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Original Article

Surgery Section

Identification and Cost of Disposable Endourological Devices for Nephrolithiasis: A Cross-Sectional Study Among Urological Trainees

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ABSTRACT

Introduction: Knowledge on health economics among urology trainees is not formally assessed. The cost of commonly utilised endourological devices may not be considered by trainees.

Aim: The present study was conducted with the aim to assess whether urology trainees were knowledgeable on identification and cost of commonly used disposable devices in the management of nephrolithiasis.

Materials and Methods: Forty urology trainees in Ireland were invited to complete a visual online questionnaire on the identification of 10 frequently utilised disposable endourological devices. In addition, trainees were requested to estimate the cost of 12 disposable endourological devices. Responses were stratified according to trainee grade and urological subspecialty of interest. Data are presented as a mean ± standard deviation.

Results: The response rate was 70% (28/40). Endourology was the subspecialty of interest in 21% (n= 6). No trainee correctly identified all 10 endourological devices and the mean test score was 5.32 ± 2.28. No trainee accurately estimated the cost for all 12 devices assessed. The cost of endourological devices was underestimated by €67.13 ± €60.76 per device. A total of 54% (n=15) of trainees underestimated the total cost of disposable devices used during standard flexible ureterorenoscopy, laser lithotripsy and JJ stent insertion by €303.66 ± €113.83.

Conclusion: Our findings indicate deficiencies in trainee knowledge on endourological devices and their associated costs. Incorporating a health economics module into postgraduate urology training may familiarise trainees with healthcare expenditure within their departments.

Keywords: Disposable devices, Endourology, Health economics, Urology training

INTRODUCTION

Flexible ureterorenoscopy is a relatively recent urological development and costs approximately €1,160 per procedure [1]. It has gained widespread acceptance into the field of endourology as it is minimally invasive and effective for treating renal calculi. During a standard flexible ureterorenoscopy numerous disposable devices are utilised including guidewires, ureteric stents, stone retrieval baskets and laser fibres. Urological trainees receive no formal training or assessment on the cost and identification of these devices. Educating trainees and surgeons on disposable devices has been shown to reduce procedure costs in other surgical disciplines [2]. Furthermore, surgeons tend to underestimate the cost of high-cost items and surgical experience does not correlate with estimation accuracy [3]. The aim of our study was to assess urology trainees' ability to identify and estimate costs of commonly used disposable endourological devices in the management of nephrolithiasis and identify potential deficiencies in postgraduate urology teaching of departmental healthcare economics.

MATERIALS AND METHODS

The Royal College of Surgeons in Ireland (RCSI) was consulted to obtain a national database of all current urology trainees in Ireland. Trainees were invited to partake in a questionnaire via email. Non-respondents were sent a reminder email on a 2-weekly basis for the duration of the study (3 months). The trainee database was inclusive of all urology trainees in the Republic of Ireland. Ethical approval for this study was obtained from the hospital ethics committee.

An anonymous online survey consisting of 23 multiple-choice questions (MCQs) was created using Survey Monkey©. The survey was divided into sections 1, 2 and 3. Prior to Section 1 respondents were asked their gender, grade and subspecialty of interest. Non-consultant grades of training in the Republic of Ireland (from junior to senior) are; Senior House Officer (SHO), registrar and Specialist Registrar (SpR). Fellows were also asked to participate in the study.

Section 1 of the survey consisted of images of disposable devices and trainees were requested to identify each device. The endourological devices were as follows: NGage© stone extractor, Gemini© stone retrieval basket, Zero Tip© stone retrieval basket, Graspit© stone retrieval forceps, Segura© stone retrieval basket, Percuflex Plus© ureteral stent, Terumo© wire, LISA© flexible laser fibre, Navigator© access sheath and Pathfinder© irrigator. In section 2, trainees were requested to estimate the cost of 12 disposable endourological devices. The hospitals procurement department was consulted to cost each device [Table/Fig-1]. Trainees were presented with multiple choice questions (MCQs) with 4 possible answers which consisted of a price range (e.g. a. €100-€200, b. €200-€400 etc.). Section 3 of the survey consisted of one MCQ requesting respondents to estimate the total cost of disposable devices utilised during a standard flexible ureterorenoscopy and laser lithotripsy procedure with insertion of a ureteral stent.

Respondents received one point for each correctly answered MCQ. There was no negative marking for incorrectly answered MCQs. The maximum score in section 1 was 10, section 2 was 12 and section 3 was 1. Thus the maximum score achievable for the survey was 23. Data are presented as a mean ± standard deviation.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional

and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

RESULTS

Response Rate

The questionnaire was delivered to 40 trainees and the response rate was 70% (28/40). Two questionnaires were incomplete. Analysis was performed on every returned survey. The highest response rate was by SpRs (54%, n=15) followed by registrar trainees (29%, n=8). SHOs accounted for 11% (n=3) of responses and fellows 7% (n=2). Endourology was the subspecialty of interest for 21% (n=6). 68% (n=19) of respondents were male and 32% (n=9) were female. All respondents were working in the public healthcare sector at the time of the study.

Identification of Devices

[Table/Fig-1] demonstrates trainees' responses for correctly identifying each disposable endourological device. The mean test score was 5.32 ± 2.28 (10 questions, range: 2-9). The Percuflex Plus© ureteral stent was most recognisable among trainees and was correctly identified by 93% (n=26) of respondents. The Graspit© stone retrieval forceps was the most unrecognisable device and was correctly identified by 21% (n=6) of respondents.

Name of device	Correctly identified (n)	Cost (€)	Correct responses for cost (n)	Underestimated (€)
NGage Stone Extractor	68% (n=19)	299.42	21% (n=6)	146.25
Gemini Stone Retrieval Basket	25% (n=7)	180	39% (n=11)	81.67
Zero Tip Stone Retrieval Basket	46% (n=13)	176.80	21% (n=6)	79.3
Graspit Stone Retrieval Forceps	21% (n=6)	149.50	36% (n=10)	69.06
Segura Stone Retrieval Basket	46% (n=13)	148.85	32% (n=9)	71.5
Percuflex Plus Ureteral Stent	93% (n=26)	70.85	25% (n=7)	34.47
PTFE Standard Guidewire	NA	11	50% (n=14)	5.25
Sensor Guidewire	NA	29	61% (n=17)	11.67
Terumo Guidewire	25% (n=7)	40	61% (n=17)	18.33
LISA Flexible Laser Fibre	68% (n=19)	400	50% (n=14)	208.33
Navigator Ureteral Access Sheath	89% (n=25)	154	25% (n=7)	72.95
Pathfinder Irrigator	86% (n=24)	27	29% (n=8)	6.78

[Table/Fig-1]: Summary of responses for endourological device identification and cost.
Correct responses for cost and extent of cost underestimation are also represented as mean (€)
* NA=not assessed- authors felt that these devices were visually indistinguishable from one another and therefore decided to exclude them in order to avoid misidentification leading to erroneous results

Cost of Devices

[Table/Fig-1] also demonstrates cost estimation for endourological devices among trainees. No trainee accurately estimated the cost for all 12 devices assessed. The cost of endourologicial devices was underestimated by €67.13 ± €60.76 per device. Trainees scored highest at estimating the cost of the Sensor© guidewire and Terumo© guidewire with each of these devices accurately priced by 61% (n=17) of trainees. Trainees scored lowest in accurately costing the NGage© stone extractor and Zero Tip© stone retrieval basket with 21% (n=6) of respondents correctly pricing these devices. Trainees underestimated the cost of the LISA© flexible laser fibre by €208.33 ± €51.49 and this was the most underestimated device on costing. A total of 54% (n=15) of trainees underestimated the total cost of disposable devices used during standard flexible ureterorenoscopy, laser lithotripsy and JJ stent insertion by €303.66 ± €113.83.

DISCUSSION

Guidewires, ureteric stents, stone retrieval baskets and laser fibres are used on a daily basis by urology trainees. Despite their widespread use; there are no taught modules dedicated to endourological devices and their economic impact on the department. Herein, we identified broad variations in the perception of cost of commonly utilised disposable devices among urology trainees. We also demonstrated that the cost of disposable devices, with the exception of guidewires, was consistently underestimated by trainees. Finally, we identified deficiencies among trainees at identifying certain devices, in particular stone retrieval devices. In order to maximise the cost-effectiveness of the productive operating theatre it is important to address knowledge deficiencies on healthcare economics in the near future.

Although doctors are responsible for a considerable portion of healthcare spending, their knowledge on health economics has been traditionally poor as demonstrated in one study where 80% were unaware of the costs of medications and only 13% had been formally educated on drug costs [4]. To combat these deficiencies the General Medical Council suggest that undergraduate medical training should enable doctors to discuss issues relating to health economics [5], however health economics is taught differently across medical schools [6]. Educating medical professionals should not only include health economics modules as part of their undergraduate education, it should involve continuous education and assessment of postgraduate trainees by their training bodies. This module could be incorporated online or presented at training days. Informed trainees may exercise greater financial responsibility and generate cost saving opportunities.

Different surgical subspecialties have investigated whether educating surgeons on the cost of disposable devices can increase savings. Vigneswaran et al., provided general surgeons with information on the cost of commonly utilised disposable devices [2]. At the end of the 2013 fiscal year surgeons were presented with the cost of items used during laparoscopic and open unilateral herniorrhaphy, and were supplied with cost effective alternatives. Items assessed included fixation/tacking devices, trocars, clip appliers, dissectors and laparoscopic scissors. These figures were then compared with the spending for the following fiscal year and they demonstrated a 21% reduction in the cost of laparoscopic hernia repair and an 8.6% reduction for open hernia repair [2]. The cost savings were due to a reduction in the use of certain disposable devices such as clip appliers and scissors, and selective use of certain fixation devices and trocars [2]. Zygourakis et al., calculated the cost of unused disposable devices in the neurosurgery operating theatre during 58 cases in one month [7]. It was shown to be $968 per case, resulting in a cost to their department of $2.9 million per year [7]. They noted that the particular surgeon was an important factor regarding unused supply cost [7].

Stone retrieval and fragmenting devices play a pivotal role in the management of urinary tract calculi. Recent technological advances have resulted in an increase in the use of flexible ureterorenoscopy and laser lithotripsy for the management of upper tract and renal calculi. In the UK a recent 5 year review demonstrated that flexible ureterorenoscopy had increased from 3267 to 6631 cases (103% increases) for managing renal calculi [8]. Stone free rates range from 73.6-94.1% and it provides a shorter length of stay (WMD: 1.28; 95% CI, 0.79-1.77; p<0.0001) when compared with PCNL [9]. A curtailed inpatient stay may also lead to increased savings.

There is a steep learning curve associated with flexible ureterorenoscopy and its associated disposable endourological

devices. Simulation-based training for flexible ureterorenoscopy improves technical skills of trainees and should perhaps be incorporated on a more compulsory basis [10]. In the present study we found that a disposable laser fibre was the most underestimated device among trainees. The Graspit© stone retrieval forceps and the Gemini© stone retrieval basket were the least accurately identified devices among trainees. Although trainees may be knowledgeable of the role of these devices; their knowledge on nomenclature is poor and this finding is consistent with nomenclature among general surgical trainees. Bryson et al., also demonstrated that general surgical trainees were knowledgeable on the role of surgical devices but remained deficient on nomenclature [11].

LIMITATION

A limitation with the present study is its response rate. Although the sample size was representative of all urology trainees in the Republic of Ireland; the response rate was 70% (28/40). A further potential limitation is that every assessed device was restricted to the management of nephrolithiasis. A broader range of urological devices inclusive of theatre and outpatient departments could be assessed in future to thoroughly assess trainee knowledge on health economics. However, this is the first study assessing trainee knowledge on health economics in Ireland and it may serve as useful template for additional studies in this field in the near future.

CONCLUSION

Urological trainees are deficient in identifying and costing disposable endourological devices. Designing a health economics module into postgraduate urology training may improve the efficiency of healthcare expenditure within urological departments.

AUTHORS' CONTRIBUTIONS

David Galvin and Gerald Lennon carried out supervision and drafting of the manuscript; Niall Davis and David Mulvin analysed the data; David Quinlan carried out supervision; Cliodhna Browne collected the data, and Eoin Mac Craith designed the study, analysed the data, and drafted the manuscript. The authors would like to acknowledge Jennifer Davis (Clinical Nurse Manager, Urology Theatre, St. Vincent's University Hospital) for her role in obtaining the cost of devices.

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