Comparative Effectiveness of Intravenous vs Oral Antibiotics for Postdischarge Treatment of Acute Osteomyelitis in Children

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ABSTRACT

Importance Postdischarge treatment of acute osteomyelitis in children requires weeks of antibiotic therapy, which can be administered orally or intravenously via a peripherally inserted central catheter (PICC). The catheters carry a risk for serious complications, but limited evidence exists on the effectiveness of oral therapy.

Objective To compare the effectiveness and adverse outcomes of postdischarge antibiotic therapy administered via the PICC or the oral route.

Design, Setting, and Participants We performed a retrospective cohort study comparing PICC and oral therapy for the treatment of acute osteomyelitis. Among children hospitalized from January 1, 2009, through December 31, 2012, at 36 participating children’s hospitals, we used discharge codes to identify potentially eligible participants. Results of medical record review confirmed eligibility and defined treatment group allocation and study outcomes. We used within- and across-hospital propensity score-based full matching to adjust for confounding by indication.

Interventions Postdischarge administration of antibiotics via the PICC or the oral route.

Main Outcomes and Measures The primary outcome was treatment failure. Secondary outcomes included adverse drug reaction, PICC line complication, and a composite of all 3 end points.

Results Among 2060 children and adolescents (hereinafter referred to as children) with osteomyelitis, 1005 received oral antibiotics at discharge, whereas 1055 received PICC-administered antibiotics. The proportion of children treated via the PICC route varied across hospitals from 0 to 100%. In the across-hospital (risk difference, 0.3% [95% CI, −0.1% to 2.5%]) and within-hospital (risk difference, 0.6% [95% CI, −0.2% to 3.0%]) matched analyses, children treated with antibiotics via the oral route (reference group) did not experience more treatment failures than those treated with antibiotics via the PICC route. Rates of adverse drug reaction were low (<4% in both groups) but slightly greater in the PICC group in across-hospital (risk difference, 1.7% [95% CI, 0.1%-3.3%]) and within-hospital (risk difference, 2.1% [95% CI, 0.3%-3.8%]) matched analyses. Among the children in the PICC group, 158 (15.0%) had a PICC complication that required an emergency department visit (n = 96), a rehospitalization (n = 38), or both (n = 24). As a result, the PICC group had a much higher risk of requiring a return visit to the emergency department or for hospitalization for any adverse outcome in across-hospital (risk difference, 14.6% [95% CI, 11.3%-17.9%]) and within-hospital (risk difference, 14.0% [95% CI, 10.5%-17.6%]) matched analyses.

Conclusions and Relevance Given the magnitude and seriousness of PICC complications, clinicians should reconsider the practice of treating otherwise healthy children with acute osteomyelitis with prolonged intravenous antibiotics after hospital discharge when an equally effective oral alternative exists.
Urokinase Versus VATS for Treatment of Empyema: A Randomized Multicenter Clinical Trial

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ABSTRACT

BACKGROUND AND OBJECTIVE: Parapneumonic empyma (PPE) is a frequent complication of acute bacterial pneumonia in children. There is limited evidence regarding the optimal treatment of this condition. The aim of this study was to compare the efficacy of drainage plus urokinase versus video-assisted thoracoscopic surgery in the treatment of PPE in childhood.

METHODS: This prospective, randomized, multicenter clinical trial enrolled patients aged <15 years and hospitalized with septated PPE. Study patients were randomized to receive urokinase or thoracoscopy. The main outcome variable was the length of hospital stay after treatment. The secondary outcomes were total length of hospital stay, number of days with the chest drain, number of days with fever, and treatment failures. The trial was approved by the ethics committees of all the participating hospitals.

RESULTS: A total of 103 patients were randomized to treatment and analyzed; 53 were treated with thoracoscopy and 50 with urokinase. There were no differences in demographic characteristics or in the main baseline characteristics between the 2 groups. No statistically significant differences were found between thoracoscopy and urokinase in the median postoperative stay (10 vs 9 days), median hospital stay (14 vs 13 days), or days febrile after treatment (4 vs 6 days). A second intervention was required in 15% of children in the thoracoscopy group versus 10% in the urokinase group (P = .47).

CONCLUSIONS: Drainage plus urokinase instillation is as effective as video-assisted thoracoscopic surgery as first-line treatment of septated PPE in children.
Changes in gastric and lung microflora with acid suppression: acid suppression and bacterial growth.
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ABSTRACT
IMPORTANCE: The use of acid suppression has been associated with an increased risk of upper and lower respiratory tract infections in the outpatient setting but the mechanism behind this increased risk is unknown. We hypothesize that this infection risk results from gastric bacterial overgrowth with subsequent seeding of the lungs.

OBJECTIVES: To determine if acid-suppression use results in gastric bacterial overgrowth, if there are changes in lung microflora associated with the use of acid suppression, and if changes in lung microflora are related to full-column nonacid gastroesophageal reflux.

DESIGN, SETTING, AND PARTICIPANTS: A 5-year prospective cohort study at a tertiary care center where children ages 1 to 18 years were undergoing bronchoscopy and endoscopy for the evaluation of chronic cough. Acid-suppression use was assessed through questionnaires with confirmation using an electronic medical record review.

MAIN OUTCOMES AND MEASURES: Our primary outcome was to compare differences in concentration and prevalence of gastric and lung bacteria between patients who were and were not receiving acid-suppression therapy. We compared medians using the Wilcoxon signed rank test and determined prevalence ratios using asymptotic standard errors and 95% confidence intervals. We determined correlations between continuous variables using Pearson correlation coefficients and compared categorical variables using the Fisher exact test.

RESULTS: Forty-six percent of patients taking acid-suppression medication had gastric bacterial growth compared with 18% of untreated patients (P = .003). Staphylococcus (prevalence ratio, 12.75 [95% CI, 1.72-94.36]), Streptococcus (prevalence ratio, 6.91 [95% CI, 1.64-29.02]), Veillonella (prevalence ratio, 9.56 [95% CI, 1.26-72.67]), Dermabacter (prevalence ratio, 4.78 [95% CI, 1.09-21.02]), and Rothia (prevalence ratio, 6.38 [95% CI, 1.50-27.02]) were found more commonly in the gastric fluid of treated patients. The median bacterial concentration was higher in treated patients than in untreated patients (P = .001). There was no difference in the prevalence (P > .23) of different bacterial genera or the median concentration of total bacteria (P = .85) in the lungs between treated and untreated patients. There were significant positive correlations between proximal nonacid reflux burden and lung concentrations of Bacillus (r = 0.47, P = .005), Dermabacter (r = 0.37, P = .008), Lactobacillus (r = 0.45, P = .001), Peptostreptococcus (r = 0.37, P = .008), and Capnocytophaga (r = 0.37, P = .008).

CONCLUSIONS AND RELEVANCE: Acid-suppression use results in gastric bacterial overgrowth of genera including Staphylococcus and Streptococcus. Full-column nonacid reflux is associated with greater concentrations of bacteria in the lung. Additional studies are needed to determine if acid suppression-related microflora changes predict clinical infection risk; these results suggest that acid suppression use may need to be limited in patients at risk for infections.
Central catheter-associated bloodstream infection reduction with ethanol lock prophylaxis in pediatric intestinal failure: broadening quality improvement initiatives from hospital to home.

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ABSTRACT

IMPORTANCE: Children with intestinal failure are at high risk for developing central catheter-associated bloodstream infections (CCABSI) owing to children's chronic dependence on central venous catheters for parenteral nutrition.

OBJECTIVE: To evaluate the effectiveness and safety of the addition of ethanol lock prophylaxis to a best-practice CCABSI prevention bundle on hospital and ambulatory CCABSI rates in children with intestinal failure.

DESIGN, SETTING, AND PARTICIPANTS: Quality improvement and statistical process control analysis that took place at a tertiary care pediatric hospital and patient homes. Participants included children who were 18 years or younger with intestinal failure requiring a central venous catheter.

INTERVENTIONS: Central catheter-associated bloodstream infection prevention bundle that included daily ethanol lock prophylaxis.

MAIN OUTCOMES AND MEASURES: Central catheter-associated bloodstream infection rates and safety outcomes (central catheter insertions, repairs, and hospitalizations) before (January 1, 2011-January 31, 2012) and after (February 1, 2012-December 31, 2013) ethanol lock prophylaxis bundle implementation.

RESULTS: Twenty-four children with intestinal failure received the ethanol lock prophylaxis CCABSI prevention bundle for a median of 266 days (range, 12-635 days). Rates of CCABSI decreased from 6.99 CCABSI per 1000 catheter days at baseline to 0.42 CCABSI per 1000 catheter days after ethanol lock prophylaxis bundle implementation, despite an increase in the total number of catheter days. A subset of 14 children who received prolonged ethanol lock prophylaxis (≥3 months) had fewer median (range) central catheter insertions 0 (0-2) vs 3 (0-6); P = .001. The pre-ELP intervention CCABSI rates in this subset was 7.01 per 1000 catheter days vs 0.64 per 1000 catheter days for post-ELP intervention (P = .004). There were no significant differences in the total number of hospital admissions; however, there were fewer hospitalizations for fever and CCABSI (P = .003).

CONCLUSIONS AND RELEVANCE: A best-practice CCABSI prevention bundle that included ethanol lock prophylaxis in both the hospital and home was successfully implemented, well tolerated, and demonstrated a significant and sustained reduction in preventable harm in the form of CCABSI in children with intestinal failure.
Blood Culture Time to Positivity in Febrile Infants With Bacteremia

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ABSTRACT

Importance  Blood cultures are often obtained as part of the evaluation of infants with fever and these infants are typically observed until their cultures are determined to have no growth. However, the time to positivity of blood culture results in this population is not known.

Objective  To determine the time to positivity of blood culture results in febrile infants admitted to a general inpatient unit.

Design, Setting, and Participants  Multicenter, retrospective, cross-sectional evaluation of blood culture time to positivity. Data were collected by community and academic hospital systems associated with the Pediatric Research in Inpatient Settings Network. The study included febrile infants 90 days of age or younger with bacteremia and without surgical histories outside of an intensive care unit.

Exposures  Blood culture growing pathogenic bacteria.

Main Outcomes and Measures  Time to positivity and proportion of positive blood culture results that become positive more than 24 hours after placement in the analyzer.

Results  A total of 392 pathogenic blood cultures were included from 17 hospital systems across the United States. The mean (SD) time to positivity was 15.41 (8.30) hours. By 24 hours, 91% (95% CI, 88-93) had turned positive. By 36 and 48 hours, 96% (95% CI, 95-98) and 99% (95% CI, 97-100) had become positive, respectively.

Conclusions and Relevance  Most pathogens in febrile, bacteremic infants 90 days of age or younger hospitalized on a general inpatient unit will be identified within 24 hours of collection. These data suggest that inpatient observation of febrile infants for more than 24 hours may be unnecessary in most infants.
Identification of children and adolescents at risk for renal scarring after a first urinary tract infection: a meta-analysis with individual patient data.

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ABSTRACT

IMPORTANCE: No studies have systematically examined the accuracy of clinical, laboratory, and imaging variables in detecting renal scarring in children and adolescents with a first urinary tract infection.

OBJECTIVES: To identify independent prognostic factors for the development of renal scarring and to combine these factors in prediction models that could be useful in clinical practice.

DATA SOURCES: MEDLINE and EMBASE.

STUDY SELECTION: We included patients aged 0 to 18 years with a first urinary tract infection who underwent follow-up renal scanning with technetium Tc 99m succimer at least 5 months later.

DATA EXTRACTION AND SYNTHESIS: We pooled individual patient data from 9 cohort studies.

MAIN OUTCOMES AND MEASURES: We examined the association between predictor variables assessed at the time of the first urinary tract infection and the development of renal scarring. Renal scarring was defined by the presence of photopenia on the renal scan. We assessed the following 3 models: clinical (demographic information, fever, and etiologic organism) and ultrasonographic findings (model 1); model 1 plus serum levels of inflammatory markers (model 2); and model 2 plus voiding cystourethrogram findings (model 3).

RESULTS: Of the 1280 included participants, 199 (15.5%) had renal scarring. A temperature of at least 39°C, an etiologic organism other than Escherichia coli, an abnormal ultrasonographic finding, polymorphonuclear cell count of greater than 60%, C-reactive protein level of greater than 40 mg/L, and presence of vesicoureteral reflux were all associated with the development of renal scars (P ≤ .01 for all). Although the presence of grade IV or V vesicoureteral reflux was the strongest predictor of renal scarring, this degree of reflux was present in only 4.1% of patients. The overall predictive ability of model 1 with 3 variables (temperature, ultrasonographic findings, and etiologic organism) was only 3% to 5% less than the predictive ability of models requiring a blood draw and/or a voiding cystourethrogram. Patients with a model 1 score of 2 or more (21.7% of the sample) represent a particularly high-risk group in whom the risk for renal scarring was 30.7%. At this cutoff, model 1 identified 44.9% of patients with eventual renal scarring.

CONCLUSIONS AND RELEVANCE: Children and adolescents with an abnormal renal ultrasonographic finding or with a combination of high fever (≥39°C) and an etiologic organism other than E coli are at high risk for the development of renal scarring.
Invasive Pneumococcal Disease After Implementation of 13-Valent Conjugate Vaccine

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ABSTRACT

OBJECTIVE: To examine whether there is a different clinical profile and severity of invasive pneumococcal disease (IPD) in children caused by nonvaccine types in the era of 13-valent pneumococcal conjugate vaccine (PCV13).


RESULTS: There were 168 pre-PCV13 cases of IPD and 85 post-PCV13 cases of IPD in Massachusetts children ≤5 years of age. PCV13 serotypes declined by 18% in the first 2 years after PCV13 use (P = .011). In the post-PCV13 phase, a higher proportion of children were hospitalized (57.6% vs 50.6%), and a higher proportion of children had comorbidity (23.5% vs 19.6%). Neither difference was statistically significant, nor were comparisons of IPD caused by vaccine and nonvaccine types. Children with comorbidities had higher rates of IPD caused by a nonvaccine type (27.6% vs 17.2%; P = .085), were more likely to be hospitalized (80.4% vs 50%; P < .0001), and were more likely to have a longer hospital stay (median of 3 days vs 0.5 days; P = .0001).

CONCLUSIONS: Initial data suggest that nonvaccine serotypes are more common in children with underlying conditions, who have greater morbidity from disease. In the post-PCV13 era, a larger proportion of patients are hospitalized, but mortality rates are unchanged. Routine vaccination with PCV13 may not be enough to reduce the risk in patients with comorbidity.