

Boston children's hospital: measuring patient essay sample

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Our review shows that the current system of health care payment is not always value-based, and health care providers throughout the state are compensated at widely different rates for providing similar quality and complexity of services. ... To control cost growth, we must shift how we purchase health care to align payments with value, measured by those factors the health care market should reward, such as better quality. — Office of the Attorney General Martha Coakley, Commonwealth of Massachusetts¹

Boston Children's Hospital (BCH) aimed to be a worldwide leader in improving children's health through the provision of high-quality care, cutting-edge research, teaching, and local community outreach. As one of the largest independent pediatric medical centers in the United States, BCH offered a complete range of health care services for children from all over the world (see Exhibits 13). BCH was also the provider-of-last-resort for children with rare diseases, such as Wiskott Aldrich (blood disease) and Bubble Boy Syndrome (combined immunodeficiency) and had highly-specialized physicians and expensive equipment available at all times. In 2011, U. S. News & World Report ranked BCH as the top pediatric hospital in the U. S., with more top-ranked specialties— Heart and Heart Surgery, Neurology and Neurosurgery, Cancer, Orthopaedics, Urology, and Kidney Disorders—than any other pediatric hospital. ²

Patients made over 500, 000 visits to BCH's 228 specialized clinical programs in 2011, and its surgeons performed more than 26, 000 procedures. The majority of BCH's care was provided at its main campus in

Boston's Longwood Medical Area. It also delivered regional care at six community hospital locations and several specialty care centers in eastern Massachusetts and New Hampshire. BCH treated 90% of the most critically ill children in Massachusetts and was the largest provider for low-income families in the state, with 30% of its patients covered by Medicaid. BCH also contained the world's largest pediatric hospital-based research center, with \$225 million in annual funding and over 1,100 scientists. Its laboratory researchers and physician investigators had identified novel treatments and therapies for a wide range of debilitating pediatric conditions, from Nobel Prize-winning work in polio to the more recent discovery of genetic variants linked to appetite control and obesity.

Professor Robert S. Kaplan, Fellow Mary L. Witkowski, and Research Associate Jessica A. Hohman prepared this case, with the assistance of Gisele Charron, Ron Heald, and Drs. Von Nguyen, Apurva Shah, and Megan Abbott. Internal company data in the case have been disguised. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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BCH Physicians were employed by 15 Foundations, not the hospital itself. Each clinical department had a Foundation that ran the physician practices, independently of both the hospital and each other. A Foundation rented clinical space from the hospital and charged patients for the professional services rendered by its physicians, a charge separate from that charged by BCH for nonphysician services. While financially and legally distinct, the 15 Foundations were organized into one central Physician's Organization (the "P. O."). The P. O. oversaw collective contracting and shared management initiatives. The P. O. had a defined working relationship with the hospital; P. O. directors served on the hospital's board of directors and hospital executives served on the P. O.'s board.

Local and National Market for Pediatric Care

In 2006, Massachusetts began enacting health reforms that expanded insurance coverage to all residents through a combination of mandates and subsidies. In 2008, the state formed a Special Commission on the Health Care Payment System to address rising health care costs. The commission's final report recommended a transition to risk-adjusted global payments for all providers in the state. ⁵ Many believed that the health reforms in Massachusetts foreshadowed coverage expansions and new national payment models in response to rising cost pressure. BCH, the only freestanding pediatric hospital in Boston, had historically reported higher

costs (and prices) than local pediatric wards embedded within adult hospitals.

One local alternative, Tufts' Floating Hospital for Children, a unit embedded within the much larger Tufts' Medical Center in downtown Boston, had been recognized for charging prices 50% lower than BCH's while producing comparable outcomes. a, 6 Floating Hospital had seen its volume and revenue from pediatric care grow significantly over the last few years. Payors, reacting to BCH's higher prices, began excluding BCH from certain offerings while simultaneously increasing cost sharing in their tiered/limited network plans that still included BCH. In 2012, these tiered/limited network plans represented almost 15% of the Massachusetts market. 7

BCH executives clearly saw the challenge of sustaining its industry-leading ranking and research agenda amidst the intense local and national pressure to reduce costs. They knew that their prices were comparable to other free-standing pediatric hospitals around the country, and suspected that the costs reported by pediatric wards within full service hospitals might be under-reported due to cross-subsidies from more lucrative adult departments. They knew, however, that BCH did incur higher costs to fulfill its substantial research and teaching missions and to care for a significantly more complex and resource-intensive patient population.

BCH had been experimenting with new reimbursement approaches and, in 2012, became the first pediatric hospital to enter into an Alternative Quality Contract (AQC) with Blue Cross Blue Shield of Massachusetts. This three-year

AQC signaled a shift from fee-for-service reimbursement to fixed payments with additional rewards based on savings generated and quality targets reached. The contract specified no rate increases for 2012 and modest increases below inflation for the remainder of the agreement. Other public and private payors were also approaching BCH to negotiate bundled payments that would cover whole episodes of care that would replace traditional fee-for-service reimbursements.

a Tufts network estimated an average of \$6, 000 lower per comparable admission. Martha Coakley's 2008 report estimated that

BCH was paid almost twice as much per patient as Floating for similar care; but these figures are averages not adjusted for the complexity of patients

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Amidst these private insurer initiatives, financially-pressured state and local governments had been reducing their reimbursements to medical care providers. BCH's contract with New Hampshire's Medicaid program had recently lapsed, and the state was unsure whether it could continue to afford to send patients to BCH. If other states made similar decisions, fewer low-income patients would have access to BCH facilities and care.

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To protect its core mission of making care accessible for the local population, BCH was reducing prices at its satellite locations and cutting more than \$125 million in costs over the last three years through a series of initiatives such as care delivery re-design and the shifting of low-intensity services to less costly satellites and community partners. 8 BCH's physician-led initiatives included the Program for Patient Safety and Quality (PPSQ) and Standardized Clinical Assessment and Management Plans (SCAMPs). SCAMPs attempted to improve patient outcomes and reduce unnecessary resource utilization through systematic data analysis. Physicians created a SCAMP for a particular medical condition by process mapping the various clinical pathways different clinicians used for patients, and analyzing each pathway's outcomes. They used the information to develop a consensus-based standardized care plan with built-in feedback mechanisms for continuous improvement and innovation.

By 2012, BCH physicians had launched 42 SCAMPs. Dr. Peter Waters, Clinical Chief of Orthopaedic Surgery, who was also President of the Pediatric Orthopaedic Society of North America (POSNA), had initiated a national quality, safety, and value initiative for benchmarking orthopaedic care and reducing variation in practice patterns at the national level and within his own department. Waters had also overseen the development of a SCAMP for distal radius fractures at BCH Orthopaedics. The SCAMP team defined a range of outcomes, including a number of functional measures and patient-reported outcomes, for the distal radius care pathway. Waters hoped to use quality and cost measures to optimize this care pathway. Dr. John Meara,

Chair of the Department of Plastic and Oral Surgery, had been conducting a pilot project in his department to better measure costs and outcomes. Meara was convinced that the care provided at BCH was outstanding:

Our outcomes are superior to those of our competitors, and even though we may have higher unit prices for individual procedures, we believe that our total medical expenses for a particular condition are lower over the full care cycle. We treat patients more efficiently with fewer complications and fewer visits than other providers.

He knew, however, that more accurate cost information would help him define and negotiate bundled payments with payors. BCH management wondered whether Meara's costing initiative could provide additional insight into the drivers of cost at BCH and help BCH further improve its care delivery processes and create forward-looking value-based reimbursement mechanisms.

Cost Measurement at BCH

Not all physician foundations used a costing system. Those that did, such as the Department of Plastic and Oral Surgery and the Department of Orthopaedic Surgery, used the Ratio-of-Cost-to Data analysis on patients going through a particular SCAMP was completed every 200 patients, or every six months to assess

whether the algorithm or decision tree needed to be further refined. c Distal Radius fracture refers to a medical condition commonly known as a "broken wrist." Often due to a fall on an outstretched hand, this fracture (or broken

bone) is located on the distal end (furthest from the torso and close to the wrist joint) of one of the two bones in the forearm known as the radius. Treatment usually involves immobilization with a cast or, occasionally, surgery.

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Charges (RCC) approach. Hospital departments used a different system based on internally-derived Relative Value Units (RVUs).

Estimating Costs using the Ratio-of-Cost-to-Charges (RCC) Method RCC was a simple and easy to use cost system for hospital departments and physician practices. First developed in the 1960s, the RCC approach assumed that costs were proportional to charges, which allowed financial managers to use readily available charge data to calculate costs. The RCC method first collected all the charges produced by a revenue-producing clinical department, such as Orthopaedic Surgery. It then aggregated all the department's traceable expenses, such as the costs of personnel compensation, equipment, supplies, information systems, and billing. To these, it added the hospital's allocations of shared costs—such as for utilities, space, and housekeeping—to the department. The method divided the sum of all departmental traceable and allocated costs by the department's total charges to calculate the department's RCC rate.

To calculate the cost of any particular departmental procedure or intervention, it multiplied the procedure's charge by the department's RCC rate. For example, a department with total costs of \$4.2 million and total annual charges of \$7.0 million would have an RCC of 0.6. The cost of any single billable event was estimated by multiplying the procedure's charge, say \$800, by the RCC (for a cost of \$480). The charges in the RCC calculation came from physician practices' charge masters, in effect, the "list prices" for these services, which were based on physician fee schedules established by the Centers for Medicare and Medicaid Services (CMS) (see Exhibit 4).

Estimating Costs using the Internal Cost Relative Value Unit (RVU) Method

For hospital costing, BCH used its Alliance Decision Support system. Alliance was a MedAssets decision-support platform that integrated financial, clinical, and administrative information. It was similar to other decision-support products, such as Allscripts' Sunrise EPSi, used by many leading health care providers. These systems gave providers the ability to use either internal or CMS-derived RVUs to assign the hospital's departmental costs to individual procedures and activities. The complex RVU approach was presumed to be more accurate than the RCC approach. d The hospital RVU system categorized departments as either direct or indirect based on whether those departments billed for patient-facing services. Boston Children's Hospital had approximately 150 direct departments and 300 indirect departments. Examples of direct departments included the Cardiac Catheterization Lab, the operating room, and each inpatient ward at the hospital. Indirect departments included areas such as human resources, housekeeping and

facilities. The Alliance System summed a direct department's "direct costs" into functional categories, such as employees and supplies.

Each direct department worked with the Finance Department to estimate an RVU weight for each billable procedure it performed. The RVU estimate used factors such as procedure time required, procedure complexity, and the procedure's RVU from a national survey. A simple laboratory test for cholesterol in a patient's blood, for example, might have a Labor RVU of 2X while a complex molecular genetic test might have a Labor RVU of 40X. Alliance utilized 15 categories of RVUs within each hospital department, typically nine direct and six indirect (e. g., a Labor RVU, a Supply RVU, and an Equipment RVU).

d The internal cost RVU was distinct from the physician Charge RVU of the name initials used to calculate charges by

Medicare for physician services (as described in Exhibit 4).

In principle, hospital departments could review and update their RVUs each year, but, in actual practice, many updated less frequently than annually. Financial managers, with little direct medical knowledge of the evolving complexity of clinical procedures, could not by themselves update the RVU estimates though they did attempt to keep the RVUs for the highest revenue procedures as up to date as possible.

In order to calculate the total annual number of RVUs for a department, the number of RVUs per charge code (or billable event) was multiplied by the

annual volume of that charge code. This was aggregated for all the services charged in the department during the year. The direct cost per RVU for that department was then the total direct cost for the department divided by the total number of RVUs. To find the direct cost of an individual billable event X:

Direct Labor Cost Billable Event "A" = Each billable event had a separate Labor RVU, Supply RVU, and Equipment RVU. Costs from indirect departments were also allocated to each direct department. BCH's finance department allocated categories of indirect cost such as building depreciation, housekeeping, and human resources to direct cost centers based on a variety of metrics such as square feet, length of stay, and salary. These indirect costs were then assigned to the individual charge items based on RVUs or the percentage of direct cost that the charge code represented. In order to calculate the cost of a particular patient, the summary of the patient's charged items was created from the patient's billing record and the associated costs of those events were totaled over the relevant time period.

Alliance was a top-down system that tied directly to other financial accounts within the hospital such as the general ledger and the patient billing system. All indirect cost elements (such as the cost of a piece of equipment, the staff of a department, or a bucket of overhead costs) were considered 100% fixed and were divided by the actual volume of activity in the year, so that decreases in procedure volume would lead to higher cost per procedure actually performed.

Department of Plastic and Oral Surgery

BCH's Department of Plastic and Oral Surgery (DPOS) provided comprehensive care for a wide variety of congenital and acquired conditions. As one of the largest pediatric plastic and oral surgery centers in the country, it performed over 3, 000 surgical procedures and handled more than 14, 000 outpatient visits each year. The DPOS also had a comprehensive research program, and continually translated the knowledge gained in its scientific laboratories into improved clinical care. 9 Dr. John Meara, Chief of the DPOS, had joined BCH in 2006 after spending several years practicing in Australia where he had also earned his MBA. Anticipating the potential introduction of new reimbursement models at the state and national level, Meara had attended Professor Michael Porter's value-based health care delivery course at Harvard Business School (HBS) in 2009.

Inspired by the course, Meara launched a project aimed at measuring clinical outcomes and costs in his subspecialty, cleft and craniofacial surgery. Meara felt that more accurate cost information would help him re-design care processes and improve the pricing for DPOS services. Meara used the DPOS Foundation's RCC system and BCH's Hospital Cost RVU-based costing system to examine the costs of providing care to patients with cleft palates and several other conditions treated in the department. He was surprised to learn that 40% of the costs of the first 18 months of care for certain cleft palate patients were incurred during the few days they spent in the ICU after surgery. Meara described his reaction:

Even before I started the project, I knew that a complex patient who went to the ICU cost more. However, I had no idea how much more and what was driving that. For a majority of patients, I was fairly certain that we could get the same quality and safety of care in a “stepdown” ward with just a few areas of increased surveillance. I needed to know this kind of information if I were to do anything about reducing costs.

In the midst of this study, Meara received a phone call from Porter inquiring as to whether Meara would be interested in testing a new costing approach, time-driven activity-based costing (TDABC), which he and a colleague were initiating in health care. Meara agreed, and he quickly assembled a team to begin the pilot. Dr. Megan Abbott, a resident who had had been working on the project as a research fellow and had also attended the value-based health care delivery course with Meara, agreed to head the new costing project. Meara asked Dr. Von Nguyen, an Internal Medicine physician with an MPH and experience at a major consultancy, to join the team, and Ronald Heald, the department's program administrator and financial manager, to contribute analytical leadership and access to the Foundation's financial information.

Meara decided to test the new costing approach in a simple setting, a new patient visit to a plastic surgeon. He selected three conditions encountered in normal practice that represented the full range of potential patient care needs: primary care, simple surgery, and complex surgery (see Exhibit 6). 1.

Deformational or positional plagiocephaly was a common disorder characterized by a flattening of the head or face, typically caused by placing an infant in the same position (e. g., on the infant's back) for long periods of time. Plagiocephaly had no known medical repercussions and typically resolved with non-invasive interventions such as observation/support, positional advice, or a simple molding helmet.

Benign neoplasms of the skin were harmless cutaneous growths that included common skin lesions such as skin cysts, benign skin tumors, and congenital nevi (moles). Physicians typically monitored the appearance and growth patterns of these lesions; but they removed particularly large and bothersome skin growths, as well as nevi that looked suspicious for malignancy. This was done in the office or in the operating room using a simple surgical procedure called an excision.

Craniosynostosis was a deformity that arose when one or more sutures (the fibrous connections that separate the bones of an infant's skull) fused earlier than normal. To the untrained eye, the physical deformity seen in craniosynostosis looked similar to plagiocephaly, but it was actually a far more serious condition that could result in developmental delays and cognitive impairment, as well as secondary neurological complications from high pressure inside the skull. Surgeons usually performed a complex surgical procedure to correct the deformity and reduce intracranial pressure.

Despite the variation in treatment complexity for these three conditions, the initial office visit for each was typically coded in the CMS system as a " level-

3 visit," carrying a uniform charge of \$350. e Meara believed, however, that the clinical and administrative work required for patients with e All charge and cost numbers found in this case have been created artificially by the HBS case writers for illustrative purposes only and do not represent actual data at BCH.

Plagiocephaly is a primary care diagnosis—a service that we provide for the local and regional community. It is not a diagnosis upon which to build an academic craniofacial department. Craniosynostosis, on the other hand, is a complex condition requiring a multidisciplinary approach. As an academic surgeon, these are the types of procedures that fascinate us clinically, provide us with challenging research questions, and allow us to teach residents and fellows.

The project team collected the data to verify the costing done by the Foundation's existing RCC system. In 2011, the total charges for all plastic surgery patient encounters were \$12, 449, 500, with actual reimbursements considerably lower at approximately \$7, 967, 680. Total clinical and administrative costs for the department (excluding the costs of the surgeons' research and teaching time) were \$7, 469, 700.

The Time-Driven Activity-Based Costing (TDABC) Approach

The TDABC approach required a project team to map out every administrative and clinical process involved in the treatment of a medical condition (e. g., craniosynostosis or cleft palate) over a complete care cycle. The care cycle started when the patient first presented for treatment and

extended through surgery, recovery, and discharge. The DPOS project's initial focus, however, was only on the initial clinical visit. They wanted to complete the costing quickly and easily so they could compare the TDABC costs of the visits with the RCC cost estimates. The team invited Doris Quinn, a Ph. D. who served as the Director of Process Improvement and Quality Education at MD Anderson Cancer Center (another hospital introducing TDABC for cost measurement), to travel to Boston to train them on how to create condition-specific process maps. The team appended, to each process step, the job classification of the person performing the step and the time required to complete it. Exhibit 7 shows the process maps for the three types of new office visits.

TDABC also required an estimate of the cost per minute for the clinical and administrative personnel involved in the care process. This ratio, called the capacity cost rate, was obtained by dividing an individual's annual compensation and support costs, such as attributable supervision, HR, IT and occupancy costs) by the total number of minutes per year that the person was available to work with patients.

Abbott developed a survey to gather information about the number of minutes that physicians had available for patient-related work (see Exhibit 8). She obtained the following data from personnel interviews and surveys:

1. DPOS surgeons had four weeks of vacation, plus ten holiday days and another ten days for professional conferences and training.

2. DPOS surgeons generally worked five days per week and ten hours per day. About 1.2 hours (72 minutes) were taken up with non-clinical meetings and breaks. Of the remaining time, about 25% was for research and teaching, leaving 75% for clinical work.

3. Non-physician personnel had two weeks of vacation, ten holiday days, five days for sick and personal leave, and five training days.

Non-physician personnel worked eight-hour days, with an average of 1.5 hours per day used for breaks and training.

Heald collected data on office expenses and compensation for DPOS's clinical and administrative personnel (see Exhibit 9). In a final step, the team prepared an Excel spreadsheet (see Exhibit 10) to calculate the TDABC costs of the three different types of office visits and compare these to the RCC cost estimates.

Department of Orthopaedic Surgery: Cast Room

As the work in the DPOS project progressed, Dr. Waters and Dr. Apurva Shah, an attending physician in the Orthopaedic Department, concurrently worked on their own costing initiative. The Department of Orthopaedic Surgery—with its 13 specialty clinics, 92,000 annual patient visits, and 25% of BCH's surgical volume—was the largest pediatric orthopaedic program in the United States. The department offered the full spectrum of care for orthopaedic conditions and developmental disorders, including congenital, neuromuscular, oncologic and post-traumatic problems of the musculoskeletal system.

Waters had recently completed a management course at HBS, where he had learned about TDABC and its potential applications to health care. An orthopaedic project using TDABC seemed a natural extension of the department's value initiatives and SCAMP projects. With the involvement of Dr. James Kasser, the Surgeon-in-Chief for both the entire hospital and the Orthopaedic department itself, Waters and Shah chose to apply TDABC to the complete cycle of care for particular medical conditions, such as distal radius fractures. They worked extensively with other Foundations and the hospital to evaluate costs while simultaneously developing appropriate SCAMPS and outcome measurements by medical condition. Additionally, they took an in-depth look at one hospital department, the cast room, to study that component of care across all medical conditions.

Cast room technicians applied and removed a large variety of casts for children with fractures and congenital deformities. Shah and Waters decided to examine the costs for three common types of casts: long leg, Petrie long leg, and clubfoot (see Exhibit 11). A patient receiving a single long leg cast had an option to use Gore-Tex padding to make the cast water-resistant. The Petrie long leg cast was effectively two long leg casts connected by a bar. It was used for complex conditions such as Legg-Calvé-Perthes, a rare disease in which the blood supply to the femoral head was lost causing bone collapse. A clubfoot cast was used as part of the sequential treatment process for patients with clubfoot. A physician slowly moved the patient's foot from a club (or inwardly-pointing direction) to a neutral position using a series of casts over the course of several weeks. The care cycle for cast room

patients started with a physician performing an examination on the patient, reviewing available imaging, and then formulating a diagnosis and treatment plan.

The patient then went to the cast room with an order for the application of a particular cast type. After the patient arrived in the cast room, the cast technician checked the order, set up the appropriate supplies, and positioned the patient before applying the long leg or Petrie long leg cast. For clubfoot casts, a physician personally re-positioned the patient's foot and ankle as a technician helped to apply the cast. After applying each cast, the cast technician provided discharge instructions and informed patients about when to return for cast removal. The charge for the application of the original cast included an allowance for its removal so removal was not a separate billable event.

Cast Room: Cost Analysis using the RVU System

Shah started the cost analysis by obtaining information about the hospital charges for the three types of casts from the Finance Department's Charge Master. A typical clubfoot treatment cycle required five separate casts to be applied. The hospital recorded the clubfoot charge each time the patient came to the cast room for application of an original or replacement cast; no charge was made for removing the final cast. To estimate the physician's average charge for clubfoot casts, Shah examined Foundation billing records, which covered the work done over the patient's entire care cycle. He summarized the charge and reimbursement data as shown in the table below:

Procedure

Shah then looked at the Alliance System to obtain existing cost information for the cast room. Since the cast room billed for casts and other patient services, it was classified as a direct department. Shah collected information about the RVUs for procedures done within the cast room. The Finance Department, in coordination with cast room management, created an RVU scale to account for the labor needed to apply each type of cast.

The cast room had annual labor costs of \$300, 000 per year and its annual work delivered 24, 000 RVUs of care. This led to a labor cost per RVU of \$12. 50. To analyze the labor cost for the physician's work on clubfoot casts, Shah used the RCC approach, similar to that in use by the Orthopaedic Foundation. The Foundation had total annual expenses of \$23. 1 million and total charges of \$42 million, leading to an RCC of 55%.

BCHs Alliance system estimated costs separately for direct and indirect supplies. Direct supplies, such as the plaster and bandages used for casting fractures, could be linked to specific procedures. Indirect supplies, such as computer printing paper, were common to all procedures. The RVU methodology allocated the costs of direct supplies to billed events based on the 6. 5% ratio of the cast room's total direct supplies' costs to charges. For indirect supplies, the system divided the department's total indirect supply costs by the number of annual procedures (billed events) to obtain an indirect supply cost per procedure, which was \$1. 60 for the cast room.

f Note: The reimbursement numbers in this case have been created artificially by the case writers for illustrative purposes only and do not represent actual reimbursement data of the organization.

The RVU methodology allocated the costs of indirect departments (such as Billing, Safety and Quality, Occupancy, Human Resources, Information Technology, Housekeeping, Dietary, and Laundry) to each direct department, using a single metric for each indirect department. For example, the Billing Department allocation basis was percentage of gross patient services revenue, Human Resources was percentage of salary and wage expenses, and Occupancy was percentage of total square feet.

The RVU methodology then allocated the assigned indirect costs down to each type of procedure performed in the direct department. This was done using the percentage of direct costs that the particular procedure represented. With \$520, 000 of total direct costs for all personnel and equipment in the cast room (principally the cost of labor, supplies, and equipment) and \$280, 800 of hospital indirect costs allocated to the cast room, the indirect-to-direct cost ratio was 54%. Shah summarized all the charge and RVU methodology cost data in a single table (see Exhibit 12).

Cast Room: Time-Driven Activity-Based Cost (TDABC) Analysis

In parallel with collecting BCH charges and RVU cost data, Shah organized a series of processmapping meetings with Orthopaedic surgeons, residents, nurses, cast technicians, and other personnel. Expert groups, consisting of personnel relevant to each step of the casting process, met to create

maps for treating cast-room patients. These expert groups identified the resources involved in each step of cast application and the resource times for each. Although Shah and his project team measured times for some process steps using a stopwatch, expert opinions proved more reliable due to significant time variation within their small sample. Exhibit 13 shows the process maps for applying and removing the three types of casts. Shah interviewed technicians to learn about the quantity and costs of materials used in the three types of casts. He then multiplied the quantities by the unit-supply costs to generate the data in the following table:

Finally, Shah surveyed the Orthopaedic surgeons to determine how much time they spent delivering patient care, educating students, performing research, and doing administrative work. He performed similar time estimates for the cast room technicians and other personnel. For the costing component, Shah worked with the Finance Department to gather the relevant information for the cast room personnel. He allocated indirect costs using an indirect-to-direct cost ratio of 54%, which was consistent with the existing RVU methodology. A more detailed TDABC approach would have required additional process mapping and significant personnel costing within each major hospital support department.

Shah summarized all the process time and cost data in an Excel spreadsheet (see Exhibit 14) and began to calculate the TDABC costs and margins for the three types of casts.

The Way Forward

Meara, Waters and Shah met to review the findings of their respective TDABC pilot projects. The studies had shown considerable differences between the costs and margins calculated by the TDABC approach and those produced by the Foundation's and hospital's existing cost systems. Dr. Meara and his team wondered about the causes of the discrepancies. As the discussion continued, Meara suddenly realized that one of his patients had failed to show for an appointment. He wondered whether he could measure the costs associated with these frequent "no-shows." Shah and Waters confirmed that Orthopaedics also experienced scheduling and communication problems, especially when they received incomplete clinical information about a patient.

For example, when the Emergency Department transferred a patient with a wrist fracture but with incomplete information on necessary X-rays or casting orders, patient service representatives, nurses and physicians in Orthopaedics had to make multiple phone calls to resolve the confusion. This was more likely to occur for complex patients or patients coming from distant locations. While the costs of incomplete information were not currently tracked, Shah noted that a preliminary TDABC analysis had showed about \$100 of costs incurred to clarify the miscommunication whenever an X-ray was ordered with incomplete information. In addition, the patient experienced delays in treatment for the fracture.

As the meeting closed, Meara re-stated his belief that innovative payment models could not be implemented with poor costing information:

With reimbursement models, such as bundled payments, you will be burned if you don't know your costs. How can you offer a bundled all-in price if you don't know what your procedures truly cost and what drives those costs?

Waters and Kasser contemplated how they could use bundled payments for fracture care: We would like to get to the point where we could negotiate with payors for a fair and competitive price for treating fractures in all our centers. Our goal would be to deliver high quality care, over the patient's entire care cycle, with few complications, better outcomes for patients and overall lower cost for Massachusetts payors.

As they prepared for an upcoming meeting of the Enterprise Costing Workgroup, a multidisciplinary team representing multiple hospital and clinical departments, Meara and Waters considered what to recommend.