EVALUATION OF EMPIRIC MANAGEMENT OF PEDIATRIC PATIENTS HOSPITALIZED WITH COMMUNITY-ACQUIRED PNEUMONIA

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BACKGROUND

In August 2011, the Pediatric Infectious Disease Society and the Infectious Diseases Society of America published the first evidence-based guidelines on the management of community-acquired pneumonia (CAP) in otherwise healthy infants and children older than 3 months of age. Narrow-spectrum antibiotics are preferred to limit antimicrobial resistance. For fully immunized inpatients, the first line empiric treatment is narrow-spectrum ampicillin or penicillin G.

INPATIENT EMPIRIC THERAPY FOR PEDIATRIC CAP

Population	Therapy
Fully immunized patients and in regions with minimal pneumococcal penicillin resistance	Ampicillin 150-200 mg/kg/day divided every 6 hours OR Penicillin 200,000-250,000 Units/kg/day divided every 4-6 hours
Not fully immunized patients and in regions with pneumococcal penicillin resistance	Third-generation parenteral cephalosporin
Presumed atypical pneumonia	A macrolide (oral or parenteral) + ß-lactam antibiotic, if atypical pneumonia is in doubt
S. aureus suspected	Vancomycin or clindamycin + ß-lactam antibiotic

OBJECTIVES

Primary:

- To assess if there is an overuse of broad-spectrum antibiotics in the empiric management of CAP in pediatric patients 3 months to 21 years of age.

Secondary:

- Conduct cost analysis including the cost of the drug used, cost of labor of administration, and hospital length of stay costs.
- Determine if it is necessary to implement a power plan for CAP in pediatrics that adheres to the evidence based guidelines of using narrow-spectrum antibiotic coverage.

METHODS

Retrospective chart review of admitted pediatric patients at a large-tertiary teaching hospital over the previous year with a diagnosis of CAP (to include appropriate diagnostic codes to include those that had this diagnosis at any point in their hospital stay).

- Assess how CAP in children has been empirically treated over the previous year
  - Review what antibiotic was empirically initiated upon suspected diagnosis of CAP
  - Determine if broad-spectrum antibiotics were overused. The overuse of broad-spectrum antibiotics is defined as any instance in which broad-spectrum antibiotics were not ordered according to the guidelines.
  - Review prior antibiotic use prior to admission within the previous year
  - Review any other antibiotics given throughout inpatient stay
  - Review what medication the patient was discharged on
- Cost analysis of empiric antibiotics
  - Cost of empiric antibiotic used
  - Cost of labor of administration
  - Hospital length of stay costs
- If overuse of broad-spectrum antimicrobial use is found, implementation of a power plan adhering to the CAP in pediatrics guidelines is warranted.
  - Prospectively review if the implementation of a Pediatric CAP power plan alters the choice of antibiotic and treatment outcomes

Data source:

Stony Brook Children's Hospital Inpatients on the general pediatric unit and the pediatric intensive care unit

Inclusion criteria:

- ICD-9-CM (diagnosis codes including: 482.40, 482.41, 482.42, 482.31, 482.39, 482.49, 482.9, 483, 483.8, 483.83, 481, 136.9, 513) discharge diagnosis of pneumonia. ICD-9-CM (diagnosis codes 511.9 and 510) discharge diagnosis of pleural effusion and empyema, respectively.
- Otherwise healthy children and infants, within the age range of at least 3 months to 21 years

Exclusion criteria:

- Immunodeficiency or chronic medical conditions (i.e., structural lung disease, end stage renal disease, bronchopulmonary dysplasia, exception: asthma)
- Long term care patients
- Cystic Fibrosis patients

Outcome measures:

Primary outcome measures:

- Empiric antibiotic
- Antibiotic choice upon cultures/sensitivities
- Length of hospitalization
- Length of treatment course
- Readmission within 30 days
- Time to resolution of observed clinical and vital sign abnormalities
- Mortality
- Antibiotic at discharge
- Development of pneumonia-associated complications:

Pulmonary	Metastatic	Systemic
• Pleural effusion or empyema • Pneumothorax • Lung abscess • Bronchopleural fistula • Necrotizing pneumonia • Acute respiratory failure	• Meningitis • CNS abscess • Pericarditis • Endocarditis • Osteomyelitis • Septic arthritis	• Systemic inflammatory response syndrome or sepsis • Hemolytic uremic syndrome

Secondary outcome measure:

- Cost analysis of empiric antibiotics
  - Cost of each dose of antibiotic used
  - Number of doses
  - Total cost of empiric antibiotic
  - Cost of labor of administration
  - Hospital lengths of stay costs

CASE REPORT DATA

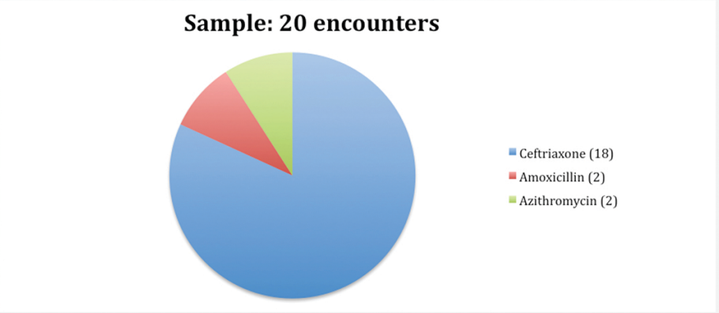
- **Season of admission**
- **Prior antibiotic use within previous year**
- **Medical intervention in the ED**
- **Received age appropriate vaccinations**
- **Suspicion of life threatening infection, including empyema**
- **Viral vs. bacterial diagnosis**
- **Antibiotic choice upon cultures/sensitivities**
- **Age**
- **Unit admission**
- **Respiratory panel results**
- **CBC, blood culture, pleural culture (when applicable)**
- **Development of pneumonia associated complications**
- **Discharge antibiotics**
- **Length of hospitalization**
- **Time to resolution of observed clinical and vital sign abnormalities**
- **Antibiotics upon discharge**
- **Cost of labor of administration**
- **Diagnosis**
- **Vitals upon admission to unit where empiric antibiotics were initiated**
- **Chest X-Ray findings**
- **Atypical Pneumonia suspected diagnosis**
- **Penicillin allergy: alternative treatment**
- **Appropriateness of empiric antibiotic choice**
- **Length of treatment course**
- **Development of pneumonia-associated complications**
- **Cost of each dose of empiric antibiotic**
- **Hospital length of stay costs**

PRELIMINARY RESULTS

Data extract after inclusion and exclusion criteria initially applied via data extract: 231 encounters

Date range of discharge dates	**9/17/2013-9/17/2014**
Readmit within 30 days	**14 encounters**
Age range	**5 months to 21 years of age**
Length of stay range	**0-23 days**

20 RANDOM ENCOUNTERS FROM 231 ENCOUNTERS EMPIRIC TREATMENT OF CAP:



- According to the random sample from 231 encounters 90% of the patients were treated with ceftriaxone, 10% were treated with amoxicillin and 10% were treated with azithromycin.

CONCLUSION

From September 17, 2013 until September 17, 2014, about 230 pediatric patients were discharged with a diagnosis of pneumonia, pleural effusion or empyema. After the exclusion criteria was applied, a random sample of 20 patients was reviewed for the empiric treatment of CAP. Empiric treatment in the majority of patients was with the broad-spectrum antibiotic ceftriaxone. Further analysis will be completed to determine if these patients were appropriately treated. This preliminary data supports the premise that broad-spectrum antibiotics are over prescribed. This project is aimed to focus on the potential overuse of broad-spectrum antibiotics in the treatment of CAP in pediatric patients. If it is concluded that broad-spectrum antibiotics are overused, a physician order set for the diagnosis of CAP will be implemented. This order set will aid in reducing the overuse of antibiotics, with the purpose of limiting antimicrobial resistance.

References

Bradley JS, Byington CL, Shah SS, et al. The management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2011;53:e25-76.

Disclosures

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