Update in Hospital Medicine: Recent Literature Impacting Clinical Care in the Inpatient Setting

Daniel D Dressler, MD, MSc, MHM, FACP
Professor of Medicine
Master Clinician
Associate Residency Program Director
Emory University Hospital
Co-Director, Semmelweis Society
Emory University School of Medicine
Daniel.Dressler@emory.edu

Dustin T Smith, MD, SFHM
Associate Professor of Medicine
Distinguished Physician
Section Chief for Education, Medical Specialty
Associate Residency Program Director
Atlanta VA Medical Center
Emory University School of Medicine
dtsmit2@emory.edu

AAPA 2020
Conference on Demand 2020 Full Library

EMORY UNIVERSITY SCHOOL OF MEDICINE

1

Disclosure of Financial Relationships

Daniel D. Dressler, MD, MSc, MHM, FACP

Has disclosed relationships with entities producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients.

Associate Editor, *NEJM Journal Watch Hospital Medicine and NEJM Journal Watch General Medicine* (MMS)
Textbook Editor, *Principles and Practice of Hospital Medicine, 2nd Edition* (McGraw-Hill)
Advisory Board, *EBMedicine*

No other financial conflicts of interest to report

2

Disclosure of Financial Relationships

Dustin T. Smith, MD, SFHM

Has disclosed relationships with entities producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients.

No financial conflicts of interest to report

3

Objectives

- Identify, interpret and incorporate into clinical practice recently published literature evidence to provide optimal management for specific conditions in hospitalized patients

Update in Hospital Medicine: Process & Format

- Selection Process (mid 2018 - present)
- Presentation
  - Case-based Format
  - Questions/Audience Involvement
  - Evidence
  - Impact on Clinical Practice in Hospital Medicine (Impact HM)

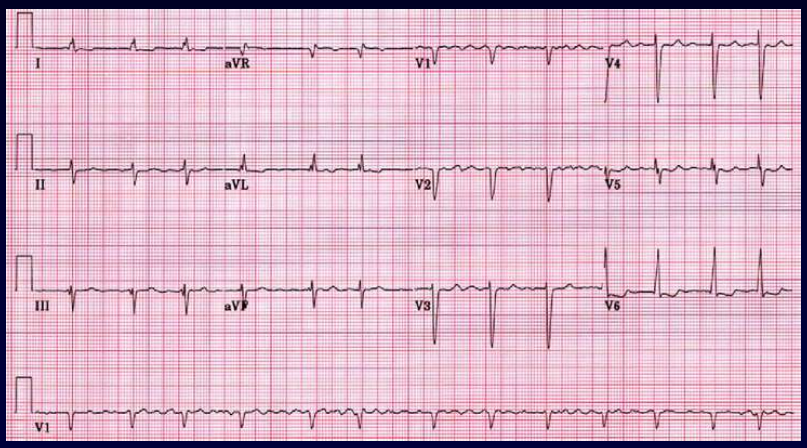
Update in Hospital Medicine: Topics

- **Major Topic Areas of Review**
  1. **Emergency Medicine**
     - **Chest Pain**
  2. **Cardiology**
     - **Acute Decompensated Heart Failure**
  3. **Psychiatry**
     - **Agitation**
  4. **Infectious Diseases**
     - **Endocarditis, Bone & Join Infection**
  5. **Critical Care Medicine**
     - **Cardiac Arrest Resuscitation, Shock Management**
  6. **Gastroenterology**
     - **Nutrition**

Case Presentation

- A 60-year-old male nonsmoker presents with burning, non-exertional "chest pain" after eating hot wings
- PMH: nonischemic HFrEF (EF<40%), HTN, Afib
- Medications: Furosemide, Sacubitril-Valsartan, Metoprolol Succinate, Spironolactone, DOAC
- VS: T 37.1, BP 128/78, HR 70, RR 14, O_2 99%
- Exam: Not obese, JVP~5 cm, normal S1/S2, no M/R/G, lungs clear, warm ext, no edema

Case Presentation



Case Presentation

Case Continued

- The patient is being evaluated in the emergency department (ED)
- POC Labs: CBC/BMP normal, Cr 1.1 mg/dL (baseline), BNP 50, Troponin <0.01 µg/L
- A GI cocktail is administered, and the patient no longer complains of symptoms

What is the most appropriate next step in the management of this patient?

A. Admit to hospital medicine for cardiac stress testing
B. Consult cardiology for left heart catheterization
C. Consult gastroenterology for upper endoscopy
D. Discharge from the ED with outpatient follow-up and/or repeat evaluation if symptoms return/persist
E. Find out where the patient got the hot wings and write a negative Yelp review about the restaurant

Prognostic Accuracy of the HEART Score for Prediction of Major Adverse Cardiac Events in Patients Presenting With Chest Pain

Fernando SM, Tran A, Cheng W, et al. Acad Emerg Med 2019;26:140-151.

Update in Hospital Medicine

12

Prognostic Accuracy of the HEART Score for Prediction of Major Adverse Cardiac Events

Background: Over-investigation of low-risk chest pain patients results in increased resource utilization without improved outcomes

Question: What is the prognostic accuracy of the HEART score for prediction of short-term MACE in adult patients with chest pain?

Methods: Meta-analysis of 30 studies

44,202 patients presenting to the ED with chest pain

Primary outcome: MACE @ 30-days or 6-weeks

MACE
death, MI, or revascularization

0-2 points each
History
ECG
Age
Risk factors
Troponin
0 to 3→low *4 to 6→moderate* *7 to 10→high*

Fernando SM et al. Acad Emerg Med. 2019;26:140-151.

Prognostic Accuracy of the HEART Score for Prediction of Major Adverse Cardiac Events

Results:

Likelihood Ratio Rule of 5's*

LR^+ 10 = +45%
LR^+ 5 = +30%
LR^+ 2 = +15%
LR 1 = 0%
LR^- 0.5 = -15%
LR^- 0.2 = -30%
LR^- 0.1 = -45%
**estimated % change in probability*

OUTCOME	Sensitivity	Specificity	LR^+	LR^-
MACE @ 30-days or 6-weeks				
HEART ≥ 4	95.9%	44.6%	1.73	0.09
HEART ≥ 7	39.5%	95.0%	7.89	0.64
TIMI ≥ 2	87.8%	48.1%	1.69	0.25
TIMI ≥ 6	2.8%	99.6%	6.53	0.98
DEATH				
HEART ≥ 4	95.0%	34.2%	1.45	0.14
HEART ≥ 7	48.4%	91.9%	5.94	0.56
MYOCARDIAL INFARCTION				
HEART ≥ 4	97.5%	40.5%	1.64	0.06
HEART ≥ 7	42.5%	96.9%	13.58	0.59

Fernando SM et al. Acad Emerg Med. 2019;26:140-151.

Update in Hospital Medicine

14

Prognostic Accuracy of the HEART Score for Prediction of Major Adverse Cardiac Events

Conclusion: **The HEART score performs very, very well in the predication of MACE, death, and MI in patients presenting with chest pain to the emergency department**

Impact HM: **The HEART score should be utilized over the TIMI score for risk stratification of patients presenting with chest pain including those high-risk or low-risk (but not necessarily for those patients with actual UA/NSTEMI)**

Fernando SM et al. Acad Emerg Med. 2019;26:140-151.

Update in Hospital Medicine

15

What is the most appropriate next step in the management of this patient?

A. Admit to hospital medicine for cardiac stress testing
B. Consult cardiology for left heart catheterization
C. Consult gastroenterology for upper endoscopy
D. Discharge from the ED with outpatient follow-up and/or repeat evaluation if symptoms return/persist
E. Find out where the patient got the hot wings and write a negative Yelp review about the restaurant

Case Conclusion

- The HEART score for this patient is 3
- The patient's symptoms are attributed to "heartburn" and the patient is counseled regarding which exacerbation factors to avoid
- The patient is discharged home from the ED and does well

Case Presentation

- You are admitting a patient from the ED with suspected osteomyelitis
- 68-year-old M with HTN, heavy EtOH use, diabetes and a h/o of recurrent diabetic foot infections
- You are now called because the patient is altered with severe agitation and concern for serious impending harm to ED patients/staff
- Attempts at reorienting the patient and verbal de-escalation are unsuccessful

What is the best IM treatment for severe agitation in this patient in the ED?

A. Haloperidol 5 mg
B. Haloperidol 10 mg
C. Midazolam 5 mg
D. Olanzapine 10 mg
E. Ziprasidone 20 mg
F. Quickly medically clear the patient and transfer to psychiatry?

Intramuscular Midazolam, Olanzapine, Ziprasidone, or Haloperidol for Treating Acute Agitation in the Emergency Department

Klein LR, Driver BE, Miner JR, et al. Ann Emerg Med 2018;72:374-384.

Update in Hospital Medicine

20

SHORT TAKE: Treating Acute Agitation in the Emergency Department

- Prospective observational study*
- 737 agitated ED patients treated with IM meds
- Median age 40, 72% men
- *AMS Scale <1 @ 15 mins*
- Results: Midazolam had a greater proportion of patients "adequately sedated"

*3-week blocks
Haloperidol 5 mg→40%
Haloperidol 10 mg→42%
Midazolam 5 mg→71%
Olanzapine 10 mg→61%
Ziprasidone 20 mg→52%

➢ Impact HM: IM Midazolam more effective for acute agitation with no difference in AEs

Klein LR et al. Ann Emerg Med. 2018;72:374-384.

Update in Hospital Medicine

21

What is the best IM treatment for severe agitation in this patient in the ED?

A. Haloperidol 5 mg
B. Haloperidol 10 mg
C. Midazolam 5 mg
D. Olanzapine 10 mg
E. Ziprasidone 20 mg
F. Quickly medically clear the patient and transfer to psychiatry?

Case Continued

- Patient is adequately sedated with midazolam
- Diagnosis: EtOH withdrawal as a cause for his agitation in the setting of acute osteomyelitis
- Patient stabilizes with CIWA protocol, benzo taper, IV antibiotics and is ready for discharge but blood cultures grew MSSA 3/3 sets
- Echo demonstrates left-sided endocarditis
- 6 weeks of antibiotic therapy is recommended by ID for this stable patient

Which treatment strategy is the preferred recommendation for this patient?

A. Bone biopsy of osteomyelitis site to direct therapy choice and determine length of antibiotic treatment
B. Continue IV antibiotics for 7 days and then switch to oral coverage for a total of 6 weeks of antibiotics
C. Continue IV antibiotics for 10 days and then switch to oral coverage for a total of 6 weeks of antibiotics
D. Continue IV antibiotics for 4 weeks total duration
E. Continue IV antibiotics for 6 weeks total duration

Partial Oral versus Intravenous Antibiotic Treatment of Endocarditis

Iversen K et al.
N Engl J Med 2019;
380:415-425.

Oral versus Intravenous Antibiotics for Bone and Joint Infection

Li HK et al.
N Engl J Med 2019;
380:425-436.

Oral versus Intravenous Antibiotics for Endocarditis and Bone/Joint Infections

Background: Patients with left-sided endocarditis and/or bone/joint infections are typically treated with IV antibiotics for up to 6 weeks

Question: Is oral antibiotic therapy in stable patients with these conditions noninferior to IV?

Methods: 2 RCTs: endocarditis (n=400); bone (n=1054)

Endocarditis: IV antibiotics for at least 10 d

Outcomes: Mortality, unplanned cardiac surgery, embolic events, relapse bacteremia

Bone: △ to PO antibiotics within 7 days

Outcome: Treatment failure @ 1 year

Iversen et al. & Li et al. N Eng J Med. 2019;380:415-436.

Update in Hospital Medicine

26

POET: Partial Oral Treatment of Endocarditis

Results:

Pathogen (%)
IV vs. PO
Strep
52.3 vs. 45.8

Enterococcus
23.1 vs. 25.4

Staph*
20.1 vs. 23.4

CNS
5.0 vs. 6.5

OUTCOME	IV (N=199)	Oral (N=201)	Difference	P value
Primary composite	12.1%	9.0%	3.1% (-3.4 to 9.6)	0.40
All-cause mortality	6.5%	3.5%	3% (-1.4 to 7.7)	NS
Unplanned cardiac surgery	3.0%	3.0%	0 (-3.3 to 3.4)	NS
Embolic event	1.5%	1.5%	0 (-2.4 to 2.4)	NS
Relapse of + blood culture	2.5%	2.5%	0 (-3.1 to 3.1)	NS
Adverse events	6.0%	5.0%	1.0%	0.66

Iversen et al. & Li et al. N Eng J Med. 2019;380:415-436.

Update in Hospital Medicine

27

OVIVA: Oral versus Intravenous Antibiotics for Bone and Joint Infection

Results:

***Median hospital LOS was 3 days greater in the IV group (P<0.001)**

***Similar % of patients in both groups received antibiotics after 6 weeks**

OUTCOME	IV (N=506)	Oral (N=507)	Difference	P value
Definitive tx failure	14.6%	13.2%	-1.4% (-5.6 to 2.9)	NS
Probable/ possible failure	1.2%	2.0%	-0.7% (-5.1 to 3.8)	NS
Serious adverse events	27.7%	26.2%	-1.5%	0.58
C. difficile diarrhea	1.7%	1.0%	-0.7%	0.30
Catheter complications	9.4%	1.0%	-8.4%	<0.001
Early tx d/c	18.9%	12.8%	-7.1%	0.006

Li HK et al. N Engl J Med 2019;380:425-436.

Update in Hospital Medicine

28

Oral versus Intravenous Antibiotics for Endocarditis and Bone/Joint Infections

Limitations:

POET:

- **Not blinded**
- **No patients had MRSA (only MSSA)**
- **All oral regimens consisted of 2 different antibiotics from different drug classes**
- **Only 1 to 1.5% IVDU patients**

OVIVA:

- **3.7% enrolled study patients had no endpoint data**
- **These patients were "imputed"**
- **Open label (i.e. treatment groups not blinded)**
- **Nearly 10% of the patients in the oral group received IV antibiotics after day 7 until the end of the treatment period**

Iversen et al. & Li et al. N Eng J Med. 2019;38:415-436.

Update in Hospital Medicine

29

Oral versus Intravenous Antibiotics for Endocarditis and Bone/Joint Infections

Conclusion: **In stable patients with left-sided endocarditis, changing to oral antibiotic treatment was noninferior to IV**

In surgical and nonsurgical patients with bone and joint infections, oral antibiotic therapy was noninferior to IV

Impact HM: **Oral antibiotic therapy appears to be a suitable alternative to IV antibiotic treatment in stable patients with endocarditis and/or bone/joint infections**

Iversen et al. & Li et al. N Eng J Med. 2019;38:415-436.

Update in Hospital Medicine

30

Which treatment strategy is the preferred recommendation for this patient?

A. Bone biopsy of osteomyelitis site to direct therapy choice and determine length of antibiotic treatment
B. Continue IV antibiotics for 7 days and then switch to oral coverage for a total of 6 weeks of antibiotics
C. Continue IV antibiotics for 10 days and then switch to oral coverage for a total of 6 weeks of antibiotics
D. Continue IV antibiotics for 4 weeks total duration
E. Continue IV antibiotics for 6 weeks total duration

Case Continued

- Repeat blood cultures are negative
- Patient is transitioned to an oral antibiotic regimen after 10 days of IV antibiotics
- On hospital day #11, the patient is successfully discharged home and does well

Case Presentation

- As you're walking into the hospital to start your shift, you hear a Code Blue called to the unit that you're walking through
- You walk into the room and find a nurse performing CPR on the patient

33

What interventions can improve relevant outcomes for patients in cardiac arrest?

A. Provide epinephrine rather than vasopressin
B. Provide amiodarone rather than lidocaine for patients with shockable rhythms
C. Provide compressions during defibrillation to minimize hands off time
D. Starbuck's Coffee IV (…wide open!)

34

Adrenaline and vasopressin for cardiac arrest

Finn J, et al. Cochrane Database Syst Rev. 2019;1: CD003179.

35

Adrenaline and vasopressin for cardiac arrest

Background: Epinephrine has been used for cardiac arrest since 1960s

Question: In patients with cardiac arrest, what is the effect of epinephrine (adrenaline) and vasopressin on relevant survival outcomes?

Methods: Meta-analysis of 26 RCTs (n = 21 704), 16 OOH cardiac arrests, 8 IHCA, 2 pediatric. Quality of evidence reported via GRADE approach.

Interventions: Comparisons of standard dose epinephrine (SDE) to placebo, high-dose epinephrine (HDE) to SDE, vasopressin to SDE and vasopressin plus SDE to SDE

Outcomes: ROSC, survival to hospital discharge, survival to hospital discharge with favorable neurologic outcome (CPC<3, or mRS<4)

Results: For comparison of HDE to SDE or comparison of Vasopressin to SDA or comparison of SDA + vasopressin to SDA, no difference in survival to discharge or survival to discharge with favorable neurologic outcomes

Other results…

Finn J, et al. Cochrane Database Syst Rev. 2019;1: CD003179.

Epi v. placebo

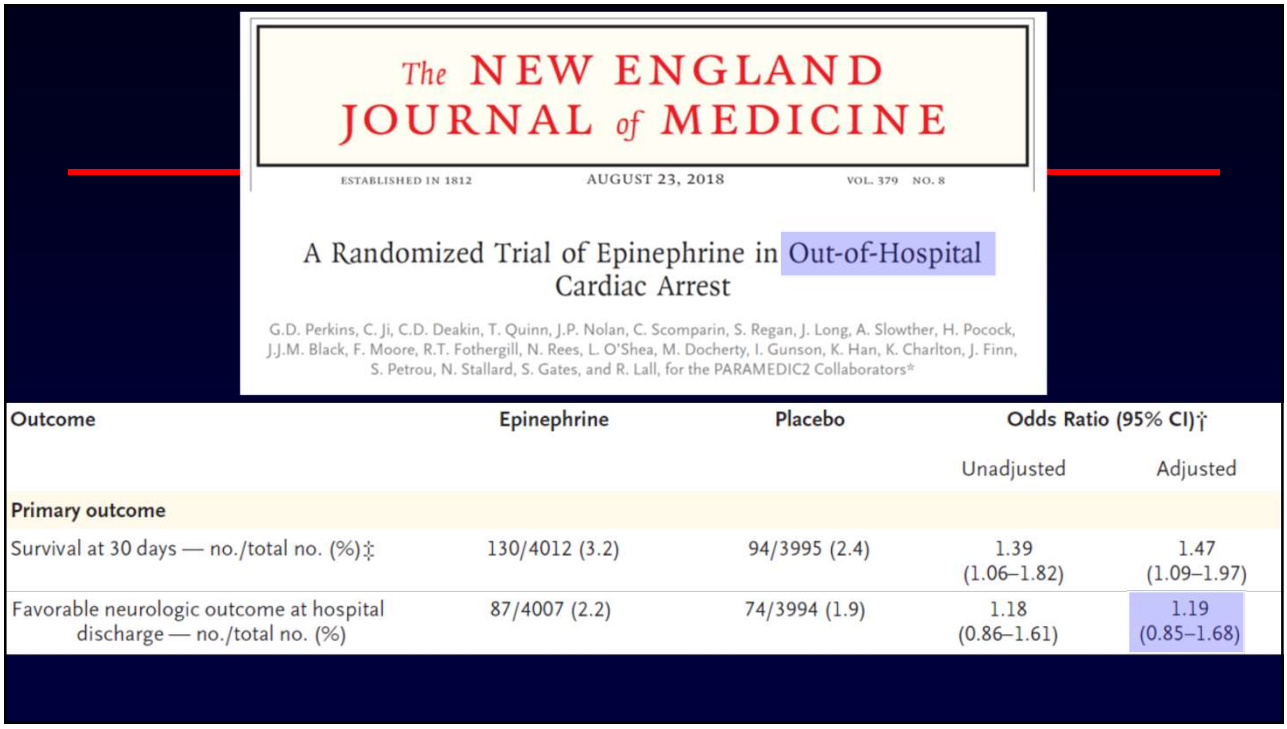
Survival to Hospital Discharge

- 3.2% v. 2.3%
- NNT 101
  - P=0.006

Survival to Hospital Discharge with Favorable Neurologic Outcome

- 2.2% v. 1.9%
- NNT (258)
  - P=0.21

Finn J, et al. Cochrane Database Syst Rev. 2019;1: CD003179.



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 23, 2018 VOL. 379 NO. 8

A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest

G.D. Perkins, C. Ji, C.D. Deakin, T. Quinn, J.P. Nolan, C. Scomparin, S. Regan, J. Long, A. Slowther, H. Pocock, J.J.M. Black, F. Moore, R.T. Fothergill, N. Rees, L. O'Shea, M. Docherty, I. Gunson, K. Han, K. Charlton, J. Finn, S. Petrou, N. Stallard, S. Gates, and R. Lall, for the PARAMEDIC2 Collaborators*

Outcome	Epinephrine	Placebo	Odds Ratio (95% CI)†	
			Unadjusted	Adjusted
Primary outcome				
Survival at 30 days — no./total no. (%)‡	130/4012 (3.2)	94/3995 (2.4)	1.39 (1.06–1.82)	1.47 (1.09–1.97)
Favorable neurologic outcome at hospital discharge — no./total no. (%)	87/4007 (2.2)	74/3994 (1.9)	1.18 (0.86–1.61)	1.19 (0.85–1.68)

38

Adrenaline and vasopressin for cardiac arrest

Conclusions: **Epinephrine likely is still preferred over vasopressin for cardiac arrest. Whether Epi actually improves the relevant outcome of survival with good neurologic outcomes remains to be seen**

Caveats: **Most studies in outpatient cardiac arrest, where outcomes much worse (Survival to hospital discharge with favorable neurologic outcomes 2-5% OHCA vs. 15-20% in IHCA).**
Little inpatient data on comparisons of Epi vs. no Epi for outcome of survival to hospital discharge with favorable neurologic outcomes

Impact HM: **Continue to use Epi in IHCA, but unclear if it truly makes a difference for patient outcomes (…possibly more so for non-shockable rhythms)**

Finn J, et al. Cochrane Database Syst Rev. 2019;1: CD003179.

39

What about antiarrhythmic drugs?

40

Effectiveness of antiarrhythmic drugs for shockable cardiac arrest: A systematic review

Ali MU, et al. Resuscitation 2018. 132; 63–72.

41

Antiarrhythmics for shockable cardiac arrest

Background: 2015 ACC/AHA Guidelines recommend amiodarone for shockable cardiac arrest, and lidocaine recommended as 'alternative'

Question: What is the effectiveness of various antiarrhythmic drugs in the management of shockable cardiac arrest in adults?

Methods: Meta-analysis of 14 RCTs and 17 observational studies.

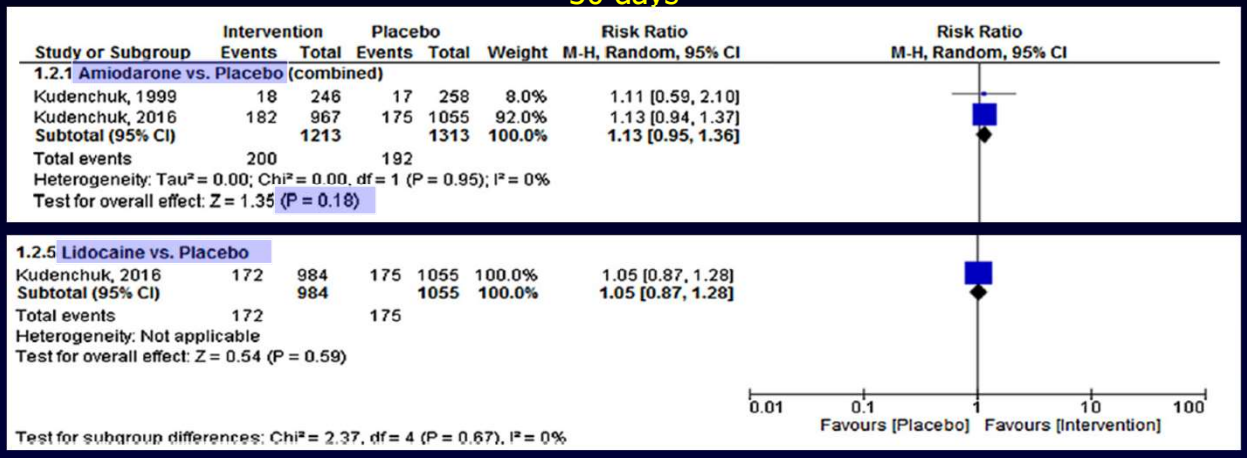
Interventions: RCT comparisons of Amiodarone to placebo (~2500 patients), Lidocaine to placebo (~2000 patients), and Amiodarone to Lidocaine (~2000 patients)

Outcomes: ROSC, survival to hospital discharge, survival to hospital discharge with favorable neurologic outcome

Ali MU, et al. Resuscitation 2018. 132; 63–72.

Amio vs. Placebo and Lidocaine vs. Placebo

Outcome: Survival to hospital discharge with good neurologic function at 30 days



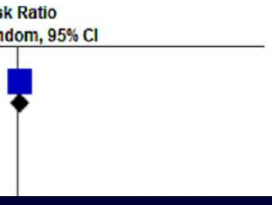
- Amio vs. placebo (~2500 patients):
  - 16.5% vs. 14.6%, (NNT 53), (p=0.18)

Ali MU, et al. Resuscitation 2018. 132; 63–72.

Amio vs. Lidocaine (head-to-head)

Outcome: Survival to hospital discharge with good neurologic function at 30 days

Study or Subgroup	Intervention 1 Events	Total	Intervention 2 Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
2.2.1 Amiodarone vs. Lidocaine						
Kudenchuk, 2016	182	967	172	984	100.0%	1.08 [0.89, 1.30]
Subtotal (95% CI)		**967**		**984**	**100.0%**	**1.08 [0.89, 1.30]**
Total events	182		172			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.77 (P = 0.44)						



Ali MU, et al. Resuscitation 2018. 132; 63–72.

Antiarrhythmics for shockable cardiac arrest

Conclusions: For shockable cardiac arrest resuscitation, amiodarone and lidocaine likely provide analogous (uncertain) benefits for improving survival to hospital discharge with good neurologic outcomes

Caveats: A 2017 Taiwan nationwide cohort study (~27,000 OOH arrest patients) showed improved survival to discharge in patients receiving either Amio (aOR 2.8) or Lido (aOR 2.5) [1-year survival Amio 8%, Lido 7%, neither 3%], but could have residual confounding. (Int J Cardiol. 2017 Jan 15;227:292-298.)

Impact HM: ACC/AHA and ERC 2018 Guidelines: Amiodarone or lidocaine may be considered for VF/pVT that is unresponsive to defibrillation. Particularly useful with witnessed arrest, for whom time to drug administration may be shorter. (Class IIb; Level of Evidence B-R)

AHA FOCUSED UPDATE Circulation. 2018;138:e740–e749.

2018 American Heart Association Focused Update on Advanced Cardiovascular Life Support Use of Antiarrhythmic Drugs During and Immediately After Cardiac Arrest

Ali MU, et al. Resuscitation 2018. 132; 63–72.

45

Short Take: Hands-On Defibrillation with a Safety Barrier

- Background: Maximizing hands-on CPR time improves outcomes in cardiac arrest.
- Question: Can a thin draping sheet of polyethylene (3′ x 3′, thickness ~0.05mm) over CPR area provide caregivers adequate insulation to permit hands-on defibrillation during resuscitation?
- Methods: 23 patients receiving 27 elective shocks (for Afib/flutter) at 200J or higher (up to 360J). 20 lb of pressure applied by provider.
- Results: Mean currents were 0.67mA, with peak of 1.08mA, well below maximum acceptable standard peak of 5mA (set by IEC). No shocks were subjectively perceptible by caregivers.
- Conclusions: This type of drape appears to provide safety to clinicians. Uninterrupted chest compressions during shock delivery are achievable and possibly next advancement in CPR protocol.

Wight JA, et al. Resuscitation. 2019; 138: 110-113.

IEC: International Electrotechnical Commission

What interventions can improve relevant outcomes for patients in cardiac arrest?

A. Provide epinephrine rather than vasopressin
B. Provide amiodarone rather than lidocaine for patients with shockable rhythms
C. Provide compressions during defibrillation to minimize hands off time
D. Starbuck's Coffee IV (…wide open!)

47

Case

- After assisting with the code, you get called to admit a patient from the ED with HF exacerbation
- The patient already received a dose of IV Lasix, and still has some increased work of breathing
- Exam:
  - VS BP 108/68 P 112 R 26 T 37.1 O2 Sat 87% on 2L, 92% on 4L
  - Elevated JVP, +S3, displaced apical impulse
  - Mild to mod increased WOB, rales to mid lung fields
  - BLE 3+ edema

48

What hospital intervention(s) can improve mortality outcomes in the management of patients admitted for ADHF?

A. ACE-inhibitors
B. Aldosterone antagonists (e.g. spironolactone)
C. Sacubitril-valsartan (Entresto)
D. Non-invasive ventilation
E. Salted peanuts and beef jerky
F. No interventions improve mortality or LOS for ADHF

49

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary edema

Berbenetz N, et al. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD005351. DOI: 10.1002/14651858.CD005351.pub4.

50

Non-Invasive Ventilation (NIV) for Cardiogenic Pulmonary Edema

Background: For patients hospitalized with acute decompensated heart failure (ADHF) and pulmonary edema, U.S. 2013 guidelines (Circulation 2013; 128:e240) and 2017 updates (Circulation 2017; 136:e137) do not address noninvasive ventilation (NIV), whereas European 2016 guidelines (Eur Heart J 2016 37:2129) recommend its prompt consideration.

Question: In hospitalized ADHF, does NIV improve relevant outcomes?

Methods: Meta-analysis of 24 RCTs, unblinded, ~2600 patients presenting to an ED or inpatients with ADHF with pulmonary edema. Average f/u: 2 weeks.

Interventions: NIV (either CPAP or bilevel ventilation) + standard medical therapy (diuretics, nitrates, O2) or standard therapy alone.

Outcomes: 1°: hospital mortality

2°: endotracheal intubation, treatment intolerance, LOS, Acute MI, other adverse events

Berbenetz N, et al. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD005351.

Non-Invasive Ventilation (NIV) for Cardiogenic Pulmonary Edema

Outcomes	NIV	Control	RR	P Value	NNT
Hospital Mortality	**11%**	**18%**	**0.65**	**<0.001**	**17**
Endotracheal Intubation	**8%**	**15%**	**0.49**	**<0.001**	**13**
Hospital LOS	Mean Difference: -0.3 days			0.51	-
Adverse Events*	3.8%	3.2%	1.04	0.81	-

No difference with CPAP vs. bilevel ventilation. Mask type did not affect outcomes.
Low heterogeneity of outcomes across studies

Adverse clinical outcomes = skin damage, mask discomfort, GI s/e, sinusitis, PTX, hypotension, arrhythmia, cardiac arrest, aspiration, CVA, Sz
***Acute MI: no difference in 2 groups (inconsistent acute MI definitions across studies)**

Berbenetz N, et al. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD005351.

Non-Invasive Ventilation (NIV) for Cardiogenic Pulmonary Edema

Conclusions: **NIV remains the sole intervention with randomized trial-level evidence for improved mortality outcomes in patients with acute HF exacerbations. Also with reduced endotracheal intubation.**

Impact HM: **Practical considerations (such as availability of intensive care unit beds or NIV devices) could limit NIV use at some institutions.**

Hospitalists should strongly consider NIV for patients with acute HF exacerbations with pulmonary edema.

Berbenetz N, et al. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD005351.

53

What hospital intervention(s) can improve mortality outcomes in the management of patients admitted for ADHF?

A. ACE-inhibitors
B. Aldosterone antagonists (e.g. spironolactone)
C. Sacubitril-valsartan (Entresto)
D. Non-invasive ventilation
E. Salted peanuts and beef jerky
F. No interventions improve mortality or LOS for ADHF

54

Case Conclusion

- Our patient was placed on CPAP while being diuresed
- HF improved dramatically within 36 hours
- Other home HF meds (ACE-I, spironolactone, β-blocker) were continued
- Discharged home after 4-day hospital stay

55

Case

- You get called about another admission, this time a 48-year-old ED patient who needs to go to the ICU.
- Patient was altered in the ED and was intubated for 'airway protection' after emesis. There was some question of substance use. Possible small RLL infiltrate on CXR.
- Admitted for respiratory failure and sepsis

56

What type of ICU care might improve our patient's outcomes?

A. Frequent lactic acid levels to guide fluid management for shock
B. Frequent capillary refill time checks to guide fluid management for shock
C. Flexible ICU visitation policies for patient's family members
D. Beignets and coffee for all ICU patients (…via NG tube if necessary)
E. None of the above interventions improve patient outcomes

57

Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients with Septic Shock

The ANDROMEDA-SHOCK Randomized Clinical Trial

Hernández G, et al. ANDROMEDA-SHOCK Trial. JAMA. 321(7):654–664. doi:10.1001/jama.2019.0071

58

Capillary Refill vs. Lactate to Guide Resuscitation in Septic Shock

Background: Surviving Sepsis guidelines endorse lactate clearance to guide resuscitation in sepsis (weak recommendation with low-quality evidence [NEJM JW Emerg Med Jun 2018 and Intensive Care Med 2018; 44:925]). CMS sepsis reporting (i.e., SEP-1) requires measuring lactate and repeating assessment if lactate is >2 mmol/L.

Question: Is capillary refill a better marker than lactate to assess adequate resuscitation of patients with septic shock?

Methods: RCT, unblinded, 424 patients, 28 hospitals in 5 South American countries. 8-hour resuscitation strategies based on serial measurements of either capillary refill time (CRT) or lactate levels

Interventions: Resuscitation guided by either capillary refill (by 10-second blanching, with <3 seconds considered normal cap-refill) every 30-minutes OR lactate levels every 2 hours

Fluid challenges (500cc crystalloid) q30' until limited by CVP. Protocols for use of vasopressors and ionotropes

Perfusion Goals: Normalize CRT (<3 seconds) OR normalize lactate (<2.0) or decrease by 20% every 2 hours

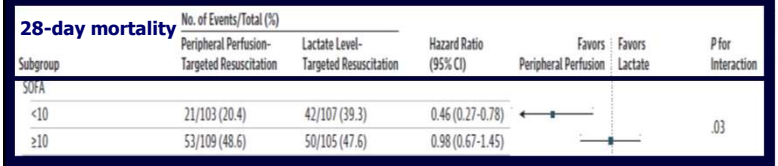
Outcomes: 1°: 28-day mortality, organ dysfunction (SOFA at 72°), LOS, amt of IVF resuscitation

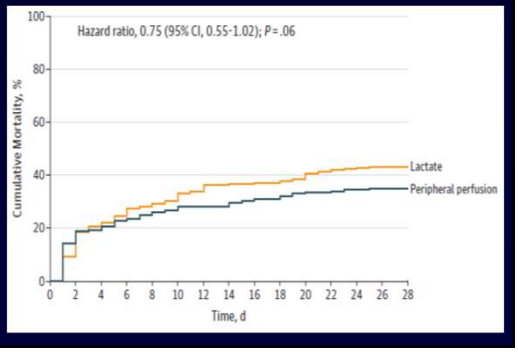
Hernández G, et al. JAMA. 321(7):654–664.

Capillary Refill vs. Lactate to Guide Resuscitation in Septic Shock

Outcomes	Capillary Refill	Lactate	aHR	P Value	NNT
Mortality, 28-day	35%	43%	0.75	0.06	(12)
Mean SOFA score at 72 hrs	5.6	6.6	-	0.045	-
Fluid resuscitation 1st 8-hrs	2.36L	2.77L	-	0.01	-

No significant differences in mechanical ventilation-free days, renal replacement-free days, ICU LOS between groups. Less IVF resuscitation in cap-refill group.





Hernández G, et al. JAMA. 321(7):654–664.

60

Capillary Refill vs. Lactate to Guide Resuscitation in Septic Shock

Conclusions: **Capillary refill guidance for septic shock resuscitation may improve short-term mortality, especially for less-ill patients (SOFA<10), but more studies are necessary for this process to be adopted more broadly.**

Impact HM: **Debate about using lactate clearance as a standardized part of sepsis care, including sepsis bundles that mandate lactate measurement, which might drive overtreatment of some patients**

Hernández G, et al. JAMA. 321(7):654–664.

61

Short Take: Flexible vs. Restrictive Visiting Policies in ICUs: Meta-Analysis

- Question: Does more flexible visiting hours for family members improve outcomes (compared with restrictive visiting) for ICU patients?
- Methods: Systematic review and meta-analysis of 16 studies
- Results: Compared with restrictive visit policies (≤6 hrs) flexible visit policies (>6 hrs) significantly reduced patient delirium (OR 0.39) and anxiety, without affecting mortality, ICU stay.
  - Improved family member satisfaction (9 studies) but higher staff burnout (single study)
- Limitations: Only 2 RCTs, most before-after studies
- Conclusions/Impact HM: Flexible visit policies in ICUs likely benefit patients and family members, but implementation needs to carefully mitigate staff concerns or challenges

Crit Care Med 2018; 46: 1175-1180.

62

What type of ICU care might improve our patient's outcomes?

A. Frequent lactic acid levels to guide fluid management for shock
B. Frequent capillary refill time checks to guide fluid management for shock
C. Flexible ICU visitation policies for patient's family members
D. Beignets and coffee for all ICU patients (…via NG tube if necessary)
E. None of the above interventions improve patient outcomes

63

Case continued…

- Our patient improved rapidly, was extubated within 24 hours, O2 sat 97% RA, procalcitonin level <0.25, and antibiotics were stopped
- Our patient was discharged home from the ICU
- Did well without return to ED or hospital

64

Case Presentation

- 77-year-old M with COPD presents from assisted living to the ED with 3 weeks of cough and SOB x 4 days.
- Initially cough was non-productive but became productive over last 4-5 days.
- He's has poor po intake over last 3-weeks and has lost 12 lbs over that time. BMI 20.
- Admitted for COPD exacerbation

65

What intervention(s) will affect this patient's outcomes?

A. Individualized nutrition support can reduce adverse events and mortality in medical floor patients
B. Aggressive inpatient nutrition in a non-ICU (floor) patient during hospital stay could increase adverse events and mortality
C. Pass the patient a steak dinner!
D. Neither A or B

66

Individualised nutritional support in medical inpatients at nutritional risk: a randomised clinical trial

Scheutz P, et al. Lancet. 2019 Jun 8;393(10188):2312-2321. doi: 10.1016/S0140-6736(18)32776-4.

67

Individualized Nutritional Support in Medical Floor Patients

Background: 2 recent ICU studies a) enternal vs. parenteral nutrition in shock RCT—NUTRIREA-2 (Lancet 2017); and b) Energy-dense vs. routine enteral nutrition in critically ill (NEJM 2018) showed no benefit

Question: Can structured nutrition screening and individualized nutrition intervention impact clinical outcomes?

Methods: RCT, unblinded, 8 Swedish hospitals over 4 years, screened all non-ICU medical patients (all able to take oral) for malnutrition, >2000 patients with increased risk malnutrition. ITT analysis

Exclusions: Surgical patients, patients with terminal conditions, and patients with known need for nutrition support (e.g. post-gastric bypass, stem cell transplantation, acute liver failure, cystic fibrosis, anorexia nervosa)

Interventions: Nutritional support—with individualized protein and calorie goals and micronutrient supplementation—or standard hospital food. >75% of nutritional support patients achieved caloric and protein goals.

Outcomes: 1º: Adverse clinical outcomes = ICU admission, hospital readmission, hospital-acquired infection, major cardiovascular event, acute renal failure, gastrointestinal complication or functional decline

Scheutz P, et al. Lancet. 2019 Jun 8;393(10188):2312-2321.

Nutrition Risk Screening Tool

- Risk score > 2
- https://www.mdcalc.com/nutrition-risk-screening-2002-nrs-2002

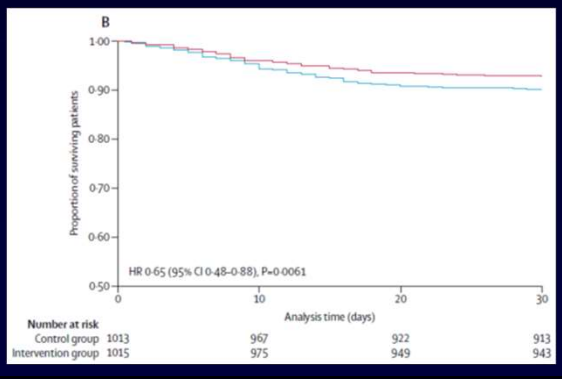
69

Individualized Nutritional Support in Medical Floor Patients

Outcomes	Nutritional Support	Control	HR	P Value	NNT
Adverse Clinical Outcomes within 30 days	23%	27%	0.81	0.02	25
Mortality within 30 days	7%	10%	0.32	<0.001	38

Adverse clinical outcomes = ICU admission, hospital readmission, hospital-acquired infection, major cardiovascular event, acute renal failure, gastrointestinal complication or functional decline

Side-effects similar in 2 groups, and few intervention patients required enteral or parenteral nutrition (~1% each).



Scheutz P, et al. Lancet. 2019 Jun 8;393(10188):2312-2321.

Individualized Nutritional Support in Medical Floor Patients

Conclusions: **Systematic screening of medical inpatients for nutritional risk and designing—by registered dieticians—a structured and individualized nutrition support plan for high-risk patients improves mortality.**

Impact HM: **For institutions, the devil will be in the details of implementation of a process and intervention that can mimic that of this study design. However, it seems worth the work for improved patient outcomes.**

For individual clinicians, it makes sense to screen inpatients and apply a structured nutrition intervention, with protein and calorie goals, for patients with expected >3-day LOS

Scheutz P, et al. Lancet. 2019 Jun 8;393(10188):2312-2321.

71

What intervention(s) will improve this patient's outcomes?

A. Individualized nutrition support can reduce adverse events and mortality in medical floor patients
B. Aggressive inpatient nutrition in a non-ICU (floor) patient during hospital stay could increase adverse events and mortality
C. Pass the patient a Beignet!
D. Neither A or B

72

Final case…

- You're discussing with your patient who enjoys high-risk sports about using a parachute during skydiving
- He asks you if there's any "strong evidence" that a parachute can actually prevent bad outcomes when jumping from an aircraft
- You council him…

73

Your counseling of a patient asking for "strong evidence" that parachutes can prevent bad outcomes when jumping from an aircraft?

A. "Don't be an idiot, wear a parachute."

B. "Would anyone in their right mind conduct a randomized controlled trial on this question?"

C. "If you want to try a jump without parachute, you might be a good candidate for this year's Darwin Awards."

D. "Can I post the video on YouTube?"

74

Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial

Robert W Yeh,[1] Linda R Valsdottir,[1] Michael W Yeh,[2] Changyu Shen,[1] Daniel B Kramer,[1] Jordan B Strom,[1] Eric A Secemsky,[1] Joanne L Healy,[1] Robert M Domeier,[3] Dhruv S Kazi,[1] Brahmajee K Nallamothu[4] On behalf of the PARACHUTE Investigators

- **PA**rticipation in **RA**ndomized trials **C**ompromised by widely **H**eld beliefs abo**U**t lack of **T**reatment **E**quipoise (**PARACHUTE**) trial
- OBJECTIVE
  - To determine if using a parachute prevents death or major traumatic injury when jumping from an aircraft.
- DESIGN: Randomized controlled trial
- SETTING
  - Private or commercial aircraft between September 2017 and August 2018.

Yeh RW, et al. BMJ 2018;363:k5094. doi: 10.1136/bmj.k5094

75

Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial

Robert W Yeh,[1] Linda R Valsdottir,[1] Michael W Yeh,[2] Changyu Shen,[1] Daniel B Kramer,[1] Jordan B Strom,[1] Eric A Secemsky,[1] Joanne L Healy,[1] Robert M Domeier,[3] Dhruv S Kazi,[1] Brahmajee K Nallamothu[4] On behalf of the PARACHUTE Investigators

- PARTICIPANTS
  - 92 aircraft passengers aged 18 and over were screened for participation.
  - 23 agreed to be enrolled and were randomized.
- INTERVENTION
  - Jumping from an aircraft (airplane or helicopter) with a parachute versus an empty backpack (unblinded).
- MAIN OUTCOME MEASURES
  - Composite of death or major traumatic injury upon impact with the ground measured immediately after landing.

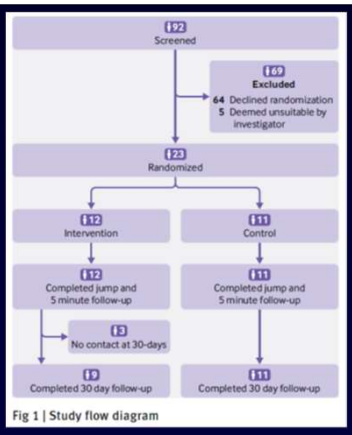


Fig 1 | Study flow diagram

Yeh RW, et al. BMJ 2018;363:k5094. doi: 10.1136/bmj.k5094

Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial

Robert W Yeh,[1] Linda R Valsdottir,[1] Michael W Yeh,[2] Changyu Shen,[1] Daniel B Kramer,[1] Jordan B Strom,[1] Eric A Secemsky,[1] Joanne L Healy,[1] Robert M Domeier,[3] Dhruv S Kazi,[1] Brahmajee K Nallamothu[4] On behalf of the PARACHUTE Investigators

- RESULTS
  - Parachute use did not significantly reduce death or major injury (0% for parachute *v* 0% for control; P>0.9).
  - Compared with individuals screened but not enrolled, participants included in the study were on aircraft at significantly **lower altitude** (mean of 0.6 m for participants *v* mean of 9146 m for nonparticipants; P<0.001) and **lower velocity** (mean of 0 km/h *v* mean of 800 km/h; P<0.001).
- CONCLUSIONS
  - Parachute use did not reduce death or major traumatic injury when jumping from aircraft in the first randomized evaluation of this intervention.
  - However, the trial was only able to enroll participants on small stationary aircraft on the ground, suggesting cautious extrapolation to high altitude jumps.

Yeh RW, et al. BMJ 2018;363:k5094. doi: 10.1136/bmj.k5094

Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial

Robert W Yeh,[1] Linda R Valsdottir,[1] Michael W Yeh,[2] Changyu Shen,[1] Daniel B Kramer,[1] Jordan B Strom,[1] Eric A Secemsky,[1] Joanne L Healy,[1] Robert M Domeier,[3] Dhruv S Kazi,[1] Brahmajee K Nallamothu[4] On behalf of the PARACHUTE Investigators

- Impact HM: When beliefs regarding the effectiveness of an intervention exist in the community, randomized trials might selectively enroll individuals with a lower perceived likelihood of benefit, thus diminishing the applicability of the results to clinical practice.

Fig 2 | Representative study participant jumping from aircraft with an empty backpack. This individual did not incur death or major injury upon impact with the ground

Yeh RW, et al. BMJ 2018;363:k5094. doi: 10.1136/bmj.k5094

78

Session clean up…

79

Take Home Points

- **Emergency Medicine**
  - Utilize the HEART score for risk stratification of patients with chest pain including both those at high- and low-risk
- **Psychiatry**
  - IM midazolam is more effective for adequate sedation of acute agitation of patients in the emergency setting with no difference in adverse affects as compared to other commonly used drug therapies in these situations

Take Home Points

- **Infectious Diseases**
  - Stable patients with endocarditis should be considered for change to oral antibiotic therapy for long-term treatment
  - Patients with bone/joint infections, whether surgical or not, should be considered for oral antibiotic therapy rather than long-term IV antibiotic treatment

81

Take Home Points

- **Critical Care Medicine for Cardiopulmonary Resuscitation**
  - Epi or vasopressin for cardiac arrest (…but Epi likely the only one available on code carts, and give it early for non-shockable arrest rhythms)
  - Amio or Lidocaine for shockable cardiac arrest
  - Hands-on defibrillation may be in our future
- **Critical Care Medicine for Septic Shock**
  - Capillary refill-guided resuscitation may be superior (or at least equivalent) to lactate-guided resuscitation especially for less-ill pts (SOFA<10)

82

Take Home Points

- **Cardiology**
  - NIV reduces mortality and intubation in acute decompensated heart failure
- **Inpatient Nutrition**
  - Screen medical floor patients for nutritional risk and provide a nutrition support plan for high-risk patients

83

Citations

- **References**

  - Ali MU, et al. Resuscitation 2018. 132; 63–72.
  - Berbenetz N, et al. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD005351.
  - Fernando SM et al. Acad Emerg Med. 2019;26:140-151.
  - Finn J, et al. Cochrane Database Syst Rev. 2019;1: CD003179.
  - Hernández G, et al. JAMA. 321(7):654–664.
  - Iversen et al. & Li et al. N Eng J Med. 2019;380:415-436.
  - Klein LR et al. Ann Emerg Med. 2018;72:374-384.
  - Li HK et al. N Engl J Med 2019;380:425-436.
  - Scheutz P, et al. Lancet. 2019 Jun 8;393(10188):2312-2321.
  - Yeh RW, et al. BMJ 2018;363:k5094. doi: 10.1136/bmj.k5094

Update in Hospital Medicine:
Recent Literature Impacting
Clinical Care in the Inpatient Setting

Thank You! Questions?

Daniel D Dressler, MD, MSc, MHM, FACP
Professor of Medicine
Emory University School of Medicine
Daniel.Dressler@emory.edu

Dustin T. Smith, MD, SFHM
Associate Professor of Medicine
Emory University School of Medicine
dtsmit2@emory.edu

85