Changes in Health Care Utilization for Pediatric Patients Treated at a Specialized Outpatient Pain Clinic

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ABSTRACT

Introduction: Pediatric pain clinics may be the most efficacious way to manage chronic and recurrent pain in children and adolescents, but families often rely heavily on nonspecialized care, such as the emergency department (ED). Health care utilization patterns for pediatric chronic pain have not been fully explored, particularly the patient-level factors that may contribute to underutilization or overutilization of certain services.

Objectives: To identify health care utilization patterns before and after treatment at a pediatric pain clinic and the associations by primary diagnosis and patient sociodemographics.

Methods: Data were obtained for all pediatric patients with an initial visit at an outpatient pediatric pain clinic between 2005 and 2009. Individual-level data included patient demographics, insurance type, and diagnosis at first pain clinic visit. Rate of health care system utilization 3 months before and after the initial pain clinic visit was quantified. Health care utilization rates before and after the initial visit to the pain clinic were compared using Wilcoxon signed-rank test.

Results: Eight hundred twenty-six pediatric pain clinic patients were included. Overall, there were significant decreases in ED utilization ($P<0.001$) and increases in outpatient service utilization ($P<0.001$) after the initial pain clinic visit. Similar patterns were noted for patients by diagnosis (headache, musculoskeletal, or abdominal pain diagnoses) and among those who were female, white, 15 to 18 years old, privately insured, middle- or high-income ($P<0.05$).

Conclusions: Visits to an outpatient pediatric pain clinic were associated with shifts in health care utilization patterns. Important changes were an overall decrease in emergency visits and an increase in outpatient visits.

INTRODUCTION

Effective pain management is a national priority and an important benchmark for quality medical care.[1] Pain is the most commonly reported symptom leading to use of the health care system, and providing optimal care for pain is complex – particularly chronic pain.[2,3] Chronic pain is persistent or recurring pain that lasts longer than 3 months and has been estimated to account for 1 in 5 physician visits.[4] Moreover, chronic pain management has been cited as an area of frustration for many physicians and has become increasingly difficult amidst the opioid epidemic.[5-7]

The emergency department (ED) is a common setting to seek pain management for a growing number of people, including children.[2,8] Many ED visits are the result of patients seeking care for nonurgent conditions that could have been treated or prevented with a primary care visit and may be avoidable.[9] Furthermore, the overuse of EDs has been estimated to cost $38 billion annually and has been driven, in part, by an excess of diagnostic testing.[10,11] Additionally, ED overcrowding and long waiting times can create suboptimal experiences and poorer health outcomes for those seeking treatment for pain.[12]

In response, there has been an increased emphasis to improve the efficacy of pain management for adults, yet the burden of chronic pain in pediatric patients has received considerably less attention. In children and adolescents, some epidemiological research has estimated a chronic pain prevalence of 30% with associated societal costs of $19.5 billion annually.[8,13] Pediatric chronic pain is also associated with poorer quality of life, school absenteeism, increased health care utilization, and a greater risk for persistent pain into adulthood.[14] The most common pediat-

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ric chronic pain diagnoses include headache, abdominal pain, and musculoskeletal pain.[14] Sociodemographic characteristics also have been associated with differences in pediatric pain prevalence, with prevalence being higher among girls, older children, and children with lower socioeconomic status.[14]

To effectively manage pediatric chronic pain, some health care systems have established specialized pediatric pain clinics. These outpatient clinics emphasize an interdisciplinary approach to pain care and have demonstrated success in improving pain and functional outcomes, as well as decreasing ED and inpatient visits.[13,15] However, there is little understanding of how these health care utilization patterns may vary among different types of pediatric patients who have sought specialized pain treatment. Therefore, the purpose of this study was twofold: (1) to identify changes in the health care utilization patterns of pediatric patients with chronic pain after seeking treatment at a specialized pediatric pain clinic, and (2) to determine if there were differences in health care utilization patterns by the patient's primary pain diagnosis and sociodemographic characteristics.

METHODS

This retrospective study was conducted within a closed, nonprofit, pediatric health care system located in southeastern Wisconsin. All health care utilization for the study's patients was obtained from the system's billing records. Data were requested for the 3-month period before and after the start date at the system's outpatient pediatric pain clinic for a total study period of 6 months for each patient. A 6-month period was chosen to detect changes in health care utilization patterns. The multidisciplinary, pediatric pain clinic focused on in this study is located at a single site on the health care system's main campus. The clinic provides specialized, pediatric pain management services including both traditional management options like medication, physical and occupational therapy, and mental health counseling, as well as holistic treatments ranging from relaxation techniques to acupuncture. All initial appointments are 90 minutes in duration. Patients and families are all seen by specialists in the areas of pain medicine, nursing, and psychology. If warranted, patients also are seen by a physical therapist. The system's institutional review board approved all study procedures.

Participants

Data were obtained for all pediatric patients between the ages of 8 and 18 years who were seen for at least 1 visit at the outpatient pediatric pain clinic between 2005 and 2009 (n = 1,437). Patients with less than 3 months of medical records data either before or after the initial pain clinic visit (n = 611) were excluded from this study.

Measures

We obtained information on patient visits to the hospital or for any outpatient services within the health care system during the study period. We categorized visits as either ED, outpatient, or short stay. Outpatient visits were any visit that occurred in an outpatient setting (ie, visits to the pain clinic, the pediatrician's office, urgent care). Short stays included ED visits that resulted in an overnight stay.

Table 1. Characteristics of the Cohort at Initial Pain Clinic Visit (n=826)

Variable	Count	(%)
Age, Years (range, 8-18)	Mean: 14.00	
Age category		
Elementary (age 8-11)	226	(27)
Middle School (age 12-14)	163	(20)
High School (age 15-18)	437	(53)
Sex		
Female	534	(65)
Male	292	(35)
Race		
White	616	(75)
Black	149	(18)
Other nonwhite	61	(7)
Income category		
Low (≤ 200% federal poverty level)	163	(20)
Middle (201%-400% federal poverty level)	453	(55)
High (> 400% federal poverty level)	209	(25)
Insurance status		
Government	141	(17)
Private	675	(82)
Self-pay	10	(1)
Diagnosis/pain location		
Headache or orofacial	262	(32)
Musculoskeletal	254	(31)
Abdominal	166	(20)
Other	64	(8)
Neuropathic, neuropathy, or central	42	(5)
Cardiovascular/chest	38	(4)

We also obtained information on patient characteristics, including sex, race, age, socioeconomic status, insurance type, and diagnosis at first pain clinic visit. Sex was dichotomized as either male or female. Race was categorized as white, black, or other. Age was divided into 3 groups including 8 to 11 years, 12 to 14 years, and 15 to 18 years. The median household income for the ZIP code associated with the patient's home address was used as a proxy measure of the socioeconomic status. Patients income levels were categorized as low (≤ 200% federal poverty level), middle (201%-400% federal poverty level) and high (> 400% federal poverty level). Insurance status was categorized as either government, private, or self-pay. The primary pain diagnoses were divided into 6 groups: headache or orofacial, musculoskeletal, abdominal, neuropathic (also neuropathy or central), cardiovascular/chest, or other.

Statistical Analyses

Descriptive statistics were used to summarize characteristics of the pediatric patients seeking care at the pain clinic. The rate of health care system utilization before and after the initial pain clinic visit was quantified by determining the mean number of visits overall and by each category (ED, outpatient, short stay) per 3-month time interval. Next, the difference in mean health care utiliza-

Table 2. Demographic Characteristics by Pain Diagnosis

Category	Musculoskeletal n (%)	Headache n (%)	Abdominal n (%)	Other n (%)	Neuropathic n (%)	Cardiovascular n (%)	Total n
Age							
8-11	81 (36)	49 (22)	61 (27)	20 (9)	10 (4)	5 (2)	226
12-14	57 (35)	46 (28)	30 (18)	8 (5)	14 (9)	8 (5)	163
15-18	124 (28)	159 (36)	75 (17)	36 (8)	18 (4)	25 (6)	437
Sex							
Female	171 (32)	172 (32)	103 (19)	38 (7)	23 (4)	27 (5)	534
Male	91 (31)	82 (28)	63 (22)	26 (9)	19 (6)	11 (4)	292
Race							
White	201 (33)	185 (30)	145 (24)	45 (7)	31 (5)	9 (1)	616
Black	41 (28)	45 (30)	12 (8)	15 (10)	8 (5)	28 (19)	149
Other	20 (33)	24 (39)	9 (15)	4 (7)	3 (5)	1 (2)	61
Income							
Low	50 (31)	51 (31)	19 (12)	18 (11)	8 (5)	17 (10)	163
Middle	149 (33)	139 (31)	90 (20)	27 (6)	28 (6)	20 (4)	
High	62 (30)	64 (31)	57 (27)	19 (9)	6 (3)	1 (<1)	209
Insurance							
Government	32 (23)	43 (31)	25 (18)	14 (10)	15 (11)	12 (9)	141
Private	227 (34)	208 (31)	139 (21)	48 (7)	27 (4)	26 (4)	675
Self-Pay	3 (30)	3 (30)	2 (20)	2 (20)	0 (0)	0 (0)	10

Table 3. Health Care Utilization Rates (Mean Visits per 100 Patients) in the 3-Month Period Before and After Initial Pain Clinic Visit: Overall and by Diagnosis

Variable Type	Emergency		Short Stay		Outpatient	
	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)
Overall	23 (40)	17 (40)[a]	9 (20)	6 (16)[a]	218 (205)	268 (243)[a]
Diagnosis						
Headache	26 (45)	16 (34)[a]	6 (22)	4 (12)	197 (205)	246 (227)[b]
Musculoskeletal	19 (33)	16 (35)c	5 (14)	4 (14)	201 (177)	247 (220)[c]
Abdominal	21 (29)	13 (24)[a]	17 (22)	8 (15)[a]	237 (232)	297 (249)[b]
Neuropathic	20 (34)	20 (40)	11 (21)	7 (19)	234 (184)	283 (177)
Cardiovascular	30 (37)	50 (101)	6 (13)	6 (14)	239 (194)	314 (272)

[a] $P<0.001$

[b] $P<0.01$

[c] $P<0.05$

tion rates before and after the initial visit to the pain clinic was tested for the total sample, by diagnosis, and by sociodemographics using Wilcoxon signed-rank test. A statistical significance level of $P<0.05$ was used for all analyses and performed with SAS 9.3 software (SAS Institute, Cary, North Carolina).

RESULTS

Study Population Characteristics

The analysis included 826 pediatric patients aged 8 to 18 years old who received care at an outpatient pediatric pain clinic. Table 1 shows the demographic characteristics of the sample. Most patients were between 15 and 18 years old (53%), white (75%), and female (65%). The sample was also largely middle-income (55%), and the majority had private insurance (82%). The most common diagnoses were headache (or orofacial) pain (32%), musculoskeletal pain (31%), and abdominal pain (20%).

Table 2 shows the prevalence of each diagnosis within each sociodemographic category. Musculoskeletal pain was most common for several groups, including adolescents who were 8 to 11 years old (36%) and 12 to 14 years old (35%), males (31%), whites (33%), privately insured (34%), or middle-income (33%). The next most common diagnosis among the groups was headache pain, which was the most common diagnosis among blacks (30%) and other (39%), government insured (31%), and high-income (31%) groups. A few groups (female, self-pay, low-income) had an equal proportion of adolescents with either headache or musculoskeletal pain.

Health Care Utilization Patterns

Table 3 shows the health care utilization rates during the 3-month period before and after the initial pain clinic visit overall and by pain diagnosis. After the initial pain clinic visit, there was a significant overall decrease in ED visits (23 vs 17 visits per 100 patients; $P<0.001$) and short stays (9 vs 6 visits per 100 patients; $P<0.001$). There was also a significant overall increase in outpatient visits (218 vs 268 visits per 100 patients; $P<0.001$). Differences in health care utilization also were noted by diagnosis. ED visits decreased for patients with headache pain (26 vs 16 visits per 100 patients; $P<0.001$), musculoskeletal pain (19 vs 16 visits per 100 patients; $P<0.05$), and abdominal pain (21 vs 13 visits per 100 patients; $P<0.001$). Outpatient visits significantly increased for each of these same groups. Finally, patients with abdominal pain had a significant decrease in short stays (17 vs 8 visits per 100 patients; $P<0.001$).

Table 4 shows the health care utilization patterns in the 3-month period before and after an initial visit to the outpatient pediatric pain clinic by sociodemographic characteristics. The rate of ED visits significantly decreased within all age groups, both females and males, whites, those with private insurance or self-pay, as well as those in the middle-income and high-income categories. Outpatient visits significantly increased for many of the same groups, including patients 15 to 18 years old, females, whites, those with private insurance, and within the middle-income and high-income categories. There were also significant decreases in short stays among several sociodemographic groups. Patients from 8 to 11 and 12 to 14 years old had significantly fewer visits, as well as both females and males, whites and blacks, those with private insurance, and patients in the low-income and middle-income categories.

Table 4. Health Care Utilization Rates (Mean Visits per 100 Patients) in the 3-Month Period Before and After Initial Pain Clinic Visit by Sociodemographic Characteristics

Variable Type	Emergency Before Mean (SD)	 After Mean (SD)	Short Stay Before Mean (SD)	 After Mean (SD)	Outpatient Before Mean (SD)	 After Mean (SD)
Age						
8-11	25 (45)	14 (27)[a]	12 (26)	6 (14)[a]	211 (189)	229 (198)
12-14	25 (38)	17 (52)[a]	8 (16)	4 (11)[a]	226 (217)	265 (244)
15-18	22 (39)	20 (40)[b]	7 (18)	7 (18)	218 (209)	290 (260)[a]
Sex						
Female	25 (42)	18 (37)[a]	8 (19)	6 (16)[b]	212 (209)	275 (258)[a]
Male	21 (37)	17 (44)[c]	10 (23)	6 (14)[a]	229 (199)	257 (212)
Race						
White	18 (33)	11 (25)[a]	9 (21)	6 (16)[a]	206 (187)	266 (233)[a]
Black	42 (59)	41 (70)	7 (18)	5 (14)[b]	267 (243)	285 (289)
Other	29 (44)	23 (35)	8 (19)	4 (13)	216 (259)	255 (215)
Insurance						
Government	35 (54)	33 (69)	10 (19)	8 (17)	279 (243)	310 (306)
Private	21 (37)	14 (29)[a]	9 (21)	5 (16)[a]	206 (195)	260 (226)[a]
Self-pay	21 (30)	4 (11)[b]	1 (3)	2 (5)	154 (143)	269 (267)
Income						
Low	44 (57)	42 (70)	6 (16)	4 (14)[b]	246 (229)	282 (285)
Middle	20 (36)	12 (25)[a]	10 (20)	5 (14)[a]	220 (209)	262 (226)[c]
High	15 (24)	11 (22)[b]	9 (24)	8 (20)	191 (174)	274 (240)[a]

[a] $P<0.001$
[b] $P<0.01$
[c] $P<0.05$

DISCUSSION

The purpose of this study was to identify if there were changes in health care utilization patterns after an initial visit at an outpatient pediatric pain clinic, and if those patterns differed by pain diagnosis and sociodemographic characteristics. We found that patients seeking treatment at the pediatric pain clinic were most likely to be female, 15 to 18 years old, have private insurance, and self-identify as white; common reasons for the initial visit were headaches, musculoskeletal pain, and abdominal pain. We identified statistically significant changes in utilization rates from 3 months before to 3 months after the initial pain clinic visit with a reduction in ED visits and short stays, and an increase in outpatient visits, overall. These findings are consistent with previous research and lend support to specialized outpatient pain clinics being an effective way to reduce the higher costs associated with emergency and inpatient services.[15] Increases in outpatient visits also aligned with prior research in that ongoing outpatient service utilization is likely once patients initiate specialized pain care.[15] While we did not account for the types of visits that occurred after the initial pain clinic visit, previous authors have asserted that an increase in outpatient care is suggestive of patients being engaged in more regularly scheduled, routine appointments to manage their pain symptoms.[15]

While there were significant changes in utilization rates overall, these patterns were not consistent within all groups. Nonwhite, low-income, and those with government insurance did not have a significant change in their overall health care utilization or their ED visits. While the specific factors that contributed to these findings are unclear, disparities in the management of pain in minority patients, who are also more likely to be low-income and on government insurance, are well-documented and multifactorial in nature.[16,17] These patients may have experienced barriers to engaging with the pain management program due to issues related to clinic accessibility (ie, difficulties with transportation or attending appointments during clinic hours of operation), cost of recommended treatments, and differences in patient-provider relationships that can affect communication and building of trust. Alternatively, their clinical presentation may have been more complex, and a 3-month period may have been inadequate in capturing any changes in utilization patterns if they did exist. Future studies should consider a longer timeframe—before and after the initial pain clinic visit—and account for the other factors, such as condition severity, when examining sociodemographic differences.

The study also identified differences in health care utilization patterns by sex. While male participants had a significant change in rates of ED visits and short stays following their initial visit to the pain clinic, there was not a significant change in their outpatient visits or overall rates of health care utilization. This may be related to differences in the types of conditions that boys seek care for compared to girls. Alternatively, there may be variations in how boys and girls cope with chronic pain. Girls may be more responsive to a collaborative approach, which offers more opportunities to interact with multiple providers and to access social support.[18]

While this study advances the knowledge of factors associated with health care utilization patterns in children and adolescents with chronic pain, there are several limitations. First, this was a cross-sectional study and data were analyzed retrospectively from a clinical database within a single hospital system. Therefore, we cannot say that the pain clinic visit caused any changes in health care utilization patterns. Additionally, patients seeking care at this pain clinic may not reflect the general population of children and adolescents with chronic pain and limits the generalizability of our findings. Our study also had a couple of groups with very small sample sizes (eg, self-pay). While our analyses were unadjusted and only focused on differences within groups, it is possible that there were not enough observations to detect statistically significant changes in groups with relatively smaller samples. We also did not account for the type or intensity of treatments that patients received at the pain clinic, so there is no way to determine if these factors may have differed between groups and the degree to which that influenced our findings. Lastly, we did not distinguish the type of outpatient visits that occurred during the study period, nor did we conduct a cost-analysis. Therefore, we are unable to confirm that the increase in outpatient utilization was related to pain-related care or establish if changing health care utilization patterns translated into direct or indirect cost savings to the health care system.

Notwithstanding these limitations, the results of this study take an important step in identifying specific factors that are associated with changes in health care patterns before and after a visit to an outpatient pediatric pain clinic. These results can inform future studies that aim to improve care and reduce the overall burden of pediatric chronic pain among children and adolescents, as well as those around them. Future research should adjust for confounding factors and examine potential interactions among the demographic and diagnostic variables. Multivariate analyses would allow for a clearer understanding of factors that drive utilization patterns, in general, and the specific factors that may foster or hinder engagement in a pediatric chronic pain management program. Mixed-methods designs, incorporating qualitative data, would be useful in interpreting findings, particularly those related to health disparities. Cost-analyses also would prove valuable in determining how changes in utilization patterns may translate into cost savings.

CONCLUSION

An initial visit to an outpatient, pediatric pain clinic was associated with shifts in health care utilization patterns. The most notable finding was an overall decrease in emergency visits and an increase in outpatient visits. Although the majority of groups followed the same pattern, the magnitude of change varied by diagnosis and sociodemographic characteristics.

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