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Cost Awareness of Interventional Radiology Devices Among Radiology Trainees

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Abstract

Aim
To assess radiology trainees' ability to identify and estimate costs of common disposable radiological devices and identify deficiencies in postgraduate teaching in terms of healthcare economics.

Methods
Postgraduate radiology trainees were invited to partake in a questionnaire via email. An anonymous online survey consisting of 26 multiple-choice questions (MCQs) was administered. Respondents were asked to identify and then cost 13 devices.

Results
The questionnaire was delivered to 82 Radiology trainees. The response rate was 60% (49/82). The mean percentage of correct answers was 91.6%. No trainee accurately estimated the cost for all 13 devices assessed. The cost of devices was underestimated by trainees 48.9% of the time and overestimated 32.3% of the time.

Conclusion
Radiology trainees are deficient in cost awareness of a number of common IR devices used. A health economics module in postgraduate radiology training may improve the efficiency of healthcare expenditure within radiology departments.

Introduction

Interventional Radiology (IR) is a vital component of modern healthcare. During a standard day in the IR suite, numerous disposable devices are utilised including guidewires, stents, needles and catheters. Both specialized IR trained consultants and Diagnostic Radiology consultants used many of these devices.

Radiology 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[1]. Furthermore, surgeons tend to underestimate the cost of high-cost items and surgical experience does not correlate with estimation accuracy[2]. Since the recent economic downturn, there has been a vogue in the health service to 'do more with less', however there is very little formal education for trainees surrounding these topics. The aim of our study was to assess radiology trainees' ability to identify and estimate costs of commonly used disposable interventional radiological devices and identify potential deficiencies in postgraduate radiology teaching in terms of healthcare economics. We also wish to add to the growing body of literature demonstrating poor cost awareness amongst physicians.

Methods

The postgraduate radiology training body of a European country was consulted to obtain accurate numbers of all current radiology trainees. Trainees were invited to partake in a questionnaire via email. Non-respondents were sent a reminder email or text message on a 2-weekly basis for the duration of the study (2 months). The trainee database was inclusive of all radiology trainees.

An anonymous online survey consisting of 26 multiple-choice questions (MCQs) was created using Survey Monkey©. Respondents were asked to provide their year of training (first to fifth year) and subspecialty of interest. Fellows (Year 5 trainees) were also asked to participate in the study.

Respondents were asked to identify 13 devices, using a combination of in vivo and ex vivo images. These images are provided in the supplementary material. They were subsequently asked to estimate the cost of each device. The devices were as follows: PICC line (6-Fr dual lumen, Bard), Angioseal Closure device (6 Fr, Terumo), Tunnelled dialysis catheter (AshSplit 32 cm), Port-A-Cath (PowerPort, Bard), pigtail drainage catheter (8 Fr, Uresil), guidewire (hydrophilic, Terumo), biopsy needle (18 x 10 mm Max-Core, Bard), micropuncture kit (Cook Medical), angioplasty balloon (5 Fr x 40 mm, Boston Scientific), IVC filter (ALN Optional vena caval filter), covered metal vascular stent (Atrium 5 x 60 mm), gastrostomy tube (MicKey 14 Fr x 3 cm, Avanos), and EVAR graft (Endurant II, Medtronic). Following each question, the trainee was asked to estimate the cost of each device. The hospitals procurement department was consulted to cost each device.

Regarding cost estimation, trainees were deemed correct if they responded to within 25% of the true cost. Respondents were not provided with a range of costs when answering.

Results

Response Rate

The questionnaire was delivered to 82 Radiology trainees and the response rate was 60% (49/82). All questionnaires were fully complete. Analysis was performed on every returned survey. The response rate varied by year of training - fourth year trainees (32.7%, n=16), third year trainees (24.5%, n=12), second years (16.3%, n=8), fifth year trainees (14.2%, n=7) and first year trainees (12.2%, n=6).

Interventional Radiology was the subspecialty of interest for 8.1% (n=4/49). All respondents were working in the public healthcare sector at the time of the study and all were enrolled in Higher Specialist Training in Radiology.

Identification of Devices

Table 1 demonstrates trainees' responses for correctly identifying each disposable radiological device. The mean percentage of correct answers given was 91.6% (13 questions). The guidewire, co-axial biopsy system, stent graft and EVAR trouser graft were correctly identified by all trainees. The tunnelled dialysis catheter was the most unrecognisable device and was correctly identified by 65% (n=32) of respondents.

Cost of Devices

Table 1 also demonstrates cost estimation for interventional radiological devices among trainees. No trainee accurately estimated the cost for all 13 devices assessed. The cost of devices was underestimated by trainees 48.9% of the time. The cost of devices was overestimated by trainees 32.3% of the time. After correct identification, trainees accurately estimated the cost of devices 18.8% of the time. These results are summarised in Figure 1. Trainees scored highest when estimating the cost of the AngioSeal closure device, accurately priced by 37.7% (n=17) of trainees. Trainees scored lowest in accurately costing an IVC filter with 0% (n=0) of respondents correctly pricing this device. The three most expensive items (IVC filter, stent graft and EVAR trouser graft) were the most frequently underestimated, at 100%, 87.8% and 98% respectively.

Name of device	**Correctly identified (n)**	**Cost (€)**	**Correct responses for cost (n)**	**Underestimated**	**Overestimated**
PICC line	90% (n=44)	85	31.8% (n=14)	27.2% (n=12)	41% (n=18)
AngioSeal Closure device	92% (n=45)	142.50	37.7% (n=17)	44.4% (n=20)	17.9% (n=8)
Tunnelled dialysis catheter	65% (n=32)	217.49	25% (n=8)	50% (n=16)	25% (n=8)
Portacath	98% (n=48)	230	18.75% (n=9)	47.9% (n=23)	33.3% (n=16)
Uresil pigtail drainage catheter	98% (n=48)	105.80	10.2% (n=5)	75% (n=36)	14.8% (n=7)
Guidewire	100% (n=49)	40	32.7% (n=16)	32.7% (n=16)	34.6% (n=17)
Co-axial biopsy needle	100% (n=49)	27.39	16.3% (n=8)	4% (n=2)	79.7% (n=39)
Micropuncture access kit	90%(n=44)	65	29.5% (n=13)	25% (n=11)	45.5% (n=20)
Angioplasty balloon	94% (n=46)	50	8.6% (n=4)	4.6% (n=1)	86.8% (n=41)
IVC filter	96% (n=47)	1365	0% (n=0)	100% (n=47)	0% (n=0)
Stent graft	100%(n=49)	1450	8.6%(n=4)	87.8% (n=43)	3.6% (n=2)
MicKey RIG tube	69% (n=34)	108	23.5% (n=8)	41.1% (n=14)	35.4% (n=12)
EVAR trouser graft	100% (n=49)	7000	2% (n=1)	98% (n=48)	0% (n=0)

Table 1 - This table displays each item, the number of trainees who correctly identified the item, it's cost, the number of correct responses for cost estimation and the number of trainees who underestimated the cost.

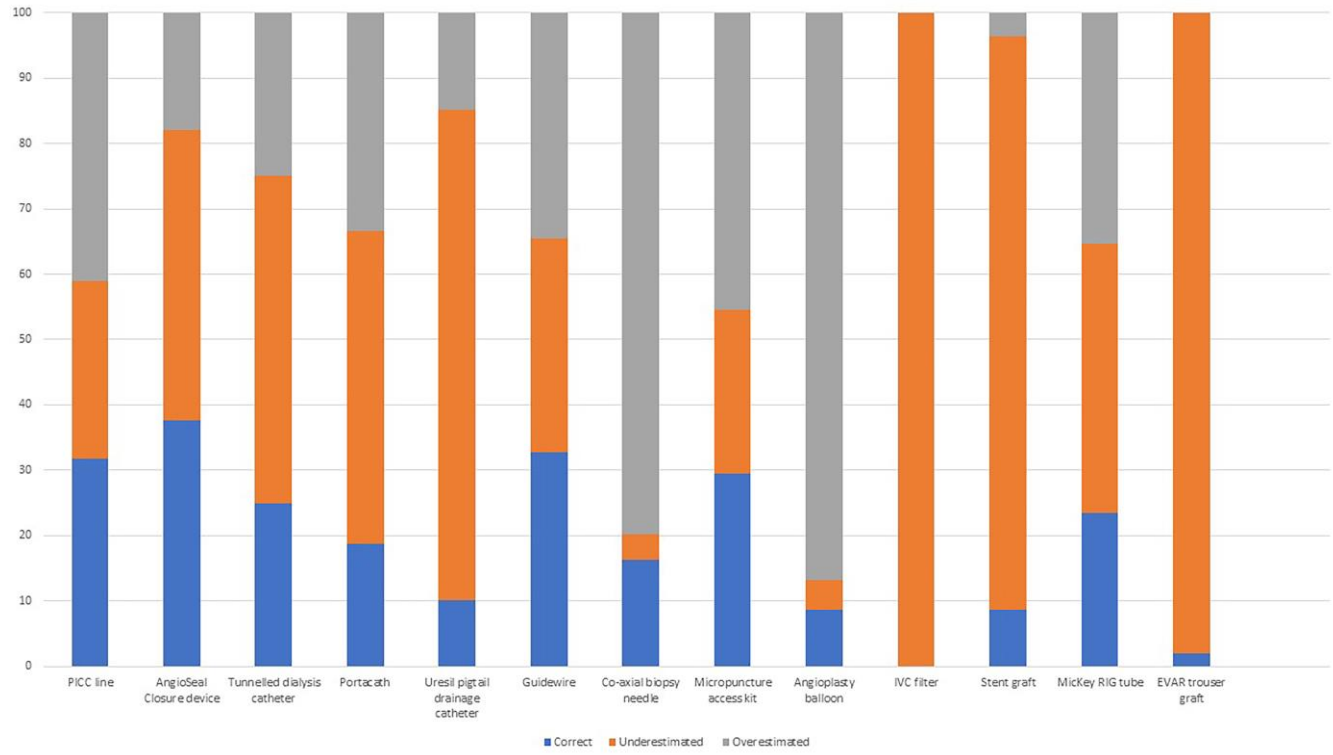

Figure 1 – Bar chart displaying the percentage of trainees who accurately estimated, overestimated and underestimated the cost of each item.

Discussion

Many modern hospitals operate a devolved budgetary management process[3]. This gives greater financial responsibility to those at the point-of-delivery of service, assuming they will be in the best position to make informed choices about the allocation of limited resources. Guidewires, drains, biopsy needles and angioplasty balloons are used on a daily basis in most radiology departments. Despite their widespread use there are no taught modules dedicated to interventional radiological devices and their economic impact on the department. In this study, we identified broad variations in the perception of cost of commonly utilised disposable devices among radiology trainees. Trainees were accurately able to estimate the cost of a device less than 20% of the time. We also demonstrated that the cost of disposable devices, was frequently underestimated by trainees. Finally, we identified that more expensive devices are more commonly underestimated. In order to maximise the cost-effectiveness of the interventional radiology department, it is important to address knowledge deficiencies in healthcare economics in the near future.

Although doctors are responsible for a considerable portion of healthcare spending, their knowledge of 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]. A number of papers have demonstrated that surgical trainees demonstrate poor knowledge of the cost of surgical equipment and that the price of high cost items tends to be underestimated[5,6].

To combat these deficiencies, the General Medical Council suggest that undergraduate medical training should encourage medical schools to teach issues relating to health economics[7], however health economics is taught differently across medical schools[8]. 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. A recent initiative by Vigneswaran et al., provided general surgeons with information on the cost of commonly utilised disposable devices[1], resulting in cost savings due to a reduction in the use of certain disposable devices and selective use of certain fixation devices and trocars[1]. Furthermore, Zygourakis et al[9], calculated the cost of unused disposable devices in the neurosurgery operating theatre which resulted in a significant cost to the hospital. They also noted that the particular surgeon was an important factor regarding unused supply cost.

There is a steep learning curve associated with deployment of certain devices used in interventional radiology, particularly the more complex and by extension, more expensive devices. Wang et al published a large cross-sectional survey on the level of cost awareness of attending interventional radiologists and vascular surgeons. 19.8% of their respondents were able to cost items accurately[10]. Our study differs in that we targeted trainee radiologists only, but only 18.8% of trainees were able to accurately cost items. The similar response rate amongst our surveyed cohort suggests greater experience with techniques involved does not necessarily translate into greater cost awareness. Ryan et al demonstrated that accuracy in estimating cost awareness does not improve with years of surgical training[5].This study adds to the growing body of evidence that knowledge of cost awareness amongst medical trainees is poor and highlights the need for this to be addressed in the near future.

While some of the devices included in our study are exclusively used in the Interventional Radiology suite, others would be used by general radiologists on a day-to-day basis. PICC lines, drainage catheters and biopsy needles are all commonly used by many different subspecialist radiologists. Analysing the data on these three devices shows that only 19.4% of trainees were accurately able to estimate the cost of these items. This demonstrates the importance of these concepts to Radiology as a whole, rather than being limited to Interventional Radiology.

A limitation with the present study is its response rate. Although the sample size was representative of all radiology trainees in the country; the response rate was 60% (49/82). A further potential limitation is the differences in prior clinical exposure to IR among surveyed trainees. Exposure to IR varies hugely between hospitals and medical schools.

In conclusion, radiology trainees are deficient in cost awareness of a number of common IR devices used. This adds to the growing body of evidence suggesting that physicians across a number of specialties demonstrate poor cost awareness. Designing a health economics module into postgraduate radiology training may improve the efficiency of healthcare expenditure within radiology departments.

Declaration of Conflicts of Interest:
The authors have no conflicts of interest to declare.

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