

## From the Director

*Exchange*, a publication from the Medical Industry Leadership Institute features dialogue on medical industry research and application. The content is a summary of research from both academia and the medical industry, followed by commentary on the importance of the research and its application. Topics highlighted in *Exchange* will span all sectors of the medical industry and include commentary from leaders in the field as well as researchers from the University of Minnesota and other academic institutions.

This issue highlights research done by Carlson School of Management researcher Rachna Shah, assistant professor of operations and management science. Shah received her PhD in operations management and her MBA from the Fisher College of Business, Ohio State University. Shah recently completed a study with Susan Meyer Goldstein, associate professor in operations and management science at the Carlson School, and Barbara Unger and Timothy Henry from the Minneapolis Heart Institute Foundation, Abbott Northwestern Hospital. Their paper, "Explaining Anomalous High Performance in a Health Care Supply Chain" appeared in *Decision Sciences* Vol. 39, No. 4 in November 2008 (759-89) and is the highlight of this issue of *Exchange*.

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## Studying High Performance in a Health Care Supply Chain

In this study, Shah and fellow researchers examined work design and its improvement in a unique setting—a health care supply chain that delivers patient care services.

### Background & Setting

Typically, supply chains consist of a central (focal) organization, which uses financial or contractual means to enforce participation among its sub-organizations. Absence of financial and contractual arrangements, as in this study, gives little incentive for independent organizations to coordinate their process improvement activities.

Shah and her team wanted to uncover why independent health care organizations would choose to coordinate and collaborate in a process improvement effort. They focused on ST elevation myocardial infarction (STEMI), the most serious type of heart attack having a high mortality rate and requiring time sensitive treatment options. STEMI occurs in nearly one million Americans annually and nearly half of those affected die before reaching a hospital. The preferred treatment is a percutaneous coronary intervention (PCI), which needs to be performed as quickly as possible, ideally within two hours, to avoid permanent heart muscle damage. This time window is particularly challenging when patients must be transported via ground or air ambulance from a community hospital without PCI services, to a hospital with

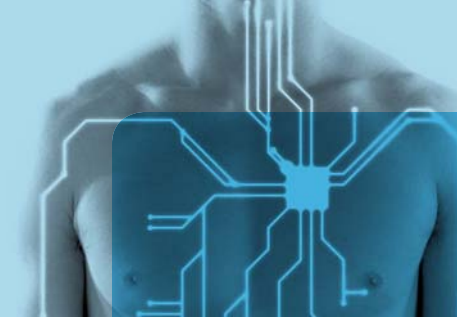
this service. (PCI is available in only 23 percent of U.S. hospitals.)

Shah and the research team selected The Minneapolis Heart Institute (MHI) at Abbott Northwestern Hospital in Minneapolis due to the remarkable performance outcomes it achieved through process improvement. STEMI performance is assessed by two related process outcome measures: a process throughput time, called time to balloon, of less than two hours and a minimized patient mortality rate. At MHI, for patients transferred from other hospitals, the process time goal is achieved for 80 percent of patients transported fewer than 60 miles and 50 percent of patients transported 60-210 miles, compared to only 10 percent for U.S. hospitals, on average. MHI's in-hospital patient mortality rate of 4.4 percent is significantly lower compared to 8-15 percent in most U.S. hospitals. Medicare recently recognized MHI for having one of the lowest heart attack mortality rates of all U.S. hospitals.

### Methods

The research team wanted to examine the process in which patients are transported from a community hospital

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to a regional treatment center (MHI) with no financial exchange between the organizations. This process can include as many as four independent organizations (local ambulance, community hospital, ground/air transporters, and MHI). Shah was able to explain the process improvement and superior performance of the MHI study using a well-established lean production philosophy of streamlining work while eliminating waste, and an abductive reasoning approach to characterize the observed process improvement.

Shah and her fellow researchers found that all four lean principles (standardized work, seamless linkages, simple and direct pathways, and process improvements based on scientific methods) were present in the studied process improvement undertaken by MHI and its partners. The researchers also used the abductive inference approach in the study. It began with a set of facts and then derived the most likely explanation. Starting with a real-life observation, in this case one hospital based care process far outperforming others; researchers undertook an in-depth study to make sense of the observed process and performance without prior adherence to any particular theory.

The data were collected primarily using three methods: interviews, direct observation of the process, and analysis of MHI's patient database related to the studied process. The researchers also reviewed medical literature in order to understand the patient population, available treatments, and comparable performance outcomes. Study methods were repeated over a two-year period.

MHI undertook a major process improvement project to better the multi-organizational process of treating STEMI patients. As a first step toward process improvement, MHI removed treatment decisions by specifying that PCI would be used in all cases. Unless the patient requested a different hospital, all eligible patients would be transported directly from partner community hospitals to MHI. Paired with the elimination of treatment decisions was the elimination of a now unnecessary requirement where the community hospital physicians had to request permission from MHI

to send a patient to them. Eliminating this step eliminated delay.

The second step of the process improvement project directly addressed treatment delivery decisions. A new treatment protocol was designed by MHI physicians, the project leader, and a team of other personnel (nurses, helicopter pilots, etc). This highly specific treatment protocol addressed each process task at the community hospital, during transport, and at MHI. All stakeholders received specific training and MHI gave ongoing patient-specific feedback to community personnel to solidify learning related to the treatment process.

In this new protocol, all process tasks are highly specified; all necessary drugs and supplies are packaged in an easily accessible kit, which also includes a checklist of all protocol activities. Patient related data are recorded on a one-page form that stays with the patient throughout the process. They also eliminated most of the information transfer steps, from more than 100 inter-organizational contacts to only three points saving valuable time.

## Findings

This study examined the implementation of lean principles in a health care service environment that had an immediate and unpredictable demand—the timing or the number of heart attacks for any given hospital. In addition, once a heart attack begins, treatment cannot be delayed without adverse effects to patient health. The results found by researchers clearly suggest that lean principles can be used successfully in a health care service process. Even without contractual or financial incentives, this supply chain was able to work on shared goals. These goals allowed employees to more strongly identify with their role in the larger health care delivery process. Also, as they understood the different jobs required to make the process successful, the employees gained a shared knowledge and respect for each other's work. Employees at each of the studied organizations wanted to help one another in their work for the benefit of the global (entire supply chain) rather than local (organizational unit), which ultimately will provide the best care to patients.

The studied supply chain created by MHI has delivered significant improvements in process cycle time and patient mortality. While patient-based performance measures have improved significantly, individual supply chain members have had to absorb various types of risk. Community hospitals had loss of revenue due to not admitting STEMI patients and MHI has seen increased overtime costs. Still, neither has reduced their participation because of the shared goals of saving lives and improving long-term results for patients.

This study demonstrates that standardized work can be used to deliver health care services, which subsequently leads to superior performance. Additionally, even in absence of financial and contractual arrangements, independent organizations can be engaged in process improvement if they share a common goal. Such “psychological contracts” may be a defining characteristic that will enable independent organizations in a supply chain to implement process improvement initiatives successfully.

## Commentary



*By Rabul Koranne, MD, MBA, FACP, Medical Director,  
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The study validates a fact that is gaining increasing recognition—healthcare industry needs to learn from other industries that have long studied and implemented best practices such as lean. The timing of this study is apt, considering the transformational reform being undertaken by the state of Minnesota and the reform debate coming to a head at the federal level. 2010 and the next few years promise to be historic in the healthcare industry with major redesign occurring in both care delivery systems and payment methodologies.

The study is especially pertinent to independent entities and how they relate with each other across the continuum of care. While many economic and regulatory forces are pushing different care delivery sites to integrate, many still remain largely independent, especially in rural areas. A body of knowledge is emerging on how to best manage transitions in care across settings to achieve optimal results. A useful model to analyze value creation across the healthcare supply chain is the Institute of Healthcare Improvement’s triple aim, which incorporates quality outcomes, cost control, and patient satisfaction into a single paradigm.

Measured quality outcomes, such as the CMS core measures, the MN Community measures, etc. strive to level the playing field for various healthcare providers

such as the hospital or community based providers. This study nicely demonstrates how utilization of lean principles inside and across settings of care can lead to standardization of processes in order to reduce variability from evidence-based best practices. As future metrics of success morph away from site-specific performance towards cross-continuum achievements, the supply chains that have performance improvement occurring within and across sites will be best poised to beat the new quality benchmarks.

The study also discusses an economic analysis of why the various entities along the supply chain might want to connect with each other. A major reason is the second triple aim of cost control, which is spurring national debate and could soon result in federal regulatory changes. Payment reform methodologies being discussed by CMS and MedPAC include bundled payments and Accountable Care Organizations, which would align incentives across the care continuum and necessitate emergence of more formal linkages and/or integration across sites of care. Again, in order for the integrated supply chain to create value, the principles outlined in the paper, would need to become the norms of these new relationships.

The third and last triple aim is patient perception and satisfaction with care. It is important to realize that the patient is an integral member of the care team and the

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- MAY 13** **Game Changing Negotiations in the Medical Industry**  
Lori Abrams, Senior Lecturer, Carlson School of Management
- MAY 26** **Understanding Health Insurance**  
Katherine Baicker, PhD, Professor of Health Economics at Harvard School of Public Health
- MAY 27** **Finding Business Opportunities Through Knowledge of Anatomy and Physiology**  
Jeffrey Hertzberg, MD, president of Medformatics Inc., and adjunct assistant professor at University of Minnesota Medical School.

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one constant across the continuum of care. Satisfaction of healthcare consumers is already being measured rigorously and reported publicly (Hospital Compare, etc.) and will likely be rewarded with pay-for-performance dollars. Patients are more likely to be satisfied if transitions in care across settings are proactively managed according to standard protocols that promote best practices while engaging patients in shared decision making.

Finally, I would like to end with a note about higher values that drive performance. The study explores shared goals and mutual understanding as one explanation of the superior performance achieved by this supply chain. There is great need for healthcare stakeholders (providers, payers, employers, consumers, etc.) to recommit to the mission of the healthcare industry—improving the health of a population. External economic and political winds are likely to continue to rage, but it is organizations that truly care about quality, fiercely act as stewards of the communities' resources, and constantly keep the patients at the center, that will triumph and become the benchmark in the healthcare industry of the future.