

A Cross-Sectional Survey of Interventional Radiologists and Vascular Surgeons Regarding the Cost and Reimbursement of Common Devices and Procedures

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ABSTRACT

Purpose: To evaluate knowledge of interventional radiologists (IRs) and vascular surgeons (VSs) on the cost of common devices and procedures and to determine factors associated with differences in understanding.

Materials and Methods: An online survey was administered to US faculty IRs and VSs. Demographic information and physicians' opinions on hospital costs were elicited. Respondents were asked to estimate the average price of 15 commonly used devices and to estimate the work relative value units (wRVUs) and average Medicare reimbursements for 10 procedures. Answer estimates were deemed correct if values were $\pm 25\%$ of the actual costs. Multivariate logistical regression was used to calculate odds ratios and 95% confidence intervals.

Results: Of the 4,926 participants contacted, 1,090 (22.1%) completed the questionnaire. Overall, 19.8%, 22.8%, and 31.9% were accurate in price estimations of devices, Medicare reimbursement, and wRVUs for procedures. Physicians who thought themselves adequately educated about wRVUs were more accurate in predicting procedural costs in wRVUs than physicians who responded otherwise (odds ratio = 1.40, 95% confidence interval, 1.29–1.52; $P < .0001$). Estimation accuracies for procedures showed a positive trend in more experienced physicians (≥ 16 y), private practice physicians, and physicians who practice in rural areas.

Conclusions: This study suggests that IRs and VSs have limited knowledge regarding device costs. Given the current health care environment, more attention should be placed on cost education and awareness so that physicians can provide the most cost-effective care.

ABBREVIATIONS

CI = confidence interval, IR = interventional radiologist, OR = odds ratio, VS = vascular surgeon, wRVU = work relative value unit

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As the United States expands health care coverage under the Affordable Care Act, increased attention has been placed on investigating medical device costs (1,2). Under these new policies, US health spending is projected to increase to \$5.01 trillion by 2022, whereas Medicare is estimated to deplete all assets by 2030 (3,4). With an aging population, services in the management of cardiovascular disease, trauma, and cancer will expect even greater utilization (5,6). Innovative minimally invasive therapies have been shown to decrease cost, by decreasing hospital length of stay and procedure recovery time (7–9). Additionally, new emphasis has been placed on physician decision making to decrease excess laboratory testing and to make informed choices on the use of commonly used devices (10). However, literature spanning the past 35 years suggests that physicians may have inadequate knowledge about the cost of frequently used

devices and regularly performed procedures (11–13). Although research on physician cost knowledge has been performed in various fields, these studies are largely outdated and do not encompass procedural specialists (14–16). These specialties are uniquely positioned to regulate spending because they use tools and instruments that can often comprise most of the total variable operating expenses. For example, it was found that 62% of transarterial chemoembolization costs were attributed to expendable equipment, whereas 87.3% of charges from endovascular aortic aneurysm repair were attributed to the cost of the endografts (1,17). These expendable materials often vary widely in cost and provide a setting where physician choice can contribute to major cost savings (18). Thus, it is important to gauge the understanding of interventional radiologists (IRs) and vascular surgeons (VSs) of device costs to prevent the misuse of limited resources and to encourage physician-controlled cost containment. This study seeks to evaluate abilities of IRs and VSs to estimate the prices of common devices and reimbursement of procedures, determine factors associated with cost knowledge, and report on their opinions on hospital expenses.

MATERIALS AND METHODS

The institutional review board approved this cross-sectional study and waived informed consent.

Participants

A cross-sectional study was conducted between June 2014 and September 2014 among active IRs and VSs. All US faculty IRs who were members of the Society of Interventional Radiology (SIR) (N = 3,074) and US faculty VSs who were members of the Society of Vascular Surgery (N = 1,852) were invited to participate in a national survey. Survey links were sent via e-mail and conducted using SurveyMonkey (SurveyMonkey, Palo Alto, California). To ensure physician anonymity and security, the SurveyMonkey Gold Feature was used in addition to privacy and security software (including Secure Sockets Layer/Transport Security Layer encryption, Qualys security scans [Qualys, Inc, Redwood City, California], and fire-wall systems). Participation in the study was voluntary, and no personal identifying information was retained. Respondents were given 4 weeks to complete the survey, and a reminder e-mail was sent at the end of each week (for a total of three reminder emails).

Survey Design

Because a validated survey does not exist on this subject, a new survey was created. A list of commonly performed procedures and commonly used devices was assembled after consulting with a team consisting of six IRs, one VS, and interventional radiology and vascular surgery

technologists. From this list, 15 devices and 15 procedures were ultimately chosen for the survey based on the commonality of the devices in hospital stock rooms, vendor-reported frequency of device sales, and generally well-known procedures to both specialties. The specific numbers of devices and procedures were chosen to survey a wide range of items, while keeping the questionnaire to a manageable length. The 15 devices were common between the two specialties, and participants were asked to estimate the average retail costs of each device to the nearest dollar in a fill-in-the-blank format. Regarding procedures, five questions overlapped between the two specialties, five were specific to interventional radiology, and five were specific to vascular surgery, resulting 10 procedural questions per specialty. Physicians were also asked to estimate the average work relative value units (wRVUs) and average Medicare reimbursement rates to the nearest dollar for these procedures in a fill-in-the-blank format. Demographic information was also elicited. The full survey is provided in the [Appendix](#).

Cost Determination

The reference values were determined using three methods. First, 2014 base retail prices and costs charged to the hospital before negotiations or discounts were obtained from various vendors. Retail prices were chosen from companies that commonly produce the device and averaged when appropriate for products made by more than one retailer. Base prices were chosen to represent actual cost to eliminate fluctuating vendor discount prices, which can vary significantly from one institution to the next (19). Second, wRVUs were determined using the 2014 National Physician Fee Schedule Relative Value File (January release), and multiple procedure payment reductions were accounted for in final adjustments (20). wRVUs were chosen as a method of assessing procedure costs to eliminate similar fluctuations in regional pricing. A wRVU is one of three components in the standardized physician payment and accounts for 48% of the total relative value units for each service. Practice expense and professional liability are the other two relative value unit types. Factors considered when determining the value of the wRVU for a service include the technical skill, physical effort, mental effort and judgment, and stress related to patient risk (21). Third, average Medicare reimbursement rates were calculated using the Medicare Current Procedural Terminology coding system, and the national average prices were used as the actual cost (22). This additional method to calculate procedural costs was chosen to compare physicians' knowledge of wRVUs versus dollar values.

Statistical Analysis

Data were analyzed per device or procedure, and each respondent's cost estimation was compared with the

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