
A Learning Community to Measure and Improve Costs and Outcomes for Joint Replacements

Executive Summary

Overview: The Institute for Healthcare Improvement (IHI) invites you to participate in a learning community of provider organizations to measure and improve costs and outcomes for knee and hip replacements, with the aim of ensuring high-value care. Faculty from Harvard Business School will teach organizations how to measure their costs of care using Time-Driven Activity-Based Costing (TDABC), while IHI faculty will coach organizations on continuous improvement, rapid-cycle testing, and outcomes measurement (including both clinical and patient reported outcomes). While focusing on hip and knee replacement, participants will learn and adapt a methodology that can be broadly applied to other procedures and serve as a precursor for bundled payments.

Timeline: The learning community will run from January 2014 through December 2014. The first in-person meeting will occur on **Thursday, January 9, 2014**, in Boston, MA and will cover how to apply the TDABC methodology and how to begin implementing outcome measures. The cost and outcomes measurement work will take place from January through early spring 2014 to establish the measurement framework and obtain baseline outcome data. A second in-person meeting will occur in spring 2014 to explore the reasons for variation in outcomes among the participants and learn how top-performers achieved their results, and then performance improvement will occur in the summer and fall of 2014.

Participation Criteria: Participation in the learning community will be limited to approximately 25 organizations. Organizations interested in the learning community will need to complete the accompanying letter of intent. To be eligible for participation, organizations must perform at least 200 joint replacement procedures per year based on Medicare volume, indicate senior-level commitment to improving the value of their care, and staff the requisite project team. Letters of intent will be accepted on a rolling basis through **December 31, 2013**.

Program Fee: \$24,500 per participating hospital and affiliated orthopedic surgeons

Contact: If you have questions about this program, or are interested in learning more, please contact IHI Project Coordinator, Kayla Devincentis at kdevincentis@ihi.org.

Why Participate?

Increasing value, understanding costs, and developing alternate payment models are critical skills for the new health care environment. By reducing the average cost of just this procedure by even 5%, a hospital would recoup the program fee with the savings from fewer than 40 procedures.¹ Major joint replacement or reattachment of the lower extremity (MS-DRGs 469 and 470) is the most common condition in the Medicare population, and accounts for the highest total Medicare episode payments (6.3%).² It is predicted that by 2030, the number of primary total knee replacements will increase by 673%, to 3.48 million procedures annually, and the number of primary total hip replacements will increase by 174%, to 572,000 procedures annually.³ Once an organization has developed this capability, it can be easily adapted to other procedures and conditions.

Who Should Participate?

The learning community seeks to enroll provider organizations that are committed to improving the value of their care. Organizations will learn the answers to the following questions:

- What is an accurate way to measure the value of care a provider delivers?
 - What does it cost to provide elective joint replacements (hips and knees) over the full care cycle, from consent for surgery through post-surgical follow-up?
 - What outcomes should a provider track, and how should they be measured?
- How do the costs and outcomes from my organization compare with those from a range of other provider organizations, and what is the most cost-effective way to deliver exceptional outcomes at the lowest cost?
- What specific changes in the design and delivery of care will allow a provider organization to take out avoidable cost while maintaining or even improving care quality and outcomes?
- How can an organization leverage cost and outcomes data to develop models for bundled payments?

¹ This assumes that the costs for the average hospital are about equal to the average Medicare reimbursement for primary knee and hip replacements without complicating complications, which was approximately \$15,000 in 2011. CMS. Medicare Provider Charge Data: Inpatient [Internet]. 2013 [cited 2013 Jul 18]. Available from: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Inpatient.html>

² American Hospital Association and Association of American Medical Colleges, "Medicare Payment Bundling: Insights from Claims Data and Policy Implications," 2012.

³ Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am*. 2007 Apr;89(4):780-785.

Program Components and Timing

Learning across the year will be organized as described in the table below.

Month:	1	2	3	4	5	6	7	8	9	10	11	12
Measure costs using Time-Driven Activity-Based Costing (TDABC)												
Analyze outcomes data and agree on a common set of outcomes measures												
Review data and establish improvement targets												
Generate improvements to increase value												

Measure Costs Using TDABC Methodology

Providers will learn to measure their underlying costs of delivering care using Time-Driven Activity-Based Costing (TDABC), which was co-developed by Harvard Business School Professor Robert S. Kaplan.⁴

After utilizing TDABC in a wide range of other industries, Professor Kaplan began applying this costing tool to health care three years ago. Since then, several leading hospitals in the US and Europe have used it to measure their costs of care for joint replacements, including Connecticut Joint Replacement Institute at Saint Francis Hospital, Mayo Clinic, Schön Klinik in Germany, University of California San Francisco Medical Center, and University of Pittsburgh Medical Center. The learning community will build on these experiences to provide participants with a template to do the costing work. The learning community will ask participants to measure their costs using the following steps:

- **Stage 1:** During the first few weeks, providers will perform the costing for a small portion of the care cycle. They will provide these initial results to the learning community sponsors for guidance and feedback.
- **Stage 2:** During the second stage, providers will complete their drafts of the costing for both hip and knee replacements, with the goal of developing one average process for the organization or for one physician for each type of replacement. The learning community sponsors will provide feedback on the drafts of the full cost models.
- **Stage 3:** During the third stage, providers will refine and validate the costing. Providers who wish to understand how the costs vary by physician in their organization will account for this variation during this phase.

Throughout all the stages, participating organizations will have access to a variety of support and learning opportunities. The learning community sponsors will conduct periodic calls with all of the

⁴ Kaplan RS, Anderson SR. Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits. Harvard Business Review Press; 2007.

participating organizations to provide feedback and guidance. The learning community sponsors will also provide feedback one-on-one to participating organizations. For a full list of community sponsors, please see **Appendix A**.

For additional detail on the costing analysis, including a simplified version of a process map for an office visit, see **Appendix B**.

Analyze Outcomes Data and Agree on a Common Set of Outcomes Measures

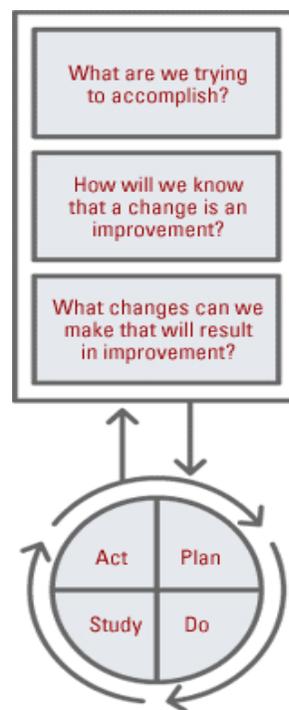
The best way to reduce costs is to improve quality. To achieve cost reduction, organizations must measure, understand, and manage variation of clinical processes that underlie care treatment.^{5,6} Participants will apply the “outcome hierarchy” introduced by Harvard Business School Professor Michael Porter to hip and knee osteoarthritis treatment. In addition, participating sites will compare their current measurement strategies, for example, information from the National Surgical Quality Improvement Project. Participants will work together to define a common set of patient-reported outcomes that should be measured and agree on a data collection approach and reporting structure. Outcomes data from participating institutions and physicians will be analyzed to define areas of excellence as well as areas for improvement. The results from outcomes measurement will serve as a starting point for performance improvement work within the learning community. The collection of these measurements will provide participants with a view of performance that can be adapted to other conditions.

Review Data and Establish Improvement Targets

Once participating organizations understand their cost structure and have a coherent view of their desired outcome measures, the community will turn its focus to improving performance. The Institute for Healthcare Improvement (IHI) has spent the last 20 years working with organizations to improve care processes and patient outcomes through transparency and shared learning. Participants will apply the Model for Improvement (MFI), IHI’s improvement methodology, to accelerate change in their local environment and learn to embed improvement into their day-to-day work.

Aims (What are we trying to accomplish?): Aims are time-specific, measurable, and focused on a specific population. During the initiative, participants will set aims for cost reduction and outcome improvements.

Measures (How will we know that a change is an improvement?): Change and improvement don’t always go hand in hand, so teams will specify how they will



⁵ James BC, Savitz LA. How Intermountain Trimmed Health Care Costs Through Robust Quality Improvement Efforts. *Health Affairs* 30. No. 6 (2011).

⁶ Clark DS, Savitz LA, Pingree SB. Cost Cutting in Health Systems Without Compromising Quality Care. *Frontiers of Health Services Management* (2010).

use measures to gauge their progress toward their desired outcomes. Improvement ideas are tested through the use of sequential observable “plan-do-study-act” cycles, and participants gather “just enough” data to understand if the changes are leading to improvement. Improvement focuses on small tests of big changes, rather than big tests of small changes, and successful changes are rapidly scaled up.

Improvement Ideas (What changes can we make that will result in improvement?): Change ideas represent our best current theory about which improvements will allow participants to reach their aims. We often develop driver diagrams to represent the change ideas and their relationship to each other. As more is learned, driver diagrams evolve to encompass new insights.

For an example of a driver diagram from IHI’s Cost & Quality initiative, see **Appendix C**.

Generate Improvements to Increase Value

Through decades of facilitating ambitious improvement initiatives, the sponsors have confirmed the value of collaborative learning in accelerating teams’ progress.⁷ Transparency of testing and results is a hallmark of these designs, and often participants learn to relate to each other as a powerful “brain trust” of improvement partners.

Stage 1: Identify high-value practices. IHI will work with organizations in the learning community to identify practices at each level of the care process that deliver notable value. High-value practices will be determined by analyzing both costs and outcomes.

Stage 2: Engage in the learning system. Participants will be part of a learning community of organizations focused on sharing insights from the data, identifying and testing changes based on high-value practices. The learning community will be supported by subject matter experts, such as orthopedic clinicians and change management experts. Within the learning community, participants will:

- **Identify change opportunities from high-value practices.** IHI will facilitate in-depth discussion of the high-value practices identified. From this discussion, participants will be able to identify approaches that they can test and adapt to their local settings.
- **Share lessons from testing the application of high-value practices.** IHI will provide coaching on how to test approaches in the local setting using improvement methods, for example, the Model for Improvement. Participants will share what has or has not worked for them at the local level and undertake shared problem-solving.

The learning system includes the following elements:

- **Monthly all team calls** will provide an opportunity for shared learning, networking, and refinement of action plans;
- **1:1 coaching calls** will be held with individual teams as needed to ensure a rapid pace for testing and to troubleshoot any barriers encountered;

⁷ *The Breakthrough Series: IHI’s Collaborative Model for Achieving Breakthrough Improvement*. IHI Innovation Series white paper. Boston: Institute for Healthcare Improvement; 2003. (Available on www.IHI.org)

- **An email distribution list (project listserv)** will be created to provide a virtual discussion space for participating organizations to ask questions of one another; and
- **Site visits** may be organized to high-value facilities to see first-hand their patient-care pathways for total joint procedures.

Timeline

September – December 2013

Letter of intent submissions and organization selection: The learning community sponsors are seeking a diverse range of applicants to ensure that learning is captured from different types of facilities. The goal is to include a mix of academic centers, community hospitals, urban and rural facilities, and participants from multiple countries. Applicants will be selected based on their hospital demographics and their demonstrated personnel and financial commitment. The letters of intent will be reviewed and accepted on a rolling basis. The final deadline for participation will be December 31, 2013, or when the program has reached capacity.

Informational calls: Two informational calls will be held for organizations that are interested in learning more about the learning community. The first one will be held on **October 1, 2013 from 1:00 – 2:00 PM EST** and the second will be held on **October 30, 2013 from 3:00 – 4:00 PM EST**.

Pre-work: All organizations are encouraged to enroll at least one month prior to the in-person training to allow time for required pre-work. The learning community sponsors will be available to begin work and training with organizations upon enrollment. If organizations choose to start work prior to January 2014, they will receive support from the learning community sponsors in pre-work completion and analysis.

January 2014

Launch Webinar: There will be a webinar in early January, prior to the Project Team In-Person Training, to provide an overview of the learning community to participating organizations. The webinar will be recorded and available for people who cannot join.

Project Team In-Person Training: On **January 9, 2014**, there will be a full-day training session in Boston, MA. The project leader and finance lead from each participating organization is expected to attend. Organizations are allowed to send one additional person. The training session will cover how to apply the TDABC methodology and how to begin implementing the selected outcomes measures. Please note that, while meals will be provided during the training day, travel and lodging costs are not included within the program fees.

February – April 2014

Cost and Outcomes Measurement: Organizations will complete the cost measurement work, and will provide their outcomes data for analysis. Calls will be held with all participating organizations every 1-2

weeks to provide additional guidance and answer questions. Organizations will also receive feedback on their work from the learning community sponsors.

April – May 2014

Data Synthesis: During April and May, the learning community sponsors will synthesize and analyze the cost and outcomes data provided by each of the participating organizations. During this time period, the sponsors will conduct follow-up calls with each of the participating organizations to better understand their data, and to help identify and validate performance improvement opportunities.

Cost and Outcomes Results In-Person Meeting: At a to-be-determined date in May 2014, there will be an in-person meeting in Boston to discuss the results of the cost and outcomes measurement work, and to help participating organizations develop and prepare to execute their performance improvement plans.

June – October 2014

Performance Improvement: The learning community sponsors will work with the participating organizations to move toward actual testing of improvements, and to help with implementation and scale-up of locally successful solutions. In addition to monthly all team calls, project faculty will be available for calls every few weeks with the participating organizations to provide coaching on strategies for accelerating change.

November – December 2014

Re-Measure and Synthesize: Organizations will re-measure their outcomes and costs to see how much they have improved the value of their care during the program.

Participation Requirements

Senior Leadership Support: Senior executive commitment is vital to the success of this program. This person needs to ensure that the relevant clinicians, finance people, and administrators participate fully in the analysis and improvement activities.

Project Team: The project team for this work typically consists of a project leader, a physician adviser, a financial analyst, and a clinical operations/performance improvement representative.

- **Project Leader:** The project leader will be the primary point of contact with the learning community. The project leader should be skilled at managing projects in both clinical and financial areas. The project leader need not have deep experience with joint replacements.
- **Physician Adviser:** The physician adviser's role is to be a champion for the project with clinicians so they are excited to participate, and to provide the physician's input into the costing, outcomes and performance improvement.

- **Financial Analyst:** The financial analyst is in charge of assembling the necessary information to develop the capacity cost rates for each type of clinician, and other key inputs into the financial model, such as average lengths of stay, inpatient nursing staffing ratios, transfusion rates, etc.
- **Clinical Operations/Performance Improvement:** This person is in charge of helping to arrange meetings with the relevant people and capturing potential ideas for performance improvement. The project leader could play this role, depending on how familiar he or she is with the relevant people and processes involved in the care delivery.

It is expected that the work will take an average of 5-10 hours per week of the project leader's time, 1-2 hours per week of the physician adviser's time, 5-10 hours per week of the financial analyst's time, and about 3-5 hours per week of the clinical operations/performance improvement representative's time. As organizations begin the performance improvement work, it is expected that the above allocation will change slightly to allow more support from the performance improvement representative. The amount of time required will depend on how easy it is to schedule meetings with the relevant range of clinicians, the ease with which the financial information can be accessed, and whether the organization is interested in accounting for physician variation in the costing. The project team will also need a modest amount of time over the course of the project from a range of the clinicians involved in the care cycle to gather their input.

Data Sharing and Confidentiality Standards: Within the learning community, organizations will be expected to share with one another the set of activities involved in the care cycle, the type of resources (people, supplies, drugs, etc.) involved in performing each activity, how long it takes to perform each activity, the total costs using standardized cost rates provided by the learning community sponsors, and the outcomes achieved. Participating organizations will be expected to allow IHI and the program faculty to publicly use and disclose the following information: the names of the participating organizations, data from individual organizations as long as it is reasonably de-identified, and analyses and summaries of the data in aggregate across all or many of the participating providers (e.g., comparisons of US to international organizations). Any organization-specific data that is not de-identified would only be shared publicly after approval by that organization.

Program Fee: The program fee per participating organization is \$24,500. This fee covers the participation of one hospital and the clinical team that performs joint replacements there (including physicians even if they are not part of the hospital organization). An organization can have up to two affiliated or subsidiary hospitals participate, but the organization must pay the program fee per participating hospital.

Application Process

Organizations that are interested in participating in the learning community should submit the accompanying letter of intent to kdevincintis@ihi.org by December 31, 2013. Letters of intent will be reviewed and accepted on a rolling basis. The learning community sponsors plan to limit enrollment in the learning community to approximately 25 organizations; thus, organizations are encouraged to apply

well before the December 31, 2013, deadline. Organizations will be selected based on the strength of their applications, with an eye towards having a diverse group of organizations represented.

Two informational calls will be held for organizations that are interested in learning more about the learning community. The first one will be held on **October 1, 2013 from 1:00 – 2:00 PM EST** and the second will be held on **October 30, 2013 from 3:00 – 4:00 PM EST**.

Contact

If you have questions about this program, or are interested in learning more, please contact IHI Project Coordinator, Kayla Devincentis at kdevincentis@ihi.org.

Appendix A: Core Faculty

Derek Haas, MBA, is a Senior Project Leader at Harvard Business School (HBS). At HBS he works with health care providers to help them better measure and manage their costs, and he also teaches in executive education courses related to value management in health care. He has previously worked on the staff of the President's Council of Economic Advisers, advised the Massachusetts Office of the Inspector General on a range of health care policy issues, consulted with Bain & Company where he focused on performance improvement, and partnered with the Massachusetts Association of Chamber of Commerce Executives to launch the Chamber Health Coop to make health insurance more affordable for small businesses. Mr. Haas holds a MBA and a BA in Economics from Harvard University, where he was elected to Phi Beta Kappa.

Anila Hussaini, RN, MPH, Project Director, Institute for Healthcare Improvement (IHI) is the operations lead for IHI's national initiative on reducing surgical site infections for hip and knee replacements. At IHI, Anila leads the operations of the Patient Safety Executive Development Program and manages relationships with strategic clients aiming to improve safety within their organizations. Anila's interest in quality improvement began when she traveled to Lesotho and led a quality improvement initiative to implement the first triage system in the country's largest district hospital. Previously, Anila worked as a Registered Nurse at Children's Healthcare of Atlanta and as a Clinical Research Coordinator at the Boston University School of Medicine, where she coordinated clinical trials focused on scleroderma and lupus. Ms. Hussaini holds a BSN from Emory University and a MPH in International Health from Boston University School of Public Health.

Robert S. Kaplan, PhD, is the Marvin Bower Professor of Leadership Development, Emeritus, at the Harvard Business School. He joined the HBS faculty in 1984 after spending 16 years on the faculty of the business school at Carnegie-Mellon University, where he served as Dean from 1977 to 1983. Kaplan received a B.S. and M.S. in Electrical Engineering from M.I.T., and a Ph.D. in Operations Research from Cornell University. He has received honorary doctorates from the Universities of Stuttgart (1994), Lodz (2006), and Waterloo (2008).

Professor Kaplan's research, executive education teaching, and consulting focus on linking cost and performance management systems to strategy implementation. Kaplan was co-developer of both activity-based costing and the Balanced Scorecard. He has authored or co-authored 14 books and more than 150 papers, including 23 in *Harvard Business Review*. Recent books include *The Execution Premium: Linking Strategy to Operations for Competitive Advantage*, the fifth Balanced Scorecard book co-authored with David Norton, and *Time-Driven Activity-Based Costing* with Steve Anderson.

Kevin Little, PhD, Improvement Advisor, Institute for Healthcare Improvement (IHI), is a statistician specializing in the use of information to study, understand, and improve system performance. His experience in application of statistical methods includes direct work with scientists and engineers in a range of disciplines. He has also coached improvement teams in a range of industries. Dr. Little served as Improvement Advisor to the National Health Disparities Collaboratives from 2001 to 2006, and to IHI's

Hospital Portfolio of projects from 2010 to 2012. Recently, he worked on the measurement strategy for the Healthier Hospitals Initiative and led a pilot to improve physician communication behaviors.

Katharine Luther, RN, MPM, Vice President, Institute for Healthcare Improvement (IHI), is responsible for furthering IHI's work to help hospital leaders and staff achieve bold aims. Key to this work is developing strategic partnerships that leverage innovation, pilot testing, implementation, and continuous learning across organizations, systems, professional societies, and entire countries. Previously, she served as Executive Director at IHI, designing new programs to impact cost and health care quality. Ms. Luther has over 25 years of experience in clinical and process improvement, focusing on large-scale change projects and program development, system improvement, rapid-cycle change, developing and managing a portfolio of projects, and working with all levels of health care staff and leaders. Her clinical experience includes critical care, emergency room, trauma, and psychiatry. Prior to joining IHI, she held leadership positions at the University of Pittsburgh Medical Center, MD Anderson Cancer Center, and Memorial Hermann–Texas Medical Center. She has experience in Lean and is a Six Sigma Master Black Belt.

Lucy Savitz, PhD, MBA, is the Director of Research and Education, Intermountain Health Care, Institute for Healthcare Delivery Research, Salt Lake City, Utah. Dr. Savitz has over two decades of applied health services research experience with a focus on the implementation and evaluation of clinical process innovations. Her applied research in diabetes, cardiovascular disease, and mental health service delivery improvements is supplemented by her hands-on experience in making the business case for quality. She served for two years as a Malcolm Baldrige National Quality Award Program Examiner. Her research background is complemented by her work as a financial planner for a health system together with longstanding involvement with the CDC Management Academy, contributing a rich, multifaceted perspective on innovation and spread of mental health integration.

Sam Wertheimer, MPH, is a Research Associate at the Institute for Strategy and Competitiveness. His work includes implementing and scaling Time-Driven Activity-Based Costing, and helping health care providers transition to new payment methodologies. Previously, he was a researcher with RAND Health in Santa Monica, CA, where he focused on domestic health policy and health services delivery. He has published work on performance measures, quality improvement, and the relationship between cost and quality, and has expertise in qualitative program evaluations and survey research methods. Sam earned an MPH from The Dartmouth Institute for Health Policy and Clinical Practice and a BA from Stanford University.

Orthopedic Surgeon Faculty Advisors

Kevin Bozic, MD, is Professor and Vice Chair in the Department of Orthopaedic Surgery and a member of the core faculty of the Philip R. Lee Institute for Health Policy Studies at the University of California, San Francisco (UCSF). Dr. Bozic is a graduate of the UCSF School of Medicine and the Harvard Combined Orthopaedic Residency Program. Additionally, he holds a Bachelor of Science degree in Biomedical Engineering from Duke University and a Masters of Business Administration from Harvard Business

School. Dr. Bozic has fellowship training in Adult Reconstructive Surgery from Rush University Medical Center in Chicago.

Dr. Bozic's clinical interests are in adult reconstructive surgery of the hip and knee, with an emphasis on primary and revision hip and knee replacement. His research interests are broadly in the fields of health policy and health care services research, and specifically in the areas of healthcare technology assessment, cost-effectiveness analysis, shared medical decision making, and the impact of healthcare reform on cost and quality. In addition to his clinical and research activities, Dr. Bozic is actively involved in numerous regional and national health policy initiatives, including the Agency for Healthcare Research and Quality's (AHRQ) Effective Healthcare Stakeholder Group, the Integrated Healthcare Association's Value Assessment of Medical Technologies Program, and the California Health Care Foundation's California Joint Replacement Registry Project.

Dr. Bozic also holds both regional and national leadership positions, as President of the California Orthopaedic Association, Board of Trustees of the Orthopaedic Research and Education Foundation (OREF) and the Board of Directors of the American Joint Replacement Registry (AJRR), and as Chair of the American Academy of Orthopaedic Surgeons (AAOS) Council on Research and Quality.

Dr. Bozic has been the recipient of numerous awards and honors, including the Orthopaedic Research and Education Foundation's Clinical Research Award, the American Academy of Orthopaedic Surgeon's Clinician-Scientist Traveling Fellowship Award, the American Orthopaedic Association's American-British-Canadian Traveling Fellowship, the American Association of Hip and Knee Surgeon's James A. Rand Young Investigator Award, and the Orthopaedic Research Society's William Harris Award.

Since arriving at UCSF, Dr. Bozic has received extramural funding for his research from the OREF, AHRQ, National Institutes of Health (NIH), Robert Wood Johnson Foundation (RWJF), and the California HealthCare Foundation.

Anthony DiGioia, MD, is the Medical Director of The Orthopaedic Program and The Innovation Center at Magee-Womens Hospital of the University of Pittsburgh Medical Center (UPMC). He is a practicing orthopaedic surgeon at Renaissance Orthopaedics, PC, located at Magee-Womens Hospital of UPMC, and an engineer by training. He developed the Patient- and Family-Centered Care (PFCC) Methodology and Practice, which combines the art and science of performance for health care and is an innovation in the process of care delivery that dramatically improves patient outcomes, quality, safety, and efficiencies, and reduces costs while delivering exceptional care experiences. Dr. DiGioia collaborates with caregivers and health care leaders to export the PFCC Methodology and Practice for any care experience, anywhere.

Appendix B: Time-Driven Activity-Based Costing Example for an Office Visit

Applying TDABC requires two steps. In Step 1, you define the care delivery process by identifying all of the activities that are involved in the care cycle, identify who performs each activity, estimate how long it takes to perform each activity, and determine the probability that each activity will be used in a patient’s care cycle. In Step 2, you calculate the cost per unit of time for each type of personnel involved in the care cycle. The total cost of the care cycle can then be calculated by multiplying each personnel type’s cost rate by the time that personnel type spends performing each activity, and then summing across the activities in the care cycle.

A simplified version of a process map for an office visit is shown below, with the numbers in the gray circles representing the average amount of time in minutes each activity takes. In the table below are illustrative capacity cost rates that have been calculated for each of the different type of personnel.



	Physician	Registered Nurse	Ambulatory Service Rep	Clinical Assistant
Annual Cost (fully loaded)	\$522,720	\$134,550	\$89,700	\$71,760
Annual Clinical Minutes Available	87,120	89,700	89,700	89,700
Capacity Cost Rate (\$/min)	\$6.00	\$1.50	\$1.00	\$0.80

The total cost of the office visit is then calculated.

Activity	Personnel	Minutes	Capacity Cost Rate	Allocated Cost (\$)
Patient chart prep, check-in	ASR	6	\$1.00	\$6
Prep, take to room, height and weight	Clinical Assistant	5	\$0.80	\$4
Take history, new patient documentation	Registered Nurse	20	\$1.50	\$30
Consult with MD	Physician	22	\$6.00	\$132
Check-out	ASR	5	\$1.00	\$5
Total		58		\$177

TDABC can be used to calculate non-personnel costs as well, but for simplicity this learning community will focus on calculating personnel costs, which are the largest component of provider costs. The learning community will ask participants to measure their costs using the following steps:

- **Care Delivery Process:** Multidisciplinary teams representing the different types of clinicians who are involved in the care cycle will meet to depict the process for the average patient, with alternative pathways allowed for processes that depend on specific patient characteristics. The intent is to restrict analysis to patients without complicating co-morbidities or serious risk factors. If elements of the care delivery process, such as lengths of time or probabilities, vary by physician, an organization can choose to determine the care cycle costs by physician. It is usually simplest and accurate enough to use clinician estimates for most of the activity times, but time stamps from the OR, PACU, etc., can be used to supplement these estimates. Similarly, most of the probabilities can be estimated, but for some, such as transfusion rates, percent of patients discharged to post-acute care, etc., actual data is preferable when readily available.
- **Capacity Cost Rates:** Calculating the capacity cost rates involves determining the average fully loaded cost and the average clinical minutes available per year by type of clinician. Determining the fully loaded costs by type of clinician requires data on compensation and benefits. Determining the average clinical minutes available requires an estimate of the average number of days per year and the average number of minutes per day each type of clinician is available for performing patient care, excluding time spent in research, teaching, and administration. The capacity cost rates are usually calculated as averages for each type of clinician, although they can be calculated by physician if the organization wishes to evaluate costs by physician.
- **Non-Personnel Costs:** While the focus of the costing work will be direct personnel costs, organizations will be asked to provide their existing allocation/estimates for materials, supplies, and indirect costs for joint replacements, and to explain how those numbers were developed.
- **Patient Characteristics:** In order to help facilitate an informed comparison of the results, organizations will prepare summary statistics on their patient populations, e.g., average age, gender, ASA score, etc.

Appendix C: Driver Diagram from IHI's Cost & Quality initiative

A driver diagram is a pictorial display of a system and can be used as a method for breaking down problems and formulating strategy and actions. The driver diagram below is from IHI's Cost & Quality initiative. Please note, the Cost & Quality initiative had a broad scope and the driver diagram below would need to be adapted for the joints learning community.

