SEPSIS

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WHAT IS SEPSIS?

- REVISED GUIDELINES IN 2016 BY THE SOCIETY OF CRITICAL CARE MEDICINE (SC (US) AND THE EUROPEAN SOCIETY FOR INTENSIVE CARE MEDICINE (ESICM).
  - SEPSIS:
    - "LIFE THREATENING ORGAN DYSFUNCTION DUE TO A DYSREGULATED HOST RESPON TO INFECTION."
  - SEPTIC SHOCK:
    - "…A SUBSET OF SEPSIS IN WHICH PARTICULARLY PROFOUND CIRCULATORY, CELLULAR, AND METABOLIC ABNORMALITIES SUBSTANTIAL INCREASE MORTALITY."

WHY DO WE NEED TO KNOW?

- SEPSIS IS THE LEADING CAUSE OF DEATH FROM INFECTION AND ITS REPORTED INCIDENCE IS ON THE RISE.
- IN THE UNITED STATES, SEPSIS ACCOUNTED FOR MORE THAN $20 BILLION IN HOSPITAL COSTS IN 2011.
- MORTALITY RATE OF 10%

Surviving Sepsis Campaign Bundles

- Treatment focuses on
  - Drawing labs (Blood Cultures and Lactic Acid (LA))
  - Administering Antibiotics
  - Restoring hemodynamic stability (fluids & vasopressors)

- Determine Time Zero
- 3 Hour Bundle
  1. Lactic Acid
  2. Blood Cultures
  3. Antibiotics
  4. IV Fluids- 30 ml/kg

- 6 Hour Bundle
  - Hypotension management
  - Repeat Lactic Acid
  - Physician Reassessment

Focus of 2019 and 2020 Strategic Initiative

Sepsis Core Measure- All Bundle Elements

What triggers the SAFE Alert?

2 SIRS + 1 OD = Alert

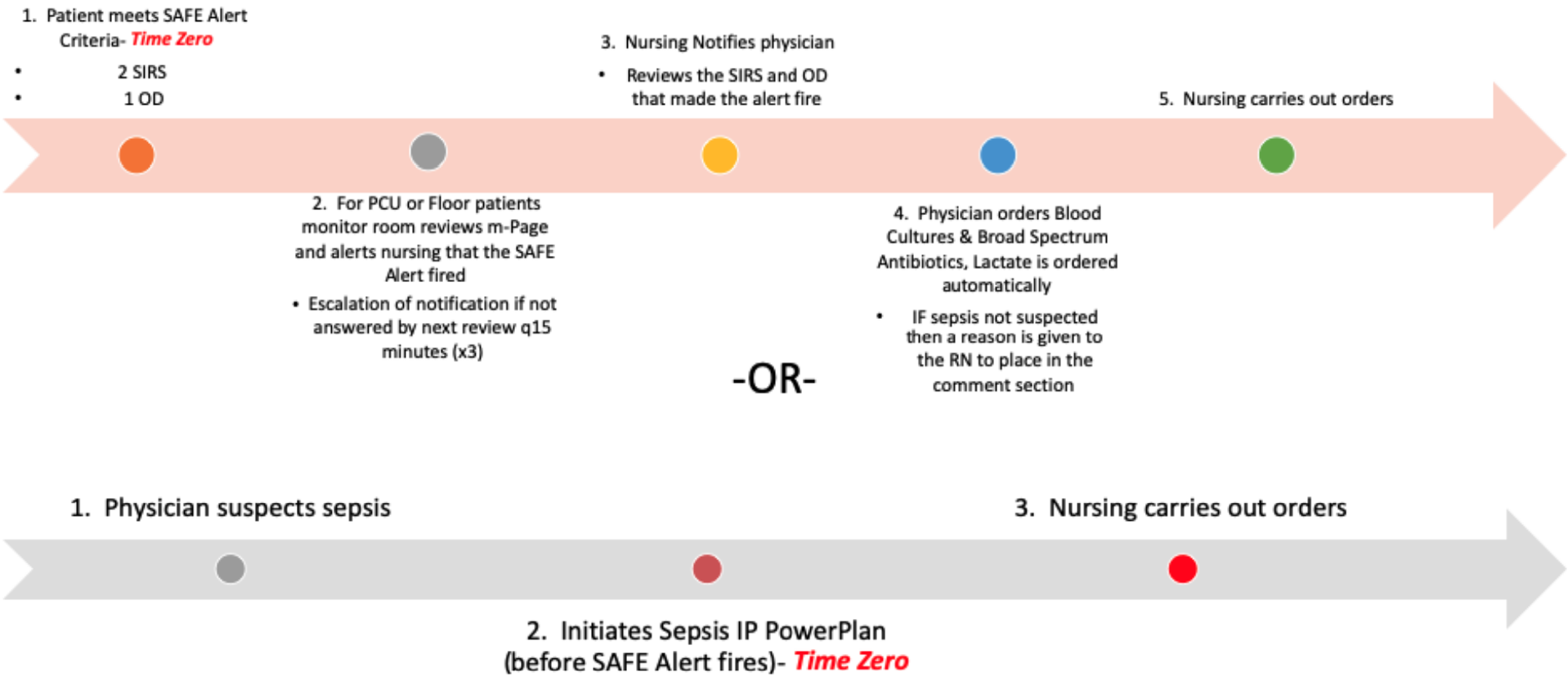
Within 6 hours

Within 8 hours

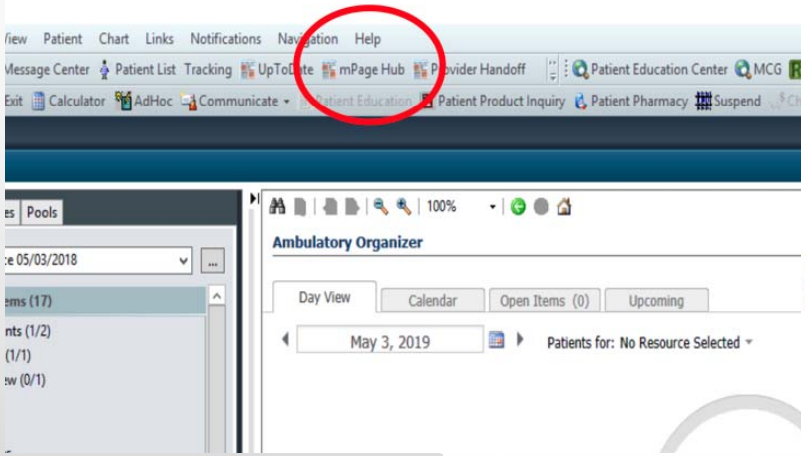
Systemic Inflammatory Response Syndrome (SIRS) Criteria
• Respiratory Rate > 20
• Heart Rate > 90
• Core temperature < 36°C or > 38.3°C
• WBC < 4 or > 12 or Bands > 10

Organ Dysfunction (OD) Criteria
• Creatinine > 2.0 and increased from prior result and not on epoetin alfa (home or IP med)
• Bilirubin Total > 2.0 and increased from prior result by .5
• Platelet < 100k and decreased from prior result
• aPTT > 60 and no active order for anticoagulant
• Hypoxemia: O2 Saturation < 90
• Delirium Assessment = Positive
• MAP < 65
• SBP < 90
• Lactic Acid > 2.0
• INR > 1.5
• Urine output < 0.5 mL/kg/hr for 2 or more hours

Once SAFE alert fires….



Where do I find the Safe Alerts?



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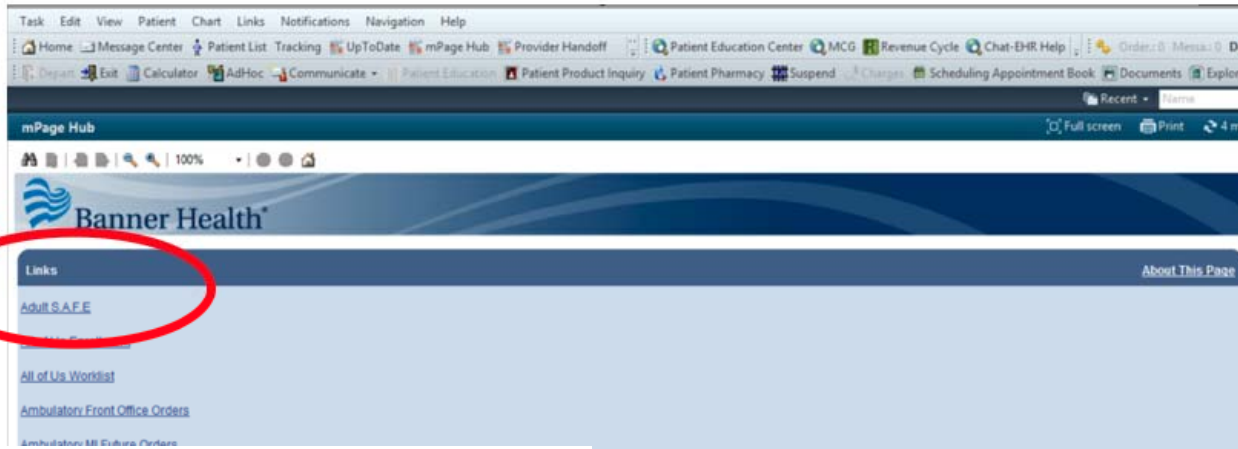

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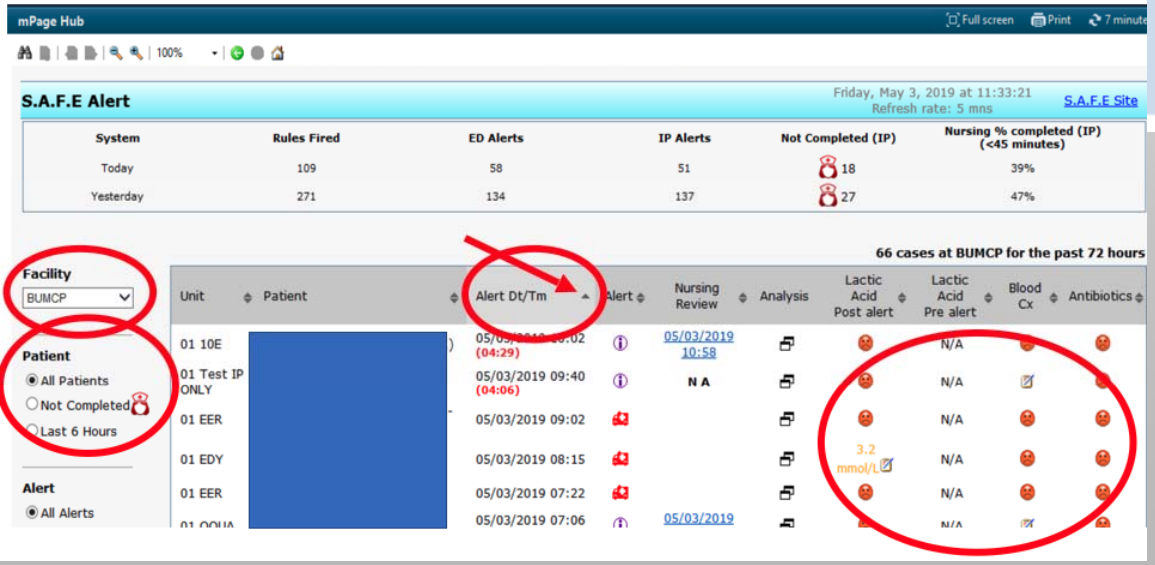
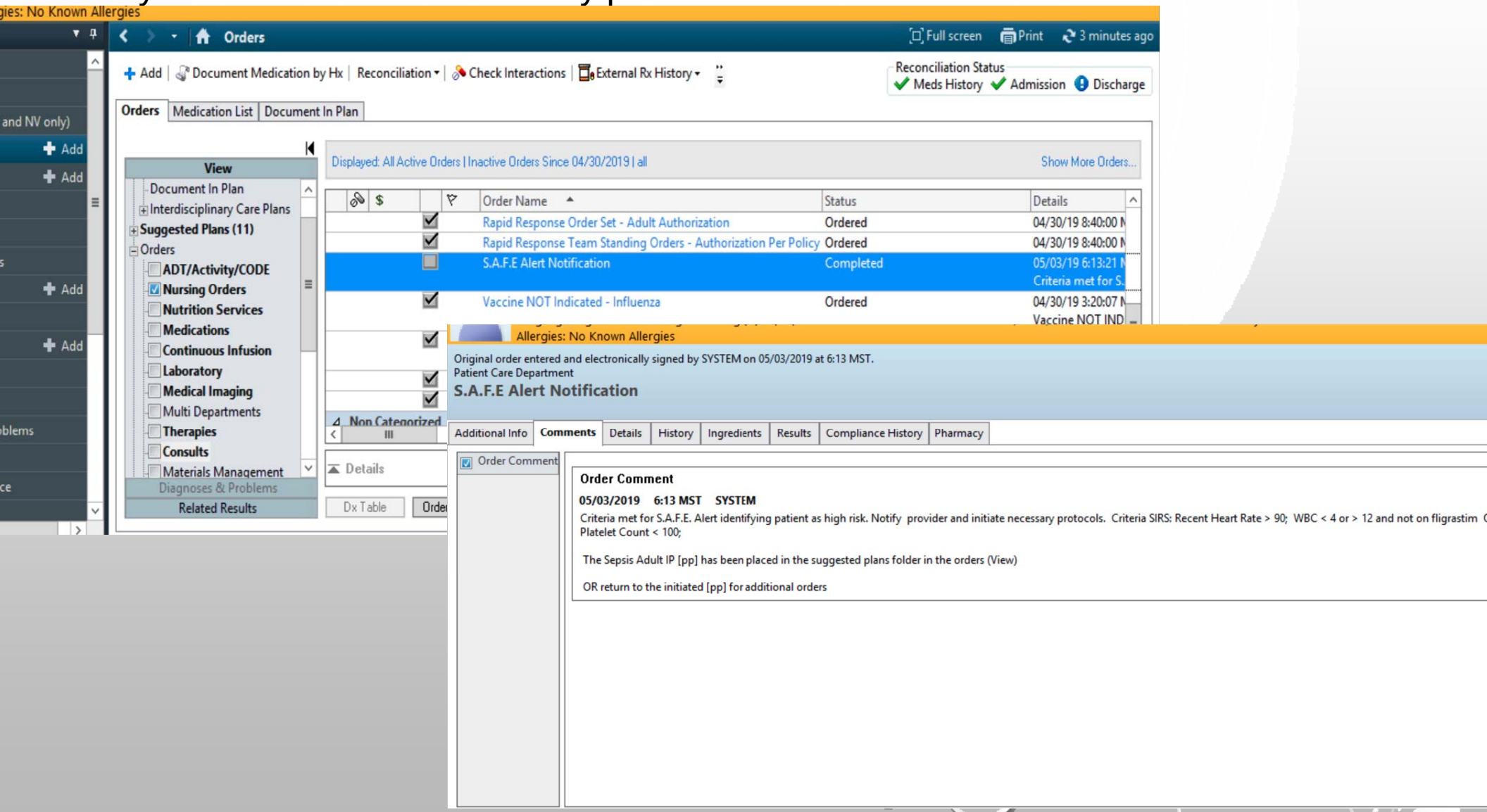


Why did the Safe Alert fire on my patient?



Another way to look at Early Warning Systems

- University of Utah found that a "graded" scale improved the accuracy of prediction of when a patient was decompensating.
- A score of 7+ using similar predictors as the SAFE alert improved their early detection and accuracy

Modified Early Warning Score Criteria and Response

MEWS Score	3	2	1	0	1	2	3
Heart Rate		<40	≤50	≤100	≤110	≤129	>129
Systolic Bld Pressure	<70	≤80	≤100	≤199		>200	
Respiratory Rate		<8		≤14	≤20	≤30	≥30
Temperature		<35.0	≤36	≤38	>38	>38.6	
Urine Output	<10mL	<30mL	<45mL				
				1			
LOC Score			New Agitation/Confusion	Alert	Responds to Verbal	Responds to Pain	Unresponsive
O2 Saturation < 90% : Not part of scoring mechanism but can display							

Score Range	FREQUENCY OF MONITORING	CLINICAL RESPONSE
0-4	Minimum 12 hours	• Continue to monitor and review MEWS every 12 hours
Total: 5-6	Minimum of 4 hours	• Consider notifying physician of MEWS score • Notify charge nurse • Consider placing a consult to Rapid Response Nurses • Increase MEWS assessment every 4 hours with increased frequency in assessments
Total: 7+	Minimum of 2 hours or per patient acuity	• Consider calling Physician with current assessment data • Consider calling a Rapid Response • Call RRT Consult nurse • Consider transfering to step-down or ICU

HOW DO WE ASSESS RISK IN SEPTIC PATIENTS?

- SOFA = “SEQUENTIAL ORGAN FAILURE ASSESSMENT”
  - USE TO PREDICT MORTALITY IN NON-ICU PATIENTS, NOT TO DIAGNOSE SEPSIS.
- QSOFA = QUICK SOFA
  - A “POSITIVE" QSOFA SCORE (≥2) SUGGESTS HIGH RISK OF POOR OUTCOME IN PATIENTS WITH SUSPECTED INFECTION.
- APACHE = "ACUTE PHYSIOLOGY, AGE AND CHRONIC HEALTH EVALUATION"

QSOFA

- ALTERED MENTAL STATUS (GCS<15)
- RESPIRATORY RATE (>22)
- SYSTOLIC BP (<100)

- USE WORST SCORES OVER THE PRIOR 24 HOURS.
- USED ON THE MEDICAL FLOOR:
  - NON-ICU PATIENTS
  - WITH SUSPECTED INFECTION
  - TO ASSESS NEED FOR FURTHER STUDIES TO LOOK FOR POTENTIAL ORGAN DAMAGE
  - TO ASSESS FOR INCREASED RISK OF HIGHER MORTALITY AND PATIENT PLACEMENT

SOFA

- PREDICTOR OF MORTALITY IN THE ICU
- BASED ON OBJECTIVE DATA
- DYNAMIC MEASUREMENT OF INTERVENTIONS
  - PAO2 (NORMAL 75-100)
  - FIO2 (FRACTION OF INHALED O2)
  - ON MECHANICAL VENTILATION? (INCLUDES CPAP/BIPAP)
  - PLATELETS
  - GCS
  - BILIRUBIN
  - MEAN ARTERIAL PRESSURE (MAP)
  - CREATININE

APACHE VS. SOFA

Feature	APACHE	SOFA
Basis	Three factors that influence outcome in critically ill patients 1. chronic background disease 2. patient reserve 3. severity of acute illness	Degree of organ dysfunction is related to acute illness(initially based on sepsis related organ dysfunction but later validated for organ dysfunction not related to sepsis)
Score	Physiological variable, chronic health conditions, emergency / elective admissions, and post-operative / non-operative admissions	Defined score (1-4) for each of six organ systems 1. Respiratory 2. CVS 3. CNS 4. renal 5. Coagulation 6. Liver
Scoring duration	Based on the most abnormal measurements in the first 24 hours of ICU stay	Daily scoring of individual and composite scores possible during course of ICU stay
Population outcome comparison	Standardized mortality ratios can be used for large patient populations	No predicted mortality algorithm In general, higher SOFA score is associated with worse outcome.Treatment effects on SOFA
Individual patient outcomes	Not possible to predict individual patient outcome or response to therapy	Response of organ dysfunction to therapy can be followed over time

YOU ARE PAGED BY A NURSE ON 15E ON YOUR LAST NIGHT OF SEVEN IN A ROW AT 0342 TO EVALUATE A PATIENT. YOU QUICKLY SNORT SOME ESPRESSO AND PULL ON THAT LONG WHITE-COAT YOU ALWAYS WANTED BUT ARE CURRENTLY REGRETTING.

AS YOU'RE TALKING TO THE NURSE YOU OPEN THE CHART AND SEE THE FOLLOWING HPI FROM EARLIER THAT DAY:

- "MR. HABIB IS A 56-YEAR-OLD MAN WITH PAST MEDICAL HISTORY OF DIET-CONTROLLED DM2, HTN, AND A HISTORY OF PROSTATE CANCER IN 2015 WHO WAS ADMITTED FOLLOWING A SIX-DAY HISTORY OF WORSENING PRODUCTIVE COUGH, SOB, AND AN EPISODE OF VOMITING AND DIZZINESS ON THE DAY OF ADMISSION. MEDICATIONS INCLUDE METFORMIN, LISINOPRIL, GABAPENTIN, AMLODIPINE, ASPIRIN, ATORVASTATIN AND PRN TYLENOL."

YOU REVIEW SOME MORE AND NOTE THE FOLLOWING:

- IN THE ED VITALS WERE AS FOLLOWS:
  - BP 131/86, HR 90, SPO2 91%, RR 26, T38.
- HE WAS STARTED ON O2 NASAL CANNULA AT 3L AND HIS SPO2 IMPROVED TO 95%.
- CHEST X-RAY SHOWED "RIGHT-SIDED CONSOLIDATION IN THE LOWER LOBE."
- HE WAS GIVEN A LITER OF NORMAL SALINE AND ADMITTED ON AZITHROMYCIN AND CEFTRIAXONE.

IN THE ASSESSMENT AND PLAN OF THE H&P THE AUTHOR'S DIFFERENTIAL INCLUDES COMMUNITY-ACQUIRED PNEUMONIA AND PLEURAL EFFUSION.

MOST RECENT ECHO (3 WEEKS AGO) SHOWED A NORMAL HEART WITH EF 55 – 60%.

THE NURSE HAS NOW CALLED YOU TO EVALUATE THE PATIENT AS SHE FEELS THAT THERE IS "SOMETHING NOT RIGHT."

- LABS ON ADMISSION SHOWED WBC 14, HB 11, PLT 322, K 4.2, CR 1.4 (BASELINE 1.3), MG 2.1, PO4 2.5. BLOOD GLUCOSE WAS 156.
- CULTURES OF BLOOD AND SPUTUM ARE PENDING. URINALYSIS WAS POSITIVE FOR KETONES AND GLUCOSE; NEGATIVE OTHERWISE.
- ON EXAMINATION YOU SEE AN ILL-APPEARING, WELL-NOURISHED MALE IN MILD DISTRESS. HE APPEARS STATED AGE; SITTING UP IN BED WEARING A NASAL CANNULA. THERE IS NO EDEMA, CARDIAC EXAM IS WNL, NO SKIN CHANGES. HE IS SLIGHTLY DIAPHORETIC AND LOOKS TIRED.
- VITALS ARE NOW AS FOLLOWS:
  - BP 94/48, HR 112, SPO2 91%, RR 27, T38.4.
- YOU INCREASE HIS OXYGEN TO 6L NC. YOU ASK FOR REPEAT LABS AND A CHEST X-RAY:
  - WBC 21, HB 10.7, PLT 319, K 3.8, CR 1.7, MG 2, PO4 2.5. BLOOD GLUCOSE IS 132. ANION GAP IS 17.
  - REPEAT CHEST X-RAY IS UNCHANGED FROM THE PRIOR STUDY.
- THE NURSE ASKS YOU “SO WHAT NOW, DOCTOR?”

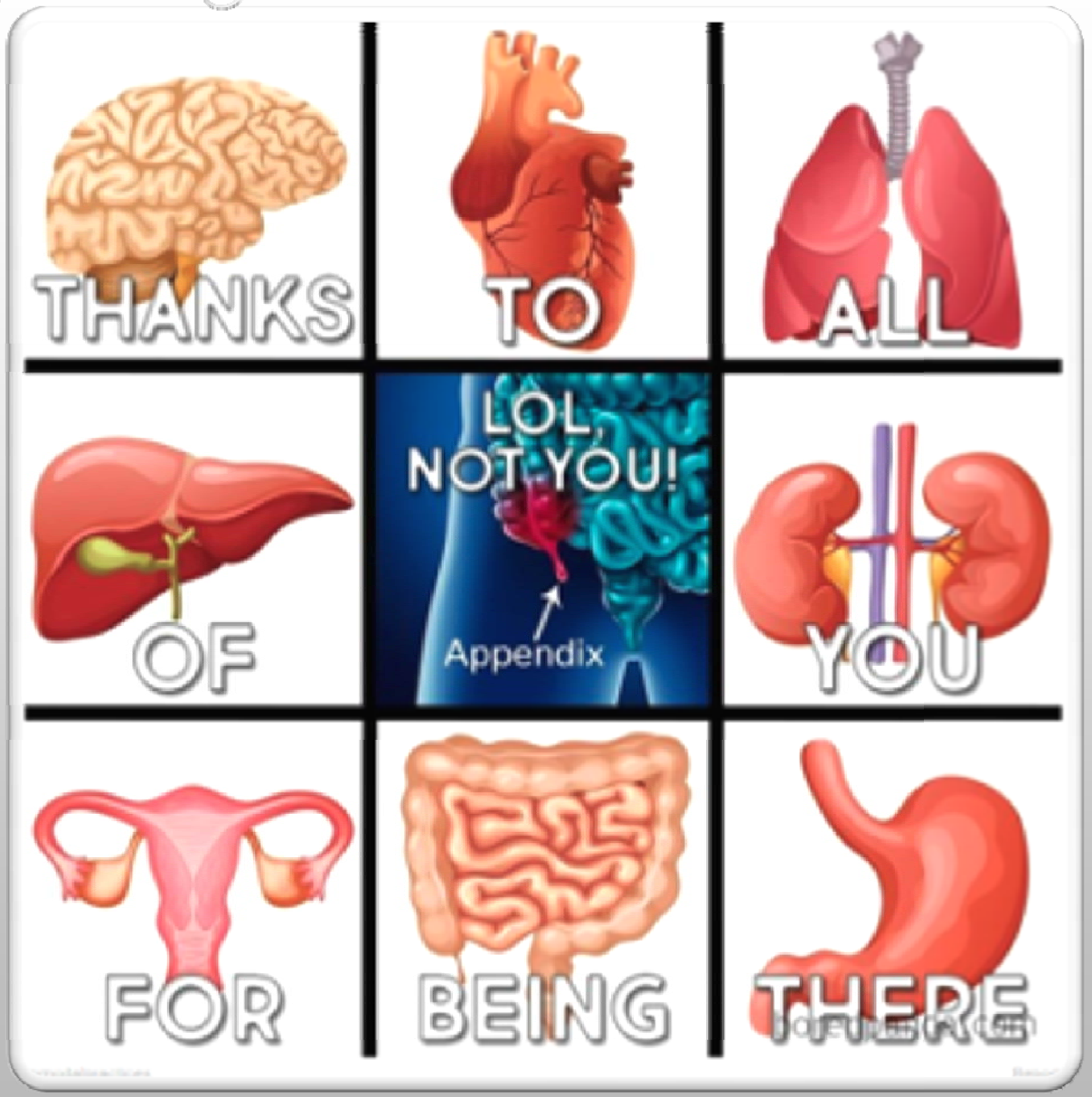
O WHAT
IOW,
OCTOR?

A. "THE PATIENT IS FINE. IS LULU'S OPEN?"

B. "I'M NOT REALLY SURE IF WE NEED TO DO ANYTHING. WE CAN TALK ABOUT IT ON ROUNDS TOMORROW."

C. "OMG OMG OMG I'M FREAKING OUT!!!!"

D. "THE PATIENT IS NOT DOING SO GREAT, LET'S START WITH SOME FLUIDS."



- IS THE PATIENT SEPTIC?
- IS THE PATIENT IN SEPTIC SHOCK?

VHICH OF HESE BEST EPRESENTS HE "SEPSIS UNDLE"?

- 30 ML/KG CRYSTALLOID FLUID, DOPAMINE FOR RENAL PROTECTION, BLOOD CULTURES, DOUBLE PSEUDOMONAS COVERAGE WITH BROAD-SPECTRUM ANTIBIOTICS?
- B. 30 ML/KG CRYSTALLOID FLUID PLUS ALBUMIN, BLOOD CULTURES, BROAD-SPECTRUM ANTIBIOTICS, MEASURE SERUM LACTATE AND USE VASOPRESSORS TO KEEP MAP ABOVE 65?
- C. A. 30 ML/KG CRYSTALLOID FLUID, BLOOD CULTURES, BROAD-SPECTRUM ANTIBIOTICS, MEASURE SERUM LACTATE AND USE VASOPRESSORS TO KEEP MAP ABOVE 65?
- D. EPINEPHRINE PUSH, 30 ML/KG CRYSTALLOID FLUID, BLOOD/URINE/SPUTUM CULTURES, SERUM LACTATE AND PROCALCITONIN?

Surviving Sepsis Campaign

BUNDLE

HOUR-1 BUNDLE: INITIAL RESUSCITATION FOR SEPSIS AND SEPTIC SHOCK:

1) Measure lactate level.*
2) Obtain blood cultures before administering antibiotics.
3) Administer broad-spectrum antibiotics.
4) Begin rapid administration of 30mL/kg crystalloid for hypotension or lactate ≥4 mmol/L.
5) Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg

*Remeasure lactate if initial lactate elevated (> 2 mmol/L).

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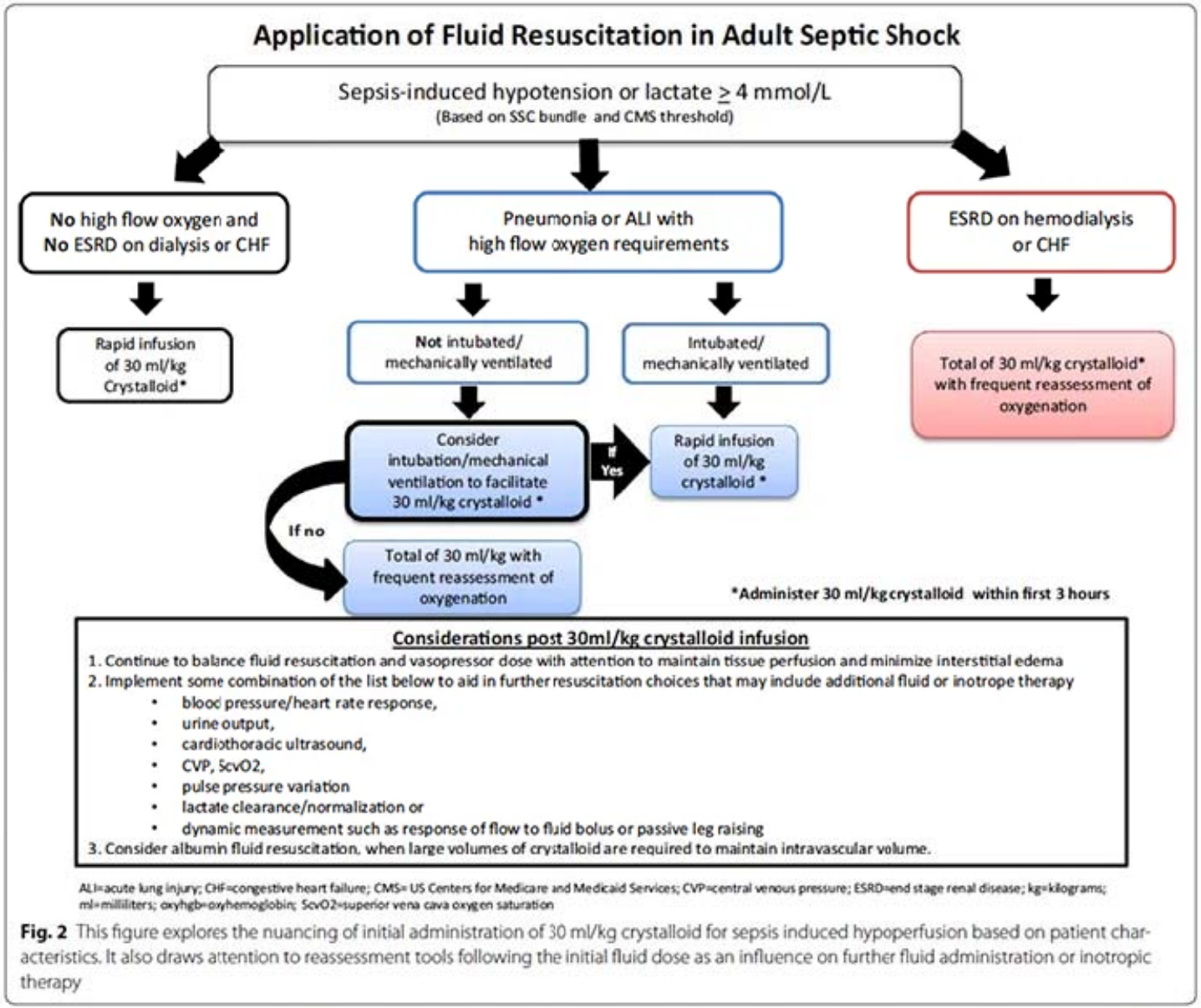


Fig. 2 This figure explores the nuancing of initial administration of 30 ml/kg crystalloid for sepsis induced hypoperfusion based on patient characteristics. It also draws attention to reassessment tools following the initial fluid dose as an influence on further fluid administration or inotropic therapy

Dellinger RP, Schorr CA, Levy MM: User's guide to the 2016 Surviving Sepsis Guidelines

THE CASE CONTINUES…

YOU ORDER A STAT LACTIC ACID. IT COMES BACK AS 6.3.

AFTER ADEQUATE FLUID RESUSCITATION YOU CALCULATE THE MAP AT 62.

YOU DRAW ANOTHER SET OF BLOOD CULTURES AND START BROAD SPECTRUM ANTIBIOTICS.

- USUALLY VANCOMYCIN/ZOSYN OR CEFEPIME

SEPTIC SHOCK:

PERSISTING HYPOTENSION REQUIRING VASOPRESSORS TO MAINTAIN MAP ≥65 MM HG.

BLOOD LACTATE >2 MMOL/L DESPITE ADEQUATE VOLUME RESUSCITATION.

MAPGOALS

- FIRST CHOICE VASOPRESSOR IN ALMOST EVERY CIRCUMSTANCE IS NOREPINEPHRINE ("NE").
- BRAND NAME FOR NE IS LEVOPHED ®
- THERE ARE NO ABSOLUTE CONTRAINDICATIONS TO THE USE OF NE FOR HYPOTENSION IN SEPTIC PATIENTS.
- TITRATE TO MAP GREATER THAN 65 IN MOST PATIENTS.
- YOU SHOULD NOT GIVE LEVOPHED ON THE FLOOR WITHOUT SWAT PRESENT. IF BLOOD PRESSURE IS DANGEROUSLY LOW CALL A RAPID RESPONSE OR A CODE.
- NEXT STEP IS VASOPRESSIN.
- MOST FEARED COMPLICATIONS FROM PRESSORS: CARDIAC ARRYTHMIAS AND ISCHEMIC GUT.

- THE PATIENT IS ON BROAD SPECTRUM ANTIBIOTICS AND MAP IS STILL 62. THE PATIENT IS NOW ON HIGH-FLOW NASAL CANNU RR IS 32. WHAT NOW?
  - A. "NOTHING. WE SAVED A LIFE TODAY."
  - B. "IT'S 0520: HASHTAG DAY-TEAM PROBLEMS!"
  - C. "CALL THE ICU FOR TRANSFER."
  - D. "CALL A CODE. IT'S THE FASTEST WAY TO GET THE ICU TEAM HER

- THE PATIENT RESPONDS TO FLUID RESUCITATION AND IS ON BROAD SPECTRUM ANTIBIOTICS, HE APPEARS COMFORTABLE ON 6L NC. WHAT NOW?
  - A. "NOTHING. WE SAVED A LIFE TODAY."
  - B. "LET'S ADD A QUICK NOTE TO THE CHART WITH WHAT WE DID AND WHY, AND MAKE SURE WE GIVE A GOOD SIGN-OUT TO THE DAY TEAM THAT THIS PAITENT IS A PRIORITY FOR ROUNDS. HE NEEDS ANOTHER LACTIC ACID LEVEL IN 4-6 HOURS."
  - C. "CALL THE ICU FOR TRANSFER."
  - D. "IS LULU'S OPEN?"

ANOTHER CASE

- YOU ARE CALLED AS A MEDICINE CONSULT TO THE SURGICAL FLOOR FOR A PATIENT WITH END-STAGE RENAL DISEASE WHO HAS COME TO THE HOSPITAL FOR A KNEE REPLACMENT TWO DAYS AGO. THE SURGERY WENT WELL AND THEY EXPECT TO DISCHARGE THE PATIENT IN THE MORNING AS LONG AS HE HAS HAD A BOWEL MOVEMENT.
- VITALS ARE AS FOLLOWS:
  - BP 98/63, RR 14, HR 100, T100.6, SPO2 97% ON ROOM AIR
- THE PATIENT EXPLAINS AWAY HIS SYMPTOMS SAYING THAT HE HAD A COLD BEFORE THE SURGERY AND HAD A SMALL TEMPERATURE AT HOME.
- HIS KNEE IS DRESSED SO YOU REMOVE THE DRESSING. THERE APPEARS TO BE SLIGHT DRAINAGE FROM THE WOUND BUT THERE IS NO ODOR OR REDNESS.

- WHAT NOW?
  - A. ACTIVATE THE SEPSIS BUNDLE.
  - B. GIVE SOME FLUIDS: MAYBE THE PATIENT IS JUST DEHYDRATED.
  - C. CALL THE SURGERY TEAM.
  - D. A & C

LAST ONE

- YOU ARE CALLED TO THE BEDSIDE ON 12E FOR A PATIENT WHO JUST HAD A WITNESSED TONIC-CLONIC SEIZURE WHICH LASTED ABOUT THREE MINUTES. THE PATIENT IS A 22-YEAR-OLD MAN WITH A KNOWN SEIZURE DISORDER FOR WHICH HE TAKES LEVETIRACETAM AND PHENYTOIN.
- THIS IS THE FIRST SEIZURE HE HAS HAD SINCE ADMISSION FOR A CARDIAC ARREST SUFFERED AFTER HE "OVERDID IT" ON COCAINE AND HEROIN TWO DAYS AGO.
- HE HAS HAD A LOT OF VOMITING IN RESPONSE TO NARCOTIC PAIN MEDICINE, WHICH HE HAS BEEN PRESCRIBED FOR BROKEN RIBS DUE TO AGGRESSIVE CPR BY HIS 280LB BEST FRIEND.
- HE HAS BEEN TREATED WITH 3MG ATIVAN AND IS NOW CONFUSED AND DROWSY.
- THE NURSE DREW LABS BEFORE YOU ARRIVED AND WBC IS SLIGHTLY ELEVATED. LACTIC IS 8.0. CMP WNL. PHENYTOIN LEVEL WAS LOW THIS MORNING.
- VITALS AS FOLLOWS:
  - BP 110/68, HR 112, RR 18, T100.2, SPO2 100% ON 2L NC

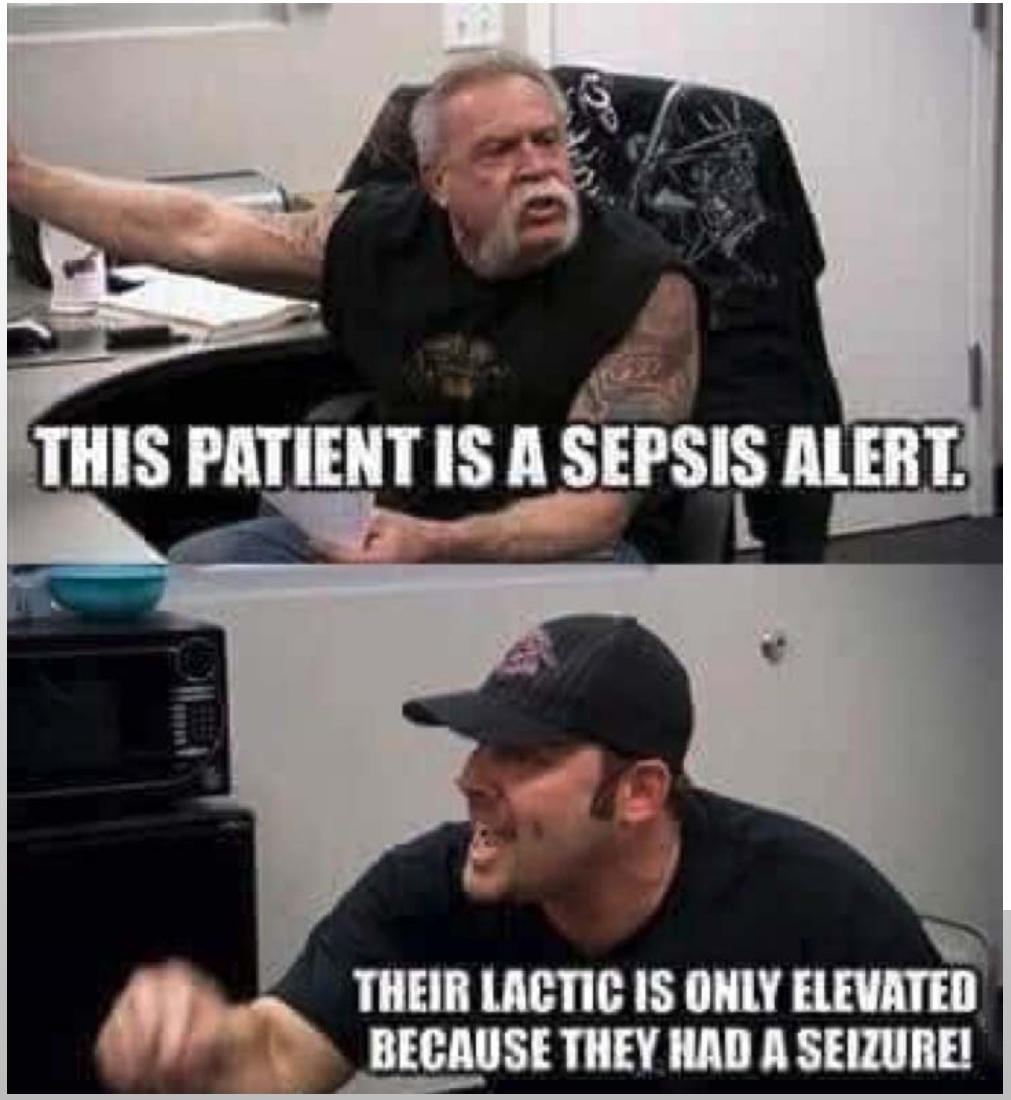
- WHAT'S GOING ON HERE?

A. THE LACTIC IS ELEVATED BECAUSE OF THE SEIZURE. ORDER AN EEG AND GIVE A LOADING DOSE OF IV DILANTIN.

B. THE PATIENT IS SEPTIC. ACTIVATE THE SEPSIS BUNDLE.

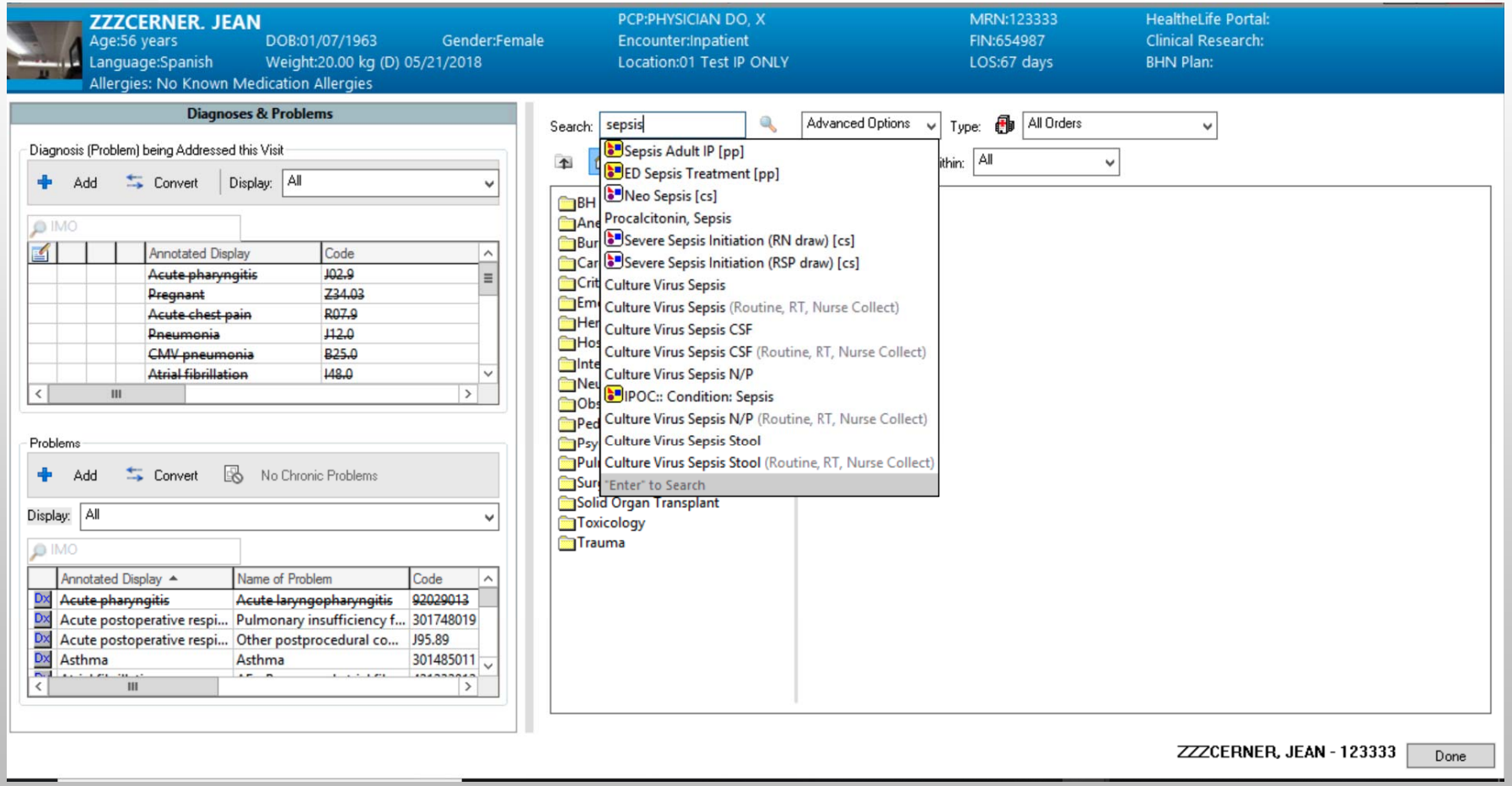
C. ACTIVATE THE SEPSIS BUNDLE AND ORDER AN EEG.

D. TREND THE LACTICS AND CALL NEUROLOGY IN THE MORNING.

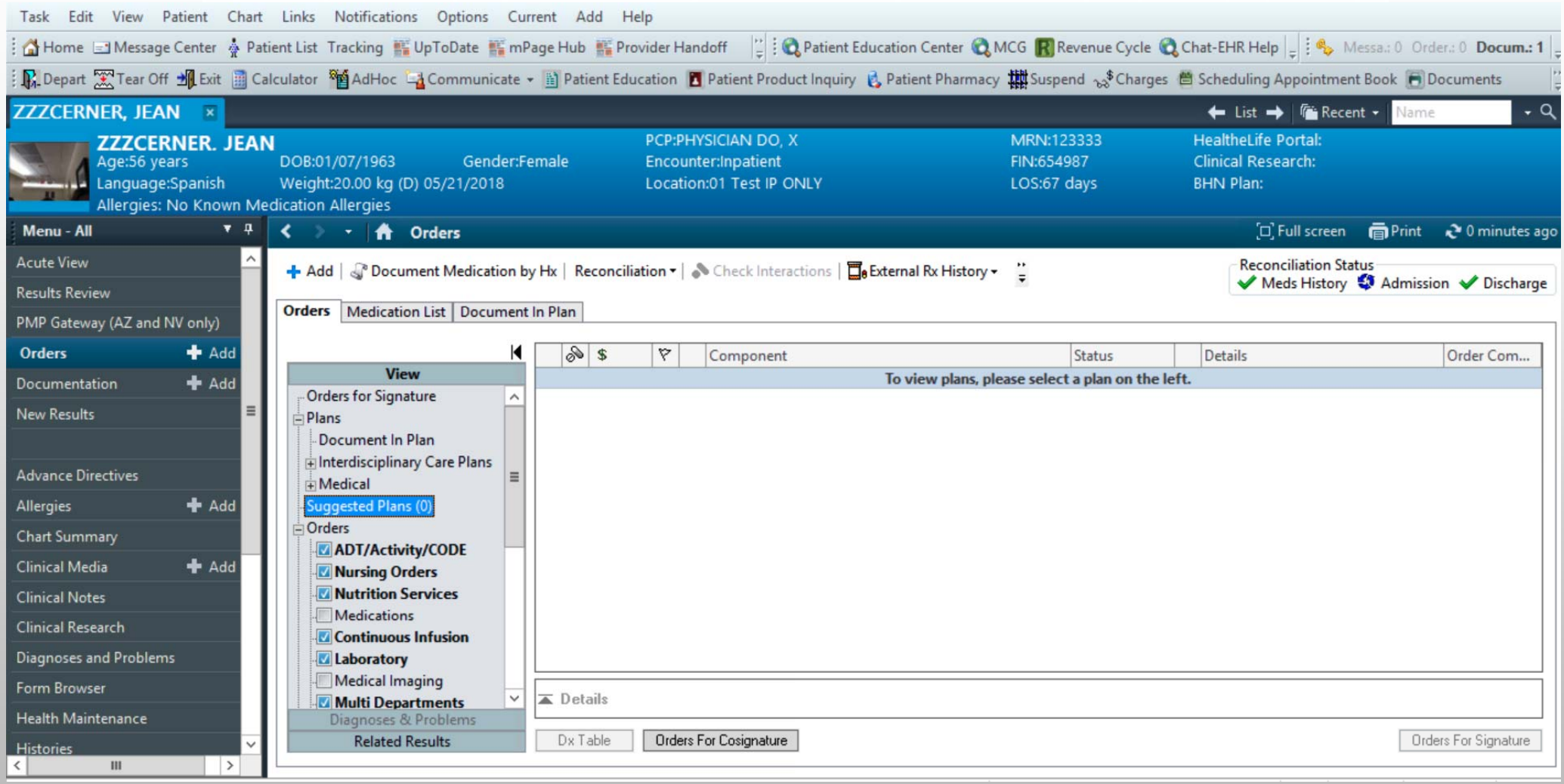

THIS PATIENT IS A SEPSIS ALERT.
THEIR LACTIC IS ONLY ELEVATED BECAUSE THEY HAD A SEIZURE!


THEY MEET THE CRITERIA!
© LICENSETONURSE.COM
IT'S NOT SEPSIS!
ZOSYN, VANC, AND 30MLS PER KG!

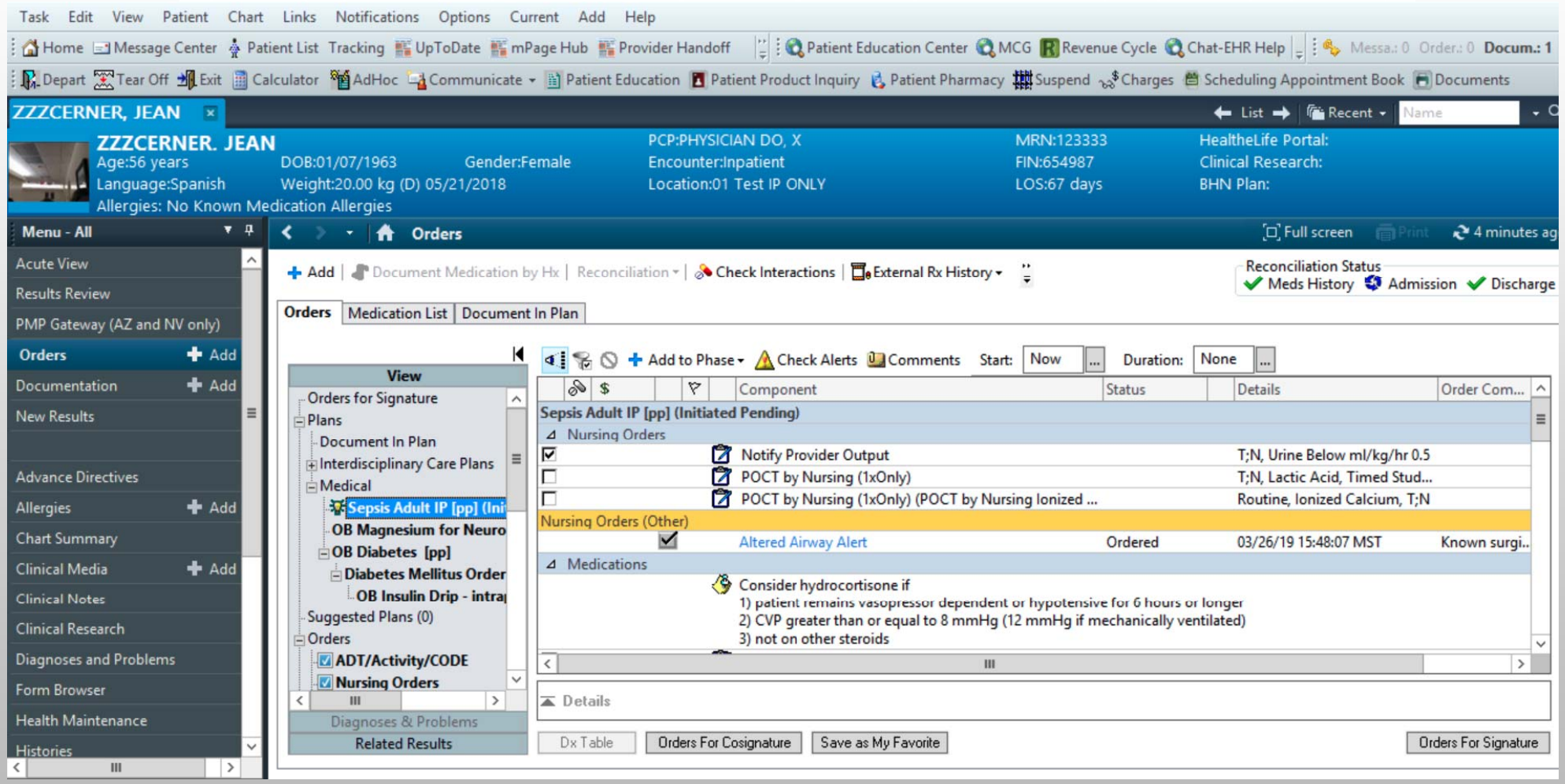
I think that my patient is septic…



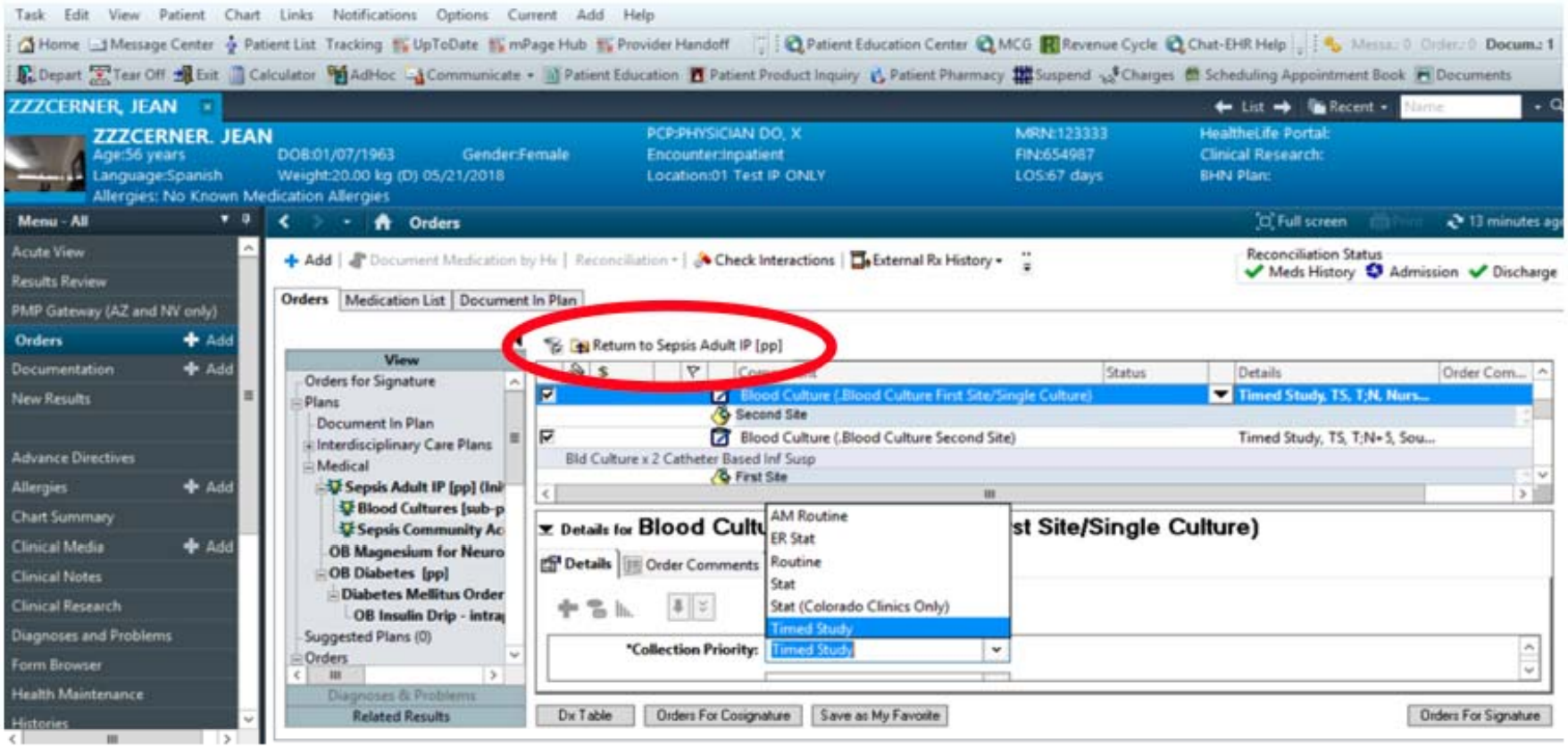
Or just find it under suggested plans…



Now for the best part!



So you ordered blood cultures but now want to get back to the original sepsis power plan…



E SEPSIS
OMMANDMENTS

- MEMORIZE THE 1HR SEPSIS BUNDLE!
- THE ONLY THING THAT HAS BEEN PROVEN TO SAVE LIVES OUT OF ALL THE BUN TIMELY ANTIBIOTIC THERAPY.
- THE FIRST VASOPRESSOR SHOULD BE NOREPINEPHRINE IN A "STABLE/UNSTABLE" PATIENT.
- LISTEN TO YOUR NURSES.
- THERE IS NO SUBSTITUTION FOR LOOKING AT YOUR PATIENT.
- A PUTATIVE PLAN IS BETTER THAN NO PLAN.
- HATERS GONNA HATE.
- KNOW YOUR VITALS.
- IF YOU FEEL LIKE YOU'RE "BENDING" THE RULES CALL FOR HELP.
- REMEMBER THAT NOT ALL SHOCK IS SEPTIC.
- THE ICU IS ALWAYS AVAILABLE TO EVALUATE A PATIENT IF YOU'RE NOT SURE.
    - AMION (PULMONARY FELLOWSHIP PAGE) WILL TELL YOU WHO IS ON CA DURING THE DAY.
    - AT NIGHT PAGE THE INTENSIVIST ATTENDING PAGER (ON THE IM AMION).

SOURCES

- RHODES, ANDREW MB BS, MD(RES) (CO-CHAIR)[1] ET AL. SURVIVING SEPSIS CAMPAIGN: INTERNATIONAL GUIDELINES FOR MANAGEMENT OF SEPSIS AND SEPTIC SHOCK: 2016, CRITICAL CARE MEDICINE: MARCH 2017 - VOLUME 45 - ISSUE 3 - P 486-552 DOI: 10.1097/CCM.0000000000002255

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