SEPSIS AND SEPTICEMIA
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DEFINITIONS
SYSTEMIC INFLAMMATORY RESPONSE SYNDROME
SEPSIS
SEVERE SEPSIS
SEPTIC SHOCK
MULTIPLE ORGAN FAILURE
BACTEREMIA
SEPTICEMIA

SIRS
TEMP >38.5
HEART RATE >90/BPM
RESP RATE >20/MIN
WBC >12,000 OR <4000
REQUIRES TWO OR MORE OF THE ABOVE
CAN BE FROM AUTOIMMUNE
DISEASE,PANCREATITIS,BURNS OR INFECTION ETC

SEPTICEMIA
1,665,000 CASES/ YEAR IN USA
2% OF HOSPITALIZED PATIENTS
27 TO 30% FATALITY IN USA
AFRICAN AMERICANS, ELDERLY AT GREATEST RISK
FURTHER CRITERIA FOR SEPSIS

GENERAL:
- FEVER >38.3
- HYPOTHERMIA (CORE<36)
- HEART RATE >90
- TACHYPNEA
- ALTERED MENTAL STATUS
- SIGNIFICANT EDEMA OF POS FLUID BAL.
- HYPERGLYCEMIA

INFLAMMATORY VARIABLES

- LEUKOCYTOSIS >12,000
- LEUKOPENIA <4000
- NORMAL WBC >10% IMMATURE CELLS
- CRP > 2X NORMAL
- PROCALCITONIN >2X NORMAL

HEMODYNAMIC AND TISSUE PERFUSION VARIABLES

- ARTERIAL HYPOTENSION
  - SYSTOLIC BP<90
  - MAP<70
  - SBP DECREASE > 40MM
- HYPERLACTATEMIA (>1MMOLE)
- DECREASED CAPILLARY REFILL OR MOTTLING

ORGAN DYSFUNCTION (severe sepsis)

- DECREASED RENAL BLOOD FLOW <0.5 ML/KG/HR
COMMUNITY ACQUIRED BLOOD STREAM INFECTIONS

COMMON ORGANISMS
- STAPH AUREUS
- STREP PNEUMO
- COAG NEG STAPH
- ENTEROBACTERIACEAE
- NO ORGANISM IDENTIFIED

COMMON COMMUNITY BSI PORTALS OF ENTRY

- RESP TRACT
- SKIN
- URINARY TRACT

NOSOCOMIAL MICROBIOLOGY

54% OF BLD STREAM INFECTIONS ARE NOSOCOMIAL
OVER HALF ARE GRAM POSITIVE
MICROORGANISMS VARY BY SITE AND BY NATURE OF THE PATIENT
MOST COMMON GRAM POSITIVE ORG: COAG NEG STAPH, COAG POS STAPH
ENTEROCCI
MOST COMMON GRAM NEGATIVE ORG: E.COLI, ENTEROBACTER, KLEBSIELLA

COMMON NOSOCOMIAL BSI PORTALS OF ENTRY

- GU TRACT
- PNEUMONIA
- VASC ACCESS
- SURG WOUNDS
- INTRA ABD INFECT
COMMON COMORBIDITIES
DIABETES
NEOPLASMS
IMMUNE SUPPRESSION
DEBILITATION
COPD
URINARY CATHETERIZATION
INTRA VASC ACCESS

PATHOPHYSIOLOGY
SEPSIS RESULTS FROM THE INTERACTION OF MICROBIAL LIGANDS (PAMP) WITH INNATE IMMUNE SYSTEM RECEPTORS WHICH RESULTS IN THE RELEASE OF INFLAMMATORY CYTOKINES INITIALLY FROM MONONUCLEAR PHAGOCYTES (IL1, TNF)
FOR GRAM POSITIVE ORGANISMS THE PEPTIDOGLYCANs ARE A MAJOR VIRULENCE FACTOR AND FOR GRAM NEGATIVE ORGANISMS THE LIPOPOLYSACCHARIDES IMPORTANT VIRULENCE FACTORS

PATHOPHYSIOLOGY
PMNS ARE ACTIVATED, EXPRESS ADHESION FACTORS, AGGREGATE, MARGINATE TO ENDOTHELIUM AND RELEASE INFLAMMATORY MEDIATORS
OTHER CELLS ARE ACTIVATED TO SECRETE OTHER INFLAMMATORY MEDIATORS
CIRCULATING FACTORS LIKE COMPLEMENT AND BRADYKININ ARE ACTIVATED

INFLAMMATORY MEDIATORS
TUMOR NECROSIS FACTOR ALPHA
INTERLEUKIN 1
PLATELET ACT. FACTOR
INTERLEUKINS 2, 6, 8, 10
INTERFERON
EICOSINOIDS
BRADYKININ
COMPLEMENT SYSTEM
PATHOPHYSIOLOGY

INTERACTION BETWEEN PMNS AND ENDOTHELIAL CELLS LEADS TO VASOACTIVE FACTORS AND INFLAMMATION WHICH CAN BECOME UNCONTROLLED
ALTERATIONS IN MICROCIRCULATION LEADS TO TISSUE HYPOXIA AND ORGAN DAMAGE
DEPRESSION OF CARDIAC FUNCTION ADDS TO CIRCULATORY PROBLEMS
HYPOTENSION CAN RESULT

PATHOPHYSIOLOGY

CIRCULATORY DYSFUNCTION LEADS TO REDISTRIBUTION OF BLOOD, DECREASED ART. TONE, ENDOTHELIAL PERMEABILITY, VENOUS DILATATION, CARDIAC DEPRESSION

PATHOPHYSIOLOGY

ORGAN DYSFUNCTION AND CELLULAR INJURY CAN RESULT:
DISS INTRAVASC. COAG
ACUTE RESP DISTRESS SYN
ACUTE RENAL FAILURE
ALTERED LFTS
ALTERED GI FUNCTION
ALTERED CNS FUNCTION

SIGNS AND SYMPTOMS

FEVER, CHILLS
TACHYCARDIA
HYPERVERVENTILATION
CONFUSION
HYPOTENSION
OLIGURIA
PALLOR
**DIAGNOSIS**

BLOOD CULTURES
AT LEAST TWO FROM DIFFERENT SITES
MUST USE SEPARATE NEEDLES, SYRINGES
BEST TIME IS JUST BEFORE FEVER SPIKE

**ESSENTIAL MONITORING**

OXIMETRY
ABGS
CREAT
PLATELET COUNT
MENTAL STATE
BILIRUBIN
LACTATE
BLOOD PRESSURE
CXR

**TREATMENT**

CORRECT HYPOXIA AND HYPOTENSION
ASSESS OXYGEN, ALL PROVIDED O2 - INTUBATE IF NEEDED
ASSESS PERFUSION, PROVIDE IV ACCESS
EARLY GOAL DIRECTED THERAPY WITHIN FIRST 6 HOURS PROVIDE FLUIDS

**TREATMENT**

PROVIDE LARGE FLUID VOLUMES:
CRYSTALLOIDS ADEQUATE (500 CC BOLUSES)
ASSESS VOLUME STATUS AFTER EACH INFUSION (BP, LUNG STATUS ETC)
MAY NEED CVP, MEAN ART BP, SvO2
BLOOD TRANSFUSION IF LOW HGB
VASOPRESSORS IF NO RESPONSE TO FLUIDS (NOREPINEPHRINE)
DOBUTAMINE AS INOTROPIC AGENT
TREATMENT
IDENTIFY THE SEPTIC FOCUS AND
ERADICATE THE SEPTIC FOCUS
ANTIBIOTIC THERAPY
VANCO PLUS 3rd or 4th GENERATION CEPHALOSPORIN
OR AMINOGLY OR FLUOROQUINOLONE
CARBAPENEM ALTERNATIVE

ANTIBIOTIC THERAPY
SHOULD BE DOEN EMPIRICALLY AND WITHOUT DELAY
INAPPROPRIATE ANTIBIOTICS INCREASES MORTALITY
DEESCALATE ANTIBIOTICS WITH RESULTS FROM
CULTURE AND SENSITIVITY

TREATMENT
SOURCE CONTROL: SURGICAL INTERVENTION IF NEEDED
TO DRAIN INFECTED AREA
VASOPRESSIN AS ALTERNATIVE TO NOREPINEPHRINE

CORE MEASURES
CORE MEASURES ARE INCORPORATED INTO CRITICAL
LISTS DESIGNATED AS BUNDLES
**SEPSIS BUNDLES:**

**RESUSCITATION BUNDLE**

- Serum lactate
- Blood culture before antibiotics
- Broad spectrum antibiotics administered within 3 hours for ED admission and 1 hr for ICU admission for hypotension or lactate >4mM
- Deliver initial crystalloid 20mL/kg crystalloid or colloid equivalent
- Vasopressors if no response for persistant hypotension despite fluids or lactate >4mM
- Achieve CVP >8mm Hg
- Achieve venous oxygen saturation of >70%

**SEPSIS BUNDLE:**

**MANAGEMENT BUNDLE**

- Low dose steroids administered in accord with STD ICU policy
- Glucose control maintained <180 mg/dL
- Inspiratory plateau pressures maintained <30 cm water for mechanically ventilated patients

**AREAS OF DEBATE**

- Use of steroids
- Intensive insulin therapy
- Crystalloids versus colloids

**MORTALITY**

- SIRS 7%
- Sepsis 16%
- Severe sepsis 20%
- Septic shock 46%
REFERENCES

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REFERENCES


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