Appendix. Details of Maternal Deaths Due to Sepsis

<table>
<thead>
<tr>
<th>Patient Number</th>
<th>Case narrative</th>
<th>Time of presentation vital signs: HR, RR, BP, T, SpO₂ (vital signs triggering MEWC¹ are bolded)</th>
<th>Antibiotic choice at time of diagnosis. Appropriate for clinical situation?</th>
<th>Organism identified</th>
<th>Delay in appropriate antibiotic treatment or escalation of care?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multiparous woman at term underwent an uncomplicated repeat CD. Complained of a cough during hospitalization. Last charted SpO₂ was 93% on RA the day of delivery and was not repeated. CXR performed but not read prior to discharge was significant for bilateral patchy infiltrates. Given amoxicillin PO and was discharged. The day after discharge, patient presented severely hypoxic and was transferred to another hospital. She died 8 days later.</td>
<td>Remainder of vital signs not available from transferring hospital, 67% on RA</td>
<td>• Ciprofloxacin</td>
<td>Not identified</td>
<td>Delay in appropriate antibiotic treatment: yes, patient SpO₂ and CXR should have been followed up and antibiotics for pneumonia should have been prescribed prior to discharge. Delay in escalation of care: yes, patient was cyanotic at admission, but was not transferred to a tertiary care center for over 10 hours.</td>
</tr>
<tr>
<td>2</td>
<td>Multiparous woman presented with placental abruption and underwent repeat CD. Postoperative course complicated by ileus but ultimately discharged after a small bowel movement. Readmitted on POD #5 complaining of abdominal pain, distention, and unable to pass flatus. Large amount of free air was present under both diaphragms, but dismissed as thought to be due to bowel gas.</td>
<td>142, 24, 145/72, 36.1°C, SpO₂ not done</td>
<td>• Cefoxitin</td>
<td>Bacteroides caccae</td>
<td>Delay in appropriate antibiotic treatment: yes, patient had signs concerning for bowel perforation, but general surgery not consulted and antibiotics were not prescribed.</td>
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<th>Recent CD. On POD #6, general surgery was consulted, antibiotics immediately started, and she was taken to the OR. Focal necrosis of the transverse colon was identified. Postoperatively, the patient was transferred to a medical/surgical floor. She had persistent oliguria overnight without physician evaluation for over 10 hours. During a routine vital sign check, she was found in cardiac arrest, resuscitated and died 3 days later.</th>
<th>Not cover Enterococcus</th>
<th>Started until the next day. Delay in escalation of care: yes, patient with known perforated viscus was severely oliguric overnight for over 10 hours without transfer to the ICU.</th>
</tr>
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</table>
| 3 | Multiparous woman during the 2nd trimester with hyperemesis gravidarum on TPN with PICC line presented with a 2-day history of fever and shortness of breath. She was admitted to the antepartum floor and had increasing O\textsubscript{2} requirements with no improvement in SpO\textsubscript{2}. Within 12 hours of admission, she was severely acidic with a lactate acid >10 mmol/L and went into cardiac arrest, was resuscitated and died 2 days later. | • Cefotetan  
  • Inadequate treatment given Central Line Associated Blood Stream Infection (CLABSI)  
  • Klebsiella, Group D Streptococcus, Enterobacter cloacae and Enterococcus faecalis | Delay in appropriate antibiotic treatment: yes, although antibiotics were given at admission, appropriate antibiotics were not given until 7 hours after admission. Delay in escalation of care: yes, patient was admitted tachypneic (greater>35 bpm), hypotensive at times, requiring oxygen without transfer to the ICU for 9 hours after admission. |
| 4 | Nulliparous woman during the 1st trimester with an unknown blood dyscrasia, one-month history of vaginal bleeding, and severe thrombocytopenia (platelet count 26 x 10\textsuperscript{9}/L) was admitted to the ICU. She underwent a D&C on HD#2, and was transferred to the floor on HD#3. She was later 110, 24, 86/64, 38.3°C, 93% on RA | • Ampicillin/Sulbactam  
  • Gentamicin  
  • Inadequate for clinical situation, Streptococcus pyogenes | Delay in appropriate antibiotic treatment: yes, occurred due to the failure to give clindamycin. Delay in escalation of care: no, patient was... |
<table>
<thead>
<tr>
<th>Case</th>
<th>Clinical Presentation</th>
<th>Vital Signs</th>
<th>Microbiology</th>
<th>Treatment</th>
<th>Delay in Treatment</th>
<th>Delay in Escalation of Care</th>
</tr>
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<tbody>
<tr>
<td>5</td>
<td>Nulliparous woman during the 1st trimester presented with vaginal bleeding from a suspected missed abortion and reported fever and rigors at home. She underwent a D&amp;C. In the PACU, the patient was in DIC. Tachypnea and tachycardia worsened in the PACU, and she became profoundly hypotensive and went into cardiac arrest and was unable to be resuscitated and died.</td>
<td>135, 24, 70/45, 36.5°C, 98% on RA</td>
<td>E. coli in blood</td>
<td>Ampicillin, Gentamicin, Clindamycin</td>
<td>Not identified</td>
<td>Delay in appropriate antibiotic treatment: no, appropriate antibiotics were given.</td>
</tr>
<tr>
<td>6</td>
<td>Nulliparous woman during the 3rd trimester with a history of bariatric surgery 4 years prior presented with epigastric and abdominal pain and coffee ground emesis. Pancreatitis was suspected, and she was admitted to the floor. No imaging or antibiotics were ordered. She became increasingly tachycardic, tachypneic and hypotensive and was transferred to ICU, intubated, and started on cefotetan. After 12 hours of no improvement, she underwent exploratory laparotomy, and CD. Bowel ischemia was identified and she underwent a right hemicolectomy. She died 2 days later.</td>
<td>87, 20, 128/77, 36.2°C, 96% on RA</td>
<td>Streptococcus pyogenes, Klebsiella in urine</td>
<td>Cefotetan</td>
<td>Inadequate treatment for clinical situation</td>
<td>Delay of appropriate antibiotic treatment: yes, occurred due to treatment given not broad for intra-abdominal pathology.</td>
</tr>
<tr>
<td>7</td>
<td>Multiparous woman at term presented for induction of labor and underwent an uncomplicated NSVD. Patient complained of a sore throat and cough. She had marked erythema and a throat culture was sent. Culture returned Group A Streptococcus, but she was discharged without antibiotics. She presented</td>
<td>115, 20, 113/70, 34.8°C, SpO₂ not done</td>
<td>Streptococcus pyogenes in blood, Klebsiella in urine</td>
<td>Ampicillin/Sulbactam</td>
<td>Inadequate treatment for clinical situation, culture should have been followed up and treated.</td>
<td>Delay of appropriate antibiotics: yes, culture should have been followed up and treated.</td>
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on PPD #7 to a different hospital with abdominal pain and vaginal bleeding. She went into cardiac arrest 2 hours after arrival.

8  Multiparous woman at term underwent an uncomplicated NSVD. PPD#20 presented to the ED with chronic subcutaneous drug abuse and shortness of breath. She was admitted to the ICU for sepsis and found to have endocarditis. She was taken to the OR for valve replacement and continued to have persistent endocarditis and had withdrawal of care.

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<td><strong>142, 40, 117/70, 36.9°C, 83% on RA</strong></td>
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<td>Levofloxacin</td>
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<td></td>
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<td>Metronidazole</td>
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<td></td>
<td>Inadequate treatment, need <em>Staphylococcus aureus</em> coverage for drug use</td>
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<td>Methicillin-sensitive <em>S. aureus</em> in blood/sputum, <em>Enterobacter</em> in urine</td>
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<td>Delay of appropriate antibiotics: yes, antibiotic therapy not appropriate until transfer to the ICU hours later from the ER.</td>
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<td>Delay in escalation of care: no, admitted to the ICU at admission.</td>
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9  Multiparous woman had a preterm CD due to eclampsia and ICU admission. She presented on PPD #28 with chest pain and SOB. She was treated for CAP, even though she was recently hospitalized in the ICU and had HCAP. She was on a telemetry floor and continued to decline and went into cardiac arrest. She was transferred to the ICU and arrested again and expired 3 days later.

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<td><strong>161, 20, 110/77, 39.7°C, 95% on 2LNC</strong></td>
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<td></td>
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<td>Ceftriaxone</td>
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<td>Inadequate treatment, need coverage for HCAP, was recently intubated in ICU</td>
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<td></td>
<td>Methicillin-resistant <em>S. aureus</em></td>
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<td></td>
<td>Delay in appropriate antibiotic treatment: yes, not given appropriate antibiotic therapy until admitted to telemetry service hours later.</td>
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<td></td>
<td>Delay in escalation of care: yes, was not done until she needed intubation. She had been tachypneic (&gt;35bpm) and tachycardic (&gt;150bpm) and</td>
</tr>
<tr>
<td>Case</td>
<td>Description</td>
<td>Temperature</td>
<td>Oxygen Saturation</td>
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<td>10</td>
<td>Nulliparous woman during the 2nd trimester with sickle cell disease presented in sickle cell crisis. HD#1 developed a fever and was started on cefazolin. Over the next 24 hours developed tachypnea with respiratory distress and was intubated and transferred to ICU. She went into cardiac arrest, and resuscitation was unsuccessful.</td>
<td>90, 18, 36.4°C, 126/89, SpO₂ 100% on RA</td>
<td>Cefazolin</td>
</tr>
<tr>
<td>11</td>
<td>Multiparous woman at term underwent an uncomplicated NSVD. She presented PPD #10 with SOB and neck pain. She was tachycardic and tachypneic. 38.6°C in the ED, but antibiotics were not ordered until 7 hours after arrival. She was transferred to the ICU. She was found to have ascites and underwent exploratory laparotomy, D&amp;C. Purulent fluid was noted in the abdomen without bowel perforation. She was recovering from sepsis and transferred to the floor. She was found unresponsive and unable to be resuscitated.</td>
<td>142, 60, 146/50, 37.1°C, SpO₂ 99% on RA</td>
<td>Vancomycin, Clindamycin, Gentamicin</td>
</tr>
<tr>
<td>12</td>
<td>Multiparous woman at term underwent uncomplicated NSVD. She presented PPD #15 with hypoxia and SOB and found to have multi lobar pneumonia. She was intubated for respiratory distress and hypoxia. 3 days later had neurologic</td>
<td>119, 24, 126/92, 36.3°C, 70% on RA</td>
<td>Ceftriaxone, Azithromycin</td>
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<table>
<thead>
<tr>
<th>Case</th>
<th>Description</th>
<th>Risk of HCAP from Recent Admission</th>
<th>Delay in Escalation of Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Unknown parity during the 1st trimester presented to the ER complaining of fever/nausea/vomiting and was sent home. She presented the next day tachycardic, tachypneic, and hypotensive. She was transferred to a tertiary care center. En route suffered cardiac arrest and died.</td>
<td>Missing</td>
<td>Unable to determine antibiotic type</td>
</tr>
<tr>
<td>14</td>
<td>Supermorbidly obese nulliparous woman during the 1st trimester with suspected ectopic pregnancy underwent an unsuccessful operative laparoscopy due to inability to insufflate. On POD#1, the patient complained of abdominal pain. Further imaging was ordered. She became increasingly tachycardic and tachypneic. Progress notes stated concern for bowel perforation but no antibiotics were ordered. The patient decompensated further and underwent an exploratory laparotomy and a sigmoid perforation was identified. She died 2 days later.</td>
<td>n/a, sepsis occurred later in hospitalization</td>
<td>Ampicillin/Sulbactam, Metronidazole</td>
</tr>
<tr>
<td>15</td>
<td>Multiparous woman during the 3rd trimester with a history of cocaine use presented with abdominal pain and placental abruption. She underwent cesarean delivery due to malpresentation. Within the first 24 hours, Tmax 40.5°C. Patient became tachycardic, hypotensive, and hypothermic and was transferred to the ICU. An IM consultant noted positive blood cultures and started broad spectrum antibiotics. Died 2 days later.</td>
<td>n/a, sepsis occurred later in hospitalization</td>
<td>Cefazolin, Ciprofloxacin, Metronidazole</td>
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<th></th>
<th>Multiparous woman at term with a pregnancy complicated by stillbirth and no prenatal care presented in labor and underwent a NSVD. She had an uncomplicated postpartum course and was discharged. She presented 17 days later complaining of abdominal pain. Physical exam was negative, but no further workup or vital signs were documented. She died at home 10 days later of Group A <em>Streptococcus</em> infection.</th>
<th>n/a, DOA</th>
<th>n/a</th>
<th><em>Streptococcus pyogenes</em></th>
<th>Unable to be determined based on available information</th>
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<td>17</td>
<td>Multiparous woman presented to the ER on PPD #8 after a VAVD with a low-grade fever and diagnosed with a UTI and given IM ceftriaxone and PO cephalaxin. PPD#14 was found unresponsive at home and DOA. Retained products of conception were identified on maternal autopsy.</td>
<td>n/a DOA</td>
<td>n/a</td>
<td>Not identified</td>
<td>Unable to be determined based on available information</td>
</tr>
<tr>
<td>18</td>
<td>Nulliparous woman during the 2nd trimester underwent D&amp;E with 2-day cervical preparation at an outpatient clinic and complained of heavy vaginal bleeding later that day after discharge. She was found unresponsive at home and presented DOA at the hospital. Autopsy demonstrated uterine infarction and systemic bacterial infection.</td>
<td>n/a DOA</td>
<td>n/a</td>
<td>Not identified</td>
<td>Unable to be determined based on available information</td>
</tr>
<tr>
<td>19</td>
<td>Multiparous woman at term underwent uncomplicated NSVD. Patient was found unresponsive on PPD #5. DOA upon arrival to hospital. She had reportedly been complaining of signs charted for 8 hours were temperature, vital signs had deteriorated in the meantime.</td>
<td>n/a DOA</td>
<td>n/a</td>
<td>Not identified</td>
<td>Unable to be determined based on available information</td>
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abdominal pain. Autopsy significant for liters of pus in the abdominal cavity. No RPOC.

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<tr>
<td>20</td>
<td>Nulliparous woman at term underwent uncomplicated NSVD. Hospitalization was only significant for a temperature of 37.9°C the morning of discharge. Discharged on PPD#2. On PPD#3, patient was found in cardiac arrest at home, and was DOA upon arrival to the hospital. Per the family, she had cold symptoms, chest congestion, and a fever earlier in the day.</td>
<td>n/a DOA</td>
<td>n/a</td>
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<tr>
<td>21</td>
<td>Multiparous woman during the 2nd trimester was found DOA at home. Postmortem blood cultures positive for group B <em>Streptococcus</em>.</td>
<td>n/a DOA</td>
<td>n/a</td>
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<tbody>
<tr>
<td>22</td>
<td>Multiparous woman at term was found dead at home. Autopsy significant for acute bronchoalveolar pneumonia.</td>
<td>n/a DOA</td>
<td>n/a</td>
</tr>
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</table>

*Abbreviations: MEWC=maternal early warning criteria, CD=cesarean delivery, HCAP=healthcare-associated pneumonia, POD=postoperative day, CLABSI=central line associated blood stream infection, PPD=postpartum day, DOA=dead on arrival, RPOC=retained products of conception, CAP=community acquired pneumonia.*

*According to American Thoracic Society/Infectious Diseases Society of America guidelines, HCAP includes any patient who was hospitalized in an acute care hospital for two or more days within 90 days of the infection; resided in a nursing home or long-term care facility; received recent intravenous antibiotic therapy, chemotherapy, or wound care within the past 30 days of the current infection; or attended a hospital or hemodialysis clinic.*


The authors provided this information as a supplement to their article.
References
