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

Ron Keren, MD, MPH
Professor of Pediatrics and Epidemiology
Perelman School of Medicine at the University of Pennsylvania
Vice President of Quality
The Children’s Hospital of Philadelphia
Imagine
Simplified Treatment of Acute Staphylococcal Osteomyelitis of Childhood

Heikki Peltola, MD*; Leila Unkila-Kallio, MD‡; Markku J.T. Kallio, MD§; and the Finnish Study Group¶
2004
Methods

• Retrospective cohort study of all patients admitted to the Children’s Hospital of Philadelphia between January 1, 2000, and December 31, 2003, with a diagnosis of AHO.

• 80 patients with AHO met inclusion criteria.
  – 75 (94%) received >2 weeks of intravenous (IV) antibiotic therapy via a CVC
  – 5 (6%) received <2 weeks of IV antibiotic therapy before conversion to oral therapy for a median of 25 days.
Results

• Of the 75 patients who received >2 weeks of IV therapy, **41% had >=1 CVC-associated complication.**
  – 17 (23%) had a **CVC malfunction or displacement**
  – 8 (11%) had a **catheter-associated bloodstream infection**
  – 8 (11%) had **fever with negative blood culture results**
  – 4 (5%) had a **local skin infection at the site of catheter insertion.**
Complications of Central Venous Catheters Used for the Treatment of Acute Hematogenous Osteomyelitis

Rebecca Ruebner, MD\textsuperscript{a}, Ron Keren, MD, MPH\textsuperscript{a,d}, Susan Coffin, MD, MPH\textsuperscript{a,e}, Jaclyn Chu, MHS\textsuperscript{a}, David Horn, MD\textsuperscript{b,f}, Theoklis E. Zaoutis, MD, MSCE\textsuperscript{a,e}

Departments of \textsuperscript{a}Pediatrics and \textsuperscript{b}Surgery and \textsuperscript{c}Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania; Divisions of \textsuperscript{d}General Pediatrics, \textsuperscript{e}Infectious Diseases, and \textsuperscript{f}Orthopedic Surgery, Children’s Hospital of Philadelphia, Philadelphia, Pennsylvania.

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ARTICLE

Prolonged Intravenous Therapy Versus Early Transition to Oral Antimicrobial Therapy for Acute Osteomyelitis in Children

Theoklis Zaoutis, MD, MSCEa,b,c,d,e, A. Russell Localio, PhDd,e, Kateri Leckerman, MSa, Stephanie Saddlemere, MSPHe, David Bertoch, MHa, Ron Keren, MD, MPHb,c,d,e,f

aDivisions of Infectious Diseases and bGeneral Pediatrics and cCenter for Pediatric Clinical Effectiveness, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; Departments of dPediatrics and eBiostatistics and Epidemiology and fCenter for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania; gChild Health Corporation of America, Shawnee Mission, Kansas

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Pediatric Health Information System

PHIS By The Numbers
(Since 2004)
- Participating Hospitals: 44
- Inpatient Cases: 5.0 million
- Inpatient Days: 30.2 million
- ED encounters: 20.2 million

Over 125 data items submitted by hospitals for each patient.
What’s Collected

**Patient Abstract and ICD-9 Coding**
- Patient Abstract
- Diagnoses (ICD-9)
- Procedures (ICD-9)

**Billed Transaction/Utilization Data**
(all items/services billed to the patient)
- Pharmacy
- Imaging / Radiology
- Lab
- Clinical
- Supplies
- Other
  - Room/Nursing
  - Surgical Svcs
  - Other Misc.

** patient encounter **

Hospital ID  | Disposition
Patient ID   | APR-DRG
Dates/LOS    | MS-DRG
Age, Bw, Gest Age | Key Physicians
Principal Diagnosis | Payer
Principal Procedure

[Children’s Hospital Association Logo]
Methods

• Retrospective cohort study
• Children 2 months to 17 years diagnosed with acute osteomyelitis between 2000 and 2005 at 29 freestanding children’s hospitals
• 1969 children met inclusion criteria, 1021 IV, 948 oral
PHIS data from 2000-2005
Results

• Propensity score adjusted differences in treatment failure (rehosp within 6 months)

• Treatment failure rate was 5% (54 of 1021) in the prolonged intravenous therapy group and 4% (38 of 948) in the oral therapy group.

• No significant association between treatment failure and the mode of antimicrobial therapy.

• 35 (3.4%) children in prolonged intravenous therapy group readmitted for a catheter-associated complication.
Percent Converted to Oral Antibiotics

PHIS data from 2009-2011
Why not much change?

• No dissemination and implementation plan
• Study limitations
  – Administrative data only
  – Questions about ascertainment of osteo diagnosis, exposure, outcome
  – Residual confounding
  – Rise of CA-MRSA
PCORI CER Proposal

- Chart review to confirm diagnosis, exposure, outcomes
- Within and across hospital propensity score-based full matching
- Stakeholder engagement
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Ron Keren, MD, MPH; Samir S. Shah, MD, MSCE; Rajendu Srivastava, MD, FRCPC, MPH; Shawn Rangel, MD; Michael Bendel-Stenzel, MD; Nada Harik, MD; John Hartley, DO; Michelle Lopez, MD; Luis Seguias, MD; Joel Tieder, MD; Matthew Bryan, PhD; Wu Gong, MS; Matt Hall, PhD; Russell Localio, PhD; Xianqun Luan, MS; Rachel deBerardinis, BA; Allison Parker, MS; for the Pediatric Research in Inpatient Settings Network

Methods

• Retrospective cohort study
• Children hospitalized from January 1, 2009, through December 31, 2012, at 36 participating children’s hospitals
Treatment Failure

Defined as revisit to the ED or a rehospitalization for:
- change in the antibiotic prescribed or its dosage
- prolongation of antibiotic therapy
- conversion from the oral to the PICC route
- bone abscess drainage
- debridement of necrotic bone
- bone biopsy
- drainage of an abscess of the skin or muscle
- arthrocentesis
- diagnosis of a pathologic fracture
Results

- 2060 children with osteomyelitis
- 1005 oral antibiotics, 1055 PICC-administered antibiotics.
- The proportion of children treated via the PICC route varied across hospitals from 0 to 100%.
- Treatment failure risk difference = 0.3% [95% CI, −0.1% to 2.5%]) (across hospital matched analyses)
- Among children in 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).
Comments

- Likely to be strongest evidence available to answer question
- RCT not feasible
- Confirms results of prior study that used only administrative data
- Results consistent, even with rise in MRSA prevalence (study period 2009-2012)
Comments

- Similar analyses (and findings) for complicated pneumonia and perforated appendicitis
Secrets to Success

- Funding institute interested in CER
- Availability of data -- PHIS -- hosted by CHA
- Pediatric Research in Inpatient Settings (PRIS) - research network to identify site leads and facilitate chart review
- Engaged clinicians
Dissemination

• PCORI-organized CME seminar
• JAMA Pediatrics sponsored Twitter Journal Club
• CHA sponsored webinar
• Coverage in dozens of pediatric and lay media
Implementation

• Partner with CHA to produce quarterly reports
• We validated admin codes and they have high sens/spec for case, exposure, outcome ascertainment.
• Audit and feedback reports back to CMOs, CQOs, CSOs.
• Change package-- education, guideline, treatment recommendations
Questions

• Why has it taken almost 20 years to move from innovation to CER to implementation?
• How many children treated unnecessarily with central venous catheters?
• How can we make better use of our data to accelerate knowledge generation/translation?