CHAPTER 9

Ureteropelvic Junction Obstruction

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INTRODUCTION

Ureteropelvic junction (UPJ) obstruction is a condition in which urine is unable to travel from the renal pelvis to the bladder because of a blockage occurring at the UPJ. The etiology of UPJ obstruction includes both congenital and acquired conditions. The majority of cases are congenital. Acquired conditions include stone disease, postoperative or inflammatory strictures, and urothelial neoplasms.

A congenital UPJ obstruction may be due to either an intrinsic or an extrinsic cause, or, in some cases, both. Most common intrinsic obstructions are the result of an adynamic segment. This functional defect may be due to an interruption of the circular musculature of the UPJ (1) or an alteration of the collagen fibers and composition between and around the muscular cells (2). Less common intrinsic causes include valvular mucosal folds, persistent fetal convolutions, and ureteral polyps. The role of aberrant lower pole vessels as an extrinsic cause of UPJ obstruction is less clear in the pathogenesis of the disease. These vessels cross the proximal ureter anteriorly and are thought to be responsible, in part, for functional obstruction. It is unknown whether the vessel alone directly compresses the UPJ or leads to intrinsic narrowing.

DEFINITION AND DIAGNOSIS

In the larger sense, hydroureteronephrosis refers to the dilation of a kidney and its ureter. It may be associated with obstruction or reflux from the bladder. UPJ obstruction typically refers to a blockage at the junction of the renal pelvis and the start of the ureter. The diagnosis of UPJ obstruction is challenging and requires a functional study that confirms the impediment of urine flow out of the renal pelvis. In addition, an anatomic evaluation is necessary to confirm that the sole site of the obstruction is at the UPJ. Therefore, the finding of hydronephrosis alone may result in the overdiagnosis of this anatomic defect. Ultrasonography is the most widely used technique for evaluating the kidney for hydronephrosis. Unfortunately, this modality cannot address the functional significance of the hydronephrosis. Similarly, computed tomography and magnetic resonance urography (MRU) of the abdomen can identify hydronephrosis and suggest a UPJ obstruction when noting a transition in the caliber of the ureter at the UPJ; however, without pyelography, the functional drainage of the kidney cannot be assessed. Historically, intravenous pyelography (IVP) was the functional study most often performed to evaluate obstruction, but radionucleotide renography has now eclipsed IVP as the functional study of choice. Both of these studies can obtain information regarding the differential function and drainage of the kidney. Table 1 presents diagnosis and procedure codes associated with UPJ obstruction.

Hydronephros is secondary to obstruction can lead to progressive renal deterioration. Herein lies the clinical dilemma of UPJ obstruction: when is the obstruction significant enough to warrant repair? Prior to the introduction of routine imaging during the perinatal period, the majority of patients with a UPJ obstruction were symptomatic at the time

Table 1. Codes used in the diagnosis and management of ureteropelvic junction obstruction

Individuals with one or more of the following:	
ICD-9 diagnosis codes	
753.2[a]	Obstructive defects of renal pelvis and ureter
75.20	Unspecified obstructive defect of renal pelvis and ureter
753.21	Congenital obstruction of ureteropelvic junction
CPT procedure codes	
50400	Pyeloplasty (Foley Y-pyeloplasty), plastic operation on renal pelvis, with or without plastic operation on ureter, nephropexy, nephrostomy, pyelostomy, or ureteral splinting; simple
50405	Pyeloplasty (Foley Y-pyeloplasty), plastic operation on renal pelvis, with or without plastic operation on ureter, nephropexy, nephrostomy, pyelostomy, or ureteral splinting; complicated (congenital kidney abnormality, secondary pyeloplasty, solitary kidney, calycoplasty)
50544	Laparoscopy, surgical; pyeloplasty
50575	Renal endoscopy through nephrotomy or pyelotomy, with or without irrigation, instillation, or ureteropyelography, exclusive of radiologic service; with endopyelotomy (includes cystoscopy, ureteroscopy, dilation of ureter and ureteral pelvic junction, incision of ureteral pelvic junction and insertion of endopyelotomy stent)
50740	Ureteropyelostomy, anastomosis of ureter and renal pelvis
50750	Ureterocalycostomy, anastomosis of ureter and renal calyx
52342	Cystourethroscopy; with treatment of ureteropelvic junction stricture (eg, balloon dilation, laser, electrocautery, and incision)
52346	Cystourethroscopy with ureteroscopy; with treatment of intra-renal stricture (eg, balloon dilation, laser, electrocautery, and incision)

[a]Included in definition for datasets prior to 1997.

of presentation. The symptoms include a palpable mass, failure to thrive, feeding difficulties, or sepsis in the infant; in the older child and adult, symptoms include episodic flank pain, nausea, vomiting, urinary tract infections, and hematuria. The introduction of perinatal sonographic screening in the 1980s dramatically changed the presentation and treatment of UPJ obstruction. The majority of congenital UPJ obstructions are now diagnosed prenatally. Historically, there was a trend toward early surgical intervention with the hope of preserving renal function (3). However, since 1988, management of prenatally diagnosed UPJ obstruction in select cases has changed from surgical intervention to observation (4). The indications for intervention include the presence of symptoms associated with obstruction, impairment of overall renal function or progressive impairment of ipsilateral renal function, development of stones or infection, and, rarely, causal hypertension.

Access to healthcare cost and utilization data may help confirm these practice patterns and further elucidate the natural history of asymptomatic UPJ obstruction followed conservatively. Current practice trends suggest that the majority of UPJ obstructions are managed early in life as a result of prenatal screening. Currently, many patients born prior to the era of perinatal sonographic screening are now presenting with UPJ obstruction manifested during a diuretic event, often caused by caffeine or alcohol. If perinatal sonographic screening is successful in detecting congenital UPJ obstruction and those that require intervention are treated during childhood, the number of adult patients admitted for this condition should decline in the future. The exception would be patients with acquired UPJ obstruction. Moreover, the increasing trend toward conservative management of congenital UPJ obstruction may result in these patients becoming susceptible to precipitating events later in life that can convert an asymptomatic UPJ obstruction to a symptomatic one.

TREATMENT

The standard repair for UPJ obstruction has historically been open pyeloplasty. However, over the years, numerous minimally invasive options have become available. Many of these endourological procedures, including percutaneous endopyelotomy (5), "cautery wire balloon" endopyelotomy (6), and ureteroscopic endopyelotomy (7), are associated with reduced length of hospital stay and postoperative recovery. Unfortunately, the success rate for many of them does not approach the rate afforded by open pyeloplasty (8, 9). Laparoscopic pyeloplasty, however, is proving to offer the success rate of an open procedure with the decreased morbidity of an endourological procedure (10). Because of the lack of appropriately-sized instruments, many of the minimally invasive techniques are not available for pediatric patients.

TRENDS IN HEALTHCARE RESOURCE UTILIZATION

Inpatient Care

According to the Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID) for 1997 and 2000 (Table 2), the rate of inpatient hospitalizations of patients under the age of 18 has remained unchanged at 2.4 per 100,000 population. KID is based on a sample of pediatric discharges from US community hospitals. Because it samples only pediatric discharges, KID allows a more in-depth analysis of pediatric resource utilization than is available in the all-ages HCUP dataset. KID for 2000 includes 2,784 hospitals from 27 States. KID for 1997 includes 2,521 hospitals from 22 States.

Hospitalization rates were highest in children under 3 years of age from 1997 to 2000, at 8.8 and 9.3 per 100,000. In both 1997 and 2000, the majority of patients were male (71% and 72%, respectively), and hospitalizations occurred almost exclusively at urban centers. These data parallel those recently reported by Nelson et al. in an analysis of HCUP data for patients less than 18 years of age between 1988 and 2000 (11). The study, in which 70.7% of the patients were male, found that fewer neonatal patients were undergoing surgery for UPJ obstruction, but overall, patients tended to be younger at the time of surgery (60.1 vs 69.4 months).

Table 2. Inpatient hospital stays for ureteropelvic junction obstruction listed as primary diagnosis in 1997 and 2000, count, rate[a] (95% CI)

	1997		2000	
	Count	Rate	Count	Rate
Total[b]	1,696	2.4 (2.0–2.7)	1,725	2.4 (1.9–2.8)
Age				
< 3	1,036	8.8 (7.3–10)	1,089	9.3 (7.3–11)
3–10	433	1.3 (1.0–1.6)	432	1.3 (1.0–1.6)
11–17	227	0.8 (0.6–1.0)	204	0.7 (0.5–1.0)
Gender				
Male	1,197	3.3 (2.7–3.8)	1,250	3.4 (2.8–4.0)
Female	498	1.4 (1.2–1.7)	476	1.4 (1.0–1.7)
Region				
Midwest	334	2.0 (1.4–2.6)	322	1.9 (0.8–2.9)
Northeast	399	3.0 (1.8–4.2)	420	3.2 (1.8–4.7)
South	471	1.9 (1.2–2.7)	541	2.2 (1.4–3.0)
West	491	2.9 (2.1–3.8)	443	2.6 (1.6–3.4)
MSA				
Rural	43	*	60	*
Urban	1,653	3.0 (2.6–3.5)	1,650	2.9 (2.4–3.5)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 is based on 1997 or 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

[b]Persons of missing MSA are included in the totals.

NOTES: Counts may not sum to totals due to rounding.

Race/ethnicity breakdown not included because of large percent of missing values.

SOURCE: Healthcare Cost and Utilization Project Kids' Inpatient Database, 1997 and 2000.

In addition, the percentage of procedures done at urban teaching hospitals increased significantly, from 48.9% to 61.3%. The authors concluded that between 1988 and 2000, the decline in procedures performed in newborns suggested that patients with prenatal hydronephrosis were increasingly being observed instead of undergoing early surgery.

Data from HCUP for patients with a primary diagnosis of UPJ obstruction for the years 1994 to 2000 revealed an overall decrease in the age-adjusted rate of inpatient hospitalization, from 1.1 per 100,000 to 0.8 per 100,000 (Table 3). The data included both adults and children, yet the trend was seen only in patients less than 18 years of age. The overall rate for these patients decreased from 2.8 per 100,000 to 1.7 per 100,000. This may reflect the trend toward conservative management of certain patients with perinatally diagnosed asymptomatic UPJ obstruction. The rates of inpatient hospitalizations for patients 18 years of age and older varied minimally over 1994, 1996, 1998, and 2000 (0.60, 0.60, 0.50, and 0.50 per 100,000, respectively) (Table 3). This finding is not unexpected, since these patients were born before the era of routine sonographic screening. Data for patients born after the initiation of prenatal screening would be expected to have a lower rate of hospitalization for UPJ obstruction. The rate of hospitalization was greater for males than for females in all years reported (60, 66, 65, and 58%, respectively) (calculations based on data in Table 3). The rate appears lower than that reported in male patients less than 18 years of age (Table 3), which would suggest a greater incidence of acquired UPJ obstructions in female patients or an increased likelihood for female patients to become symptomatic from a congenital UPJ obstruction as they become older. The data also indicate that Caucasians had the highest rate of hospitalization and that most hospitalizations took place at urban centers.

Table 3. Inpatient hospital stays for ureteropelvic junction obstruction listed as primary diagnosis, count, rate[a] (95% CI), age-adjusted rate[b]

	1994			1996			1998			2000		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total[c]	2,821	1.1 (0.9–1.3)	1.1	2,663	1.0 (0.8–1.2)	1.0	2,304	0.9 (0.7–1.0)	0.9	2,215	0.8 (0.6–1.0)	0.8
Age												
< 18	1,900	2.8 (2.1–3.4)		1,701	2.4 (1.8–3.0)		1,332	1.9 (1.3–2.4)		1,228	1.7 (1.1–2.3)	
> 18		0.6			0.6			0.5			0.5	
18–24	158	0.6 (0.4–0.9)		170	0.7 (0.4–0.9)		225	0.9 (0.6–1.2)		185	0.7 (0.5–1.0)	
25–34	225	0.6 (0.4–0.7)		263	0.6 (0.4–0.8)		173	0.4 (0.3–0.6)		167	0.4 (0.3–0.6)	
35–44	228	0.6 (0.4–0.8)		164	*		175	0.4 (0.3–0.5)		229	0.5 (0.4–0.7)	
45+	295	0.4 (0.3–0.5)		365	0.4 (0.3–0.6)		394	0.4 (0.3–0.6)		406	0.4 (0.3–0.6)	
Gender												
Male	1,690	1.4 (1.1–1.7)	1.3	1,745	1.4 (1.1–1.6)	1.3	1,492	1.1 (0.9–1.4)	1.1	1,288	1.0 (0.7–1.2)	0.9
Female	1,131	0.9 (0.7–1.0)	0.9	918	0.7 (0.5–0.8)	0.7	812	0.6 (0.5–0.7)	0.6	927	0.7 (0.5–0.8)	0.7
Race/ethnicity												
White	1,677	0.9 (0.7–1.1)	1.0	1,563	0.8 (0.6–1.0)	0.9	1,332	0.7 (0.5–0.8)	0.7	1,218	0.6 (0.5–0.8)	0.7
Black	242	0.8 (0.5–1.0)	0.6	185	0.6 (0.3–0.8)	0.5	*	*	*	156	0.4 (0.2–0.7)	0.4
Hispanic	211	*	*	322	1.1 (0.7–1.6)	0.9	*	*	*	169	0.5 (0.2–0.8)	0.4
Region												
Midwest	833	1.4 (1.0–1.7)	1.4	737	1.2 (0.8–1.6)	1.2	623	1.0 (0.7–1.3)	1.0	590	0.9 (0.6–1.2)	0.9
Northeast	516	1.0 (0.6–1.4)	1.0	506	1.0 (0.6–1.4)	1.0	521	*	*	424	0.8 (0.5–1.1)	0.8
South	1,111	1.3 (0.8–1.8)	1.3	950	1.0 (0.7–1.4)	1.0	777	0.8 (0.6–1.1)	0.8	644	0.7 (0.4–0.9)	0.7
West	360	0.6 (0.4–0.8)	0.6	470	0.8 (0.5–1.1)	0.8	383	0.6 (0.3–1.0)	0.6	558	*	*
MSA												
Rural	269	0.4 (0.3–0.6)	0.4	272	0.5 (0.3–0.6)	0.4	235	0.4 (0.2–0.6)	0.4	166	0.3 (0.2–0.4)	0.3
Urban	2,552	1.4 (1.1–1.6)	1.3	2,391	1.2 (0.9–1.4)	1.2	2,055	1.0 (0.8–1.2)	1.0	2,049	1.0 (0.7–1.2)	1.0

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 is based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Age-adjusted to the US Census-derived age distribution of the year under analysis.

[c]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 4. Physician office visits by Medicare beneficiaries with ureteropelvic junction obstruction listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c]

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total[d]	2,320	6.6 (5.4–7.9)		2,200	6.2 (5.1–7.4)		2,360	7.0 (5.8–8.3)		2,260	6.4 (5.2–7.6)	
Total < 65	200	3.6 (1.4–5.9)		200	3.3 (1.2–5.3)		260	4.2 (1.9–6.5)		160	2.3 (0.7–3.8)	
Total 65+	2,120	7.2 (5.8–8.6)	7.6	2,000	6.8 (5.5–8.2)	6.8	2,100	7.7 (6.2–9.2)	7.7	2,100	7.4 (6.0–8.9)	7.3
Age												
65–69	340	3.8 (2.0–5.6)		360	4.3 (2.3–6.2)		400	5.5 (3.1–7.8)		440	5.8 (3.4–8.3)	
70–74	500	6.6 (4.0–9.2)		760	9.8 (6.7–13)		780	11 (7.6–15)		480	6.9 (4.1–9.7)	
75–79	680	12 (7.9–16)		460	8.1 (4.8–11)		400	7.1 (4.0–10)		460	7.7 (4.6–11)	
80–84	520	14 (8.4–19)		220	5.6 (2.3–8.9)		320	8.3 (4.2–12)		420	10 (5.9–15)	
85–89	60	2.9 (0–6.2)		140	6.4 (1.7–11)		160	7.3 (2.2–12)		160	6.9 (2.1–12)	
95+	20	2.4 (0–7.1)		20	2.2 (0–6.6)		20	2.2 (0–6.5)		100	10 (1.3–20)	
Race/ethnicity												
White	1,580	5.3 (4.2–6.5)	5.6	1,640	5.4 (4.2–6.6)	5.2	2,140	7.5 (6.1–9.0)	7.5	2,000	6.7 (5.4–8.0)	6.9
Black	120	4.0 (0.8–7.3)	4.7	160	5.0 (1.5–8.4)	6.2	60	1.9 (0–4.1)	1.9	60	1.8 (0–3.8)	1.2
Asian	…	...	…	0	0	0	120	38 (7.6–69)	38	180	38 (13–63)	25
Hispanic	…	...	…	0	0	0	0	0	0	0	0	0
N. American Native	…	...	…	0	0	0	0	0	0	0	0	0
Gender												
Male	840	5.6 (3.9–7.3)	6.3	820	5.4 (3.7–7.0)	5.9	540	3.7 (2.3–5.1)	4.1	540	3.5 (2.2–4.8)	3.8
Female	1,480	7.4 (5.7–9.1)	6.9	1,380	6.8 (5.2–8.5)	6.4	1,820	9.6 (7.6–12)	9.1	1,720	8.7 (6.8–10)	8.4
Region												
Midwest	300	3.4 (1.7–5.2)	3.0	180	2.0 (0.7–3.3)	1.8	720	8.3 (5.6–11.1)	8.1	420	4.8 (2.7–6.8)	4.8
Northeast	440	5.7 (3.3–8.1)	6.8	540	7.0 (4.4–9.7)	7.0	300	4.5 (2.2–6.7)	4.5	360	5.2 (2.8–7.6)	4.6
South	1,440	12 (9.1–14)	11	840	6.6 (4.6–8.6)	6.8	840	6.8 (4.7–8.8)	7.1	980	7.4 (5.3–9.5)	8.1
West	100	1.8 (0.2–3.4)	1.8	640	12 (8.1–17)	12	500	10 (6.1–14)	9.7	500	9.3 (5.6–13)	8.1

…data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Age-adjusted to the US Census-derived age distribution of the year under analysis.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998, 2001.

Table 5. Mean inpatient length of stay (LOS) and cost per child admitted with ureteropelvic junction obstruction[a] listed as primary diagnosis, 1999–2003

	Count	Percent	LOS	Mean Cost
Total	3,078		2.9	$7,728
Age				
0–2	1,933	63%	2.9	$7,649
3–10	795	26%	2.8	$7,525
11–17	329	11%	3.0	$8,660
18+	21	1%	3.0	$8,154
Race/ethnicity				
White	2,007	65%	2.7	$7,659
Black	286	9%	3.2	$7,703
Asian	37	1%	3.2	$7,925
Hispanic	333	11%	3.5	$8,542
N. American Native	6	0%	2.5	$8,064
Missing	142	5%	1.9	$5,807
Other	267	9%	3.1	$8,243
Gender				
Female	920	30%	2.7	$7,372
Male	2,158	70%	3.0	$7,880
Region				
Midwest	993	32%	2.7	$7,651
Northeast	489	16%	3.5	$9,581
South	1,065	35%	2.7	$6,930
West	531	17%	2.9	$7,767

[a]Using ICD-9 codes 753.20 (unspecified obstructive defect of renal pelvis and ureter) and 753.21 (Congenital obstruction of ureteropelvic junction).
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2003.

Outpatient Care

Physician Office Visits

The data for physician office visits by Medicare beneficiaries with UPJ obstruction as the primary diagnosis in 1992, 1995, 1998, and 2001 are shown in Table 4. The overall age-adjusted rate for patients over 65 years of age remained relatively unchanged over the reported years. Interestingly, females had the highest rate of physician office visits in this population, and the trend was increasing (64, 63, 77, and 76%, respectively) (calculations based on data in Table 4). These data coincide with data in the HCUP dataset for patients over 18 years of age. As in the other samples, the rate of physician office visits for UPJ obstruction was highest in the Caucasian population.

Length of Stay

The database from the National Association of Children's Hospitals and Related Institutions (NACHRI) for 1999–2003 reported the mean inpatient length of stay (LOS) and cost per child (Table 5). The mean length of stay during this period was 2.9 days. Between 1994 and 2000 (Table 6), LOS dropped further for children than for adults. Nelson et al. observed a decrease from 6.6 days in 1988 to 3.7 days in 1997–2000 (11). These data suggest a further decrease in length of stay between 2000 and 2003. The majority of patients were under the age of 2 (63%) at the time of treatment. This is similar to the trend seen in the HCUP Kids' database for inpatient hospitalizations, where the highest rate was for children less than 3 years of age (Table 2).

ECONOMIC IMPACT

Data on the cost of treating patients with UPJ obstruction are limited. However, NACHRI data suggest that the average cost per hospitalization from 1999 to 2003 was $7,728 (Table 5). While average length of stay associated with the treatment of UPJ obstruction has declined markedly over time,

Table 6. Length of stay (LOS) for patients with a primary diagnosis of ureteropelvic junction obstruction

	1994				1996				1998				2000			
	Count	LOS (Mean)	LOS (Median)	LOS (Max)	Count	LOS (Mean)	LOS (Median)	LOS (Max)	Count	LOS (Mean)	LOS (Median)	LOS (Max)	Count	LOS (Mean)	LOS (Median)	LOS (Max)
Total[a]	2,821	5	4	111	2,663	3.8	3	34	2,304	3.5	3	17	2,215	3.3	3	42
Age																
< 18	1,900	5.3	4	111	1,701	3.9	3	34	1,332	3.3	3	17	1,228	2.8	2	16
18–24	158	4.2	5	9	170	3.1	3	7	225	3.8	4	9	185	3	3	9
25–34	225	4	4	11	263	3.5	3	14	173	3.8	3	8	167	3.3	3	8
35–44	228	3.9	4	9	*	*	*	*	175	3.3	3	7	229	3.4	3	9
45+	295	5.4	5	24	365	4.2	4	17	394	4.1	3	17	406	4.8	4	42
Gender																
Male	1,690	5.1	4	111	1,745	3.8	3	34	1,492	3.4	3	17	1,288	3.3	3	42
Female	1,131	5	4	21	918	3.8	3	19	812	3.8	3	17	927	3.3	3	12
Race/ethnicity																
White	1,677	5	4	111	1,563	3.8	3	17	1,332	3.5	3	17	1,218	3.2	3	16
Black	242	5.6	4	18	185	5.4	4	34	*	*	*	*	156	3.4	3	10
Hispanic	211	5.4	5	16	322	4.2	3	30	*	*	*	*	169	3.3	3	10
Region																
Midwest	833	4.7	4	24	950	3.6	3	17	623	3.5	3	17	590	3.5	3	42
Northeast	516	6.5	4	111	506	4.3	3	34	521	3.7	3	17	424	3.3	3	10
South	1,111	4.9	4	20	950	3.6	3	19	777	3.5	3	12	644	3.6	3	16
West	360	4.1	4	15	470	4	4	30	383	3.5	3	13	558	2.6	2	7
MSA																
Rural	269	3.5	4	8	272	3.4	3	8	235	3.6	3	17	166	4.3	4	12
Urban	2,552	5.2	4	111	2,391	3.9	3	34	2,055	3.5	3	17	2,049	3.2	3	42

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 7. Inpatient expenditures for patients with ureteropelvic junction obstruction

	1994	1996	1998	2000
Total	$12,073,190	$12,274,483	$11,279,536	$11,747,477

SOURCE: National Ambulatory Medical Care Survey; National Hospital Ambulatory Medical Care Survey; Healthcare Cost and Utilization Project; Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

there appears to have been no change in aggregate expenditures over this period. Length of stay may have decreased, but there has been at most a small decline in total inpatient spending from $12.1 million to $11.8 million (Table 7). It may be that inpatient services were moved to ambulatory surgery locations, making the overall picture hard to estimate from the data. Additionally, reimbursement for inpatient stays may have gone down in parallel with the decreasing length of stay, but charges may have been artificially inflated, thus masking the decline.

Average length of stay and treatment costs for children remain considerably higher in the Northeast, which may be due to the increased costs associated with minimally invasive procedures. Over the past decade, treatment for UPJ obstruction has shifted from open pyeloplasty to endopyelotomy to laparoscopic pyeloplasty (12, 13).

CONCLUSIONS

The majority of UPJ obstructions are diagnosed in the perinatal period. The practice of surgical intervention during the neonatal period has decreased, while there has been an increasing trend toward conservative management.

RECOMMENDATIONS

The following questions need to be addressed to gain a better understanding of the natural history of UPJ obstruction:

- When (if ever) do patients who are followed conservatively for UPJ obstruction undergo surgical intervention (at what age and how long after diagnosis)?
- What proportion of patients with congenital UPJ obstruction who do not undergo surgical correction during childhood become symptomatic as adults (at what age)?
- Is there an equal propensity of renal failure in males and females with UPJ obstruction?
- Is there an identifiable precipitating event later in the life of untreated patients for whom conservative therapy is not successful?
- How has the increased utilization of prenatal ultrasound impacted the management of pediatric UPJ obstruction?

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