# Applying the Toyota Production System to a Healthcare Organization: A Case Study on a Rural Community Healthcare Provider

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*Over the last five decades the Toyota Production System (TPS) has evolved from an advanced socio-technical concept in manufacturing to a participative design for large-scale change management. Toyota has been able to sustain a strategic competitive advantage by applying TPS as a process innovation and intervention, as measured by quality, reliability, productivity, cost reduction, sales and market share growth, and market capitalization. Many organizations are trying to replicate Toyota's success with TPS in their respective business/industry environments. It could be argued that the correlation between the application of TPS as part of organizational strategy and Toyota's documented success in achieving the aforementioned outcomes creates an "industrial engineering paradigm" or "social change intervention" that crosses multiple industries. In this light, TPS can be a powerful intervention technique, even in industries unaccustomed to advanced production techniques such as the healthcare industry. Because the healthcare industry is under enormous pressure to reduce costs, increase reliability and quality, and enhance organizational effectiveness, TPS-like interventions are significant to healthcare organizations. This article captures the process of applying TPS to a healthcare organization. It analyzes the challenges, problems, and outcomes, and addresses remedies for enhancing the success of TPS implementation.*

*Key words: healthcare, patient safety, quality, Toyota Production System*

## INTRODUCTION

Small rural community healthcare providers, in general, have limited access to labor and capital resources compared to their larger counterparts; however, they face the same regulatory pressures from accreditation organizations with regard to quality of care and patient safety. A paradoxical relationship exists between the amount (and changing nature) of regulation that exists within the healthcare environment, and the ability of community healthcare providers to absorb the impact of frequent policy and market changes. This is because such providers generally serve smaller dedicated markets and, because of aging populations, are dependent on federal Medicare program reimbursement. Because that reimbursement is established prospectively (not based on cost), the requirement for providers to effectively manage their cost per patient case is paramount to ensure viable margins. In addition to the challenge of managing costs, community healthcare providers also must be able to offer broad-based healthcare services to the populations they serve. That puts them in a position to manage quality care as well as cost and do so in an environment of intense patient safety compliance concerns.

Community Health Systems (CHS) is one network that is facing these challenges and trying to improve the performance of its rural hospitals through advanced management techniques. Rural community healthcare systems constitute 41 percent of the community healthcare service provided in the United

States (AHA 2006). Heartland Regional Medical Center in Marion, IL, is one of the hospitals in the CHS network that is addressing quality, cost management, and patient safety goals together. This hospital is Medicare dependent (qualifying also as a Medicare disproportionate share hospital) and designated as a "small/rural" provider, according to the Illinois Hospital Association Health Information Department. In preparation for a 2005 accreditation survey, this hospital applied a business-level strategy that not only created a compliant environment of quality care and safety, but also established the foundation for improved margins based on cost control. In this article, the authors capture the application of the Toyota Production System (TPS) as a process innovation/intervention technique in this hospital to improve performance in quality, safety, and cost reduction, and survive accreditation audits.

This article reviews various historical and modern conceptualizations of TPS; traces the significance of TPS in strategy, structural, and cultural interventions; and highlights the role of TPS in establishing control systems and standards. Through this case study on Heartland Regional Medical Center, the authors assess the prerequisites for successful intervention and evaluate the preparedness of rural community healthcare providers to implement TPS. The authors also analyze the regulatory environment within the healthcare industry, and highlight the need for TPS to improve patient safety outcomes. Emphasis is placed on TPS as a participative design (PD) intervention within the healthcare setting. Projects undertaken by the Quality Assurance/Regulatory Compliance Department at Heartland Regional Medical Center also are identified.

# TOYOTA PRODUCTION SYSTEM (TPS) AND ITS APPLICATIONS: A REVIEW

The TPS is a manufacturing philosophy and methodology created by Toyota with the main objective of reducing wastes, defects, transportation costs, inventory, waiting time, and the extent of processing (Liker 2003; Monden 1998; Ohno 1995). A modern viewpoint describes TPS as striving toward an ideal whole system (Emiliani et al. 2003; Spear and Bowen 1999) or one that has the following output characteristics:

- Is defect free (elimination of "Jidoka" or "Andon" events causing the warning system to "flash")
- Can be delivered one request at a time
- Can be supplied on demand in the version requested
- Can be delivered immediately
- Can be produced without wasting materials, labor, energy, or other resources
- Can be produced in a work environment that is safe physically, emotionally, and professionally for every employee

This definition combines employee involvement in work design output objectives, and is possibly more suitable for organizations of all kinds to directly relate to, regardless of technology employed.

# The Need for TPS in Healthcare Organizations

Based on the aforementioned conceptualizations of TPS, one can visualize how TPS can result in outcomes that can be considered building blocks of competitive advantage, for example, efficiency (elimination of waste), customer responsiveness (time and customization elements), quality (zero defect output), and innovation (creation of a culture that involves and empowers all employees to enhance creativity). Toyota has been able to sustain strategic competitive advantage by applying this process intervention/innovation over five decades, as measured by quality, reliability, productivity, cost reduction, sales and market share growth, and market capitalization. It could be argued that the correlation between the application of TPS as part of organizational strategy and its documented success in achieving the aforementioned outcomes creates an "industrial engineering paradigm" that crosses multiple industries. Further, from a strategic perspective, it could be argued that the application of TPS plays to cost leadership advantage in industries unaccustomed to advanced production techniques,

**Table 1** Applicability of TPS attributes to hospital operations.

| TPS attribute | Hospital application |
|---|---|
| • Product delivered defect free | • Defects correlate to patient safety standards in healthcare. Standards that are established by JCAHO require adherence in order for hospitals to be licensed, participate in the federal Medicare program, and differentiate themselves on the basis of quality, in order to effectively deal with increasing demand for specialized acute services. Higher quality hospitals will be rewarded. |
| • Product delivered one request at a time<br>• Product can be supplied on demand in the version requested<br>• Product can be delivered immediately | • Each patient represents a unique treatment complexity and demands a customized treatment plan. When presenting for treatment, care is requested, but may not be available immediately; however, providers can differentiate themselves based on the speed with which they can deliver care. |
| • Product can be produced without wasting materials<br>• Product can be produced without wasting labor | • Faced with increasing costs for drugs, technology, and labor, hospital expenses must be carefully contained within the context of net revenue produced. Sophisticated material and labor management systems assist hospitals with controlling and budgeting costs. |
| • Product can be produced in a work environment that is physically, emotionally, and professionally safe | • Labor shortages in healthcare are expected to grow. With this in mind, hospitals are required to ensure adequate employee training and development in order to mitigate turnover, improve morale, and ensure a safe working environment. |



such as healthcare services (Spear 2004). Healthcare providers in general and small rural healthcare providers in particular are in need of a process intervention such as TPS and are characteristically similar to that of a manufacturing environment.

Moreover, the external industry environment is also forcing the healthcare industry to seek performance enhancements through the application of techniques such as TPS (Spear 2004; 2005). There are several environmental forces that are demanding a change within the healthcare industry (Futurescan 2005). These forces include:

1. The level and nature of demand for acute care services is changing to include dramatic increases in the need for specialized services, due to the aging population and the increasing uninsured population.
2. Hospitals are facing increasing competition in delivering acute care services. Physician-based clinics and specialty hospitals are taking business away. An emphasis on quality also is making consumers proactive.
3. New technology offers advantages and challenges. Increased patient safety value comes at a high price.
4. Costs grow while available capital may be shrinking. Increasing costs for wages and pharmaceuticals are challenging profits.
5. An adequate work force is not guaranteed. Labor shortages are expected to grow.
6. Improved quality and safety standards are a must. Higher performing hospitals will be rewarded.

These trends are more painstakingly realized by rural community hospitals, as access to capital, technology, and resources is somewhat limited because of their locations and size.

Like manufacturing organizations, healthcare providers like those within the CHS network are facing challenges from rising labor and material costs, intense competition, scarce human resources, customer demand for impeccable quality, and stringent safety and performance standards. Table 1 represents applicability of TPS attributes to hospital operations.

## CRITERIA FOR SUCCESSFUL APPLICATION OF TPS

To achieve a competitive advantage using TPS requires adherence to the fundamental technical rules, developing suitable organizational/structural design, and fostering cultural norms and values that facilitate the TPS processes. Several scholars have traced the important criteria for successful application of TPS in terms of task, structural, cultural, and

control systems prerequisites (Emiliani et al. 2003; Spear and Bowen 1999). For example, Spear and Bowen (1999) have identified four rules that form the basis of TPS as a suitable application within the organization. To be applied successfully, TPS demands that an organization's task structure comply with these rules:

1. All work must be highly specified as to content, sequence, timing, and outcome.
2. Every customer-supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses.
3. The pathway for every product and service must be simple and direct.
4. Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level of the organization.

These rules specify how the work is performed, how knowledge is transferred between workers and within the system, how production is coordinated between tasks and services, and how the process is controlled, measured, and sustained. These rules also implicitly prescribe the organizational structure and control systems that are required to be in place to implement TPS gainfully. Additionally, organizational cultural norms that need to be adhered to are evident in the knowledge exchanges demanded in the TPS model. For example, TPS emphasizes knowledge transfers, knowledge creation at the lowest level of the organization, and the contributions required of employees at all levels as they interact with their work environment. Structure, control systems, and cultural specifications are integrally built into the TPS model, and in order for this system to work appropriately, organizations need to evaluate these areas and design them to match the demands of TPS.

The TPS method is scientific in that it clearly delineates the responsibilities at the operational level to a very high degree of specification, and it does not promote vertical command and controls (Spear and Bowen 1999). As a result one can see the structure in a TPS environment as decentralized, flat, and having a minimum chain of command. Additionally, control systems are established to raise the level of both innovation and quantitative performance. TPS facilitates creative behaviors and stimulates workers and managers to engage in "experimentation" that is widely recognized as the cornerstone of the learning organization. Successful companies adapting versions of TPS use the collective talents of multiple individuals to invent or reinvent work processes. TPS also emphasizes certain leadership qualities in managers implementing TPS. For example, it demands an operations-oriented team leader who is passionate about ideas and innovations (Moore 2004; Spear 2004). So, it is evident that TPS as a process innovation demands sponsorship and commitment from all levels of employees, and emphasizes organizational culture that is driven by knowledge creation and innovation. While this may be a hurdle for some companies, it is a prerequisite to the implementation of TPS.

## ACHIEVING QUALITY CARE AND PATIENT SAFETY THROUGH TPS

Under the audit methodology established by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), hospitals must explicitly demonstrate a compliant environment of care in each of the six patient safety goal categories (see Table 4). They must do so through the process intelligence of patient caregivers, and appropriate action steps along the clinical pathway. The clinical pathway or "production line" is audited using two techniques: the patient tracer methodology and the system tracer methodology. JCAHO defines the patient tracer methodology as "taking the patient's experience and tracing it through the organization and determining in a variety of different areas—it could be information management, assessment, treatment, patient education—for that individual patient how the organization is performing, how it's executing on its plans related to standards compliance, and best quality safest care" (JCAHO 2005). System tracer methodology is defined as "tracing a process through the

**Table 2** The correlation between TPS elements and the accomplishment of quality and patient safety.

| TPS rule | Enhancement to patient safety |
|---|---|
| All work shall be highly specified as to content, sequence, timing, and outcome. | • All patient treatment is highly specified through documentation of actions, located in patient's medical record.<br>• Events, specification of treatment intervention times, and patient outcomes management must be noted. |
| Every customer-supplier connection must be direct and there must be an unambiguous yes-or-no way to send requests and receive responses. | • The patient-nurse interaction is direct, as is the nurse-alternate caregiver.<br>• Ambiguity can result in compromises to patient safety; therefore, communication must be precise and clear. |
| The pathway for every product and service must be simple and direct. | • Clinical pathways established for each treatment initiative, ensuring that a "best practice" methodology is employed. |
| Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level of the organization. | • Quality improvements initiated under the direction of an internal independent body (Quality and Regulatory Compliance), which documents, experiments, guides, and coordinates patient safety initiatives to be compliant with patient safety goals, at the caregiver level within the organization. |



organization and focusing on the process or the system itself" (JCAHO 2005). JCAHO uses these tools to review the confluence of individual activities and organizationwide systems and processes to gain a complete picture of effectiveness and performance, much like the TPS analysis technique. In Table 2, the authors show the correlation between TPS elements and the accomplishment of quality and patient safety.

Hospitals, in general, are in need of a high degree of integration, because often they are organized around functions or disparate departments. As such, they inherently lack the reliable mechanisms for integrating the individual departments into a coherent whole (Spear 2004). One such example of this need for integration is that in hospital environments, the revenue generation process is started at the time of patient registration, with the input of a "raw material," that is, patient demographic, insurance, and chief complaint information. In order for the hospital to appropriately bill for patient care, there must be significant coordination between the registration process, the throughput clinical and ancillary diagnostic areas that charge for services, and the billing/patient accounting department that sends an invoice to the insurance companies to get paid. Without coordination, lapses in information and process standards result in delays, defects, and extra cost burdens. TPS allows for effective coordination to occur.

## ORGANIZATIONAL ASSESSMENT OF RURAL COMMUNITY HEALTHCARE SYSTEMS

A small rural healthcare provider is defined as one that has fewer than 150 acute care beds and/or is located outside a metropolitan statistical area. Heartland Regional Medical Center represents a prototype of a small rural healthcare provider in the CHS network. Located in Marion, IL, it is the only full-service hospital in Williamson County, IL, which has a population of 63,094 (U.S. Census Bureau 2004). Its business model is defined as follows (CHS 2006):

- Increase the share of healthcare dollars spent by local residents and limit inpatient and outpatient migration to larger urban facilities. This is done through the recruitment of primary care physicians and specialists; targeted capital expenditures designed to expand the breadth of services; and providing capital to invest in facilities, primarily the emergency room and ancillary services.
- Growth through selective acquisitions (approximately three to four per year).
- Reduce costs through standardizing and centralizing operations; optimize resource allocation by optimizing the company devised case and resource management program; capitalize on purchasing

**Table 3** Quality and regulatory compliance team case problems.

| Case problems | Accountable areas |
|---|---|
| Obstetrical admission/ check-in procedures | Patient registration/ Obstetrical nursing unit |
| Medication management and storage procedures | Pharmacy/ Emergency nursing unit |
| Use of standard abbreviations | Health information management/ Nursing administration |
| Reconciling patient medications | Pharmacy/Nursing units |
| Patient risk prevention program | Nursing units |



efficiencies; install standardized management information systems; and manage staffing levels.

- Improve quality through training, best practice sharing, assistance in complying with regulatory requirements, standardized accreditation documentation, and patient/ physician/staff satisfaction surveys.

As part of the strategy to improve quality, the CHS network has established a standard structure that supports regulatory compliance objectives and internal operating performance. Table 3 identifies the quality and regulatory compliance team case problems.

# DEMONSTRATION OF TPS ACTION STEPS WITHIN HEARTLAND REGIONAL MEDICAL CENTER

## Observation

In action, TPS insists on learning from the defects or failures in operations. Observing failures or defects within the system that cause that system to be inefficient is a key principle of TPS. An example of inefficiencies in hospital operations is observing patients being routed to a nursing unit after arrival for inpatient admission. The admission check-in procedures require all patients to have identification banding performed when they arrive at the facility. This banding, by JCAHO standards, is to have two patient identifiers. As part of the audit process at Heartland, it was found that expectant mothers arriving for delivery were told by their physicians to report directly to the obstetrical unit and bypass admissions. By doing so, the admission requirements were not being met and, therefore, a breach in the standard was identified. This created ambiguity in the nursing unit and resulted in the patient being sent back upstream in the process. In this case, treatment commenced on the patient prior to proper identification and treatment consent, which is a JCAHO violation of patient safety goal no. 1.

To deal with this issue, a team comprising first-shift nursing unit staff and two admitting clerks from the dayshift hypothesized that coordinating patient registration closer to the point of presentation/care would alleviate incorrect routing of patients. The team devised a countermeasure plan to create a mini-registration unit in the obstetrical unit. They stocked supplies and forms, and requested a label printer from information services to be used for identification banding, so they could band patients arriving directly from the physician's office. Admitting clerks trained nurses on the proper procedures, and the method was tested with staff members acting as patients. The result was improved customer responsiveness from the patient, as well as physicians, who previously received negative feedback from their patients. And although complaint issues had been documented, directly observing the breakdown in the system prompted the change to occur.

## Testing of Hypotheses Through Experimentation

TPS also involves fine tuning or constant "experimentation." This allows contingencies to be explored in greater depth, and the interaction among the staff creates more unity as alternative options are explored, problem scenarios are presented, and results are debated. In the previous example, two original alternative hypotheses were agreed upon to move to experimentation. The first one has been

discussed; the second one involved a paging system, whereby an admitting clerk would receive notification that a breakdown had occurred on the unit, so as to then be summoned to the unit to complete the admitting and banding procedure. A pilot of this hypothesis failed for the following reasons: responsiveness from the admitting staff could not always be predicted. When a page was sent, it was found that admitting clerks may not have been available at the time because they were performing admitting procedures on other patients. Their ability to respond to the page was compromised, but for good reason. Also, because of staffing constraints on the second shift, particularly during the 3:00 p.m. to 6:00 p.m period, admitting clerks were unable to leave the work area. On the nursing side, the staff members were primarily interested in ensuring that the patient received initial treatment and, therefore, became ambivalent to going through the paging procedure. This hypothesis was discarded, but only after experimentation among the same group of workers occurred and findings were confirmed.

## Coordinated Constant Experimentation

As customization increases, demand increases, and service or product categories are enhanced, existing sociotechnical systems cannot remain static. As a result, existing processes must undergo coordinated, constant experimentation. Documentation of the coordinated experimentation efforts through a logging system allows for reflection and progression. This process permits the adaptation of design as the product or service changes, and it does so in shorter cycle times, allowing for quicker changes to occur. As such, any redesign process does not become burdensome, overcomplicated, or drawn out over long periods of time. Members of the original obstetrical department "mini-registration" initiative continue to evaluate the process as new physicians are recruited, a change in key personnel takes place, or other departments such as case management require information from the task. Constant experimentation also battles the constraint of worker turnover. It acts as a learning lab for new employees, and shortens the learning curve on required processes.

It's important, therefore, to engage in constant experimentation to solicit better ideas and ensure continuous training, as Heartland and hospitals in general compete to recruit and retain valuable human resources.

## Manage Through Enabling Lower-Level Workers

TPS is effective only when lower-level workers are involved in solving problems. Spear (2004) points out that the higher the level of management, the lesser the level of employee involvement in problem solving. Within the hospital sphere, the Quality Assurance and Regulatory Compliance (QRC) department manages the boundary. They are observed acting as enablers in the system, using the JCAHO patient safety goals as a guideline for staff and managers to produce their own results. The result is measured against the patient safety goal and the QRC department processes descriptive statistics to allow for team evaluation. The QRC team is also there for interpretation—to evaluate experimentation against the context of the patient safety goal, as intended by JCAHO. Also, functional managers are not formal managers in the change management process within Heartland's quality initiatives. They are members of the team, and content expertise is pushed down the formal chain of command. Another example solidifies the rules of engagement and TPS action steps described up to this point.

## Establishing Countermeasures to Breaching Quality/Safety Goals

The QRC observation practices usually result in evidence of a gap in the process of delivering patient care. Something within the clinical pathway can be pinpointed as askew, and in the case of medication management within three clinical departments, that

gap was discovered. A drowning victim arrived in the emergency room at Heartland. At the same time, a QRC team member was stationed in the emergency room setting, observing practices being followed on a number of patient encounters. Drowning victims have a hypothermic body temperature of less than 95 degrees F. Part of the treatment protocol is introducing warm intravenous (IV) fluid to the victim in an attempt to revive the organs. This technique also increases body temperature slowly, without inducing shock.

The QRC team member observed the case nurse proceed to an incubation storage unit, which looks much like a refrigerator except that it is designed to warm the contents rather than cool them. Each IV fluid set has a manufacturer's recommended temperature-level threshold, so as not to disable the effectiveness of the medication when introduced to a patient. The sequence of steps involved in obtaining the IV fluid from the incubation unit includes verification of date stored, temperature setting, and manufacturer's recommended threshold. The discovery by the case nurse of an excessive temperature setting within the incubation unit caused her to question the reliability of the IV solution she was obtaining for the patient under her care. To her surprise, the heat threshold had been exceeded to a level greater than what was recommended by the manufacturer and, of course, caused an immediate patient safety concern.

Because of the ambiguous situation, the nurse created a work-around, which meant a "stat" page to pharmacy for retrieval of the same IV solution from their storage unit. Luckily for everyone involved, the clinical pathway continued with a favorable outcome for the patient, notwithstanding the delay involved in procuring the IV solution. This is precisely the value of TPS. The observation of a work-around, a noticeable defect in the process, and an ambiguity of next steps all required intervention toward standardization so as to confirm patient safety rather than guess at it. When the "red light" went on, a "Jidoka" or "Andon" event occurred, and the wheels were put into motion to break down the sequence of events. Within minutes, a team comprising first-shift nurses and two emergency room clerks huddled with the QRC team member to analyze this situation. The first point made was that this represented a breach in patient safety goal no. 3, as prescribed by the JCAHO, and if the JCAHO was on site during this event it would be considered a "type 1," or severe, violation causing the hospital to potentially lose accreditation. This was the "burning platform" required for the next step, and that was the solicitation of open ideas to mitigate this from occurring in the future. Focus was on accountability to ensure an adequate record was kept of the three variables involved in the storage of IV fluid medication, that is, existing temperature of the incubator, date of original storage, and manufacturer's recommended storage threshold. The team members chose a lead from each shift to comply with completion of a mediation management log on the incubator, which included these three items as well as the name of the team member checking them.

For a period of one month, the same person is required to perform the evaluation, and a second team member verifies that it was performed. This project is in the "experimentation" stage at Heartland. The important lessons are: 1) the huddle took place immediately after the observation; 2) the QRC team member acted only to create the "burning platform" instead of acting as the problem solver; and 3) the team created a countermeasure within the context of participative design, that is, the form and accountability for completing it was generated by a collaboration of workers. This exercise clearly follows the spirit of TPS. However, for it to be useful to the hospital as a whole, it must be spread throughout the institution, and the process of observation and experimentation must be everyone's task.

## Additional Observations

It was found that the QRC team employed the same TPS "whole system" methodology when performing additional patient safety audits. These findings and the implemented remedies are explored here. In order to improve communication among caregivers and ultimately ensure patient safety, a common theme within hospital facilities is to implement a standardized list of abbreviations and also identify a "dangerous" list of

**Table 4** Goals related to improving quality of care and patient safety and the associated TPS strategy.

| Goals | Affect on healthcare operations | Application of TPS philosophy |
|---|---|---|
| **Goal 1** Improve the accuracy of patient identification | Wrong-patient errors occur in virtually all aspects of diagnosis and treatment. The intent for this goal is twofold; first, to reliably identify the individual as the person for whom the service or treatment is intended; second, to match the service or treatment to that individual. | Creating a treatment plan that is unique to the individual fulfills the TPS requirement that all work is highly specified as to content. While clinical pathways can be created for "categories" of care, each represents a customized version of the care template. Pathways must be documented and act as controls during delivery of care. |
| **Goal 2** Improve the effectiveness of communication among caregivers | Ineffective communication is the most frequently cited category of root causes of sentinel events. Effective communication, which is timely, accurate, complete, unambiguous, and understood by the recipient, reduces error and results in improved patient safety. | Reduction in errors is the direct result of creating an unambiguous customer-supplier connection. Role-playing and experimentation allows caregivers to identify weaknesses in that connection. |
| **Goal 3** Improve the safety of using medications | When medications are part of the patient treatment plan, appropriate management is critical to ensuring patient safety. The development of standardized and redundant systems has been shown to decrease errors and improve outcomes. | A specific pathway must be created and followed consistently in order to analyze variations from the standard. |
| **Goal 4** Reduce the risk of healthcare-associated infections | Compliance with the CDC hand-hygiene guidelines will reduce the transmission of infectious agents by staff to patients, thereby decreasing the incidence of healthcare-associated infections. | Work environments must be physically safe. Training and development programs that address the environment of care satisfies the TPS attribute of workplace safety. |
| **Goal 5** Accurately and completely reconcile medications | Patients are most at risk during transitions in care (handoffs) across settings, services, providers, or levels of care. The development, reconciliation, and communication of an accurate medication list throughout the continuum of care is essential in the reduction of transition-related adverse drug events. | Implementation of a product delivery plan (reconciling medications at the point of production and dispensing) ensures safe customized delivery. |
| **Goal 6** Reduce the risk of patient harm resulting from falls | Falls account for a significant portion of injuries in hospitalized patients, long-term care residents, and home care recipients. In the context of the population it serves, the services it provides, and its environment of care, the organization should evaluate its patients' risk for falls and take action to reduce the risk of falling and to reduce the risk of injury, should a fall occur. The evaluation could include fall history, medications and alcohol consumption review, gait and balance screening walking aids, assistive technologies and protective devices assessment, and environmental assessments. | Identify risks that create a potential for failure, through repeat assessment of patient care areas from shift to shift. Identify potential risks as "defects" and mitigate them accordingly. |



abbreviations to be avoided. The QRC team at Heartland, through chart auditing, discerned that several abbreviations and symbols were potentially in use that could result in the intended meaning being misinterpreted and patient safety being compromised (a potential breach of patient safety goal no. 2).

Two examples of this are illustrated here to draw the link between interpretation and potential patient safety compromise. The abbreviation "IU" was documented with the intended meaning of "international unit;" however, it could have been misinterpreted as "IV"—"intravenous," or the number 10. To abate this problem, the recommendation was to require that the phrase "international unit" be appropriately spelled out, instead of abbreviated. Another "dangerous" abbreviation identified was the symbol "Q.D," which

**Table 5** Specific case problems categorized by patient safety goal.

| Goals | Process rules to implement TPS | Problem assessment | Remedies |
|---|---|---|---|
| **Goal 1** Improve the accuracy of patient identification | • Use at least two patient identifiers (neither to be the patient's room number) whenever administering medications or blood products, taking blood samples and other specimens for clinical testing, or providing any other treatments or procedures. | • Direct admissions to obstetrical unit precluded proper identification of patients. | • Implementation of "mini-registration" process on the obstetrical unit. |
| **Goal 2** Improve the effectiveness of communication among caregivers | • For verbal or telephone orders, verify the complete order or test result by having the person receiving the order or test result "read back" the complete order or test result.<br>• Standardize a list of abbreviations, acronyms, and symbols that are not to be used throughout the organization.<br>• Measure, assess, and take action to improve the timeliness of reporting of critical test results.<br>• Implement a standardized approach to "hands off" communications including an opportunity to ask and respond to questions. | • Potential misinterpretation of abbreviations and symbols. | • Eliminate common misinterpretations in favor of mandated documentation. |
| **Goal 3** Improve the safety of using medications | • Standardize and limit the number of drug concentrations available within the organization.<br>• Identify and annually review a list of look alike/sound alike drugs used in the organization, and take action to prevent errors involving the interchange of these drugs.<br>• Label all medications, medication containers, or other solutions in preoperative and sterile settings and ensure proper storage conditions. | • Excessive temperature setting within IV storage incubation unit. | • Implementation of medication management log, accountability for completion of log assigned to team lead. |
| **Goal 4** Reduce the risk of healthcare-associated infections | • Comply with the CDC hand-hygiene guidelines.<br>• Manage as sentinel events all identified cases of unanticipated death or major loss of function associated with a healthcare infection. | • Potential noncompliance with CDC handwashing guidelines. | • Install signage and provide emblematic method as a reminder. |
| **Goal 5** Accurately and completely reconcile medications | • Implement a process for obtaining and documenting a complete list of the patient's current medications upon admission.<br>• A complete list of the patient's medications is communicated to the next provider of service when a patient is referred or transferred to another setting. | • Potential avoidance of medication management assessment. | • Mandate use of medication management documentation as essential component of patient's chart. Subject to QRC audit. |
| **Goal 6** Reduce the risk of patient harm resulting from falls | • Implement a fall reduction program and evaluate the effectiveness of the program. | • Potential improper lifting and transportation techniques. | • Implement employee retraining and build training into new employee orientation. Subject to QRC audit. |



was intended to mean "everyday." This, however, was routinely misinterpreted as "Q.I.D" or "every other day." Clearly, this misinterpretation could result in medication errors and a patient safety concern. This abbreviation was discontinued in favor of the phrase "daily," or "every day."

To reduce the risk of healthcare-acquired infections (patient safety goal no. 4), the QRC department at Heartland not only installed reminder signs to "wash hands for a minimum of 10 to 15 seconds" within each clinical area, but also came up with a rhetorical/symbolic method for helping employees

understand this. During orientation for new employees, and reorientation of existing employees, the QRC team demonstrated the use of the "Happy Birthday" song, that is, singing the song while washing one's hands to ensure hygiene guidelines are met. This was not only engaging, but also emblematic and pragmatic.

Patient safety goal no. 5 requires hospitals to accurately and completely reconcile patient medications. As a patient proceeds through the admission process and is referred to a clinical unit, that unit is required to document existing medication use. The QRC team facilitates this requirement by ensuring that the medication management documentation is a mandated component of the patient's chart and subject to review by the QRC audit team. Finally, patient goal no. 6 requires hospitals to engage in a risk reduction program to manage patient harm resulting from falls. In many cases, it was determined that patient falls resulted from inappropriate physical assistance provided to the patient by the caregivers. This was observed by QRC members, and a retraining program was implemented to ensure proper lifting and transportation techniques. In addition, the program was instilled in the new employee orientation program, and is also subject to audit through QRC observation. A summary of the goals related to improving quality of care and patient safety, the effect on healthcare operations, and the associated TPS strategy are presented in Table 4.

The specific case problems are categorized according to patient safety goal, with remedies identified in Table 5.

# LESSONS LEARNED

As previously mentioned, small rural community providers have a magnified challenge in dealing with current trends, particularly access to capital, technology, and resources, and dealing with cost burdens imposed by pharmaceuticals and technically skilled human resources. CHS has devised a business model that provides guidance to its small rural community providers in the area of quality and patient outcome management, specifically requiring standardization of accreditation documentation. This is a model that when enforced can produce positive outcomes, and when implemented with the help of methods like TPS can result in building competitive advantages.

In returning to Emery's (1995) rationale for developing participative design, one can find constraints in introducing TPS to a community hospital. In essence, the rationale describes universal organizational constraints that must be overcome. Traditional hierarchies are unacceptable in a TPS environment, where participation of employees creates collective consciousness and a shared mental model, rather than fragmented top-down solutions. This requires rethinking the role of management, one that precludes the higher levels of the hierarchy exclusively acting in roles of problem solvers at the expense of the ideas of the work group. Additional studies that account for variations in management style are recommended.

Systemwide, expansion of TPS from a work unit concept to a whole system change is limited by "silo" affects, or the divisional nature of hospital operations. Breaking down these silos through challenging processes within each of them increases the interaction among divisional employees and recognizes their interdependence. Additional TPS intervention studies that take into account the diversity of multidisciplinary operations is necessary to ascertain the level of sustainability of the TPS intervention.

Successful projects that are not sustainable through time because of worker turnover can be mitigated by strategic reward systems such as pay for performance or best practice rewards tied to patient safety and cost reduction outcomes. Incentives built into a control system help the employees to realize a sense of ownership in their actions. Additional studies are needed to determine the strength of correlation between compensation/reward systems and TPS sustainability. Finally, hiring practices and skill-building mechanisms associated with a learning organization can create an expert-driven process that possesses the energy for change rather than the complacency of resistance. This would include creating observation skills associated with TPS, training in the scientific method, and establishing interdisciplinary process education sessions. This will build the perception that redesign is part of the job description rather than a

complicated process, and move the right people into the right "experimentalist" positions, such that the organization will start to achieve documented strategic results, much like Toyota. The structure, control systems, and culture will make the difference.

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