents immediate pacing (equipment issues), ok to give atropine/fluids but the PRIORITY IS PACING not getting an IV to push atropine
- In an AWAKE but unstable patient
 - Get pacer pads on and get capture
 - Move to pain control/sedation quickly as they may not tolerate pacing
- Place pads on dry chest wall (mat need to towel off if diaphoretic)
 - Do NOT place over implanted hardware (AICD/pacer), wounds or medication patches
- Press "PACER" button at bottom of Monitor
 - Once Pacer screen pulls up, use the round and arrow buttons on the right side of the screen to set current and rate
- Start ALL Patients (adult and peds) at an output of 30 mA
 - Initial HR is determined by age, for adults it 70 ppm.



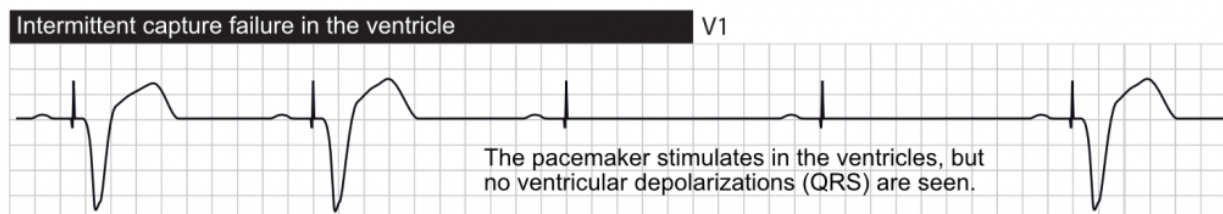
-Location of pacer button (left image) and selection buttons (Right image)

- The ultimate goal is to start with a heart rate that is significantly HIGHER than the heart rate you are treating, so you know when you have electrical Capture
- Increase the CURRENT by 10 mA increments until you get electrical capture
 - This should be accomplished rapidly, over less than a minute
 - Helps you to quickly determine if pacing is going to work or not.
 - Your max output is 140 mA
- MAKE SURE your 4-lead is in place or pacer will not work
- Sedation performed with ketamine (0.5 mg/kg)
 - This is a LOWER DOSE than in DAA

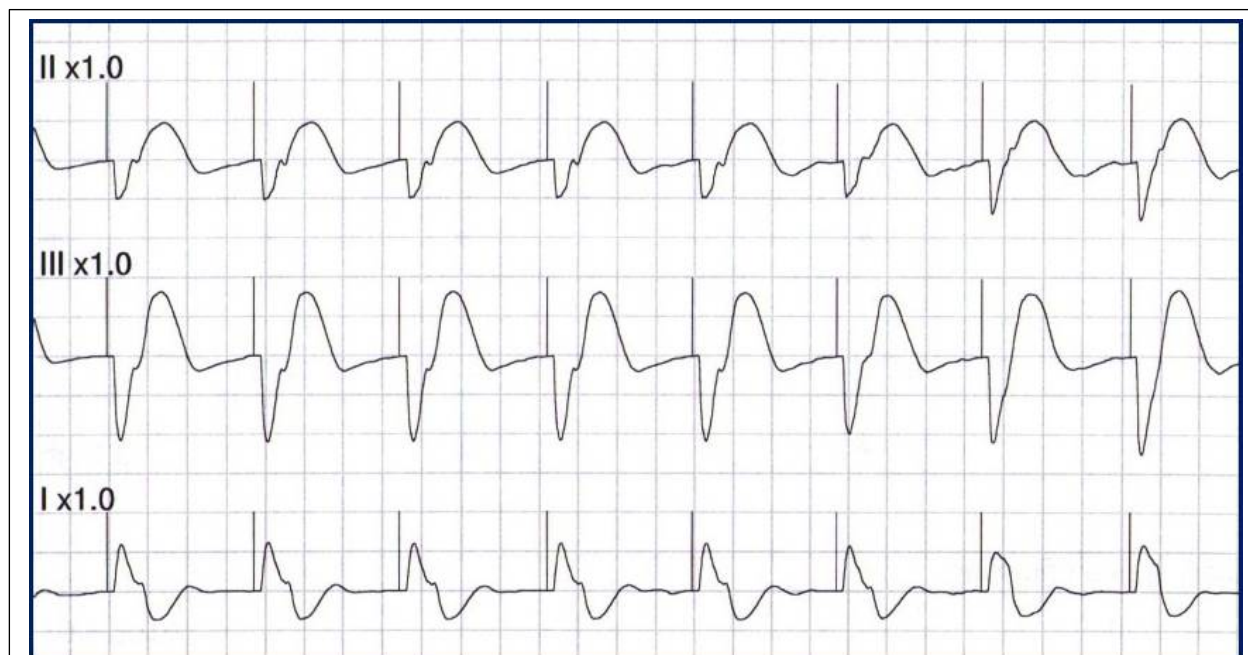
PEDIATRIC				Adult
Age	0-36 Months	36 months—12 years	≥ 12 years	12 years and older
Rate	120 ppm	100 ppm	70 ppm	70 ppm

• How to Assess Capture

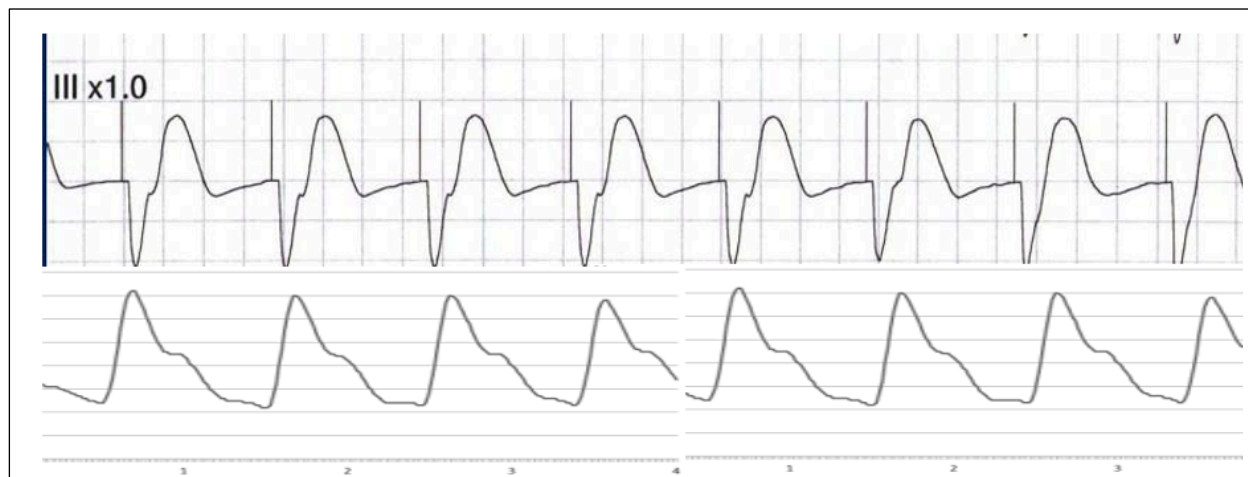
- Two kinds of capture: Electrical and mechanical
 - Electrical capture: The cardiac conduction pathway cells of the heart may respond to the electrical signal of the pacer, but that does NOT mean the myocardial or actual heart muscle cells are actually responding
 - Mechanical: This is the myocardial response to the electrical signal from pacer – means the heart is actually beating in response to pacing
- Electrical capture:
 - After each pacer spike, will get a wide QRS complex (like a PVC)
 - HR of the wide complexes will match the set pacer rate
- Demand Pacing
 - Will only cause the pacer to fire if the patient’s heart is beating intrinsically
 - Will result in the pacer only firing 40 times per minute if set at 70 but patient’s heart is beating 30
 - Even on demand mode, if mechanical capture is maintained, BP and SPO2 pleth wave will not falter
 - When patient’s heart beats independently, will perfuse
 - WHEN IN DOUBT – treat like is intermittent capture
 - You do NOT have capture if:
 - Intermittent Wide complex with intervening narrow complex QRS in patient with little or no underlying rhythm
 - The HR on the ECG does NOT match the set paced rate



- Both types of capture look IDENTICAL on the 4-lead
 - Differentiate based on pulse, Pulse-ox and BP
 - If with electrical capture, you get palpable pulse, the BP improves and the Pulse-oximetry waveform corresponds to the 4-lead, can say you have mechanical capture
- If you have electrical capture but not mechanical, continue to increase current by 10mA increments until mechanical capture achieved or until maxed
- Once you have capture, repeat VS to assess for response to pacing



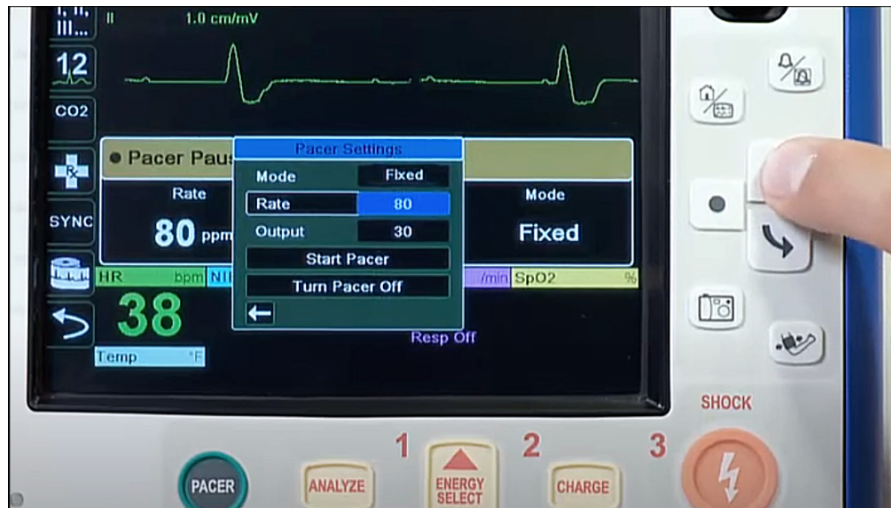
-Example of electrical capture, cannot determine mechanical from ECG alone



-Example of mechanical capture (Top ECG, bottom SPO2 waveform)

- **Hypotension Despite Pacing**

- Once you have verified mechanical and electrical capture and your patient is STILL hypotensive
 - First attempt to increase the pacer Heart Rate
 - Will help boost cardiac output, but the higher you go the less an increase will mean
 - As you increase HR (and frequently recheck to ensure mechanical capture is maintained) gradually (suggest 10 BPM increments) to get to goal BP
- If the hypotension persists DESPITE increased HR and good capture
 - Consider other interventions
 - Give IV fluids
 - Consider Push-dose epi
 - Consider an epi-drip
 - Epinephrine is better in this specific area as it more directly stimulates the heart muscle
 - Levo is not the pressor of choice here
 - Remember; E is for Electricity



- **What to Do if Pacing Fails**

- If you have maximized current and have no indication of capture, or persistent electrical capture WITHOUT mechanical capture
 - Check pad placement – make sure you have good contact, consider repositioning
 - Check connections to make sure no issues
- Consider alternative causes for symptomatic bradycardia
 - Toxicologic causes: Beta-blocker or Calcium channel blocker toxicity
 - Metabolic causes: Hyperkalemia, severe acidosis or hypoxia
 - Severe shock
 - Hypothermia – Do NOT pace patients with body temp <86°F
- Treat potential alternative causes of symptomatic bradycardia per protocol

- **Pacing in the Peri-Code Patient**

- In patients who are very unstable or are close to arresting
 - Pacing can be the answer (if hypotensive and bradycardic) but can MASK the loss of pulses
 - Will lose mechanical capture OR will have insufficient perfusion with capture
 - Assess based on palpable pulses, mental status and mechanical capture
- Be very cautious applying pacing to patients with multiple system failures
 - Persistent low GCS
 - Respiratory and cardiac failure
- Even Post-ROSC, must watch these patients very very closely as pacing can mask the loss of ROSC
 - Keep a close eye on mechanical capture, pulses and marker of perfusion

- **The Handoff**

- One of the most crucial steps in Pacing care
- There have been multiple cases of patients crashing during transition of care at the hospital
- Discussion of transition of care should likely take place with the care provider in the room (not a nurse only handoff)
 - Clearly state that the patient is currently PACER DEPENDENT
 - Leave your pads and equipment in place until instructed by the accepting practitioner on how the transition will take place and what the specific plan is
 - Do NOT remove pacing unless specifically instructed to by the accepting practitioner and with verbalization of the plan to transfer pacing to their equipment
 - Place facility pads in antero-lateral positions and prepare facility monitor with appropriate settings
 - Get electrodes in place and be ready to pace instantly once you have stopped
 - EMS timeout
 - Countdown to transition

SUMMARY IN BRIEF

- Pacing is a tool ONLY in patients who are hypotensive AND bradycardic WITH symptoms
- Start pacing at 30mA and 70 BPM; increase by 10mA rapidly until capture or until max output reached (140mA)
- Assess capture based on BP and agreement between SPO2 pleth waveform and your 4-lead
- Demand pacing is complex- when in doubt, treat like its intermittent capture
- When hypotension doesn't get fixed by pacing; up the HR then consider other treatments (epi/fluids)
- Pacing can mask an arrest – be very careful and vigilant in these patients; monitor ETCO₂, SPO₂ and pulses
- Handoff practices in the ED are CRITICAL; have a provider, have a plan and minimize interruptions

- **Additional Resources**

Zoll X-series Pacing Video

https://www.youtube.com/watch?v=L43BOnTp_IQ