

Less is More, Even in the ICU



Society of
Critical Care Medicine



The Intensive Care Professionals



EMORY
UNIVERSITY

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Less is More, Even in the ICU

- How can less be more?
- What is the Choosing Wisely campaign?
- Are there times when more is more?
- Implementing Choosing Wisely!



Value in Healthcare

$$\text{VALUE} = \frac{\text{QUALITY}}{\text{COST}}$$

Core Principles of Medical Ethics

- **Autonomy**
 - Requires the patient to have autonomy of thought, intention, and action when making health care decisions, fully informed of risks and benefits and free of coercion or coaxing.
- **Beneficence**
 - Healthcare must produce a net benefit to the patient, as well as to prevent or minimize harm.
- **Non-maleficence**
 - Avoid harm or injury to the patient and to others in society, either through acts of commission or omission.
- **Justice**
 - Burdens and benefits of healthcare must be distributed equally among all groups in society in order to be fair to all, including fair distribution of scarce resources, competing needs, rights and obligations, and potential conflicts with legislation.

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**Just because we can,
doesn't mean we should**

Overuse, A Very Real, Underappreciated Patient Safety Issue . . .

An estimated one-third of care delivered in the United States is considered wasteful

Institute of Medicine.

Best Care at Lower Cost: The Path to Continuously Learning Health Care in America. Washington, DC: National Academies Press; 2012.

- ❖ **Physical harm**
- ❖ **Emotional harm**
- ❖ **Financial harm**

Fisher ES, et al. JAMA. 1999;281(5):446-453.

Berwick DM, Hackbarth AD. JAMA 2012;307:1513-1516.

Moriates C, et al JAMA. 2013;310(6):577-578.

“As evidence increases about the harms from health care overuse, physicians have a professional obligation to reduce these events on both an individual patient level and across health care systems. **Overuse may need to be considered equal to adverse events and reviewed in the same context.”**

Zapata JA, et al. JAMA 2017; 317 (8): 849-850.

Therapeutic Illusion



"The problem is that you're overmedicated.
Luckily there are drugs that can help with that."

Overcoming Therapeutic Illusion

- ❖ **Providers and patients are constantly looking for an exact and immediate medical answer**
- ❖ **Frequent assumption that families and referring physicians expect us to do something**
- ❖ **Equate multiple tests and therapies with being thorough or caring**
- ❖ **Reassurance or “watch and wait” viewed with disinterest or not doing enough**

Casarett D. *N Engl J Med* 2016; 374: 1203-1205.

Overcoming Therapeutic Illusion

- ❖ **Promise of new technology or therapies**
- ❖ **Practice defensive medicine from concerns about the risks of litigation**
- ❖ **Health care systems and third-party payors may incentivize more testing and care than is necessary**
- ❖ **Lack of continuity may result in the substitution of excessive testing in place of a thorough assessment**

Casarett D. *N Engl J Med* 2016; 374: 1203-1205.

Complex Decision-Making in the ICU???

- Excess information reduces the accuracy of decision-making yet increases the confidence in the decision-making process
 - The ICU is among the most information-rich environments in healthcare
- All information and decision making is subject to, and contributes to, cognitive bias
 - A systematic pattern of deviation from rationality in judgment
 - Produces a mistake in remembering, reasoning, evaluating, or decision-making as a result of retaining beliefs or preferences despite contrary information
- When data are new, time is short and decision-making is complex, minimizing choices outperforms data-rich heuristic models

**Hall CC, Ariss L, Todorov A. *Organ Behav Hum Decis Process* 2007; 103(2): 277-90.
Hardman D. *Judgment and Decision Making*. 2003**



Choosing Wisely[®]

An initiative of the ABIM Foundation

Brody H. N Engl J Med 2010; 362:283-285. Cassel CK, et al. JAMA 2012; 307:1801-1802.

Choosing Wisely Examples



An initiative of the ABIM Foundation

Clinician Lists

- ***Complete lists of recommendations by society can be found by clicking the society name or via individual recommendation pages.***

Society	Recommendation
American College of Chest Physicians and American Thoracic Society	Don't perform CT screening for lung cancer among patients at low risk for lung cancer.
American College of Chest Physicians and American Thoracic Society	Don't perform chest computed tomography (CT angiography) to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay.
Infectious Diseases Society of America	Avoid prophylactic antibiotics for the treatment of mitral valve prolapse.
Infectious Diseases Society of America	Avoid testing for a Clostridium difficile infection in the absence of diarrhea.
Infectious Diseases Society of America	Don't use antibiotic therapy for stasis dermatitis of lower extremities.
Infectious Diseases Society of America	Avoid prescribing antibiotics for upper respiratory infections.
Infectious Diseases Society of America	Don't treat asymptomatic bacteruria with antibiotics.

<http://www.choosingwisely.org/clinician-lists/>

Choosing Wisely in the ICU

- ❖ Addressed by the Critical Care Societies Collaborative
- ❖ Includes multi-professional ICU team perspective
- ❖ Reflects 150,000 members

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<http://www.choosingwisely.org/societies/critical-care-societies-collaborative-critical-care/>
<https://ccsconline.org/high-value-care/choosing-wisely>

Evidence-Based “Less is More”

Fundamentals of Critical Care

- Relative to other areas of medicine, critical care is still a young specialty
- The earliest dogma in caring for critically ill and injured patients was based on normalizing physiology and function
- We also presumed that patients should:
 - Remain at rest
 - Be sedated, particularly if ventilated
 - Avoid stimulation (especially from family!)
 - Have normal measures of physiology and biochemistry (e.g. labs)

Ventilatory Strategies in ARDS

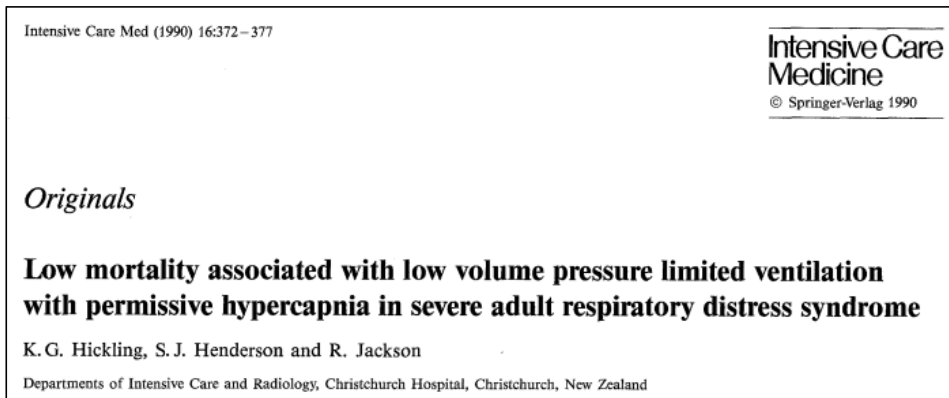
Traditional Approach

- High priority to traditional goals of acid-base balance and patient comfort
- Lower priority to lung protection

Low Stretch Approach

- High priority to lung protection
- Lower priority to traditional goals of acid-base balance and patient comfort

Permissive Hypercapnia in ARDS

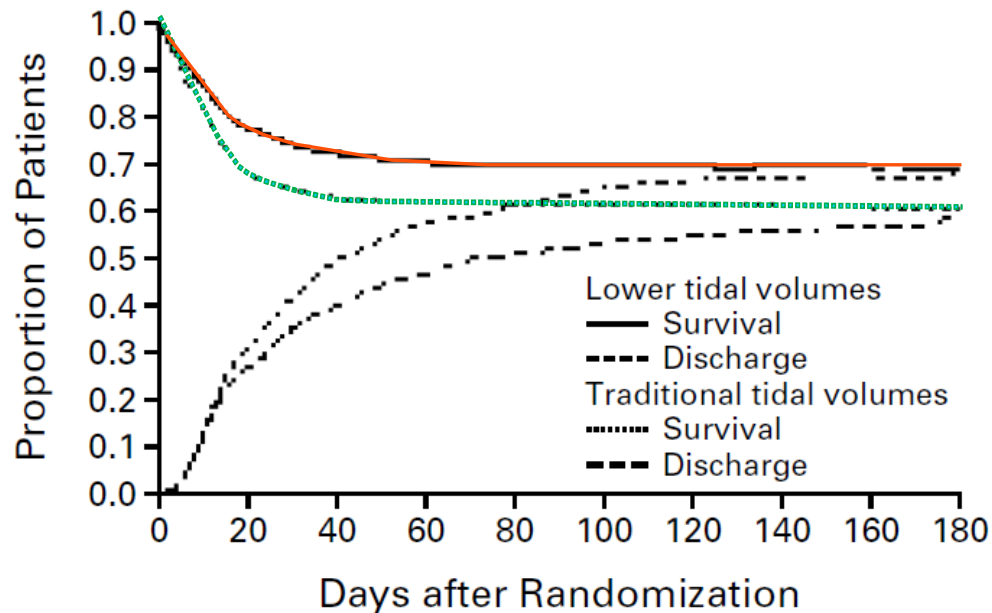


“We suggest that this ventilatory management may substantially reduce mortality in ARDS, particularly from respiratory failure.”

- Since 1984 we have limited PIP in patients with ARDS by reducing tidal volume, allowing spontaneous breathing with SIMV and disregarding hypercapnia. Since 1987, 50 patients with severe ARDS with a "lung injury score" ≥ 2.5 and a mean PaO₂/FiO₂ ratio of 94 were managed in this manner.
 - The mean maximum PaCO₂ was 62 mmHg, the highest being 129 mmHg.
- The hospital mortality was significantly lower than that predicted by Apache II (16% vs. 39.6%, $p < 0.001$).
- Only one death was due to respiratory failure, caused by pneumocystis pneumonia.
 - 10 patients had a "ventilator score" > 80 , which has previously predicted 100% mortality from respiratory failure. Only 2 died, neither from respiratory failure.
- There was no significant difference in lung injury score, ventilator score, PaO₂/FiO₂ or maximum PaCO₂ between survivors and non-survivors.

Hickling K. *Intensive Care Med* 1990; 16: 372-377.

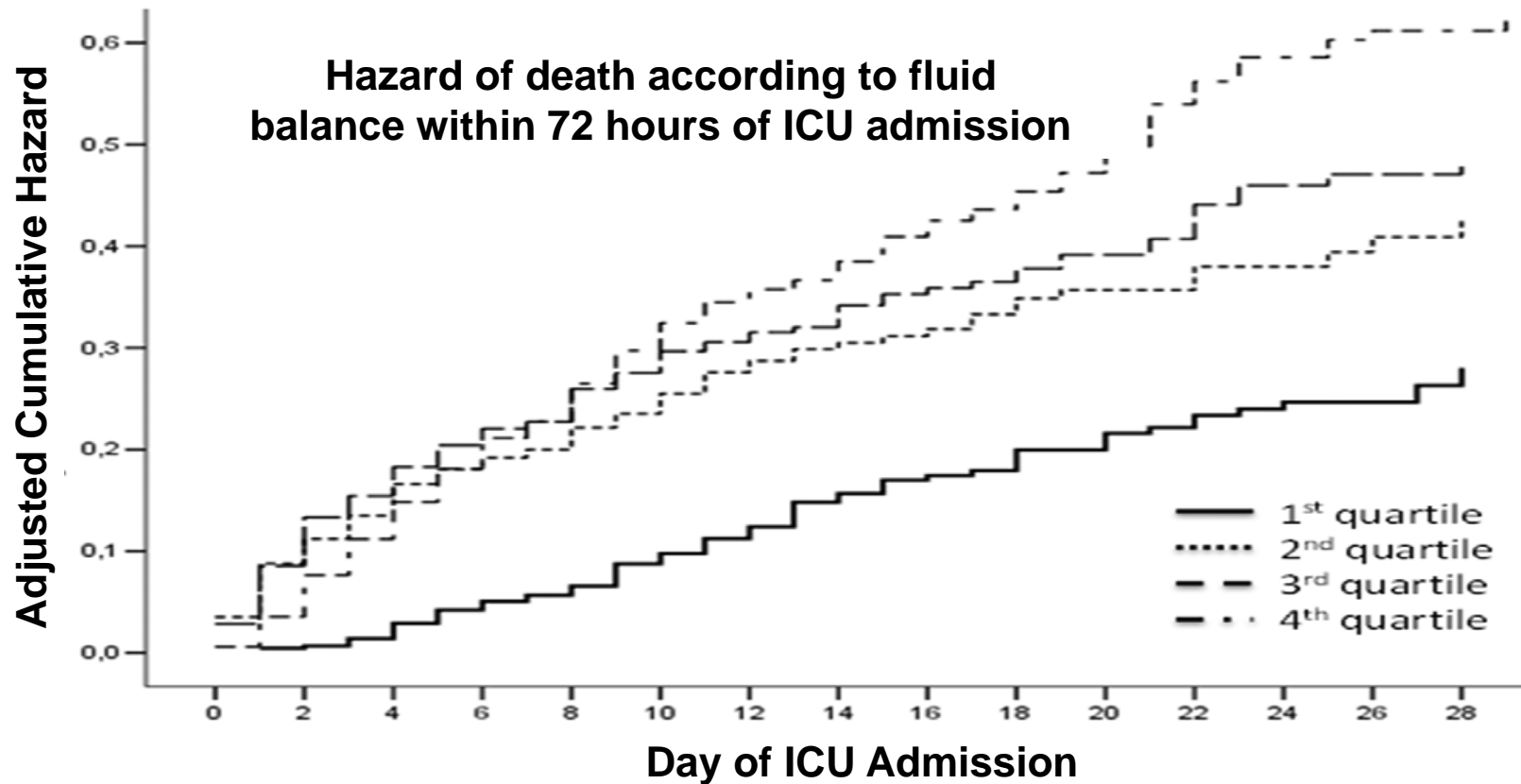
Lower Tidal Volumes in ARDS Patients



VARIABLE	GROUP RECEIVING LOWER TIDAL VOLUMES	GROUP RECEIVING TRADITIONAL TIDAL VOLUMES	P VALUE
Death before discharge home and breathing without assistance (%)	31.0	39.8	0.007
Breathing without assistance by day 28 (%)	65.7	55.0	<0.001
No. of ventilator-free days, days 1 to 28	12±11	10±11	0.007
Barotrauma, days 1 to 28 (%)	10	11	0.43
No. of days without failure of nonpulmonary organs or systems, days 1 to 28	15±11	12±11	0.006

ARDS Network. *N Engl J Med* 2000; 342: 1301-8.

Higher Fluid Balance Increases The Risk of Death From Sepsis



Sakr Y, et al. Crit Care Med 2017; 45: 386–394.

CRITICAL CARE PERSPECTIVE

Unproven and Expensive before Proven and Cheap: Extracorporeal Membrane Oxygenation versus Prone Position in Acute Respiratory Distress Syndrome

Xuehan Li^{1,2,3}, Damon C. Scales^{3,4}, and Brian P. Kavanagh^{1,3}

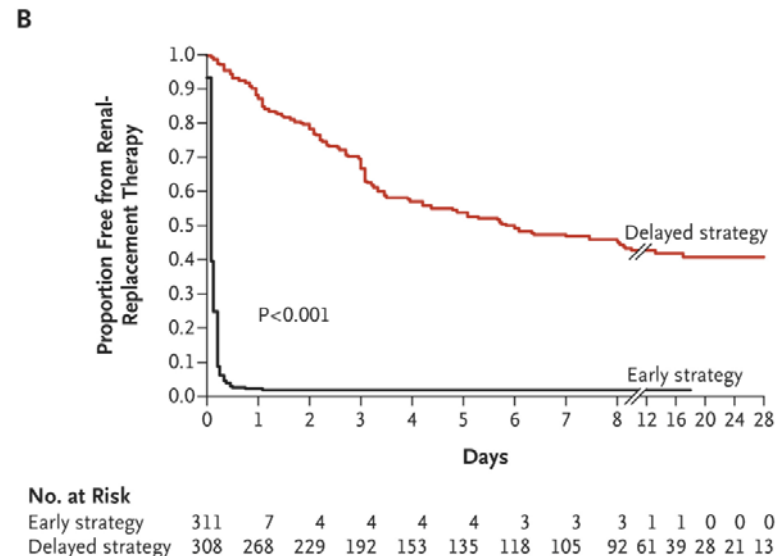
¹Department of Critical Care Medicine and Anesthesia, Hospital for Sick Children, University of Toronto, Toronto, Canada; ²Department of Anesthesiology, West China Hospital of Sichuan University, Chengdu, Sichuan, China; ³Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada; and ⁴Department of Critical Care Medicine, Sunnybrook Health Sciences Centre, Toronto, Canada

- In studies of venovenous ECMO, prone positioning was used in only 19% of ECMO studies published after 2013 (19%) compared to 55% of those published before 2013 ($p = 0.05$)
- Conclusion: the majority of study patients who received ECMO did not first receive prone positioning therapy
 - Prone positioning is “simple, cheap, and of proven benefit”
- These data suggest a systematic bias in the reporting of outcomes after ECMO in the literature.
 - “Inferences about the efficacy of ECMO in ARDS are of limited use.”

Li X, Scales D, Kavanagh B. *Am J Respir Crit Care Med* 2018; 197(8): 991-993.

Dangers of Early Renal Replacement Therapy

- 620 ICU patients randomized to early or delayed initiation of renal replacement therapy (RRT)
- No difference in survival
- Urine output occurred earlier in the delayed RRT group
- Twice as many early RRT patients developed CLABSI (10% vs 5%, $p=0.03$)
- **49% of patients in the delayed group never needed RRT**



Gaudry S, et al. *N Engl J Med* 2016; 375: 122-133.

Early Parenteral Nutrition

- In 4640 critically ill adults, early parenteral nutrition started at day 2 compared to day 8 resulted in **more ICU infections (26.2% vs 22.8%)** and **more cholestasis**
- *6.3% relative decrease in the likelihood of being discharged alive earlier from the ICU and from the hospital*
- Rates of death in the ICU and in the hospital and rates of survival at 90 days were similar in the two groups
- In 1440 critically ill children, early parenteral nutrition started at day 1 compared to day 8 resulted in **more infections (18.5% vs. 10.7%, aOR 2.08)** and **longer stay in the ICU** (9.2 days vs. 6.5 days) and the hospital
- Delayed parenteral nutrition resulted in a higher likelihood of an earlier live discharge from the ICU, a shorter duration of mechanical ventilation, a reduced need for renal-replacement therapy

Casaer MP, et al. *N Engl J Med* 2011; 2011;365:506-17.

Fivez T, et al. *N Engl J Med* 2016; 374:1111-1122.

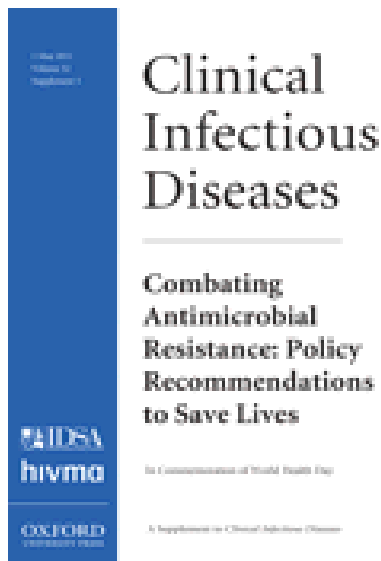
Nutrition in ARDS

- OMEGA study of antioxidant vs. standard enteral nutrition
 - Twice daily supplements of n-3 fatty acids, γ -linolenic acid and antioxidants
 - **Terminated for “futility” after enrolling 272 ARDS patients**
 - More days with diarrhea (29% vs. 21%; $p=0.001$)
 - Fewer ventilator-free days (14.0 vs. 17.2; $p = 0.02$)
 - Fewer ICU-free days (14.0 vs. 16.7; $p = 0.04$)
 - Fewer non-pulmonary organ failure-free days (12.3 vs. 15.5; $p = 0.02$)
 - Higher 60-day hospital mortality (26.6% vs. 16.3%; $p = 0.054$)
- EDEN study of early vs. late enteral nutrition in 1000 ALI & ARDS patients
 - Nutrition at ICU admission vs. day 6
 - No difference in mortality or other relevant clinical outcomes
 - Less feeding intolerance in the late nutrition group

* Rice TW, et al. *JAMA* 2011; 306(14): 1574-1581.

† Rice TW, et al. *JAMA* 2012; 307(8): 795-803.

Antimicrobial Stewardship Is Crucial for Value-Based Care



Appropriate antimicrobial stewardship that includes optimal selection, dose, and duration of treatment, as well as control of antibiotic use, will prevent or slow the emergence of resistance among microorganisms.

ISDA. *Clin Infect Dis* 1997; 25 (3): 584-599.

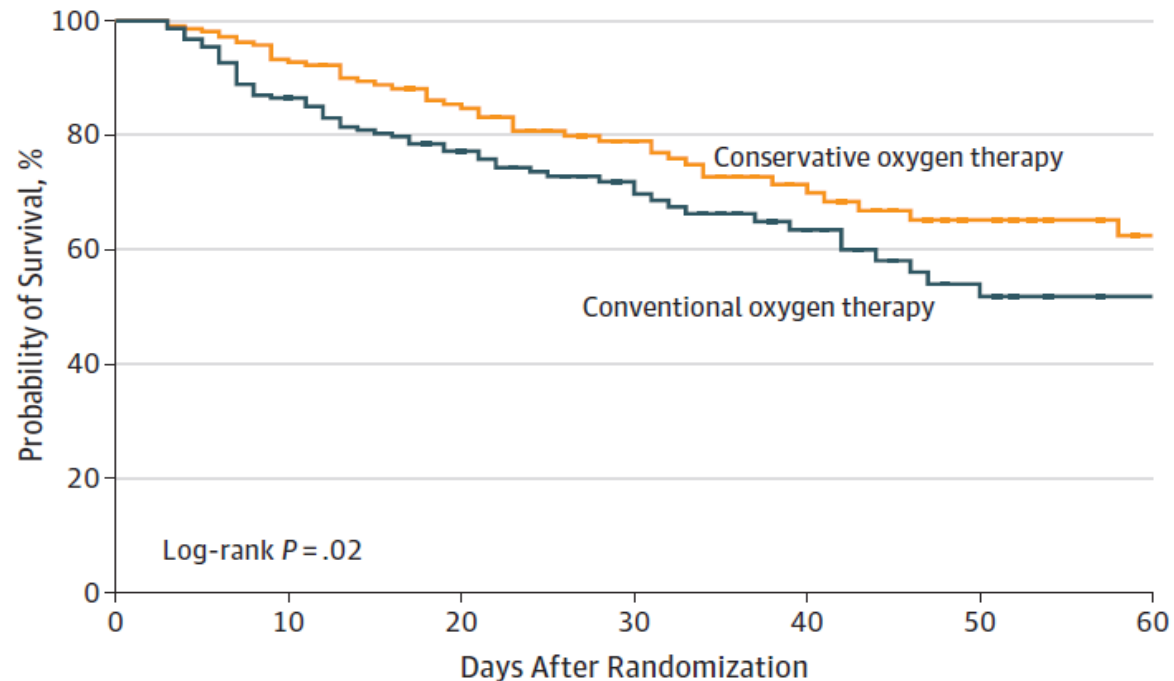
Minimizing Antibiotic Exposure

Outcomes	Studies	Participants	Statistical Method	Effect Size
Duration of antibiotic treatment for the first episode of infection	5	938	WMD (FEM), 95% CI	-2.14 (-2.48 to -1.80)
Total duration of antibiotic treatment	3	801	WMD (FEM), 95% CI	-4.19 (-4.98 to -3.39)
Antibiotic-free days	3	801	WMD (FEM), 95% CI	2.94 (1.92 to 3.96)
28-day mortality	6	1,010	OR (FEM), 95% CI	0.93 (0.69 to 1.26)
Hospital mortality	4	317	OR (FEM), 95% CI	0.86 (0.52 to 1.44)
ICU length of stay	6	1,010	WMD (FEM), 95% CI	-0.49 (-1.55 to 0.57)
Hospital length of stay	3	801	WMD (FEM), 95% CI	-0.13 (-1.10 to 0.84)
Days free from mechanical ventilation	2	722	WMD (FEM), 95% CI	0.60 (-0.64 to 1.85)
Superinfection rate	3	790	OR (FEM), 95% CI	1.13 (0.83 to 1.54)
Persistent/relapsed infection rate	3	801	OR (FEM), 95% CI	0.97 (0.56 to 1.69)

Kopterides P, et al. *Crit Care Med* 2010; 38 (11): 2229-2241.

Conventional Versus Conservative Oxygen Therapy in the ICU

Probability of survival from study inclusion through day 60 for patients in the conservative and conventional oxygen strategy groups

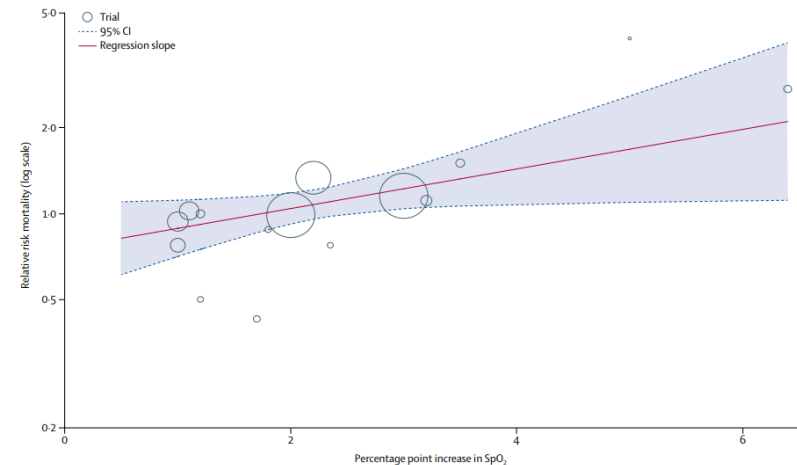
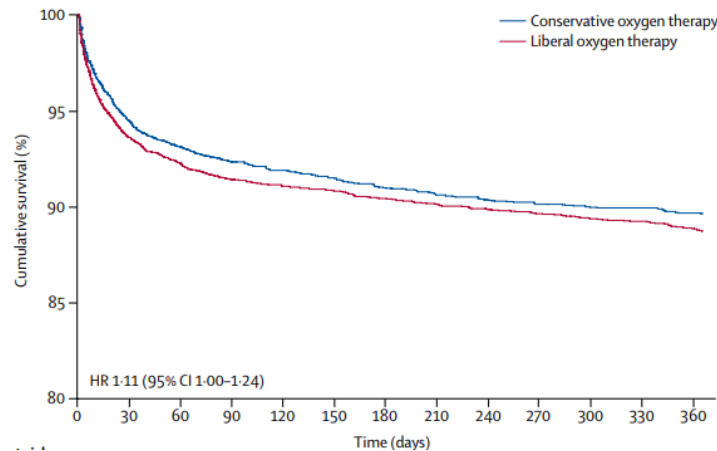


No. at risk							
Conservative oxygen therapy	216	201	188	181	173	170	169
Conventional oxygen therapy	218	189	172	163	158	152	152

Girardis M, et al. *JAMA* 2016; 316(15): 1583-1589.

Conservative Oxygen Therapy is Best!

- Systematic review of 25 RCT of oxygen therapy in critically ill patients with sepsis, stroke, trauma, myocardial infarction, cardiac arrest, or emergency surgery.
- A liberal oxygen strategy (median SpO₂ 96%) increased mortality in the hospital (RR 1.21), at 30 days (RR 1.14), and at longest follow-up (RR 1.10).



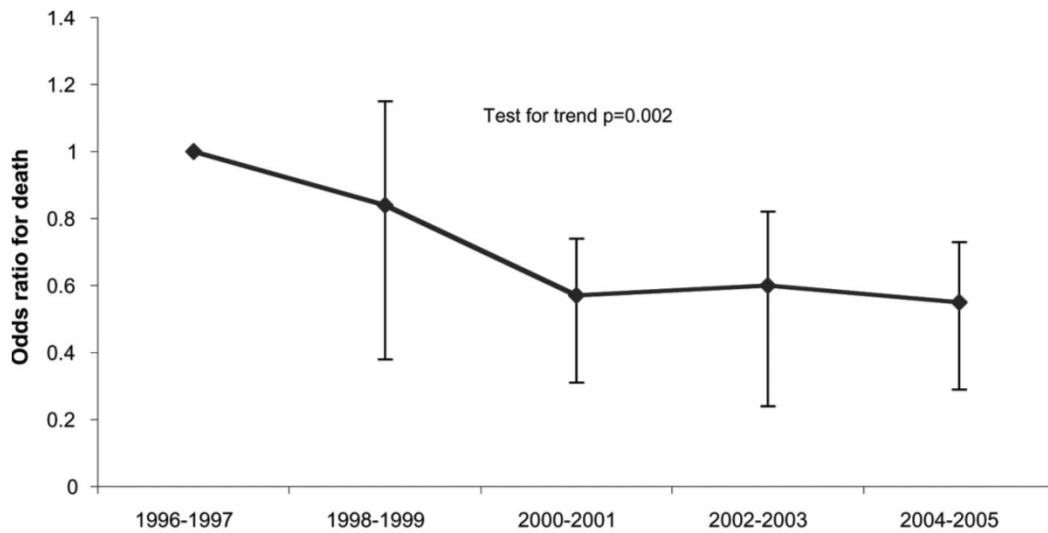
Chu DK, et al. *Lancet* 2018; 391: 1693-1705.

Low Value of Routine Chest Radiographs In A Mixed Medical-Surgical ICU

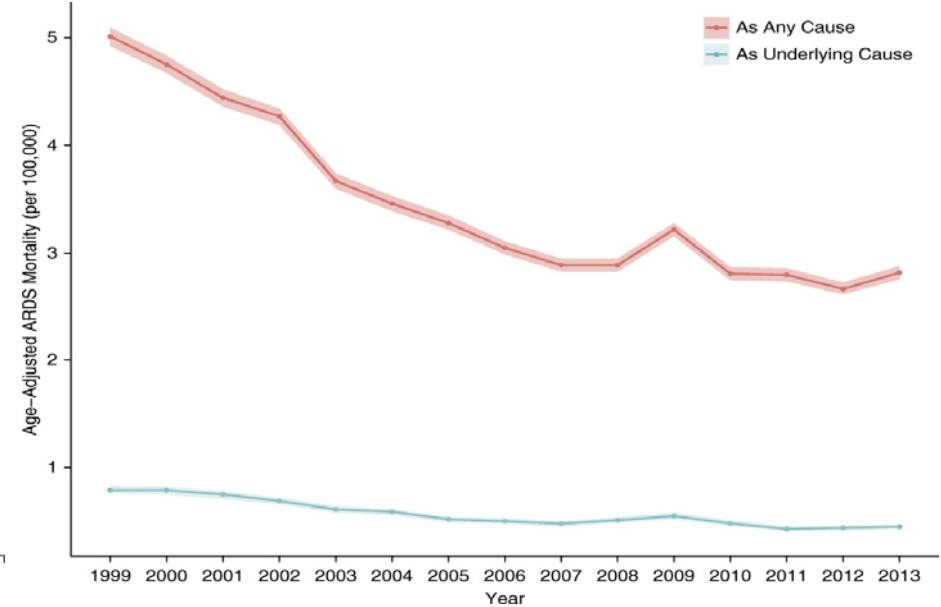
- ❖ 1780 daily routine CXRs in 559 hospital admissions evaluated
- ❖ Diagnostic and therapeutic efficiency of daily routine CXRs was 4.4% and 1.9% respectively.
- ❖ Abandoning daily routine CXRs did not affect clinically indicated CXRs orders, ICU LOS, readmission rate, or mortality.
- ❖ A total CXR volume reduction of 35% (\$9900/bed/year) was observed after abandoning daily routine CXRs.
- ❖ **Daily routine CXRs can be safely abandoned in the ICU.**

Hendrikse KA, et al. *Chest* 2007; 132(3): 823-828.

What Caused Changes in ARDS Mortality?

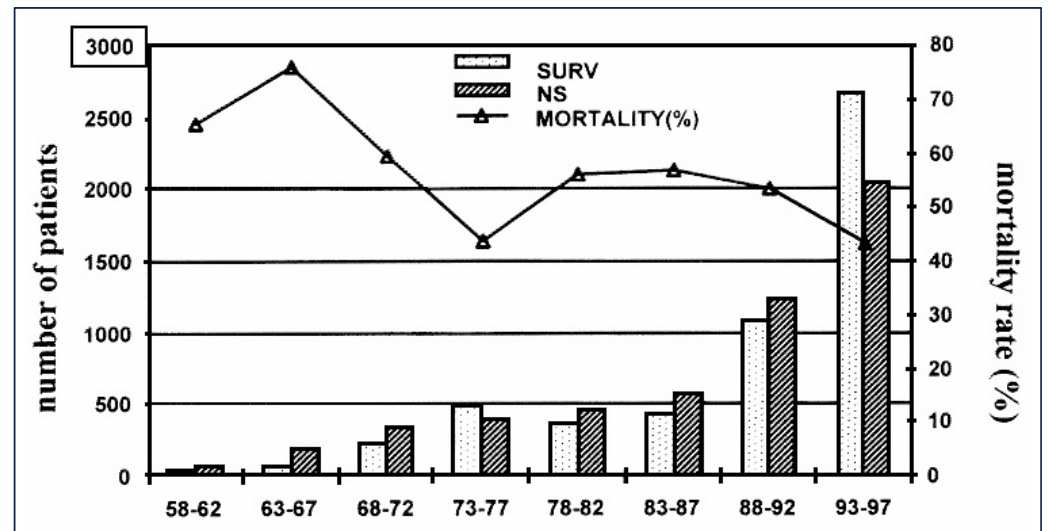
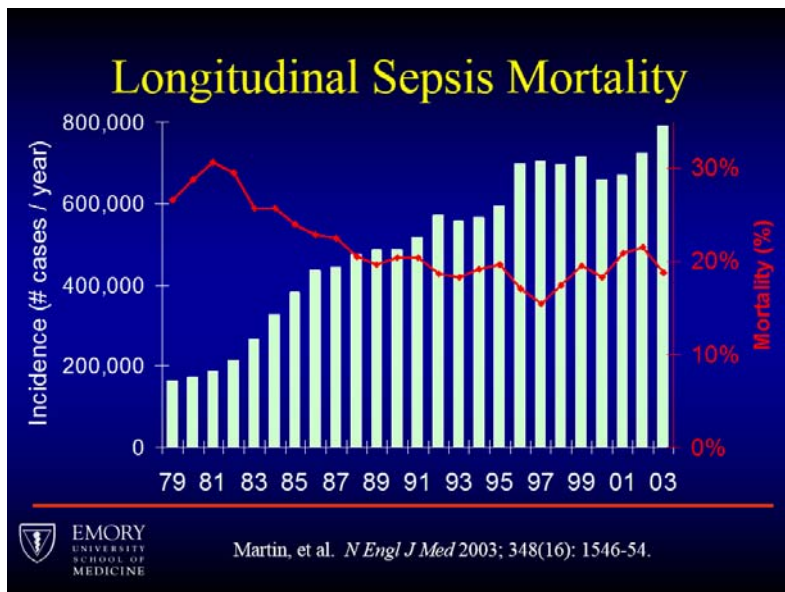


Erickson SE, et al. *Crit Care Med* 2009; 37: 1574 –1579.



Cochi S, et al. *Ann Am Thorac Soc* 2016; 13(10): 1742-51.

What Caused Changes in Sepsis Mortality?



Martin GS, et al. *N Engl J Med* 2003; 348(16): 1546-64.

Friedman, Silva, Vincent. *Crit Care Med* 1998; 26(12): 2078-86.

Key Advances in Critical Care

- “So what has been done within my ICU that has made a difference? The answer is, probably, less. **Less aggressive ventilation** with increasing tolerance of still-acceptable levels of hypercapnia and hypoxaemia. **Less reliance on endotracheal intubation** in preference to noninvasive modes of ventilation. **Less paralysis. Less sedation. Less use of etomidate.** Lower blood pressure targets requiring less use of catecholamines. **Less fluid loading** (to avoid the 'Michelin man' syndrome). **Fewer blood transfusions. Shorter-duration antibiotic courses** with an increasing emphasis on monotherapy. Less nutritional neglect but also less persistence with enteral feeding in the presence of gastrointestinal intolerance. Less acceptance of high blood glucose levels. **Less attention to monitoring superfluous variables** and derived parameters, but a greater emphasis on attention to basics including maintaining or restoring the adequacy of organ perfusion, although with the relatively insensitive tools that we currently have available.”

Singer M. *Crit Care* 2006; 10(1): 122.

Evidence-Based “More is More”

Sometimes, More is More

- Early aggressive therapy for life-threatening conditions
 - Traumatic injuries, stroke, STEMI, cardiac arrest, sepsis
- Palliative and end-of-life care
- Most consider the evidence carefully, as it applies to your patient

How is It Possible That More Can Be More?

“More” care that is timely and of high quality often leads to less care needed later

More Becomes Less

Fewer resources

More patient-centered

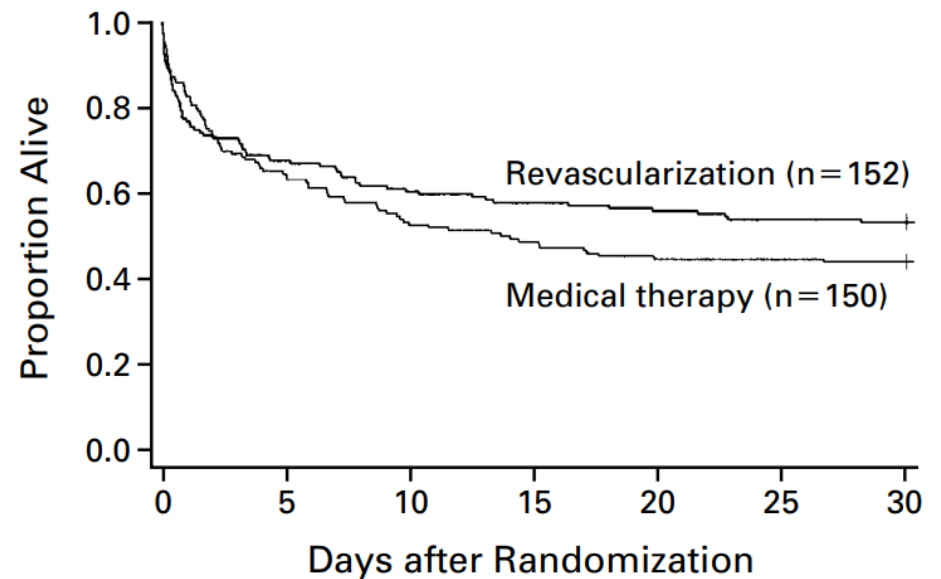
Less invasive

Lower risk

Better disposition

Revascularization for STEMI with Cardiogenic Shock

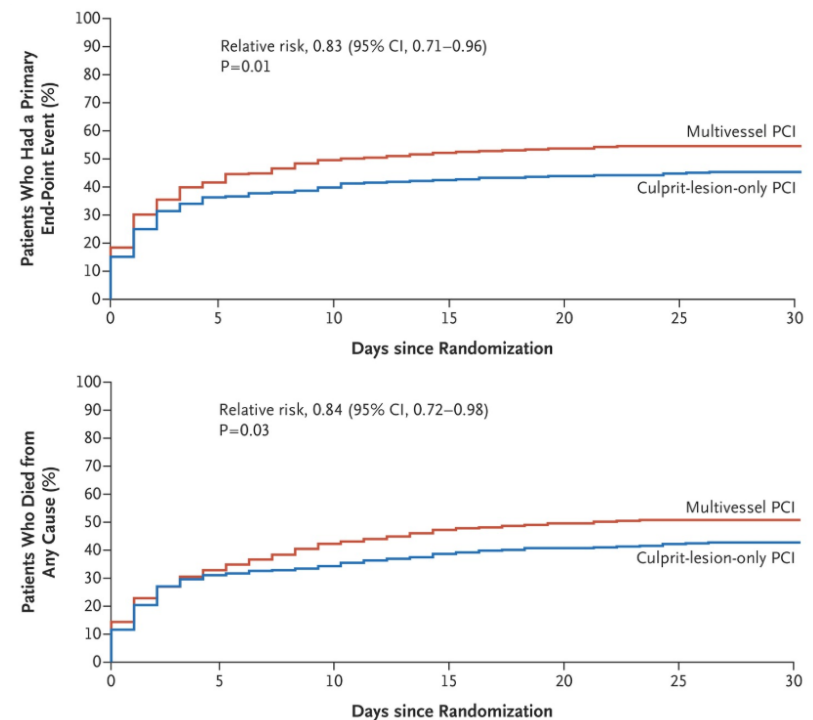
- Among patients with LV failure and cardiogenic shock from acute MI, early revascularization with PCI improves survival
- Overall mortality between the revascularization and medical-therapy groups was numerically but not statistically better at 30 days (46.7% vs. 56.0%, $P=0.11$)
- Mortality at 6 months was lower in the revascularization group than in the medical-therapy group (50.3% vs. 63.1%, $P=0.027$)



- Mortality at 60 days
 - Medical therapy = 63.1%
 - Revascularization = 50.3%

Yet even when More is More, Less is (Still) More

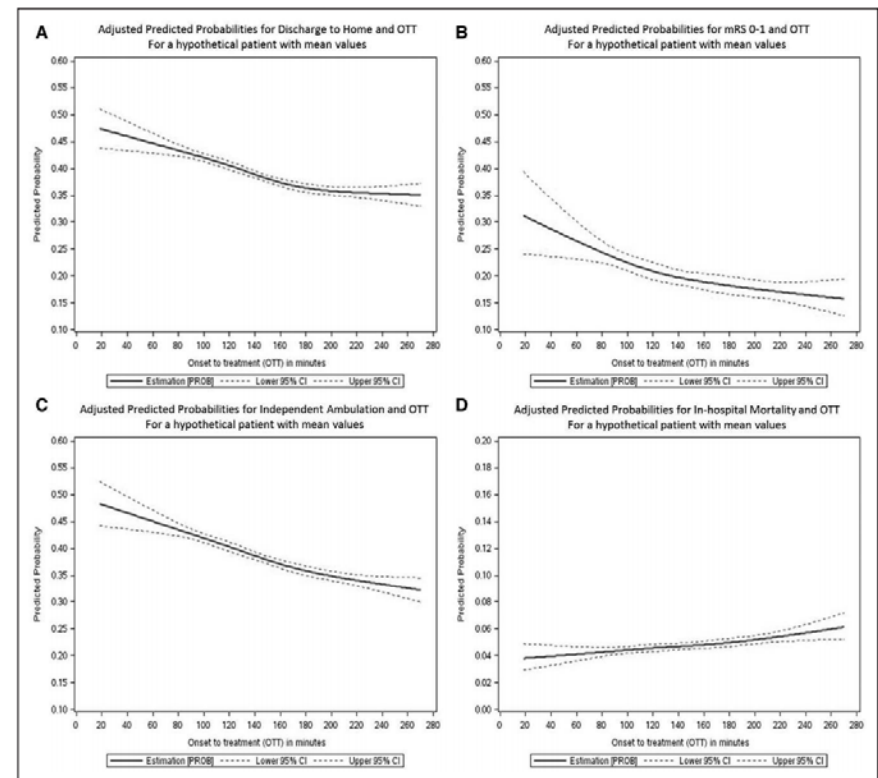
- Among patients with multivessel coronary artery disease and acute MI with cardiogenic shock, single vessel (culprit vessel) PCI is superior to multivessel PCI.
- The 30-day risk of death or severe AKI leading to RRT, or a composite endpoint of both, was lower in those undergoing single vessel PCI



Thiele H, et al. *NEJM* 2017; 377: 2419-2432.

Stroke Therapy: Early is More

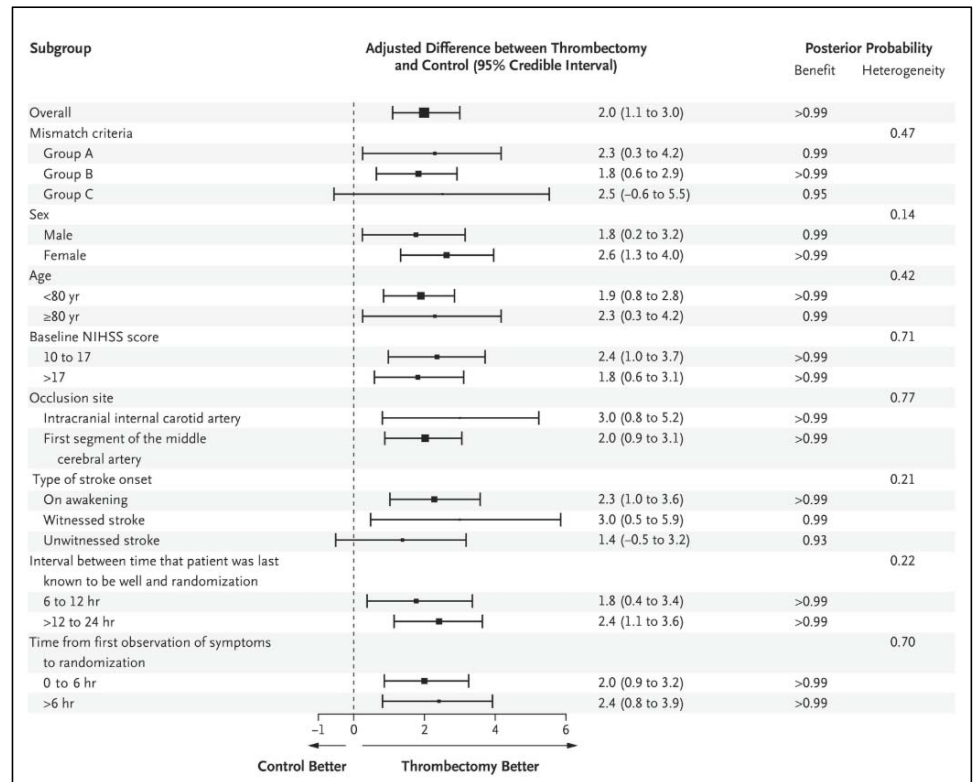
- In 65,384 tPA treated stroke patients, treatment within the first 60 minutes compared to 61-270 minutes (4.5 hour treatment window) was associated with increased odds of:
 - discharge to home 1.25
 - independent discharge ambulation 1.22
 - freedom from disability 1.72
- All without increased hemorrhagic complications or in-hospital mortality



Kim JT, et al. *Circulation* 2016; 135: 128-139.

But Grady can lead the way to save you later...

- RCT of thrombectomy or usual care in 206 patients with major intra-cranial artery occlusion, **6-24 hours after CVA**
 - Enrollment in the trial was stopped early
- The mean modified Rankin scale of function at 90 days was greater in the thrombectomy group (5.5 vs. 3.4)
- Functional independence at 90 days was greater in the thrombectomy group (49% vs. 13%)
- No significant difference in symptomatic intracranial hemorrhage between the two groups (6% vs. 3%, $P=0.50$), or in 90-day mortality (19% vs. 18%, $P=1.00$).

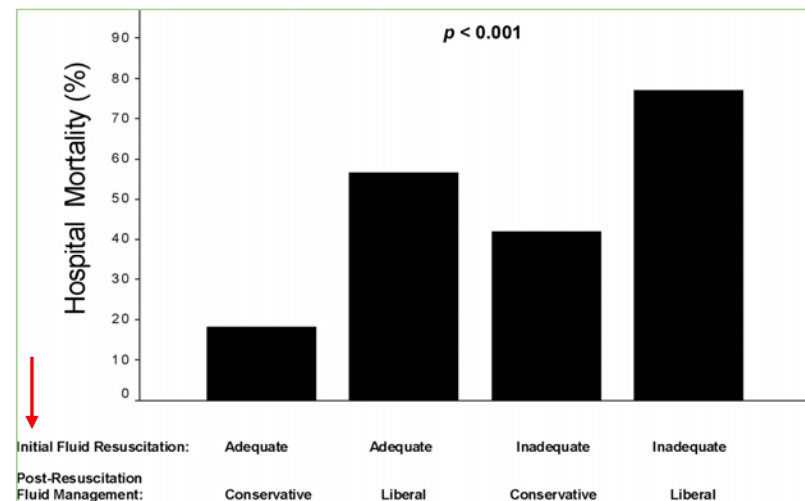
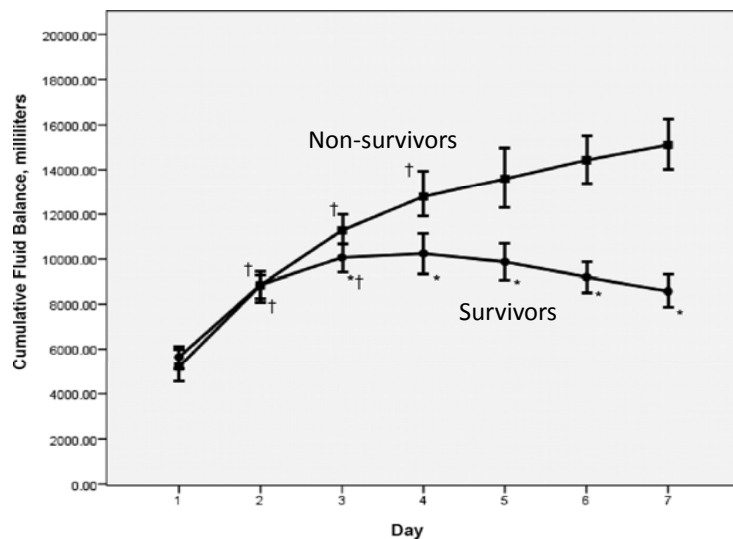


*** Nogueira R, et al. *N Engl J Med* 2018; 378: 11-21. ***



More is Better, and Timing Matters in ARDS

- Cohort of 212 septic shock patients who developed ARDS
- Both early and late fluid management strategies influenced the likelihood of survival



Murphy, et al. *Chest* 2009; 136: 102-109.

More Mobilization!



*Hogdson CL, et al. Crit Care 2013; 28; 17 (1): 207.
Schweickert WD, et al. Chest 2011; 140 (6): 1612–1617 .*

Waiting, Waste and ICU Liberation

- ❖ The biggest waste in medicine is waiting
- ❖ The unwritten engine of ICU Liberation is weaning:
 - Weaning sedation
 - Weaning mechanical ventilation
 - Weaning (or minimizing immobilization)
- ❖ Proactive, scheduled weaning will reduce waiting
- ❖ Reducing waiting in the ICU will increase value:
 - By improving quality
 - By decreasing waste (unnecessary costs)

ABCDEF Bundle

- A.** Always prioritize treatment of pain.
- B.** Undertake scheduled daily spontaneous breathing trials and spontaneous awakening trials.
- C.** Be cognizant of the choice of drug classes utilized for sedation.
- D.** Monitor for and minimize delirium.
- E.** Facilitate early mobilization.
- F.** Empower and engage families in the care plan.

Choosing Wisely in the ICU

- ❖ Top five list for critical care medicine
- ❖ Developed by the Critical Care Societies Collaborative
- ❖ Includes multi-professional ICU team perspective
- ❖ Reflects 150,000 members

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<https://ccsconline.org/high-value-care/choosing-wisely>

Choosing Wisely in the ICU

- 1. Don't order diagnostic tests at regular intervals.**
- 2. Don't transfuse red blood cells in hemodynamically stable, non-bleeding patients with a reasonable hematocrit.**
- 3. Don't prescribe parenteral nutrition in adequately nourished patients during their first week.**
- 4. Don't deeply sedate mechanically ventilated patients without a specific indication and without daily attempts to lighten that sedation.**
- 5. Don't continue life support for patients at high risk for death or severely impaired functional recovery without also offering comfort care only.**

Promoting Value In Critical Care By Practicing, “Less Is More”

- 1. Begin with one or more elements of Choosing Wisely.**
- 2. Incorporate the ICU Liberation A through F bundle as "usual care" for every ICU patient.**
- 3. Promote a learning health care environment in the ICU to identify and implement evidence-based practice.**



“Sometimes more is not necessarily better, and a barrage of tests and therapies should not automatically imply thoroughness and caring.”

Friedman JN. Saying Yes to Less. J Pediatr 2017; 184: 4-5.

Less Is More





Don't just do something, stand there.
But don't wait to start practicing Less Is More!

Thank you!



Department of Medicine

Division of Pulmonary, Allergy,
Critical Care and Sleep Medicine

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