RESEARCH ARTICLE

Hospital Costs and Charges of Discharge Delays in Children Hospitalized for Abuse and Neglect

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ABSTRACT

OBJECTIVES: Hospitalizations for child maltreatment cases are longer and costlier than hospitalizations for medically similar nonabuse cases. Some discharges are delayed despite medical clearance because of a lack of safe disposition, increasing the cost of hospitalization. We aim to quantify the additional charges and costs of these delays.

METHODS: A retrospective chart review evaluated the dates of medical clearance and clinical characteristics of child protection team inpatient consults from 2012 to 2014 at a 595-bed quaternary-care urban hospital. Charges and costs were compared between those with no delay, those with any delay, and those with a delay >1 day. We excluded children who were not admitted, in whom no abuse was suspected, or in whom sexual abuse was suspected absent extragenital injury.

RESULTS: Thirty-six percent (134 of 375) of children hospitalized for abuse remained hospitalized after medical clearance and 20.5% (77 of 375) of children were delayed >1 day. Among those who were delayed, the mean number of days delayed was 4.37 (SD ±7.44). Mean charges after medical clearance were $13 647.53 (±$30 172.17), and mean costs after medical clearance were $6521.93 (±$13 975.34). Both charges and costs were markedly right-skewed. Median costs after medical clearance were $1553.64 (interquartile range, $26.10–$5244.20). Cumulatively, 586 total days of delay resulted in excess charges of $1.8 million.

CONCLUSIONS: Continued hospitalization beyond medical clearance occurs often and represents a significant cost. Further study is needed to evaluate whether interventions can be targeted at children with characteristics correlated with prolonged discharge delays.

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Dr Bachim conceptualized and designed the study, designed the data collection instruments, performed the majority of the data collection, and critically reviewed the manuscript; Dr Lee participated in data collection; Ms Smith participated in data collection and critically reviewed the manuscript; Dr Camp performed statistical analysis and interpretation and critically reviewed the manuscript; Dr Lee drafted the initial manuscript; Drs Patel and Donaruma-Kwoh critically reviewed the manuscript; and all authors approved the final manuscript as submitted.

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When child abuse victims are hospitalized and a child protective services (CPS) agency is involved, some patients may remain hospitalized for extended periods despite being medically ready for discharge while CPS searches for safe, appropriate placement. Child abuse and neglect are known generally to present tremendous health and economic burdens,[1] and >700 000 cases per year are substantiated.[2] Although the precise economic effect of abuse is unknown,[3–5] 1 recent review estimated the total lifetime economic burden from each year's new cases of child maltreatment to be $124 billion.[6] Considering the immediate costs after child abuse, hospitalizations for child abuse are longer, more expensive, more likely to be fatal compared with other hospitalizations,[7] and represent a disproportionate and significant cost to public insurers.[8] Ettaro et al[9] found hospital length of stay and charges to be higher, even when directly comparing cases of abusive head trauma to nonabusive head trauma.

To date, hospital costs have only been evaluated indirectly by assessing charges, and the costs added by delays in discharge after medical clearance have not been studied. The frequency, duration, and added cost of hospitalization beyond medical clearance remain unknown. We aim to measure the charges and costs of continued hospitalization beyond medical clearance in children admitted for suspected physical abuse or neglect, and hypothesize that discharge delays predict significantly higher total hospital costs and charges.

METHODS

Setting and Participants

We conducted a retrospective chart review of all children who received consults from the child protection team (CPT) at a 595-bed quaternary-care urban hospital that admits more than 25 000 patients per year. The consult team's patient database was queried for medical record numbers and demographic information for the patients evaluated from 2012 to 2014. Children were excluded if they were not admitted to the hospital, did not receive a CPT consult, were not diagnosed with abuse or neglect by CPT, were victims of isolated sexual abuse, or died. We chose not to use *International Classification of Diseases, Ninth Revision* codes to identify child abuse cases to avoid errors from unreliable coding.[10] The type of maltreatment (for example, physical abuse versus medical neglect), length of admission in days, length of PICU stay in days, clinical characteristics (medication information, feeding requirements, and demographic information, including type of insurance), whether the child was in CPS custody, and discharge disposition were abstracted from the medical record.

Data Collection

Date of medical clearance was determined by reviewing the notes in the medical record. We considered a patient medically cleared after all ordered consults and testing were completed, and when, in order of priority, at least 1 of the following occurred: (1) a social worker's or case manager's note explicitly stated that a patient had been medically cleared by physicians, (2) a medical provider's note explicitly stated that a patient was medically cleared, or (3) if no explicit statement was ever made, when the plan of care documented no active medical care as agreed on by a consensus of 2 authors. A random set of 8% of eligible charts were reviewed by a blinded second reviewer to evaluate agreement on date of medical clearance. Financial data, including hospital charges, total hospital costs (both direct and indirect), type of insurance and initial dollars collected, were obtained from hospital financial records via Allscripts EPSi (Allscripts Solutions, Chicago, IL). Hospital costs are calculated within EPSi by using relative value unit costing. This method allocates hospital expenses to each activity by averaging the cost of capital goods and labor minutes across their utilization for a given activity, and then it assigns that cost to each activity that occurred in a hospitalization. Although initial reimbursement data were collected, final data were not available because some payers reserve the right to review expenditures and request repayment for spending deemed medically unnecessary. That process is still pending at the time of this writing. Professional services were not included in this analysis.

Data Analysis

We assessed mean and median days of delay from medical clearance and mean and median charges and costs for the total hospitalization as well as for hospitalization after medical clearance. Group comparisons were made among children with no delay, children with any delay, and children with a delay of >1 day. The distribution of the continuous variables was assessed for symmetry by using the Shapiro-Wilk test for normality. Categorical variables were analyzed by using the Pearson χ^2 test. For non-normally distributed variables, nonparametric testing (Mann–Whitney *U* test) was used to determine statistically significant differences between group medians. Demographic and clinical factors were compared with the number of delayed days after medical clearance. An intraclass correlation coefficient, using a 2-way mixed model, was conducted on the subset of charts assessed by the secondary reviewer. All analyses were conducted by using the Statistical Package for the Social Sciences version 23 software (IBM SPSS Statistics, IBM Corporation, Armonk, NY), and charts were produced by using Microsoft Excel 2007 (Microsoft Corporation, Seattle, WA). The local institutional review board approved this study.

RESULTS

We reviewed 673 charts. After exclusions, 375 children were eligible for our study, as displayed in Fig 1. Of those, 134 children (35.7%) had delayed discharge beyond medical clearance of at least 1 day. The number of children by days delayed is displayed in Table 1. Fourteen children (3.7%) were delayed by >7 days, and the maximum was 56 days. Among those who were delayed ($n = 134$), the mean number of days delayed was 4.37 (SD ±7.44) with a median of 2.00 (interquartile range [IQR]: 1.0–4.0). Cumulatively, children were delayed by a total of 586 days. The intraclass correlation coefficient was 0.91 (95% confidence interval 0.82–0.96, *P* value <.001), demonstrating high agreement. The variables of age, days in hospital, and days in PICU were all right-skewed. All variables

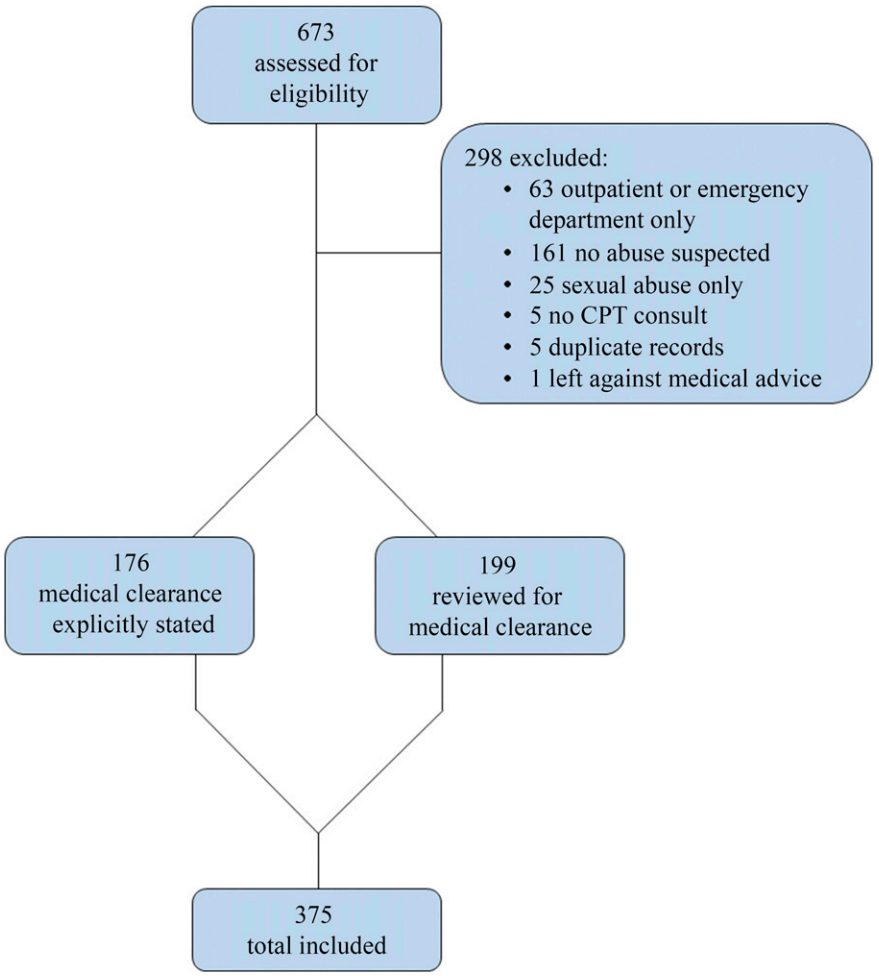

FIGURE 1 Flow diagram.

concerning cost or amount collected were non-normally distributed (Shapiro-Wilk *P* value <.001).

As seen in Table 2, age, race, sex, type of abuse, and type of insurance were not significantly associated with delayed discharge as defined by a *P* value <.05. However, significant differences were seen in the number of days in the hospital and PICU, CPS custody, and discharge disposition when comparing any delay and no delay after discharge. Similar results were found when comparing a delay >1 day or in delays up to 26 days. The percent of children with eventual delays who had been admitted to the PICU was 39.6% compared with 25.7% of children who did not have a delay (Pearson χ^2 *P* value = .01) (results not shown). A majority of children (55.2%) who experienced any delay were in CPS custody (*P* value < .001) (Table 1). Alternatively, 74% of children in CPS custody experienced delayed discharges compared with only 21.8% among children not in CPS custody.

Means, SDs, medians, and IQRs of hospital charges and costs, both total and after medical clearance, are shown in Table 3. Total charges after medical clearance were $1 830 305.08 ($3123.39 per day of delay) (results not shown). Total costs after medical clearance were $875 046.60 ($1493.25 per day of delay) (results not shown). All charges and costs were markedly right-skewed, with means higher than medians. Children with any delay or children with delays >1 day had significantly higher total charges and costs than children without delays (all *P* values <.001, respectively).

TABLE 1 Number of Children by Days Delayed

Days Delayed	No. of Children
1	57
2	22
3	16
4	9
5	5
6	3
7	8
>7	14
Total	134

Figure 2 shows that 2 children had particularly long delays: 42 and 56 days resulting in a combined $319 688.44 in charges after medical clearance and $146 643.74 in costs after medical clearance. These 2 hospitalizations represented 16.7% of all days of delay, 17.5% of all charges after medical clearance, and 16.8% of all costs after medical clearance. Tables 1 and 2 display patient characteristics and cost and charges for the remaining patients, who had lengths of stay between 1 and 26 days, in the rightmost column.

Mean hospital cost after medical clearance was $6522, including these 2 outliers, and $5510 excluding them.

DISCUSSION

Continued hospitalization beyond medical clearance resulted in increased costs in a system with limited resources. Although less than half of abused children had a delayed discharge, 1 in 5 abused children experienced a delay of >1 day. The hospitalization of children after medical clearance occupied limited hospital bed space and may have impeded hospitalization of children who require active medical care. Additionally, each day of delay resulted in a mean of $3123 in charges and $1493 in costs, not including physician or provider costs, which is a burden on both hospitals and payers. All cost data were extremely right-skewed, with means much larger than medians. An intervention targeting a relatively small number of children could make a large impact on this allocation of resources.

TABLE 2 Patient Characteristics ($N = 375$)

	Not Delayed	Any Delay	*P*: Any Delay Versus Not Delayed	Delayed >1 d	*P*: Delay >1 d Versus Not Delayed	Delayed 1–26 d	*P*: Delayed 1–26 d Versus Not Delayed
No. of children, *n* (%)	241 (64.3)	134 (35.7)	—	77 (24.2)	—	132 (35.2)	—
Age, y, median (IQR)	0.67 (0.25–1.38)	0.58 (0.25–1.44)	.53[a]	0.58 (0.21–1.46)	.62[a]	0.58 (0.25–1.42)	.48[a]
Sex, *n* (%)							
Male	140 (58.1)	77 (57.5)	.91	48 (62.3)	.51	76 (57.6)	.92
Female	101 (41.9)	57 (42.5)	—	29 (37.7)	—	56 (42.4)	—
Race and/or ethnicity, *n* (%)							
White	74 (30.7)	32 (23.9)	—	15 (19.5)	—	32 (24.2)	—
African American	66 (27.4)	42 (31.3)	.53	28 (36.4)	.20	41 (31.1)	.57
Hispanic	88 (36.5)	51 (38.1)	—	31 (40.3)	—	50 (37.9)	—
Asian American, other, or unknown	13 (5.4)	9 (6.7)	—	3 (3.9)	—	9 (6.8)	—
Types of trauma, *n* (%)							
Head	72 (29.9)	30 (22.4)	—	12 (15.6)	—	29 (22.0)	—
Abdominal	3 (1.2)	1 (0.7)	—	1 (1.3)	—	1 (0.8)	—
Skeletal	32 (13.3)	17 (12.7)	—	11 (14.3)	—	17 (12.9)	—
Cutaneous	11 (4.6)	4 (3.0)	.54	2 (2.6)	.27	4 (3.0)	.51
Burns	1 (0.4)	1 (0.7)	—	0 (0.0)	—	1 (0.8)	—
Neglect	47 (19.5)	28 (20.9)	—	20 (26.0)	—	27 (20.5)	—
Medical child abuse	3 (1.2)	0 (0.0)	—	0 (0.0)	—	0 (0.0)	—
Other	1 (0.4)	1 (0.7)	—	0 (0.0)	—	1 (0.8)	—
>1 abuse	71 (29.5)	52 (38.8)	—	31 (40.3)	—	52 (39.4)	—
Days in the hospital, median (IQR)	3.0 (2.0–7.50)	8.0 (4.0–18.25)	<.001[a]	14.0 (7.0–23.0)	<.001[a]	8.0 (4.0–16.8)	<.001[a]
Days in PICU, median (IQR)	0.0 (0.0–1.0)	0.0 (0.0–3.25)	.003[a]	0.0 (0.0–4.0)	.003[a]	0.0 (0.0–3.0)	.004[a]
Insurance type, *n* (%)							
Children's Health Insurance Program	1 (0.4)	0 (0.0)	—	0 (0.0)	—	0 (0.0)	—
Managed care	41 (17.0)	13 (9.7)	—	4 (5.2)	—	13 (9.8)	—
Medicaid managed care	149 (61.8)	102 (76.1)	.08	59 (76.6)	.10	101 (76.5)	.08
Medicaid traditional	43 (17.8)	18 (13.4)	—	13 (16.9)	—	17 (12.9)	—
Self-pay or charity	4 (1.7)	0 (0.0)	—	0 (0.0)	—	0 (0.0)	—
Other[b]	3 (1.2)	1 (0.7)	—	1 (1.3)	—	1 (0.8)	—
Child in CPS Custody, *n* (%)							
No	215 (89.2)	60 (44.8)	—	21 (27.3)	—	60 (45.5)	—
Yes	26 (10.8)	74 (55.2)	<.001	56 (72.7)	<.001	72 (54.5)	<.001
Discharge disposition, *n* (%)							
Nonfamily or foster	29 (12.0)	68 (50.7)	<.001	52 (67.5)	<.001	66 (50.0)	<.001
Family or friend	212 (88.0)	66 (49.3)	—	25 (32.5)	—	66 (50.0)	—

—, not applicable.
[a] Mann–Whitney *U* test *P* values were provided for non-normally distributed data.
[b] "Other" insurance type includes more than 1 insurance.

Mean and median total costs are higher in children who have discharge delays even after subtracting the cost of those delays. In other words, children who will eventually have delayed discharges have costlier preclearance hospitalizations. This may suggest that children who will eventually be delayed are more ill on initial presentation and therefore costlier with longer lengths of stay, even preclearance. However, although children who eventually experienced delays did tend to have longer PICU stays, most children with delays were not in the PICU at all, because median PICU stay was 0 days even in this population. Alternatively, higher pre-delay costs may suggest that our methodology tended to underestimate delay after medical clearance, increasing apparent pre-delay lengths of stay and hospital costs.

TABLE 3 Comparison of Hospital Charges and Costs Among Delayed and Not Delayed After Medical Clearance ($N = 375$)

	Not Delayed	Any Delay	*P*: Any Delay Versus Not Delayed[a]	Delayed >1 d	*P*: Delay >1 d Versus Not Delayed[a]	Delayed 1–26 d	*P*: Delay 1–26 d Versus Not Delayed[a]
No. of children, *n* (%)	241 (64.3)	134 (35.7)	—	77 (24.2)	—	132 (35.2)	—
Total hospital charges, $							
Median	23 532.60	45 532.04	<.001	59 664.52	<.001	44 207.03	<.001
IQR	12 238.24–55 293.39	24 212.59–140 595.03	—	33 966.78–208 767.95	—	24 080.76–137 321.01	—
Mean	70 766.65	121 569.76	—	161 963.86	—	119 028.40	—
SD	141 731.09	200 658.52	—	243 070.76	—	200 977.71	—
Charges after medical clearance, $							
Median	0.00	3263.92	<.001	9797.00	<.001	3228.11	<.001
IQR	0.00–$0.00	51.83–10 514.44	—	4410.82–20 848.61	—	37.44–10 479.16	—
Mean	6.37	13 647.53	—	23 482.98	—	11 432.43	—
SD	98.91	30 172.17	—	36 909.71	—	24 251.14	—
Total hospital costs, $							
Median	8901.15	17 551.45	<.001	29 118.12	<.001	17 465.27	<.001
IQR	4884.35–21 777.69	8916.62–57 224.53	—	13 027.36–74 991.77	—	8854.65–56 094.20	—
Mean	27 433.63	49 893.63	—	67 498.60	—	48 710.35	—
SD	53 891.99	83 049.95	—	101 232.44	—	83 055.31	—
Cost after medical clearance, $							
Median	0.00	1553.64	<.001	4705.46	<.001	1547.08	<.001
IQR	0.00–0.00	26.10–244.20	—	2144.28–10 674.43	—	25.02–5052.44	—
Mean	4.60	6521.93	—	11 184.48	—	5509.81	—
SD	71.41	13 975.34	—	17 019.71	—	11 328.21	—

—, not applicable.
[a] Mann–Whitney *U* test *P* values were provided for non-normally distributed data.

Although a small proportion of children experienced long delays, the combination of frequent short delays and less frequent but costlier long delays aggregates to a significant cost to our health care system. Interventions must focus on both populations to be truly effective, and further study of the characteristics of children likely to experience delays (either short or long) will help inform any proposals. Although CPS was involved with all of the children in this study, discharge delays were more common in children whom CPS took legal custody of during the admission. We plan to use our data set to identify additional factors correlated with delays and particularly with long delays, helping us to work toward finding the best place for children who would be better cared for outside of acute-level hospital care. Further study should evaluate the feasibility of other caregiving arrangements. For example, children who have been medically cleared could be cared for by staff other than physicians and nurses, providing a safe environment at much lower cost, whether in or out of a hospital. Additionally, some children have special medical needs, either as sequelae of abusive injuries or from previous chronic medical conditions, but are medically cleared for discharge to a medical foster home. Although these children are awaiting placement, it may be more cost-effective to provide nursing support at a regular foster home than to prolong an inpatient hospitalization. Of course, increasing investment in training and recruiting foster parents would help expedite placement as well. Investing in the development, implementation, and ongoing support of evidence-based, effective child maltreatment prevention programs would reduce not only the burden of medically unnecessary hospitalization on the public, but also the entire economic burden of child maltreatment on both the national and local economies.

Any interventions to expedite discharge, however, must provide that children be discharged to a safe, appropriate environment where they will not experience continued abuse and will not need to return to the hospital for future subsequent injuries.

Our study has a few limitations. First, we did not evaluate all children with delayed discharges because our methodology captured only hospitalizations in which CPT was consulted. For example, we did not capture any children who received CPT consults at an initial hospitalization but experienced delayed discharge on a subsequent readmission during which CPT was not consulted. However, we believe that CPT is consulted on the vast majority of

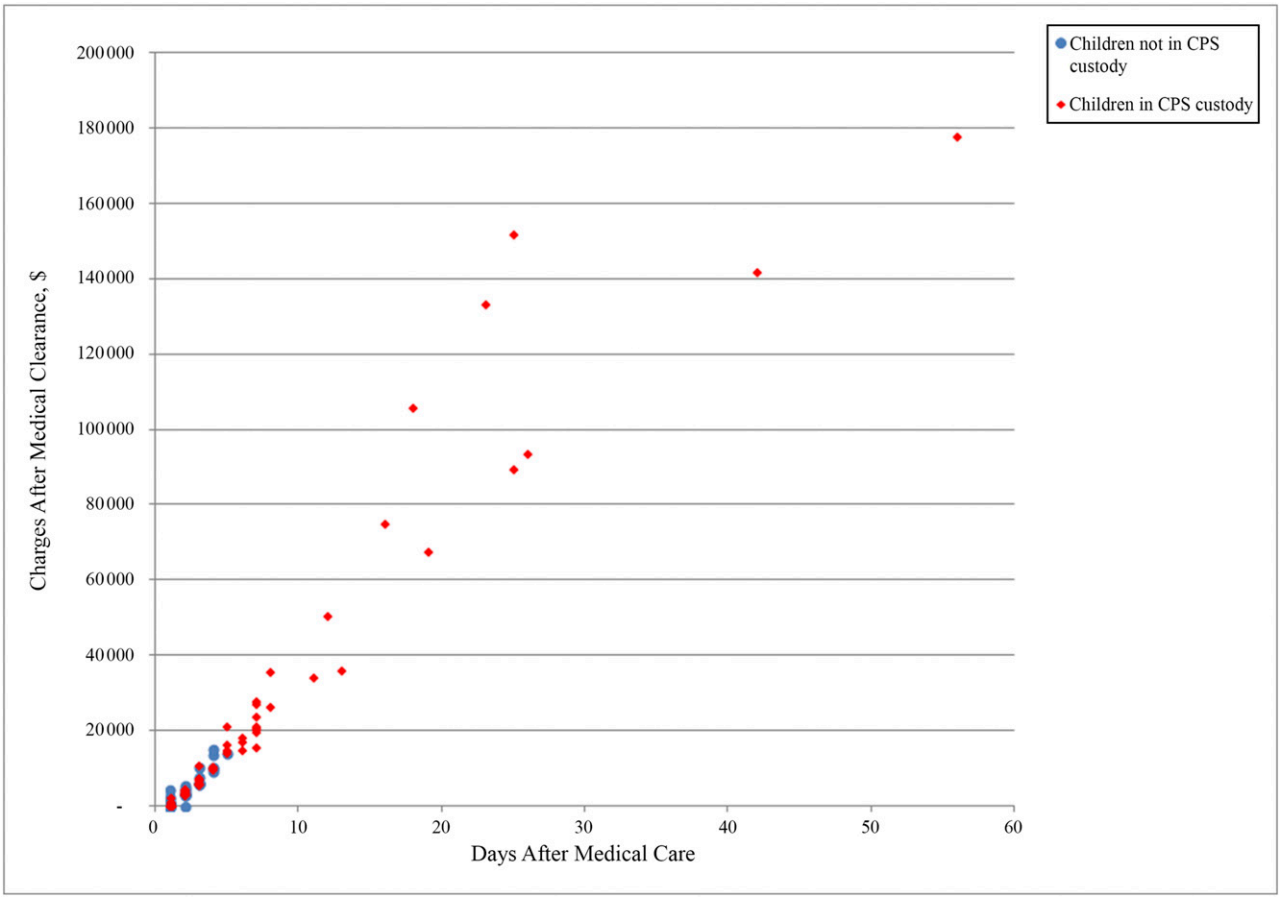

FIGURE 2 Scatterplot of hospital charges after medical clearance versus days after medical clearance for patients with any delay.

hospitalizations of patients in whom abuse is suspected, especially when CPS is involved and discharge delays are possible. We also did not capture any children in whom abuse was never suspected to begin with; we know that some of these children experience delayed discharges for social reasons as well, and we are unable to compare our population with a control cohort without CPT consultation.

Second, we likely underestimated discharge delays in our patients. Care managers and physicians are often reluctant to explicitly state that a patient is medically cleared until discharge is imminent. Our methodology, however, defers to those explicit statements: whenever an explicit statement of medical clearance was made, we used that date rather than any previous dates. Third, we excluded any children in whom CPT did not suspect abuse. Some of these children, however, may experience a brief delay in discharge while awaiting permission from CPS for the child to be discharged from the hospital if an agency referral had been made before the consult. Finally, we conducted a study of children at 1 particular hospital, working with the policies of local protective services agencies; our findings may not apply to other hospitals or other localities that operate differently.

CONCLUSIONS

With our data, we found that more than one-third of children hospitalized for child abuse at our hospital from 2012 to 2014 were hospitalized for at least 1 day beyond medical clearance, and those delayed discharges are associated with increased charges and costs of their hospitalizations. A small fraction of children experienced especially long delays, and just 2 children represented 16.8% of all costs beyond medical clearance. Further study should elaborate the feasibility of alternative caregiving arrangements.

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