PHIS for Health Services Research

Harold K. Simon, MD, MBA
Marcus Professor & Vice-Chair for Faculty Department of Pediatrics,
Professor of Pediatrics and Emergency Medicine Emory
Associate Director for Faculty Emory + Children's Pediatric Institute

Kiesha Fraser Doh, MD
Assistant Professor of Pediatrics and Emergency Medicine
Director of Outreach Division of Pediatric Emergency Medicine
Emory University and Children's Healthcare of Atlanta

Center for Clinical Outcomes Research and Public Health
Center for Clinical and Translational Research
May 1, 2020

Acknowledgements

- Thank you to Matt Hall, PhD, Principal Biostatistician for Children's Hospital Association (CHA) who shared much of the substance and context for this presentation.

- To note, while involved for several years with CHA and PHIS related research I have no financial interests of conflicts related to this presentation

Overview for today

- What is PHIS & its sources
- Strengths & limitations
- Examples of PHIS related research
- Research resources

What is PHIS

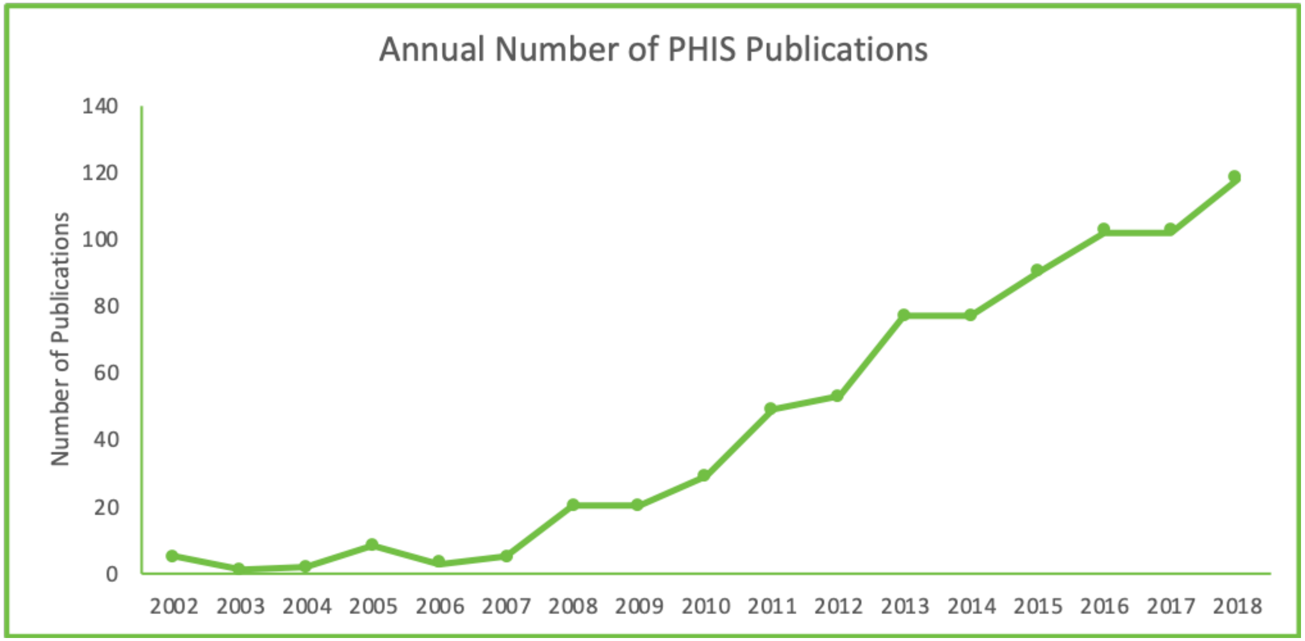
- Pediatric Health Information System (PHIS)
- Administrative data is collected primarily for **billing** purposes, but is sent to multiple stakeholders for various reasons (e.g. quality, benchmarking)
- Buy-in and evolution to a research resource
- Research initiatives (began 2006)
  - 10 invited physicians to perform collaborative research with PHIS
  - First publication 2007 Off-Label Drug Use in Hospitalized Children (2007) Archives of Pediatrics & Adolescent Medicine
  - Through 2019, >800 publications, 200+journals

Output Successes

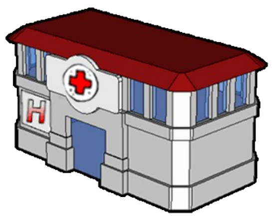
- 800+ publications
- 200+ journals

Top Journals

	N Articles
Pediatrics	99
The Journal of Pediatrics	49
Journal of Pediatric Surgery	40
Pediatric Blood & Cancer	28
JAMA Pediatrics	25
Pediatric Critical Care Medicine	24
Hospital Pediatrics	24
Pediatric Cardiology	22
Journal of Hospital Medicine	21



PHIS Data



Arrival

Registrar enters demographics into record

During the Encounter

Clinicians document Dx and Pr in the chart

Resources administered captured in billing record

Discharge

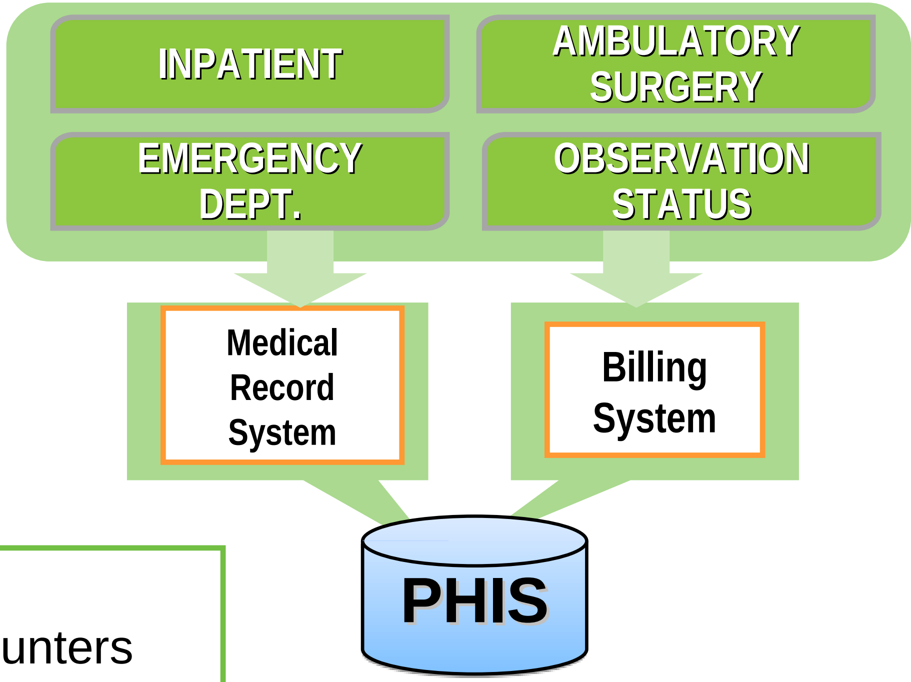
Coding dept “translates” documentation to CPT/ICD-10

What data are in PHIS?

PHIS By The Numbers

(Since 2004)

- Participating Hospitals: **52**
- Inpatient Cases: **7.4 million**
- Inpatient Days: **46.0 million**
- ED encounters: **32.4 million**
- Total Charges: **$534 billion**
- Total ICD-9/10 Codes: **188.4 million**



Key features...
Patients can be tracked across encounters
Hospitals have direct access
Hospitals are un-blinded

PHIS participating hospitals

Akron – Akron Children's Hospital
Ann Arbor – C.S. Mott Children's Hospital
****Atlanta - Children's Healthcare of Atlanta**
Austin – Dell Children's Medical Center of Central Texas
Birmingham - Children's of Alabama
Boston – Boston Children's Hospital
Charleston – MUSC Children's Hospital
Chicago – Lurie Children's Hospital of Chicago
Chicago – Comer Children's Hospital
Chicago – Advocate Children's Hospital
Cincinnati - Children's Hospital Medical Center
Cleveland – UH Rainbow Babies & Children's Hospital
Columbus – Nationwide Children's Hospital
Corpus Christi - Driscoll Children's Hospital
Dallas - Children's Health Children's Medical Center of Dallas
Denver - Children's Hospital Colorado
Fresno / Madera – Valley Children's Hospital
Ft. Worth - Cook Children's Medical Center
Hartford - Connecticut Children's Medical Center
Houston - Texas Children's Hospital
Houston – Children's Memorial Hermann Hospital
Indianapolis - Riley Hospital for Children at Indiana University Health
Kansas City - Children's Mercy Hospitals & Clinics
Knoxville - East Tennessee Children's Hospital
Little Rock - Arkansas Children's Hospital
Long Beach – Miller Children's and Women's Hospital Long Beach
Los Angeles - Children's Hospital Los Angeles
Louisville – Norton Children's Hospital
Memphis - Le Bonheur Children's Medical Center
Miami – Nicklaus Children's Hospital
Milwaukee - Children's Hospital of Wisconsin
Minneapolis – Children's Minnesota
Nashville - Vanderbilt Children's Hospital
New Haven – Yale-New Haven Children's Hospital
New York - New York Presbyterian-Morgan Stanley Children's Hosl
Norfolk - Children's Hospital of The King's Daughters
Oakland - UCSF Benioff Children's Hospital Oakland
Omaha - Children's Hospital and Medical Center
Orange - Children's Hospital of Orange County
Palo Alto - Lucile Packard Children's Hospital Stanford
Philadelphia - The Children's Hospital of Philadelphia
Phoenix - Phoenix Children's Hospital
Pittsburgh - Children's Hospital of Pittsburgh of UPMC
Salt Lake City - Primary Children's Hospital
San Diego – Rady Children's Hospital San Diego
Seattle – Seattle Children's Hospital
St. Petersburg – Johns Hopkins All Children's Hospital
St. Louis - St. Louis Children's Hospital
Washington D.C. - Children's National Health System

**NOTE: CHOA reports from all 3 campuses. Reports pooled data but can be separated by campus

Current CHA Structure for Collaborative Research

Chair: Samir Shah, MD (Cincinnati)

6 CHA statisticians

Research network with 13 active research nodes

10-20 physicians in each group

- Mix of hospitals
- Mix of research experience (for mentoring purposes)

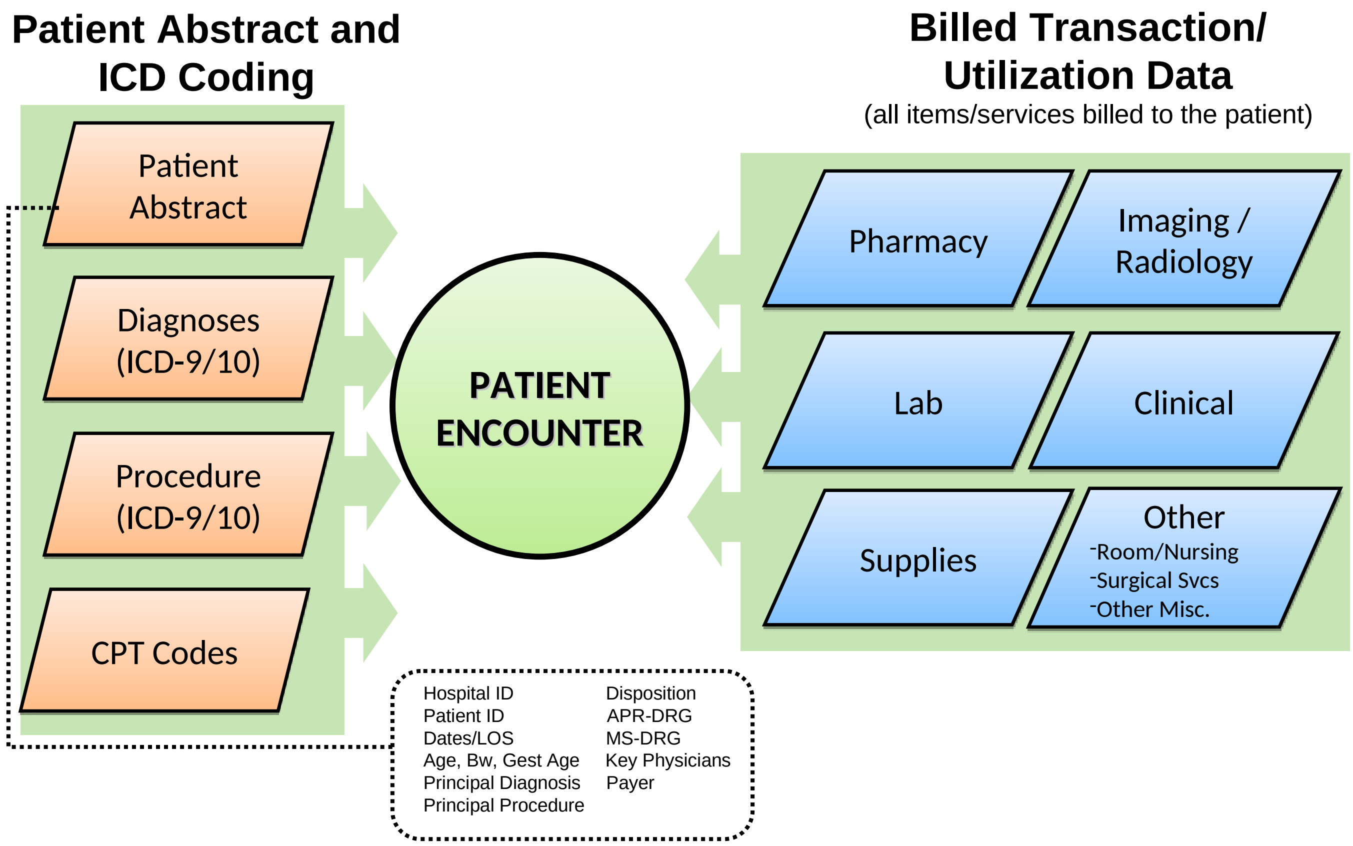
Current research nodes and working groups through CHA

Infectious diseases
Emergency Department
Hospital Medicine
Intensive Care
Complex care
Mental health
Quality
Surgery
Social determinants of health
Policy
Special Interest Groups

- Pneumonia
- Readmissions
- Asthma

Data also available through local access at all contributing institutions

What’s collected on each encounter?



Patient abstract

Hospital Number	Hospital City	Campus ID	Discharge ID	Medical Record Number	Patient Type - Title	Admit Age In Years	Admit Age In Days	Length Of Stay
2028	[illegible]		146295309	431732028	0 - Inpatient	4	1665	64

Disposition Title	TPN Flag	NICU Flag	ICU Flag	Mechanical Vent Flag	Medical Complication Flag	Surgical Complication Flag	Complex Chronic Condition Flag
Discharge to Home or Self Care	N	N	Y	N	N	Y	Y

ECMO Flag	ED Charge Flag	PSL Specific Code - Title	APR-DRG Code - Title	Severity Level	Risk Of Mortality	Attending Physician	Attending Physician Sub-Specialty Code - Title
N	Y	20 - Neuroscience Service - Surgic	21 - Craniotomy X for trauma	4	3	1972590636	33 - Surgery - Neurological

Primary Source Of Payment Title	Adj Billed Charges	Principal Dx Code - Title (ICD)	Principal Dx Present On Admit	Principal Px Code - Title (ICD)
In-State Medicaid (other)	$947,736	T8501XA - Breakdown ventricular intracranial shunt initial	Y	00W63JZ - Revision synth substitute cereb ventricle, perc

Diagnoses (ICD-9/10)

- Up to 41 dxs, assigned at discharge
- Present on admission indicator
- Not date stamped

Procedures (ICD-9/10)

- Up to 41 prs, assigned at discharge
- Not just surgical
- Date stamped

Billing data in PHIS

Hospital A

Hospital B

CTC Code

124133.1011552

12 ➔ Anti-infectives (Drug Class = 12)

124 ➔ Misc antibiotics (Therapeutic Cat = 124)

124133 ➔ Vancomycin (Generic Drug=124133)

12413310 ➔ oral (Route of Administration=10)

1241331011 ➔ tablet (Dosage Form=11)

124133101155 ➔ 55 (Strength=125)

1241331011552 ➔ mg (Unit of Measure=2)

PHIS pharmacy data

Discharge ID	Pharmacy CTC Code	Drug Class	Drug Class Title	Generic Drug	Generic Drug Title	Date Of Service	Day Of Service	Pharmacy Charges	Adj Pharmacy Charges
146295309	1160672020862	11	Central nervous system and autonomic	116067	Valproic acid and derivatives	[illegible]	0	$90	$64
146295309	1160672020862	11	Central nervous system and autonomic	116067	Valproic acid and derivatives	[illegible]	1	$90	$64
146295309	1121152020511	11	Central nervous system and autonomic	112115	Fentanyl (base) (citrate)	[illegible]	2	$90	$64
146295309	1122012020202	11	Central nervous system and autonomic	112201	Acetaminophen (APAP) (N-acet	[illegible]	2	$45	$32
146295309	1152352020652	11	Central nervous system and autonomic	115235	Propofol	[illegible]	2	$45	$32
146295309	1153212061294	11	Central nervous system and autonomic	115321	Bupivacaine HCl	[illegible]	2	$45	$32
146295309	1153712065364	11	Central nervous system and autonomic	115371	Lidocaine HCl and epinephrine H	[illegible]	2	$45	$32
146295309	1160672020862	11	Central nervous system and autonomic	116067	Valproic acid and derivatives	[illegible]	2	$90	$64
146295309	1171552020362	11	Central nervous system and autonomic	117155	Rocuronium bromide	[illegible]	2	$90	$64
146295309	1192152020012	11	Central nervous system and autonomic	119215	Neostigmine (bromide) (methyls	[illegible]	2	$45	$32
146295309	1221092020013	12	Anti-infective agents	122109	Cefazolin sodium	[illegible]	2	$68	$48
146295309	1241572220367	12	Anti-infective agents	124157	Bacitracin (zinc)	[illegible]	2	$45	$32
146295309	1311412070000	13	Cardiac and adrenergic agents	131141	Lidocaine HCl	[illegible]	2	$45	$32
146295309	1313151011362	13	Cardiac and adrenergic agents	131315	Ephedrine (sulfate)	[illegible]	2	$135	$97
146295309	1121312020042	11	Central nervous system and autonomic	112131	Morphine sulfate	[illegible]	3	$60	$43
146295309	1122011016592	11	Central nervous system and autonomic	112201	Acetaminophen (APAP) (N-acet	[illegible]	3	$30	$21
146295309	1122012020202	11	Central nervous system and autonomic	112201	Acetaminophen (APAP) (N-acet	[illegible]	3	$45	$32
146295309	1160672020862	11	Central nervous system and autonomic	116067	Valproic acid and derivatives	[illegible]	3	$135	$97
146295309	1221092020013	12	Anti-infective agents	122109	Cefazolin sodium	[illegible]	3	$78	$56
146295309	1122011016592	11	Central nervous system and autonomic	112201	Acetaminophen (APAP) (N-acet	[illegible]	4	$60	$43
146295309	1122601016512	11	Central nervous system and autonomic	112260	Ibuprofen	[illegible]	4	$44	$32

Value:

- Compare drug utilization
- Compare when drugs were given (by day)
- Compare route of administration

Strengths and Limitations for Research

Strengths of administrative data in research

- Patient level data
- Line item utilization
- Population size = Power
  - Multiple institutions for rare conditions
- Hospital-to-hospital variation

Strengths and Limitations for Research

Limitations of administrative data in research

- Retrospective and observational
- Significant risk adjustment factors might be missing
  - Potentially link to registries
- Outcomes are limited
- Unknown Sen/Spec for many ICD-9/10 codes; dxs and pxs rely on proper documentation and coding
  - ICD codes in administrative databases generally have high specificity (e.g., few instances in which patients did not in fact receive a diagnosis of the condition) but may have lower sensitivity (i.e., the administrative diagnosis may fail to detect all true cases) - Zaoutis, Pediatrics, 2006
- Charges are billed resource, not necessarily administered

Overcoming limitations with linkages

Registries
Case ascertainment
Risk adjustment
Outcomes

↔

PHIS
Cost
Utilization
Long term outcomes

- PHIS linkages to date:
- Vermont Oxford Network (NICU)
- Children’s Hospitals Neonatal Database (NICU)
- Society of Thoracic Surgeons (Cardiac Surgery)
- Virtual PICU System (PICU)
- Children’s Oncology Group (Oncology)
- Center for International Blood and Marrow Transplant Research (BMT)
- Pediatric Heart Network (Cardiac Surgery)
- United Network for Organ Sharing (Transplant)
- Scientific Registry of Transplant Recipients (Transplant)
- Cystic Fibrosis Foundation (CF)
- National Surgical Quality Improvement Program (Gen Surgery)

- Also, studies have combined hospital level surveys for hospital factor characteristic linkages

Types of Research Using PHIS

- Prioritization
- Epidemiology / Population Estimates
- Drivers of cost
- Longitudinal Data Analysis
- Utilization Variation
- Comparative Effectiveness

Prioritization

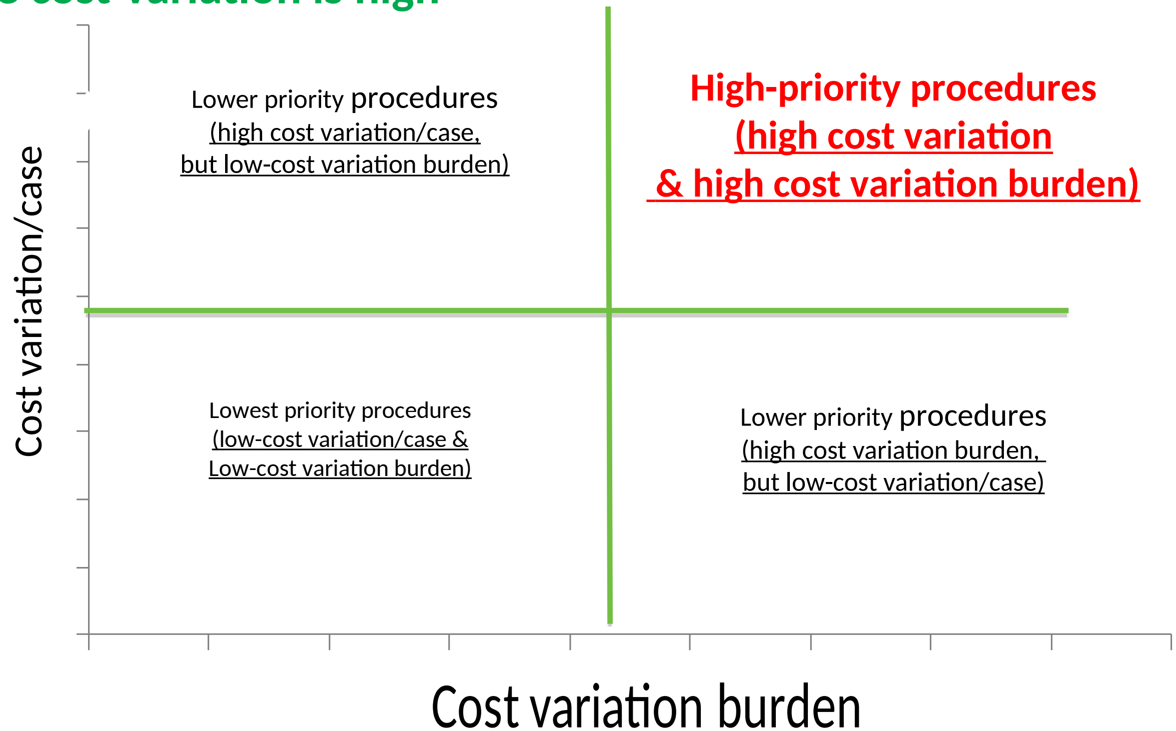
Quantifying the Burden of Interhospital Cost Variation in Pediatric Surgery: Implications for the Prioritization of Comparative Effectiveness Research.

Cameron DB[1], Graham DA[2], Milliren CE[2], Glass CC[1], Feng C[1], Sidhwa F[1], Thangarajah H[3], Hall M[4], Rangel SJ[1]. JAMA Pediatr. 2017 Feb 6;171(2):e163926. doi: 10.1001/jamapediatrics.2016.3926. Epub 2017 Feb 6.

- 44 hospitals
- 30 most common pediatric surgical conditions
- N=95,353
- Cost variation quantified after adjusting for differences in patient-level case-mix and hospital-level accounting methods

Prioritization

Framework: Define opportunities where variation between hospitals is great and relative cost-variation is high



Prioritization

Epidemiology / Population Estimates

- PHIS is a non-population based database
- Population estimates difficult, but some sub-populations
  - Epidemiology of quaternary diagnoses or procedures Epidemiology within children's hospitals

- Potential research topics…
  - What is the prevalence of a disease in the population?
  - How frequently is a procedure done in a population?
  - How often is a co-morbidity present among hospitalized children with a specific diagnosis?

Epidemiology / Population Estimates

The Care of Adult Patients in Pediatric EDs.

Samuels-Kalow M, Neuman MI, Rodean J, Marin J, Aronson PL, Hall M, Freedman SB, Morse RB, Cohen E, Simon HK, Shah SS, Berry JG, Alpern ER.

PMID PMID:30853574 *Academic Pediatrics* Nov – Dec 2019;19(8):942-947.

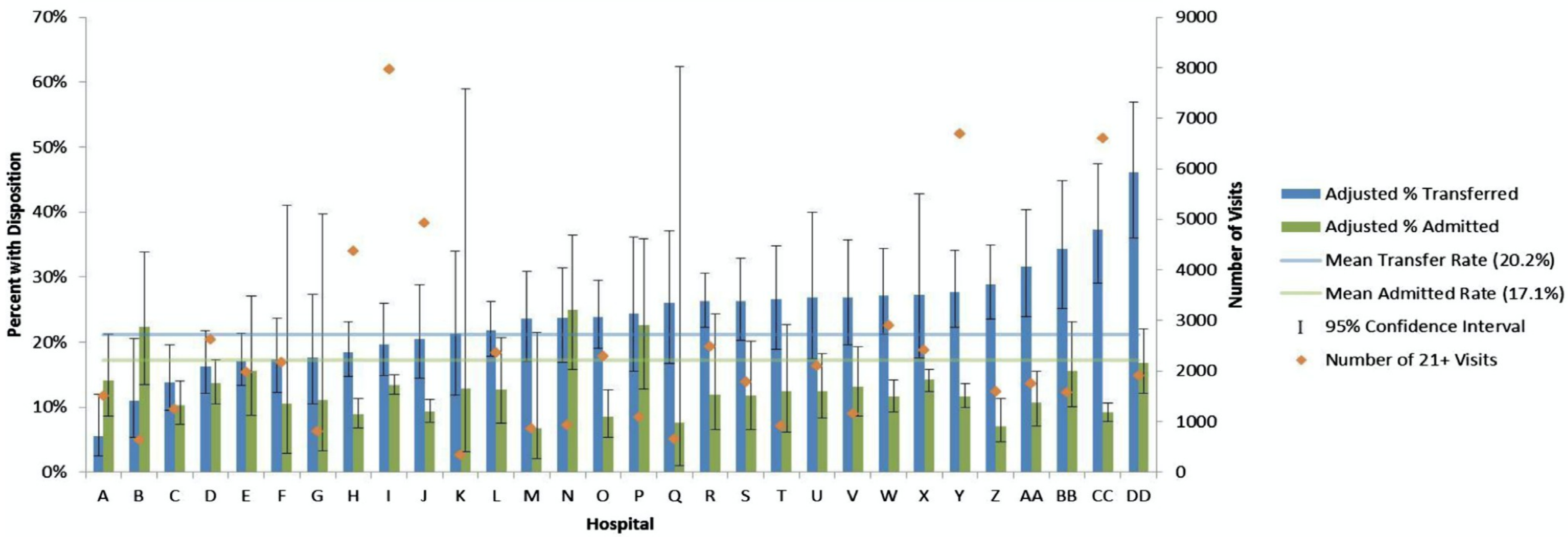


Figure. *Variation in admission and transfer rates for adult (21 years of age) patients among hospitals. The left-side y-axis represents the percentage of adult patients, and the right-side y-axis represents the number of adult visits. The x-axis identifies each included hospital. The blue bars are the adjusted* percentage of adult patients who were transferred, with error bars representing the 95% confidence interval. The green bars are the adjusted percentage of adult patients who were admitted, with error bars representing the 95% confidence interval. Orange circles demonstrate the adult volume by center. *Adjusted for model elements in Table 2.*

Drivers of cost

- Most administrative data sources capture charges, not costs
  - Costs are estimated using cost-to-charge ratios (hospital-level or department specific)

- Potential research topics…
  - Public vs. private expenditures
  - Incremental costs associated with comorbidities
  - Compare costs of treating with drug x versus drug y
  - Identify factors associated with increased cost

Drivers of Cost

Pediatric Severe Sepsis: Current Trends and Outcomes from the Pediatric Health Information Systems Database

Ruth A, McCracken CE, Fortenberry JD, Hall M, Simon HK. Hebbar KB. Pediatric Severe Sepsis: Database. *Pediatr Critical Care Medicine* PMID: 25226500 Nov. 2014; 15(9):828-38.

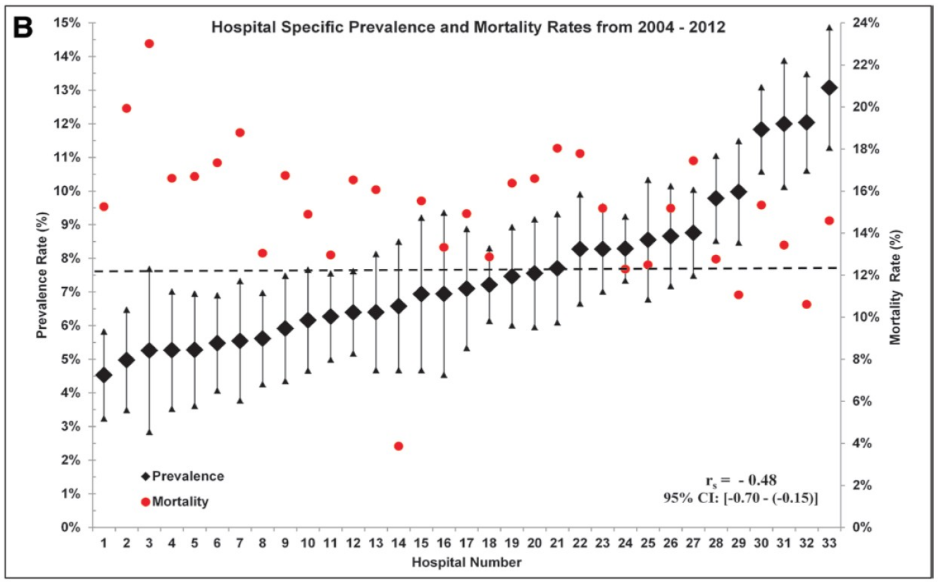


Figure 2. A, Change in overall prevalence and mortality rates of children with pediatric severe sepsis (PSS). Data are from 33 hospitals for which continuous data were available for the time period. Prevalence rates significantly increased ($p < 0.001$) and mortality rates significantly decreased ($p < 0.001$) over time. **B**, Hospital-specific prevalence and mortality for pediatric patients with severe sepsis. *Diamonds* represent prevalence, *triangles* represent 95% CIs, and *circles* represent mortality rates. There is significant negative correlation between prevalence and mortality ($r_s = -0.48$; 95% CI, -0.70 to -0.15; $p = 0.005$).

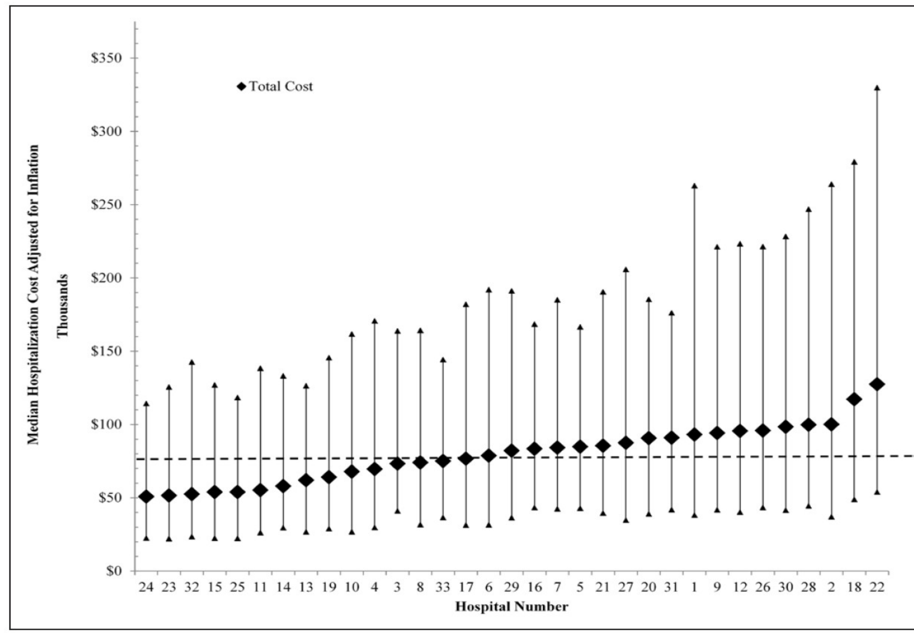
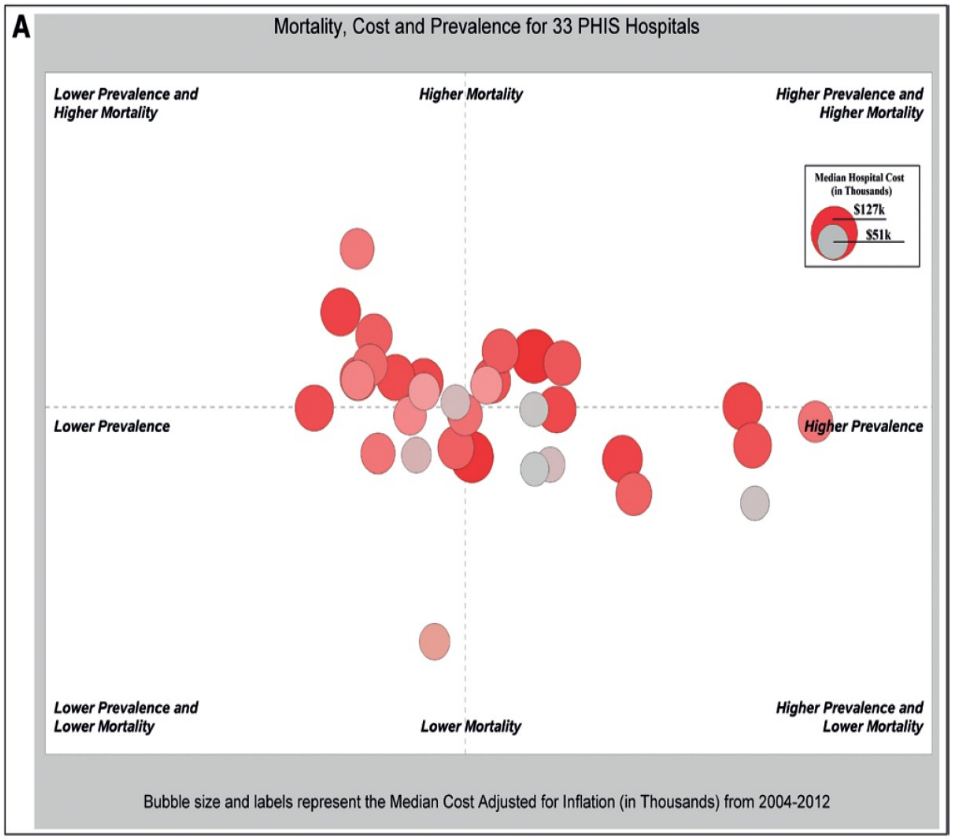


Figure 3. Median total hospitalization cost of patients with pediatric severe sepsis by hospital. *Diamonds* represent aggregate median costs from 2004 to 2012 after inflation, and *triangles* are 25th and 75th percentiles. *Dashed line* represents overall median cost ($77,598). Hospital number correlates with Figure 2.

Drivers of Cost



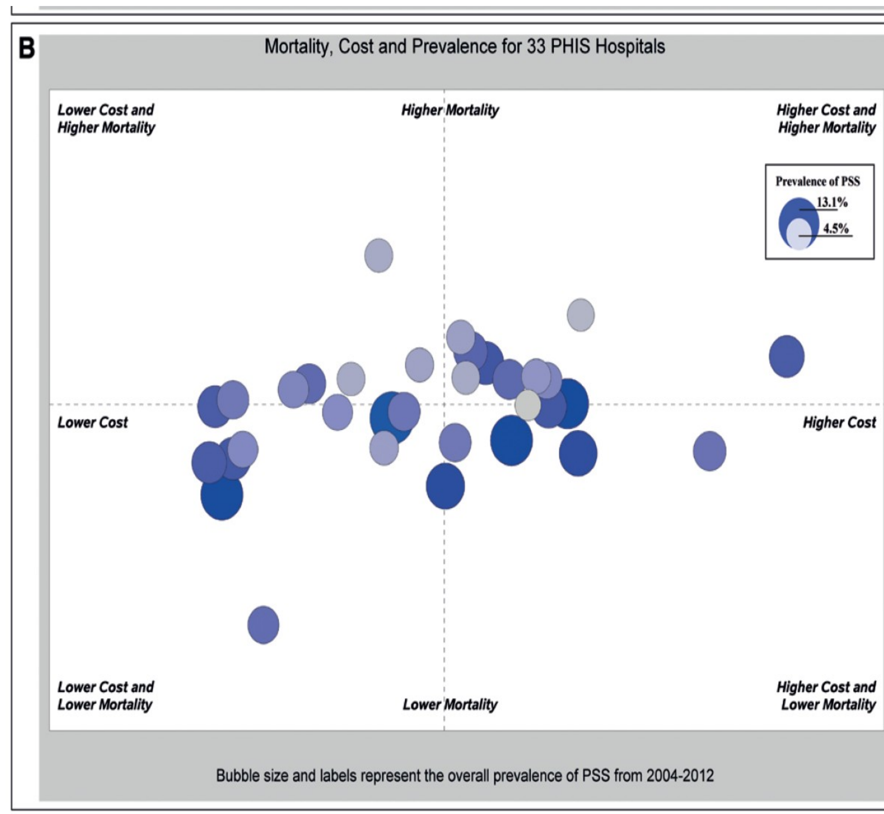


Figure 4. A, Association of individual center pediatric severe sepsis (PSS) prevalence, mortality, and cost. Horizontal axis represents median hospital prevalence, vertical axis represents median hospital mortality, and *bubble size* represents relative center median cost. Individual center prevalence was negatively correlated

Longitudinal Data Analysis

- PHIS can track patients across encounters within the same hospital

- Potential research topics…
  - Readmissions
  - Time-to-event analysis
  - Trends in admissions or seasonality

Longitudinal Data Analysis

THE JOURNAL OF PEDIATRICS • www.jpeds.com

ORIGINAL ARTICLES

Delayed Diagnoses in Children with Constipation: Multicenter Retrospective Cohort Study

Stephen B. Freedman, MDCM, MSc[1], Jonathan Rodean, MPP[2], Matthew Hall, PhD[2], Elizabeth R. Alpern, MD, MSCE[3], Paul L. Aronson, MD[4], Harold K. Simon, MD, MBA[5], Samir S. Shah, MD, MSCE[6], Jennifer R. Marin, MD[7], Eyal Cohen, MD, MSc[8], Rustin B. Morse, MD, MMM[9,10], Yiannis Katsogridakis, MD, MPH[3], Jay G. Berry, MD, MPH[11], and Mark I. Neuman, MD, MPH[12]

Objective The use of abdominal radiographs contributes to increased healthcare costs, radiation exposure, and potentially to misdiagnoses. We evaluated the association between abdominal radiograph performance and emergency department (ED) revisits with important alternate diagnosis among children with constipation.

Study design Retrospective cohort study of children aged <18 years diagnosed with constipation at one of 23 EDs from 2004 to 2015. The primary exposure was abdominal radiograph performance. The primary outcome was a 3-day ED revisit with a clinically important alternate diagnosis. RAND/University of California, Los Angeles methodology was used to define whether the revisit was related to the index visit and due to a clinically important condition other than constipation. Regression analysis was performed to identify exposures independently related to the primary outcome.

Results A total of 65.7% (185 439/282 225) of children with constipation had an index ED visit abdominal radiograph performed. Three-day revisits occurred in 3.7% (10 566/282 225) of children, and 0.28% (784/282 225) returned with a clinically important alternate related diagnosis. Appendicitis was the most common such revisit, accounting for 34.1% of all 3-day clinically important related revisits. Children who had an abdominal radiograph performed were more likely to have a 3-day revisit with a clinically important alternate related diagnosis (0.33% vs 0.17%; difference 0.17%; 95% CI 0.13-0.20). Following adjustment for covariates, abdominal radiograph performance was associated with a 3-day revisit with a clinically important alternate diagnosis (aOR: 1.39; 95% CI 1.15-1.67). Additional characteristics associated with the primary outcome included narcotic (aOR: 2.63) and antiemetic (aOR: 2.35) administration and underlying comorbidities (aOR: 2.52).

Conclusions Among children diagnosed with constipation, abdominal radiograph performance is associated with an increased risk of a revisit with a clinically important alternate related diagnosis. *(J Pediatr 2017;■■:■■-■■).*

an increased risk of a revisit with a clinically important alternate related diagnosis. (J Pediatr 2017;■■:■■-■■).

Longitudinal Data Analysis

Delayed Diagnoses in Children with Constipation: Multicenter Retrospective Cohort Study. **Freedman SB**, Rodean J, Hall M, Alpern ER, Aronson PL, Simon HK, Shah SS, Marin JR, Cohen E, Morse RB, Katsogridakis Y, Berry JG[1], Neuman MI[1]. J Pediatr. 2017 Jul;186:87-94.e16. doi: 10.1016/j.jpeds.2017.03.061. Epub 2017 Apr 28.

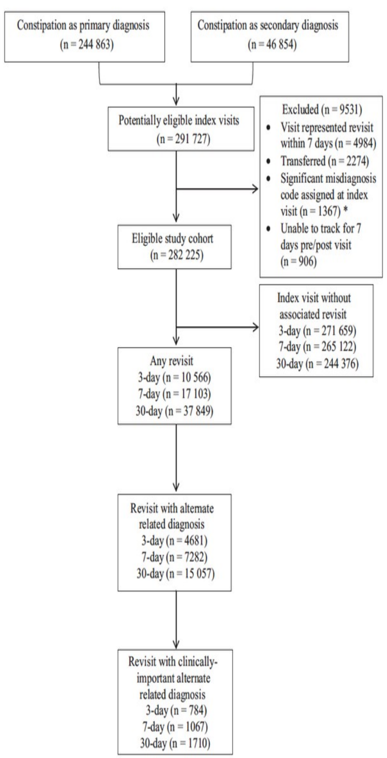


Figure 1. Study participants and outcomes. *Ineligible as significant alternate related diagnosis included in list of index visit diagnoses.

Variables	3-d revisit, OR (95% CI)	3-d revisit with alternate related diagnosis, OR (95% CI)	3-d revisit with clinically important alternate related diagnosis, OR (95% CI)
Demographics			
Age			
0-6 mo	1.15 (1.06-1.24)	0.96 (0.85-1.09)	0.53 (0.36-0.77)
7-12 mo	1.10 (0.99-1.23)	1.02 (0.86-1.20)	0.53 (0.32-0.88)
1-2 y	1.18 (1.11-1.25)	1.08 (0.98-1.18)	0.99 (0.79-1.23)
3-8 y	1.02 (0.97-1.07)	1.03 (0.96-1.10)	0.79 (0.67-0.94)
9-18 y	Ref	Ref	Ref
Sex			
Male	1.09 (1.05-1.13)	1.03 (0.97-1.09)	1.39 (1.21-1.61)
Female	Ref	Ref	Ref
Race or ethnic group			
Non-Hispanic white	Ref	Ref	Ref
Non-Hispanic black	0.91 (0.86-0.96)	0.90 (0.83-0.98)	1.06 (0.87-1.30)
Hispanic	0.93 (0.87-0.98)	1.03 (0.95-1.12)	1.25 (1.01-1.54)
Asian	1.07 (0.92-1.25)	1.31 (1.06-1.61)	1.51 (0.93-2.45)
Other	0.86 (0.79-0.93)	0.88 (0.78-0.98)	0.91 (0.68-1.22)
Payer			
Government	Ref	Ref	Ref
Private	0.93 (0.89-0.98)	1.01 (0.94-1.08)	1.21 (1.02-1.43)
Other	0.82 (0.76-0.88)	0.88 (0.79-0.98)	1.07 (0.83-1.36)
Previous diagnosis of constipation	1.43 (1.35-1.52)	1.10 (0.99-1.21)	0.85 (0.66-1.09)
Complex chronic condition	1.85 (1.75-1.97)	1.79 (1.63-1.95)	2.52 (2.09-3.04)
Year			
2004-2006	Ref	Ref	Ref
2007-2009	0.91 (0.86-0.97)	0.94 (0.85-1.03)	0.80 (0.65-0.99)
2010-2012	0.84 (0.79-0.90)	0.87 (0.79-0.95)	0.71 (0.57-0.88)
2013-2015	0.80 (0.75-0.85)	0.75 (0.68-0.83)	0.47 (0.37-0.59)
Season			
Spring	1.03 (0.98-1.09)	1.06 (0.98-1.16)	1.09 (0.89-1.33)
Summer	1.06 (1.00-1.12)	1.12 (1.03-1.22)	1.25 (1.02-1.53)
Fall	1.09 (1.03-1.15)	1.13 (1.04-1.23)	1.03 (0.84-1.26)
Winter	Ref	Ref	Ref
ED admission time			
12 a.m. to 7:59 a.m.	1.02 (0.96-1.09)	1.09 (0.99-1.19)	1.14 (0.92-1.42)
8 a.m. to 3:59 p.m.	Ref	Ref	Ref
4 p.m. to 11:59 p.m.	1.08 (1.04-1.13)	1.11 (1.04-1.18)	1.12 (0.96-1.31)
Diagnostic testing performed			
Abdominal/pelvic radiograph	1.10 (1.05-1.15)	1.16 (1.08-1.25)	1.40 (1.16-1.68)
Abdominal/pelvic ultrasound	1.01 (0.93-1.09)	1.10 (0.99-1.23)	0.81 (0.61-1.08)
Abdominal/pelvic CT	0.96 (0.83-1.11)	0.97 (0.80-1.18)	0.76 (0.49-1.17)
CBC	1.23 (1.14-1.34)	1.30 (1.15-1.45)	1.99 (1.58-2.50)
C-reactive protein or ESR	0.95 (0.86-1.05)	0.97 (0.85-1.12)	0.71 (0.53-0.96)
Serum electrolytes or AST or ALT or lipase	1.02 (0.93-1.13)	1.04 (0.91-1.18)	0.67 (0.50-0.89)
Medications administered			
Non-narcotic analgesic	1.46 (1.38-1.55)	1.57 (1.45-1.71)	1.98 (1.64-2.39)
Narcotic analgesic	1.71 (1.53-1.90)	1.87 (1.62-2.17)	2.63 (2.00-3.47)
Antiemetic	1.56 (1.46-1.67)	1.83 (1.66-2.01)	2.35 (1.92-2.89)
Enema or suppository or oral laxative	1.34 (1.29-1.40)	1.38 (1.30-1.47)	1.66 (1.43-1.92)

Utilization Variation

- Look for frequency of utilization (drugs, imaging, labs, etc.) in a population
- Variation in patient care within/across hospitals

- Potential research topics…
  - Disparities in care
  - Adherence to evidence-based guidelines
  - Evaluate the effect of clinical care guidelines (pre vs. post)
  - Impact of case volume on outcomes

Utilization Variation

Hospital-level compliance with asthma care quality measures at children's hospitals and subsequent asthma-related outcomes. Morse RB, Hall M, Fieldston ES, McGwire G, Anspacher M, Sills MR, Williams K, Oyemwense N, Mann KJ, Simon HK, Shah SS.JAMA. 2011 Oct 5;306(13):1454-60. doi: 10.1001/jama.2011.1385.PMID: 21972307

Hospital-Level Compliance With Asthma Care Quality Measures at Children's Hospitals and Subsequent Asthma-Related Outcomes

Rustin B. Morse, MD
Matthew Hall, PhD
Evan S. Fieldston, MD, MBA, MSHP
Gerd McGwire, MD, PhD
Melanie Anspacher, MD
Marion R. Sills, MD, MPH
Kristi Williams, MD
Naomi Oyemwense, BA
Keith J. Mann, MD
Harold K. Simon, MD, MBA
Samir S. Shah, MD, MSCE

Context The Children's Asthma Care (CAC) measure set evaluates whether children admitted to hospitals with asthma receive relievers (CAC-1) and systemic corticosteroids (CAC-2) and whether they are discharged with a home management plan of care (CAC-3). It is the only Joint Commission core measure applicable to evaluate the quality of care for hospitalized children.

Objectives To evaluate longitudinal trends in CAC measure compliance and to determine if an association exists between compliance and outcomes.

Design, Setting, and Patients Cross-sectional study using administrative data and CAC compliance data for 30 US children's hospitals. A total of 37 267 children admitted with asthma between January 1, 2008, and September 30, 2010, with follow-up through December 31, 2010, accounted for 45 499 hospital admissions. Hospital-level CAC measure compliance data were obtained from the National Association of Children's Hospitals and Related Institutions. Readmission and postdischarge emergency department (ED) utilization data were obtained from the Pediatric Health Information System.

Main Outcome Measures Children's Asthma Care measure compliance trends; postdischarge ED utilization and asthma-related readmission rates at 7, 30, and 90 days.

Results The minimum quarterly CAC-1 and CAC-2 measure compliance rates reported by any hospital were 97.1% and 89.5%, respectively. Individual hospital CAC-2 compliance exceeded 95% for 97.9% of the quarters. Lack of variability in CAC-1 and CAC-2 compliance precluded examination of their association with the specified outcomes. Mean CAC-3 compliance was 40.6% (95% CI, 34.1%-47.1%) and 72.9% (95% CI, 68.8%-76.9%) for the initial and final 3 quarters of the study, respectively. The mean 7-, 30-, and 90-day postdischarge ED utilization rates were 1.5% (95% CI, 1.3%-1.6%), 4.3% (95% CI, 4.0%-4.5%), and 11.1% (95% CI, 10.5%-11.7%) and the mean quarterly 7-, 30-, and 90-day readmission rates were 1.4% (95% CI, 1.2%-1.6%), 3.1% (95% CI, 2.8%-3.3%), and 7.6% (95% CI, 7.2%-8.1%). There was no significant association between overall CAC-3 compliance (odds ratio [OR] for 5% improvement in compliance) and postdischarge ED utilization rates at 7 days (OR, 1.00; 95% CI, 0.98-1.02), 30 days (OR, 0.97; 95% CI, 0.90-1.04), and 90 days (OR, 0.96; 95% CI, 0.77-1.18). In addition, there was no significant association between overall CAC-3 compliance (OR for 5% improvement in compliance) and readmission rates at 7 days (OR, 1.00; 95% CI, 0.99-1.02), 30 days (OR, 0.99; 95% CI, 0.96-1.02), and 90 days (OR, 1.01; 95% CI, 0.90-1.12).

Conclusion Among children admitted to pediatric hospitals for asthma, there was high hospital-level compliance with CAC-1 and CAC-2 quality measures and moderate compliance with the CAC-3 measure but no association between CAC-3 compliance and subsequent ED visits and asthma-related readmissions.

JAMA. 2011;306(13):1454-1460 www.jama.com

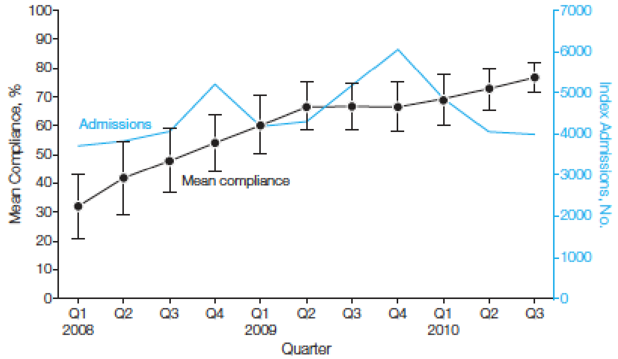
Joint Commission–accredited hospitals submit process measure compliance data, many of which are publicly reported, for a variety of common diagnoses, such as acute myocardial infarction, congestive heart failure, and pneumonia.[1] Until recently, none of the more than 50 Joint Commission core measures evaluated care provided to hospitalized children.

To address this shortcoming, the Joint Commission, in collaboration with the Child Health Corporation of America (CHCA), the National Association of Children's Hospitals and Related Institutions (NACHRI), and Medical Management Planning Inc, developed the Children's Asthma Care (CAC) measure set.[2] This set of process measures evaluates at the hospital level whether patients aged 2 to 17 years admitted with an asthma exacerbation received relievers (CAC-1) and systemic corticosteroids (CAC-2) during the admission and whether they were discharged with a complete home management plan of care (HMPC) (CAC-3). The CAC measures were endorsed by the National Quality

See also pp 1481 and 1487.

Author Affiliations are listed at the end of this article.
Corresponding Author: Rustin B. Morse, MD, Phoenix Children's Hospital, University of Arizona College of Medicine, 1919 E Thomas Rd, Phoenix, AZ 85016 (rmorse@phoenixchildrens.com).

Figure 1. Children's Asthma Care Measure 3 Compliance and Admission Volume Over Time



Error bars indicate 95% CIs.

Comparative Effectiveness

Low-Value Diagnostic Imaging Use in the Pediatric Emergency Department in the United States and Canada. Cohen E, Rodean J, Diong C, Hall M, Freedman SB, Aronson PL, Simon HK, Marin JR, Samuels-Kalow M, Alpern ER, Morse RB, Shah SS, Peltz A, Neuman MI.JAMA Pediatr. 2019 3;173(8):e191439.PMID: 31157877

Note: Here we used PHIS versus Canadian database

Objective: To compare overall and low-value use of diagnostic imaging across pediatric ED visits in Ontario, Canada, and the United States.

Design, setting, and participants: This study used administrative health databases from 4 pediatric EDs in Ontario and 26 in the United States in calendar years 2006 through 2016. Individuals 18 years and younger who were discharged from the ED, including after visits for diagnoses in which imaging is not routinely recommended (eg, asthma, bronchiolitis, abdominal pain, constipation, concussion, febrile convulsion, seizure, and headache) were included. Data analysis occurred from April 2018 to October 2018.

Main outcome and measures: Overall and condition-specific low-value imaging use. Three-day and 7-day rates of hospital admission and those admissions resulting in intensive care, surgery, or in-hospital mortality were assessed as balancing measures.

Results: A total of 1 783 752 visits in Ontario and 21 807 332 visits in the United States were analyzed. Compared with visits in the United States, those in Canada had lower overall use of head computed tomography (Canada, 22 942 [1.3%] vs the United States, 753 270 [3.5%]; $P < .001$), abdomen computed tomography (5626 [0.3%] vs 211 018 [1.0%]; $P < .001$), chest radiographic imaging (208 843 [11.7%] vs 3 408 540 [15.6%]; $P < .001$), and abdominal radiographic imaging (77 147 [4.3%] vs 3 607 141 [16.5%]; $P < .001$). Low-value imaging use was lower in Canada than the United States for multiple indications, including abdominal radiographic images for constipation (absolute difference, 23.7% [95% CI, 23.2%-24.3%]) and abdominal pain (20.6% [95% CI, 20.3%-21.0%]) and head computed tomographic scans for concussion (22.9% [95% CI, 22.3%-23.4%]). Abdominal computed tomographic use for constipation and abdominal pain, although low overall, were approximately 10-fold higher in the United States (0.1% [95% CI, 0.1%-0.2%] vs 1.2% [95% CI, 1.2%-1.2%]) and abdominal pain (0.8% [95% CI, 0.7%-0.9%] vs 7.0% [95% CI, 6.9%-7.1%]). Rates of 3-day and 7-day post-ED adverse outcomes were similar.

Conclusions and relevance: Low-value imaging rates were lower in pediatric EDs in Ontario compared with the United States, particularly those involving ionizing radiation. Lower use of imaging in Canada was not associated with higher rates of adverse outcomes, suggesting that usage may be safely reduced in the United States.

PHIS Training Options

There are two types of training (depending on need) to access PHIS. Both are free with CHCA participation, the first is much more involved.

a) To be a PHIS reporter (i.e. write reports against PHIS) using Business Objects, there is an online summer course upcoming. Contact for more info: Analytics.Support@childrenshospitals.org and reference PHIS REPORTER ACCESS

b) To simply extract raw data from PHIS to be analyzed elsewhere (this is most common for researchers), you need training for using the Cohort Builder. There is a series of 4-5 online on-demand videos to watch. Contact for more info: Analytics.Support@childrenshospitals.org and reference COHORT BUILDER ACCESS

Individuals with Local reporter PHIS Access

- Primary Contact
  - Robert Palmer PhD Director, Outcomes and Quality Measurement (Robert.Palmer@choa.org)
- Local Children's PHIS Reporters recognized by CHA
- Adams, Destinee Data Management Coordinator
- Braykov, Nikolay BI Quantitative Analyst
- Cash, Lisa   Quality Analysis Data Engineer
- Edmond, Mary Manager of Analysis and Transformation
- Giannopoulos, Helen Clinical Pharmacy Manager, Egleston Campus
- Hua, Hannah BI Quantitative Analyst
- McCarter, Andrea BI Quantitative Analyst
- McRae, William Outcomes Analyst
- Palmer, Robert Director, Outcomes and Quality Measurement
- Plant, Juanita Government Profiling Specialist
- Rocks, Greg Business Analyst
- Sterner-Allison, Jennifer Pharmacy Clinical Manager
- Sullivan, Dennis Quality Analysis Data Engineer
- Sumrall, Nathan Medical Economist
- Tejedor-Sojo, Javier Medical Director Outcomes and Population Health
- Wong, Emily BI Quantitative Analyst
- Others???

Joining Potential National Research Groups

- **<u>Getting involved in a PHIS research group</u>**: Contact: Research@childrenshospitals.org
  - (Matt and a few others monitor this site)
  - Alternatively Matt.Hall@childrenhospitals.org

Utilizing CHA-PHIS Database from Research Idea to Publication-First Phase

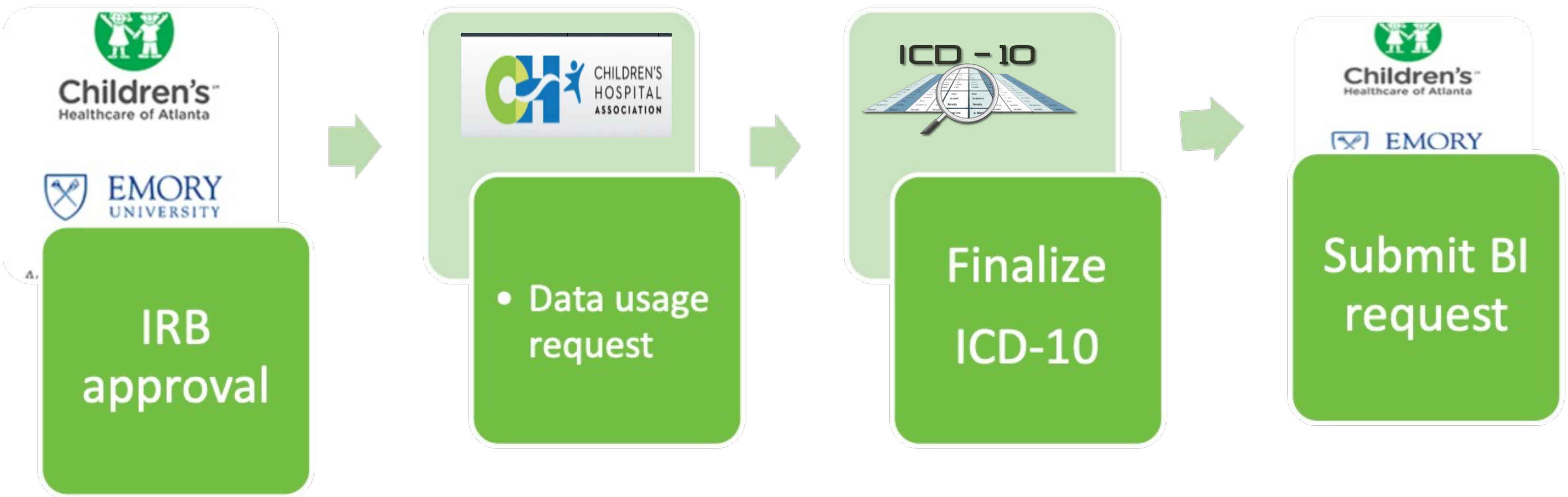
Research Question

Research Datasets

- KID
- NED
- EHR
- PHIS

Talk to Outcome Center

Utilizing CHA-PHIS Database from Research Idea to Publication-First Phase



Utilizing CHA-PHIS Database from Research Idea to Publication- Second Phase

Data acquisition CHOA BI Analyst

Obtain files to CHOA email

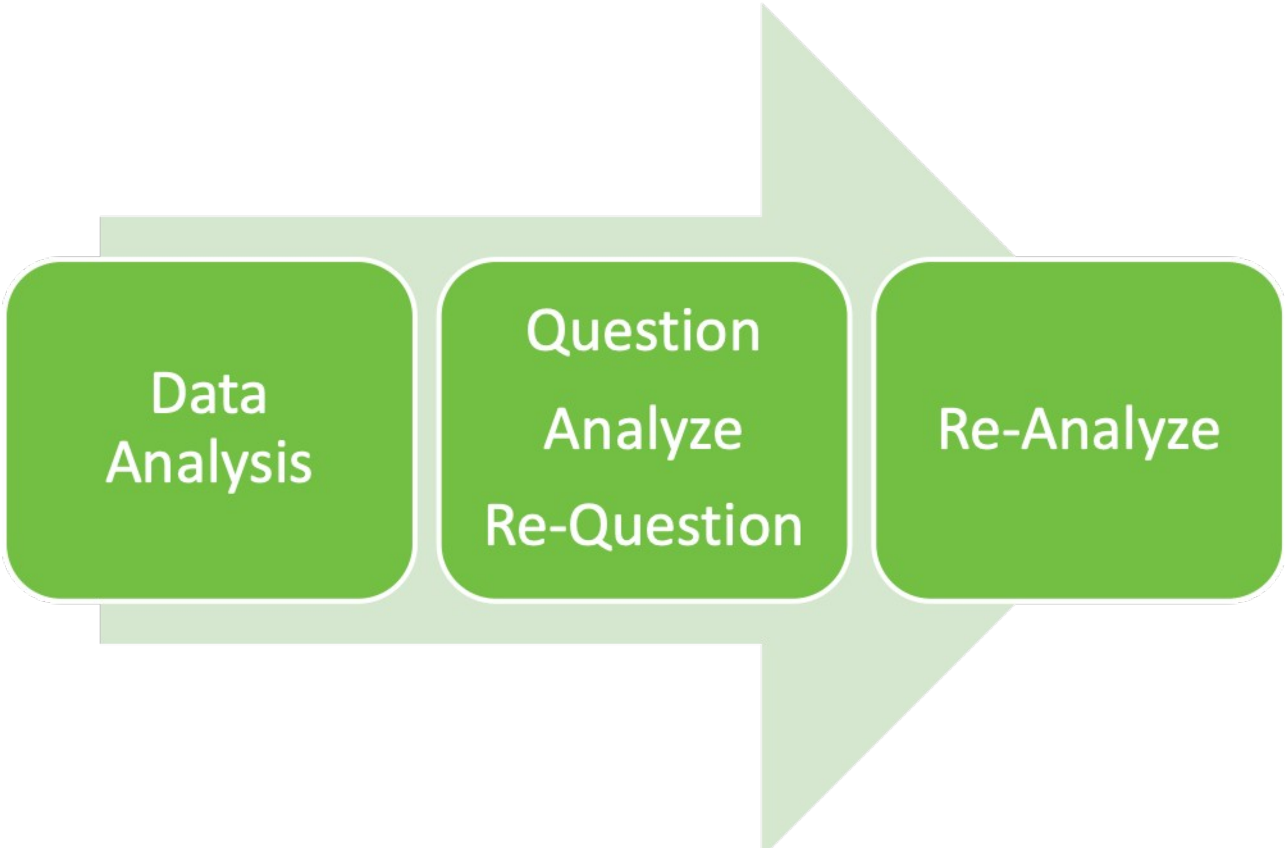
Upload to data analytic software

Question

Analyze

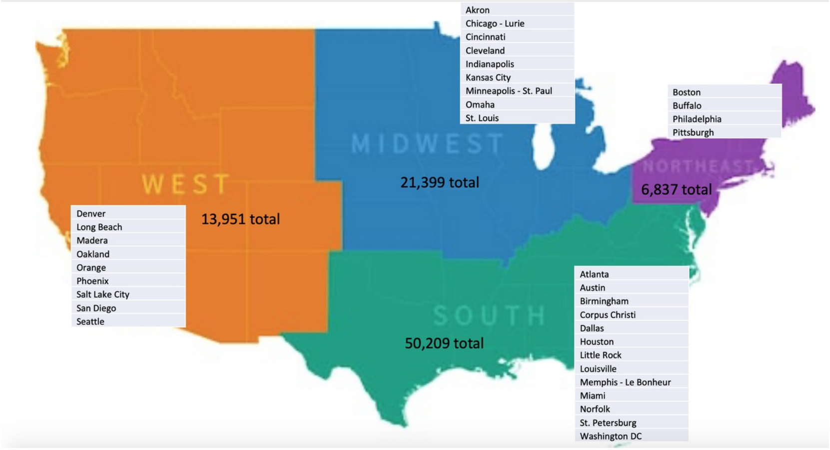
Re-Question

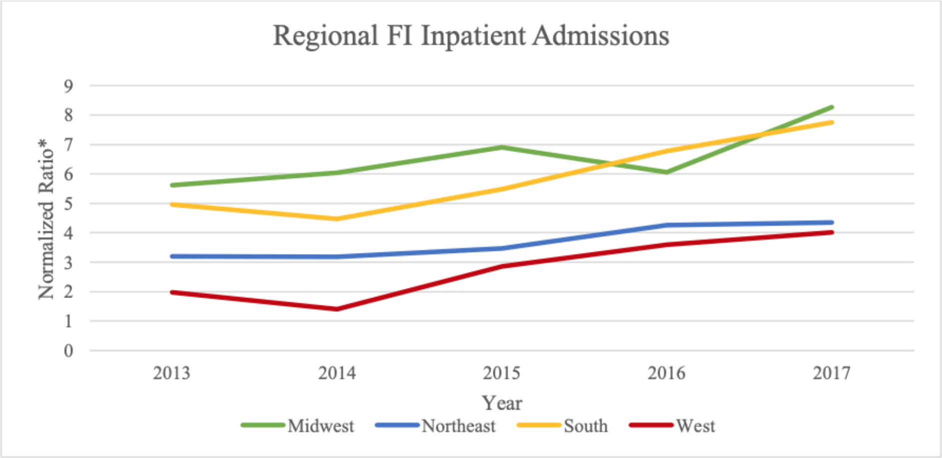
Utilizing CHA-PHIS Database from Research Idea to Publication- Third Phase



Utilizing CHA-PHIS Database from Research Idea to Publication-
Success Phase-Data

Variable		Overall N = 92392	Firearm Injuries N = 3247	Motor Vehicle Injuries N = 89145	P Value
Patient Age	0-2	14636 (15.84%)	184 (5.67%)	14452 (16.21%)	<.001
	3-5	14635 (15.84%)	272 (8.38%)	14363 (16.11%)	
	6-10	25169 (27.24%)	464 (14.29%)	24705 (27.71%)	
	11-14	17700 (19.16%)	974 (30.00%)	16726 (18.76%)	
	15-18	20252 (21.92%)	1353 (41.67%)	18899 (21.20%)	
Patient Gender*	Female	48691 (52.86%)	674 (20.98%)	48017 (54.01%)	<.001
	Male	43428 (47.14%)	2539 (79.02%)	40889 (45.99%)	
Patient Ethnicity**	Hispanic or Latino	16549 (19.64%)	295 (10.20%)	16254 (19.98%)	<.001
	Not Hispanic or Latino	67702 (80.36%)	2597 (89.80%)	65105 (80.02%)	
Patient Race	Black	41073 (44.46%)	2071 (63.78%)	39002 (43.75%)	<.001
	White	38036 (41.17%)	880 (27.10%)	37156 (41.68%)	
	Other***	13283 (14.37%)	296 (9.12%)	12987 (14.57%)	
Hospital Location	Midwest	21399 (23.16%)	1068 (32.89%)	20331 (22.81%)	<.001
	Northeast	6837 (7.40%)	260 (8.01%)	6577 (7.38%)	
	South	50205 (54.34%)	1552 (47.80%)	48653 (54.58%)	
	West	13951 (15.10%)	367 (11.30%)	13584 (15.24%)	
Patient Insurance+	Public	53150 (58.22%)	2398 (75.01%)	50752 (57.61%)	<.001
	Private	26048 (28.53%)	536 (16.77%)	25512 (28.96%)	
	Other	12092 (13.25%)	263 (8.23%)	11829 (13.43%)	
Predicted Median Income++		36657 (28974, 47442)	32051 (25985, 40049)	36848 (28974, 47684)	<.001





CHILDREN'S HOSPITAL

Health Services Research Academy

Progress through interactive, on-demand modules that offer a step-by-step guide on how to do health services research.

Put learning into practice with expert mentors and statistical support.

Acquire the practical fundamentals of health services research to succeed in your research career.

childrenshospitals.org/researchacademy

Children's Hospital Association

600 13th St., NW | Suite 500 | Washington, DC 20005 | 202-753-5500

16011 College Blvd. | Suite 250 | Lenexa, KS 66219 | 913-262-1436

www.childrenshospitals.org

CHA Health Services Research Academy

This teaches the fundamentals of doing HSR with any database. It is a pay to participate program, and participation is tiered based on the individual's needs.

3 Tiers (about 27 participants this year)

Run by Matt Hall

- 1) 25 online HSR modules
  - About ½ hr each (~2k)
- 2) Modules
  - plus 1 consult/mo (~6k)
- 3) Modules
  - plus 2 consults/mo
  - ongoing stats project support (~12 K)

PHIS for Health Services Research

???