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Determining the True Costs of Treating Small Renal Masses Using Time Driven, Activity Based Costing

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Abstract

Introduction: We report the implementation of time driven, activity based costing for competing treatments of small renal masses at an academic referral center.

Methods: To use time driven, activity based costing we developed a process map outlining the steps to treat small renal masses. We then derived the costs of supplying every resource per unit time. Known as the capacity cost rate, this included equipment and its depreciation (eg price per minute of the operating room table), personnel and space (eg cost per minute to rent clinic space). We multiplied each capacity cost rate by the time for each step. Time driven, activity based costing was defined as the sum of the products for each intervention.

Results: Robot-assisted laparoscopic partial nephrectomy was the most expensive treatment for small renal masses. It was 69.7% more costly than the most inexpensive inpatient modality, laparoscopic radical nephrectomy ($17,841.79 vs $10,514.05). Equipment costs were greater for laparoscopic radical nephrectomy than for open partial nephrectomy. However for laparoscopic radical nephrectomy vs open partial nephrectomy the lower personnel capacity cost rate due to faster operating room time (195.2 vs 217.3 minutes, $p = 0.001$) and shorter length of stay (2.4 vs 3.7 days, $p = 0.13$) were the primary drivers in lowering costs. Radiofrequency ablation was 48.4% less expensive than laparoscopic radical nephrectomy ($5,093.83 vs $10,514.05) largely by avoiding inpatient costs. Renal biopsy contributed 3.5% vs 12.2% to the overall cost of robot-assisted laparoscopic partial nephrectomy vs radiofrequency ablation but it may allow for increased active surveillance.

Abbreviations and Acronyms

AS = active surveillance

CCR = capacity cost rate

LOS = length of stay

LRN = laparoscopic radical nephrectomy

OPN = open partial nephrectomy

RALPN = robot-assisted laparoscopic partial nephrectomy

RALRN = robot-assisted LRN

RFA = radiofrequency ablation

SRM = small renal mass

TDABC = time driven, activity based costing

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Conclusions: Using time driven, activity based costing we determined the relative resource utilization of competing small renal mass treatments, finding significant cost differences among various treatments. This informs value considerations, which are particularly relevant in the current health care milieu.

Key Words: kidney neoplasms; cost allocation/methods; value-based purchasing; costs and cost analysis; practice management, medical

With increasing detection of incidentally detected SRMs and greater national focus to avoid the overtreatment of indolent tumors[1] determining the value of treatment, defined as the ratio of quality of care delivered to the health care dollars spent,[2] has become of paramount importance. However analyzing the quality of care delivered is complicated by the multitude of SRM treatment options. Nephron sparing surgery remains the gold standard,[3] although RFA,[4] cryoablation[5] and AS[6] demonstrate excellent cancer specific survival. Similarly research foci illuminating cost differences remain sparse,[7] further complicating the value equation.

Although numerous outcomes studies for SRM treatment continue to be published, the value agenda cannot be pushed forward until antiquated costing analyses are improved. Current models include arbitrary charges and cost expenditures that provide neither transparency nor confer a recommendation for improvement.[8] Moreover these costs rely primarily on the inpatient setting, failing to capture the total costs incurred by a specific patient during the duration of care for a specific disease process.[9] Meanwhile emphasis continues to be placed on the development of cost containment strategies, including ACOs (accountable care organizations) and bundled payment programs.[10] For these to be successful health care systems must accurately track the true costs of care for entire disease processes. Only by achieving this goal may providers maximize the value of health care delivery in accordance with changing reimbursement models.

TDABC is a time tested costing paradigm traditionally applied in industry, which when introduced into health care enables hospitals and providers to systematically trace the costs of a disease process across an episode of care.[11] TDABC encapsulates personnel, space, materials and equipment costs in the inpatient and outpatient settings while also considering the average time that a patient spends with each resource.[12] Furthermore TDABC creates a cost algorithm that may be compiled across multiple health care organizations that provide care for a particular patient to determine the total costs of a defined episode of care.[7]

In this study we describe our experience with TDABC to outline the costs of treating a SRM from the initial urology clinic visit through intervention and the first followup visit at an academic referral center. TDABC allows for providers and hospital administrators to accurately quantify and assess the costs of clinical, administrative and operative processes so that this information can be used to redesign or optimize inefficient clinical processes.

Materials and Methods

Background

To determine the actual cost of care for treating a SRM we incorporated the TDABC method as originally described by Kaplan and Anderson at Harvard Business School.[12] Under this model our health care team at UCLA traced the path of a patient throughout the episode of care for treatment of a SRM. This involved identifying the cost of care for every resource used in treatment, including space, materials and equipment, and personnel, and also calculating the average time that a patient spent with each resource. The episode of care was then defined as the summation of the quantity of resource units multiplied by the price per unit time of that resource.

Defining the Process Map

We assembled a team of clinicians, business analysts, clinical administrators, operative administrators and nurse supervisors to define each resource involved in treating a SRM and then developed step-by-step process maps of all clinical and administrative processes used. For each treatment algorithm we defined the episode of care as starting from the initial preoperative visit and ending at the first followup visit after intervention (fig. 1). [F1]

The specific interventions analyzed followed AUA (American Urological Association) practice guidelines[13] and were the most commonly used SRM procedures at our institution, including RFA, cryoablation, OPN, LRN, RALPN, RALRN and AS. We captured data on all SRMs treated at UCLA from March 2013 to January 2015 using mean operative time and LOS estimates derived from our 129 most recent SRM surgical cases, including 27 RFAs, 14 cryoablations and 110 renal biopsies. Open radical nephrectomy for SRM was not performed frequently enough