The Impact of Changing Public Policy on Hospital Care for California Children Age 0 to 4 - 1983 to 1997

By

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JUNE, 2000

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ACKNOWLEDGEMENTS

The authors are grateful to the California Policy Research Center, California Program on Access to Care for its financial support of this research. The views presented here are those of the authors and should not be attributed to the funding agency, its directors, officers, or staff.

Ted Clay, MS, provided critically important programming and statistical support. Kristie Kooken and Molly Bradshaw, MPH, provided valuable research support. No matter how short the timeline, they cheerfully answered questions, found references, and helped with spreadsheets. Cindie Sedik and Jennifer Gee provided excellent administrative support.

We also thank the following colleagues and friends for their willingness to read and critique the report: Carol Miller, RN, PhD, Institute for Health Policy Studies, UCSF; Don DeMoro, Director, Institute for Health and Socio-economic Policy, Orinda; Esther Blau, RN; Ann Troy, MD; and William Rothman, MD.

INTRODUCTION

Since the mid 1980's, a variety of state and federal initiatives have expanded health insurance coverage for low income pregnant woman, children and youth. These initiatives are reviewed in the companion volume to this study, The Impact of Changing Public Policy on Hospital Admission Patterns for California Children Age 0 to 4 - 1983 to 1997.[1]

As the goal of improving access to healthcare for low income women and children gained momentum, parallel efforts to restrict access to publicly funded programs also gained momentum, nationally and particularly in California. One effort targeted immigrant populations. For example, Proposition 187, passed by California voters in 1994, attempted among other things to deny health care to undocumented immigrants and their children. The other effort was, as President Clinton pledged in 1996, to "end welfare as we know it." The Welfare Reform Act (HR 3734), also known as Temporary Aid to Needy Families (TANF), shifted welfare responsibility from the federal level to states and limited support to five years. It also delinked Medicaid from financial assistance.

Against this background of major shifting public policies between 1983 and 1997, and with grave concerns for the future, we undertook a long overdue analysis of changes in hospital utilization patterns for California's most vulnerable children between the age of 0 to 4 excluding neonates. This group was chosen because this age most need primary and preventive care and has the highest child hospitalization rates.

We do not know of any other study that has examined the longitudinal impact of these major shifts in healthcare delivery on <u>any</u> California population.

Our companion report examined the longitudinal impact of these healthcare initiatives on the child population. We found that hospital utilization decreased from a population standpoint, although not as much in the child population as in the adult population. We took this to mean that at least some children received more primary care. Race/ethnic disparities in hospital utilization had been reduced in some ways and had increased in others, to the particular disadvantage of Hispanic and Black children. A consistent trend centering around 1994 suggested that all race/ethnic groups were negatively impacted by welfare reform and that Hispanic children experienced a dual impact from Proposition 187. All measures began to change -- in the wrong direction -- after 1994. It became abundantly clear that welfare reform and Proposition 187 had negatively impacted the use of primary care services in this age group.

While we had no way to know if Medi-Cal children were at greater risk of hospital admission in 1983, we were able to identify that in 1997, they had almost a 3-fold increased population risk compared with other children. Our county-level comparisons of changes in population, race/ethnic composition, and hospital utilization (discharges, days, LOS, charges) identified differences over time within and across MCMC plan types that were inconsistent with an explicit assumption by policy makers that MCMC would contain costs.

As our examination proceeded, we became increasingly concerned about variations over time in what might be considered quality of care measures -- source of entry into the hospital, length of stay, procedures used, complications of care, and disposition -- that went well beyond our initial focus and simply could not be explained away by changes in the underlying clinical profile.

Thus, in this report we review -- from the hospital point of view -- the longitudinal impact of changing public policy on children admitted to California's general acute care hospitals with an

eye to quality of care. We begin by examining changes in characteristics of children admitted and payors. We also examine changes in clinical characteristics, in quality of care measures, and in resource utilization. Findings of this study will help policy makers, insurers, providers, and consumer advocates understand changes in the overall demographics of who is hospitalized, why they are hospitalized, processes of care, and the outcomes for California's youngest children. It will provide a baseline against which to compare changes immediately before us.

METHOD

DATA SOURCES AND CASE SELECTION

Data sources and case selection are described in the companion volume to this report.[1] At the end of the selection process, we had 1,687,886 records for children age 0 to 4 who lived in California ZIP codes and had been discharged from general acute care hospitals between 1983 and 1997.

ANALYSIS VARIABLES

We created a series of analysis variables to classify patient demographic characteristics, clinical characteristics, and characteristics of the hospitalization.

DEMOGRAPHIC CHARACTERISTICS

- **Age**. Age was classified into three groups: 0 (less than 1 year old), 1-2 years, and 3-4 years.

- **Race/Ethnicity**. Race/ethnicity was classified as follows: White Non-Hispanic (White), Hispanic All Race (Hispanic), African American (Black), Asian, and Other.[2]

- **County of Residence**. Before 1990, OSHPD identified the ZIP and county of the hospital discharging the patient and the patient ZIP of residence, but not the patient county of residence. A master file was created with one record for every ZIP that had ever been recorded for patients of any age and for every hospital between 1983 and 1997. If the ZIP had a county identity attached, we saved that information. For those ZIPs still missing a county, we merged the 1980 and 1990 census files and assigned county of residence to PDDS records missing one.

CLINICAL CHARACTERISTICS

- **Primary Clinical Condition**. Every record was classified into one of four primary clinical conditions in the following order:

    1. **Injuries (INJ)**. Software developed by FHOP[3] and the California Department of Health Services[4] (the latter based on recommended CDC injury categories[5]) was used to classify records as to whether they reflected an injury.[6]

    2. **Ambulatory Care Sensitive (ACS) Condition**. The remaining cases were identified as ACS based on the principal diagnosis using the Billings classification system.[7] ACS includes diagnoses such as bronchitis, pneumonia, respiratory infections, and other diagnoses shown be preventable through access to primary care.[8]

3. **Surgical Condition (SUR)**. All remaining cases that the DRG categorized as surgical were assigned "Surgical" as the primary clinical condition.[9]

4. **Medical Condition (MED)**. Finally, the primary clinical condition "Medical" was assigned to all remaining records.

- **Procedures**. The number of procedures recorded for each case were counted. Software developed for the Healthcare Cost and Utilization Project (HCUP)[10] was used to classify procedures as minor diagnostic, minor therapeutic, major diagnostic, and major therapeutic. With the HCUP classification system, a case can be assigned to more than one category. For instance, a case can have a minor diagnostic and major therapeutic procedure. The number of times every procedure was assigned to one of these four categories was also counted. The results are presented as 0 (none) or 1 (1 or more times)..

- **Complications of care**. Each record was evaluated as to whether any complication of care was documented. Software developed for HCUP[10] and the American Nurses Association[11] was used to identify records with complications. The number of times each complication class appeared on a record was coded as 0 (none) or 1 (1 or more times) and finally classified the record as to whether it had any complication of care.

HOSPITALIZATION CHARACTERISTICS

- **Disposition**. Record were assigned to one of two categories: routine (discharged to home) and non-routine. This latter category included all other possible dispositions, including patient death. Most children were discharged home (95.7%), and few children died in-hospital over the 15-years (11,514, 0.7%).

- **Payment Source**. This is the anticipated payor at time of discharge. Therefore, it is not possible to know if the child was uninsured at admission. This variable was coded into four categories: Medi-Cal, HMO/PHP, Private and other (Champus, Workers Comp, other government), and uninsured. In the narrative, Medi-Cal and uninsured sometimes are grouped as Public Sector with HMO/PHP and Private/Other grouped as Private Sector.

- **Length of Stay (LOS)**. About 5% of discharges had a LOS of zero days; that is, the child was admitted and discharged on the same day. All records admitted and discharged on the same day were changed to a LOS of 1 day to more accurately reflect the family and social burden of admitting and discharging a sick child. Because OSHPD coding rules require charges to be reported for the year, the LOS upper range was truncated at 365.

- **Total charges**. About 9.3% of records were missing charges over the 15-year period. This ranged from 10.9% in 1983 to 7.2% in 1997. Charges are missing non-randomly, because OSHPD does not require Kaiser and children's hospitals to report this. However, charges are reported when non-Kaiser members receive care in Kaiser facilities or Kaiser members receive care in non-Kaiser facilities. To better estimate the total economic burden of early childhood hospitalization, we imputed charges for records lacking them, using charges converted to 1997 dollars to control for inflation.[12] Charges may bear no relationship to reimbursement, but are thought to represent the cost of providing care.

DATA SUMMARY AND ANALYSIS

The above variables were summarized to the state and county level by year, and by race/ethnic and payor groups within years. Using the resulting numbers and population estimates from the DOF, we calculated rates per 10,000 population (the population rate) and 1,000 discharges (the discharge rate). Continuous variables LOS and charges were summarized to obtain the sum, mean, standard deviation, and percentile (25%ile, 50%ile, 75%ile) by year and by race/ethnic and payor groups within year. These summaries were output as comma delimited ASCII files and imported into Excel for preparing tables and figures.

Using the discharge-level file and categorical variables within blocks, we did a series of multivariate models within year to predict LOS and charges for all discharges and the four sub-group clinical conditions. In the models, the comparison child was a White Non-Hispanic boy, age 0, admitted for an ACS diagnosis (in the analyses of all discharges), with no procedures, no complications, Private Sector insurance (private or HMO/PHP), and a routine discharge. Variables were entered into the models in blocks, first the medical condition block with ACS as the comparison (in the analyses of all discharges), then procedures with no procedure as the comparison, any complication with no complication as the comparison, admission source ER or other facility (i.e., the case transferred in from some other state-licensed healthcare facility) with routine as the comparison, non-routine disposition including death with routine as the comparison, demographic characteristic (sex, age), payor (Medi-Cal and uninsured with Private Sector as comparison), and race/ethnicity (White as the comparison).

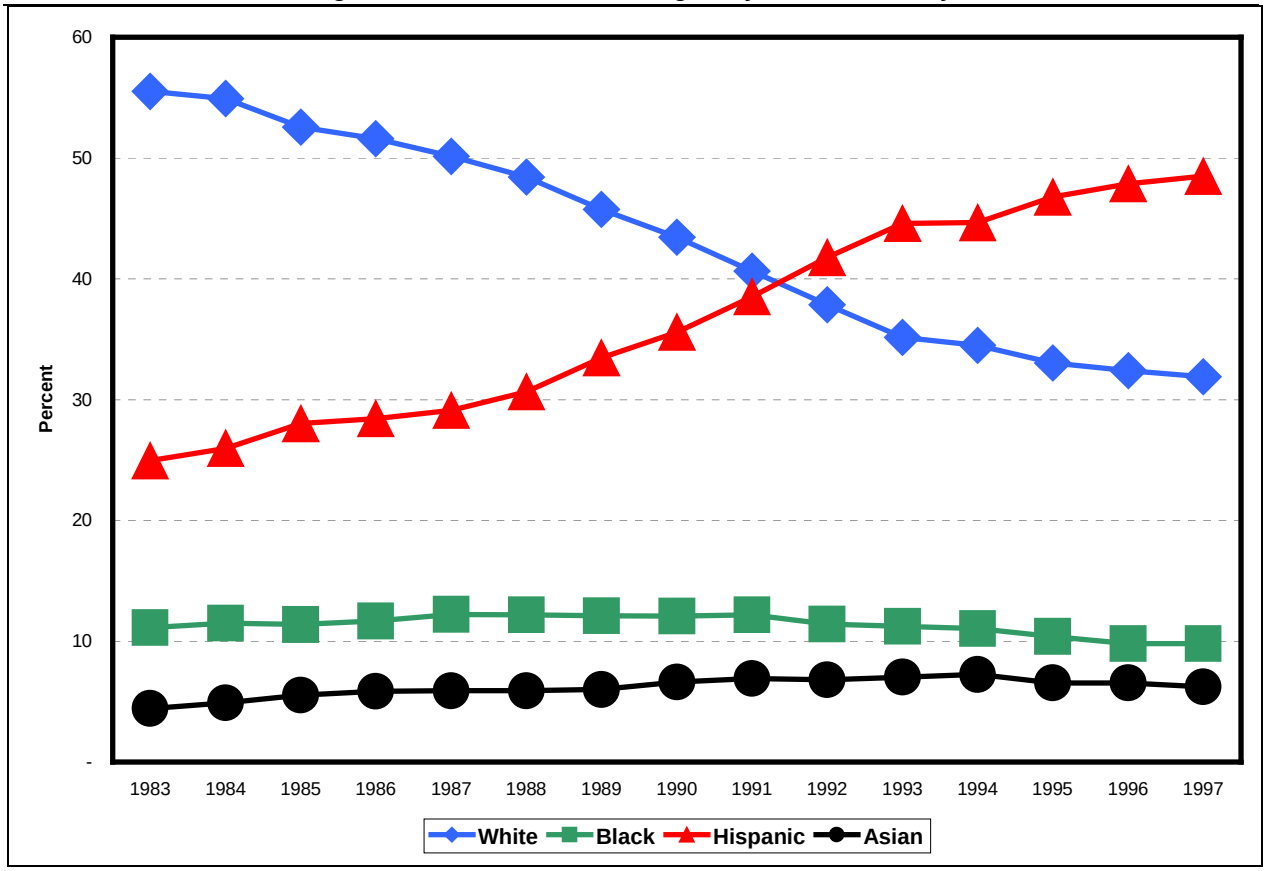
In presenting results, figures show 1983 through 1997, and tables compare 1983 and 1997.

CHANGES IN HOSPITAL USERS AND PAYORS

RACE/ETHNICITY

Figure 1 shows percent changes in race/ethnic composition of discharged children during the study period. In 1983, White children were 55% of discharges; in 1997, 32%. The trend was reversed for Hispanic children: 25% in 1983 and 48% in 1997. Black children were 11% of discharges in 1983 and 10% in 1997. Asian children were 4% in 1983 and 6% in 1997.

Figure 1. Percent of Discharges by Race/Ethnicity



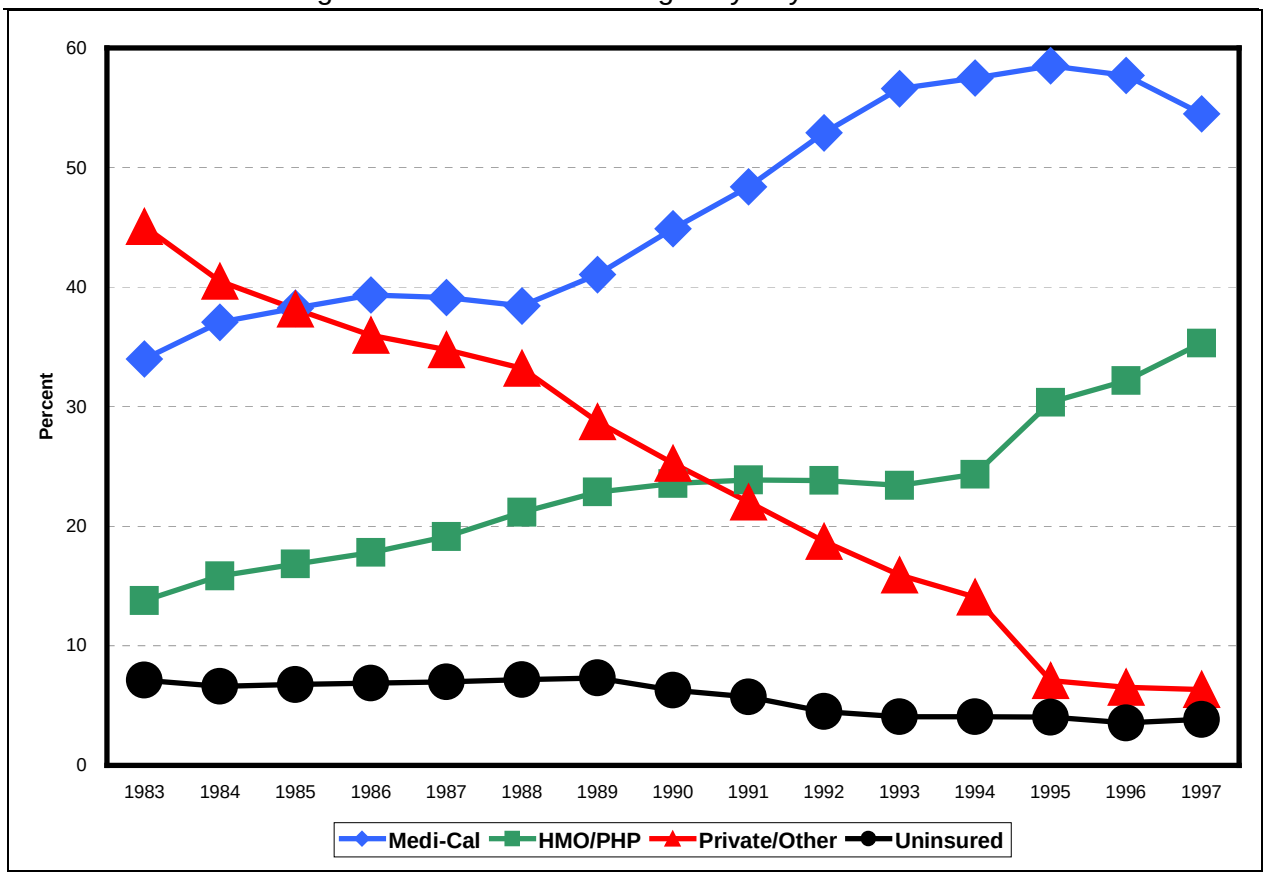
In terms of other demographic characteristics for the study group, about 59% were boys, with minor variation from year to year. Children younger than one year accounted for 39% of discharges in 1983 and 46% in 1997. This represents an absolute 7% increase and a relative 15% increase in this age group. Children age 1 to 2 accounted for 38% of discharges in 1983 and 36% in 1997. Discharges of children age 3-4 declined from 23% to 19% between 1983 and 1997. This represents an absolute 4% decline and a relative 17% decline.

PAYMENT SOURCE

Figure 2 shows changes in anticipated payment source between 1983 and 1997. In 1983, the Private Sector paid for 59% of discharges; by 1997, 41%. Within the Private Sector, HMO/PHPs increased from 14% to 35% of discharges and other private payors declined from 45% to 6%. By 1997, there was an absolute 18% drop, and a relative 42% overall drop in the percent of hospitalized children with Private Sector coverage.

In 1983, the Public Sector paid for 41% of discharged children. By 1997, the percent of children uninsured at discharge declined from 7% to 4%, but Medi-Cal paid for 59% of discharges.

Figure 2. Percent of Discharges by Payment Source



During this period, race/ethnic differences in anticipated payment source changed for admitted children. Table 1 shows the percent of admissions in 1983 and 1997 by Private and Public Sector. In 1983, the Private Sector paid for 68% of White, 53% of Asian, 48% of Black, and 44% of Hispanic admissions. By 1997, every group except Asian children received less Private Sector care. Asian children were close to achieving parity with White children because Asian Private Sector admissions increased 4% while White decreased 5%. Private Sector admissions decreased from their earlier lows for Black and Hispanic children respectively 16% and 17%.

Table 1. Changes in Race Ethnicity Percent by Payor, 1983 and 1997

Pay Source	Race/Ethnicity	1983 %	1997 %	% Change
Private Sector (HMO/PHP/ Private/Other)	White	68	63	(5)
	Black	48	32	(16)
	Hispanic	44	27	(17)
	Asian	53	58	4
Public Sector Medi-Cal	White	26	33	8
	Black	48	65	17
	Hispanic	45	68	23
	Asian	43	39	(3)
Uninsured	White	6	3	(3)
	Black	4	3	(1)
	Hispanic	11	5	(7)
	Asian	4	3	(1)

By 1997, 3% of each race/ethnic group except Hispanic (5%) remained uninsured at discharge. Although a small gap remained for uninsured Hispanic children, they experienced the largest absolute decrease.

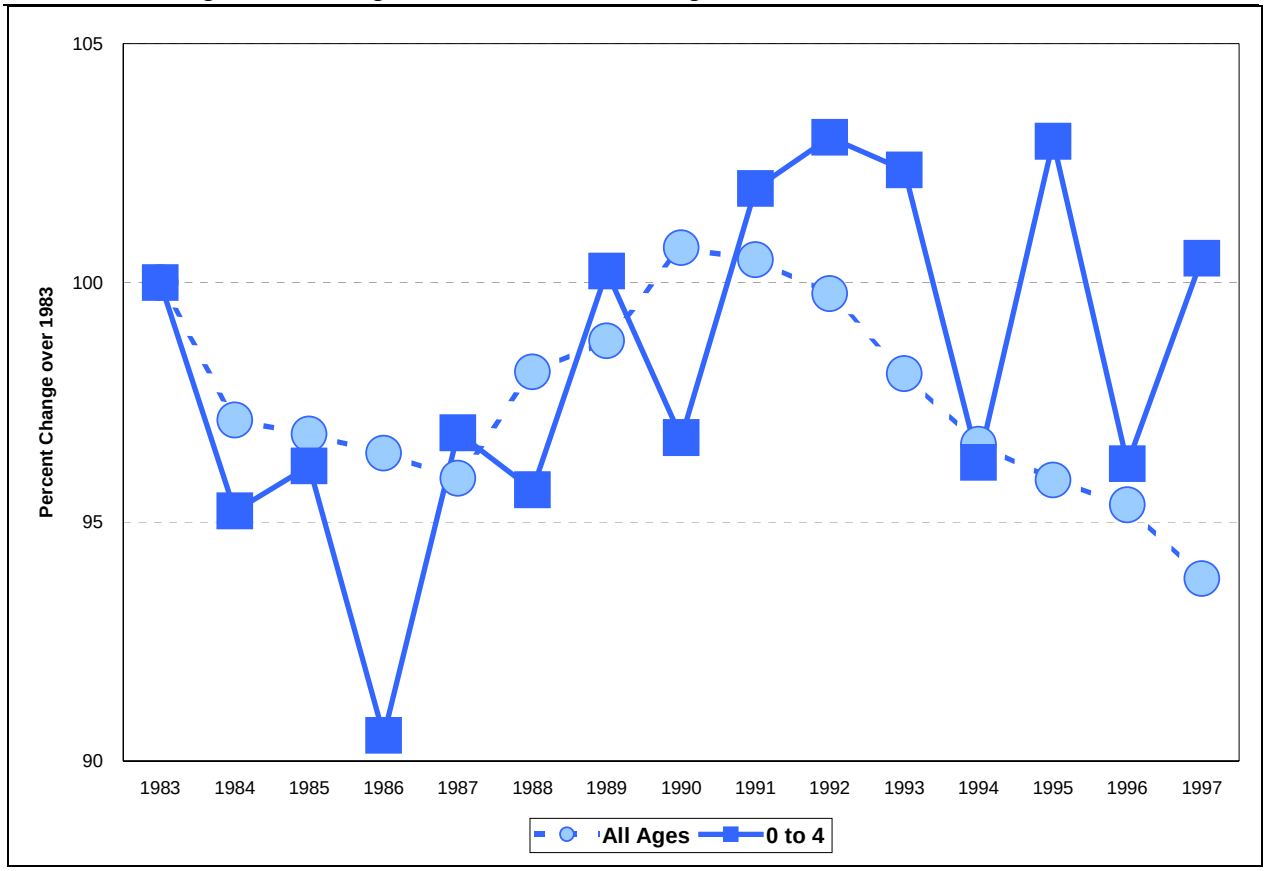
During the 15-year period, Medi-Cal participation increased for every group except Asian children. There is a one-to-one correspondence between decreases in the percents of Private Sector and uninsured discharges and increases in the percents of Medi-Cal discharges. For example, Medi-Cal coverage of White children increased 8%, which exactly matches the 5% and 3% decrease in Private Sector and uninsured. For Asian children, the 1% decrease uninsured and 3% decrease in Medi-Cal exactly equals the 4% Private Sector increase.

CHANGES IN HOSPITAL CARE

DISCHARGES

Between 1983 and 1997, California hospitals discharged 51,818,002 patients. Of these, children age 0 to 4 excluding neonates accounted for 3.3% of total discharges, or 1,687,886. Using 1983 as the baseline year, Figure 3 compares the percentage change in the number of discharges for all patients to the percentage change in the number of study group discharges.

Figure 3. Change in Number of Discharges as Percent of 1983 Values



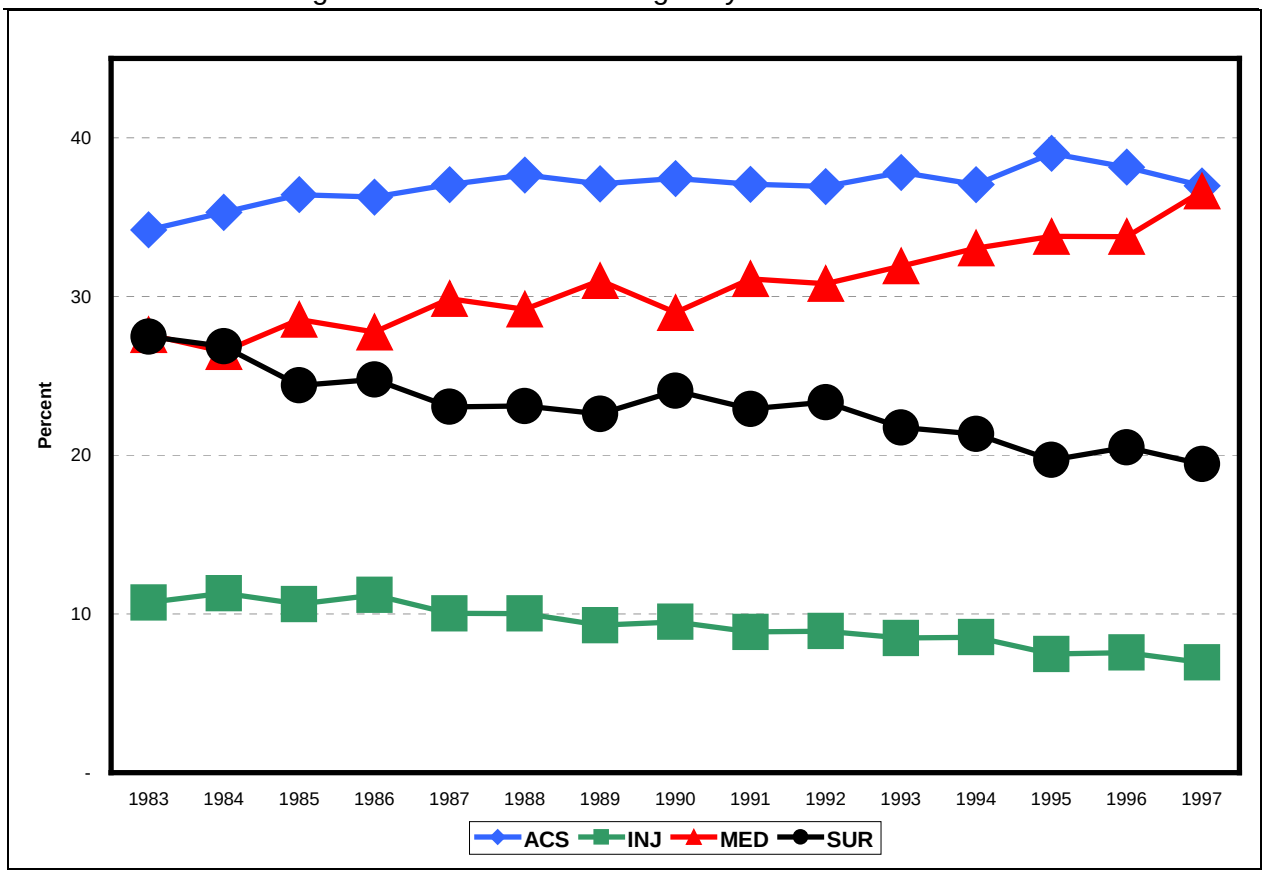
Between 1983 and 1987, total discharges steadily declined to 4% below the 1983 number, rose steadily until 1990 to 1% above the 1983 number, and then declined steadily. By 1997, the number of all discharges had declined 6% relative to 1983.

The pattern of change in discharges for the study group was very different, with 5% to 6% swings typical from year to year. In 1986, discharges were 9% less than in 1983. In 1992 and 1995, the number of discharges was 3% higher than in 1983. Since 1991, the 3-year rolling average number of discharges (not shown) was above 1983 for every period except 1994-1996. The year to year swing was independent of the percent of admissions by race/ethnicity or payor.

DIAGNOSES

Since many ACS conditions are infectious in nature, hospital admissions may be expected to vary yearly. However, Figure 4 shows that swings in number of discharges were not associated with annual variations in diagnostic categories. That is, the percent of children admitted with a particular diagnosis did not vary systematically with the number of children admitted, as one would expect if the variation in numbers was due to such things as infections. Instead, as a percent of all admissions, ACS cases increased relatively steadily throughout the period (ACS began to decrease in 1994 but remained above 1983), injury and surgical cases declined steadily, and medical cases increased steadily.

Figure 4. Percent of Discharges by Clinical Condition



PROCEDURES

Figure 5 summarizes changes in patterns of procedures over the study period. Totals can exceed 100% because children can have procedures in more than one procedure category. The use of procedures and types of procedures varied significantly from year to year and independently of clinical condition. Since 1990, there has been a steady increase in the percent of children who have no procedure during their hospital stay, although there has been little change in LOS. By 1997, 54% of admitted children had no recorded procedure for the condition causing their admission. The percent of cases treated with major therapeutic procedures remained relatively constant. The use of minor diagnostic and therapeutic procedures peaked in 1990 and 1991.

Figure 5. Percent of Procedures by Type

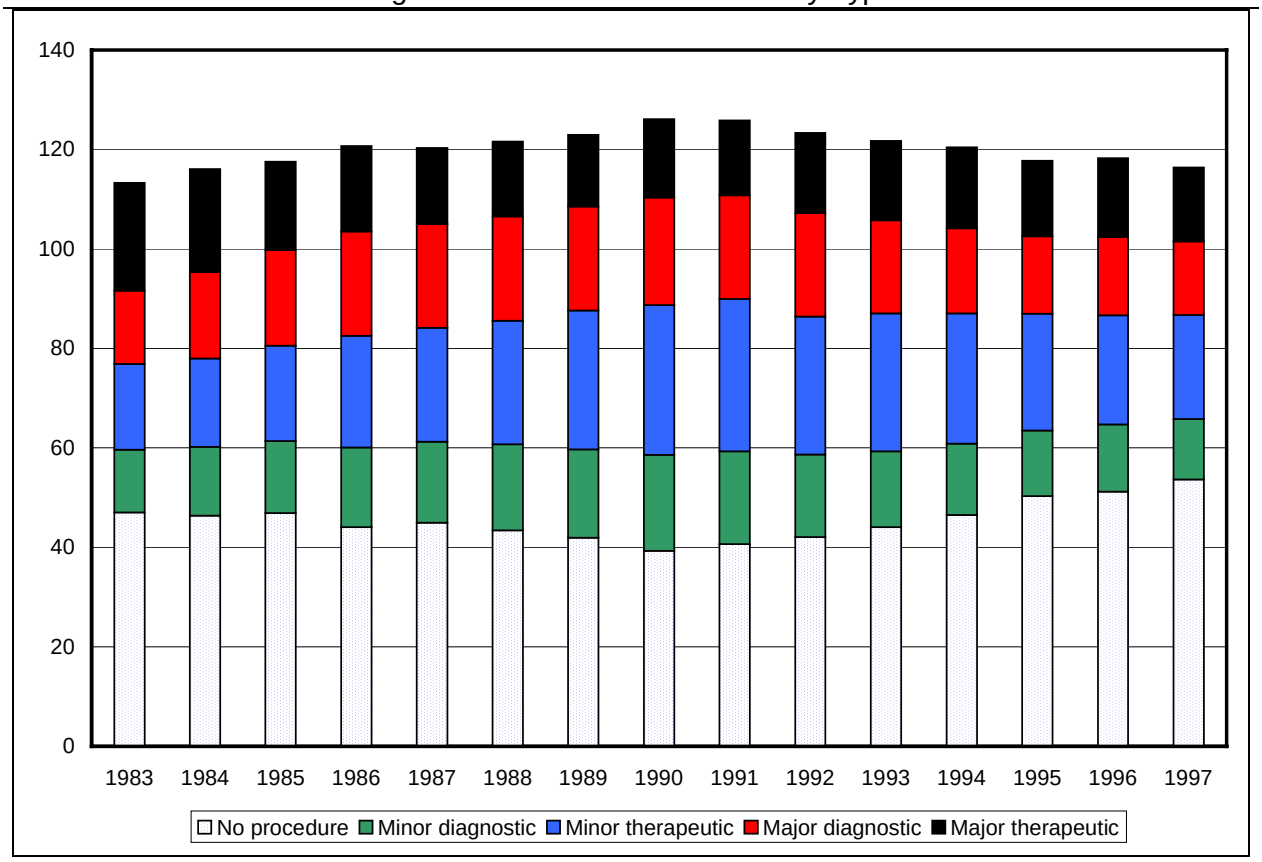
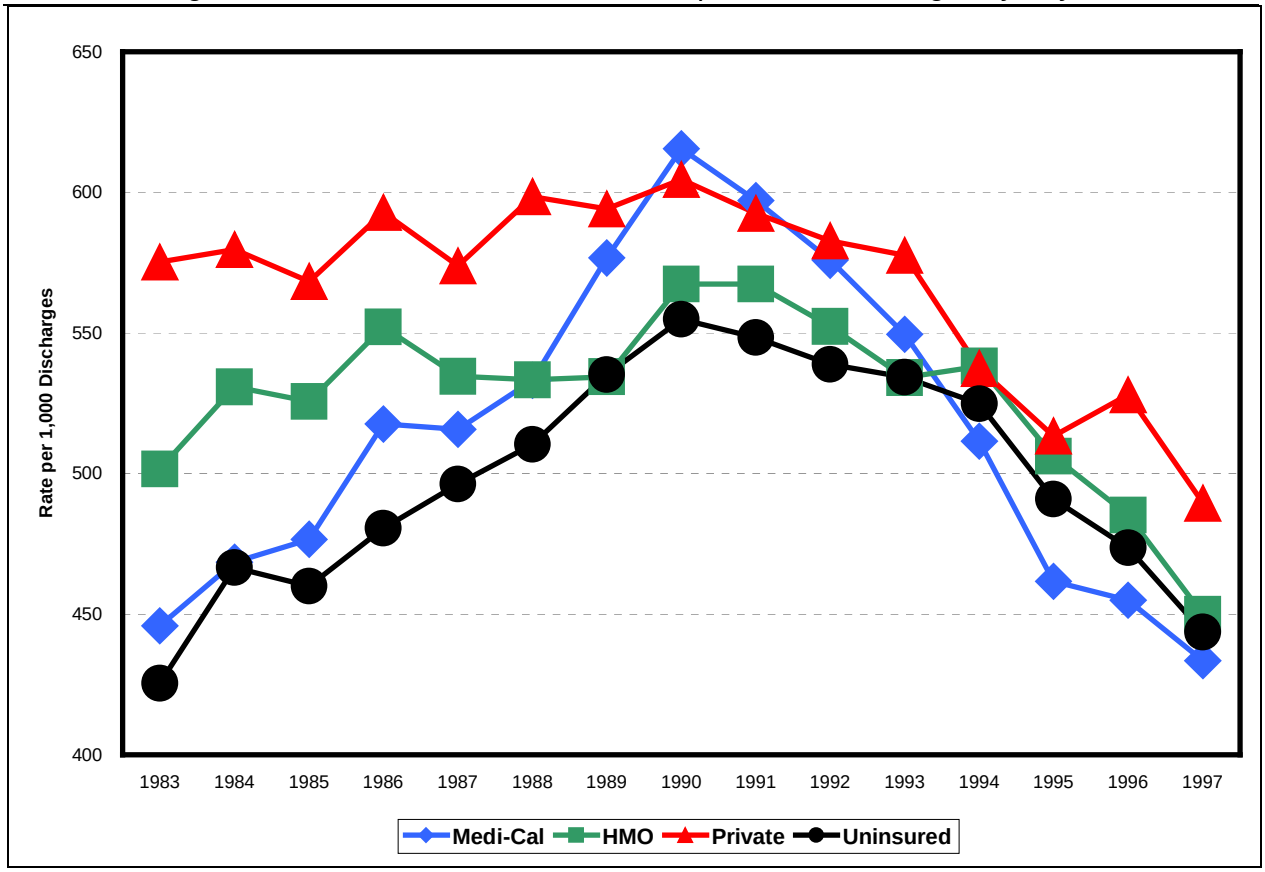


Figure 6 shows by payor the rate per 1,000 discharges having at least one procedure. For all payors, this rate peaked in 1990. In general, physicians apparently were least likely to order (or obtain approval for) at least one procedure for uninsured children as compared with children covered by other payors. The gap between Public and Private Sector was much greater in 1983 than in 1997. The general trend since 1990 has been to reduce the gap among payors. By 1997, Private Sector children had much lower procedure rates than they had in 1983. In fact, procedure rates varied little among payors, and Private Sector children had low procedure rates similar to Public Sector children.

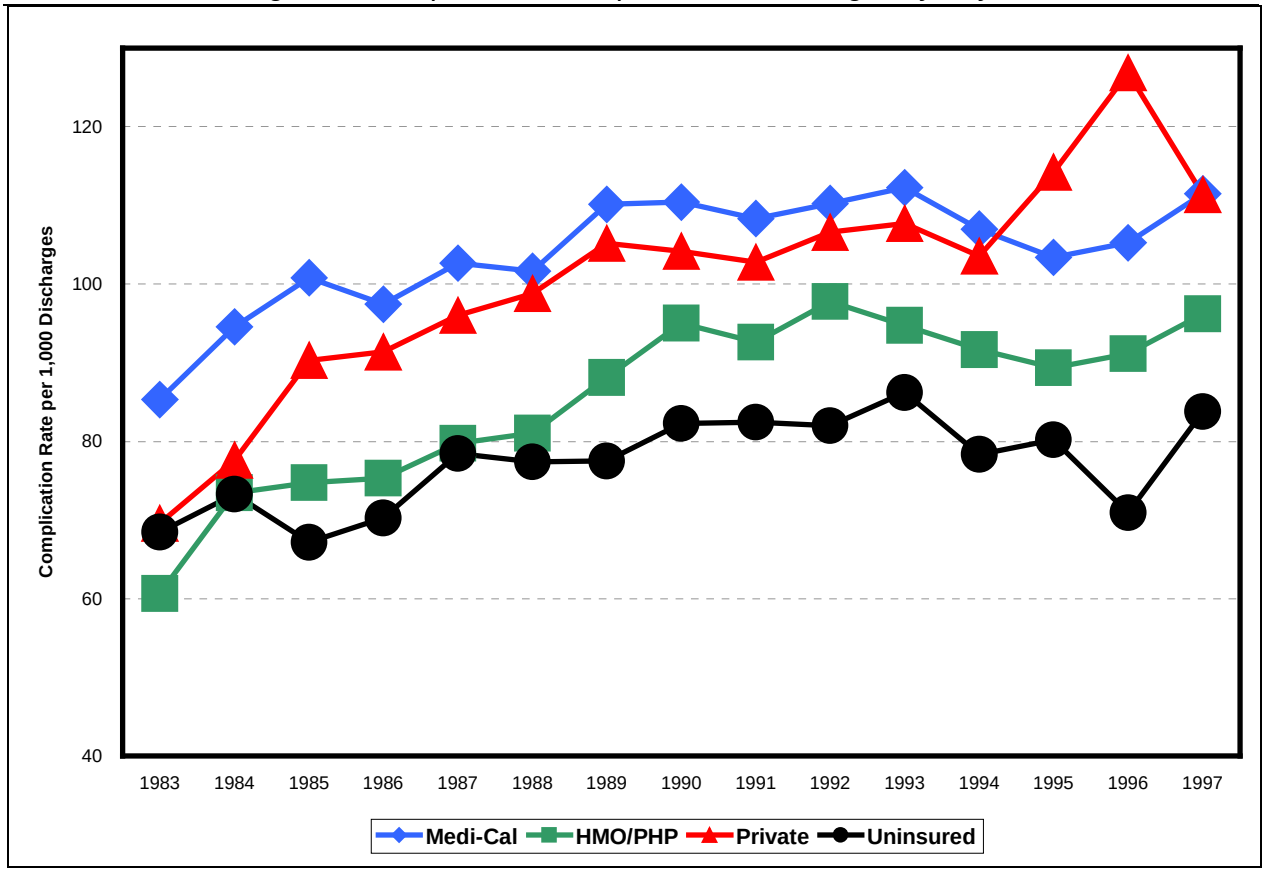
Figure 6. At Least One Procedure - Rate per 1,000 Discharges by Payor



COMPLICATIONS OF CARE

In 1983, 7.1% of children experienced at least one complication of care. The rate peaked in 1993 at 10.4%. By 1997, the rate was 10.1%. Figure 7 shows the complication rate per 1,000 discharges by payor. The rate increased for all payors over this time. Children with Medi-Cal and private coverage were more likely to have complications of care over the entire study period. Their rates increased relatively 30% and 57% respectively. The rate for children with HMO/PHP coverage rose from 61 per 1,000 discharges in 1983 to 96 in 1997, a relative 57% increase. Uninsured children, least likely to have complications, experienced a 20% increase.

Figure 7. Complication Rate per 1,000 Discharges by Payor

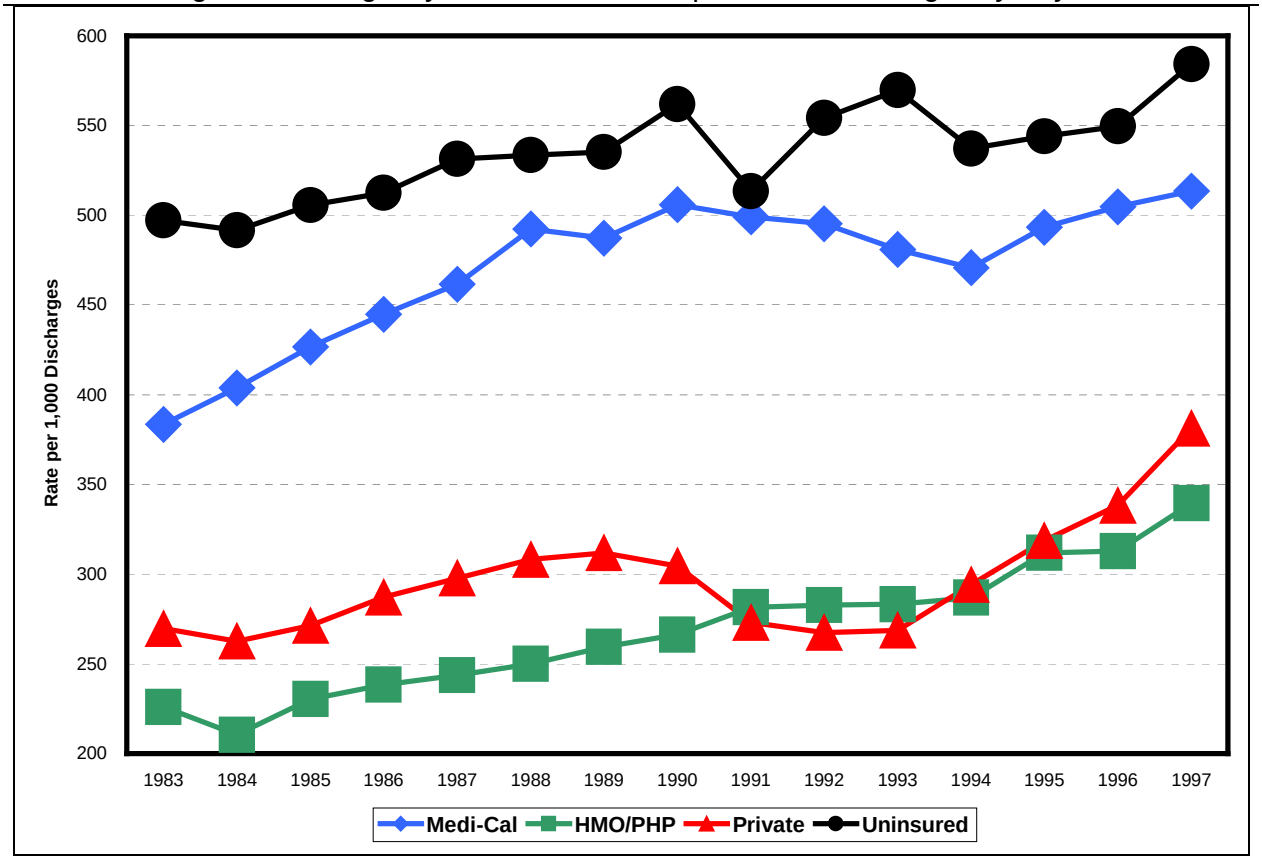


EMERGENCY ROOM ADMISSIONS

Emergency room (ER) admissions are thought to be sensitive to access to outpatient care. In a heavily penetrated managed care environment, one would expect ER admission rates to decline. Instead, population-based ER admission rates were fairly steady throughout this period. From the hospital viewpoint ER admissions increased steadily as a percent of all admissions from 30.6% in 1983 to 43.0% in 1997, with a sharp hike beginning 1994.[1]

Figure 8 shows by payor the ER admission rate per 1,000 discharges. Public Sector children were much more likely to enter the hospital through the ER, with uninsured children having the highest rate. ER admissions per 1,000 cases are higher for all payors in 1997 than in 1983 and have risen steadily since 1994.

Figure 8. Emergency Room Admissions per 1,000 Discharges by Payor

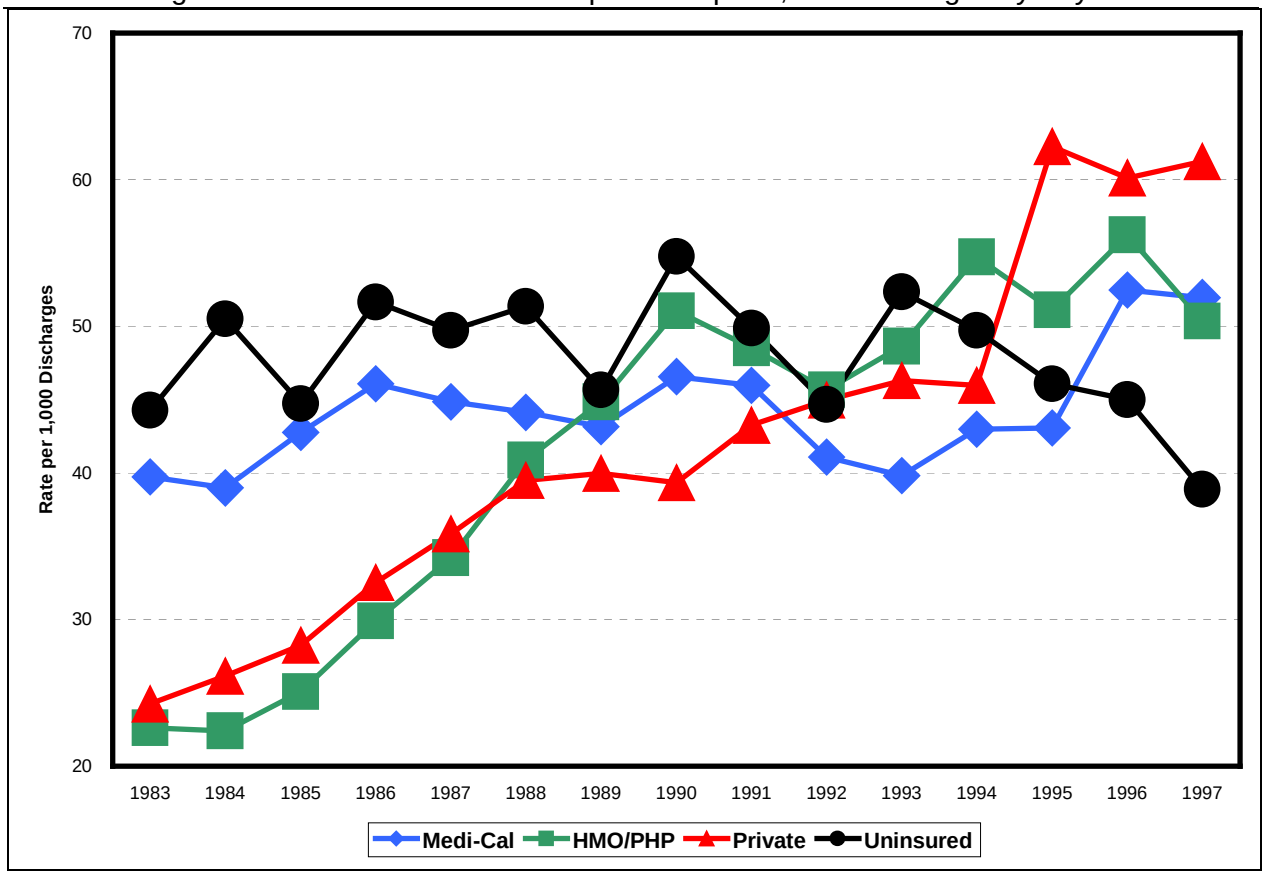


PATIENT DISPOSITION

Most children age 0 to 4 are discharged routinely. The overall non-routine discharge rate (death plus discharge to other facilities) increased from 2.95% to 4.96%, peaking in 1996. All of the increase was due to non-routine discharges for reasons other than death. Between 1983 and 1997, deaths declined from 0.66% to 0.45% of all discharges in this age group.

Figure 9 shows changes by payor for the rate per 1,000 non-routine discharges. Between 1983 and 1997, non-routine dispositions varied between 40 and 55 per 1,000 discharges for Public Sector children. For Private Sector children, non-routine dispositions rose steadily from about 20 per 1,000 in 1983 to between 50 and 60 per 1,000 in 1997. Thus, the likelihood of a non-routine disposition for Private Sector children rose to equal or exceed that of Public Sector children.

Figure 9. Rate of Non-Routine Dispositions per 1,000 Discharges by Payor

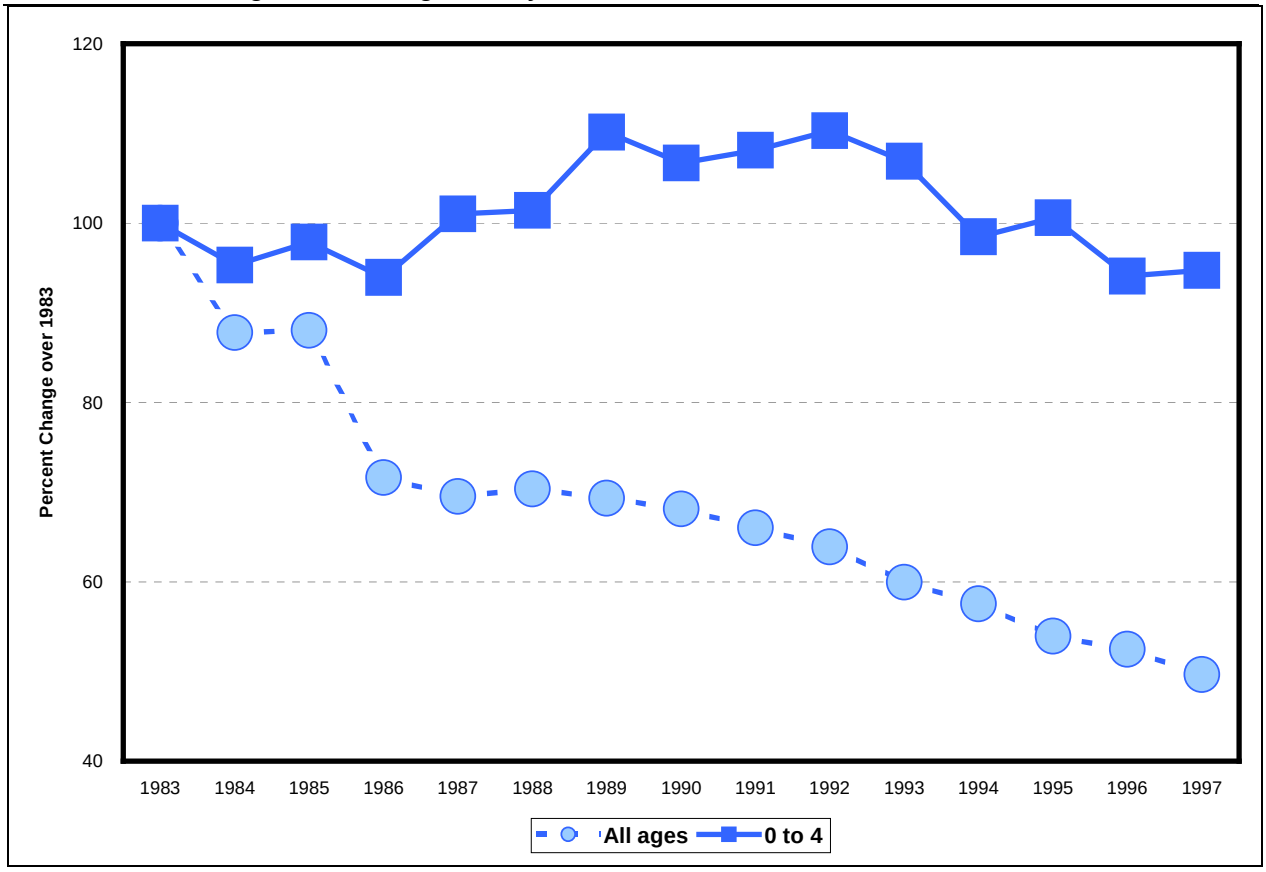


OUTCOMES OF CARE

TOTAL DAYS OF CARE

Between 1983 and 1997, California hospitals provided more than 266 million days of care. Of these, 7 million (2.7%) were provided to children age 0 to 4. Figure 10 shows the percent change in days of care for the total hospitalized population and the target age group.

Figure 9. Change in Days of Care as a Percent of 1983 Values



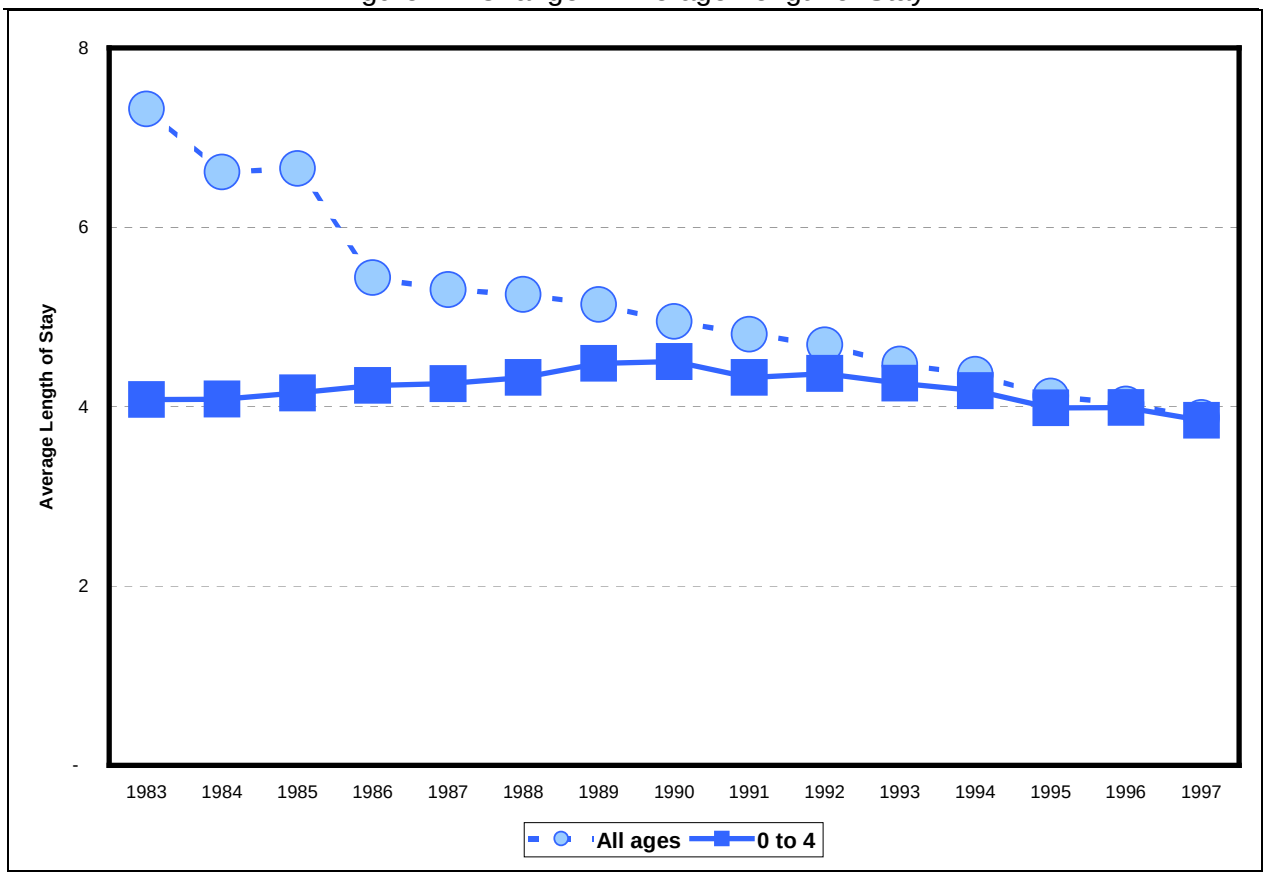
Between 1983 and 1997 discharges for all patients dropped 6%. Figure 10 shows that total days of care dropped to 50% of the 1983 number. Similar to annual fluctuations in discharges, days of care for study group children fluctuated 7% to 10% around 1983 days of care.

Within the study group, the Private Sector paid for 59% of discharges and 55% of days of care in 1983. By 1997, the Private Sector paid for 41% of discharges and 38% of days. The Public Sector paid for 41% of discharges and 45% of days in 1983. By 1997, the Public Sector paid for 59% of discharges and 62% of days. Days of care by race/ethnicity maintained their relative relationships

LENGTH OF STAY

Figure 11 compares average LOS for the total hospitalized population and the study group. Between 1983 and 1997, LOS for the total population declined from 7.3 to 3.8 days. By contrast, the study group LOS changed little: 4.1 days in 1983 and 3.8 days in 1997.

Figure 11. Change in Average Length of Stay



Between 1983 and 1997, LOS for White children remained about 0.5 days shorter than for children of other race/ethnic groups. The difference was relatively steady throughout the period and the gap did not close.

Figure 12 compares LOS by payor. LOS decreased for all payor categories except private insurance. Throughout the entire period, LOS was highest for children with Medi-Cal coverage, peaking in 1990 and then declining steadily. LOS dropped continuously for the uninsured from 4.2 to 3.7. In 1983, LOS was about 3.7 for both private and HMO/PHP. By 1997, for those few children still covered by private insurance, LOS had risen to 4.1, the same as Medi-Cal. For children with HMO/PHP coverage it had dropped to 3.4, just above the uninsured.

Figure 12. Change in Average Length of Stay by Payor

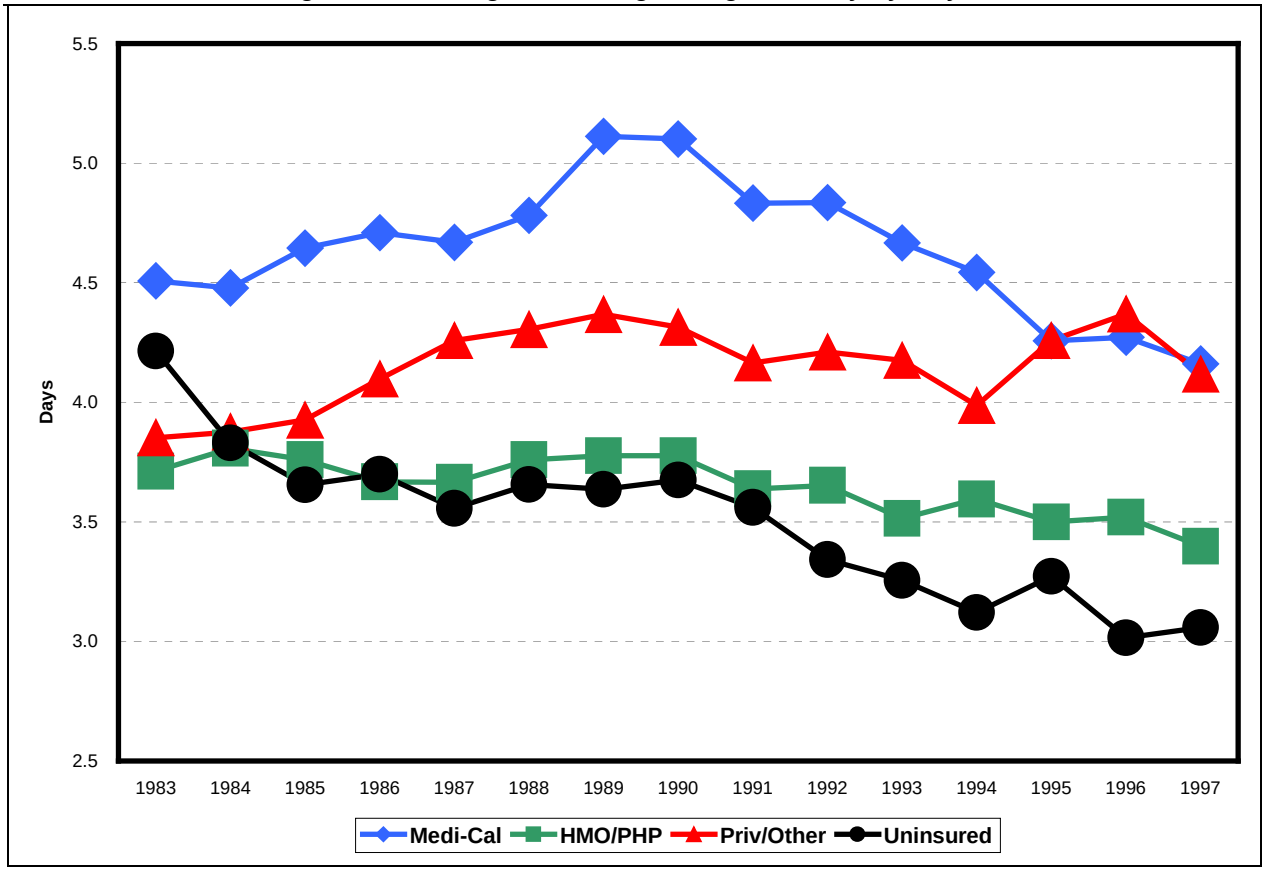


Table 2 shows changes in LOS between 1983 and 1997 by sector, payor, and race/ethnicity. Overall, LOS declined 8% for HMOs and increased 5% for other Private payors. Race/ethnic LOS disparities decreased in the HMO group and increased in the private payor group. The Public Sector saw a 10% decrease in LOS for Medi-Cal patients and a 38% decrease for the uninsured.

Table 2. Changes in LOS by Sector, Payor, and Race/Ethnicity, 1983 and 1997

Sector	Payor	Race	1983	1997	%Change
LOS	Grand Mean		4.1	3.8	(0.08)
Private	HMO/PHP	Total	3.7	3.4	(0.09)
		White	3.5	3.3	(0.07)
		Black	4.0	3.2	(0.24)
		Hispanic	4.2	3.5	(0.19)
		Asian	3.6	3.6	0.00
	Private/Other	Total	3.9	4.1	0.05
		White	3.6	3.5	(0.03)
		Black	4.5	4.8	0.05
		Hispanic	4.5	4.7	0.04
		Asian	4.0	4.3	0.07
Public	Medi-Cal	Total	4.5	4.1	(0.10)
		White	4.2	3.9	(0.08)
		Black	4.8	4.1	(0.16)
		Hispanic	4.8	4.2	(0.14)
		Asian	4.9	4.1	(0.19)
	Uninsured	Total	4.2	3.1	(0.38)
		White	3.6	2.8	(0.32)
		Black	4.5	3.4	(0.34)
		Hispanic	4.8	3.1	(0.53)
		Asian	4.3	3.0	(0.42)

Race/ethnic gaps were sharply reduced in the Public Sector. Overall, however, children who remained uninsured at discharge in 1997 had shorter LOS than their insured peers. For example, a white uninsured child had LOS of 3.1 days, compared with 3.3 for White children with HMO coverage, 3.5 for other private sector payors, and 3.9 for Medi-Cal.

Table 3 summarizes results of the LOS multivariate analysis, for all discharges and by clinical condition, comparing 1983 with 1997.[13] The top of the table presents overall model statistics by year, within condition. The total number of cases remained fairly stable but, as we have described, case mix changed between 1983 and 1997. Specifically, there were more ACS and other medical condition cases, and fewer injury and surgical cases.

Table 3. Multivariate Regressions to Predict Length of Stay, 1983 and 1997

	TOTAL		ACS		INJURY		MEDICAL		SURGICAL	
Measure	1983	1997	1983	1997	1983	1997	1983	1997	1983	1997
N of Cases	109,855	110,851	37,544	41,193	11,802	7,639	30,317	40,653	30,189	21,363
Model DF	19	19	16	16	16	16	16	16	16	16
Total SS	4,089,005	4,036,906	653,103	409,698	558,950	177,580	673,294	142,632	2,188,593	2,669,511
Model SS	583,323	943,525	59,667	56,484	86,109	40,675	39,932	31,614	563,845	875,400
Mean LOS	4.01	3.78	3.78	2.92	3.78	2.85	3.80	3.30	4.61	6.69
Explained Variance %	14.3	23.4	9.1	13.8	15.4	22.9	5.9	12.1	25.8	32.8
Diagnoses	0.4	5.6								
Procedures	7.8	10.1	5.7	9.8	10.0	11.7	2.2	6.7	15.5	22.4
Complications	2.4	4.6	0.6	1.3	2.2	9.3	0.9	2.8	4.5	6.4
Admission Source	2.2	1.8	0.6	0.2	2.5	0.6	1.5	1.4	4.6	3.0
NR Disposition	0.3	0.7	0.1	0.4	0.1	0.9	0.2	0.3	0.2	0.5
Demographic	0.8	0.3	1.6	1.1	0.1	0.1	0.4	0.2	0.7	0.4
Payor	0.1	0.3	0.2	0.9	0.1	0.3	0.2	0.7	0.1	0.1
Race/Ethicity	0.3	0.1	0.3	0.1	0.3	0.1	0.5	0.1	0.2	0.1

Although LOS dropped slightly between 1983 and 1997, variation across conditions was significant. For example, LOS dropped about a day for ACS and injury cases, dropped half a day for medical cases, and increased 2 days for surgical cases.

The amount of variance explained by the models increased significantly between 1983 and 1997: 9% overall, about 5% for ACS, 7% for injury and surgical cases, and 6% for medical cases. Across models, the least LOS variance was explained for ACS and medical cases.

The next part of the table examines the percent of variance explained by a variable block. The overall percent of variance explained by diagnoses, procedures, and complications rose between 1983 and 1997 and accounted for most of the increased model variance. Admission source, demographic, and race/ethnic characteristics declined in importance, and payor increased slightly with most increase due to ACS and other medical cases.

Table 4 shows the influence of individual variables between 1983 and 1997 overall and within medical conditions. An injury case stayed about .51 day less than an ACS case in 1983 and about 1.5 days less in 1997. In 1983, surgical cases stayed about 0.75 days less than ACS cases, but only 0.38 days less in 1997. LOS was little changed for medical cases.

Table 4. Regression Coefficients to Predict Length of Stay, 1983 and 1997

Variable		TOTAL		ACS		INJURY		MEDICAL		SURGICAL	
Block	Label	1983	1997	1983	1997	1983	1997	1983	1997	1983	1997
	Intercept	2.1	1.1	3.3	2.2	1.4	1.6	2.8	2.2	(1.0)	(4.5)
Condition	Injury	(0.5)	(1.5)								
	Medical	0.2	0.3								
	Surgical	(0.8)	(0.4)								
Procedure	Minor diagnostic	2.2	1.4	1.1	0.7	1.9	0.9	1.6	1.2	4.0	1.8
	Minor Therapeutic	2.4	2.5	1.5	0.7	3.5	2.2	0.6	0.7	3.8	6.7
	Major diagnostic	2.2	2.0	1.8	0.9	(0.4)	(1.0)	1.6	1.9	3.1	4.2
	Major therapeutic	2.0	3.5	0.4	5.3	3.3	1.9	1.2	4.0	3.3	5.5
Complication	Any complication	3.3	4.1	1.2	1.3	5.1	7.2	1.7	2.1	5.3	6.6
Admit	Emergency room	0.4	0.2	(0.1)	(0.2)	0.4	(0.5)	0.0	(0.0)	1.4	1.3
Source	Other facility	4.0	3.4	1.5	0.7	3.6	0.6	2.6	2.0	9.1	6.2
Disposition	Non-routine	1.8	2.3	0.9	1.1	1.0	1.9	1.2	0.9	2.3	3.0
Demographic	Female	0.2	0.2	0.1	0.1	(0.1)	(0.1)	0.2	0.1	0.4	0.5
Characteristic	Age 1-2	(0.9)	(0.5)	(0.9)	(0.5)	(0.5)	(0.4)	(0.5)	(0.2)	(1.1)	(1.0)
	Age 3-4	(1.3)	(0.6)	(1.2)	(0.7)	(0.4)	(0.3)	(0.5)	(0.1)	(1.7)	(1.6)
Payment	MediCal	0.4	0.5	0.3	0.5	0.4	0.3	0.3	0.5	0.2	0.5
Source	Uninsured	0.1	(0.2)	(0.2)	(0.1)	(0.0)	(0.5)	0.3	(0.1)	0.4	(0.3)
Race/	Black	0.7	0.4	0.4	0.1	0.8	0.4	0.9	0.2	0.9	1.2
Ethnicity	Hispanic	0.7	0.4	0.5	0.3	0.7	0.2	0.6	0.3	0.9	0.9
	Asian	0.5	0.3	0.4	0.2	1.2	(0.2)	0.4	0.2	0.5	0.8

In the Total model, one or more complications of care were predicted to add 3.3 days to a hospital stay in 1983 and 4.1 days in 1997. The influence of complications varied by condition, adding about 1 day for ACS cases in 1983 and 1997, but increasing from 5 to 7 days for injury cases. Complications of care have the greatest impact on LOS for injured children and children with surgical conditions.

Transfer in from another facility had been a strong predictor for injured children in 1983 but was less important in 1997. It had the greatest consistent impact on LOS for children with medical or surgical conditions. In 1983 and 1997, surgical cases with a non-routine disposition stayed about 2 to 3 days longer before they were transferred elsewhere or died. In 1983, injury cases stayed about 1 day longer if they had a non-routine disposition. In 1997, a non-routine disposition added about 2 days to LOS. That is, hospitals were keeping complex cases longer before transferring them to another level of care.

After all other variables were in the models, payment source and race/ethnicity added small but statistically significant amounts of variance to the models. We conclude that the impact of payor and race/ethnicity on LOS was less important once other clinical characteristics were understood. Also, the importance of race/ethnicity decreased over the study period.

TOTAL CHARGES

Using 1997 adjusted dollars, annual total charges for the study group increased more than 75%, rising from $810 million to $1.4 billion. Figure 13 shows changes in adjusted total dollars by payor. The pattern of change in total charges generally follows the pattern of changes in percent of children for which each payor paid.

Figure 13. Total Charges ($97) by Payor

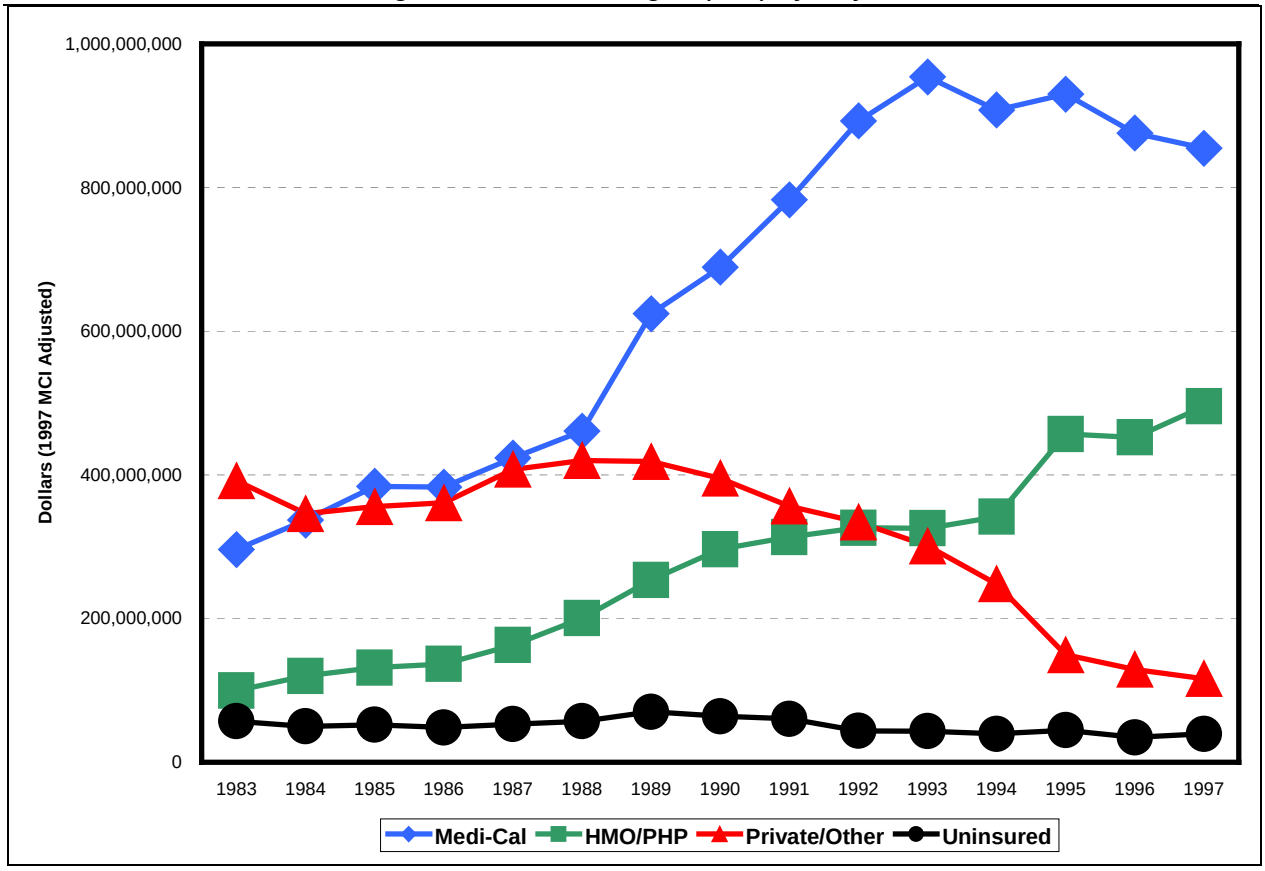


Figure 14 shows changes in average charges by payor. In 1983, average charges were quite similar across payors. By 1997, private payors almost vanished from the healthcare scene, had the highest average charge for the few remaining children they covered. Average charges for the uninsured increased the least (about $1,800) in the intervening years, and by far were the lowest in 1997. Medi-Cal and HMO/PHP charges rose at different rates through 1989 and flattened since then. By 1997, little difference remained between Medi-Cal and HMO/PHP average charges.

Figure 14. Average Charges ($97) by Payor

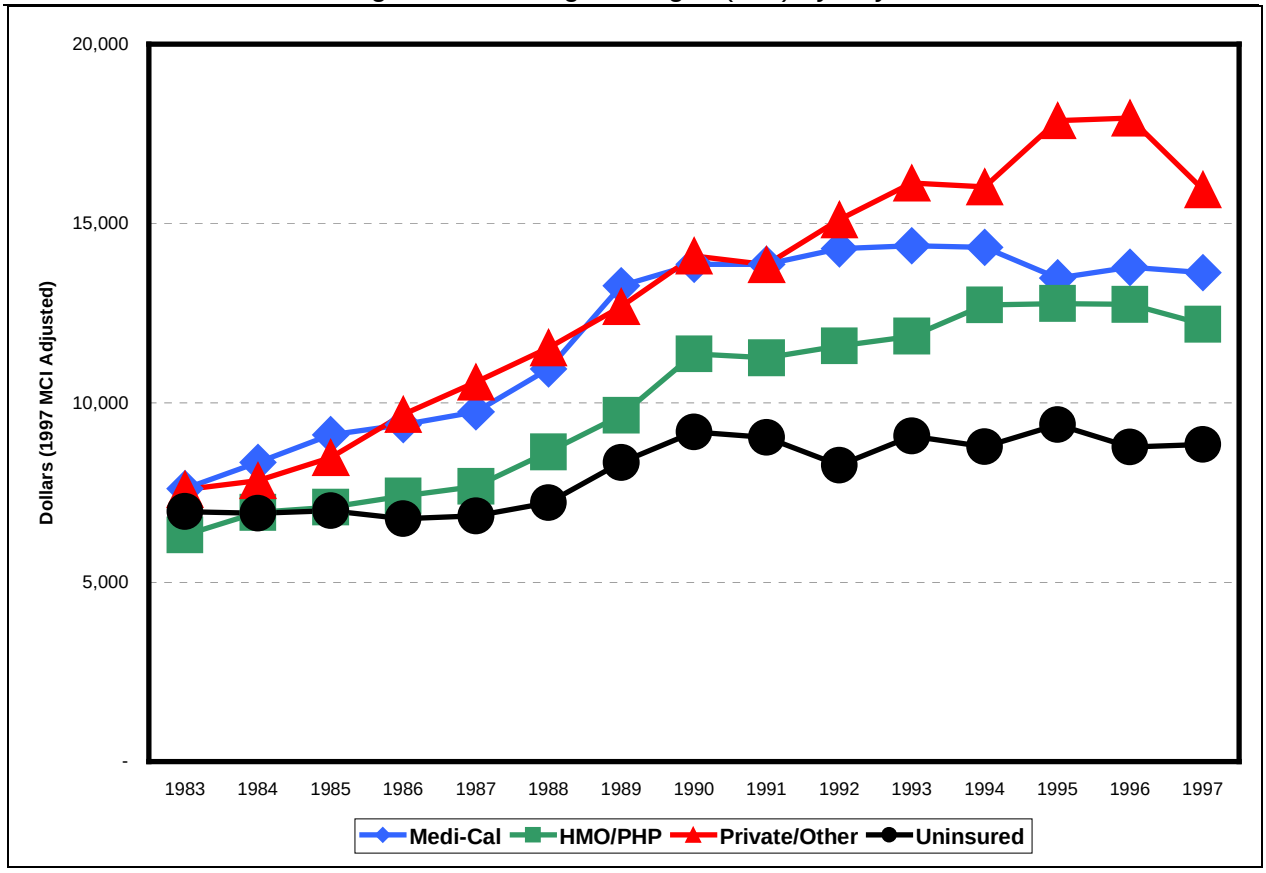


Table 5 summarizes multivariate results for adjusted charges, for all discharges and by condition, comparing 1983 with 1997.[14] Results were similar in trend to LOS model results.

Table 5. Multivariate Results to Predict Total Charges, 1983 and 1997

	TOTAL		ACS		INJURY		MEDICAL		SURGICAL	
Measure	1983	1997	1983	1997	1983	1997	1983	1997	1983	1997
N of Cases	109,855	110,851	37,544	41,193	11,802	7,639	30,317	40,653	30,189	21,363
Model DF	19	19	16	16	16	16	16	16	16	16
Total SS	474,495	1,674,389	34,665	83,475	32,358	50,357	30,470	82,014	370,470	1,353,299
Model SS	58,967	363,413	3,361	13,560	6,547	14,343	2,017	13,520	65,090	65,090
Mean CHG97	7,377	12,976	5,765	7,256	6,785	11,358	5,692	8,657	11,304	32,803
Total Variance - % Expl.	12.43	21.70	9.69	16.24	20.2	28.5	6.6	16.5	17.6	26.7
Diagnoses	1.4	6.3								
Procedures	6.1	9.8	6.7	13.8	12.1	14.6	2.5	12.2	10.2	19.0
Complications	1.6	3.2	0.6	1.1	3.3	10.7	0.8	1.9	2.2	4.4
Admission Source	2.2	1.3	1.1	0.4	3.6	0.5	1.9	1.5	4.2	1.9
Disposition	0.7	1.0	0.4	0.6	1.1	2.4	0.8	0.5	0.6	1.1
Demographic	0.3	0.1	0.5	0.1	0.0	0.0	0.1	0.0	0.2	0.2
Payor	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.3	0.0	0.0
Race/Ethicity	0.2	0.0	0.3	0.0	0.1	0.1	0.4	0.0	0.1	0.0

Between 1983 and 1997, adjusted average charge increased relatively 76%, from $7,377 to $12,976. These changes were not distributed evenly across diagnostic groupings. For example, adjusted charge increased 26% for ACS cases, 52% for medical cases, 67% for injury cases, and 190% for surgical cases.

Diagnoses, procedures, complications, and non-routine dispositions increased in explanatory power, leading to a large increase in explained variance for adjusted charges. In 1983 and in 1997, procedures contributed the most variance explained by the models. For injury cases, most of the increase in adjusted charge model variance was due to the increased impact of complications of care and non-routine dispositions.

Table 6 shows changes in coefficients between 1983 and 1997. The effect of minor diagnostic procedures changed little between 1983 and 1997. Coefficients for major therapeutic procedures more than tripled. Coefficients for major therapeutic procedures for ACS cases increased 10 fold, for medical cases 8 fold, and for surgical cases almost tripled. For surgical cases, absolutely the most expensive, procedure estimates tripled for every procedure class except minor diagnostic. The adjusted charge estimate associated with a complication more than doubled. Injury and surgical cases had the highest complication estimate. Since admission rates had dropped most substantially for these cases, these results may suggest that the average case for these conditions was more complex in 1997 than 1983. That is, perhaps children were less likely to be admitted with less serious injuries or conditions that could be treated outpatient.

Table 6. Regression Coefficients to Predict Total Charges, 1983 and 1997

Variable		Total		ACS		INJURY		MEDICAL		SURGICAL	
Block	Label	1983	1997	1983	1997	1983	1997	1983	1997	1983	1997
	Intercept	1,169	(990)	3,964	4,177	224	(279)	3,479	4,700	(8,392)	(37,689)
Condition	Injury	(1,214)	(6,740)								
	Medical	516	1,008								
	Surgical	(1,060)	(3,329)								
Procedure	Minor diagnostic	6,011	6,925	2,590	2,541	5,532	8,504	2,729	4,341	12,044	8,505
	Minor Therapeutic	6,961	13,407	3,772	2,989	6,072	7,270	2,228	3,247	12,803	37,227
	Major diagnostic	7,447	12,747	4,371	3,896	4,098	3,731	4,129	9,617	12,038	31,160
	Major therapeutic	8,137	28,918	2,961	32,593	10,010	12,619	3,239	24,801	14,510	46,310
Complication	Any complication	8,974	21,833	2,804	5,353	14,546	40,279	3,330	6,831	14,740	38,816
Admit Source	Emergency room	1,142	851	354	211	927	(288)	328	508	1,388	2,186
	Other facility	13,699	18,922	4,993	4,746	9,857	5,802	6,133	8,140	35,983	33,552
Disposition	Non-routine	9,887	17,745	3,835	6,407	8,331	17,686	4,991	4,365	16,490	33,026
Demographic Characteristic	Female	244	300	29	174	(216)	(9)	305	10	334	1,482
	Age 1-2	(1,560)	(968)	(1,261)	(888)	(234)	(16)	(569)	(426)	(2,689)	(4,616)
	Age 3-4	(2,780)	(2,397)	(1,474)	(994)	(898)	862	(540)	104	(4,158)	(10,004)
Payment Source	MediCal	(69)	1,091	(22)	1,038	250	1,712	(150)	1,233	(1,059)	1,151
	Uninsured	(900)	(1,604)	(772)	(596)	(724)	(959)	(318)	(706)	(3,040)	(4,675)
Race/ Ethnicity	Black	2,215	609	1,190	310	1,668	1,152	1,953	79	3,683	1,458
	Hispanic	1,560	433	1,114	435	811	(825)	1,020	595	2,271	1,336
	Asian	1,111	1,199	1,018	913	1,869	(166)	801	658	1,434	2,132

After all other variables were in the models, payment source and race/ethnicity added small but statistically significant amounts of variance to the models. The impact of payor increased slightly. On average, after controlling for all other variables in the model, charges for Medi-Cal cases were about $1,100 adjusted dollars more than Private Sector cases in 1997. The gap in charges for uninsured cases compared with Private Sector cases had increased from -$900 in 1983 to -$1600 in 1997, probably because their stays were shorter and they had fewer procedures. The same general pattern is observed across all conditions.

We conclude that the impact of payor and race/ethnicity on adjusted charges was less important once other clinical characteristics were understood. Further, the importance of race/ethnicity as a factor explaining adjusted charges decreased over the study period.

DISCUSSION

Hospitalizations account for the major portion of health care costs for children. The intent of expanded insurance coverage for children and the transition of children in both employer based insurance and Medi-Cal to managed care models was in part to prevent serious illness and subsequent costly hospitalizations and also in part to reduce costs. Results of these policies should be seen in changes in the hospitalized population. Thus, in order to explore the effectiveness of these strategies, it is critical to monitor who is being admitted, why they are being admitted, what kind of care they are receiving, and what factors influence the cost of care.

Over the 15 years of this study, demographics of the hospitalized population changed dramatically to mirror changing California demographics. Hispanic children increased to almost half of the hospital population. During that same period the proportion of White children declined to less than one-third of discharges. Discharges for Black and Asian children were relatively stable as a proportion of discharges.

In 1983, the public sector paid for 41% of discharges. By 1997, the Public Sector paid for 59% of discharges. Over this period the percent of children uninsured at discharge declined from 7% to 4%, the percent of privately insured declined from 45% to 6% and the percent with HMOs increased from 14% to 35%. There was a one-to-one correspondence between the shift from the Private Sector and uninsured into Medi-Cal.

Today the Public Sector pays most hospital costs for children age 0 to 4. This is the result of the dramatic shifts in insurance coverage. Children of Private Sector employees have been shifted to the Public Sector for their insurance. These shifts out of the Private Sector insurance market disadvantaged all children, but particularly Black and Hispanic children. Our findings mirror those of the 1998 GAO report showing that as private companies eliminated or decreased employee benefits, the public sector increasingly absorbed the cost.[15]

We initially were interested in exploring differences in hospital care in order to explore changes in types of illness as well as content and quality of care received by subgroups of children. However, as our examination proceeded, we became increasingly concerned about variations over time in hospital utilization (discharges, days), procedures used, complications of care, and disposition that went well beyond our initial focus and simply could not be explained away by changes in the underlying clinical profile. In the discussion that follows, we focus on the impact of changing public policy on the availability and quality of hospital care provided to California's very young children.

STRUCTURAL CAPACITY

In the first volume of this report, we found that hospital utilization as measured by population-based rates of discharges and days of care had been reduced for the pediatric population age 0 to 4, but not as much as for the total population. Examining the data from the hospital view, we found significant decreases in number of discharges, days of care, and length of stay for the total population and relative stability in these measures for the pediatric population.

In this discussion, we focus on the impact of changing health policy on structural capacity. Our attention focuses on the availability of hospitals and ancillary healthcare services as they are relevant to caring for the pediatric population age 0 to 4. We believe the stability of children's utilization has implications both for the structural capacity of California hospitals and for the abilities of communities within which hospitals are located to serve the pediatric population. In

particular, we focus on the impact of hospital closures and changes in the hospital sub-structure.

In a series of annual studies started in 1987, the Office of Inspector General (OIG) has documented a steady annual decline nationally in the availability of both hospitals and beds.[16] For the first time in nearly 80 years, the American Hospital Association has found that America has fewer than 6,000 hospitals and that community hospitals fell below 5,000 for the first time in perhaps half a century.[17]

The California picture is different from the national picture. Simonson and MacDonald found the number of acute care hospitals and beds in California has been relatively constant for many years, with a net loss of 5% of hospitals representing only 4,000 beds between 1988 and 1997.[18] Most hospitals that closed re-opened under different management or relocated to different locations in their areas, necessitating new hospital licensure.

Both nationally and in California about one-third of closures are small hospitals in rural areas, resulting in large geographic areas with no hospital services. In both urban and rural areas, the OIG has found that hospitals serving higher percents of non-Medicare patients -- i.e., younger patients -- were more likely to close. In urban areas, average non-Medicare utilization among hospitals that closed was 61% compared to an average of 54%.[16] Hospital closures in urban areas have resulted in reduced access for minority populations.[19]

No matter where closures occur in rural or urban communities, children may be traveling farther from their homes to obtain needed care in 1997 than in 1983. For example, Sutter Health announced it is moving Northern California's third largest pediatric intensive care unit out from a "beautiful site in the middle of a residential neighborhood" into downtown central Sacramento.[20] When hospitals close, related health care resources such as medical offices and pharmacies also tend to move or close.[21]

Because ancillary medical resources tend to cluster around hospitals, and tend move or close when hospitals move or close, children living in these areas increasingly are less likely to receive preventive outpatient services close to home. For example, pharmacy closures have been shown to reduce Medicaid prescription claims.[22] In addition to impacting the health of a community's families, hospital closure negatively affects the community's economic prospects.[23] Closures increase travel times to receive hospital services and residents of the affected communities have heightened anxiety about their ability to receive timely emergency services.[24] Thus hospital closures affect access to the full range of pediatric services and related resources, increase stress on families trying to obtain those services, and negatively impact the economic wellbeing of families living in the communities.

Another crucial piece of infrastructure is the availability of emergency rooms, which this study identified as a key route for children's hospital admissions. In 1998, Alameda and Contra Costa counties had eight fewer hospital ERs than they did had twelve years earlier.[25] As we are writing this report, another Contra Costa county ER has closed.[26] In November 1999, Mt. Zion Hospital ER closed in San Francisco. Overall, California lost 19 ERs since 1997, while the number of visits increased from 8.8 million to 10 million.[27]

Despite these losses of ER capacity, we found that ER admissions increased both from the population and the hospital viewpoint. ER admissions were highest for Public Sector children. One study followed the use of pediatric ERs by inner-city families over three decades.[28] The researchers found that more ER users reported a regular source of care in 1993 than in

previous decades, but most did not contact that source before visiting the ER. Coupled with the losses of ER capacity, these findings again suggest that many children may be traveling further from their homes to receive care, that poor children may be particularly affected by ER closures, and that managed care has failed to engage families in preventive care.

In addition, California hospitals have been undergoing other important sub-structure changes. There has been a notable shift in the distribution of licensed beds for certain types of care. For example, between 1995 and 1997 there was an average increase of 64% in the number of long-term care beds relative to the period 1988 to 1990.[18] Northern California has pared hospital capacity for medical surgical beds under a fully penetrated managed care regime.[29]

We were unable to find any studies examining changes in the supply of pediatric beds either in California or nationally. However, the relative stability in the number of discharges, in the face of a declining population-based admission rate, suggests that pediatric beds have not declined in their overall availability although hospital closures and substructure changes may have changed where those beds are located and who accesses them.

The implementation of SB1953 (Alquist) will impact the future availability of inpatient care.[30] This legislation requires facilities to meet stringent seismic safety standards beginning in the year 2001 if they wish to continue providing inpatient care. Experts have predicted one in four hospitals would shut down because of their inability to meet retrofitting requirements by the year 2008.[31] These closures probably will further impact the geographic ease with which families can access care for their children.

The history and pattern of closures in response to managed care implies more restricted access to care for all of California's residents, not just its children. Coupled with the specter of California's inability to meet earthquake standards to make hospitals safe, widespread public concern has been voiced. California's Attorney General has been aggressively pursuing antitrust litigation against large healthcare systems whose mergers, acquisitions, and subsequent closures reduce community access to hospital care.[32] [33] How these issues are resolved certainly will affect the ability to deliver healthcare for all Californians, and regional inequities in structural capacity are sure to persist if not increase. Given an apparent constant need for hospitals in children age 0 to 4, these shifts may particularly affect young children and their families.

QUALITY OF CARE

In our analysis, we identified a number of issues that could not be explained by the clinical characteristics of children admitted to hospital. These included annual variations in numbers and types of procedures used and rising rates of complications and non-routine discharges.

A new HCFA study analyzing 1997 to 1999 national medical records data found that California ranks in the bottom 10% of states for providing quality care to Medicare beneficiaries.[34] Quoted officials suggested results were not limited to Medicare patients and went on to add, "[The report] shows the way physicians and hospitals have altered the practice of medicine to accommodate the needs of managed care. We need to ask if there's a staffing problem in hospitals . . . that's resulting in poor practice" [35] In the following discussion, we make some effort to examine whether practice has changed.

PROCEDURES

In this study both the numbers and classes of clinical procedures recorded varied significantly from year to year beyond what could be explained by annual variations in the underlying clinical diagnoses causing admissions. From 1983 to 1991, the percent of hospitalized children undergoing procedures increased in all categories except major procedures. After this time the percent of children with even one procedure steadily decreased.

In 1983, children with Private Sector coverage were more likely to have a procedure than children with Public Sector coverage. By 1997, rates for both groups were about the same, with 54% overall having no procedure. Major therapeutic procedures were carried out for about 13% of Medi-Cal cases in 1983 and 1997, but declined from 26% to 16% for other payors in 1997. Although we did not report it, there also were significant variations in rates of change by clinical condition, procedure type, and payor.

With more than half of California's youngest hospitalized population receiving no procedure of any kind by 1997, we must wonder WHY they were admitted. In 1983, 61% of admissions were for ACS or other medical conditions, with injury and surgery accounting for the remaining 39%. In 1997, ACS and other medical conditions accounted for 74% of admissions and more than 70% of ACS and other medical conditions had no recorded procedure.

The number of procedures a child undergoes after admission could be an indication of the complexity and severity of the clinical condition. Doing more procedures could be a way to generate increased revenue. Not offering procedures also could be a way to increase the hospital bottom line, in that the hospital could bill for the stay but incur minimal charges.

If pediatric cases admitted to hospital are indeed more complex -- as hospitals have been saying for years -- we should see increased procedures and LOS commensurate with the increases in charges. However, we see fewer procedures, and increased complications and charges. Are cases more complex because the children were sicker when admitted, or do cases become more complex because of the quality of care provided during admission?

Without an in-depth analysis, we cannot be sure why these variations occurred. However, we note a possible association between the implementation of cost cutting strategies such as the PPS and DRGs, which limited reimbursement by condition. This may discourage use of procedures that were not medically necessary. However, it would not explain the failure of annual variations in procedure usage to be related to annual variations in underlying clinical conditions necessitating the admission. Nor would it explain the increase in complications, discussed below.

One possible explanation for the reduction in procedures may be structural. Hospital staff with the appropriate licensure to do the various procedures may no longer be employed to do inpatient procedures. Data available from OSHPD indicate a significant reduction in all licensed categories. Most attention has focused on registered nurse availability.[36] However, use of other licensed professionals also declined between 1989 and 1998 even though the total number of hospital employees increased, primarily due to increases in administrative staff and the use of unlicensed direct care personnel.[37]

For example, the Marin Healthcare District documented that RN hours had declined 40% while the use of other licensed professionals (pharmacists, respiratory therapists, phlebotomists, physical therapists, etc) had dropped 85% between 1983 -- when the District leased its publicly-

owned hospital -- and 1997.[38] The District's tenant had carried out these significant staff reductions when the number of discharges had declined only 3% and the number of days of care had declined only 20%. Thus the impact on the patient population in terms of the availability of all licensed caregivers to provide care was substantially greater than the reduction in hospital utilization.

While there has been a significant shift to do diagnostic testing before admission and to provide more of certain types of care out-of-hospital following discharge, these trends would seem to be have limited impact for the pediatric population we studied. With so many entering through the emergency room, there would not be time to do pre-admission evaluations. Further, in working with the pediatric population, it is particularly important to have licensed professionals trained to work with children. Reduced availability of all licensed professionals in hospitals, coupled with the probable loss of professionals specifically skilled to work with children, may be implicated in the reduction in procedures.

COMPLICATIONS OF CARE

We found that the percent of discharges with recorded complications of care rose 46% from 7.1% in 1983 to 10.4% in 1997. Throughout the period, complication rates were highest for children with Medi-Cal coverage and they constituted the bulk of children admitted. Complication rates rose over all payor categories, ranging from about a 60% relative increase for Private Sector groups to 30% for Medi-Cal and 20% for the uninsured.

In multivariate models to understand changes in LOS and charges, complications were significant predictors, and the importance of a complication to these outcomes increased markedly between 1983 and 1997.

This increase occurred despite the fact that admissions for clinical conditions that might be expected to cause complications, i.e., injuries and surgery, significantly decreased over the period, decreased at a rate greater than the rate for ACS and other medical conditions, and that major therapeutic procedures were constant as a percent of discharges. Inequities between Public and Private Sector children had been achieved to the disadvantage of Private Sector children by increasing their complication rate.

Using 1992 data, the Institute of Medicine estimated that anywhere from 750,000 to slightly over a million adverse hospital events occurred annually.[39] The most common complications of care are related to medications and procedures, and operative-related problems. Other more recent studies have found that the IOM may have underestimated the problem of adverse drug effects as much as five fold.[40]

There is some evidence to raise the possibility that quality of care issues may be involved. Numerous studies have found that complications vary among hospitals.[41] [42] [43] [44] One study showed widespread misuse of drugs and under and over use of procedures, including overuse of antibiotics and tympanostomies for children.[45]

These problems may be related to reductions in qualified staff to care for children. The American Nurses Association (ANA) analyzed characteristics of care for all discharges in 1991 through 1993 from New York, Massachusetts, and California.[11] Their study involved 26 million hospital discharge abstracts, as they analyzed all data, not just children as we have done here. ANA related complications to hospital staffing patterns, LOS, and charges. They found complications increased length of stay and charges and that complications were sensitive to

nurse staffing. That is, decreasing RN staffing increased complications of care. Inpatient mortality has been shown to be inversely associated the availability of certain pharmacy services.[46] That is, decreasing pharmacy service availability increased mortality.

In this study, we did not relate complications to staffing. In California, registered nurse staffing ratios have been legislatively protected in neonatal and pediatric intensive care units for many years. It seems unlikely that the increasing trend for complications among children is due to hospital variation in numbers of RN staff. In fact, complication rates may be lower than might otherwise be expected since nurse staffing is protected to some extent.

One possible explanation may be that, although RN staffing is protected in some pediatric units, hospitals may be rotating RNs hospital-wide among units on an as-needed basis without attending to the underlying special patient acuity and nursing skill set appropriate to care for pediatric patients, as Title 22 would require. That is, the use of specially trained pediatric nurses may have declined. Understanding reasons for increased complication rates for young pediatric cases would require further study to identify the causes.

Another hospital-based explanation may be that certain hospitals under- or over-code. The California Hospital Outcomes Project had to abandon hospital rankings for disc surgery and delivery complications because of non-random variations in coding complications. One hospital forthrightly commented that their guidelines ". . . allowed a physician to instruct the hospital whether or not to report diagnoses, major or minor, which might be interpreted as complications."[47] A subsequent medical records re-abstraction study focusing on delivery complications found hospitals that would have been ranked well had under-reported their complications.[48]

In the context of this study, the possibility of under-coding would be particularly troubling, in that it would imply that the true complication rate is much higher, to the developmental detriment of these very young patients.

Another possibility is that cases have been up-coded to obtain higher reimbursement for care provided and that the true complication rate has not changed. This possibility, particularly in light of an apparent decreasing use of procedures for the pediatric hospital population, would have serious ramifications for Medi-Cal reimbursement.

A recent study by the Centers for Disease Control compared the rate of in-hospital pregnancy-related complications among women with different type of health insurance.[49] The overall multivariate likelihood of an adverse maternal outcome during hospitalization for a delivery was not significantly different between MCMC and Medicaid FFS groups in California and Florida. However, mothers in the MCMC group compared with mothers in the private managed care group experienced a higher likelihood of eclampsia. The authors concluded that managed care has not adversely affected pregnancy outcomes in Medicaid-sponsored women. Yet, payor system changes may be insufficient to achieve complete parity of outcomes relative to private managed care patients.

PATIENT DISPOSITION

Healthcare quality is difficult to measure. Some have suggested that rather than measuring outcomes in terms of specific procedures relative to specific medical conditions, it may be more fruitful to measure aggregated discharge classifications where possible. This approach is demonstrated in public reporting options available on the world wide web from AHRQ.[50]

A recently completed study identified that non-routine dispositions increased from 19.2% to 23.4% of all discharges from California hospitals between 1995 and 1998, a change that strongly correlates with the drop in full-time RNs and decline in the number of staffed beds.[51]

We found that most children age 0 to 4 are discharged routinely. However, the non-routine discharge rate increased from 2.95% to 4.96%, for a relative 68% increase between 1983 and 1995. Public Sector children had consistently higher rates of non-routine discharges throughout the study period, and by 1997 Private Sector children had the same likelihood of a non-routine disposition as Public Sector children. That is, equity had been achieved by increasing the likelihood of a non-routine disposition for Private Sector children.

In models to understand changes in LOS and charges, non-routine discharges increased both outcomes, and the importance of a non-routine discharge to these outcomes increased significantly between 1983 and 1997.

Some of the stability in LOS and increase in charges may be associated with keeping children longer before transferring them to another facility better able to provide care. That is, increased penetration of managed care may be keeping children longer in facilities lacking the resources to adequately care for them before authorizing transfer to a more appropriate hospital.

POLICY RECOMMENDATIONS

Some investigation needs to be undertaken to examine the impact of changes in the geographic availability of key health care infrastructure on pediatric outpatient utilization. Studies suggest hospital closures and relocations have been accompanied by commensurate shifts in the availability of other healthcare resources and have had detrimental impacts on communities. If these shifts are reducing children's access to primary care and are resulting in needless hospital admissions, "rationalization" policies implicit in managed care may be detrimental to the health of children. This is particularly the urgent to investigate since we saw that charges actually increased while quality of care decreased.

Regulatory agencies need to put continuous quality improvement initiatives in place and monitor them. These CQI activities should include monitoring changes in types of ER admissions and dispositions, and a careful review of complication rates, including the types and causes of complications of care experienced by children, with particular focus on payor and race/ethnicity.

Variations in use of procedures need to be examined to better understand whether children are being deprived of needed care due to cost considerations or are being admitted to care without need. If children are being admitted in order to get necessary tests, policies permitting out-patient testing must be reconsidered. Delayed testing may lead to inappropriate admissions, more complications, longer stays, and higher charges.

A study needs to examine underlying causes for the increased percent of children experiencing complications. This should include the distribution of complications among hospitals to see if particular hospitals or hospital types have higher rates. The relationship of complication rates with the over or under use of particular procedures and clinical diagnosis should be explored. The impact of registered nurse availability, availability of qualified pediatric nurses, the general skill mix, and the availability of ancillary licensed professionals should be included, particularly in light of ANA's study using California data.

The adequacy of policies mandating nurse-patient ratios in pediatric hospital units needs to be reexamined. It may not be enough to partially protect the pediatric staffing and skill mix. We also may need to fully protect children by requiring pediatric specialty nurses in all pediatric units.

If at all possible, some research on this issue ought to be done before regulations are written to implement AB394. With the signing of AB394, California is set to become the first state in the country to mandate nurse-to-patient ratios in all units. Those currently preparing regulations to implement AB394, scheduled to go into effect in 2002, could benefit by timely research to help them consider both the staffing skill mix (RN, LVN, aide) as well as the underlying pediatric staff training and competency as it pertains to complications among children.

All of these various issues strongly suggest the need for medical record reabstraction studies to investigate what is happening in pediatric hospital care, particularly for Medi-Cal patients.

CONCLUSION

California has been in the forefront of healthcare reform for many years. Before this study, no longitudinal population-based investigations had been undertaken to understand the impact of health reform on the patient population. We began this long overdue examination by focusing on healthcare utilization patterns of California's youngest children age 0 to 4 excluding neonates.

Our initial intent was to focus on the impact of publicly-funded insurance and managed care on reducing race/ethnic disparities in access to healthcare. Specifically, we wanted to examine whether public policies had achieved their desired intent of providing all young children more access and more equitable access to primary care in physician offices and other community settings. In the companion volume to this report, we found that hospital utilization decreased from a population standpoint. We took this to mean that at least some children received more primary care.

However, race/ethnic disparities had been reduced in some ways and had increased in others, both in the population and in the hospital, to the particular disadvantage of Hispanic and Black children. Multivariate models to understand LOS and charges for hospitalized children identified that the impact of race/ethnicity had been reduced but not eliminated after children were admitted.

We observed a consistent trend centering around 1994 suggesting that all race/ethnic groups were negatively impacted by welfare reform and that Hispanic children experienced a dual impact from Proposition 187. All measures began to change -- in the wrong direction -- after 1994. It is abundantly clear that these events negatively impacted the use of primary care services in this age group.

During the study period, there was a general shifting out of Private Sector and into Public Sector insurance programs, with Hispanic and Black children particularly disadvantaged. As our examination proceeded, we became increasingly concerned about variations over time in source of entry into the hospital, procedures used, complications of care, and disposition that went well beyond our initial focus and simply could not be explained away by changes in the underlying clinical profile. By 1997 compared with 1983, rates of ER admissions, complications, and non-routine discharges rose and use of procedures fell significantly.

The most consistent clinical effect of the shift out of the Private Sector was primarily to the detriment of children with Private Sector insurance. Their quality of care fell or rose to equal that

previously experienced more often in 1983 by Public Sector children. That is, all groups experienced poorer care. Equity had been achieved by lowering the quality of care for Private Sector children to that offered to Public Sector children. Since virtually all hospitalized Private Sector children were covered under managed care plans, this is a concern.

Some structural changes seem responsive to the move to managed care. In our discussion, we highlighted significant structural changes -- availability of hospitals, emergency rooms, licensed personnel -- that have occurred parallel with legislative policy initiatives and that seem to be related to decreased quality of care. While these changes may make healthcare delivery more "rational" from an economic view, they also may make the healthcare environment less family friendly, to the particular disadvantage of families with very young children.

Our concern has become increasingly developmental: Would so many of our youngest children be admitted to hospital -- with the attendant risk of serious future problems associated with trauma, attachment, and loss -- in a different healthcare environment?

The answer to this question must wait another day, for some time in the future, after several years of post-welfare reform, after the lingering impact of Proposition 187 fades, after several years of Healthy Families. And, maybe, after several years of universal healthcare.

ENDNOTES

[1] Oliva G and Remy L. The Impact of Changing Public Policy on Hospital Admission Patterns for California Children Age 0 to 4 - 1983 to 1997.

[2] In analyses, we excluded children with "other" race. Thus, the number of cases used differs by about 4% from the total numbers of cases actually found in each year.

[3] EpiHosp Manual, Family Health Outcomes Project, 1998.

[4] Injury Tables, California, 1996 Deaths and Nonfatal Hospitalizations. Prepared by the Injury Surveillance and Epidemiology Section of the California Department of Health Services.

[5] CDC (MMWR 1997; 46 (No. RR-14).

[6] The first part of the routine used FHOP principal diagnosis variables, focusing on certain injury types (broken bones, concussion, etc). We also flagged as injuries records in MDCs 21 (Injuries, poisonings and toxic effects of drugs, excluding adverse effects of treatment) and 22 (Burns).

This permits us to know the case was an injury but does not permit us to describe the mechanism or intent. Injury E-Codes did not become part of the PDDS record until July, 1990. Records after that date with any principal external cause of injury (E-code) were flagged unless they indicated late effects of a previous injury or adverse effects of treatment for another condition. We used software provided by the Records identified as an injury using any classification method (FHOP, MDC, E-Code) were assigned a primary condition of "Injury".

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[11] American Nurses Association. (1997). Implementing Nursing's Report Card. A Study of RN Staffing, Length of Stay and Patient Outcomes. Washington, DC: American Nurses Publishing.

[12] Using records with a charge, we created a file containing the original charge and the charge converted to 1997 dollars (CHG97), from the monthly Medical Care Consumer Price Index. (Bureau of Labor Statistics Data, Consumer Price Index-All Urban Consumers, West Size A. Downloaded from http://146.142.4.24/cgi-bin/dsrv.) This was converted to dollars per day, trimmed at the 99th percentile, and converted to logged dollars per day. Within DRG and year, for DRGs with 30 or more cases, we obtained a predicted log charge per day, controlling for the child's age, length of stay, number of diagnoses and number of procedures. If the DRG had fewer than 30 cases a year, we combined years within 5-year rolling averages. The predicted logged dollar per day was converted back into 1997 dollars .

We imputed charges using the predicted value based on the child's age, number of diagnoses and number of procedures, DRG, and year of discharge . Then we converted the dollars back to their original value within each year. We merged records for cases missing a charge back into the master file and converted all charges to 1997 dollars. At the end of the process, we had the original charge, a total charge based on the original or imputed value, the inflated charge, and a variable flagging cases that had been imputed.

We imputed charges on 7% of Medi-Cal cases, 2% on Private/Other, 4% on uninsured, and 39% of HMO/PHP. Average charges on imputed cases were $3,422 less than cases with charges that had not been imputed.

We flagged every record with imputed charges. We examined whether the imputation affected the models in two ways. First, we checked the bivariate correlation of the imputed charges to the CHG97 in each year. The correlation was -.022 in 1983 and -0.016 in 1997. We added the dummy variable as the last variable in the multivariate models, and it was statistically non-significant. As a result, we do not show the results for this variable in presenting our models.

[13] This table shows results from regressions using the ALOS variable trimmed at 120 days. We tested models using untrimmed ALOS, and with logged ALOS. Results were best with the extreme ALOS trimmed. Results from the logged models were similar in direction, but the amount of explained variance was higher. We are showing this model because it is easier to understand.

[14] We did the model using logged charges, and results were similar. Because most people have difficulty understanding logged values, we made a decision to present the results in dollars.

[15] United States General Accounting Office. Health Insurance for Children. Declines in Employment-Based Coverage Leave Millions Uninsured; State and Private Programs Offer New Approaches. Testimony Before the Subcommittee on Health, Committee on Ways and Means, House of Representatives. GAO/T-HEHS-97-105. Wash., DC: Apr 8, 1997.

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