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May 13th, 11:30 AM - 1:30 PM

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Collins, Megan E.; Hall, Matt; Stephens, John; and Markham, Jessica L., "Understanding Inpatient Diagnostic Imaging Use in Children's Hospitals to Prioritize Stewardship Efforts" (2024). *Research Days*. 7.

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Understanding Inpatient Diagnostic Imaging Use in Children's Hospitals to Prioritize Stewardship Efforts

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Background

- Healthcare waste has estimated annual costs of over \$760 billion in the United States
- The most prevalent and costly imaging studies among hospitalized children are not known

Objective

- To describe diagnostic imaging studies among hospitalized children with the highest prevalence, cost, rates of repetition, and hospital variation

Methods

- Retrospective cohort study of hospitalized children <18 years of age
 - 1/1/2021 to 12/31/2022
 - 45 hospitals in PHIS
- All radiologic imaging for inpatient and observation encounters using billing codes
- Images grouped by modality and body location
 - Excluded images classified as other/unspecified body location
- Intraclass correlation coefficient used to measure variation across hospitals after adjusting for age and severity

Results

Table: Top 10 Prevalence, Costs, and Rates of Repeat Testing

Imaging Modality & Body Location	Rank by Prevalence	Rank by Cost	Encounters with Images N (%)	Encounters with >1 Image N	Total Cost (\$)	Hospital Variation (ICC)
Chest XR	1	2	479650 (31.5)	172380	278,347,423	0.01
Abdominal XR	2	4	234249 (15.4)	93599	122,186,784	0.02
Cardiovascular US	3	1	196768 (12.9)	127788	546,933,023	0.01
Abdominal US	4	8	137238 (9.0)	21545	62,004,211	0.21
Bone/Joint XR	5	10	131866 (8.7)	51829	45,879,777	0.02
Head CT	6	6	100369 (6.6)	13988	103,213,482	0.04
Genitourinary US	7	12	98719 (6.5)	16700	43,722,749	0.20
Head MRI	8	3	95984 (6.3)	18860	196,254,562	0.02
Head US	9	13	58506 (3.8)	23588	43,558,833	0.28
Abdominal CT	10	7	55679 (3.7)	4601	99,578,208	0.03

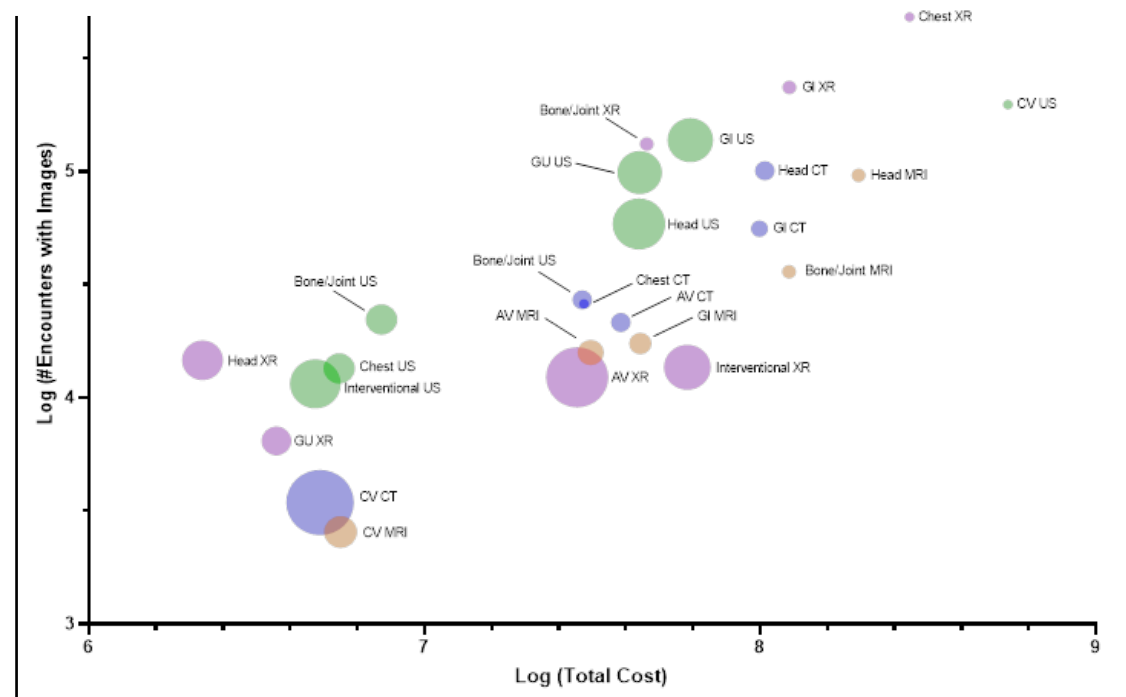


Figure: Prevalence, Cost, and Variation in Imaging Use for the 25 Most Prevalent Diagnostic Imaging Studies

Bubbles plotted based on prevalence of test use and cost (US \$). Bubble size indicates variation across hospitals in imaging use as measured with the ICC (i.e., larger bubble size means greater variation). Bubbles are color-coded based on type of imaging modality.

Results

- 1,523,343 encounters
- 59.1% had diagnostic imaging
- Most frequently repeated imaging studies: chest XR, cardiovascular US (i.e., echocardiogram), abdominal XR
- Costliest individual imaging studies: cardiovascular US, chest XR, head/brain MRI
- Highest interhospital variability: head US, interventional XR, abdominal US

Conclusions

- Chest XR and cardiovascular US among the most prevalent, costly, and frequently repeated imaging studies.
- Abdominal XR, abdominal US, bone/joint XR, head/brain CT, and head/brain MRI were high in both prevalence and cost
- Ionizing radiation exposure:
 - 5 of the 10 most used imaging techniques
 - 4 of the 10 most repeated imaging techniques

