Control of an Outbreak of Multidrug Resistant *Acinetobacter Baumannii* in a Neonatal ICU

Coretha Weaver, BSN, CIC  
Children’s Hospital at Erlanger  
Chattanooga, TN

1. Objectives  
Participants will be able to:  
- Summarize contributing factors in this outbreak and strategies used to control transmission.  
- Discuss the importance of prompt and frequent communication and the engagement of all disciplines in the prevention efforts.  
- Describe the benefits of using an electronic infection prevention surveillance system (EIPSS) during an outbreak.

2. Children’s Hospital At Erlanger  
- 121 bed facility (58 bed Level 3 NICU)  
- Part of a 533 bed, 5 facility regional teaching health system  
- Level 1 Trauma Center

3. *Acinetobacter Baumannii*  
- Gram negative rod which is ubiquitous in the environment and causes infections at all body sites  
- A global problem for healthcare facilities  
  - Reports of isolates resistant to all known antimicrobials  
  - Outbreaks of multidrug resistant strains common in adult ICUs

4. *Acinetobacter Baumannii*  
- Uncanny ability to survive for prolonged periods in the environment even on dry surfaces (Range 21-33 days)  
- Very few outbreaks of multidrug resistant *Acinetobacter Baumannii* (MDR Ab) in NICUs reported in the literature with only one in the US.

5. *Stenotrophomonas Maltophilia* (*S. Malt.*)  
- Gram negative rod formerly classified as Pseudomonas and *Xanthomonas*  
- Found in water, soil, and sewage and increasingly affects immunocompromised hosts  
- Causes a wide range of infections, most often pneumonia in cystics or others with compromised lung function  
- Inherently resistant to usual antibiotics  
- Many reported outbreaks in ICUs related to water sources

6. The Presumed Index  
- 1st MDR-Ab isolate – Identified January 27, 2010 in a sputum culture collected on Jan 23rd from a 33 day old ventilated male  
- Born Dec. 25th at an outlying facility and transported to us the same day by our neonatal transport team  
- Born by C-section at 27 weeks 855 gm to mom with no other significant medical history

7. Initial Response  
- Moved index patient to isolation room on contact (glove and gown required) precautions in same POD with no admits or transfers from the POD  
- Reinforced adherence to hand hygiene and contact isolation for all
• Initiated surveillance of other infants in the POD w/ rectal swabs on all and sputum from intubated infants.
• Collected environmental, equipment, and hand cultures

8. Microbiological Surveillance
• An additional case found in POD 2- two bed spaces away from the index
• Surveillance cultures collected on all infants in the unit
  – 4 more cases (1 sputum and 3 rectal) found in three other PODs.
• Initiated weekly sputum and rectal swabs on Feb. 5th until last infant discharged end of May
• All isolates sent to state lab for molecular typing

9. Ongoing Response
• Single cohort POD established by Feb. 24th - nursing and respiratory staff, and equipment
• Conducted an environmental assessment in the NICU and surrounding spaces
• Collected environmental, hand, and equipment cultures. All were negative
• Initiated intensive environmental disinfection practices for all disciplines

10. Communicating Findings and Needs
• Initiated daily huddle with NICU manager, medical leadership, respiratory care, and hospital administrator to collect and share information
• Ongoing small group meetings with staff
• Staff education initiated to address NICU support staff, consultants, section chiefs
• Script developed for parents

11. Search of Electronic IP Surveillance System
• Search for all cases in historical lab data and automated EPI graphs produced
• Set-up automatic electronic alerts to notify IP staff as soon as new isolate identified
• Generates patient line lists with ADT data, and antimicrobial susceptibility data in seconds

12. Gathering Information
• Initiated literature and medical record reviews
• Contacted state epidemiologist and other NICUs in the region for information
• State HD sent Epidemiology team to assist with data analysis at our request

13. Concerning Finding
• A clinical culture from a four month old infant in the Pediatric ICU had what appeared to be our outbreak strain of MDR AB on Feb.8th (hospital day 7)
• The infant had been in the NICU for 2 months but discharged before any of the affected infants were admitted to NICU

14. Concerning Finding
• Respiratory staff, consultants, support staff and equipment common to both units
• Surveillance of PICU patients was conducted for two weeks and no additional cases were found

15. Another Potential Problem
• One infant with *S. Malt.* in the sputum had been on contact precautions in the NICU since Nov 2009
• Two additional cases were identified in Jan 2010 in clinical sputum cultures
• Surveillance for *S. Malt.* was added to the weekly swabs on Feb. 5th
16. Confirmed Problem
• Ten more infants were identified between Feb and April 2010 for a total of 13 cases.
• Cohorted with MDR Ab but assigned separately where possible
• Additional hand, environmental, and water cultures were taken – All were negative

17. Surveillance Culture Results

18. Summary of Patient Factors
• All infants with MDR-Ab were ventilated at some point and all with S.Malt were either ventilated or received other respiratory modalities (i.e. high flow nasal cannula)
• All infants had exposure to multiple antibiotics prior to acquiring either organism
• None of the 20 infants developed an infection or were treated for either organism
  — ID consult required prior to treating

19. Other Findings
• All affected infants shared bed spaces in close proximity to each other at some point before detection of the outbreak
• The antimicrobial resistance pattern for MDR-Ab was nearly identical to isolates seen in Erlanger adult ICUs.

20. Susceptibility Patterns

   MDR Ab
   R- Amikacin
   R- Cefepime
   I- Ceftriaxone
   R- Ciprofloxacin
   R- Gentamicin
   S- Levofloxacin
   S- Meropenem
   R- Tobramycin

   S. Maltophilia
   R- Ceftazidime
   S- Levofloxacin
   S- Trimeth –Sulfa

21. Possible Contributing Factors
• Unit capacity is 58; Census of 62 at onset of outbreak and consistently high weeks prior to outbreak
  — Decompression unit not opened due to staffing issues
• Lapses in cleaning and disinfection of ventilatory equipment
• Inadequate space for processing RT equipment
• Respiratory staff assigned to Children’s ER assisting in NICU and occasionally in the adult ER

22. Possible Contributing Factors
• Inconsistencies in environmental cleaning and disinfection practices
• Excessive clutter throughout the unit
• Failure of staff to use good hand hygiene
• Sharing of some reusable equipment with the adult facility (i.e. oxygen flow meters)
• Recycling of patient care supplies
23. A Special Visit
- Joint Commission visits on Feb 25th
  - Recommended ↑ nurse staffing in cohort POD
  - High dusting of vents and supply pyxis and carts
  - Overall satisfied with management of the outbreak
24. Control Measures
25. Reinforcing Basic Infection Prevention Measures
- Hand hygiene observations with immediate feedback to all disciplines and managers
- Refined contact isolation procedures with the help of nursing and medical staff
  ✓ Handling of medical equipment
  ✓ Charts, pens, stethoscopes
  ✓ Glucose monitors
  ✓ Breastmilk
26. Practice and Process Changes
- Plan to expand to additional nursery space to keep census to 58 or below
- Increase nurse-patient ratio in the isolation cohort to 1:2
- Discontinued recycling process for patient supplies
- Discontinued respiratory cross coverage to NICU from any other area
27. Consultants and Support Staff
- Monthly orientation to the unit for residents
- Meetings with medical consultants and development of expectations while in the NICU
- Nursing staff empowered to stop offenders of any kind and report repeat push back
28. Cleaning and Disinfection of RT Equipment
- Developed written process for cleaning vents and associated equipment. Laminated instruction cards attached to vents
- Re-educated respiratory equipment technician
- New equipment cleaning area
29. Clarification on Processing of Neosensors
30. Environmental Cleaning and Disinfection
- Clarification of cleaning responsibilities for nursing and environmental services (EVS)
  — Implemented revised EVS cleaning checklist
  — EVS Director and Nurse Manager established processes to maintain
- Standard disinfectants used in NICU include Quat w/15% alcohol and Cavicide
31. Terminal Cleaning and Disinfection of Cohort PODs
- Environmental services terminally cleaned cohort PODs
- Hydrogen peroxide vapor used to augment terminal disinfection of cohort PODs
Post-treatment cultures were negative for all growth.

32. Conclusions
- Transient hand carriage of the organisms by healthcare workers and lapses in basic IP practices likely played a role in the transmission of these pathogens.
- No environmental reservoir was identified.

33. Factors Supporting Resolution of the Outbreak
- Prompt implementation and maintenance of intensive infection prevention measures with the first case.
- Daily engagement of executive leadership and their prompt response to needs.
- Increased nurse staffing in the cohort POD.
- Good old fashion team work!!!!!

Thank You!