ORIGINAL ARTICLE CLINICAL PRACTICE MANAGEMENT

Improving Efficiency Using Time-Driven Activity-Based Costing Methodology

SA-CME

Laura C. Tibor, MBA, BEng[a], *Stacy R. Schultz, BA*[a], *Ronald Menaker, EdD, MBA, CPA*[a], *Bradley D. Weber, MBA*[a], *Jay Ness, BS*[a], *Paula Smith, RN, MSN*[a], *Phillip M. Young, MD*[a]

Abstract

Purpose: The aim of this study was to increase efficiency in MR enterography using a time-driven activity-based costing methodology.

Methods: In February 2015, a multidisciplinary team was formed to identify the personnel, equipment, space, and supply costs of providing outpatient MR enterography. The team mapped the current state, completed observations, performed timings, and calculated costs associated with each element of the process. The team used Pareto charts to understand the highest cost and most time-consuming activities, brainstormed opportunities, and assessed impact. Plan-do-study-act cycles were developed to test the changes, and run charts were used to monitor progress. The process changes consisted of revising the workflow associated with the preparation and administration of glucagon, with completed implementation in November 2015.

Results: The time-driven activity-based costing methodology allowed the radiology department to develop a process to more accurately identify the costs of providing MR enterography. The primary process modification was reassigning responsibility for the administration of glucagon from nurses to technologists. After implementation, the improvements demonstrated success by reducing non-value-added steps and cost by 13%, staff time by 16%, and patient process time by 17%. The saved process time was used to augment existing examination time slots to more accurately accommodate the entire enterographic examination. Anecdotal comments were captured to validate improved staff satisfaction within the multidisciplinary team.

Conclusions: This process provided a successful outcome to address daily workflow frustrations that could not previously be improved. A multidisciplinary team was necessary to achieve success, in addition to the use of a structured problem-solving approach.

Key Words: TDABC, time-driven activity-based costing, MR, enterography, efficiency

J Am Coll Radiol 2017;■:■-■.

INTRODUCTION

As health care organizations continue to experience declining reimbursement, increased complexity, and increased accountability for delivering affordable, high-quality care, leaders must explore all available methods of cost containment and process streamlining. Radiology departments must position themselves appropriately to react to the impending shift from fee-for-service to value-based payment models. According to Lee and Enzmann [1], "to measure and identify areas for providing and improving integrated diagnostic information, radiology must engage clinicians and managers to map the processes and associated costs of episodes of patient care." Time-driven activity-based costing (TDABC) was developed as an alternative to traditional activity-based costing models historically used throughout industry and various organizations. In defining TDABC, Kaplan et al [2] stated, "TDABC enables providers to measure accurately the costs of treating patients for a specific medical condition across a full longitudinal care cycle. It uses two proven management tools: process mapping from industrial engineering and activity-based costing from accounting." In the health care setting, value-stream mapping and other process analysis tools are frequently used, but they do not typically account for the cost component.

The purpose of this article is to inform physicians and administrative leaders how TDABC can be used to identify specific time and cost values for all steps in a given health care event. Unlike the historically used activity-based costing method, which accounts only for

[a]Department of Radiology, Mayo Clinic, Rochester, Minnesota.

Corresponding author and reprints: Laura C. Tibor, MBA, BEng, Department of Radiology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905; e-mail: tibor.laura@mayo.edu.

The authors have no conflicts of interest related to the material discussed in this article.

1546-1440/16/$36.00 ■ http://dx.doi.org/10.1016/j.jacr.2016.11.014

capturing costs on the basis of certain activities, TDABC leverages the per-unit time allocation for every step of a given process. By identifying non-value-added activities, opportunities exist to reduce or eliminate those activities that may lead to decreased costs and increased process efficiency. An example of TDABC application and outcomes are outlined in this report.

Mayo Clinic radiology leaders requested the division of MRI to apply TDABC to a specific abdominal MRI examination, MR enterography, that was perceived to be fraught with non-value-added steps and duplicated work effort, presenting an opportunity for overall process improvement. A review of existing workflow maps identified opportunities for the staff to work differently. In the original workflow, nurses were contacted by the MRI scanner technologist when glucagon administration was needed. The nurse would prepare the medication and go to the scanner to administer it to the patient. Because of other responsibilities, the nurse may have been busy with other patient care–related tasks during the time the technologist identified that glucagon was needed, creating interruptions for the nurse and inadvertent potential delays in glucagon administration. Timing of the glucagon injection for MR enterography is important because it can affect image quality.

Historically, the department had struggled to keep the cost of providing MR enterography less than the Medicare reimbursement rates. The core objective of the MRI team was to decrease the overall cost to provide MR enterography while decreasing the overall process time. This examination had previously been analyzed using a value-stream map and a swim-lane diagram. Although those two methods helped clearly illustrate the process flows, actual per-step costs were not previously assigned. By identifying the amount of time required for each process step, the radiology finance team was able to apply accurate cost-per-unit amounts to the process steps. The added layers of information quickly allowed the team to target key opportunity areas to reduce cost, reduce process time, and simplify the entire patient experience.

METHODS

A multidisciplinary team consisting of clinical assistants, registered nurses (RNs) and licensed practical nurses (LPNs), radiologists, schedulers, technologists, and a process improvement coach met to review the existing value-stream map and swim-lane diagram of the current state of MR enterography. The team developed a current-state high-level swim-lane diagram that illustrated each process step by role (Fig. 1). Then, observations and data collection provided the necessary process times and staff participation percentages for each process step. Manual timings were completed on randomly selected patients, and median times were used.

Costing

Next, a personnel cost was generated for each step in the swim-lane diagram. Personnel cost was determined by the median number of minutes involved, the type of employee involved, and the percentage of time that step was executed by each type of employee. A midrange salary was used for each different type of allied health employee (clinical assistant, RN, LPN, intravenous technician, and MRI technologist) and resident, and a top-level salary was used for each radiologist process step (consistent with institutional guidelines). Total personnel costs included salary, benefits, and supervisory overhead. The personnel capacity (minutes) was calculated using the available days per year for each different job category (total days less weekends, holidays, vacation, and training) and the available productive minutes per day. These two components, total personnel costs and personnel capacity, were used to determine a rate per minute for each different job category, which was then applied to each swim-lane diagram step.

Equipment costs were calculated on the basis of the annual straight-line depreciation of every piece of equipment used in an MR enterographic examination. A standard annual maintenance cost was also included. The equipment capacity (minutes) was based on the number of days available (less weekends, holidays, and days unavailable because of maintenance) and the number of productive minutes available per day. This equipment cost per minute was then applied to the number of minutes for the actual examination.

Space costs were determined by the total square footage of the space used for an MR enterographic examination, as well as the type of space being used for the examination. Three different types of space, with different rates per square foot, were included in the analysis (storage, office, and imaging). The space capacity and rate per minute were calculated using a similar method as for the equipment.

Supply costs (eg, syringes, medication, linen) were determined by nurses and technologists working with radiology supply chain management. The team developed a list of items and determined the cost and frequency of use for each item used in the examination. All of these cost components (personnel, equipment, space, supplies) were added together to calculate a total cost per examination.