SEPSIS KILLS

Adult Sepsis Pathway
Learning objectives

• Explain the risk of sepsis
• Describe the SEPSIS KILLS program
• Explain the rationale for the adult sepsis pathway changes
• Relate learned material to a case study
The problem with sepsis

• All patients are at risk
• High mortality/morbidity (~25%)
• Major cause of avoidable death in hospital
• 30% Rapid Response calls are sepsis related
• Signs & symptoms can be subtle
• Increasing incidence and resource intensive
• International failure to manage appropriately
NSW Health priority is to reduce the preventable harm to patients with sepsis.
3 key actions for NSW

RECOGNISE

RESUSCITATE

REFER
3 key actions for NSW

**RECOGNISE** the risk factors, signs and symptoms of sepsis

**RESUSCITATE** with rapid administration of intravenous antibiotics and fluids

**REFER** to appropriate senior clinicians and teams with retrieval if appropriate
Time to 1st antibiotics (mins)
Adult and paediatric patients

Source: CEC Sepsis database (n= 28,412)
In-hospital mortality - Adults

- 2009-11: 19.30%
- 2012: 17.20%
- 2013: 14.10%
- 2015: 13.37%
Adults (16 years +) in the emergency department or ward

Consider sepsis **any time your patient deteriorates**

- **AND/OR** have signs and symptoms of infection
- **PLUS** Red or Yellow Zone observations
- **OR** a clinician is concerned/suspects sepsis

Note: the Maternal Sepsis Pathway should be used from 20 weeks gestation up to 42 days post-partum
Adult pathway

Adults (16 years +) in the emergency department or ward

Consider sepsis **any time your patient deteriorates**

- **AND/OR** have signs and symptoms of infection

- **PLUS** Red or Yellow Zone observations

- **OR** a clinician is concerned/suspects sepsis
Adult sepsis pathway for use in all emergency departments and inpatient wards
Use relevant febrile neutropenia guidelines if the patient has haematology/oncology diagnosis
Use relevant nephrology guidelines for renal dialysis patients

ARE YOU CONCERNED THAT YOUR PATIENT COULD HAVE SEPSIS?
Consider the following risk factors
- Re-presentation within 48 hours
- Immunocompromised
- Recent surgery or wound
- Age > 65 years
- Indwelling medical device
- Fall

Absence of risk factors does not exclude sepsis as a cause of deterioration

Does your patient have any new onset of the following signs and symptoms of infection?
- Fever or rigor
- Dysuria/frequency
- Abdominal pain/distension/peritonism
- Cough/sputum/breathlessness
- Line associated infection/redness/swelling/pain
- Altered cognition

PLUS

Any RED ZONE observation OR additional criteria
- SBP < 90mmHg
- Lactate > 4mmol/L
- Base excess < -5.0

TWO or more YELLOW ZONE observations OR additional criteria including clinician concern
- Temperature < 35.5°C or > 38.5°C
- SBP < 100mmHg
- Heart rate > 50 or < 120 per minute
- Altered UOC or new onset of confusion
- Obtained a blood gas
- Lactate > 2mmol/L is significant in sepsis

Patient has SEVERE SEPSIS or SEPTIC SHOCK until proven otherwise
- Sepsis is a medical emergency
- Call for a Rapid Response (as per local CERS) unless already made
- Conduct targeted history and clinical examination

Patient may have SEPSIS
- Call for a Clinical Review (as per local CERS) unless already made
- Conduct targeted history and clinical examination
- Obtain SENIOR CLINICIAN review to confirm diagnosis and prioritise investigations and management
- Does the senior clinician consider the patient has sepsis?

Look for other common causes of deterioration and treat
- New arrhythmia
- Hypovolaemia/haemorrhage
- Pulmonary embolus/DVT
- Abdominal
- Stroke
- Overdose/sedation
- Repeat observations within 30 minutes AND increase the frequency of observations as indicated by the patient’s condition
- Document decision/diagnosis and management plan in the health care record
- Re-evaluate for sepsis if observations remain abnormal or deteriorate

Respond & Escalate

Commence treatment as per sepsis resuscitation guideline (over page)
AND inform the Attending Medical Officer (as per local CERS)

Discuss management plan with the patient and their family
Adapt treatment to the patient's end of life care plan if applicable

No writing
Adult sepsis pathway for use in all emergency departments and inpatient wards
Use relevant febrile neutropenia guidelines if the patient has haematology/oncology diagnosis
Use relevant nephrology guidelines for renal dialysis patients

ARE YOU CONCERNED THAT YOUR PATIENT COULD HAVE SEPSIS?
Consider the following risk factors

☐ Re-presentation within 48 hours
☐ Recent surgery or wound
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☐ Fall

Absence of risk factors does not exclude sepsis as a cause of deterioration

Does your patient have any new onset of the following signs and symptoms of infection?

☐ Fever or rigors
☐ Dysuria/frequency
☐ Cough/sputum/breathlessness
☐ Line associated infection/redness/swelling/pain
☐ Abdominal pain/distension/peritonism
☐ Altered cognition
PLUS

Any RED ZONE observation OR additional criteria
- SBP < 90mmHg
- Lactate ≥ 4mmol/L
- Base excess < -5.0

TWO or more YELLOW ZONE observations OR additional criteria including clinician concern
- Respirations ≤ 10 or ≥ 25 per minute
- SpO2 < 95%
- SBP < 100mmHg
- Heart rate ≤ 50 or ≥ 120 per minute
- Altered LOC or new onset of confusion
- Temperature < 35.5°C or > 38.5°C
- Obtain a blood gas
- Lactate ≥ 2mmol/L is significant in sepsis

YES

NO
Any RED ZONE observation OR additional criteria

YES

Patient has SEVERE SEPSIS or SEPTIC SHOCK until proven otherwise
- Sepsis is a medical emergency
- Call for a Rapid Response (as per local CERS) unless already made
- Conduct targeted history and clinical examination

TWO or more YELLOW ZONE observations OR additional criteria including clinician concern

YES

Patient may have SEPSIS
- Call for a Clinical Review (as per local CERS) unless already made
- Conduct targeted history and clinical examination
- Obtain SENIOR CLINICIAN review to confirm diagnosis and prioritise investigations and management

Does the senior clinician consider the patient has sepsis?

NO

Look for other common causes of deterioration and treat
- New arrhythmia
- Hypovolaemia/haemorrhage
- Pulmonary embolus/DVT
- Atelectasis
- AMI
- Stroke
- Overdose/over sedation

- Repeat observations within 30 minutes AND increase the frequency of observations as indicated
Early escalation is key

- Call for a Rapid Response (as per local CERS) unless already made
- Conduct targeted history and clinical examination
- Conduct targeted history and clinical examination
- Obtain SENIOR CLINICIAN review to confirm diagnosis and prioritise investigations and management
Commence treatment as per sepsis resuscitation guideline (over page) AND inform the Attending Medical Officer (as per local CERS)
Airway - Assess and maintain patent airway
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>Airway</strong> - Assess and maintain patent airway</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td><strong>Breathing</strong> - Assess and administer oxygen if required; aim $\text{SpO}_2 \geq 95%$ (or 88-92% for COPD)</td>
</tr>
</tbody>
</table>
Airway - Assess and maintain patent airway

Breathing - Assess and administer oxygen if required; aim $\text{SpO}_2 \geq 95\%$ (or 88-92\% for COPD)

Circulation - Vascular access, blood/culture collection, fluid resuscitation and antibiotics

Consider intraosseous access after two failed attempts at cannulation

Collect Blood Cultures
Take two (2) sets from two (2) separate sites

☐ Yes  ☐ Not obtained

For patients with a central venous access device (CVAD), take one set from the CVAD plus one set peripherally

Collect Lactate
Lactate $\geq 2\text{mmol/L}$ after adequate fluid resuscitation is significant

☐ Yes  ☐ Not obtained

Lactate: ___ ___ ___ mmol/L

Collect EBC, FBC, CRP, PCT, LFTs

☐ Yes  ☐ Not obtained
Airway - Assess and maintain patent airway

Breathing - Assess and administer oxygen if required; aim $\text{SpO}_2 \geq 95\%$ (or 88-92\% for COPD)

Circulation - Vascular access, blood/culture collection, fluid resuscitation and antibiotics

Consider intravenous access after two failed attempts at cannulation

- Collect Blood Cultures
  - Take two (2) sets from two (2) separate sites

  For patients with a central venous access device (CVAD), take one set from the CVAD plus one set peripherally

- Collect Lactate
  - Lactate $\geq 2\text{mmol/L}$ after adequate fluid resuscitation is significant

- Collect FBC, EUC, CRP/PCT, LFTs, coag and glucose
  - BSL $> 7.7\text{mmol/L}$ in the absence of diabetes may be significant

Order and collect other investigations and cultures prior to antibiotics (unless a SENIOR CLINICIAN assesses that this would result in an unacceptable delay in commencing antibiotic therapy)
- Urine, cerebrospinal fluid, wound swab, joint or organ space aspirate

Fluid Resuscitation (intravenous or intraosseous)
- Use crystalloid
- Aim Systolic Blood Pressure > 100mmHg
- Monitor for signs of pulmonary oedema and review at risk patients more frequently

Consider commencement of vasopressors

Document investigations and cultures collected:

- Emergency Department patient
  - Give initial 30mL/kg bolus STAT, if no response repeat 20mL/kg STAT

- Inpatient
  - Initial 250-500mL bolus STAT, if no response repeat 250-500mL STAT

If no response in SBP after 1000mL call a Rapid Response
Vascular access

Blood cultures: 2 sets from 2 different sites

Send other bloods: FBC, EUC, CRP/PCT, LFTs, Coags + glucose

Send a blood gas to get a lactate value (over 2.0 is significant)

Give antibiotics within 1-2 hours

Give fluid:
  - 20ml/kg x 2 in the ED
  - 250-500ml x 2 in the wards

No response to 1000ml of fluids? Call a rapid response.
Severe sepsis or septic shock → Use CEC Adult Antibiotic Guideline for Severe Sepsis & Septic Shock or locally endorsed antibiotic prescribing guideline → Prescribe and administer antibiotics within 60 MINUTES of sepsis recognition

Sepsis → Use locally endorsed antibiotic prescribing guideline → Prescribe and administer antibiotics promptly in a timeframe directed by senior clinician (must be within 2 hours)
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Disability - Assess level of consciousness (LOC) using Alert, Voice, Pain, Unresponsive (AVPU)</td>
</tr>
<tr>
<td>E</td>
<td>Exposure - Re-examine the patient for other potential sources of infection to guide further investigations</td>
</tr>
<tr>
<td>F</td>
<td>Fluid - Monitor/document strict fluid input/output and consider IDC (if not already inserted)</td>
</tr>
<tr>
<td>G</td>
<td>Check Blood Glucose Level - Manage as per local guidelines</td>
</tr>
</tbody>
</table>
In summary

• Cannula, bloods, gas, BSL
• Fluid (1L)
• Antibiotics
• Urinary catheter
• Early referral to senior staff
  • Other investigations
# SEPSIS MANAGEMENT PLAN

Patients with presumed sepsis are at a high risk of deterioration despite initial resuscitation with intravenous antibiotics and fluids. These patients require a management plan which needs to be discussed with the Attending Medical Officer (AMO). The Infectious Diseases Physician/Clinical Microbiologist and Anti-infective Stewardship (AIS) team are to be consulted where necessary. This plan needs to be communicated to the Senior Medical Officer, Nurse in Charge, patient and patient’s family.

Specific management plans are to be documented in the health care record.

<table>
<thead>
<tr>
<th>Continue monitoring</th>
<th>Initial 24 hours</th>
<th>Fluid resuscitation</th>
<th>Reassess</th>
<th>Review treatment/management</th>
<th>24 - 40 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prescribe the frequency of observations</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>• Prescribe IV fluids as appropriate based on the patient’s condition</td>
<td>• Actively seek microbiology/investigation results and review</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• Monitor and reassess for signs of deterioration which may include one or more of the following:</td>
<td>• Discuss diagnosis, document source of sepsis in the health care record</td>
<td>Monitor for signs of pulmonary edema</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• Respiratory rate in the Red or Yellow Zone</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>Check preliminary results</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• Systolic blood pressure &lt; 100mmHg</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>If patient is neutropenic, review antibiotics and change if required</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• Decreased or no improvement in level of consciousness</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td></td>
<td>• Review treatment/management</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• Urine output less than 0.5ml/kg/hr</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td></td>
<td>• Review treatment/management</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>• No improvement in serum lactate level</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td></td>
<td>• Review treatment/management</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
<tr>
<td>If deteriorating (has any Red or Yellow Zone criteria), escalate as per local CERS and inform AMO</td>
<td>• Confirm diagnosis, document source of sepsis in the health care record</td>
<td></td>
<td>• Review treatment/management</td>
<td>• Discuss with AMO</td>
<td>• Active monitoring for deterioration including urine output</td>
</tr>
</tbody>
</table>

Repeat lab results 4 and 8 hours post recognition.
### Specific management plans are to be documented in the health care record

**Continue monitoring**
- Prescribe the frequency of observations
  - Minimum recommendation every 30 minutes for 2 hours, then hourly for 4 hours
- Monitor and reassess for signs of deterioration which may include one or more of the following:
  - Respiratory rate in the Red or Yellow Zone
  - Systolic blood pressure < 100mmHg
  - Decreased or no improvement in level of consciousness
  - Urine output less than 0.5mL/kg/hr
  - No improvement in serum lactate level

If deteriorating (has any Red or Yellow Zone criteria), escalate as per local CERS and inform AMO

### Initial 24 hours

<table>
<thead>
<tr>
<th>Repeat lactate 4 and 8 hours post recognition</th>
<th>Date: <em><strong>/</strong></em>/___ Time: ___ : ___ Result: ___ . ___ mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 hours</td>
<td></td>
</tr>
<tr>
<td>8 hours</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluid resuscitation</th>
<th>Prescription: IV fluids as appropriate based on the patient’s condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monitor for signs of pulmonary oedema</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reassess</th>
<th>Confirm diagnosis and consider other causes of deterioration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check preliminary results</td>
</tr>
<tr>
<td></td>
<td>If patient is neutropenic, review antibiotics and change if required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review treatment/management</th>
<th>Discuss with AMO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Document plan to continue, change or cease antibiotics</td>
</tr>
<tr>
<td></td>
<td>Continue monitoring for deterioration including urine output</td>
</tr>
<tr>
<td></td>
<td>If the patient’s recovery is uncertain discuss the goals of care with the patient and their family</td>
</tr>
</tbody>
</table>
Prescribe the frequency of observations

*Minimum recommendation every 30 minutes for 2 hours, then hourly for 4 hours*

- Monitor and reassess for signs of deterioration which may include one or more of the following:
  - Respiratory rate in the Red or Yellow Zone
  - Systolic blood pressure < 100mmHg
  - Decreased or no improvement in level of consciousness
  - Urine output less than 0.5mL/kg/hr
  - No improvement in serum lactate level

If deteriorating (has any Red or Yellow Zone criteria), escalate as per local CERS and inform AMO
| Repeat lactate 4 and 8 hours post recognition | 4 hours    Date:___/___/___  Time:___:___  Result ___ |
|--------------------------------------------|------------|----------------------|
| 8 hours                                    | Date:___/___/___  Time:___:___  Result ___ |

**Fluid resuscitation**

- Prescribe IV fluids as appropriate based on the patient’s condition
- Monitor for signs of pulmonary oedema

**Reassess**

- Confirm diagnosis and consider other causes of deterioration
- Check preliminary results

*If patient is neutropenic, review antibiotics and change if required*
## Review treatment/management
- Discuss with AMO
- Document plan to continue, change or cease antibiotics
- Continue monitoring for deterioration including urine output
- If the patient’s recovery is uncertain discuss the goals of care with the patient and their family

## Reassess
- Actively seek microbiology/investigation results and review
- Confirm diagnosis, document source of sepsis in the health care record
- Discuss with AMO
- Consider seeking advice from infectious disease/microbiology physician
- Document plan to continue, change or cease antibiotics
- Obtain AMS approval for restricted antibiotics
- Repeat biochemistry as indicated
- Continue monitoring for deterioration including urine output
Case Study
Mr. A

- COPD
- PVD
- OSA: nocturnal CPAP
- GORD
- Hypertension
- RA: long term steroids, 10g/day of pred
- 20 min walk; ~ 1500m
- Pulmonary rehab in March:

“Mr. A feels that he has benefited from completing the pulmonary rehabilitation program, although this is not reflected in his 6 minute walk test results.”
Prologue

• 1 week of “unwellness”
• Productive cough
• Fevers at home
• Decreased exercise tolerance
On the eve of presentation

• Morning of the 23rd:
  • Malaise
  • Dizziness
  • SOB
  • Progressively worse throughout the day
  • Febrile at home, around 38.5°

• Ongoing productive cough - brown sputum
<table>
<thead>
<tr>
<th>Triage Presenting Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased SOB since this afternoon</td>
</tr>
<tr>
<td>Denies chest pain</td>
</tr>
<tr>
<td>Pt has increased work of breathing</td>
</tr>
<tr>
<td>Hx: COPD</td>
</tr>
</tbody>
</table>
In the ED at around 22:00

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature, Tympanic</td>
<td>37.8 DegC</td>
</tr>
<tr>
<td>Heart Rate</td>
<td></td>
</tr>
<tr>
<td>Pulse Rate</td>
<td>128 bpm H</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>36 br pm C</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>91 mmHg L</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>68 mmHg</td>
</tr>
<tr>
<td>Mean Arterial Pressure</td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>96 %</td>
</tr>
</tbody>
</table>

On examination
- HR 105
- Sats 100% on 2L hudson
- BP 80 - 90 systolic
- Large Body habitus
- Alert, GCS 15

Severe work of breathing
- Use of intercostal muscles/ abdominal breathing
- Words
- Nil central cyanosis

Generalised crepitations throughout
- Scattered wheeze
- Decreased air entry in bases
CXR in 2011
### Blood Gas Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.320</td>
</tr>
<tr>
<td>pCO₂</td>
<td>28.0 mmHg</td>
</tr>
<tr>
<td>pO₂</td>
<td>76.1 mmHg</td>
</tr>
<tr>
<td>cHCO₃⁻(P)ₖ</td>
<td>14.0 mmol/L</td>
</tr>
<tr>
<td>cBase(Ecf)ₖ</td>
<td>-10.9 mmol/L</td>
</tr>
</tbody>
</table>

### Oximetry Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ctHb</td>
<td>12.4 g/dL</td>
</tr>
<tr>
<td>sO₂</td>
<td>93.3 %</td>
</tr>
<tr>
<td>FO₂Hb</td>
<td>91.2 %</td>
</tr>
<tr>
<td>FMetHb</td>
<td>0.9 %</td>
</tr>
<tr>
<td>FCOHb</td>
<td>1.4 %</td>
</tr>
<tr>
<td>FHHb</td>
<td>6.5 %</td>
</tr>
</tbody>
</table>

### Metabolite Values

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>cGlu</td>
<td>7.2 mmol/L</td>
</tr>
<tr>
<td>cLac</td>
<td>5.3 mmol/L</td>
</tr>
<tr>
<td>cCrea</td>
<td>178 μmol/L</td>
</tr>
<tr>
<td>GFR if nonAAₖ</td>
<td>33 mL/min/1</td>
</tr>
<tr>
<td>GFR if AAₖ</td>
<td>40 mL/min/1</td>
</tr>
</tbody>
</table>

### Location

| Location | WMDEU |
- 0100: moved from Bed 6 into resus;
- BiPAP: IPAP 12, EPAP 8
- 40% FiO2
<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Level</td>
<td>139 mmol/L</td>
</tr>
<tr>
<td>Potassium Level</td>
<td>4.1 mmol/L</td>
</tr>
<tr>
<td>Chloride Level</td>
<td>108 mmol/L</td>
</tr>
<tr>
<td>Bicarbonate Level</td>
<td>18 mmol/L</td>
</tr>
<tr>
<td>Anion gap</td>
<td>17 mmol/L</td>
</tr>
<tr>
<td>Urea Level</td>
<td>8.7 mmol/L</td>
</tr>
<tr>
<td>Creatinine Level</td>
<td>160 umol/L</td>
</tr>
<tr>
<td>eGFR</td>
<td>37 mL/min/1.73m</td>
</tr>
<tr>
<td>Total Bilirubin</td>
<td>25 umol/L</td>
</tr>
<tr>
<td>Serum Protein</td>
<td>57 g/L</td>
</tr>
<tr>
<td>Albumin</td>
<td>29 g/L</td>
</tr>
<tr>
<td>Tot Globulin</td>
<td>28 g/L</td>
</tr>
<tr>
<td>ALT</td>
<td>29 U/L</td>
</tr>
<tr>
<td>AST</td>
<td>24 U/L</td>
</tr>
<tr>
<td>GGT</td>
<td>52 U/L</td>
</tr>
<tr>
<td>Alkaline Phosphatase Level</td>
<td>73 U/L</td>
</tr>
<tr>
<td>Creatine Kinase Level</td>
<td></td>
</tr>
<tr>
<td>hs Troponin I</td>
<td>34 ng/L</td>
</tr>
<tr>
<td>Calcium Level</td>
<td>1.89 mmol/L L</td>
</tr>
<tr>
<td>Calcium Level Corrected</td>
<td>2.11 mmol/L L</td>
</tr>
<tr>
<td>Magnesium Level</td>
<td>0.93 mmol/L</td>
</tr>
<tr>
<td>Phosphate Level</td>
<td>1.24 mmol/L</td>
</tr>
<tr>
<td>Random Glucose Level</td>
<td>6.0 mmol/L</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>124 g/L L</td>
</tr>
<tr>
<td>White Cell Count</td>
<td>17.3 x10^9/L H</td>
</tr>
<tr>
<td>Platelets</td>
<td>234 x10^9/L</td>
</tr>
<tr>
<td>RCC</td>
<td>3.9 x10^12/L L</td>
</tr>
<tr>
<td>Haematocrit</td>
<td>0.38 L</td>
</tr>
<tr>
<td>MCV</td>
<td>100 fL H</td>
</tr>
<tr>
<td>MCH</td>
<td>32 pg</td>
</tr>
<tr>
<td>MCHC</td>
<td>322 g/L</td>
</tr>
<tr>
<td>RDW</td>
<td>15.3 % H</td>
</tr>
<tr>
<td>Absolute Neutrophils</td>
<td>14.9 x10^9/L H</td>
</tr>
<tr>
<td>Absolute Lymphocytes</td>
<td>1.4 x10^9/L</td>
</tr>
<tr>
<td>Absolute Monocytes</td>
<td>0.8 x10^9/L</td>
</tr>
<tr>
<td>Absolute Eosinophils</td>
<td>0.1 x10^9/L</td>
</tr>
<tr>
<td>Absolute Basophils</td>
<td>0.0 x10^9/L</td>
</tr>
<tr>
<td>C Reactive Protein</td>
<td>200 mg/L H</td>
</tr>
</tbody>
</table>
• 0230: “hypotensive”, they reckon. 250ml normal saline bolus given.
• 0230: “hypotensive”, they reckon. 250ml normal saline bolus given.

Pt awake and alert.
Increased WOB and increased RR remains.
HR 120.
R/V by dr - ?fluid overload, IVF ceased.
Ventolin neb given with little effect.
Pt unwell looking.
0330: seen by ED reg;

- "ATSP re. pt has not passed urine"
- "bedside TTE: good contractility"
- More 250ml boluses given
<table>
<thead>
<tr>
<th>Time</th>
<th>Blood Pressure (mmHg)</th>
<th>Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SBP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DBP</td>
<td></td>
</tr>
<tr>
<td>1:45</td>
<td>102/60</td>
<td>113</td>
</tr>
<tr>
<td>2:00</td>
<td>102/60</td>
<td>119</td>
</tr>
<tr>
<td>2:15</td>
<td>102/60</td>
<td>119</td>
</tr>
<tr>
<td>2:30</td>
<td>102/60</td>
<td>119</td>
</tr>
</tbody>
</table>

**Other Values:**
- **Respiratory Rate:**
- **O₂ Saturation:** 95%
ED morning handover

• Repeat ABG
• Stat antibiotics (ceftriaxone and azithromycin)
• Urgent ICU referral

• IDC inserted: 25ml urine in the bladder
### ABG at 09:00

#### Blood Gas Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.296</td>
<td></td>
</tr>
<tr>
<td>$pCO_2$</td>
<td>34.6</td>
<td>mmHg</td>
</tr>
<tr>
<td>$pO_2$</td>
<td>119</td>
<td>mmHg</td>
</tr>
</tbody>
</table>

#### Acid Base Status

- $cHCO_3^-(P,st)_c$: 17.3 mmol/L
- $cBase(B)_c$: -8.8 mmol/L

#### Electrolyte Values

- $cK^+$: 3.9 mmol/L
- $cNa^+$: 131 mmol/L
- $cCa^{2+}$: 1.14 mmol/L
- $cCa^{2+}(7.4)_c$: 1.07 mmol/L
- $cCl^-$: 103 mmol/L

### Metabolite Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$cGlu$</td>
<td>14.3</td>
<td>mmol/L</td>
</tr>
<tr>
<td>$cLac$</td>
<td>5.6</td>
<td>mmol/L</td>
</tr>
</tbody>
</table>

#### Oxygen Status

- $cHb$: 93 g/L
- $sO_2$: 93.0%
- $p50_e$: 28.84 mmHg
- $pO_2(a/A)_e$: 19.5%
- $FMetHb$: 1.4%
- $FCOHb$: 0.9%
- $p50(st)_d$: 26.84 mmHg
- $FShunt_e$: 24.6%
- $FO_2Hb$: 95.7%
- Hct: 28.7%
ICU review 09:30

- “impression: severe sepsis due to pneumonia”
- Intubated
- Peri-intubation cardiac arrest, 5 min CPR
- Transferred to ICU on 100% FiO2
- Remained oligoanuric
- MOSF with high vasopressor requirements and 10 days of ICU stay
**Pneumococcal Ag**

<table>
<thead>
<tr>
<th>Micro Reports</th>
<th>Specimen</th>
<th>Action List</th>
</tr>
</thead>
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<tr>
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**FINAL REPORT**

*Streptococcus pneumoniae* DETECTED by rapid antigen testing
Can we do better?
### Triage Presenting Information

- **Temperature, Tympanic:** 37.8 DegC
- **Pulse Rate:** 128 bpm H
- **Respiratory Rate:** 36 br pm C
- **Systolic Blood Pressure:** 91 mmHg L
- **Diastolic Blood Pressure:** 68 mmHg

**Hx:** COPD

**Increased SOB since this afternoon**

Denies chest pain

Pt has increased work of breathing

---

**ARE YOU CONCERNED THAT YOUR PATIENT COULD HAVE SEPSIS?**

Consider the following risk factors:

- Re-presentation within 48 hours
- Immuno-compromised
- Recent surgery or wound
- Age > 65 years
- Indwelling medical device
- Fall

**Absence of risk factors does not exclude sepsis as a cause of deterioration**

**Does your patient have any new onset of the following signs and symptoms of infection?**

- Fever or rigors
- Line associated infection/redness/swelling/pain
- Dysuria/frequency
- Abdominal pain/distension/peritonism
- Cough/sputum/breathlessness
- Altered cognition
TEMPERATURE, TYPANIC: 37.8 DegC

HEART RATE: 128 bpm H

RESPIRATORY RATE: 36 br pm C

SYSTOLIC BLOOD PRESSURE: 91 mmHg L

DIASTOLIC BLOOD PRESSURE: 68 mmHg

TRADE PRESENTING INFORMATION

Increased SOB since this afternoon
Denies chest pain
Pt has increased work of breathing
Hx: COPD

ARE YOU CONCERNED THAT YOUR PATIENT COULD HAVE SEPSIS?
Consider the following risk factors

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<tr>
<td>Mean Arterial Pressure</td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>96 %</td>
</tr>
</tbody>
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*Any RED ZONE observation OR additional criteria:*
- SBP < 90mmHg
- Lactate ≥ 4mmol/L
- Base excess < -5.0

**PLUS**

*Two or more YELLOW ZONE observations OR additional criteria including clinician concern:*
- Respirations ≤ 10 or ≥ 25 per minute
- SpO₂ < 95%
- SBP < 100mmHg
- Heart rate ≤ 50 or ≥ 120 per minute
- Altered LOC or new onset of confusion
- Temperature < 35.5°C or > 38.5°C

**Obtain a blood gas**
- Lactate ≥ 2mmol/L is significant in sepsis

**Decision Path:**
- **YES**
- **NO**
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<tr>
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**Metabolite Values**

- $\text{pO}_2$: 76.1 mmHg
- $c\text{HCO}_3^- (P)_c$: 14.0 mmol/L
- $c\text{Base (Ecf)}_c$: -10.9 mmol/L

**Any RED ZONE observation or additional criteria**

- SBP < 90 mmHg
- Lactate $\geq$ 4 mmol/L
- Base excess $< -5.0$

**PLUS**

**TWO or more YELLOW ZONE observations or additional criteria including clinician concern**

- Respirations $\leq$ 10 or $\geq$ 25 per minute
- $SpO_2$ < 95%
- SBP < 100 mmHg
- Heart rate $\leq$ 50 or $\geq$ 120 per minute
- Altered LOC or new onset of confusion
- Temperature $< 35.5^\circ C$ or $> 38.5^\circ C$

**Obtain a blood gas**

- Lactate $\geq$ 2 mmol/L is significant in sepsis

**YES**

**NO**
Patient has SEVERE SEPSIS or SEPTIC SHOCK until proven otherwise
- Access
- Blood gas
- React to lactate
- Fluids
- Cultures
- Antibiotics

- LOC
- Look for source

- IDC
- BSL
- Reassess
- 1.0 L normal saline
A
B - O2
C
Access
Blood gas
React to lactate
Fluids
Cultures
Antibiotics
D - LOC
E - look for source
F - IDC
G - BSL
Reassess

1.0 L normal saline
“COGNITIVE ERRORS ARE A COMMON CAUSE OF DIAGNOSTIC ERROR AND PREDOMINANTLY REFLECT PROBLEMS WITH SYNTHESIS OF THE AVAILABLE INFORMATION”

Mark L. Graber, MD; Nancy Franklin, PhD; Ruthanna Gordon, PhD
Arch Intern Med. 2005;165:1493-1499
This is why we have these cognitive aids
RECOGNISE the risk factors, signs and symptoms of sepsis

RESUSCITATE with rapid administration of intravenous antibiotics and fluids

REFER to appropriate senior clinicians and teams with retrieval if appropriate