Trends in Upper Tract Stone Disease in England: Evidence from the Hospital Episodes Statistics Database

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Key Words

Urolithiasis · Trend · Ureteroscopy · PCNL · Lithotripsy

Abstract

Aims: The study aimed to determine the current trends in urolithiasis-related admissions and associated interventions in England between 2006/2007 and 2013/2014 utilizing Hospital Episode Statistics (HES) online data. **Material and Methods:** Data was extracted from the online HES data set for each year from 2006/2007 to 2013/2014 inclusive. Admissions and procedural interventions were identified from their corresponding OPCS-4 and ICD-10 codes. **Results:** Finished consultant episodes (FCEs) for urolithiasis have increased by 20% over the last 7 years, with 93,039 FCEs in the year 2013/2014. Based on English population statistics, the life-time prevalence of urolithiasis based on hospital-related admission/intervention data for 2013/2014 is 14%. The biggest increases were seen in those aged ≥ 75 years (up by 51%, $n = 2,853$). Total interventions have increased from 28,624 to 42,068, with increased rates of shock wave lithotripsy (26%),

ureteroscopy (URS; 86%) and percutaneous nephrolithotomy (149%). Emergency URS procedures have increased by 38%. Day-case rates for ureteric and renal URS, in 2013/2014, were 22 and 21%, respectively. **Conclusions:** Over the last 7 years, there is a rising prevalence of kidney stone disease with associated increase in the number of interventions related to it. Both elective and emergency URS procedures are increasing, with a rising trend for day-case URS. Similar trends are seen worldwide and future resource planning for urolithiasis is needed to match the increase in demand.

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Introduction

With a global incidence of around 10%, urolithiasis and its management is becoming a major healthcare issue [1–5]. Technological advances have resulted in ever increasing treatment options, enabling us to achieve improved stone-free rates and offering our patients the best quality care.

In England, the National Health Service (NHS) collects Hospital Episodes Statistic (HES) data that report on trends in English health utilization. Initially set up in 1987, HES data are reported on an annual basis. Classification of diseases (ICD-10) and surgical procedures and interventions are coded (using the OPCS-4) that is mandatory for admitted patient care commissioning data sets. Every hospital-related admission or procedure in England is coded in the secondary care setting, by an independently trained clinical coder. Data from each organization can then be collated nationally to derive the HES data set. HES data can be used for multiple purposes, including health resource planning, analysis of trends in admissions and interventional procedures, as well as future work force planning needs.

HES data are freely available online (<http://www.hesonline.nhs.uk>) and can be accessed, downloaded and analyzed independently via the website. In 2012, Turney et al. [2] reported on current trends in stone disease, utilizing English HES data over a 10-year period up to 2010. They reported increases in the prevalence and treatment of stone disease in England, concluding that such increases will have important implications for workforce planning, training, service delivery and research in the stone disease.

In the past few years, endourological advances and increasing sub-specialization have helped improve stone management for our patients. In view of the ever-increasing healthcare demands, limited financial funding and increased patient expectations, we believe it is imperative that we know the current trends in stone disease. Our aim is to update and further examine trends in kidney stone disease in England, using HES data, for disease prevalence and management.

Methods

All data were exported from the HES online data set (<http://www.hesonline.nhs.uk>). Data were collected on a yearly basis, from 2006/2007 to 2013/2014, inclusive of a 7-year period. The prevalence of stone-related admissions, using the ICD-10 diagnosis codes, was collected. Reported data relate to finished consultant episodes (FCEs). Using the OPCS-4 procedural codes, we were able to identify all stone-related procedures [6–10]. Data collected included the following: age, demographics, location and nature of the procedures, emergency workload, length of stay (LoS) and procedural day-case rates.

Extrapolating these data to population statistics gives an estimate of urolithiasis requiring FCEs in England. According to the Office of National Statistics, the mid-year estimate of the population in England was 51.0 million people in the year 2005 and

53.9 million in the year 2013 [3], representing a 6% increase. This gives an annual prevalence of stone disease requiring a hospital visit of 0.153% in 2006 rising to 0.172% in 2013. With an average life expectancy, across both sexes, of 79.7 years in 2005–2007 and of 81.25 years in 2012–2014 in England [4], this estimates an increase in the lifetime prevalence of urolithiasis from 12.19 to 13.98% over that time period. As these figures are based on coded hospital data, if stone-related community episodes are accounted, the lifetime prevalence is likely to be much higher.

Results

Finished Consultant Episodes

FCE for urolithiasis increased from 77,868 procedures in the year 2006/2007 to 93,039 in the year 2013/2014. This represents an increase in activity of 20% over the last 7 years. Across all age groups, except those less than 14 years, there was an increase in the total number of FCE. The percentage increase during these time periods was most significant in the >75 years age group (51%, from 5,611 to 8,964). FCE urolithiasis for 60–74 years increased by 35% (from 16,777 to 22,644), while it increased by only 12% (from 55,007 to 61,310) for those of 15–59 years. Meanwhile, the number of FCEs in those <14 years decreased marginally by 6% during the period of analysis.

Analysis of total interventions for urolithiasis per FCE including shock wave lithotripsy (SWL), percutaneous nephrolithotomy (PCNL), ureteroscopy (URS) and open surgery has demonstrated a significant increase too. In 2006/2007, there were a total of 28,624 FCE interventions for urolithiasis in total; this figure increased to 42,068 in 2013/2014, an increase of 47%. Perhaps the most staggering increase was in the rates of PCNL that rose from 678 in 2006/2007 to 1,687 in 2013/2014, representing an increase of 149%. It should be noted, however, that the PCNL rate increased from 678 in 2006/2007 to 1,209 in 2007/2008 representing an increase of nearly 79% in 1 year. The number of open procedures for urolithiasis decreased by 38% (from 328 to 202) during the study period. Both SWL and URS demonstrated increases in FCE by 26 and 86%, respectively.

Further sub-analysis of trends in SWL and URS, by location of stone, confirms an increasing trend across all modalities and locations. There was, in total, a 45% increase in SWL and URS for renal and ureteric stones from 2006/2007 to 2013/2014. Notably during the study period, interventions for renal stones using URS had increased from 2,597 in 2006/2007 to 6,048 in 2013/2014, an increase of 133%. At the same time, SWL for ureteric

Table 1. Number of patients for FCE, ureteric and kidney stone treatment modalities for 2006/2007 to 2013/2014 inclusive

	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	Percentage change (2006/2007–2013/2014)
FCE for 'urolithiasis', years									
Total	77,868	79,199	84,537	89,855	92,432	91,716	89,035	93,039	20
<15	464	467	470	519	422	436	491	437	–6
15–59	55,007	54,740	57,473	61,239	62,276	60,468	59,029	61,310	12
60–74	16,777	17,905	19,603	20,789	21,729	22,455	21,392	22,644	35
>75	5,611	6,066	6,898	7,217	7,887	8,221	7,976	8,464	51
Ureteric stones									
SWL	3,130	3,070	2,760	3,038	3,150	3,345	2,922	3,307	6
URS	6,327	6,822	8,004	8,773	9,358	9,859	10,338	10,562	67
Emergency URS	954	906	1,003	1,092	1,165	1,221	1,313	1,268	33
Day case URS	640	713	1,015	1,073	1,325	1,699	2,013	2,328	264
Kidney stones									
SWL	15,564	16,279	18,684	19,352	19,926	19,913	19,546	20,262	30
URS	2,597	2,704	2,842	3,267	4,085	4,618	5,315	6,048	133
Emergency URS	94	73	89	90	133	143	141	179	90
Day case URS	197	339	350	336	410	662	894	1,245	531
Combined ureteric and kidney stones									
SWL	18,694	19,349	21,444	22,390	23,076	23,258	22,468	23,569	26
URS	8,924	9,526	10,846	12,040	13,443	14,477	15,653	16,610	86
PCNL	678	1,209	1,450	1,732	1,689	1,806	1,875	1,687	149
Open stone removal	328	231	181	147	155	188	182	202	–38

Table 2. Day case rates for URS from 2006/2007 to 2013/2014

	2006/2007		2013/2014		Change in day-case rates (2006/2007 to 2013/2014), %	Increased from 2006/2007 to 2013/2014 by
	number	proportion day-case, %	number	proportion day-case, %		
Ureteric	640	10	2,328	22	264	×3.6 times
Kidney	197	7.5	1,245	21	531	×6.3 times

stones remained relatively static when taking the population variance into account, which rose marginally from 3,130 to 3,307 (6% increase) during the time period. In contrast, ureteric URS increased by 67%.

Analysis of emergency procedures for urolithiasis confirms the commonest intervention to be ureteric URS, with ureteric SWL and renal URS also prevalent but at much lower rates (table 1). The total number of emergency ureteroscopic interventions increased by 38% from 1,048 in 2006/2007 to 1,447 in 2013/2014, the highest total number of interventions to date. Renal URS showed the most significant rate of rise with a 90% increase in procedures. However, it should be noted that they accounted for only 15% of all emergency ureteroscopic procedures in the year 2013/2014.

Length of Stay

Throughout the time period, the median overall LoS for URS and PCNL have decreased by an average of 36%. Interestingly, the LoS for PCNL decreased from 5 to 4 days between 2006/2007 and 2007/2008 and has stayed consistently at 4 days since. Ureteric and renal URS LoS have decreased from 2.21 to 1.17 and 4.33 to 2.25 days, respectively (47 and 48% decrease LoS). This is largely due to the almost exponential increase in day-case procedures for both renal and ureteric URS.

Day-Case URS

The rate of day-case ureteric URS increased 3-fold, while the rate of day-case renal URS increased by over 6-fold (table 2). Despite such increases in day-case rates,

it must be noted that for the most recent year (2013/2014), the day-case rate for renal URS was only 21% and for ureteric URS was 22%.

Discussion

Findings of Our Study

Trends of Urolithiasis and Interventions

Our data demonstrate that there has been a significant increase in FCEs as a result of urolithiasis. Certainly, the lifetime prevalence of urolithiasis has historically been reported at 10% [2]; these current data put that figure at closer to 14%, meaning roughly 1 in 7 of the population will require a hospital-based intervention for urolithiasis. Similar trends of increased intervention for urolithiasis has also been demonstrated in a Canada-based study, which demonstrated a 48% increase in patients undergoing kidney stone procedures between 1991 and 2010 [11]. It must be noted that the prevalence data are based on FCEs, and one patient may have had multiple FCEs over a year and therefore, these estimates will vary. The increasing prevalence of urolithiasis is likely to be a result of increased prevalence in obesity, associated metabolic syndrome and type 2 diabetes [12]. The increasing age of patients presenting with stones, as well as the postulated underlying causes of obesity, and the metabolic syndrome pose significant problems for those commissioning healthcare. Whilst no costing analysis has been performed for this paper, there is clearly a significant and growing challenge to the provision of care for patients with urolithiasis both in terms of health expenditure and resource utilization.

Interestingly, in our study, the most significant rate of rise in FCEs for urolithiasis occurred in the >75 years age group (51% increase) over the study period. This was also demonstrated in an American study, reporting significantly increased hospital admissions for stones in older patients [13]. Certainly, this contradicts the classical teaching that stone disease affects the young and middle aged. This may have significant clinical and resource implications, particularly with an aging population. A recent analysis in the US has demonstrated an increasing trend of short-stay hospitalizations in the elderly population [14]. No correlation with the increasing incidence of urolithiasis was made; however, the importance of these 2 findings is related to the fact that the average LoS in the emergency department is 20% longer in older adults compared to younger patients and the use of laboratory and radiology services is 50% higher, with a 4-fold increase in need for social service input [14]. This has significant im-

plications for those involved with the planning and provision of healthcare.

Our data demonstrate an increase in the number of FCEs for PCNL of 79% between the years 2006/2007 and 2007/2008. Care should be taken in the interpretation of this result. PCNL has only had its own OPCS-4 code (M16.4) since 2006 [5]; it is therefore likely that there was an under-representation of PCNL procedures within that year. Nevertheless, there has been an increase in the number of PCNLs performed between 2007/2008 and 2013/2014 to the tune of 70%. In contrast, a recent, regional, study in New Zealand demonstrated a decrease in PCNL procedures over a similar time period [15]. It is, however, possible that the number of PCNLs performed in England will continue to rise. Recent advances in the technologies associated with performing PCNL, including the use of mini-PCNL, ultramini-PCNL and micro-PCNL, have resulted in percutaneous access to kidney stones via a 4.8F tract [16]. However, a recent systematic review and meta-analysis comparing PCNL (including mini-PCNL and micro-PCNL) advocated against the use of these new technologies pending further randomized studies [17]. It is therefore difficult to accurately predict the future of PCNL within England.

The cost of URS and lithotripsy has decreased and has become more cost-effective over the last few years with more centers performing it [18]. Nevertheless, with a rising trend of urolithiasis, primary prevention seems to be more cost-effective for a national healthcare system and contributes to a significant cost saving and reduction in stone burden to society [19].

Trends of Emergency Procedures for Urolithiasis

The number of ureteroscopic stone procedures within England has increased significantly over this study period with an associated increase in emergency ureteroscopic procedures. This is likely to be as a result of an increase in the availability of equipment, access to laser machines and semi-rigid ureteroscopes, as well as access to time in the emergency theatre over the study period. Furthermore, there is increasing data to support the utilization of emergency URS; recently, it has been found to be feasible, safe and effective with a success rate of 72% [20]. It is therefore likely that emergency URS rates will continue to increase relative to SWL.

Trends in Length of Hospital Stay

During the study period, the median LoS has demonstrated a decreasing trend. However, despite the advancements in PCNL technology, the median LoS has re-

mained, constantly, at 4 days since 2007/2008. With the aforementioned developments in PCNL technology and the increasing utilization of tubeless PCNL, this trend will hopefully fall. The increase in day-case URS, for both renal and ureteric stones, was significant but not unexpected given the increased sub-specialization among the urologists. Despite this, only 21–22% of ureteroscopic procedures are performed as a day-case. These proportions will hopefully increase over the next few years, especially as pressure on elective in-patient beds increase in the health-care system.

Strengths of Our Study

As with all databases, the quality of output is commensurate with the quality of data that has been inputted. In the past, criticism has been leveled at HES data in terms of its accuracy as it relies largely upon coding data, recorded from patient notes, by non-clinicians in NHS hospitals, at the time of patient discharge [5]. Furthermore, a recent paper that investigated the accuracy of clinical coding for upper tract URS found that up to 55% of the coding data can be erroneous, with the particular error of renal URS being coded as ureteric URS [6]. In spite of this, a recent systematic review demonstrated a median accuracy of 84.2% for recorded procedure data within the HES database [7]. There is an increasing body of literature that interrogates HES data, with increasing degrees of complexity, to offer a ‘real world’ insight into patient outcomes rather than randomized controlled trials in specialized units [8]. HES data are also utilized by the Government to provide the basis for national indicators of clinical quality as well as to develop, monitor and evaluate government policy [9], and therefore, are seen to hold significant importance.

Limitations of Our Study

A limitation of the data available from HES is that only episodes of urolithiasis that required treatment by a hospital consultant are included in the database. The number of patients managed conservatively by their general practitioners cannot be captured with this data set. It is therefore likely that overall prevalence rates of urolithiasis within the UK are higher than those reported in this paper. Furthermore, it is interesting to note that the British Association of Urological Surgeons recently published, online, PCNL data from the whole of the UK for 2014 [10]. On an estimated capture of 90% of PCNL data, they recorded 2,042 procedures throughout the UK from January 2014 to December 2014. Looking more closely at this data, only 56 procedures were performed outside of England giving a total of 1986 PCNLs within England during that time period. This finding gives further rise to concern as to the absolute accuracy in data capture within the HES system. However, as the time periods studied between the 2 data sets are significantly disparate, it is difficult to make any meaningful conclusions between them.

Conclusion

The HES data presented here demonstrate the increasing prevalence and intervention of urolithiasis within England over the last 7 years. There is a rise in both elective and emergency urolithiasis interventions, with a rising trend for day-case URS. Similar trends are seen worldwide, and future resource planning for primary and secondary intervention for urolithiasis is needed to match the increase in demand.

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