

## Appendix C

# Children's Outcomes

### The Need for Better Clinical Measures in Pediatrics

James Todd, MD and Carl Armon, MSPH

An editorial in the New England Journal of Medicine this week concludes: "until our performance measurement system is based on clinically relevant information and targets high priority care, performance measurement is likely to remain a great idea that is more of a distraction than a benefit."<sup>1</sup> This mimics an increasing concern in pediatrics that national efforts to improve quality and patient safety may be creating measures that may not actually be good measures or useful in improving quality. When JCAHO announced that it would hold all hospitals accountable for reporting their *Core Measures* several years ago our major pediatric institutions got together and made the oft-quoted case that "children are not little adults." This was important because JCAHO wanted to hold pediatric hospitals accountable for ensuring that every patient with community-acquired pneumonia was started on antibiotics in spite of the fact that most children with pneumonia have a viral not a bacterial illness. We were successful in convincing them, and instead developed a number of asthma core measures that are much more relevant and will be implemented this year. Increasing measurement and reporting are inevitable but we must make continued efforts to be sure that we're developing good measures.

Another recent example is the proposed application of AHRQ Pediatric Quality Indicators (PDIs [also called PSIs] ) to hospital discharge data in Colorado. The AHRQ desires to: "carefully define indicators using administrative data, establish validity and reliability, detect bias and design appropriate risk adjustment, and overcome challenges of implementation and use. Four factors—differential epidemiology of child healthcare relative to adult healthcare, dependency, demographics, and development—can pervade all aspects of children's healthcare; simply applying adult indicators to younger age ranges is insufficient."<sup>2</sup> The ORYX and Pediatric Core Measures of JCAHO both recognize the importance of pediatric-specific measures and comparing like populations (i.e. children's hospitals). However, there is a continuing risk of misinforming the public if modified adult measures like the PSIs are applied to pediatric populations and/or inter-hospital comparisons are made because:

- Most PDIs are measures of rare events.
- Incidence rates of the PDIs are not denominated by the true populations at risk.
- Children's hospitals have unique populations not adequately adjusted for risk by case-mix indexing methods.
- Experts in PDI development and evaluation have expressly warned against inter-hospital comparisons.

<sup>1</sup> Hayward R. Performance Measurement in Search of a Path. NEJM 2007; 356, 951-953.

<sup>2</sup> [http://www.qualityindicators.ahrq.gov/pdi\\_overview.htm](http://www.qualityindicators.ahrq.gov/pdi_overview.htm)

**ORYX and Pediatric Core Measures of JCAHO both recognize the importance of comparing like populations (i.e. children's hospitals):** It was recognized very early in the ORYX process that its value was primarily for internal improvement based on repetitive measurement. External comparisons were of little value and often misleading unless children's hospitals were compared to similar institutions.<sup>2</sup> *Core Measures* were specifically developed for pediatric populations because the application of adult measures gave grossly misleading results. To avoid institutional population bias, JCAHO *Core Measures* focused on specific diagnostic populations-at-risk (e.g. asthma) rather than general hospital populations.

#### **Most current indicators are measures of rare events:**

Rare events may not be preventable or may be at highest risk in specific populations and/or those not adequately reflected by case-mix adjustments. As documented by Sedman et al.: "*PSI events are relatively rare in children's hospitals; therefore, adequate analysis of true variance among hospitals is difficult.*"<sup>3</sup> Coding for such rare events may be imprecise.<sup>4</sup>

#### **Incidence rates of the PDIs are not denominated by reasonable approximations of the true populations at risk:**

True incidence is measured by dividing the total number of adverse events by the number of patients actually "at risk" for such an event (see Table 1 on next page). Hospitals caring for a large number of patients truly at risk will have a higher numerator of specific adverse events and a denominator that is not diluted by non-risk patients, resulting in a falsely elevated incidence rate when compared to hospitals that don't usually care for high risk patients. By adding substantial numbers of non-risk individuals to the denominator (i.e. by using whole hospital discharge populations) a bias against the institution caring for more high risk patients is introduced that can not be adjusted by standard "case-mix" methods which only acknowledge generic effects on the denominator and, even-so, not for patients truly "at risk". This can result (and has) in highly misleading

<sup>3</sup> Sedman, Harris, Schulz, Schwalenstocker, Remus, Scanlon, and Vinita Bahl Relevance of the Agency for Healthcare Research and Quality Patient Safety Indicators for Children's Hospitals *Pediatrics* 2005; 135-145

<sup>4</sup> Polancich S, Restrepo E, Prosser J. Cautious use of administrative data for decubitus ulcer outcome reporting. *Am J Med Qual* 2006;21(4):262-8.

comparisons that penalize institutions that care for high-risk patients potentially misinforming consumers.<sup>5</sup>

**Table 1: Failure of case mix index to correct for fundamental at-risk population differences.**

	Hospital A	Hospital B	Hosp A/B	Mislead Factor
Total Patients	1100	1000		
Rehab Patients	100	2		
# Decubiti in Rehab Pts	10	2		
# Decubiti in All Others	1	1		
<b>Decubitus Rate/1000</b>				
True Rate in At Risk Patients	100	1000	0.1	None
<b>Whole Hospital Rate</b>				
Unadjusted	10.0	3.0	3.3	33
Hosp A Adjusted to CMI = 1.1	9.1	3.0	3.0	30
Hosp A Adjusted to CMI = 1.5	6.7	3.0	2.2	22
Hosp A Adjusted to CMI = 2.0	5.0	3.0	1.7	17
Hosp A Adjusted to CMI = 3.0	3.3	3.0	1.1	11

**Children’s hospitals have unique populations not adequately adjusted for risk by case-mix indexing methods:** A comparison of all pediatric discharges < 18 yrs in Colorado for 2005 shows that The Children’s Hospital is significantly different from all remaining Colorado hospital discharges (see table below) for most major diagnostic categories in: length of stay, severity, age, and number of procedures. Adverse event numerators are falsely elevated by selective referral of high risk patients (e.g. ruptured appendix, rehab) to TCH for services not available at other institutions. These differences can not be adjusted using standard case-mix measures (see above) especially when using whole hospital discharge populations as the denominator. Current PDI methods will adversely bias both the numerator and denominator of rare event indicators for institutions caring for high-risk individuals. Although potentially useful for intra-hospital quality improvement, inter-hospital comparisons would fundamentally misinform insurers and consumers potentially leading to an increase in avoidable adverse outcomes.

**Table 2: Differences between TCH and other Colorado Hospitals in Major Diagnostic Categories (MDCs)**

MDC	N	LOS	p-value	risk ratio	Severity	p-value	risk ratio	Age	p-value	risk ratio	# px codes	p-value	risk ratio
1	883	5.38	<0.001	1.16	2.16	<0.001	1.21	6.53	<0.001	0.57	1.95	<0.001	1.37
2	38	3.61	0.004	1.40	1.49	0.662	0.94	6.39	0.023	0.69	1.58	0.195	1.16
3	408	3.45	<0.001	1.74	1.70	<0.001	1.23	3.61	<0.001	0.56	1.44	<0.001	1.55
4	1735	5.08	<0.001	1.76	1.8	<0.001	1.53	4.33	<0.001	1.16	0.87	<0.001	3.63
5	369	8.47	<0.001	1.96	2.65	<0.001	1.20	4.58	<0.001	0.41	4.51	<0.001	1.94
6	686	5.36	<0.001	1.90	1.62	<0.001	1.24	5.89	<0.001	0.86	1.71	<0.001	1.90
7	139	5.76	<0.001	1.81	2.4	<0.001	1.44	7.28	<0.001	0.48	2.34	<0.001	1.72
8	669	3.86	<0.001	1.30	1.67	0.022	1.05	9.21	<0.001	0.68	2.62	<0.001	1.22
9	202	4	<0.001	1.57	1.43	0.028	1.09	6.08	<0.001	0.58	0.9	0.588	0.99
10	250	5.26	<0.001	2.22	2	<0.001	1.18	7.78	<0.001	0.81	0.74	<0.001	2.39
11	210	6.33	<0.001	2.44	1.97	<0.001	1.19	6.97	<0.001	0.69	1.72	<0.001	1.64
12	10	5.4	0.151	2.32	2.1	0.17	1.29	7.2	0.022	0.54	2.6	0.096	1.68
13	27	3.07	0.191	1.27	1.63	0.137	1.16	12.22	<0.001	0.73	1.48	0.023	1.41
16	259	5.25	<0.001	1.64	2.27	<0.001	1.20	7.58	<0.001	0.77	1.37	<0.001	1.83
17	335	5.94	0.378	1.10	2.03	0.924	1.00	9.36	<0.001	0.70	2.78	0.025	0.91
18	296	6.49	<0.001	1.86	1.85	0.037	1.17	4.31	0.03	0.76	1.65	0.001	1.56
19	736	8.46	<0.001	1.53	1.72	<0.001	1.17	12.69	<0.001	0.79	0.18	<0.001	4.50
20	7	5.57	0.345	0.99	2.17	0.251	1.32	13.71	0.009	0.79	0.86	0.919	1.65
21	90	3.83	<0.001	1.92	2.32	<0.001	1.30	9.3	<0.001	0.54	1.64	<0.001	2.25
22	20	5.7	0.383	1.33	1.68	0.917	0.99	3.9	0.002	0.98	2.15	0.143	2.56
23	70	15.01	0.219	1.09	1.19	0.11	0.84	6.44	<0.001	0.65	2.31	<0.001	2.48
25	33	9.85	0.313	1.25	2.52	0.015	0.86	9.06	<0.001	0.55	3	0.114	0.65

**Experts in PDI development and evaluation have expressly warned against inter-hospital comparisons of PDIs (PSIs) in**

<sup>5</sup> Grobman WA, Feinglass J, Murthy S. Are the Agency for Healthcare Research and Quality obstetric trauma indicators valid measures of hospital safety? *Am J Obstet Gynecol* 2006;195(3):868-74.

**peer-reviewed publications:** Because of the limitations documented above, there is no published support for the inter-hospital comparison of PDIs. To the contrary, as emphasized by Miller et al.: “The PSIs are a set of intuitive, administrative database indicators of potential patient safety events. They are appropriate for internal quality improvement efforts but are not intended for purchasing decisions, sanctioning individual institutions, or public reporting.”<sup>6</sup> This observation has been reinforced by Sedman et. al. who, after evaluation of the PDIs using the NACHRI database, emphasized: “this underscores the appropriate use of the PSIs as institutional case-finding tools aimed at internal quality improvement, as opposed to use for directly comparing individual institutions especially in public reports.”<sup>2</sup>

**Conclusion:** In spite of the early enthusiasm for comparing hospital outcomes many proposed measures fail to meet the AHRQ’s own criteria to: “detect bias and design appropriate risk adjustment, and overcome challenges of implementation and use.” Most should not be used for inter-hospital comparisons but some may be useful for internal hospital improvement. JACHO pediatric-specific core measures are better designed for inter-hospital comparison because they had clinical pediatric input from the beginning and utilize disease-specific denominators.

Similar conclusions can be reached for many, if not most, of the proposed quality and/or patient safety measures now being proposed for pediatric application at a national level. It is important that we spend our time on the front end developing good measures or we will find ourselves fending off bad ones.

**EDITOR:**

Carolyn Brock, Program Assistant  
The Children’s Hospital, Dept. of Epidemiology, B-276  
1056 E. 19<sup>th</sup> Avenue, Denver, CO 80218  
Phone: 303-861-6412; FAX: 303-837-2631

[brock.carolyn@tchden.org](mailto:brock.carolyn@tchden.org)  
<http://www.thechildrenshospital.org>

<sup>6</sup> Marlene R. Miller; Anne Elixhauser; and Chunliu Zhan. Patient Safety Events During Pediatric Hospitalizations *Pediatrics* 2003;111;1358-1366

