Unstable Bradycardia – Pacemaker Insertion

Section 1: Case Summary

Scenario Title:	Unstable Bradycardia - Pacemaker Insertion
Keywords:	Syncope, third-degree heart block, bradycardia
Brief Description of Case:	Rural ED with limited resources. Elderly patient with syncope. Found to be in third degree heart block. Unstable requiring pacing. Initial management includes ACLS approach with transcutaneous pacing. Upon stabilization the objective is placement of a transvenous pacemaker for transport to a higher level of care for permanent pacemaker insertion.

Goals and Objectives	
Educational Goal:	1. Approach to unstable bradycardia
Objectives: (Medical and CRM)	1. ACLS bradycardia management 2. Technical aspects to starting transcutaneous and transvenous pacing
EPAs Assessed:	ACLS approach to bradycardia, recognizing the need for pacing and description of technical aspects (transcutaneous & transvenous), coordinating transfer for permanent pacemaker insertion

Learners, Setting and Personnel				
Target Learners:	☐ Junior Learners	☒ Senior Learners	☐ Staff	
	☐ Physicians	☐ Nurses	☐ RTs	☐ Inter-professional
	☐ Other Learners:			
Location:	☒ Sim Lab	☐ In Situ	☐ Other:	
Recommended Number of Facilitators:	Instructors: 1-2			
	Confederates: 1			
	Sim Techs: 1			

Scenario Development	
Date of Development:	2020
Scenario Developer(s):	Dr. Charles Stringer
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Last Revision Date:	
Revised By:	
Version Number:	

Section 2A: Initial Patient Information

A. Patient Chart					
Patient Name: Olga Malbon			Age: 74	Gender: M	Weight: 100kg
Presenting complaint: Collapse					
Temp:36.4	HR: 32	BP: 78/50	RR: 18	O_2Sat: 99	FiO_2: room air
Cap glucose: 6			GCS: 15 (E4 V5 M6)		
Triage note: Patient gardening at home upon standing felt lightheaded and passed out on to grass. No injury from fall. Witnessed by husband. No shaking, no incontinence. EHS placed c-spine collar, noted bradycardia and hypotension at the scene.					
Allergies: none					
Past Medical History: Hypertension Hypothyroidism Coronary Artery Disease (NSTEMI in 2015)			Current Medications: Ramipril 10mg PO daily Metoprolol 100mg PO BID Levothyroxine 125mcg PO daily ASA 81mg PO daily		

Section 2B: Extra Patient Information

A. Further History
The patient (Mannequin's voice): Previously well, but all day have been feeling weak. Stood up after weeding and felt very lightheaded and collapsed onto grass. No pain, palpitations, shortness of breath prior to collapse. No history of collapse. Now just feeling tired and weak. No change to medicines, no overdose, no angina, no diet change. No neck pain, no paresthesia. **Patient's husband:** Working alongside patient in garden, collapse with LOC for 5-10 seconds, no shaking/incontinence/tongue biting. Woke slightly confused which quickly cleared.

B. Physical Exam	
List any pertinent positive and negative findings -> NO SIGNIFICANT FINDINGS OTHER THAN BRADYCARDIA, NO TRAUMA	
Cardio: regular bradycardia, no murmur/rub	Neuro: GCS15
Resp: GAEBL	Head & Neck: no cspine tenderness
Abdo: SNT	MSK/skin: dry, non-tender, no signs of trauma
Other:	

Section 3: Technical Requirements/Room Vision

A. Patient
☒ Mannequin *(adult) on backboard with cspine collar placed by EHS*
☐ Standardized Patient
☐ Task Trainer
☐ Hybrid
B. Special Equipment Required
Cardiac monitor/defibrillator with pacing capability Cordis central line kit Transvenous pacemaker and wiring
C. Required Medications
Atropine, Epinephrine infusion
D. Moulage
Elderly female in casual clothes, on backboard with cspine collar
E. Monitors at Case Onset
☐ Patient on monitor with vitals displayed ☒ Patient not yet on monitor
F. Patient Reactions and Exam
Comfortable and pleasant. Appears fatigued and slightly confused deferring to husband for most questions stating she "doesn't feel quite right". Exam only notable for marked bradycardia with strong pulse.

Section 4: Confederates and Standardized Patients

Confederate and Standardized Patient Roles and Scripts	
Role	*Description of role, expected behavior, and key moments to intervene/prompt learners. Include any script required (including conveying patient information if patient is unable)*
Husband	Initial history: Working alongside patient in garden, collapse with LOC for 5-10 seconds, no shaking/incontinence/tongue biting. Woke slightly confused which quickly cleared. Response to most questions: She is healthy, no drugs or alcohol, no depression or suicidal thoughts,
EHS	C-spine collar placed out of abundance of caution as patient seemed slightly confused, but no compliant of pain and no high risk fall/injury. No focal neurologic findings.

Section 5: Scenario Progression

Scenario States, Modifiers and Triggers				
Patient State/Vitals	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State		Facilitator Notes
1. Baseline State Rhythm: 3rd degree block HR: 32 BP: 78/50 RR: 18 O_2SAT: %100 T: 36.4oC GCS: 15 Glucose: 6	Alert, mild confusion, feeling tired and 'not right'	<u>Expected Learner Actions</u> ☐Obtained a focused history/exam ☐ Obtain 12-lead ECG ☐ Obtain large bore IV access ☐ Send labs (inc. troponin, electrolytes, TSH) ☐ Initiate fluid bolus ☐Trial atropine 0.5mg IV ☐Trial epinephrine infusion ☐Place pacer pads on patient	<u>Modifiers</u> *Changes to patient condition based on learner action* -Fluids -> no change -Atropine -> no effect -Epinephrine infusion -> delay to availability (minimal effect) <u>Triggers</u> *For progression to next state* -Atropine failure -> 2. Worsening Hypotension	
2. Worsening Hypotension – ACLS bradycardia approach HR: 24 BP: 68/42		<u>Expected Learner Actions</u> ☐ Initiate transcutaneous pacing. Explain the process (Appendix C) ☐ Initiate sedation ☐ Intubation as deep sedation required (no predictors of difficulty)	<u>Modifiers</u> -Pacing (105mA due to large body habitus) -> requires sedation -Sedation -> requires intubation (straightforward intubation) <u>Triggers</u> -Intubation -> 3. Preparation for transport	
3. Preparation for transport – transvenous pacemaker placement HR 80 (paced)		<u>Expected Learner Actions</u> ☐Communicate with accepting physician from regional hospital for permanent PCM insertion	<u>Modifiers</u> -Calls regional cardiologist -> accepts but requests transvenous PCM insertion <u>Triggers</u>	

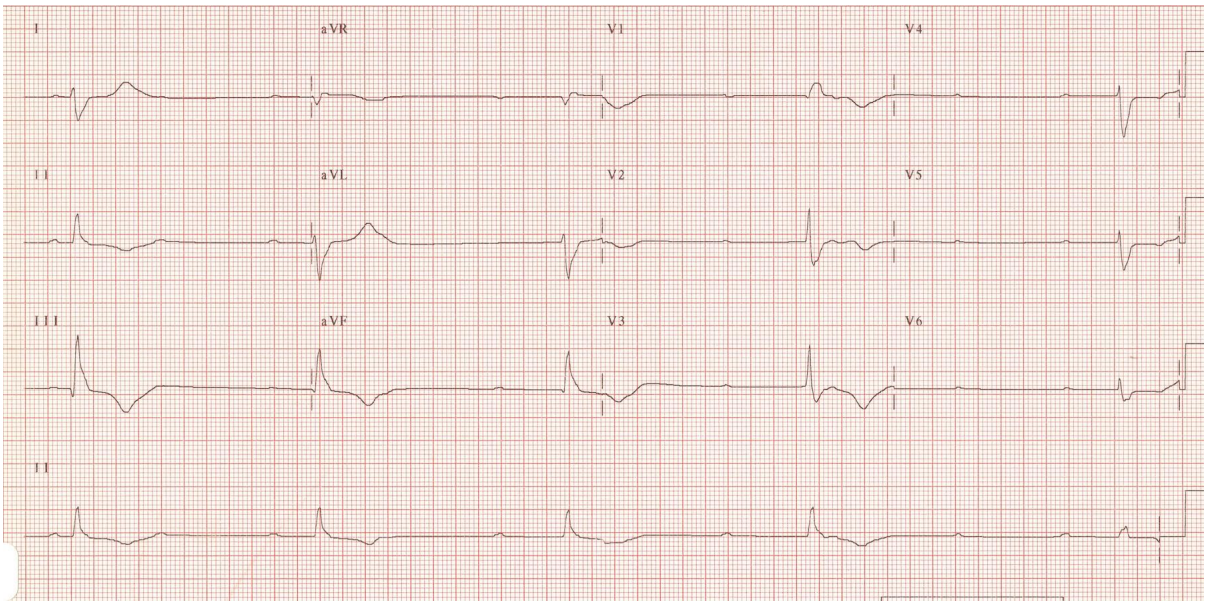
BP: 130/70		☐Transvenous pacemaker insertion. Explain process (Appendix C)	-Asks for transvenous pacing guidance -> Sim facilitator provides (Appendix C)	

Appendix A: Laboratory Results – All normal

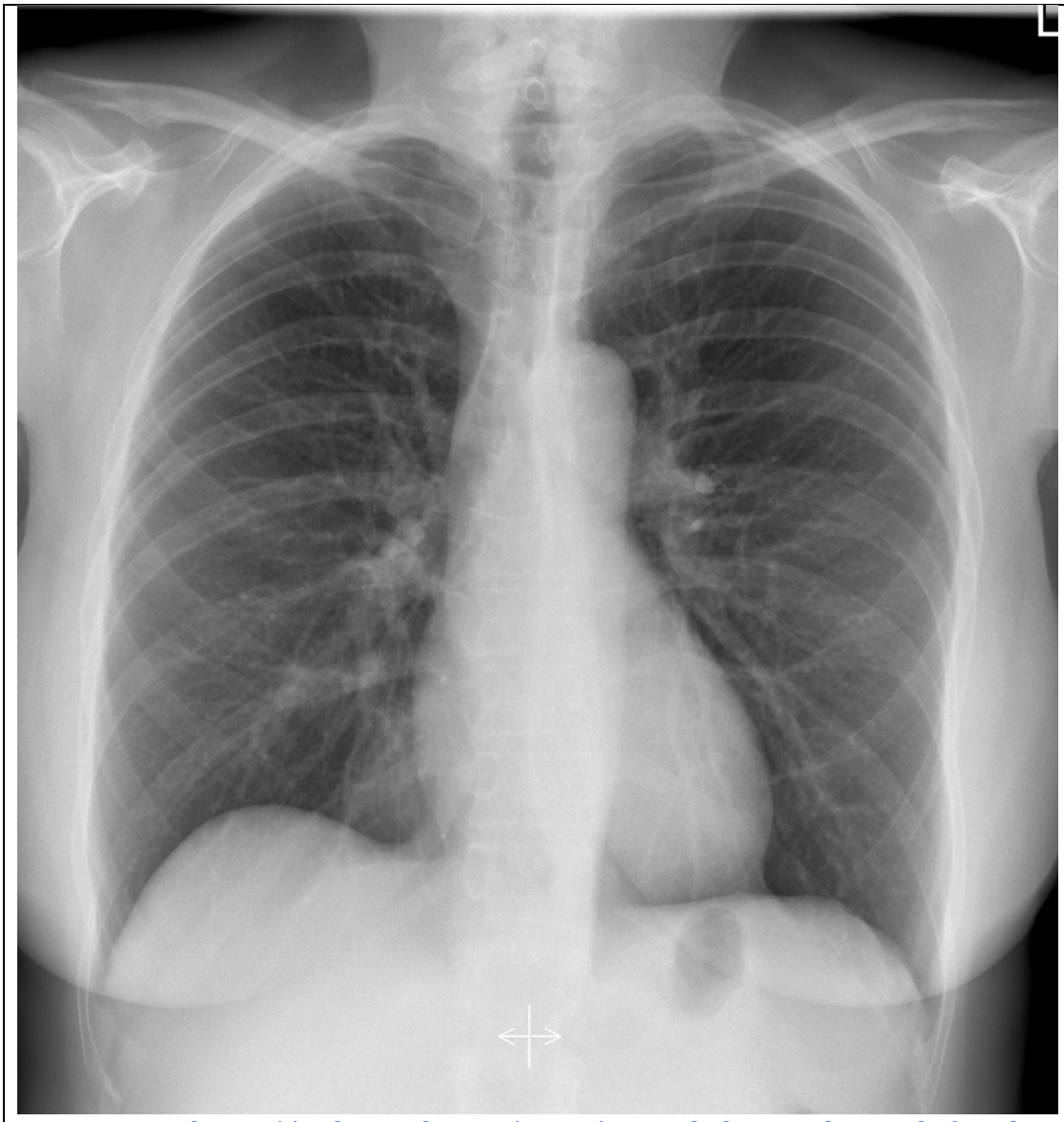
CBC WBC Hgb Plt Lytes Na K Cl HCO_3 AG Urea Cr Glucose Extended Lytes Ca Mg PO_4 Albumin TSH VBG pH pCO_2 pO_2 HCO_3 Lactate	Cardiac/Coags Trop D-dimer INR aPTT Biliary AST ALT GGT ALP Bili Lipase Tox EtOH ASA Tylenol Dig level Osmols Other B-HCG TSH

Appendix B: ECGs, X-rays, Ultrasounds and Pictures

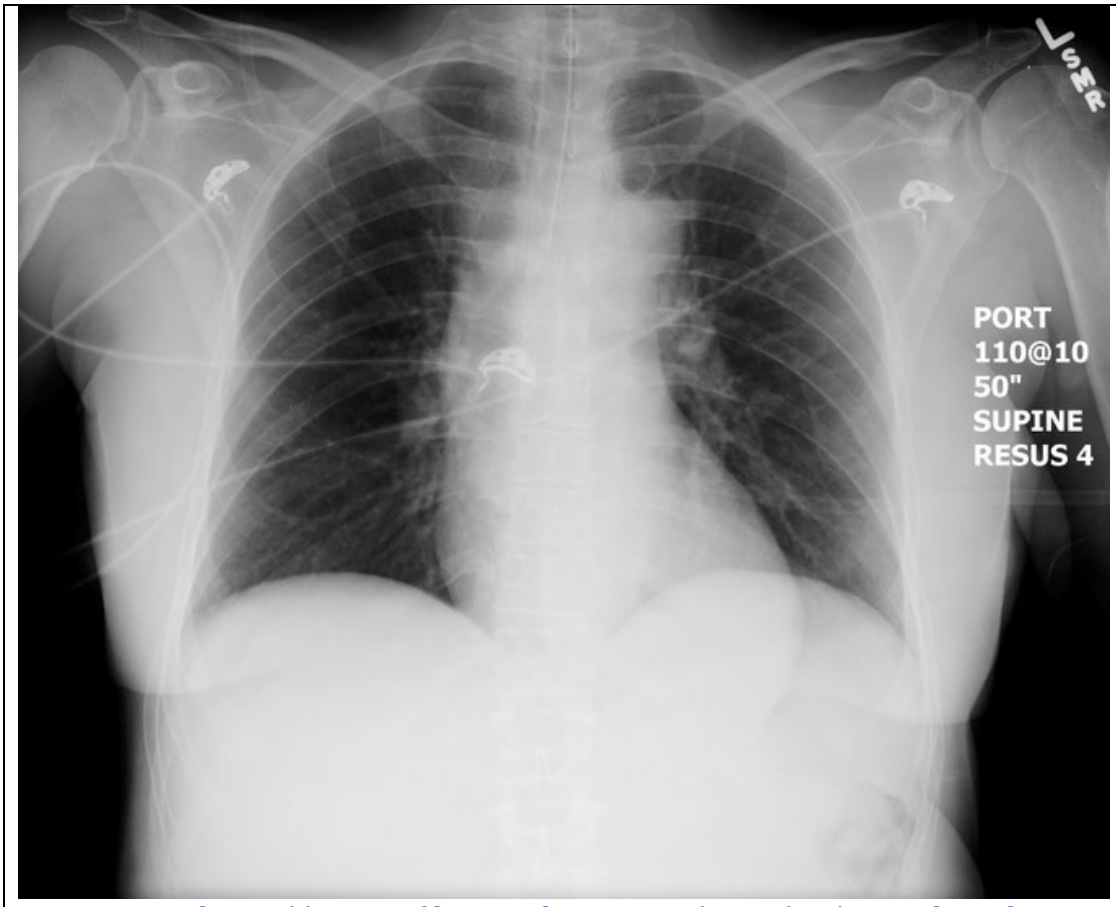
Paste in any auxiliary files required for running the session. Don't forget to include their source so you can find them later!



ECG Source: https://www.ecgquest.net/ecg/complete-heart-block-3/

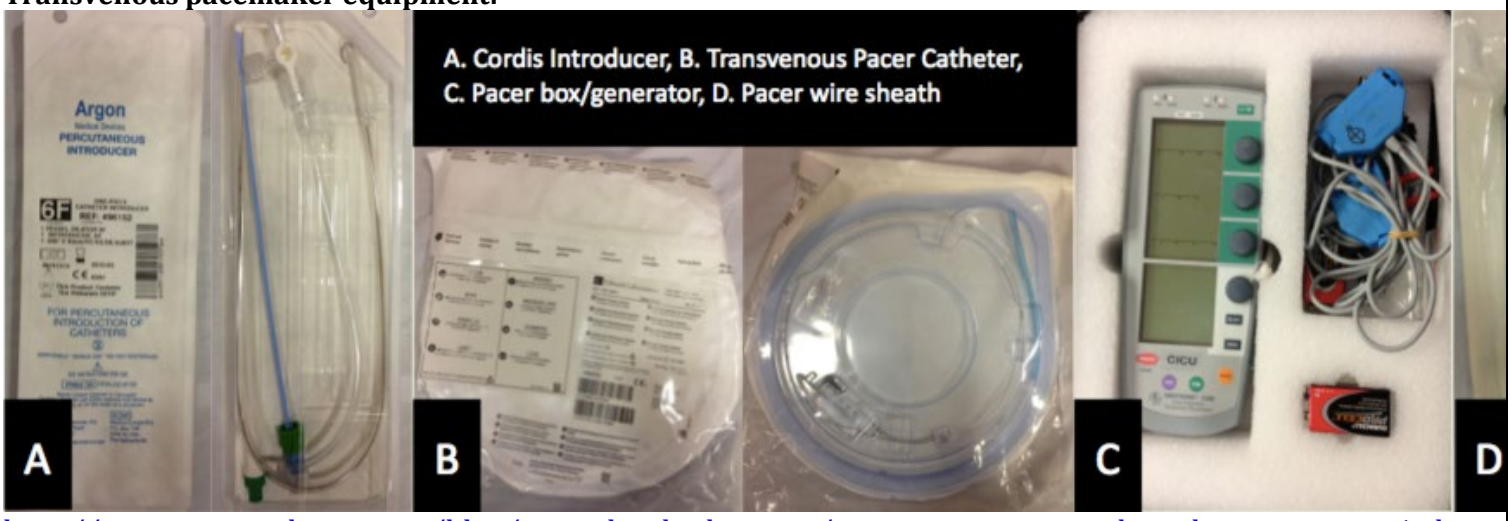


CXR source: https://radiopaedia.org/cases/normal-chest-radiograph-female-1

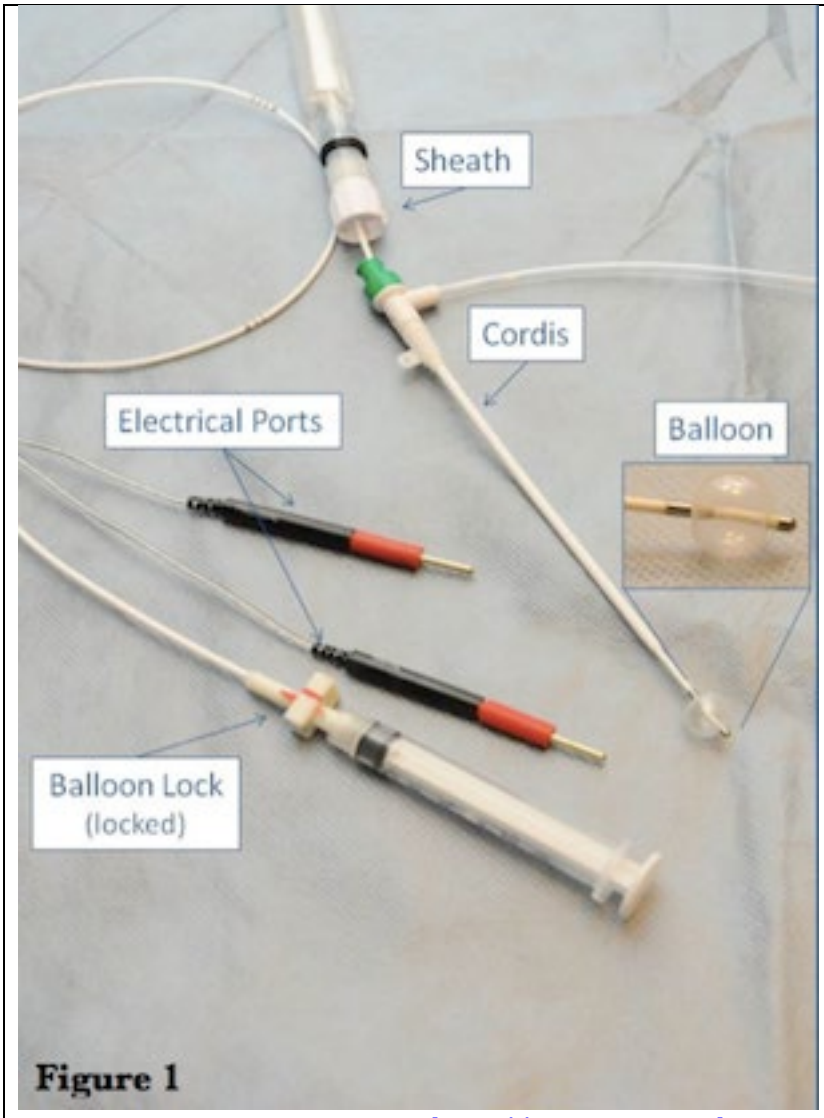


CXR source: https://emcow.files.wordpress.com/2012/11/normal-intubation2.jpg

Transvenous pacemaker equipment:



http://www.tamingthesru.com/blog/procedural-education/transvenous-pacemaker-placement-part-1-the-walkthrough



CORDIS/TV PCM setup source: http://www.tamingthesru.com/blog/procedural-education/transvenous-pacemaker-placement-part-1-the-walkthrough

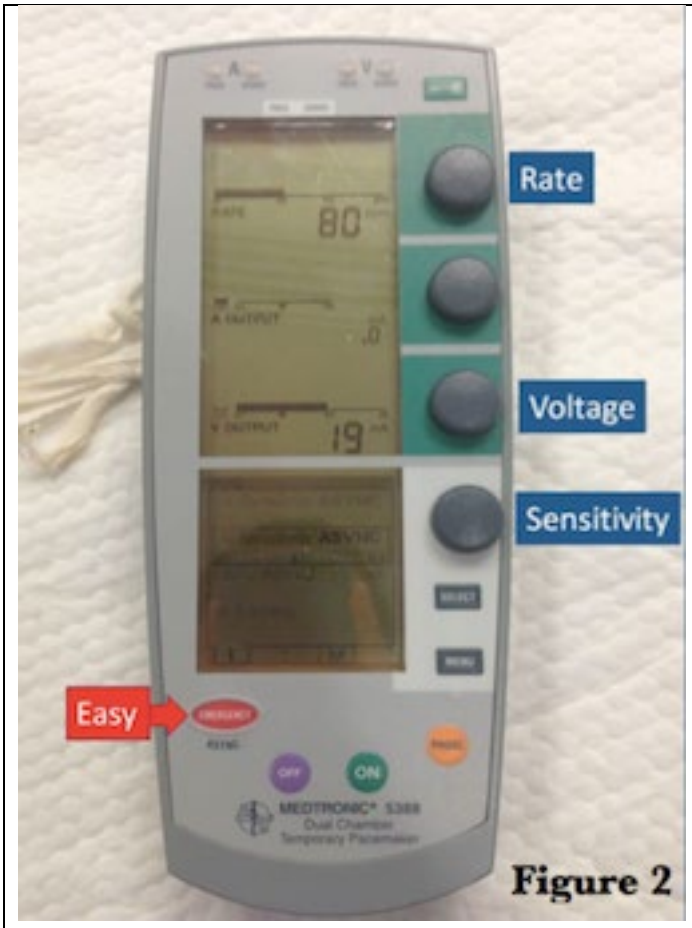


Figure 2

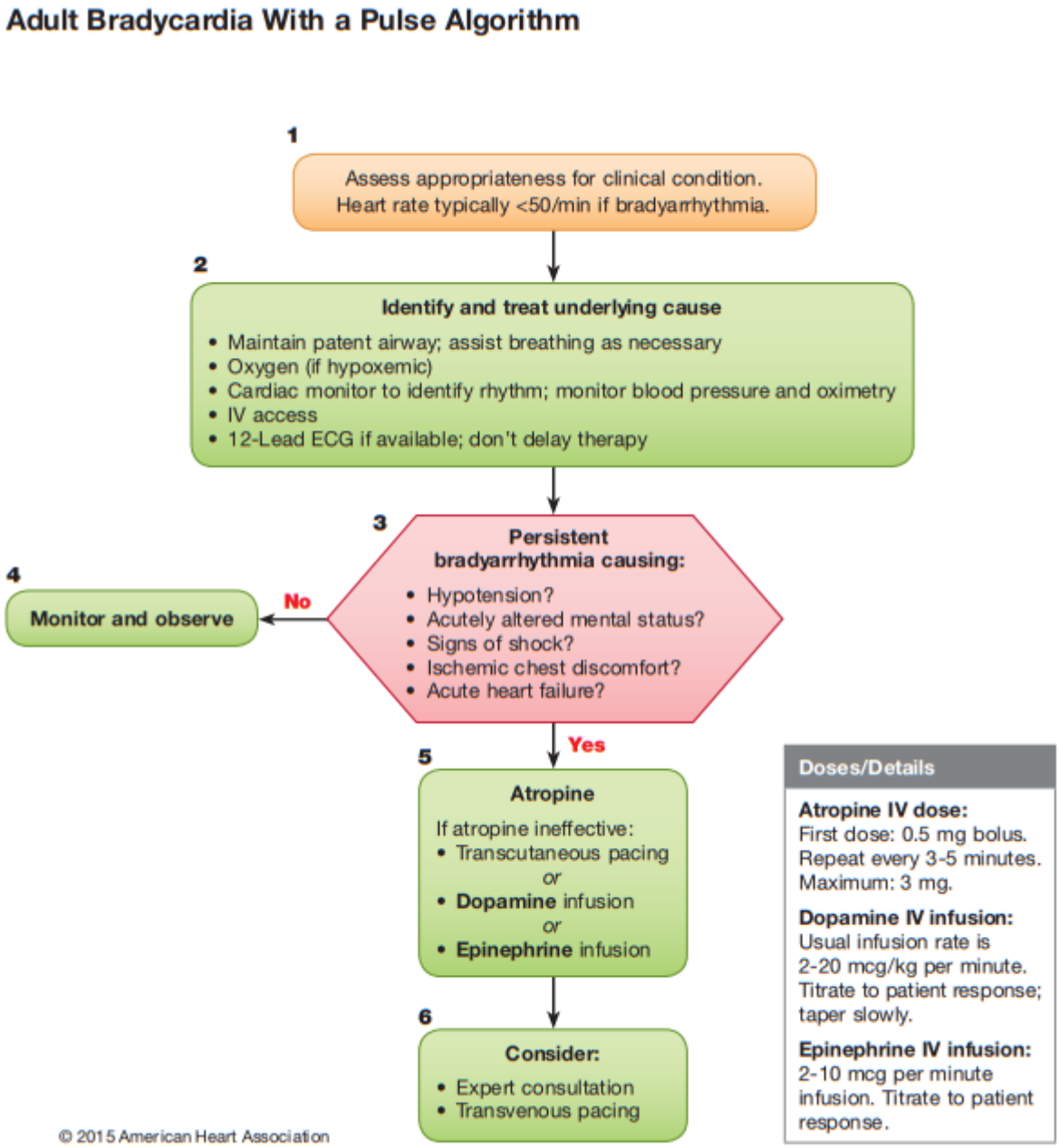
TV pacer source: http://www.tamingthesru.com/blog/procedural-education/transvenous-pacemaker-placement-part-1-the-walkthrough

Appendix C: Facilitator Cheat Sheet & Debriefing Tips

Include key errors to watch for and common challenges with the case. List issues expected to be part of the debriefing discussion. Supplemental information regarding any relevant pathophysiology, guidelines, or management information that may be reviewed during debriefing should be provided for facilitators to have as a reference.

ACLS bradycardia algorithm

1. Review the AHA bradycardia algorithm:



Transcutaneous Pacing Sequence:

1. Attach pads
2. Connect to defibrillator/pacemaker
3. Set defibrillator to **pacing mode**
4. Set **Rate** (80BPM)

5. Set **Current** and confirm capture
    a. Start at 5mA (milliamp)
    b. Look for electrical capture
    c. Feel for mechanical capture
    d. Increase current (~5mA increments) until electrical and mechanical capture
    e. Set current 10mA (~20%) above level of capture
6. Ensure adequate sedation

Transvenous Pacemaker Insertion (https://www.youtube.com/watch?v=00-T8PcbStE)

1. Equipment collection
    a. Sterile setup
    b. Ultrasound
    c. CORDIS central line kit with appropriate flushes and securement equipment
    d. Pacemaker equipment
        i. Pace Generator (ensure power)
        ii. Pacer balloon catheter with two electrical wires attached
        iii. Pacer wire adapters or wire connecting cable (to attach pacer catheter wires to pacer generator)
2. Site selection: (RIJ or L subclavian most direct)
    a. R IJ > L subclavian (preferred site for permanent pacemaker)
3. Ensure patient on cardiac monitor
4. Obtain IJ access with CORDIS
5. Confirm Pacer catheter balloon works and attach wire adapters
6. Hand sterile wire ends with adapters OR sterile connecting cable to non-sterile colleague to attach to pacer generator
7. Insert pacer catheter into cordis through attached CORDIS sterile sheath (ensure correct orientation)
8. Have non-sterile colleague set pacing generator to 80BPM, 5mA
9. Hold transcutaneous pacing if able (to inform electrical capture on monitor transvenously)
10. Advance deflated balloon through attached CORDIS sheath to 30cm (3 lines) then inflate balloon
11. Watch cardiac monitor for QRS widening/STE pattern (Electrical capture)
12. Confirm mechanical capture (palpation/pulse ox)
13. Deflate balloon, lock associated stop cock, pull sterile sleeve over catheter (locks into pacing wire)
14. Turn down current until loss of capture then increase just above for safe margin
15. Secure CORDIS and sterile sheath
16. Trouble shooting tips
    a. Deflate balloon, back out pacer catheter, rotate and re-advance to 30cm and re-inflate balloon
    b. May need to decrease sensitivity to zero on pacer generator if picking up intrinsic rate/interference.

References

1. AHA Guidelines, 2015. https://ahajournals.org/doi/10.1161/CIR.0000000000000261

