CODE BLUE

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PULMONARY AND CRITICAL CARE MEDICINE

SUMMA HEALTH MEDICAL GROUP

OUTLINE

- Responding to Code Blue: Who and Where?
  - Pager assignments, locations, shift details
- Resident Roles
- Common Code Blue Scenarios
  - Unstable arrhythmias
  - Impending respiratory failure / respiratory distress
  - Cardiac arrest
  - Seizures
  - Syncope / Falls
  - Overdoses
  - "fake codes"

RESPONDING TO CODES: WHO AND WHERE

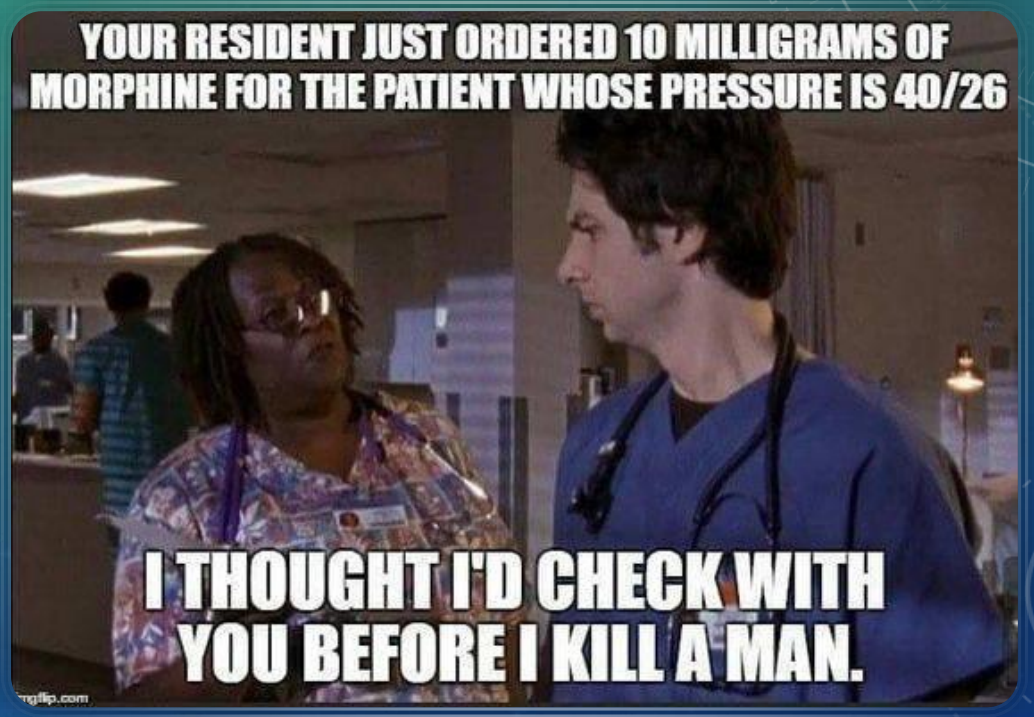
- **Days**
  - All codes:
    - ICU and CCU residents not admitting (*not* holding pagers)
    - ICU and CCU interns holding pagers
  - Floor Codes
    - Above + AR2, AI2, AI3
- Nights
  - ICU: Resident and Intern
  - CCU: Resident and Intern
  - Night Float: AR2, AI2, AI3

RESIDENT ROLES: GROUND RULES

- Do not stand around doing nothing inside the patient's room
  - Once necessary roles are covered, please exit the room to allow for easier movement of equipment and patient transfer

RESIDENT ROLES: GROUND RULES

- Treat the rapid response nurses as YOUR BOSS during a code, not the other way around



RESIDENT ROLES

- Seniors: take OWNERSHIP for running the code
  - First resident in = runs the code
  - Your ICU attending will *rarely* be the first physician on the scene on a floor code
  - DELEGATE responsibilities to the rest of your team as they arrive
    - Assign specific tasks/jobs
  - Remember the rapid nurses!

RESIDENT ROLES: INTUBATION

- **Prepare** for intubation, even if you're not sure the patient will need it
- Mask and gloves on, then *immediately* make your way towards the head of the bed
- Don't expect the RTs to know what you need
  - Immediately instruct a nurse or RT to establish suction
  - BVM (+/- PEEP valve)
  - Tube (instruct RT to test balloon)
  - Preferred blade
  - CO2 indicator
- If anticipating difficult airway: assign someone else to get the glidescope (make sure cart has a stylet and blade cover)

RESIDENT ROLES: INTUBATION - BVM

- Work with RT to bag the patient
  - Given your position at head of the bed, you should ensure appropriate patient position (chin lift) and appropriate mask seal
  - Watch for chest rise and fogging of the mask on exhalation
  - If insufficient chest rise, persistent hypoxia, difficulty delivering breaths (MO, etc) while bagging: add PEEP valve
- In the vast majority of cases, patients can be bagged efficiently throughout the entire code
  - However, "credentialing" to perform elective intubations does not apply to code blue scenarios
- This is a good time to make sure all the tools/equipment you just asked for is ready to go

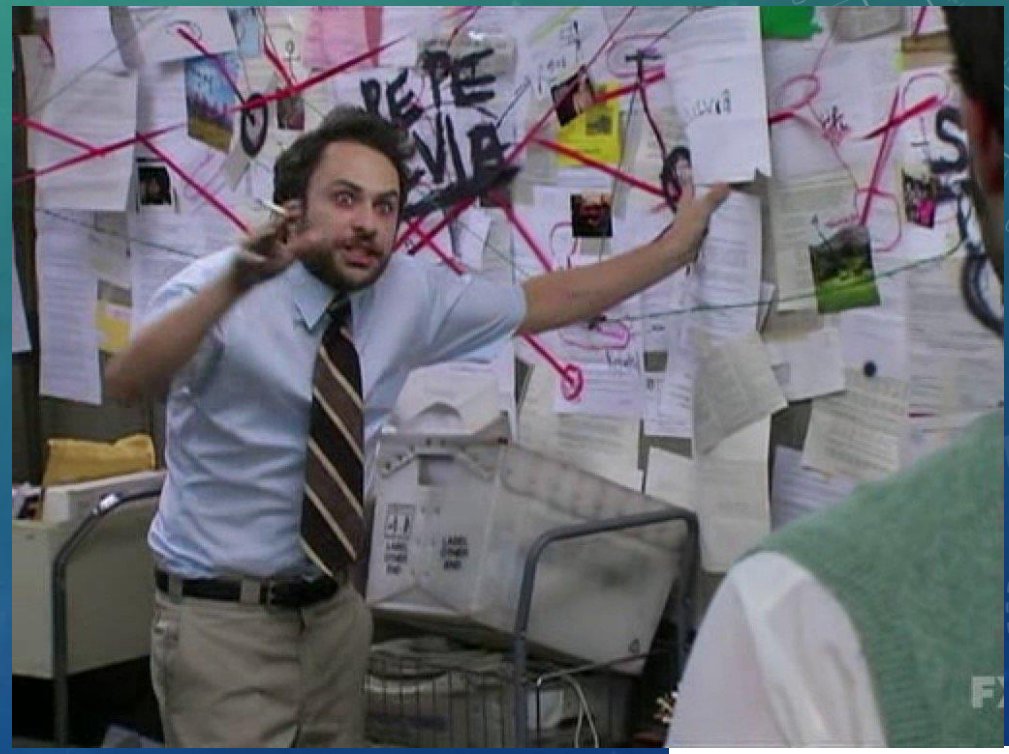
RESIDENT ROLES: CHEST COMPRESSIONS

- Only one person at a time can do CPR so...
- There need not be 13 people in a line along the back of the room, wearing gloves, ready to spring into action
- Rate = 100 BPM
  - "staying alive"

CLIP

RESIDENT ROLES: CHART REVIEW

- Undervalued but super important job
- Once assigned, go straight to a computer
- Why was the patient admitted?
- What are the pertinent comorbidities?
  - ESRD, HFrEF, COPD
- Recent procedures or surgeries?
- Review of most recent labs
  - Electrolytes, blood gases, CBC
- Review recent diagnostic imaging

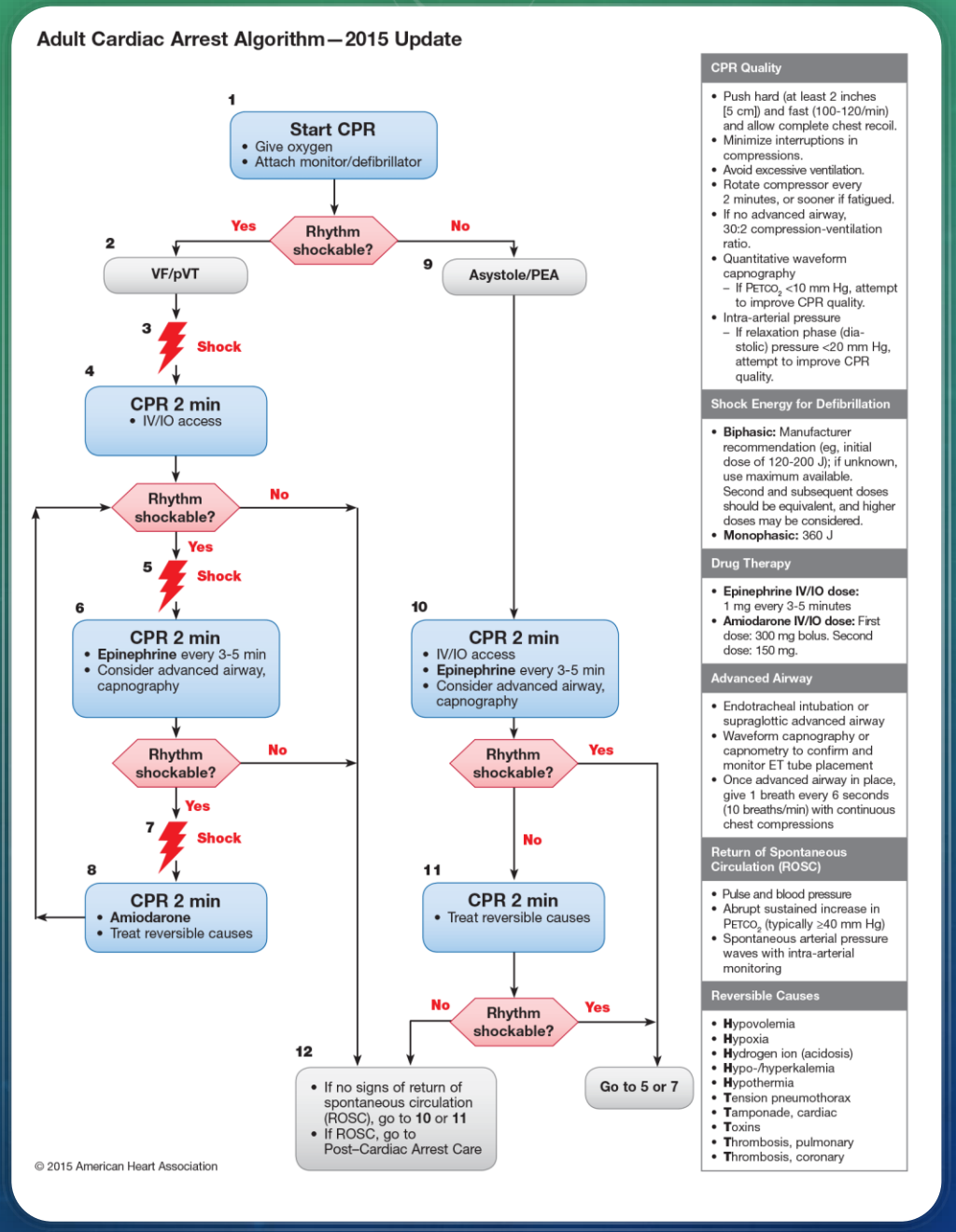


RESIDENT ROLES: ANCILLARY ROLES / JOBS

- Discussion with bedside nurse
  - Obtain further details of events leading up to the code
- Contact family / next of kin
- Contact admitting physician (or covering physician for admitting doc)
- Supply Runner
  - Ideally this should be someone who knows where things are...

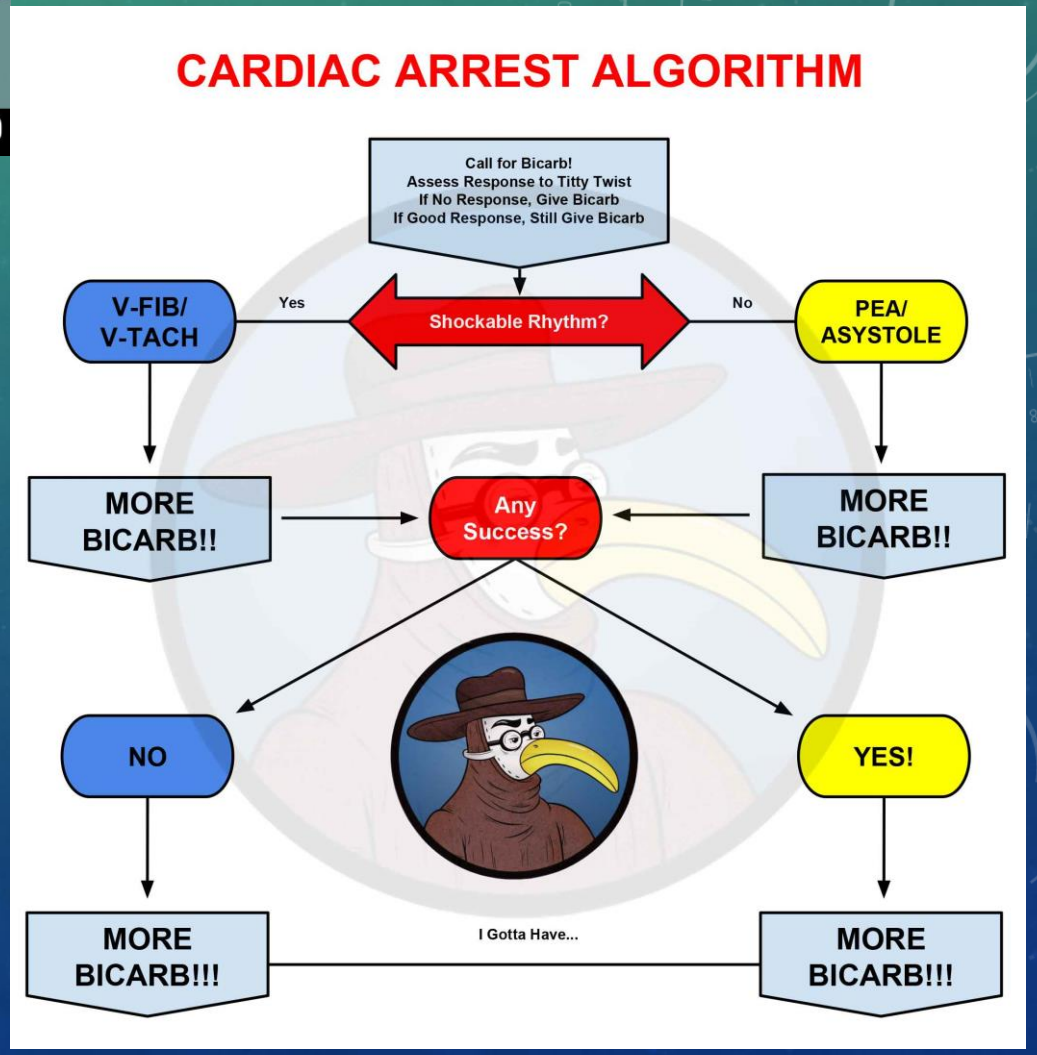
COMMON CODE SCENARIOS: CARDIAC ARREST

- 30:2 if no advanced airway
- Notice placement of intubation in the algorithm sequence



CARDIAC ARREST: OUTSIDE THE ACLS BOX

- Common things seen in codes not in the ACLS algorithm
  - HCO3
  - Calcium
  - Central venous access
- When are these things useful?
  - Calcium in ESRD assuming hyperkalemia
  - Otherwise….?
    - -Cooper J, et al. Bicarbonate does not improve hemodynamics in critically ill patients who have lactic acidosis: A prospective, controlled clinical study. Ann Int Med 1990;112:492-8
    - Forsythe SM, Schmidy GA. Sodium Bicarbonate for the Treatment of Lactic Acidosis. Chest 2000;117;260-267



CARDIAC ARREST WITH SUSPECTED MASSIVE PE

ORIGINAL INVESTIGATION

Pulmonary Embolism as Cause of Cardiac Arrest

Presentation and Outcome

Istepan Kürkciyan, MD; Giora Meron, MD; Fritz Sterz, MD; Karin Janata, MD; Hans Domanovits, MD; Michael Holzer, MD; Andrea Berzlanovich, MD; Hans C. Bankl, MD; Anton N. Laggner, MD

Background: Pulmonary embolism (PE) is a possible noncardiac cause of cardiac arrest. Mortality is very high, and often diagnosis is established only by autopsy.

Methods: In a retrospective study, we analyzed clinical presentation, diagnosis, therapy, and outcome of patients with cardiac arrest after PE admitted to the emergency department of an urban tertiary care hospital.

Results: Within 8 years, PE was found as the cause in 60 (4.8%) of 1246 cardiac arrest victims. The initial rhythm diagnosis was pulseless electrical activity in 38 (63%), asystole in 19 (32%), and ventricular fibrillation in 3 (5%) of the patients. Pronounced metabolic acidosis (median pH, 6.95, and lactate level, 16 mmol/L) was found in most patients. In 18 patients (30%), the diagnosis of PE was established only postmortem. In 42 (70%) it was diagnosed clinically, in 24 of them the diagnosis of PE was confirmed by echocardiography. In 21 patients, 100 mg of recombinant tissue-type plasminogen activator was administered as thrombolytic treatment, and 2 (10%) of these patients survived to hospital discharge. Comparison of patients of the thrombolysis group (n=21) with those of the nonthrombolysis group (n=21) showed a significantly higher rate of return of spontaneous circulation (81% vs 43%) in the thrombolysis group ($P=.03$).

Conclusions: Mortality related to cardiac arrest caused by PE is high. Echocardiography is supportive in determining PE as the cause of cardiac arrest. In view of the poor prognosis, thrombolysis should be attempted to achieve return of spontaneous circulation and probably better outcome.

Arch Intern Med. 2000;160:1529-1535

Table 3. Characteristics of 21 Patients in Whom Thrombolytic Therapy Was Administered*

Patient No./ Sex/Age, y	Location of Cardiac Arrest	ECG Rhythm	pH	Lactate, mmol/L	No-Flow Time, min	ROSC	Low-Flow Time, min	Location of PE	Outcome
1/F/44	In hospital	Asystole	6.88	25	0	No	NA	Central	Died
2/M/73	In hospital	PEA/EMD	6.99	15	17	Yes	63	Central	Died, 2 h
3/F/75	Out of hospital	PEA/EMD	7.08	27	2	Yes	13	Central	Died, 2 d
4/F/41	Out of hospital	PEA/EMD	6.88	24	0	Yes	3	Central	Died, 15 h
5/F/45	Out of hospital	PEA/EMD	6.87	21	0	Yes	80	Central	Died, 13 h
6/M/81	Out of hospital	PEA/EMD	6.92	11	10	Yes	4	Central	Died, 12 h
7/M/54	In hospital	PEA/EMD	6.86	10	0	Yes	10	Central	Died, 15 h
8/M/67	Out of hospital	PEA/EMD	6.96	18	0	Yes	15	Central	Alive
9/F/49	In hospital	PEA/EMD	6.94	9	0	Yes	10	Central	Died, 1 h
10/F/36	Out of hospital	Asystole	6.50	29	0	Yes	20	Central	Died, 5 h
11/F/25	Out of hospital	Asystole	6.66	21	0	Yes	10	Central	Died, 2 h
12/F/26	Out of hospital	Asystole	6.77	19	0	No	NA	Central	Died
13/F/60	In hospital	Asystole	6.89	20	10	Yes	5	Segmental	Died, 1 h
14/M/66	Out of hospital	PEA/EMD	6.97	16	0	No	NA	Central	Died
15/F/73	In hospital	PEA/EMD	6.83	20	0	Yes	3	Central	Died, 1 h
16/F/75	In hospital	PEA/EMD	7.13	10	0	Yes	6	Central	Died, 7 d
17/M/67	In hospital	PEA/EMD	7.00	9	0	No	NA	Central	Died
18/M/75	Out of hospital	PEA/EMD	6.95	12	0	Yes	15	Central	Died, 17 h
19/F/28	Out of hospital	Asystole	6.61	22	6	Yes	105	Central	Died, 21 h
20/M/45	Out of hospital	PEA/EMD	7.15	6	0	Yes	42	Central	Alive
21/F/64	In hospital	PEA/EMD	6.90	17	0	Yes	13	Central	Died, 23 d

Table 4. Characteristics of 21 Patients in Whom Specific Therapy Was Not Administered*

Patient No./ Sex/Age, y	Location of Cardiac Arrest	ECG Rhythm	pH	Lactate, mmol/L	No-Flow Time, min	ROSC	Low-Flow Time, min	Location of PE	Outcome
1/F/60	Out of hospital	Asystole	6.92	13	0	No	NA	Central	Died
2/M/81	Out of hospital	PEA/EMD	6.92	16	0	Yes	25	Central	Died, 2 h
3/F/66	Out of hospital	PEA/EMD	7.00	16	0	No	NA	Central	Died
4/M/51	In hospital	Asystole	6.81	25	5	Yes	15	Central	Died, 2 h
5/F/71	In hospital	PEA/EMD	NA	NA	5	No	NA	Central	Died
6/F/61	In hospital	PEA/EMD	NA	NA	20	No	NA	Central	Died
7/F/74	Out of hospital	PEA/EMD	7.12	15	0	Yes	10	Central	Died, 1 h
8/F/73	In hospital	PEA/EMD	7.08	9	2	No	NA	Segmental	Died
9/F/53	In hospital	PEA/EMD	NA	NA	0	No	NA	Central	Died
10/F/42	In hospital	PEA/EMD	6.05	21	19	Yes	33	Central	Died, 2 h
11/M/34	In hospital	PEA/EMD	NA	17	0	No	NA	Central	Died
12/F/71	Out of hospital	PEA/EMD	7.06	11	0	No	NA	Central	Died
13/M/50	In hospital	PEA/EMD	7.07	9	0	No	NA	Central	Died
14/F/73	Out of hospital	PEA/EMD	6.88	15	0	No	NA	Central	Died
15/M/73	Out of hospital	PEA/EMD	7.00	12	0	No	NA	Segmental	Died
16/F/85	In hospital	Asystole	NA	NA	4	Yes	15	Central	Died, 1 h
17/F/61	In hospital	VF	7.30	3	2	Yes	3	Segmental	Died, 20 d
18/F/62	In hospital	PEA/EMD	7.29	3	1	Yes	5	Central	Died, 11 d
19/M/69	In hospital	Asystole	7.30	2	2	Yes	7	Segmental	Alive
20/F/73	Out of hospital	Asystole	6.86	18	0	Yes	15	Central	Died, 14 h
21/M/43	In hospital	PEA/EMD	NA	NA	1	No	NA	Central	Died

- Highlights importance of using thrombolytic early in the code
- Supports other studies showing high NNT (~40) and low NNH ratios (twofold risk of bleeding)
- Still lacking sufficient evidence to support routine use

Impact of Rescue-Thrombolysis during Cardiopulmonary Resuscitation in Patients with Pulmonary Embolism

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Abstract

Background: Cardiac arrest in patients with pulmonary embolism (PE) is associated with high morbidity and mortality. Thrombolysis is expected to improve the outcome in these patients. However studies evaluating rescue-thrombolysis in patients with PE are missing, mainly due to the difficulties of clinical diagnosis of PE. We aimed to determine the success influencing factors of thrombolysis during resuscitation in patients with PE.

Methodology/Principal Findings: We analyzed retrospectively the outcome of 104 consecutive patients with confirmed (n = 63) or highly suspected (n = 41) PE and monitored cardiac arrest. In all patients rtPA was administrated for thrombolysis during cardiopulmonary resuscitation. In 40 of the 104 patients (38.5%) a return of spontaneous circulation (ROSC) could be achieved successfully. Patients with ROSC received thrombolysis significantly earlier after CPR onset compared to patients without ROSC (13.6±1.2 min versus 24.6±0.8 min; $p<0.001$). 19 patients (47.5%) out of the 40 patients with initially successful resuscitation survived to hospital discharge. In patients with hospital discharge thrombolysis therapy was begun with a significantly shorter delay after cardiac arrest compared to all other patients (11.0±1.3 vs. 22.5±0.9 min; $p<0.001$).

Conclusion: Rescue-thrombolysis should be considered and started in patients with PE and cardiac arrest, as soon as possible after cardiac arrest onset.

Citation: Er F, Nia AM, Gassanov N, Caglayan E, Erdmann E, et al. (2009) Impact of Rescue-Thrombolysis during Cardiopulmonary Resuscitation in Patients with Pulmonary Embolism. PLoS ONE 4(12): e8323. doi:10.1371/journal.pone.0008323

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ORIGINAL ARTICLE

Thrombolysis during Resuscitation for Out-of-Hospital Cardiac Arrest

Bernd W. Böttiger, M.D., Hans-Richard Arntz, M.D., Douglas A. Chamberlain, M.D., Erich Bluhmki, Ph.D., Ann Belmans, M.Sc., Thierry Danays, M.D., Pierre A. Carli, M.D., Jennifer A. Adgey, M.D., Christoph Bode, M.D., and Volker Wenzel, M.D., M.Sc., for the TROICA Trial Investigators and the European Resuscitation Council Study Group*

ABSTRACT

- 525 patients compared to 525 placebo

CONCLUSIONS

When tenecteplase was used without adjunctive antithrombotic therapy during advanced life support for out-of-hospital cardiac arrest, we did not detect an improvement in outcome, in comparison with placebo. (ClinicalTrials.gov number, NCT00157261.)

COMMENT: PEA AND ASYSTOLE ARRESTS

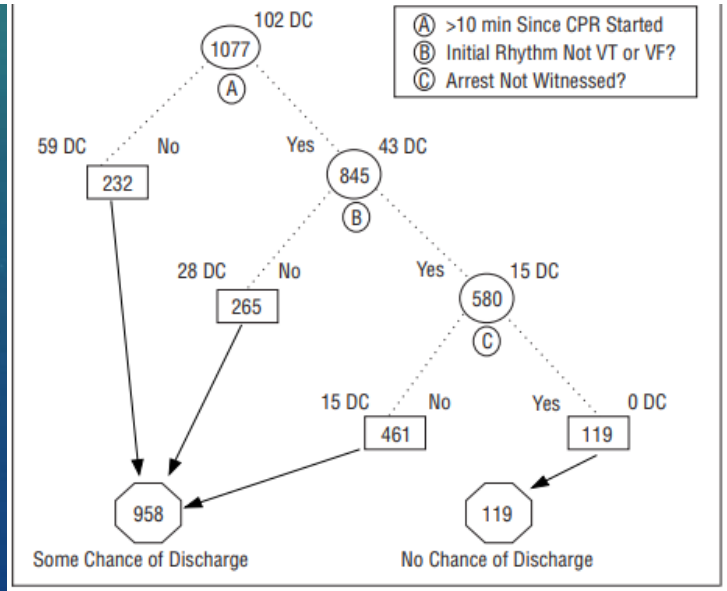
- Decision tool for determining when to cease resuscitation efforts
- 100% sensitivity (95% CI) for determining patients who will not survive to discharge when these three factors present
  - Duration of code > 10 min
  - Initial rhythm PEA or asystole
  - Unwitnessed

Arch Intern Med. 1999;159:129-134

ORIGINAL INVESTIGATION

Derivation of a Clinical Decision Rule for the Discontinuation of In-Hospital Cardiac Arrest Resuscitations

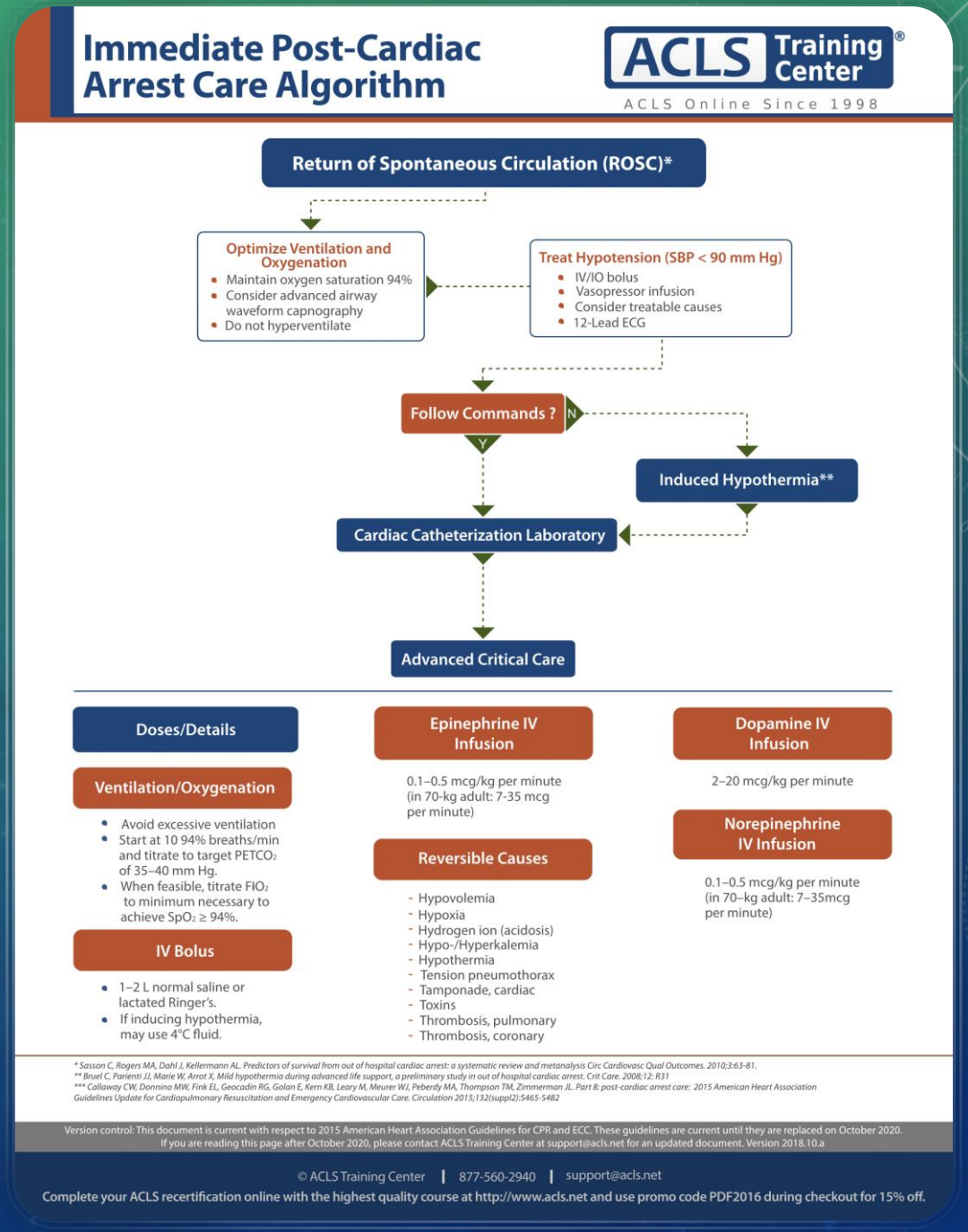
Carl van Walraven, MD, FRCPC, MSc; Alan J. Forster, MD, FRCPC; Ian G. Stiell, MD, MSc, FRCPC

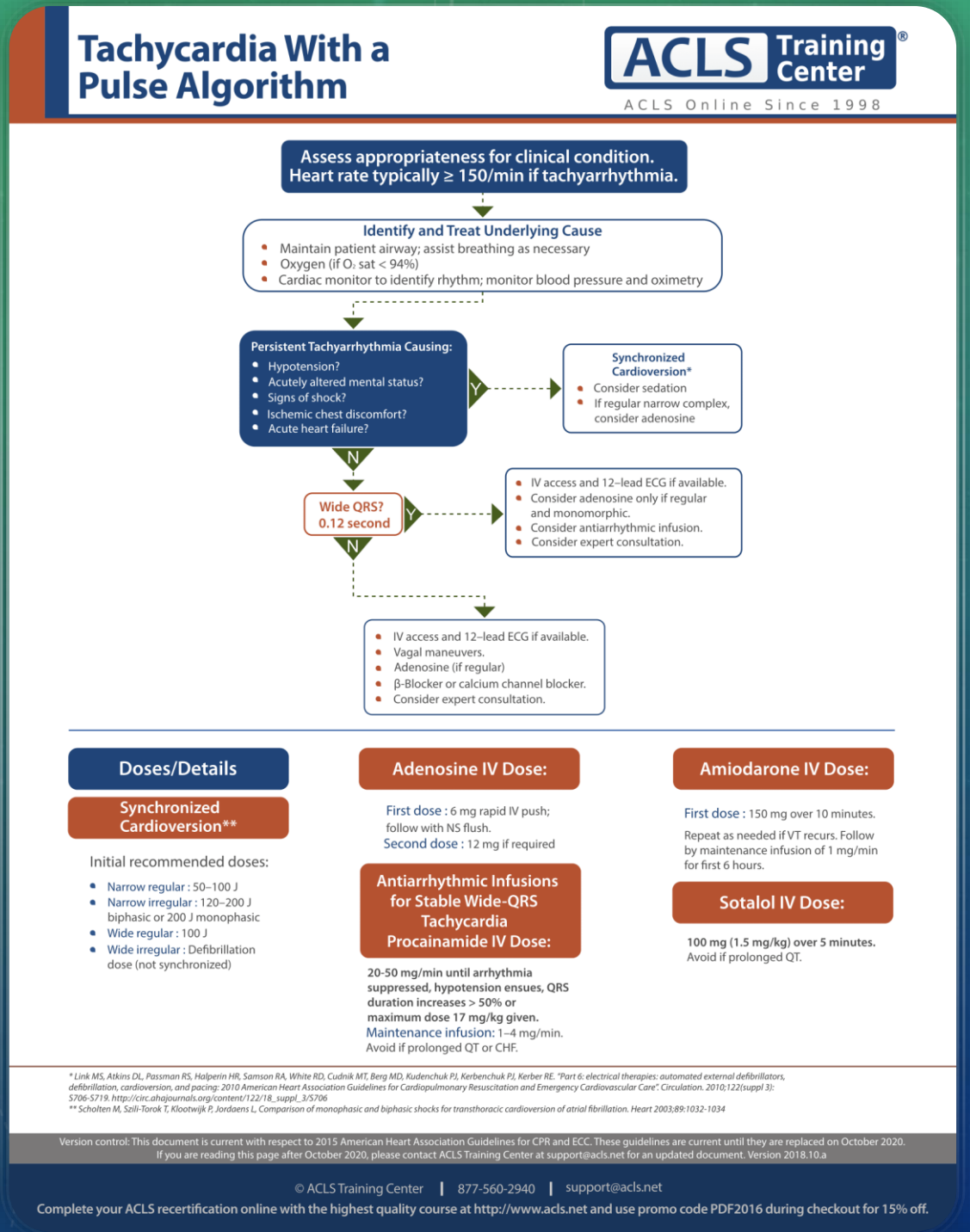


Decision rule for identifying patients with no chance of being discharged from hospital. DC indicates discharged from hospital; CPR, cardiopulmonary resuscitation; VT, ventricular tachycardia; and VF, ventricular fibrillation. Decision nodes are represented by circles. Each node contains the number of patients to which it applies.

CARDIAC ARREST: POST-ROSC

- Assess mental status / responsiveness
- Establish advanced airway (if not already done)
- Assess for immediately reversible causes:
  - EKG +/- bedside echo
    - Tamponade, RWMA
  - ALL the labs
    - Remember istat is available for ABG, BMP
    - Lactate, troponin, tox screen
  - CXR
    - Aspiration, tension PTX



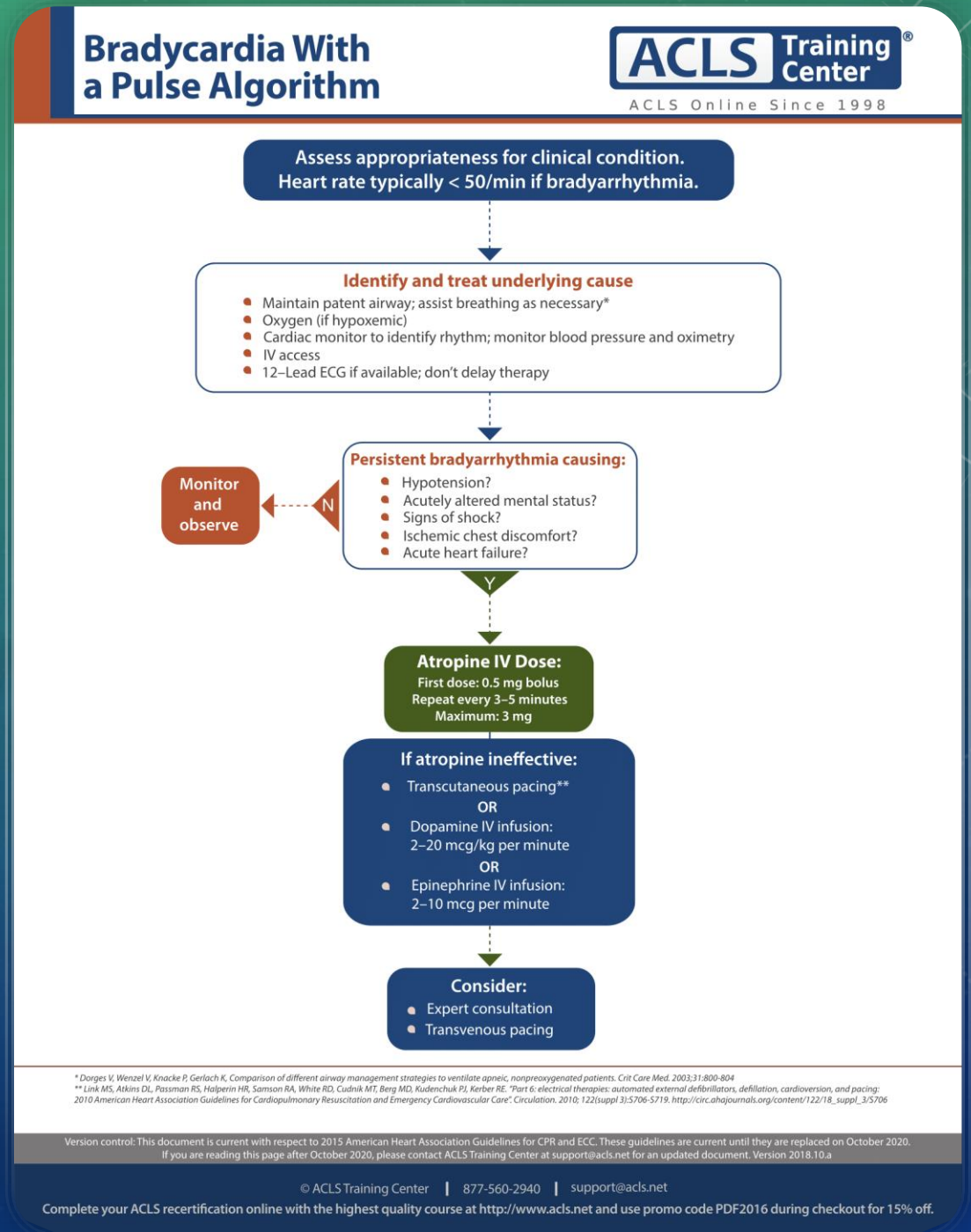


COMMON CODE SCENARIOS: UNSTABLE ARRHYTHMIAS

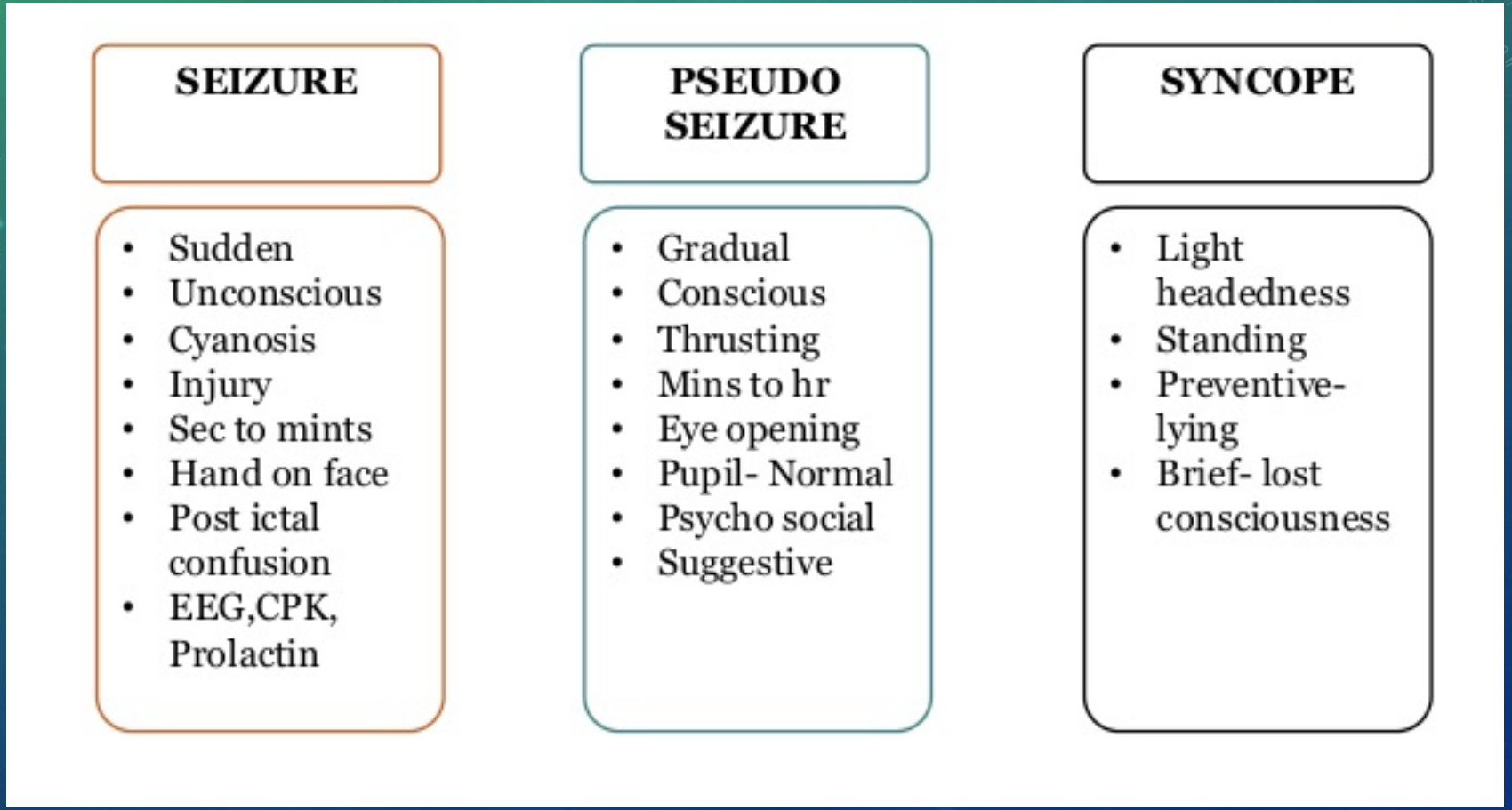
- Tachycardia with pulse
- If significant hypotension, proceed directly to cardioversion
- Medication doses:
  - Amiodarone: 150 mg over 10 min
  - Adenosine: 6 mg IVP, can follow with second dose of 12 mg IVP if needed
- CCU fellow should be present
- EKG tech present if pushing adenosine

COMMON CODE SCENARIOS: UNSTABLE ARRHYTHMIAS

- Bradycardia with pulse
- Atropine
  - 0.5 mg bolus
  - Repeat every 3-5 min for up to 3 mg
- Dopamine, Epinephrine gtts
- Transcutaneous pacing



SEIZURE VS PSYCHOGENIC PSEUDOSEIZURE



Clinical signs
Ability of observer to modify motor activity
Asynchronous limb movements
Avoidance behavior during seizure
Change in semiology/nonstereotypic seizure patterns
Closed eyes during seizure
Dystonic posturing (including opisthotonus)
Emotional/situational trigger
Gradual onset and cessation
Ictal crying, weeping
If tongue biting present, usually tip, not side of tongue
Intermittent or waxing & waning motor activity
Nonphysiologic progression
Pelvic movements (especially forward thrusting)
Prolonged seizure (>2 - 3 minutes)
Resisted eyelid opening
Seizures provoked by suggestion
Side-to-side head movements

PSYCHOGENIC PSEUDOSEIZURE

- Gradual onset
- Pelvic movement
- Resisted eyelid opening

PSYCHOGENIC PSEUDOSEIZURE

- "gold standard diagnostic tool"
  - Patient allows hand to drop on their face

SYNCOPE / FALLS

- Consult trauma for eval if concern for legitimate injury during fall
- CT head if unwitnessed fall
- Transfer to telemetry (if not going to ICU)

OVERDOSES

- Narcan
  - Initial dose: 2-4 mg IV
  - Will often require repeat dosing
  - If drip is required, must transfer to ICU for monitoring
  - Underutilized in in-hospital scenarios
    - Remember: hardly any downside to trying it!

"FAKE CODES"

- Correlation with location of code
  - Outpatient offices in 55/75/95 Arch
  - Dialysis (though this one is often also real)
  - Parking lots / parking garages
- Pre-syncope
- Hypoglycemia
- Falls (even minor)
- Please ensure a resident is available to help transfer the patient to the ED with rapid nurse

QUESTIONS + COMMENTARY