ICU v. Non-ICU:

Considering Level of Care Decisions through Common Clinical Scenarios

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No Disclosures

Learning Objectives

- Consider advantages and limitations of ICU level of care in common clinical scenarios
- Approach level of care decisions from a shared decision making perspective among providers
- Involve patients and surrogate decision makers in level of care decisions based on clinical needs, patient/decision maker preferences, anticipated outcomes

Intensive Care Unit

- Level 1
- Level 2
- Level 3

- Emergency Department
- Routine nursing floor
- Outside hospital

Intensive Care Unit

- Increasing ICU beds?
- Increased ICU bed requirements?
- Increasing ICU quality of care?
- Tipping point?

- USA v. World
- Access to care
- Cost of care
- Expectations for care

Intensive Care Unit

- Quality of care?
- Length of stay?
- Total ventilator days?
- Mortality rate?
- Percent of patients surviving to discharge?

Intensive Care Unit

PANDEMIC

Intensive Care Unit

- What is appropriate level of care?
- What determines appropriate level of care?
  - Algorithms
  - Hospital capability
  - Provider competency
- Who determines appropriate level of care?
  - Providers
  - Hospital administration
  - Patient and surrogate decision maker

MY Intensive Care Unit Goals

- High-quality
- Cost-effective
- Patient-centered

- Understanding limits
- Understanding benefit v. harm
- Understanding patient preferences on goals of care
- Understanding readiness for transfer out of ICU
- Preparing for readmission

Clinical Scenarios

Diabetic Ketoacidosis/DKA

- Concerns
  - Metabolic acidosis
  - Hyperglycemia
  - Hypoglycemia
  - Hypokalemia
  - Hypovolemia
  - Hypotension
  - Tachycardia
  - Tachypnea
  - Etiology
- What ICU Offers
  - Telemetry monitoring
  - Frequent laboratories
  - Insulin infusion titration
  - Volume status assessment
  - Mechanical ventilation
  - Closer observation

Alexis

- 28YO DM1 on subcutaneous insulin and CGM after deciding she no longer wanted to wear her insulin pump
- "Ran out of insulin two days ago and couldn't get to the free clinic because of work."
- Presented to the emergency department due to intractable nausea and vomiting for past eight hours

- Confirms polydipsia
- Confirms polyuria
- Confirms PO intolerance
- Confirms sensation of "heart racing"
- Denies recent sick contacts
- Denies chest pain
- Denies significant abdominal pain or bloating
- Denies hematemesis, melena, hematochezia
- Reminds her of "last time I had DKA"

- Afebrile
- HR 126/min
- BP 98/64mmHg
- SpO2>92% on RA RR 32/min
- WBC 18.29 with 49segs
- Hgb 17.2
- Platelets 495
- Sodium 127 Chloride 92
- Potassium 6.3 Bicarbonate 6
- BUN 34 Creatinine 1.6
- Glucose 579 Lipase 29
- Lactic acid 8.4
- UA: SG >1.030, negative nitrite, negative esterase, positive ketones
- ABG: pH 6.94, pCO2 22, pO2 194
- ECG: Sinus tachycardia; no ST or T-wave changes
- CXR: No focal infiltrate
- CT abdomen/pelvis: WNL

ICU or NON-ICU: My Recommendation

- IVF (LR preferred to NSS)
- Insulin bolus followed by insulin infusion NOW
- Serial laboratories including electrolytes, acid-base
- Telemetry monitoring (potassium)
- Respiratory monitoring

- Gets worse before gets better?
- Case Management consult
- Diabetes Education consult
- Outpatient Endocrinology referral?

- ICU

COPD with Acute Exacerbation

- Concerns
  - Work of breathing
  - Non-invasive ventilation
  - Endotracheal intubation
  - Steroids
  - Nebulizer therapy
  - Antibiotics
- What ICU Offers
  - Intensivist-driven respiratory monitoring
  - Access to Respiratory Therapy
  - Non-invasive ventilation
  - Opportunity for rapid intubation
  - Mechanical ventilation adjustments
  - ECMO

Brian

- 87YO male from SNF admitted to routine nursing floor three days ago for his fifth COPD exacerbation in past 18mths
- Aphasic and hemiparetic due to prior left MCA stroke
- Referred to NICU by Rapid Response Team due to worsening encephalopathy and concern about airway protection
- FULL CODE

- T 101.9F
- HR 58/min
- BP 94/42mmHg
- SpO2 82% on BPAP (FiO2 100%, 16/8cmH20)
- Somnolent, GCS 8 (E2, V2, M4)
- Poor cough reflex, absent gag reflex
- Minimal air movement, shallow respirations
- Irregular rate, irregular rhythm
- ABG: pH 6.98, pCO2 104, pO2 48
- CXR: Bilateral infiltrates

ICU or NON-ICU: My Recommendation

- Peri-code
- Quality of living v. quantity of living
- Goals of care discussion?
- Immediate intubation?

- Palliative Medicine consult
- ICU if FULL CODE
- Comfort Measures/NON-ICU if DNR/DNI

Acute Kidney Injury with Hyperkalemia

- Concerns
  - Acidosis
  - Arrhythmia
  - Electrolyte abnormality
  - Intoxication
  - Overload
  - Uremia
  - Urine output
  - Hydronephrosis
  - Hypotension
  - Volume assessment
- What ICU Offers
  - Telemetry monitoring
  - Hemodynamic monitoring
  - Volume status assessment
  - UOP assessment
  - Frequent laboratories
  - Emergent renal replacement therapy

Charles

- 54YO male found at home by sibling
- Last known well four days ago
- Lives alone and tends to ADLs
- Works as a contractor
- Chronic tobacco abuse
- Heavy alcohol use “on the weekends”
- Didn’t arrive to work after the Labor Day holiday weekend

- Afebrile
- HR 106/min
- BP 128/74mmHg
- SpO2 93% on 2L/min O2 via NC
- AAOx2 (person, place), drowsy and arousable
- Left hemiplegia, left hemineglect
- WBC 22.34 with 65segs
- Hgb 13.5
- Sodium 147 Chloride 112
- Potassium 6.4 Bicarbonate 10
- BUN 88 Creatine 7.9
- pH 7.04 Lactic acid 5.2
- UA: SG 1.032, negative nitrite, granular casts
- CT head/brain: Large completed right MCA stroke with cerebral edema, midline shift, mass effect on ventricle

ICU or NON-ICU: My Recommendation

- Acute kidney injury?
  - ECG with peaked T-waves
  - Telemetry with sinus tachycardia
  - IVF
  - Medical management of hyperkalemia
  - Serial laboratories
  - Nephrology consult
  - Rapid Response Team alert
  - Non-ICU
- Completed right MCA stroke?
  - Not candidate for tPA
  - Not candidate for mechanical thrombectomy
  - Beyond at/around period of peak cerebral edema
  - No immediate requirement for decompressive hemicraniectomy
  - Neurology consult
  - Palliative Medicine consult
  - Non-ICU

Hypotension

- Concerns
  - Etiology?
  - Shock?
  - What type of shock?
  - Laboratories?
  - Imaging?
  - Invasive monitoring?
- What ICU Offers
  - Arterial line
  - Swan-Ganz catheter
  - Central venous access
  - Vasopressor therapy
  - Massive transfusion
  - Endotracheal intubation
  - Renal replacement therapy
  - Closer clinical monitoring

Debbie

- 72YO morbidly-obese female sent from Primary Care office for direct admission secondary to “low blood pressure”
- HFrEF (LVEF 20%) s/p AICD
- CKD stage IV (creatinine 2.4)
- IDDM (A1c 8.8%)
- Lymphedema

- T 99.2F
- HR 116/min
- BP 84/40mmHg
- SpO2 90% on HFNC (40L, 60%)
- AAOx1 (person), difficult to arouse, no aphasia
- RRR, tachycardic, +3/6SEM RUSB
- Crackles, no wheezes, tachypneic
- Abdominal distension with fluid wave
- Cold and clammy extremities
- BUN 44 Creatinine 3.2
- Troponin-T 672 proBNP >35000
- Lactic acid 12.1
- ECG: Sinus tachycardia; T-wave inversions in precordial leads
- CXR: Diffuse pulmonary vascular congestion; small pleural effusions bilaterally; no focal infiltrate

ICU or NON-ICU: My Recommendation

- Cardiogenic shock
- IVF are not always the answer for hypotension
- TTE
- Arterial line with hemodynamic monitoring (CI, CO, SVV)
- Swan-Ganz catheter
- Vasopressors +/- inotropes
- Respiratory monitoring (?endotracheal intubation)
- Cardiology consult
- ?ECMO
- ICU

Community Acquired Pneumonia

- Concerns
  - CAP
  - ?HAP
  - ?Heart failure exacerbation
  - Antibiotic stewardship
  - Oxygen requirement
  - Work of breathing
  - Oxygen delivery
- What ICU Offers
  - Non-invasive ventilation
  - Mechanical ventilation
  - Respiratory monitoring
  - Hemodynamic monitoring

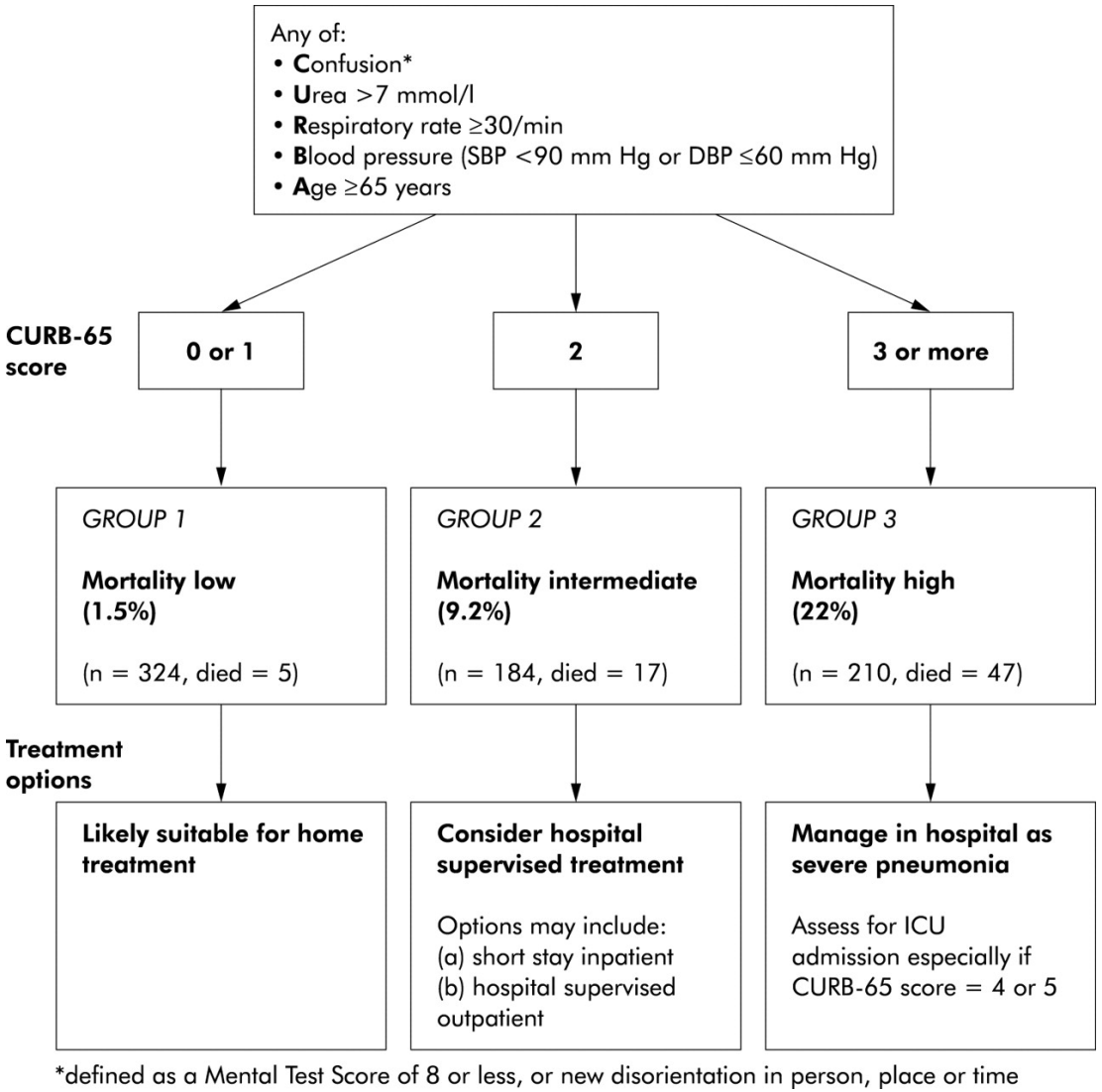
Edward

- 61YO male presenting to the emergency department by EMS for evaluation of fever, productive cough, hypoxia, confusion over past 72hrs
- Prior tobacco abuse
- Recent travel to Bermuda with family for 40th Anniversary
- COVID-19 vaccinated, boosted x2

- T 100.9F
- HR 102/min
- BP 110/78mmHg
- SpO2 89% on 6L/min RR 24/min
- AAOx2 (person, time), follows commands, no focal motor or sensory deficits
- Tachycardic, no murmur
- Decreased breath sounds at L base, tachypneic
- No significant abdominal distension or LE edema
- WBC 19.9 with 89segs
- BUN 14 Creatinine 1.2
- Streptococcus pneumoniae urine antigen positive
- MRSA PCR negative
- COVID-19 PCR negative
- CXR: L basilar infiltrate

ICU or NON-ICU: My Recommendation

- CURB-65
- Antibiotics
- Mucolytic agents
- Bronchodilators
- No emergent indication for ABG
- No emergent indication for non-invasive ventilation
- No emergent indication for intubation
- NON-ICU



Source: https://thorax.bmj.com/content/58/5/377

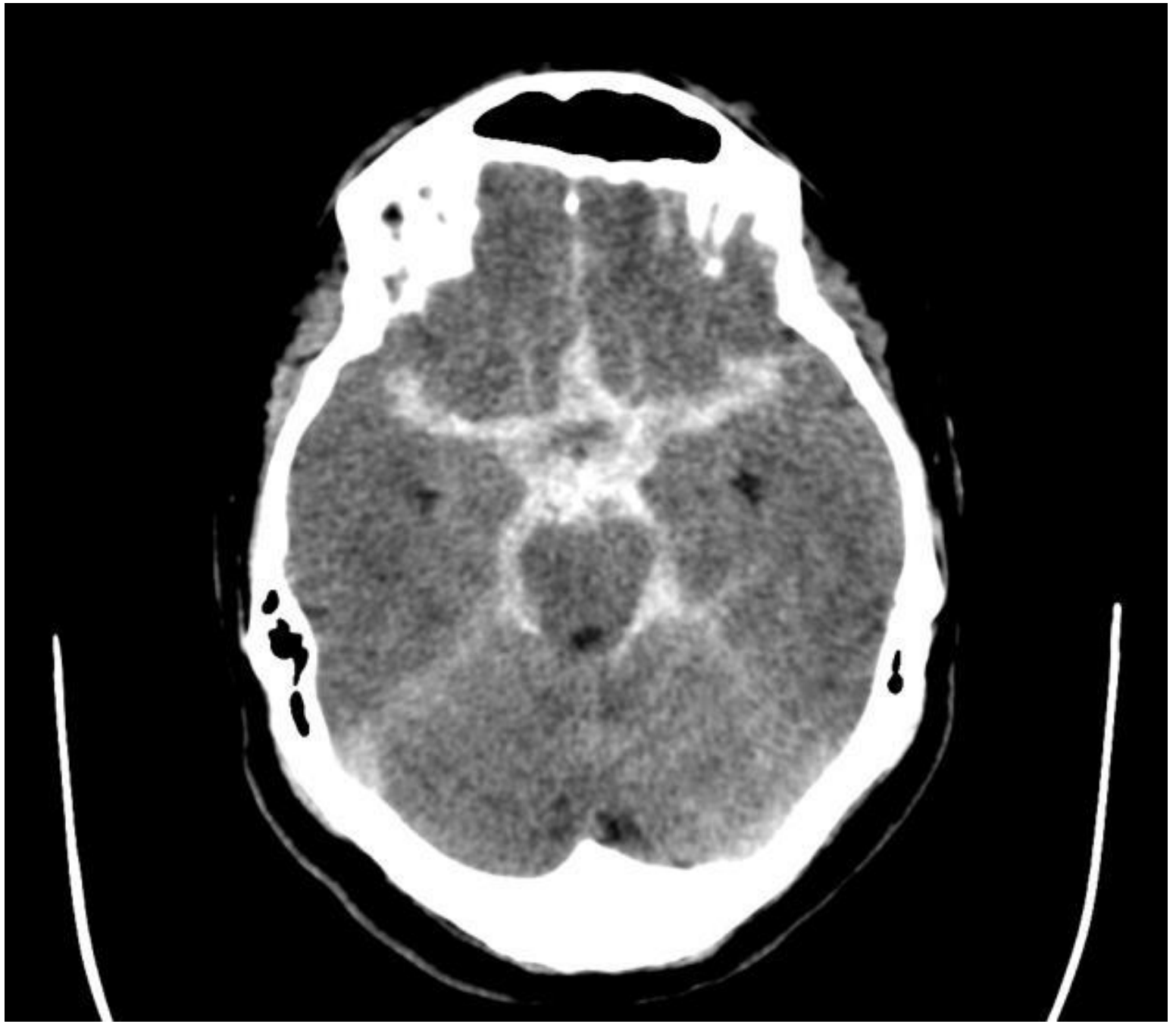
Intracranial Hemorrhage

- Concerns
  - Etiology
  - Encephalopathy
  - Hydrocephalus
  - Herniation
  - Hemodynamic monitoring
  - Respiratory monitoring
  - Airway protection
  - Impending death
- What ICU Offers
  - Hourly neurologic monitoring
  - Portable CT head/brain
  - EVD capacity
  - EEG capacity
  - Arterial line insertion
  - Central venous catheter insertion
  - Neurointensivist

Francine

- 38YO female presenting to rural Emergency Department with the worst headache of her life alongside nausea and vomiting
- Personal history of polycystic kidney disease
- Family history of intracranial aneurysm
- Manifests acute mental status change (unresponsiveness) in the Emergency Department

- Afebrile
- HR 101/min
- BP 172/98mmHg
- SpO2 88% on RA
- Unarousable, does not follow commands, GCS 4 (E1, V1, M2)
- Pupils minimally reactive B/L
- Corneal reflex absent B/L
- Cough reflex weak B/L
- Gag reflex absent B/L
- Overbreathes mechanical ventilator
- Laboratories unremarkable
- CT head/brain: Diffuse SAH
- CTA head/neck: Right ACOM aneurysm with blush consistent with rupture



Source: https://radiopaedia.org/cases/subarachnoid-haemorrhage-4

ICU or NON-ICU: My Recommendation

- Endotracheal tube
- Orogastric tube
- Arterial line
- SBP<140mmHg
- AEDs
- Nimodipine

- Goals of care discussion with surrogate decision maker

- Air ambulance to nearest neurosurgical, neurologic transfer center
- EVD
- Diagnostic cerebral angiography
- Embolization v. aneurysmal clipping
- ICU

Acute Blood Loss Anemia

- Concerns
  - Etiology
  - End-organ perfusion
  - Blood product transfusion
  - Access for blood product transfusion
  - Airway management
  - Endoscopic intervention
  - Endovascular intervention
- What ICU Offers
  - Arterial line
  - Central venous access
  - Massive transfusion
  - Serial laboratory monitoring
  - Mechanical ventilation
  - Bedside endoscopy
  - Stabilization for endovascular intervention in IR

Gregory

- 44YO male with chronic alcoholism, alcoholic cirrhosis, esophageal varices s/p banding presenting to the emergency department for hematemesis
- Sober for past one year
- Evaluated for liver transplant at regional transplant center

- Afebrile
- HR 128/min
- BP 82/34mmHg
- SpO2 80% on NRB mask
- Lethargic, follows simple commands
- Crusted blood at vermilion border
- No fresh blood in oropharynx
- Tachycardic without murmur
- CTA B/L at anterolateral thorax
- Distended and non-tender abdomen
- Hgb 3.8 Platelets 49K
- INR 2.89 Lactic acid 17.4
- BUN 89 Creatinine 2.0

ICU or NON-ICU: My Recommendation

- Endotracheal intubation
- Large-bore central venous catheter
- Massive transfusion protocol
- Serial laboratories
  - H/H, platelets, coagulation studies, ionized calcium
- SBP prophylaxis
- GI consult with EGD
- IR consult with TIPS?
- Transfer to transplant center?
- ICU

COVID-19 Respiratory Failure

- Concerns
  - Superimposed bacterial infection
  - ARDS
  - Hemodynamics
  - Oxygen requirement
  - Work of breathing
  - Risk for decompensation
- What ICU Offers
  - Respiratory monitoring
  - Non-invasive ventilation
  - Mechanical ventilation
  - Epoprostenol
  - Paralytic agents
  - Proning
  - ECMO
  - Goals of care discussions

Henrietta

- 92YO female admitted from home to routine nursing floor for COVID-19 respiratory failure
- HD#1: 3L/min O2 via NC
- HD#8: 10L/min O2 via NC
- HD#10: HFNC (40L, 70%)
- HD#12: HFNC (40L, 100%)
- HD#13: BPAP (18/8cmH20, 100%)
- Rapid Response referral to ICU for worsening respiratory failure and concern for airway protection

- T 100.2F
- HR 104/min
- BP 98/50mmHg
- SpO2 83% on BPAP
- Anxious, restless, trying to pull-off BPAP mask, does not follow commands
- Tachycardic, no murmur
- Asynchronous with BPAP, diffusely coarse breath sounds, tachypneic
- Distended abdomen
- ABG: pH 7.18, pCO2 68, pO2 46

ICU or NON-ICU: My Recommendation

- Already completed remdesivir
- Already completed steroids
- Did not receive tocilizumab or baricitinib

- "If she gets intubated, then she may never be extubated."
- "She may code during intubation."
- Emergent goals of care discussion with surrogate decision maker
- Palliative Care consult

- NON-ICU pending goals of care discussion

Concluding Thoughts

- Not every patient requires ICU level of care for a specific diagnosis
- Admission to ICU level of care is a patient-specific decision
- Admission to ICU level of care is a collaborative decision
- ICU level of care comes with a cost
- ICU level of care is not an infinite resource
- ICU level of care is a sometimes a necessary resource
- ICU care does not necessarily change the clinical endpoint or outcome

Question 1

Who or what is the umber one priority in determining level of care decisions?

A: Patient

B: Hospital

C: Physician

D: Healthcare system

E: Insurer

Question 2

74YO female presenting to the emergency department from skilled nursing facility with dyspnea.

T 101.4F

HR 112/min

SBP 90mmHg

RR 48/min on BPAP (16/8, 100%)

SpO2 81%

CXR with bilateral infiltrates

COVID-19 POSITIVE

FULL CODE

Appropriate level of care?

A: Promptly intubate; admit to ICU

B: Continue BPAP in non-ICU level of care; obtain Pulmonary and Infectious Disease consults

C: Discharge back to skilled nursing facility

D: Enroll in hospice

Question 3

36YO female long-distance runner presenting to the emergency department due to decreased urine output and myalgias after 16mile run in the summer heat.

T 103F
HR 140/min
BP 106/48mmHg
RR 24/min
SpO2 94% on RA
Awake and alert, no focal deficits
Tachycardic, no cardiac murmur
CTA B/L at anterolateral thorax
+4/5 strength at UE B/L
+4/5 strength at LE B/L

BUN 100	Creatinine 10.2
Potassium 5.0	CPK 7900
pH 7.21	Lactic acid 4.7

Appropriate level of care?

A: ICU with urgent hemodialysis

B: Non-ICU with IVF, serial laboratories and Nephrology consult

C: Discharge to home with outpatient Primary Care follow-up

Question 4

29YO male with DM1 presenting to the emergency department for intractable nausea and vomiting of three days duration.

T 98.6F

HR 134/min

BP 98/62mmHg

SpO2 96% on RA, 36 breaths/min

Dry oral mucous membranes

Diffusely tender abdomen, no guarding, no rebound, no distension

Glucose 519	AG 32
Sodium 124	Potassium 6.2
Lactic 4.3	pH 6.90

CT abdomen/pelvis: No acute process

Appropriate level of care?

A: ICU with insulin infusion

B: Non-ICU with insulin infusion

C: Non-ICU with subcutaneous insulin

D: Discharge to home with short-term outpatient Primary Care follow-up

Question 5

41YO male presenting to the local emergency department for evaluation of headache and confusion.

T 100F
HR 116/min
BP 218/140mmHg
SpO2 91% on 3L/min O2 via NC
AAOx2 (not to time), no aphasia
PERRL, CN2-12 intact
RRR, tachycardic
Crackles at lung bases B/L, no wheezes
Non-distended abdomen
1+ LE edema B/L

WBC 9.26 with 49segs
Hgb 14.9
BUN 24 Creatinine 2.1
Troponin T 129 proBNP 5940
CXR with pulmonary vascular congestion, no pleural effusion
CT head/brain without hemorrhage

Appropriate level of care?

A: Labetalol 20mg IV; furosemide 40mg IV; reassess for ICU admission

B: Clevidipine infusion; ICU

C: Hydralazine 25mg PO; NON-ICU

D: Discharge to home

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