COMMENTARY

Better Accounting Transforms Health Care Delivery

Robert S. Kaplan and Mary L. Witkowski

SYNOPSIS: The paper describes the theory and preliminary results for an action research program that explores the implications from better measurements of health care outcomes and costs. After summarizing Porter's outcome taxonomy (Porter 2010), we illustrate how to use process mapping and time-driven activity-based costing to measure the costs of treating patients over a complete cycle of care for a specific medical condition. With valid outcome and cost information, managers and clinicians can standardize clinical and administrative processes, eliminate non-value added and redundant steps, improve resource utilization, and redesign care so that appropriate medical resources perform each process step. These actions enable costs to be reduced while maintaining or improving medical outcomes. Better measurements also allow payers to offer bundled payments, based on the costs of using efficient processes and contingent on achieving superior outcomes. The end result will be a more effective and more productive health care sector. The paper concludes with suggestions for accounting research opportunities in the sector.

Keywords: cost management; health care; measurement; activity-based costing.

INTRODUCTION

Health care spending in the U.S. has increased from 7.2 percent of Gross Domestic Product in 1970, to 9.2 percent in 1980, 13.8 percent in 2000, and 17.9 percent in 2011 (Centers for Medicare & Medicaid Services [CMS] 2013). At the same time, U.S. citizens have higher morbidity and mortality rates than citizens in countries that spend much less on their health care system (Nolte and McKee 2012). Much of the higher U.S. spending is caused by a fee-for-service reimbursement system that compensates providers for the volume of procedures they perform and not for the outcomes they deliver. Another cause is the extensive fragmentation of...
health care delivery and reimbursement (Reinhardt, Hussey, and Anderson 2004) in which patients are treated in diverse organizational units including independent physician practices, primary care clinics, hospitals, and rehabilitation and chronic care centers. These clinical organizational units are structured by medical and surgical specialty, not by a patient’s medical conditions. As a result, patient treatment and its reimbursement are dispersed across multiple functional units, with each unit doing only one component of a patient’s total care for a specific medical condition.

Few incentives currently exist for treating a patient’s complete medical situation, or for performing a more active role in preventive behavior and wellness. The 2011 Affordable Care Act improves residents’ access to the U.S. health care system, but it includes only modest attempts to reform the system itself (Wilensky 2012). Increasing access to a poorly organized and inefficient system will likely eventually lead to government-imposed spending and price cuts, followed by lower quality of care, longer waits for patients, and the financial distress and exit of providers.

Other countries, while spending a smaller percentage of their GDP on health care, are also experiencing cost increases comparable to those in the U.S. (Organisation for Economic Co-operation and Development [OECD] 2011). No country has yet to solve the fundamental problem of how to reimburse providers for providing health care to their populations. The U.S. fee-for-service model clearly does not work, but the capitated payments and global reimbursement mechanisms used in other countries lead to rationing of care and queues (Lee, Beales, Kinross, Burns, and Darzi 2013; Wilcox et al. 2007).

Many of these problems are the result of a huge measurement gap: only a very few providers today—physicians, clinics, and hospitals—have valid measures of the outcomes they achieve or the costs they incur to treat individual patients for specific medical conditions. The lack of valid outcome information is partly a consequence of the fragmented way in which health care is delivered, with each provider entity responsible for only a component of the patient’s complete care experience. But health care is a more complex setting for measuring outcomes than are manufacturing and most other service industries, which may explain why providers default to input and process metrics rather than patients’ outcome metrics.

The lack of valid cost measures in health care provider organizations might require accounting historians to explain. Hospitals have evolved an idiosyncratic system that assigns expenses to procedures and patients based on charges and allocation ratios known as Relative Value Units (RVUs) and not on the actual costs they incur to treat patients. Separately, physician’s specialty societies determine, and periodically revise, RVUs for their procedures, which then get embedded into the list prices established through Medicare’s Resource-Based Relative Value Scale (RBRVS) (Hsiao, Braun, Dunn, and Becker 1988a; Hsiao, Yntema, Braun, Dunn, and Spencer 1988b; Marciarille and DeLong 2011). Physician practices then measure the cost of their procedures by calculating a ratio of their practice costs to these list prices (ratio of costs-to-charges or RCC method). Health care administrators, seemingly unaware of the huge distortions and cross-subsidies embedded in their faulty cost systems, are in the situation described by former U.S. Defense Secretary Donald Rumsfeld as, “they know not what they do not know.”

To summarize, few health care providers in the U.S. and rest of world have valid measures, by medical condition, on patient outcomes and costs. If you believe that “you can’t manage what you don’t measure,” then the current ineffectiveness and inefficiency of health care systems should not be a surprise. The best providers, lacking adequate data, have few ways to signal their superior capabilities to attract higher volumes at prices greater than their costs. Conversely, ineffective and inefficient providers remain in the system, delivering inadequate care at high societal cost, and depriving effective and efficient providers from delivering higher value to a larger population of patients (Birkmeyer et al. 2002; Birkmeyer et al. 2003). A poor industry structure with a dearth of measurements is a rich environment for accounting scholarship to play an important role through research and education on better ways to measure costs and outcomes.
In the remainder of the paper, we describe the framework and preliminary results from an action research program conducted at multiple pilot sites in the U.S. and Europe. The program’s goal is to explore how to remedy the severe measurement gaps in health care. We conclude by suggesting opportunities for accounting research in the sector.

THE VALUE FRAMEWORK

The over-arching goal for any health care system should be to increase the value delivered to patients (Porter and Teisberg 2006; Porter and Lee 2013). At present, however, many goals are advocated for health care delivery including quality, access, safety, and cost reduction. While each of these is individually desirable, none is comprehensive enough to serve as a unifying framework for health care delivery. Porter’s framework (Porter and Teisberg 2006) defines value by two parameters: patient outcomes and cost. Value increases when outcomes improve with no increase in costs, or costs are reduced while delivering the same or better outcomes. Currently, however, health care systems have diverse incentives among their various participants. A provider’s performance is measured with input and process metrics, such as certification of personnel and facilities, efficiency, access, quality, safety, and compliance. While these metrics are useful for internal cost and operational control, they are not sufficient to motivate health care providers to deliver more value—better outcomes and lower costs—to end-use customers.

Value in health care can be represented by a Value Frontier diagram of outcomes versus cost, evocative of finance’s risk-return efficient frontier curve. If we simplify outcome to a single dimension (enabling a two-dimensional representation), the Value Frontier plots the outcome on the vertical axis and cost on the horizontal axis (see Figure 1). Points on the curve, such as Providers A and B in Figure 1, represent what the best providers can currently achieve along outcome and cost dimensions.

FIGURE 1
The Value Frontier of Clinical and Functional Outcomes versus Costs
Provider A achieves outcome $y_1$, the best outcome achievable at a cost of $c_1$. At a somewhat higher cost of $c_2$, provider B delivers a higher outcome, $y_2$, perhaps by using a more expensive drug that enables a better or faster recovery or a more experienced and skilled physician. Whether it is worth spending more to reach a better outcome along the Value Frontier is a question that must be answered by a political or individual choice process that is outside the scope of our work. We can address, however, the very large number of health care providers, such as C, that lie well below the Value Frontier curve. Provider C should be able to provide the same outcome ($y_1$) at the much lower cost, $c_1$; or, alternatively, continue to spend the same amount, $c_2$, but achieve the much superior outcome, $y_2$.

Many providers deliver health care well below the Value Frontier because of inefficiencies in their administrative and clinical processes and high quantities of unused capacity. They also may have diseconomies of scale by performing an insufficient quantity of a procedure each month, leading to higher costs and worse outcomes than alternative providers of the procedure. For example, 78 percent of shoulder replacements are done by surgeons that perform this procedure only once or twice per year; fewer than 3 percent perform more than ten replacements per year. The consequences from such variation in practice experience is documented in Table 1, which shows the quite dramatic difference in outcomes and associated cost between those who perform fewer than five of these procedures per year (86 percent and 75 percent, respectively, for the two surgeries) versus the few who perform at least 15 of the procedures per year. Other studies of orthopedic procedures show the same conclusions: high-volume surgeons and surgical centers have significantly better outcomes than low-volume providers.

While many providers and suppliers today are attempting to improve health care by shifting the Value Frontier upward through new procedures, drugs, and devices, massive opportunities exist just by moving currently inefficient and ineffective providers closer to, or onto, today’s Value Frontier. Providers can make such a move by adopting processes already being used by those already on the Value Frontier. Of course, capitalizing on this improvement opportunity requires that we have valid

### TABLE 1

**Orthopedic Surgical Outcomes by Annual Surgeon Volumes**
Open Reduction Internal Fixation (ORIF) and Hemiarthroplasty (HEMI) for Repair of Femoral Fractures

<table>
<thead>
<tr>
<th>Surgeon Volume</th>
<th>Number of Cases</th>
<th>Mortality (Percent)</th>
<th>Mean Length of Stay</th>
<th>Complications (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORIF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
<td>8,972 (86%)</td>
<td>0.7</td>
<td>5.3</td>
<td>1.3</td>
</tr>
<tr>
<td>5–14</td>
<td>1,102 (11%)</td>
<td>0.2</td>
<td>3.2</td>
<td>1.0</td>
</tr>
<tr>
<td>≥ 15</td>
<td>416 (4%)</td>
<td>0</td>
<td>2.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>10,490</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
<td>4,361 (75%)</td>
<td>0.6</td>
<td>5.5</td>
<td>1.8</td>
</tr>
<tr>
<td>5–14</td>
<td>1,014 (18%)</td>
<td>0.4</td>
<td>3.8</td>
<td>1.2</td>
</tr>
<tr>
<td>≥ 15</td>
<td>419 (7%)</td>
<td>0.2</td>
<td>3.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>5,794</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Measuring Value

The unit of analysis for measuring value is a patient, with a given medical condition, being treated over a complete cycle of care (see Figure 2). Measuring outcomes over complete care cycles aligns with the patients’ perspective since this is the outcome they are most interested in, not how well a particular visit or surgical procedure was performed. The patient level is also the correct unit of analysis for costing purposes, since the demands for health care system resources arise from treating a patient’s medical condition. Different patients and different medical conditions require different quantities and mixes of health care resources, and the cost system needs to capture the quantities and costs of all the resources used over a patient’s care cycle.

Measuring Outcomes

Medical outcomes from a patient’s complete care cycle are multi-dimensional and include both near- and long-term metrics of the patient’s health (Porter 2010). The outcomes should be segmented, within a given medical condition, to control for initial conditions and patient risk factors, such as age, obesity, smoking, alcoholism, substance abuse, and other co-morbidities, that affect the medical care and also the achievable outcomes. Porter proposes a three-tier framework that can be customized for each medical condition or segment of the primary care population (Porter 2010).

Tier 1: Health Status achieved or restored; measured by survival rates, restoration of functionality, and patient’s clinical status at the completion of the cycle of care.

Tier 2: Treatment and Recovery Process; measured by time-to-recovery, and the incidence of problems during treatment and recovery such as infections, complications, medical errors, patient discomfort, and adverse side effects.

Tier 3: Sustainability; measured by time-to-recurrence of the medical condition and incidence of other care-induced illnesses.

Clinical and research teams around the world are already developing registries of outcomes for specific medical conditions such as organ transplants, in vitro fertilization, cancer, and orthopedic procedures for knee, hip, and shoulder replacements (International Consortium for Health Outcomes Measurement [ICHOM] 2014). Accounting scholars with expertise and interest in
measurement can find attractive research opportunities by working collaboratively with these health care groups to develop outcome metrics, with proper attention paid to statistical methods and auditability.

In the absence of valid outcome metrics, cost reduction initiatives, even when based on valid cost data, could be challenged and resisted by those who will claim that any potential cost savings will lead to reduced treatment quality and poorer patient outcomes. Conversely, if health care managers and clinicians focused only on improving outcomes, their actions could raise costs substantially. Only by simultaneously measuring and managing both outcomes and costs for individual patients, can we ensure that recommended changes will increase, not decrease, the value delivered to them.

**Measuring Costs**

**Health care costing errors.** Accounting scholars can make their largest and most distinctive contributions by improving cost measurement, a natural domain for them. The opportunity is especially attractive since several accounting errors pervade the sector. Perhaps the most pervasive and destructive error is using health care charges as a good surrogate for costs. Existing health care costing systems assign departmental and overhead expenses to procedures based on charges or relative value units (RVUs) that are unrelated to the costs of resources used to treat patients. So-called “cost-effectiveness” studies in medical, health management, and health policy papers attempt to document the cost consequences from an innovative treatment. But these papers invariably default to the treatment’s charge data, which represent list prices, not actual prices paid for the services performed. The list prices, determined by hospitals and physician practice groups, have little correlation with the procedure’s actual costs (Lamas and Rosenbaum 2012).

Today’s health care cost systems do an adequate job of tracking expenses by clinical departments and physician practices. Such tracking of expenses to organizational units is necessary for short-term budgeting and cost control. But, sustainable cost reductions must be based on value improvements that reduce the costs of resources used to treat patients for specific medical conditions while sustaining or improving patient outcomes. For this to occur, providers must measure accurately the costs incurred by clinical and administrative processes and also aggregate all the costs incurred across a patient’s complete cycle of care, even when this requires tracking the patient’s journey across multiple visits to clinical departments and provider organizations.

Among the reasons for the lack of attention to good costing at the patient level is a general belief that a significant percentage of health care costs is “fixed.” If only! Were any significant component of health care costs to be fixed, we would not have a cost crisis in health care since, as demand for services increased, only the so-called variable costs would increase. The fixed cost myth is especially damaging in health care since it leads the executives of provider organizations to focus on schemes to increase top-line revenues and reimbursements, rather than to make sustainable process improvements that can significantly lower what they currently believe to be their fixed costs.

Expenses such as personnel, supplies, and space represent up to 90 percent of total costs, and the spending on all of these resources can be avoided or reversed as providers improve clinical and administrative processes, use the right mix of resources for treating patients, and enhance their utilization of resource capacity. Even equipment costs are not “fixed”; web-based resellers, including eBay, make it much easier to sell equipment no longer needed. And indirect and support costs, such as for billing and human resources, are also not “fixed”; they are driven by the scale and scope of the provider’s services. With the costing approach that we are deploying at multiple pilot sites, health care administrators can, over time, match their supply of resources to actual or
forecasted patient demands, enabling them to manage almost all of their costs as “variable” with patient volume, patient mix, and process efficiencies.

**APPLYING TIME-DRIVEN ABC TO HEALTH CARE PROVIDERS**

**Time-Driven ABC Fundamentals**

Time-driven activity-based costing (TDABC) (Kaplan and Anderson 2004; Kaplan and Anderson 2007; Kaplan and Porter 2011) enables health care providers to do the following:

- measure the accurate costs of treating patients with given medical conditions
- match patient costs and outcomes to position the provider relative to the Value Frontier
- direct clinicians’ and managers’ attention to improving high-cost and inefficient processes
- encourage much better utilization of the capacity of clinical personnel, equipment, and health care facilities
- capture actual cost savings from lean initiatives and process improvements
- enable new reimbursement approaches that reward effective and efficient providers of medical and surgical care
- influence a provider’s decisions on specialization, geographical expansion or contraction, and growth opportunities

TDABC works from a basic cost accounting equation for each resource:

\[
\text{Cost} = \text{Quantity} \times \text{Price} \quad \text{or, symbolically,} \quad C = Q \times P.
\]

Stripped to its essentials, TDABC simply applies the same cost accounting procedure to all health care resources that the scientific management professionals introduced for direct labor and direct materials in manufacturing companies more than a century ago.

We estimate the \( Q \) component of the cost accounting equation through process mapping, a well-known and proven industrial engineering technique. A team of clinicians and business analysts documents existing administrative and clinical processes used in treating a given medical condition with a step-by-step map of each event in a patient’s complete care cycle (see Figure 3).

Many health care providers are already performing some form of process mapping as part of their continuous improvement, process standardization, and lean management initiatives. For costing purposes, the process maps can be less detailed than those typically used solely for improvement initiatives, but it does require two additional pieces of information: the identity of the resources (clinical and administrative personnel, equipment, and space) used at each step, and the time used (the “\( Q \)” of each resource at that step. Of course, in addition to the capacity-supplying resources at each process step, the project team identifies the quantities (and costs) of any consumable supplies (syringes, catheters, bandages, etc.), devices (such as implants), and medicines used at that step. The map can include decision nodes to represent alternative care paths that are followed based on particular circumstances and risk factors of individual patients.

The price (\( P \)) term in the cost equation equals the capacity cost rate for each resource—personnel, space, and equipment—on the process maps. The capacity cost rate’s numerator is the cost of having the resource available for productive use; the denominator equals the capacity (time) available for patient use. The two calculations are the following:

1. Numerator: Estimate the costs incurred to have each resource productive and available for the patient. The cost of a person includes, of course, compensation and fringe benefits, but also the costs of space, technology, training, supervision, and other indirect expenses that the hospital incurs to make this person available and productive. For equipment resources,
FIGURE 3
A Process Map for a Patient’s Initial Clinical Visit

**Registration and Verification**
- **Resources:** Receptionist, patient access specialist, interpreter
- **Patient arrives**
  - Check in patient; communicate arrival
  - RCPT, PAS

**Intake**
- **Nurse, receptionist**
  - Verify patient information; complete consent forms
  - PAS

**Clinician Visit**
- **MD, mid-level provider, medical assistant, patient service coordinator, RN**
  - Assess patient; assemble paperwork; place patient in room
  - RN

**Plan of Care Discussion**
- **Registered nurse, medical doctor, patient service coordinator**
  - Initiate patient workup; review patient history; conduct physical exam
  - MLP

**Plan of Care Scheduling**
- **Patient service coordinator**
  - Discuss plan of care MD
  - Review plan of care; introduce team; review schedule for return visit
  - RN

- **Schedule tests and consults; communicate schedule to patient PSC**

- **Laryngoscopy needed?**
  - **YES 10%**
  - Perform Laryngoscopy MD, RN, PAS

- **NO 90%**
  - Clean room; complete paperwork; check e-mail and voice-mail for updates or changes to plan of care RN

- **Enter next process**
  - Changes to plan of care?
    - **YES 10%**
    - Notify patient of changes RN
    - Patient departs

- **NO 90%**

**Symbols:**
- Patient
- Receptionist
- Interpreter
- RN Registered Nurse
- MLP Mid-Level Provider
- MA Medical Assistant
- MD Medical Doctor
- PAS Patient Access Specialist
- PSC Patient Service Coordinator
the costs include depreciation or rental expense and the costs of space occupied, utilities, consumable supplies, and maintenance and repair.\textsuperscript{1}

2. Denominator: Estimate the capacity, measured in hours or minutes, that each resource is actually available for productive work. For personnel, start with a complete calendar year and then subtract the time not available due to vacations, holidays, training, education, non-patient care meetings, and breaks during the day.\textsuperscript{2}

The finance team calculates each resource’s capacity cost rate ($ per hour or minute) by dividing the total costs of supplying the resource (from calculation 1 above) by the resource’s available capacity (calculated in 2 above). Appendix A illustrates the process maps, cost tracing of clinical and administrative resources, and calculation of capacity cost rates for two types of physician office visits.

In a final step, the project team obtains the total cost of caring for a patient over a complete cycle of care through the following calculation: for each process step, multiply the time spent by each resource at the process step by its capacity cost rate, add in the cost of supplies and drugs used at the process step, and sum up across all the process steps (see Figure 4).

Using TDABC to Increase Health Care Value

Clinical and administrative personnel at our pilot sites have used outcomes data, the process maps, and TDABC cost assignments to find attractive opportunities for improving the value they deliver for patients. For example, at the MD Anderson Cancer Center (MDACC), a multi-disciplinary project team used process maps and TDABC to evaluate the opportunities to improve the pre-operative anesthesiology evaluation appointment process (French et al. 2013). The team then implemented two rounds of process improvements and personnel reassignments over a three-year period. The actions led to a 33 percent reduction in the total patient and personnel time per case, and a decrease in total personnel costs of more than 40 percent, with no degradation in outcomes.

At Boston Children’s Hospital, a clinical team within the Department of Oral and Plastic Surgery mapped the 18-month process of performing cleft lip and palate surgeries on newborns. For certain patients, with high airway risk during the acute post-operative recovery period, surgeons had the infant monitored for 24 hours in the intensive care unit (ICU). The process map and associated costing revealed that about 25 percent of the total $13,000 cost, over the first 18 months of care, was incurred for the one-day post-surgical ICU stay. While the surgeons and hospital knew the ICU stay was an expensive part of the process, they had no idea about its magnitude or the most important levers to improve this step. The surgeons determined that these patients could be monitored just as effectively in an alternative, lower-staffed observation unit, which would lower costs by $1,000 (8 percent) just by this single change in protocol. The same surgical department also mapped initial patient visits to its clinic and saw that by adding a physician’s assistant, they could redesign the workflow for the initial and follow-up visit to increase the capacity of the clinic and physician, allowing them to see more patients, decrease the patient’s waiting time for appointments, and generate higher revenues from better staff utilization.

A psychiatrist in Norway did a process map and cost assignment for the workflow in his clinic, which had two psychiatrists (including himself) and three psychologists. He immediately saw an

\textsuperscript{1} Some technical costing issues arise for equipment such as lumpiness of acquisition, cost of capital, historical cost versus replacement or exit values, and peak and seasonal demands. See Kaplan and Cooper (1998, Chapter 7) for a discussion of how to cope with these issues.

\textsuperscript{2} For physicians in academic medical centers, exclude the portion of compensation and time associated with research and educational activities.
FIGURE 4
Calculating Costs over a Patient’s Complete Cycle of Care

<table>
<thead>
<tr>
<th></th>
<th>Minutes</th>
<th>Cost/minute</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial consultation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD</td>
<td>$X_1$</td>
<td>$Y_1$</td>
<td>136.13</td>
</tr>
<tr>
<td>RN</td>
<td>$X_2$</td>
<td>$Y_2$</td>
<td>68.04</td>
</tr>
<tr>
<td>CA</td>
<td>$X_3$</td>
<td>$Y_3$</td>
<td>6.17</td>
</tr>
<tr>
<td>ASR</td>
<td>$X_4$</td>
<td>$Y_4$</td>
<td>15.74</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$266.08</strong></td>
</tr>
</tbody>
</table>

|                  |         |             |        |
| **Surgical procedure** |         |             |        |
| MD               | $X_1$   | $Y_1$       | 584.99 |
| Anes.            | $X_2$   | $Y_2$       | 603.89 |
| RN               | $X_3$   | $Y_3$       | 136.29 |
| Tech             | $X_4$   | $Y_4$       | 97.82  |
| OR               | $X_5$   | $Y_5$       | 329.16 |
| **Total**        |         |             | **$1752.15** |

|                  |         |             |        |
| **Follow-up or post-operative visit** |         |             |        |
| MD               | $X_1$   | $Y_1$       | 55.19  |
| RN               | $X_2$   | $Y_2$       | 13.61  |
| CA               | $X_3$   | $Y_3$       | 3.09   |
| ASR              | $X_4$   | $Y_4$       | 1.77   |
| **Total**        |         |             | **$73.66** |

Source: Meg Abbott, M.D. and John Meara, M.D., Boston Children’s Hospital.
opportunity to modify several procedures to generate 800 hours per year (nearly 0.5 FTE) of new capacity for treating patients, while improving the quality of treatment. As he told us, “this is like a new miracle drug without any cost or side effects.” As the country’s new expert in process mapping and TDABC, he expanded his scope to new domains. After analyzing an orthopedic outpatient clinic in Oslo, he helped to implement changes that improved patient outcomes and increased capacity by 40 percent.

These individual interventions are indicative of the thousands of opportunities, within each provider organization, to improve quality while lowering the cost-to-serve. The opportunities for improvement come from multiple sources as the above examples begin to illustrate. Among these are the following.

1. **Process Improvements**

   We find enormous variation in the processes and staffing used by clinical organizations to perform exactly the same procedure on comparable patients. Even within a single clinical organization, such as a surgical unit, the individual surgeons typically use different surgical processes, clinical support personnel, implants and devices, and surgical kits for exactly the same surgeries that yield the same outcomes. They also have substantial variation in surgical times themselves, measured from first cut to final suture. For example, Surgeon A in one hospital of the German Schön Klinik system took 43 minutes for a total knee replacement. Surgeon B, at another hospital, took more than 90 minutes. Surgeon A had slightly better outcomes than Surgeon B, and he also had one fewer clinical person assisting him in the operating room during the surgery.

   Even surgeons operating with the same “first cut to final suture” time have great variation in their productivity per day because of differences in scheduling and coordination at their institution. Surgeon A, in Germany, on days that he was totally dedicated to performing knee replacements, finishes at 2:30 PM after performing seven successful surgeries; the equally-skilled Surgeon W (also only 43 minutes, first cut to final suture), in a leading U.S. hospital, can perform only three surgeries on one of his dedicated surgical days; and Surgeon D, at another leading U.S. hospital, regularly performs ten joint replacements per day. All three surgeons have comparable and excellent outcomes for their patients.

   Today, these variations in practice and impacts on cost within and between clinical units are invisible. The process maps and costing approach reveal the added time and cost of many variations that do not contribute to improved outcomes. Over time, forceful clinical leadership can standardize clinical processes and eliminate costly and non-value added variations. The process maps and associated costs also direct attention to where cycle time reductions can have the biggest impact.

2. **Resource Substitutions**

   The most significant finding in our health care research has been to document the huge variation in capacity cost rates, 10:1 and higher, between highly trained medical professionals and clinical assistants. We know of no other industry that has such a high variation between the most highly compensated and least-compensated front-line employees doing actual work and service delivery. This high variation provides opportunities to redesign administrative and clinical processes so that skilled clinicians and surgeons perform work that only they can perform (referred to as working at the “top of their license”), while reassigning many routine tasks to lower-paid personnel. The reassignments can be done without having any adverse effects on patient outcomes and, in many cases, they improve outcomes by having mid- and lower-level clinical providers and social service workers spend more time educating and counseling patients. Even with more total hours spent by employees with patients, overall costs decrease when clinicians work at the top of their license, performing work that best leverages their education, training, and experience.
The high variation in capacity cost rates exists also for equipment and facilities. Cost rates within imaging modalities alone—such as among MRI, CT, Ultrasound, and X-Ray—or among various types of laboratory equipment, show variations of the same scale as for clinical personnel. Currently, multi-site hospital enterprises deliver much care at the central academic medical center (AMC). The AMC hospital, which is located in the most expensive real estate in the region, also has the most expensive and complex equipment, and the most skilled and highly paid personnel. But many of the visits and procedures performed in the AMC complex could be performed equally well, or even better—because of shorter wait times and better focus—in satellite clinics in suburban and rural locations. These facilities are not only lower cost to the provider but also lower cost to the patients, since they are easier and more convenient to access. Reserving the AMC hospital for the most complex cases and the most at-risk patients, while doing more standard procedures and clinical visits in lower-cost satellite facilities, reduces the total cost of treating a population of patients and reduces the pressure to expand capacity at the system’s most expensive location.

3. Resource Capacity Utilization

The TDABC capacity cost rates are, by definition, based on the practical capacity of each resource (personnel and equipment). In this way, the cost of only the capacity actually used to treat patients is assigned to patients. If the demands for the resource’s capacity, from all the patients treated in a given period, are less than the available capacity, the cost of the unused capacity is identified and classified separately in the financial report for the period. In this way, administrative and clinical leaders see the cost, every period, of their organization’s unused capacity, resource by resource and in aggregate. This treatment represents a distinctive improvement from providers’ existing costing systems that bury the costs of unused capacity in overhead pools that are allocated arbitrarily to the existing volume of procedures. None of our existing pilot sites has, to date, fully implemented the TDABC approach so we cannot yet estimate the magnitude of unused capacity costs at a typical provider. But, based on casual observation at the various sites, we would be surprised if today’s cost of unused capacity was less than 20 percent.

As providers implement action plans suggested by the first two steps (process improvement and changes in resource mix used to treat patients), even more unused capacity will get created in existing resources. Once visible, the leadership team can either apply its unused capacity to treat a higher volume of patients, without increasing its spending on new resources, or to manage the excess capacity out of the system, enabling costs to be reduced without any detrimental effects on existing patient volume and outcomes. Managing the unused capacity out of the current inefficient health care system offers another big opportunity for immediate and sustainable cost reductions.

4. Optimize Costs over the Patient’s Cycle of Care

Currently, a provider’s costs get assigned only to reimbursed processes and procedures, a consequence of legacy and flawed costing approaches. Many processes, however, are not reimbursed, such as clinical conferences that assess a patient’s medical condition and recommend treatment paths, or patient education about the disease, treatment, and post-treatment rehabilitation and compliance plans. Such unreimbursed processes do consume resources, but are not tracked by existing charge and RVU-based costing systems. Their costs become embedded within large overhead pools and eventually allocated inaccurately to charged procedures, leading to unintended cross-subsidizations. When physicians and providers see all the costs associated with treatment care cycles and are held accountable for the outcomes they produce, they have motivation to develop treatment and compliance protocols that contribute to better outcomes and lower costs later in the patient’s care cycle, such as by avoiding infections and readmissions through better patient education and compliance monitoring.
Even more significantly, many payers and providers currently attempt to control costs by restricting access to expensive new drugs and innovative medical equipment and devices. But, attempting to manage costs by setting spending constraints on particular line items in a profit and loss statement is a crude and ineffective way to control health care spending. Far more effective would be to manage costs over a patient’s complete cycle of care. For example, suppose we learn, from process maps and TDABC, that the total life cycle cost to treat a patient for a particular medical condition is, say, $10,000, of which $900 is for a generic drug. A pharmaceutical company offers a newly approved drug that costs, say, $1,440 (a 60 percent higher price). The clinicians re-estimate the process maps and cost estimates to see that the revised and streamlined treatment protocol with the new drug can deliver the same patient outcomes at a total cost of $9,000. Under a spending cap for drugs, a provider is forced to reject use of the new drug even when its use reduces total costs by 10 percent, clearly a suboptimal way of making decisions about innovative drugs and medical devices. The value framework, comparing outcomes and total costs between the new procedure and the existing one, provides a much sounder basis for decision making.

“ Ain’t No Fixed Costs”

All of the initiatives described in the preceding section create the potential for increasing health care value. In order to capture and realize the cost savings, however, managers must act to eliminate or redeploy the resources their organization currently has but no longer needs after its innovation, process improvement, and restructuring initiatives. A revised budgeting process enables executives to identify surplus resources and to begin to manage them out of the enterprise. The activity-based budgeting process starts by predicting the volume and types of patients the provider expects to care for in future periods. Combining these forecasts with the process maps already developed for treating each patient condition allows providers to predict the quantity of resource hours required to perform each process and serve all the forecasted demands. The demanded resource capacity can then be divided by the estimated practical capacity of each resource type (previously calculated in developing the TDABC model) to obtain an accurate estimate of the quantity of each resource that must be supplied to meet the demands from the forecasted population of patients. Since the cost model already captures the cost of supplying each resource unit, the estimated spending budgets for future periods is easily obtained by multiplying the quantity of each resource category required by the cost of supplying that resource. Various scenarios of patient volumes and mix can be simulated to see the robustness of the updated resource capacity authorizations.

When using the TDABC model for resource capacity planning and financial budgeting, each parameter in the model should be updated to reflect expected efficiency improvements in each process (the benefits from the actions described above), as well as changes in compensation and other resource supply costs for the following year. By operating the TDABC model essentially in reverse, using forecasted patient demands to predict the resource capacity and costs required to meet that demand, managers can treat virtually all their costs as “variable.” They can readily translate efficiency improvements and process innovations into reduced spending on resources that are no longer needed. They will have the information to see how process improvements enable them to redeploy freed-up resources. Using the TDABC model for resource capacity planning and budgeting enables providers to lower their costs while still delivering equal or better outcomes. We continually stress with our pilot sites, “ain’t no fixed costs; only inattentive managers.”

VALUE-BASED REIMBURSEMENT

The TDABC budgeting approach enables providers to configure their care delivery based on efficient processes, appropriate matching of resources—personnel, equipment, and facilities—to patient demands, and optimized care, including patient education and consultations, drugs, and
devices, over the patient’s care cycle. Providers performing such innovation, however, should not be penalized as they might be with the current fee-for-service reimbursement system, which rewards volume not value. Therefore, fundamental reform of pricing and reimbursement is essential to reward the providers that deliver better care at lower cost.

Existing and proposed reimbursement methods—fee-for-service, capitation, and global budgeting (allocating a fixed amount to each provider organization for treating all patients)—have severe incentive problems (see summary in Table 2) for providers that prevent them for delivering the most value to patients.

An alternative payment mechanism, bundled payments for specific clinical conditions and primary care subpopulations, aligns better a provider’s incentives with value creation (Porter and Lee 2013). A bundled reimbursement payment should encompass the full care cycle for a medical condition. For example, providers would offer a single price, say $20,000, for a surgical procedure such as a joint replacement, to reimburse them for all the clinical, rehabilitation, and administrative processes used from the initial office visit, through the actual surgery, subsequent recovery, rehabilitation, and physical therapy. The reimbursement would cover the costs of physician services, hospitalization, imaging, laboratory tests, office visits, rehabilitation and therapy, and all the supplies, implants, and medicines used over the complete care cycle. The reimbursement would be contingent on the outcomes achieved for the patient. For treating patient populations, separate time-based bundled payments ($ per month or year) would be offered to providers delivering primary and preventive medical care to defined patient population segments, such as healthy infants and children, diabetics, healthy adults, and frail elderly (Porter, Pablo, and Lee 2013).

As part of the Affordable Care Act, many experiments with bundled payments are now underway in the U.S. (Center for Medicare and Medicaid Innovation [CMMI] 2013). These pilot projects, however, are being done with little valid information on either outcomes or costs for treating the clinical or chronic condition, or the segment of patient.

We are currently supporting several pilot projects with providers and private insurance companies, to develop bundled payments for specific medical procedures and a chronic disease condition (Witkowski, Higgins, Warner, Sherman, and Kaplan 2013). The project starts with

<table>
<thead>
<tr>
<th>Reimbursement Method</th>
<th>Flaws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fee for service</td>
<td>• Diverse rates across providers, unrelated to outcomes achieved; or similar reimbursement to providers that deliver very different outcomes. • Cost shifting among multiple payors and massive cross-subsidization of services. • Providers rewarded for the volume of services they perform, including unnecessary tests and procedures. • Providers under invest in unreimbursed but value-adding processes.</td>
</tr>
<tr>
<td>2. Global payments or capitation</td>
<td>• Providers bear insurance risk. • Pressure to expand to reach larger numbers of patients and offer more diverse service lines rather than concentrate to achieve economies-of-scale for treating specific medical conditions. • Incentive to ration services. • Incentive to target healthier populations.</td>
</tr>
<tr>
<td>3. Global budgeting</td>
<td>• Encourages rationing and delay. • Discourages use of proven care processes that deliver superior outcomes.</td>
</tr>
</tbody>
</table>
process mapping and TDABC costing, followed by a stage of process improvement. Once providers understand the cost of delivering good outcomes with efficient processes and without preventable complications (infections, re-admissions), they can quote a bundled price that covers all their costs over a complete cycle of care. The single bundled price, paid only if the provider achieves specified outcome performance from the intervention, pays for the initial visit and consultation, all the clinical and facility costs for surgical and medical procedures, and all rehabilitation and follow-up visits.

Bundled payments will encourage value-based competition among providers for each medical condition (or patient subpopulation); providers want to produce excellent outcomes for the clinical condition using efficient processes, high capacity utilization, and seamless, integrated care for patients. The payment is aligned with actions the provider can control and provides accountability for delivering care efficiently and with excellent outcomes, as defined by each specific medical condition. With bundled reimbursement based on valid outcome and cost data, effective and efficient providers should experience growth and profitability for treating patients.

Integrated Practice Units

Integrated Practice Units (IPUs), a multi-disciplinary integrated delivery team, focused on treating patients with a specific medical condition (or a set of closely related conditions), should prove to be a highly effective and efficient organizational structure for value-based competition (Porter and Teisberg 2006; Porter and Lee 2013). An IPU provides a single point of accountability for treatment outcomes and costs; it can assume responsibility for delivering the full cycle of care, including outpatient, inpatient, and rehabilitative care, including supporting services such as nutrition, social work, and behavioral and psychological counseling for patient education, compliance, and follow-up. Not all of the clinicians, therapists, or counselors may be actual employees of an IPU, but all will be selected, trained, and paid by the IPU for the services they deliver as part of the integrated cycle of care.

IPUs, focused on a specific medical condition such as a joint replacement or repair, cardiac surgery, a transplant, or a specific form of cancer, should produce superior outcomes by having dedicated teams performing high volumes of the same procedure, supplemented with all relevant support personnel who will have expertise, training, and experience with that procedure as well. With economies-of-scale from learning-by-continuous-doing, low complication rates, and high capacity utilization, the IPU should incur lower costs and deliver superior outcomes than a collection of providers that perform only individual process components of the care cycle.

Providers performing the procedure infrequently, with fragmented care delivery, and resources operated at well below capacity, will have higher costs and poorer outcomes. Over time they may experience even further diminished volumes of business, and the bundled prices paid to them will likely be below their costs, leading to their exit from treating that medical condition, a dynamic that happens in every other industry. These are the competitive dynamics that can be unleashed once we measure and, therefore, contract on outcomes and costs by medical condition.

RESEARCH OPPORTUNITIES

The introduction of cost and outcome measures into health care delivery has just started, so the opportunities for research are immense. Every reader of this article is within walking, cycling, or a short driving distance to a potential field site and source of data. Developing, introducing, and implementing new measurements in this industry will require answering numerous technical questions—both conceptual and empirical—that can be informed by careful research. Our initial projects have focused on clinical departments delivering care to patients. Additional opportunities are to investigate cost assignments for important ancillary care departments such as radiology,
laboratory, pharmacy, and central sterilization, as well as administrative support departments such as billing, laundry, housekeeping, and dietary. Researchers can explore the costs associated with medical mistakes, no-shows, administrative paperwork, inadequate documentation, processes that protect against malpractice claims, and end-of-life care.

Beyond accounting and measurement issues, field studies of the leadership and change management issues from introducing new outcome and cost measurements would be fascinating. We know from past experience that introducing new measurement systems triggers individual and organizational resistance (Argyris and Kaplan 1994). Researchers should be able to study how health care leaders solve the behavioral issues arising from introducing change and modifying power relationships within health care providers. Behavioral researchers can also explore the informational processing issues when clinicians and administrators use multi-dimensional outcome and cost data to optimize medical processes.

We have described how outcome and cost measurement allows for a new reimbursement mechanism to be introduced. What are the incentive and informational issues associated with changing the basis for reimbursement from fee-for-service, capitation, and global budgeting to bundled payments? Accounting scholars can participate in bundled payment experiments to study the tensions and conflicts as various players in the health care system attempt to work together to increase the value they deliver to patients, rather than to optimize within their own specialty and discipline. The complexity of interactions calls out for analytic research to sort out the informational and incentive issues among the various players in the system including patients, multiple providers, suppliers, and payers. Accounting historians can shed light on how health care systems, around the world, adopted reimbursement systems that are not aligned to deliver the best value to the end use customer, the patient. They can also explore how such a huge industry developed with so little calculation and reporting of outcomes and costs.

The rationale for the Affordable Care Act in the U.S. is that costs will go down if more residents are insured and seek primary care rather than get treated, as charitable cases, when they show up in hospital emergency rooms. Is this true? How much additional resources do hospitals deploy to treat such patients and how many resources will no longer be needed when more patients are insured and seek care from primary care clinicians?

Accounting scholars can participate in field experiments to document the value changes, both costs and outcomes, from introducing a new pharmaceutical or medical device into the treatment protocol for a medical condition. They can participate in field studies that document how innovative provider organizations restructure themselves to deliver the right care, at the right place, with the right mix of clinical and administrative personnel, and with high capacity utilization, to improve the value they deliver. Expertise in auditing of “soft” measures can be productively applied to the measurement and verification of the outcome measures that will be developed for each medical condition, and upon which future reimbursement and reorganization of the treatments will be based.

In these ways, accounting scholars and educators can help to influence the future of one of the largest and most important sectors of society. The challenges are huge, but we already possess the tools that can be deployed to address the issues.

REFERENCES


APPENDIX A

Numerical Example of Time-Driven ABC for Physician Office Visits

To illustrate the TDABC approach, let us examine two apparently similar but clinically different initial diagnostic office visits, which we will call Condition A and Condition B. The numbers are disguised but the case is based on an actual analysis of a surgeon’s practice. The process maps for Conditions A and B are shown below.

Condition A

From these process maps, we can estimate the matrix of resource times for the two conditions as shown below:

**Personnel Process Times (Minutes)**

<table>
<thead>
<tr>
<th>Personnel Process Times (Minutes)</th>
<th>Surgeon</th>
<th>Ambulatory Service Representative</th>
<th>Registered Nurse</th>
<th>Clinical Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition A</td>
<td>18</td>
<td>8</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Condition B</td>
<td>40</td>
<td>10.5</td>
<td>23</td>
<td>10</td>
</tr>
</tbody>
</table>
The calculation of the numerator in the capacity cost rate is shown below:

<table>
<thead>
<tr>
<th></th>
<th>Surgeon</th>
<th>Ambulatory Service Representative (ASR)</th>
<th>Registered Nurse (RN)</th>
<th>Clinical Assistant (CA)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation: Salary, Fringes and Bonus</td>
<td>$ 5,500,000</td>
<td>$ 390,000</td>
<td>$ 1,098,500</td>
<td>$ 235,300</td>
<td>$ 7,223,800</td>
</tr>
<tr>
<td>Malpractice Insurance</td>
<td>220,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Billing Services</td>
<td>760,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office expenses: rent, utilities, insurance, supplies</td>
<td>400,000</td>
<td>148,200</td>
<td>247,000</td>
<td>123,500</td>
<td>918,700</td>
</tr>
<tr>
<td>Total</td>
<td>$ 6,880,000</td>
<td>$ 538,200</td>
<td>$ 1,345,500</td>
<td>$ 358,800</td>
<td>$ 9,122,500</td>
</tr>
<tr>
<td>Research and teaching time</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical time</td>
<td>75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgeon clinical expenses</td>
<td>5,160,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Supplies</td>
<td>67,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Clinical Costs</td>
<td>5,227,200</td>
<td>$ 538,200</td>
<td>$ 1,345,500</td>
<td>$ 358,800</td>
<td>$ 7,469,700</td>
</tr>
<tr>
<td>Number of employees</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>31.0</td>
</tr>
<tr>
<td>Clinical cost per employee</td>
<td>$ 522,700</td>
<td>$ 89,700</td>
<td>$ 134,550</td>
<td>$ 71,760</td>
<td></td>
</tr>
</tbody>
</table>

And, finally, the denominator—capacity available from each resource, and the capacity cost rate are shown below:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Surgeon</th>
<th>ASR</th>
<th>RN</th>
<th>Clinical Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks per year</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Less: Weeks unavailable</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Working weeks</td>
<td>44</td>
<td>46</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Hours per day</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Less: Breaks, training, meetings</td>
<td>1.2</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Available hours</td>
<td>8.8</td>
<td>6.5</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Research and teaching</td>
<td>2.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clinical hours per day</td>
<td>6.6</td>
<td>6.5</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Clinical minutes per day</td>
<td>396</td>
<td>390</td>
<td>390</td>
<td>390</td>
</tr>
<tr>
<td>Capacity (minutes per year)</td>
<td>87,120</td>
<td>89,700</td>
<td>89,700</td>
<td>89,700</td>
</tr>
<tr>
<td>Annual Cost per person</td>
<td>$522,700</td>
<td>$89,700</td>
<td>$134,550</td>
<td>$71,760</td>
</tr>
<tr>
<td>Cost per minute</td>
<td>$6.00</td>
<td>$1.00</td>
<td>$1.50</td>
<td>$0.80</td>
</tr>
</tbody>
</table>

In the final calculation, cross multiply the matrix of process times (“Q”) with the capacity cost rates (“P”) and sum across the process steps to obtain the TDABC costs and margins of these two office visits.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Surgeon</th>
<th>ASR</th>
<th>RN</th>
<th>CA</th>
<th>Total Cost</th>
<th>Charge</th>
<th>TDABC Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition A</td>
<td>$108.00</td>
<td>$8.00</td>
<td>$34.50</td>
<td>$4.00</td>
<td>$154.50</td>
<td>$245.00</td>
<td>$90.50</td>
</tr>
<tr>
<td>Condition B</td>
<td>239.99</td>
<td>10.50</td>
<td>34.50</td>
<td>8.00</td>
<td>292.99</td>
<td>245.00</td>
<td>(47.99)</td>
</tr>
</tbody>
</table>

The existing system, based on a 90 percent ratio of costs-to-charges, had obtained the costs and margins shown below:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Charge</th>
<th>RCC Cost</th>
<th>RCC Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition A</td>
<td>$245</td>
<td>$221</td>
<td>$25</td>
</tr>
<tr>
<td>Condition B</td>
<td>$245</td>
<td>$221</td>
<td>$25</td>
</tr>
</tbody>
</table>