

# Time-Driven Activity-Based Costing in Emergency Medicine

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Value in emergency medicine is determined by both patient-important outcomes and the costs associated with achieving them. However, measuring true costs is challenging. Without an understanding of costs, emergency department (ED) leaders will be unable to determine which interventions might improve value for their patients. Although ongoing research may determine which outcomes are meaningful, an accurate costing system is also needed. This article reviews current costing mechanisms in the ED and their pitfalls. It then describes how time-driven activity-based costing may be superior to these current costing systems. Time-driven activity-based costing, in addition to being a more accurate costing system, can be used for process improvements in the ED. [Ann Emerg Med. 2016;67:765-772.]

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## INTRODUCTION

Emergency department (ED) care makes up an estimated 2% to 10% of all national health expenditures.<sup>1,2</sup> Although knowing this overall estimate may be useful at a policy level,<sup>2</sup> it provides insufficient guidance to individual ED directors, who seek to provide high-quality care with limited resources. ED directors are handicapped by the inaccurate and inadequate information provided to them by existing costing systems. Poor cost measurements can lead to subsidies across services, making it difficult to accurately assess the value of care.<sup>3</sup> Additionally, inaccurate costing systems make it difficult to link process improvements to costs, hindering the implementation of sustainable changes that might decrease cost or improve patient care quality. Using existing costing systems, ED leaders are forced to make across-the-board percentage cuts to meet their annual budget goals instead of making focused changes that address the costs' root causes.

As health care shifts from a fee-for-service system to a value-based reimbursement model, it is important to understand how emergency medicine will fit in the overall picture. In an accountable care organization, in which reimbursement may be fixed, ED leaders must know where and when resources are being over- or underused.

A properly functioning health care system must improve value, broadly defined by outcomes achieved per dollar expended, and the first step toward improving value in the ED requires accurately measuring outcomes and costs. Our goals are therefore to provide an explanation of why the time-driven activity-based costing system, advocated by Kaplan and Porter,<sup>3</sup> is superior to other costing models,

and to provide a primer on how ED leaders can best use time-driven activity-based costing in their EDs to reduce costs and improve efficiency.

## TWO CURRENT COSTING SYSTEMS: RATIO OF COSTS TO CHARGES AND RELATIVE VALUE UNIT

The two most widely used costing systems used in EDs across the United States are the ratio of costs to charges (RCC) model and the relative value unit (RVU) model. These accounting cost systems are based on top-down costing, which makes them easy to use and explains their widespread adoption, but their ease of use is offset by costing inaccuracies.

The following discussions and illustrations are from the viewpoint of the ED. Although, traditionally, the RCC and RVU models analyzed the hospital or department separate from physician groups, we combined the departmental and physician costs to provide a better comparison between the models.

Here, we provide step-by-step examples of the costing distortions created by each costing system:

### RATIO OF COSTS TO CHARGES

The RCC is calculated by taking the total cost and dividing it by total charges. This ratio can then be multiplied by a particular diagnosis' charge to obtain its RCC-based cost. The RCC can be calculated for the hospital, a specific department, or a physician group. An emergency physician group would divide its total annual

costs by its total charges for every service it provided. For example, if the total emergency physician group cost was \$8,064,000 and if the total charges were \$10,080,000, the RCC for the group would be 0.8. Finally, the charge for a specific service would be multiplied by the RCC to determine the cost of providing that particular service.

The following example uses the cost of care for treating a Medicare patient. Although charges are set differently in each hospital, we assume that the charges are the same as the Medicare reimbursement payment rates to simplify the demonstration.

As Table 1 shows,<sup>4-6</sup> according to the RCC model, it costs almost the same amount to treat a patient who complains of chest pressure as it does to treat a psychotic patient who requires restraint as the result of a drug overdose. In reality, however, patients who are agitated and a threat to themselves and staff require a larger share of the staff's time and attention. In addition, according to the RCC model, one could inappropriately conclude that laboratory services were the main cost driver of ED services. In the ED, where a wider variety of services are provided, the RCC costing method therefore can produce misleading results because it does not adequately account for the differential use of ED staff time.

Because charges are based on market power and negotiations with insurers, they usually have little correlation with the true resources required by a health care institution to care for a patient.<sup>7</sup> Additionally, RCC assumes that indirect resource costs are the same for each Common Procedural Terminology (CPT)/Ambulatory Payment Classification–level visit. For example, this model assumes all level 5 visits, regardless of chief complaint or disease process, cost the same for the ED. This is an unrealistic and invalid assumption, causing the RCC cost for an individual visit to be a poor estimate of true cost.<sup>7</sup>

**RELATIVE VALUE UNITS**

Under the RVU method, each service is assigned a value that reflects its relative effort, skill, and training requirement compared with a baseline value.<sup>7,8</sup> From the hospital side within each department, a relative weight can be assigned to each type of service.<sup>7</sup> A value of 1 is assigned to a standard procedure, with all other procedures assigned a relative value compared with that standard procedure. For a given period, the total expense is then divided by the total RVUs generated to generate a cost per RVU.

The American Medical Association–sponsored Relative Value Update Committee determines physician RVU values for each service for the Centers for Medicaid & Medicare Services.<sup>9</sup> Critics have noted that this process is not transparent and tends to undervalue nonspecialist

**Table 1.** Cost estimate using the RCC model (based on 2015 Medicare Ambulatory Payment Classification rates,<sup>4</sup> physician fee schedule,<sup>5</sup> and clinical laboratory fee schedule<sup>6</sup>).

A, Patient with chest pain (45-y-old man with chest pressure and requiring laboratory testing, chest radiograph, and an ECG).

CPT/APC/HCPCS	Description	Charge/Payment, \$	RCC	Cost of Service, \$*
<b>Physician cost of service</b>				
CPT 99285	Level 5 ED visit (MD charge)	176	0.8	140.80
CPT 93042	Interpret ECG	7	0.8	5.60
<b>Total</b>				146.40
<b>Hospital cost of service</b>				
APC 0616	Level 5 ED visit (facility charge)	493	0.8	394.40
APC 0260	Chest radiograph	59	0.8	47.20
APC 0099	12-lead ECG	78	0.8	62.40
HCPCS 85025	CBC count	10.58	0.85	8.99
HCPCS 80048	Metabolic panel	11.51	0.85	9.78
HCPCS 84484	Troponin	13.39	0.85	11.38
<b>Total</b>				534.16

APC, Ambulatory Payment Classification; CPT, Current Procedural Classification; HCPCS, Healthcare Common Procedure Coding System; ECG, electrocardiogram; MD, physician.

\*Total cost = \$146.40 + \$534.16 = \$680.56.

B, Patient who overdosed (45-y-old man agitated because of a drug overdose and requiring laboratory testing and intramuscular medication to stop his agitation).

CPT/APC/HCPCS	Description	Charge/Payment, \$	RCC	Cost of Service, \$*
<b>Physician cost of service</b>				
CPT 99285	Level 5 ED visit (MD charge)	176	0.8	140.80
CPT 93042	Interpret ECG	7	0.8	5.60
<b>Total</b>				146.40
<b>Hospital cost of service</b>				
APC 0616	Level 5 ED visit (facility charge)	493	0.8	394.40
APC 0437	Level 2 drug administration	53	0.8	42.40
APC 0099	12-lead ECG	78	0.8	62.40
HCPCS 85025	CBC count	10.58	0.85	8.99
HCPCS 80048	Metabolic panel	11.51	0.85	9.78
HCPCS G6038	Salicylate	9.66	0.85	8.21
HCPCS G6039	Acetaminophen	27.54	0.85	23.41
HCPCS G6040	Ethanol	14.70	0.85	12.50
<b>Total</b>				562.09

\*Total cost = \$146.40 + \$562.09 = \$708.49.

fields.<sup>9</sup> Yet the Medicare Physician Fee Schedule remains the main source of determining RVU values for a particular service. To determine the physician cost of a certain service, the RVU-based costing system calculates the cost per RVU, separating it into 3 categories (adjusted for the geographic practice cost index): work (physician salary costs), practice expense (overhead costs), and malpractice. Next, for each CPT for a specified period, the frequency of the CPT code is multiplied by its respective RVUs.

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