BRIEF REPORT

The Scope and Trends of Pediatric Hospitalizations in Texas, 2004–2010

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ABSTRACT

OBJECTIVE: To examine demographics and trends of financial cost and prominent diseases/conditions resulting in inpatient hospitalizations for infants, children, and adolescents in Texas between 2004 and 2010.

METHODS: Longitudinal retrospective cross-sectional study using the Texas Hospital Inpatient Discharge Database, including all pediatric hospitalizations in the state of Texas, 2004 to 2010.

RESULTS: Texas has an average of 591 571 pediatric hospitalizations per year. Birth was the most common reason for hospitalization, representing 64% of all pediatric hospitalization annually in Texas. Respiratory illnesses were the most common discharge diagnosis for hospitalized children ages 1 month to 9 years and demonstrated a 2% decrease over the study period. The rate of hospitalizations for digestive conditions and childbirth also demonstrated a decrease over this time frame: 4.7% and 3.0%, respectively. The rate of mental illness diagnoses increased 2.5% over the time frame and represented the most common discharge diagnosis for children aged 10 to 14. Childbirth was the most common reason for hospitalization for adolescents aged 15 to 17 years. There was no increase in total cost of pediatric hospitalizations over the time period under study.

CONCLUSIONS: After birth, respiratory illnesses represent the most common reason for hospitalization for children (between 1 month and 10 years of age) in Texas. Mental health conditions and childbirth represent the most common reason for hospitalization for young adolescents (10–14 years) and older adolescents (15–17 years), respectively.

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www.hospitalpediatrics.org
DOI:10.1542/hpeds.2014-0105

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HOSPITAL PEDIATRICS (ISSN Numbers: Print, 2154-1663; Online, 2154-1671).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Dr. Greeley was supported by Award Number K23HD065872 from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development or the National Institutes of Health. Funded by the National Institutes of Health (NIH).

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

Increasing attention is being given to the rising costs of health care in the United States. The cost of inpatient hospitalization is of particular concern given that the Centers for Medicare and Medicaid Services reported that hospitalization spending increased nearly 5% in 1 year (2011–2012) to $882.3 billion,[1] and hospitalization remains the largest source of resource expenditure for medical care.[2] Pediatric patients account for 16% of all hospitalizations nationally, costing an estimated $33.6 billion in 2009.[3]

With a current child population of >7.4 million and a projected 2040 child population of >10.2 million,[4] Texas has a large pediatric population. In fact, 1 in every 10 children in the United States currently resides in Texas. Furthermore, the current Texas racial makeup (35% white, 44% Hispanic, and 12% African American) is similar to the projected US diversity in 2050.[5] Although US children in general have seen significant improvements in health and well-being over the past few decades, in part due to the passage and expansion of Medicaid and the creation of the State Children's Insurance Program,[2,6] the health and well-being of children in Texas consistently ranks within the bottom 10 states when compared with other states across the country.[7] Notably, 2 key elements in this low ranking for Texas are the high rates of children without health insurance (12%–18% between 2008 and 2012) and living in poverty (24%–27% between 2008 and 2012).[2,6]

Reports on national trends of pediatric hospitalizations are published regularly,[8] but state-level specific trends are less common. The purpose of this study was to describe the trends of disease conditions and financial burden of pediatric hospitalizations in Texas.

METHODS

Data Source

We used inpatient hospital discharge data from the Texas Hospital Inpatient Discharge Public Use Data File for calendar years 2004 through 2010. These data include all inpatient hospitalizations occurring in Texas state licensed hospitals, both medical and psychiatric.[9]

The data set included categorization of hospitalizations by diagnosis-related groups (DRGs) and by Major Diagnostic Categories (MDCs). The DRG and MDC classification system was originally developed as a research tool to describe inpatient hospitalizations and is now used by Medicare and Medicaid to direct hospital payments. Each MDC was created to correlate to a specific single organ system in an attempt to make DRGs more clinically relevant.[10] We used MDCs to group all child hospitalizations into 25 primary categories. The MDCs within the data set were developed using a universal framework[10] that incorporates the principal diagnosis, secondary diagnoses, and procedures performed to achieve a broad clinical "reason" for each hospitalization. We chose to use MDCs as opposed to *International Classification of Diseases, Ninth Revision* (*ICD-9*) codes or DRG groupings because we were interested in broad disease and cost trends as opposed to specific diagnosis trends. The use of MDCs to identify the costs of inpatient care for major diseases is used by the Agency for Healthcare Research and Quality.[11] For example, asthma has 14 *ICD-9* codes that could be applied as a primary diagnosis for a claim, depending on the cause and other comorbidities (such as allergy or bronchitis). These 14 diagnosis codes could be grouped into at least 3 DRG classifications (depending on the presence of which comorbid conditions). However, all DRGs associated with the primary condition of asthma combine into MDC 04, Diseases & Disorders of the Respiratory System.[12] Although we generally report MDCs, we report DRGs in a single instance to help differentiate health term ("normal") newborns from all MDC 15 (Newborns and Other Neonates).

Although we did not validate the MDC classifications, *ICD-9* diagnosis codes were confirmed using the ICD9 utilities in Stata 12.1 (StataCorp, College Station, TX), and hospitalizations that did not include a valid primary or secondary diagnosis (ie, the diagnosis code was not identified by Stata and a coding error was not easily identifiable, eg, codes such as "99ERR" and "9 V2") were excluded ($n = 3894$, <0.001%) because it was unclear how the MDC was derived or what condition(s) the patient had while in the hospital.

Population

Because the public use data set does not include unique patient identifiers, the unit of analysis for our study was inpatient hospitalization. Our sample included all pediatric patients (age <18) who were residing in Texas at the time of their hospital discharge. Hospitalization records with diagnoses of HIV infection or drug/alcohol abuse were excluded from our analysis because they did not include patient age for stratification ($n = 1919$).

Variable Definitions

The age strata (0–28 days, 29–365 days, 1–4 years, 5–9 years, 10–14 years, and 15–17 years) were predefined within the data set and represented the patient age at discharge. Because healthy newborns were anticipated to represent a large percentage of hospitalizations due to birth and might skew results particularly around rates and costs, DRGs within MDC 15 (newborns and neonates) were used to classify newborns into 2 categories: (1) healthy (DRG 640, healthy newborn ≥2499 g) and (2) other newborns (DRGs 583–630) indicating the infant was born low birth weight or had other complications (eg, major abnormality). Patient county size was computed using the county Federal Information Processing Standards code and the National Center for Health Statistics Urban-Rural Classification Scheme for Counties.[13] Payer source was grouped into 4 categories using the primary source of payment: Medicaid, Private Insurance, Self-pay/unknown, and Other public payer (including Medicare and Civilian Health and Medical Program of the Uniformed Services). Some discharge records submitted by hospitals to the State of Texas did not have known sources of insurance, and the Texas Health Care Information Collection agency publishing the data adopted the approach of grouping these cases with self-pay cases.[9]

Analysis

Descriptive statistics were used to examine the demographics, discharge diagnoses, and costs. Rates of hospitalization were

estimated by adjusting the raw number of hospitalizations by the child population (0–17 years) of Texas for each year as reported in the US Census Bureau.[14] Using a technique similar to that used by the US Department of Health and Human Services, we constructed Poisson and Negative-Binomial regression models for count data to estimate the rate change and 95% confidence intervals over the study time period.[15] We used number of hospitalizations per 100 000 children population, for each particular year, as our outcome. Both models were run for each estimate and the estimate from the model (either Poisson or Negative-Binomial) with the lowest Akaike information criterion was reported.[16] For these analyses, *P* values less than .05 were considered significant.

Cost Analysis

The data set included total billed fees (total charges) for each hospital discharge. Multiple steps were taken to derive a conservative and standardized estimate for actual hospitalization costs over the 7-year period. Because hospital charges are subject to inflation by hospital managers and their impressions of market conditions, they are not a reliable indicator of actual payments to hospitals for services.[17] First, we examined the classification of bill types used to identify the invoice sent to an insurer. Bill types other than 111–114 (hospital-inpatient-admit through discharge, hospital-inpatient-interim first claim, hospital-inpatient-interim continuing claim, and hospital-inpatient-interim last claim) were excluded from the cost analyses to ensure adjustments and observation claims were not included. Because patients are sometimes placed on observation status based on reimbursement limitations imposed by insurers (and such terms can vary among hospitals), such cases were omitted to present a clearer view of stays that met criteria for inpatient hospitalization.[18,19] Second, to account for extreme outliers, hospitalizations lasting >365 days were excluded and per diem charges were calculated. The top and bottom 1% (charges <$385 and >$20 000 per day) were also excluded from the cost analyses. Overall, 4 038 490 (97.52%) hospitalizations during the 7-year study period were used to estimate the cost burden of care for these patients. Because our interest was to explore the financial burden from a societal perspective, the average ratio of payments received to total billed fees for each year was used to estimate costs from the broader societal/insurer perspective of hospitalizations, rather than the costs of delivering care incurred by each provider. This price-to-charge ratio was derived using payment amounts from the Medicare cost reports filed for each hospital in the state of Texas during this study period. The net revenue (or actual collected payments) and gross revenue (total billed fees) were extracted from those reports and the ratio of net revenues to gross revenues was calculated for each year from 2004 through 2010. That ratio was 36.4% in 2004, 35.8% in 2005, 34.4% in 2006, 33.0% in 2007, 31.9% in 2008, 32.5% in 2009, and 30.1% in 2010. The total billed fees (total charges) for hospitalizations in each year were multiplied by the ratio for that year. Finally, this cost estimate was transformed into 2010 dollars using Bureau of Labor Statistics medical cost inflation indices for the State of Texas during the study period. This method follows that used by Levit and colleagues to derive hospital prices for the purposes of understanding market-wide costs of hospital care.[17]

This study was approved by the University of Texas Health Science Center at Houston institutional review board, and all statistical analyses were conducted by using Stata 12.1 (Stata Corp, College Station, TX).

RESULTS

The demographics for all pediatric hospitalizations from 2004 through 2010 are displayed in Table 1. On average, Texas had >591 000 pediatric hospitalizations per year, which remained statistically unchanged over the time period of study. Hospitalization within the neonatal period (first 28 days of life) accounted for 64.4% of all pediatric hospitalizations.

The rates of inpatient hospitalization per 100 000 children by age and year are presented in Table 2. Hospitalizations during the first year of life represented the highest rate age stratum, being driven mostly by healthy normal birth weight newborns (DRG 640). The only age strata that demonstrated a change over the time period studied were the 1- to 4-year and 15- to 17-year age strata each demonstrating modest decreases; 2.2% and 0.9% respectively.

TABLE 1 Texas Pediatric Inpatient Hospitalization Demographics, 2004–2010

	Average	(%)
Age		
Neonatal	380 943[a]	64.4
1 mo to 1 y	45 975	7.8
1–4 y	48 264	8.2
5–9 y	31 434	5.3
10–14 y	36 165	6.1
15–17 y	48 790	8.2
Gender		
Female	292 966	49.5
Male	298 362	50.5
Patient county size		
Large central metro	261 746	44.4
Large fringe metro	102 594	17.4
Medium metro	102 112	17.3
Small metro	61 608	10.4
Micropolitan	36 377	6.2
Noncore	25 676	4.4
Race ethnicity		
White, NH	208 726	35.3
Black, NH	67 956	11.5
Hispanic	234 461	44.3
Other	79 376	8.9
Payment method		
Medicaid	306 041	51.7
Private insurance	222 819	37.7
Self-pay/unknown	44 400	7.5
Other public funds	18 311	3.1

Average n = 591 571 per year. NH, non-Hispanic.
[a] Average healthy term newborns (MDC 15) = 375 389.

The hospitalization rate for each MDC per year is displayed in Table 3. MDC 15 (Newborn/Neonate) was the most common reason for hospitalization, representing ~6000 hospitalizations per 100 000 children population aged ≤17. Four of the top 5 MDCs demonstrated a significant rate change over time with Mental Diseases and Disorders (MDC 19) the only MDC that significantly increased (2.5% per year) over the study period.

TABLE 2 Rate of Pediatric Inpatient Hospitalization per 100 000 by Age and Year, Texas, 2004–2010

	2004	2005	2006	2007	2008	2009	2010	Average Rate	Change in Rate	95% CI
Birth to 1 y[a]	24 332.6	24 430.0	23 807.7	24 704.3	24 008.3	24 213.2	23 794.6	24 184.4	0.997	0.993–1.002
DRG 640	85 557.5	85 189.59	87 035.5	87 340.9	84 780.0	85 656.7	85 317.7	85 839.7	0.999	0.995–1.002
1–4 y	3405.2	3413.4	3174.6	3339.7	3094.6	3196.1	2915.4	3219.9	0.978[b]	0.968–0.989
5–9 y	1840.8	1862.7	1883.7	1865.7	1779.1	1908.2	1626.5	1823.8	0.987	0.972–1.003
10–14 y	2008.8	2033.5	2019.2	2039.5	2110.3	2280.2	2029.5	2074.4	1.01	0.998–1.025
15–17 y	4615.8	4523.4	4491.8	4489.6	4467.7	4553.3	4232.6	4482.0	0.991[b]	0.986–0.997

CI, confidence interval; DRG 640, Normal Newborn.
[a] Excludes those under 1 month of age with DRG 640 (normal newborn, birth weight >2499 g).
[b] $P \leq .002$.

Table 4 displays the 5 most prevalent MDCs for each age stratum. Respiratory System (MDC 04) causes were the most common reason for hospitalization for age strata 1 month to 1 year, 1 to 4 years, and 5 to 9 years. The most common reason for hospitalization of a child within the 10- to 14-year age stratum was Mental Disease and Disorders (MDC 19), accounting for ~30% of hospitalizations in this age group. Pregnancy, Childbirth and Puberty-related conditions (MDC 14) was the most common cause for hospitalization for adolescents (15–17 years old), with Mental Disease and Disorders (MDC 19) being second most common. Together these 2 MDCs accounted for an average of 60.6% of hospitalizations for this age stratum each year.

Table 5 displays the cost of inpatient hospitalizations by age strata, year, and top 3 MDC per stratum. The 1-month to 1-year age stratum represented the largest cost driver for hospitalizations with >$1.1 billion

TABLE 3 Rate of Hospitalization for MDCs per 100 000 children, Texas, 2004–2010

	2004	2005	2006	2007	2008	2009	2010	Average Rate	Average Rate Change/y	95% CI
MDC 15: Newborns /Neonates	5942.0	5955.0	6053.4	6110.4	5959.2	6017.6	5450.8	5926.9	0.991	0.980–1.00
MDC 04: Respiratory System	735.4	705.9	705.9	744.7	663.5	716.4	609.9	697.4	0.980[a]	0.966–0.993
MDC 06: Digestive System	469.3	479.7	448.2	449.3	415.9	391.1	346.4	428.6	0.953[a]	0.936–0.970
MDC 19: Mental Diseases and Disorders	366.1	383.8	389.5	373.3	395.2	422.6	429.9	394.3	1.025[a]	1.006–1.045
MDC 14: Pregnancy/Childbirth	333.0	324.8	329.7	330.0	321.1	306.9	259.3	315.0	0.970[a]	0.950–0.991
MDC 01: Nervous System	213.4	202.4	195.2	207.1	204.0	217.6	195.3	205.0	0.997	0.972–1.023
MDC 09: Skin	155.6	162.4	157.1	158.5	158.2	148.2	138.9	154.1	0.982	0.953–1.012
MDC 08: Musculoskeletal System	147.9	145.0	150.1	148.5	148.4	143.1	123.4	143.8	0.981	0.951–1.011
MDC 03: Ear, Nose, Mouth, Throat	142.7	161.2	139.6	150.1	152.9	182.7	148.6	154.0	1.017	0.987–1.048
MDC 18: Infectious/Parasitic	140.2	151.2	140.9	159.4	140.7	146.2	122.2	143.0	0.984	0.954–1.015
MDC 11: Kidney/Urinary	134.4	129.7	118.0	121.7	118.2	118.1	107.6	121.1	0.970	0.938–1.003
MDC 10: Endocrine, Nutritional	109.5	117.6	109.7	114.3	119.3	131.3	115.3	116.7	1.017	0.982–1.052
MDC 16: Blood	73.7	75.1	69.6	73.0	72.6	76.0	67.7	72.5	0.993	0.951–1.038
MDC 05: Circulatory System	72.1	72.4	69.1	68.2	63.4	65.7	57.2	66.9	0.967	0.923–1.011
MDC 17: Lymphatic, Hematopoietic, Other	71.4	66.4	59.6	62.2	60.3	60.7	58.7	62.8	0.973	0.928–1.019
MDC 21: Poisonings, Toxic Effects, Injury	42.3	38.9	38.1	41.4	42.2	42.9	40.9	41.0	1.007	0.950–1.067
MDC 07: Hepatobiliary System and Pancreas	36.6	34.8	35.3	35.3	36.4	38.3	35.5	36.0	1.005	0.944–1.069
MDC 23: Rehabilitation, Aftercare	23.1	29.1	33.7	36.7	36.9	35.6	34.2	32.8	1.056	0.989–1.126
MDC 13: Female Reproductive System	21.6	22.2	21.0	21.6	20.5	20.7	18.5	20.9	0.978	0.902–1.061
MDC 02: Eye	17.0	16.1	16.2	15.7	15.6	15.9	15.7	16.0	0.989	0.901–1.085
MDC 25: Multiple Significant Trauma	11.8	11.6	11.7	12.2	11.3	10.6	9.7	11.3	0.972	0.871–1.086
MDC 22: Burns	8.5	8.1	7.9	8.3	8.1	8.4	7.7	8.1	0.994	0.873–1.131
MDC 12: Male Reproductive System	6.9	6.5	6.5	6.0	6.9	6.2	5.8	6.4	0.981	0.847–1.136
MDC 00: Unknown/Uncodable	5.8	8.0	8.5	7.1	8.0	4.8	3.0	6.5	0.918	0.792–1.063
MDC 20: Alcohol, Drug Use	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.985	0.338–2.872
Total	9280.7	9308.0	9314.7	9455.1	9179.0	9327.7	8402.1	9181.0	0.989	0.978–1.000

CI, confidence interval.
[a] $P \leq .01$.

TABLE 4 Top 5 MDCs by Year and Age, Texas 2004–2010

	Average Frequency	Stratum Prevalence (%)
Neonatal		
Total Hospitalizations	380 943	
MDC 15: Newborns and Other Neonates	375 389	98.5
MDC 18: Infectious and Parasitic Disease	1479	0.4
MDC 04: Respiratory System	936	0.2
MDC 23: Rehabilitation, Aftercare	682	0.2
MDC 06: Digestive System	584	0.2
1 mo to 1 y		
Total Hospitalizations	45 975	
MDC 04: Respiratory System	15 409	33.5
MDC 15: Newborns and Other Neonates	6537	14.2
MDC 06: Digestive System	6256	13.6
MDC 18: Infectious and Parasitic Disease	3527	7.6
MDC 03: Ear, Nose, Mouth, Throat	2625	5.7
1–4 y		
Total Hospitalizations	48 264	
MDC 04: Respiratory System	16 543	34.3
MDC 06: Digestive System	7236	15.0
MDC 09: Skin	3805	7.9
MDC 01: Nervous System	3406	7.1
MDC 03: Ear, Nose, Mouth, Throat	3512	7.3
5–9 y		
Total Hospitalizations	31 434	
MDC 04: Respiratory System	7125	22.6
MDC 06: Digestive System	5004	15.9
MDC 19: Mental Diseases and Disorders	3829	12.2
MDC 01: Nervous System	2609	8.3
MDC 08: Musculoskeletal System	2129	6.8
10–14 y		
Total Hospitalizations	36 165	
MDC 19: Mental Diseases and Disorders	11 067	30.5
MDC 06: Digestive System	5199	14.4
MDC 04: Respiratory System	3244	9.0
MDC 08: Musculoskeletal System	2745	7.6
MDC 01: Nervous System	2577	7.1
15–17 y		
Total Hospitalizations	48 790	
MDC 14: Pregnancy, Childbirth	19 305	39.6
MDC 19: Mental Diseases and Disorders	10 239	21.0
MDC 06: Digestive System	3271	6.7
MDC 08: Musculoskeletal System	2154	4.4
MDC 01: Nervous System	1975	4.0

in 2010 adjusted costs each year. Although this age stratum represents one-third of all pediatric hospitalization costs each year, hospitalizations for Newborn and Neonatal (MDC 15) causes accounted for >70% of the total annual pediatric hospitalization costs. Over the time period, Respiratory System (MDC 04) hospitalizations demonstrated a decrease in costs for age strata 1 month to 1 year, 1 to 4 years, and 5 to 9 years (1.3%, 0.6%, and 0.9%, respectively) but an increase in costs for the neonatal age stratum (0.6%). The overall costs for the 1-month to 1-year and 1- to 4-year age strata both increased by 1.2% over the time period, with the 10- to 14-year stratum demonstrating a 1.3% decrease.

DISCUSSION

Our study is the first to report trends of hospitalizations and costs for an entire pediatric population within a state. Despite the absence of an overall secular trend in median or total costs, some age strata and disease categories demonstrated significant trends over the time frame studied. Although the overall rate of pediatric hospitalizations remained unchanged, we identified a modest decrease in hospitalizations in the 1- to 4-year and 15- to 17-year age strata (2.2% and 0.9%, respectively). We identified 3 important implications in our data.

First, as anticipated, the largest numbers of pediatric patients were within the newborn/neonatal age strata, representing 64% of all pediatric hospitalizations. Healthy newborns represented on average 88% of all neonatal hospitalizations but only 40% of the costs. Within our data, the largest drivers of costs within the neonatal period, and for all pediatric hospitalizations, are neonates or infants with hospitalizations due to neonatal complications. These represent neonates who have complications from delivery, are low birth weight (<2499 g), or have congenital defects or genetic conditions. The median cost per hospitalization for newborns born with these conditions was nearly 7.5-fold higher than the otherwise healthy newborn. Eleven percent of newborns, those designated as "other" newborns within the MDC 15 category, accounted for 56% of costs within neonatal hospitalizations and 38% of the costs for all pediatric hospitalizations. The high cost of neonatal intensive care has been well described and comes as no surprise.[20,21] Hospitalizations for neonatal complications continue through the first year of life, costing $740 million annually.[22] The median hospitalization costs for infants with neonatal complications is >10 times higher than any other MDC in any of the age

TABLE 5 Annual Costs in 2010 US Dollars of Inpatient Hospitalizations by Age and Top MDC, Texas, 2004–2010

	Average Median Cost per Hospitalization ($)	Average Total Costs ($Millions)	Average Change in Median Cost per Hospitalization	95% CI
Neonatal				
Overall cost	736	767.41	1.007	0.993–1.021
MDC 15: Newborns and Other Neonates				
Normal newborns >2499 g	682	304.71	1.006	0.992–1.021
All other newborns	5066	434.25	0.995	0.990–1.000
MDC 18: Infectious and Parasitic Diseases	3330	6.45	1.017***	1.008–1.027
MDC 04: Respiratory System	3801	5.49	1.006*	1.000–1.012
1 mo to 1 y				
Overall cost	4282	1117.10	1.012***	1.006–1.018
MDC 04: Respiratory System	3614	121.02	0.992*	0.986–0.998
MDC 06: Digestive System	3144	44.54	1.043***	1.032–1.054
MDC 15: Newborns and Other Neonates	76 482	739.75	0.987***	0.982–0.992
1–4 y				
Overall cost	3583	343.87	1.012***	1.006–1.018
MDC 04: Respiratory System	3441	103.85	0.994*	0.987–1.000
MDC 06: Digestive System	2605	36.34	1.065***	1.049–1.081
MDC 09: Skin	3664	16.29	1.000	0.993–1.006
5–9 y				
Overall cost	4458	238.78	0.997	0.991–1.002
MDC 04: Respiratory System	3875	48.83	0.991*	0.982–0.999
MDC 06: Digestive System	5026	33.65	1.033***	1.027–1.038
MDC 19: Mental Diseases and Disorders	4053	19.41	0.954***	0.944–0.964
10–14 y				
Overall cost	4698	288.94	0.987***	0.982–0.993
MDC 19: Mental Diseases and Disorders	3561	51.52	0.961***	0.950–0.973
MDC 06: Digestive System	6105	40.35	1.001*	1.002–1.017
MDC 04: Respiratory System	4776	32.61	1.003	0.994–1.013
15–17 y				
Overall cost	3792	310.37	0.996	0.990–1.002
MDC 14: Pregnancy, Childbirth and Puberty	3145	72.35	1.010**	1.003–1.017
MDC 19: Mental Diseases and Disorders	3086	44.11	0.962***	0.948–0.976
MDC 06: Digestive System	6278	25.98	1.007**	1.002–1.011

CI, confidence interval.
*$P < .05$.
**$P < .01$.
***$P < .001$.

strata. Developing management strategies to limit even a small number of these infants' hospitalizations would result in significant cost savings. A comprehensive care model (medical home with 24-hour-a-day medical access) for high-risk infants has been demonstrated to achieve fewer hospitalizations, fewer intensive care admissions, shorter hospital length of stays, and fewer emergency department visits and to do so at a lower annual cost per child-year.[23,24]

Second, the most common reason for hospitalization in the 10- to 14-year age stratum was Mental Disease or Disorder (MDC 19), accounting for ~30% of all hospitalizations. Despite no overall temporal trend identified for the 10- to 14-year age

stratum, the Mental Disease and Disorders category had a 2.5% rate increase (4.5% increase of number) over the time period of the study. This increase is comparable to recent national estimates demonstrating a 48.5% increase in the number of early adolescents (ages 10–14 years) hospitalized for a mental health condition.[25] In light of this increase in Mental Disease and Disorders hospitalizations, the 3.9% decrease in median cost per year (Table 5) for this category is striking. Pediatric hospitalizations for Mental Disease and Disorders demonstrated the largest rate increase of any MDC (Table 3). Within Texas, there were an additional 550 to 600 pediatric patients hospitalized each year for a mental health condition. This is consistent with recent data showing growth in per capita and overall mental health spending in the United States between 2000 and 2006[26] and increases in bed capacity and revenue at private psychiatric hospitals over the same years.[27] National estimates of spending on mental health care demonstrated an overall decline in spending on inpatient psychiatric care despite a modest increase in mental health spending overall.[26] This discrepancy is explained by a tripling in spending on psychotropic prescription medications.

Our data reinforce the importance of mental health disorders among adolescents. Half of all lifetime mental health diagnoses start by age 14 years,[28] and an estimated 20% of adolescents have a diagnosable mental health disorder.[29] The prevalence of depression in adolescents is reported as high as 28.7%.[30] Given the significant future mortality and morbidity associated with adolescent hospitalizations for a mental health diagnoses, the increase in hospitalization rate noted in our data (2.5% per year) has significant future implications.[29,31] The difficulty in obtaining appropriate outpatient mental health services may partially explain the increase in hospitalizations we identified. Other potential explanations for the increase in adolescent hospitalizations for mental health conditions include improved disease surveillance, improved disease recognition, increased disease burden (more children with mental illness), or increased access to inpatient psychiatric services.

Third, the most common reason for hospitalization for an older adolescent patient (15–17 years of age) was childbirth. This represents 39.6% of hospitalizations for that age stratum and 3% of all pediatric hospitalizations. The total costs for hospitalization of the adolescent patient for childbirth remained stable at $72 million per year. The second most common reason for hospitalization within this age stratum was a mental health condition, which, combined with childbirth, accounts for 62% of all adolescent hospitalizations and 5% of all pediatric hospitalizations. One potential explanation for the prominence of Mental Health diagnoses is that they require a coordinated outpatient system of care. According to the American Academy of Pediatrics Task Force on Mental Health, the uneven reimbursement for non–face-to-face services hampers effective coordination required for outpatient mental health management.[32] Texas has higher rates of pediatric hospitalizations of patients with Medicaid (51.7%) and uninsured (7.5%) than the national average (43.6% and 7.5%, Medicaid and uninsured, respectively), which may contribute to increased hospitalization rates.[33] The high rate of adolescent hospitalizations for childbirth is due to the high teen pregnancy rate in Texas; a 15- to 17-year-old rate of 25.6 per 1000 females aged 15 to 19, compared with the national average of 15.4 per 1000 females aged 15 to 19.[34] The absence of an coordinated approach to teen pregnancy prevention within the state has been proposed as a underlying reason for the increased rate.[35]

We can place our Texas data on pediatric hospitalizations in context by comparing with current national estimates. The Healthcare Cost and Utilization Project Kids' Inpatient Database provides national estimates of inpatient hospitalizations for patients under 21 years old.[36] Data from the database demonstrate that estimates for overall pediatric hospitalization rates remained stable with the exception of the 15- to 17-year age stratum, demonstrating a 7.8% decrease from 2000.[33] Our data are similar with our adolescent age stratum demonstrating an 8% decrease from 2004 through 2010. Nationally, pregnancy represents 34.1% of all adolescent hospitalizations.[33] As with Texas, pregnancy was nationally the most common reason for hospitalization for the 15- to 17-year age group. For teen pregnancy, national rates of hospitalization declined by 12% between 2006 and 2009; rates in Texas also declined during that period, but only by 8%.

There are several notable limitations for our study. Our data contained deidentified hospitalization-level data and thus could not account for readmissions. In addition, our data did not contain emergency department or outpatient care. Trends identified within our data may not apply to care received in noninpatient settings. Another important caution is that due to Texas policy, our data did not contain children who were diagnosed with HIV or those seeking substance abuse treatment without parental consent. These conditions were removed a priori from our analysis. Because the Texas Department of Health and Human Services reports 876 pediatric HIV/AIDS cases in the state as of 2007[37] and 6934 adolescents receiving inpatient treatment of illicit substance abuse in 2009,[38] these numbers would not be likely to influence our analysis. Lastly, given the large numbers of hospitalizations and the exploratory nature of the study, caution must be exercised in overinterpreting the significance of the results. We reported a number of statistically significant trends in hospitalization rates and costs that may not be clinically meaningful. Although we report confidence intervals as well as *P* values, some degree of significance could have occurred simply due to random chance and multiple comparisons.

Despite these limitations, our data highlight important broad trends, over time and across a large population of demographically diverse children, in pediatric hospitalizations in Texas. Because many health care providers and networks contend with an ever-changing financial landscape, our data may provide a better understanding of the scope, and future disease burdens, of pediatric hospitalizations to better inform policy and practice.

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Hospital Pediatrics 2015;5;390
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