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Perfecting Patient Care

Integrating Principles of Process Redesign in Nursing Homes

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The authors describe the principles of Perfecting Patient Care (PPC) and provide case examples of work redesign and measurable outcomes at one nursing home. The impact of PPC was evaluated by examining employee, family, and resident satisfaction scores. PPC helped with process redesign to eliminate linen shortages and to decrease the resident fall rate. For the employee job satisfaction survey, improved scores resulted for nine questions; six scores were similar to baseline; and four scores were lower than at baseline. For the family satisfaction survey improved scores resulted for 17 questions; five scores were similar to those at baseline; and no scores were lower than baseline. For the resident satisfaction survey scores on 13 questions improved compared to baseline; eight scores were similar to those at baseline; and one score was lower than baseline. Thus, we found using PPC, improvements in work processes were implemented at this pilot facility.

Keywords: *Toyota production system; nursing homes; quality improvement*

Nursing homes face many of the same operational pressures as hospitals and community-based organizations: staffing shortages and suboptimal work design that is not organized around patient needs (Kohn, Corrigan, & Donaldson, 1999; Leape & Berwick, 2005). In addition to these operational pressures, several reports have made it evident that within many nursing homes the incidence of poor clinical outcomes (e.g., pressure ulcers, falls,

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infections) exist (General Accounting Office [GAO], 1999; Institute of Medicine [IOM], 2001). Creative work redesign to eliminate inefficiencies, error, and waste could serve to increase employee, resident, and family satisfaction and could also conserve resources and improve many resident outcomes (Milstein, Galvin, Delbanco, Salber, & Buck, 2000; Mohr, Abelson, & Barach, 2002; Tyler et al., 2006). However, few published accounts of replicable, reliable, and sustainable work design initiatives in nursing homes exist.

A work design initiative successfully used by The Jewish Healthcare Foundation to improve hospital care was perfecting patient care (PPC). The PPC is based on the Toyota Production System (TPS). The PPC was shown to be successful at the University of Pittsburgh Medical Center in improving patient safety (Thompson, Wolf, & Spear, 2003), reducing infections (Thompson et al., 2003), reducing deaths, improving analytic procedures (Persoon, Zaleski, & Frerichs, 2006), and reducing diagnostic errors (Raab et al., 2006). Moreover, the effective use of TPS has occurred with firms as diverse as Alcoa (aluminum smelting) that saved more than US$1 billion (Spear, 2004) and Showa (manufacturing) that increased profits (Womack & Jones, 2003).

The basic principle behind PPC is process redesign. That is, process redesign involves improving the way work practices are conducted. For example, improved work practices could involve eliminating wasted time, eliminating wasted materials, and eliminating duplication. This would seem particularly appropriate for nursing homes, given their endemic understaffing, high absenteeism rates, and high turnover (Decker, 2006). Thus, using the Jewish Association on Aging nursing home as its demonstration site, an initiative was started to replicate the previous hospital-based success of PPC (e.g., Thompson et al., 2003). In this article, we describe the principles of PPC, provide case examples of work design changes, and present how this initiative has changed measurable outcomes at this nursing home.

PPC

The practice approach used (i.e., PPC) is derived from one of the most successful business improvement models in the world—TPS. The TPS is credited with making Toyota a leader in key productivity and operating measures among the major automakers (Chalice, 2007). Toyota leads the major automakers in plant capacity utilization rates, product initial quality, and worker absenteeism rates (Chalice, 2007).

Table 1
Rules of Work Design of the Toyota Production System

Rule 1: Activities

All work shall be highly specified as to content, sequence, timing, and outcome (i.e., how workers conduct their work activities; in a nursing home one example includes how to lift a resident).

Rule 2: Connections

Every customer-supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses (i.e., the relationship between workers, timing of work, and delivery of work; in a nursing home one example includes information passed along at shift changes).

Rule 3: Pathway

The pathway for every product and service must be simple and direct (i.e., work to a specified flow; in a nursing home one example includes ordering meals).

Rule 4: Improvement

Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, as close to the work as possible in the organization (i.e., workers make small measurable changes; in a nursing home one example includes linen, described in Table 3).

Note: Table 3 provides an example of how these rules were used in the nursing home.

The general idea behind TPS (and thus, PPC used in the nursing home initiative) is that good work design for operational excellence relies on continuous learning and problem solving in the course of work. The idea is deceptively simple but can be expanded into five principles. With some minor changes in language to be nursing home specific (such as replacing customer with resident) these five principles are as follows: (a) All work must focus on meeting the needs of the residents; (b) give workers tools for addressing problems, to help them better meet resident needs, one by one; (c) support a blame-free workplace that makes it safe to report errors; (d) create bedside resource teams applying the scientific method to test work design changes; (e) provide workers with a help chain—up to and including managers when necessary—to help workers solve problems quickly, at the point of care. Using this approach, every worker contributes to rapid, frequent, low-cost improvements. These five principles were used in the nursing home initiative.

Four work design rules have been described as essential components of TPS (Spear & Bowen, 1999). These rules are shown in Table 1. What TPS proposes is that workers come in contact with problems almost every day and have evolved workarounds for these problems, such that these workarounds become integrated into the normal daily work. The TPS seeks to eliminate these workarounds by having workers identify the root causes

Table 2
Areas of Waste Identified in the Nursing Home

Waste	Example
Overproduction	Too many "special diet" meals.
	Batch medication bubble cards are wasted.
Excess inventory	Medication room overstocked with supplies.
	Medications expired and are discarded.
Defects	Cold meals.
	Dysfunctional lifts (e.g., dead batteries).
	Not appropriate oxygen supplies for new admission.
Overprocessing	Resident information repeated on multiple forms.
	Multiple signatures on forms.
Waiting	Resident waiting for medication before therapy.
	Lost admissions due to delays in turnaround for clean room.
People	Nurses aides not being part of problem solving.
	High absenteeism and high turnover.
Motion	Finding equipment when needed (e.g., lifts).
	Searching for resident for therapy and activities.
Transportation	Meals transported from dietary to units in one cart then moved onto small carts to distribute meals to resident rooms.
	Transporting large quantities of supplies to the floor when not needed.

and then design ways of improving their own work processes. One further key to TPS is that these solutions are introduced gradually and in local areas. This is because solutions for one area may not be appropriate for other areas. Workers are encouraged to ask why they did not complete all of their work, why their work was not effective, or how their work could be improved, and to come up with solutions using the TPS process. These four work design rules were used in the nursing home initiative.

The TPS process includes a formidable lexicon, including kanban cards, kanban pull systems, production cells, and andon cords (Spear, 2004). However, once this lexicon is removed, one of the underlying notions responsible for the success of TPS is the elimination of waste. Waste is defined as "elements of production that do not add value to the product or service being produced" (Persoon et al., 2006, p. 17). This waste is described as coming from eight sources (Alukal & Chalice, 2007) listed in Table 2. In the nursing home, eliminating waste frees up the time for workers, who can then have more contact with residents (which should improve the quality of care and reduce errors). An example would be staff time wasted searching for needed supplies or calling to clarify medication orders. A further example, on which we elaborate below, is wasted linen used for bathing residents.

All workers at the nursing home site received training in these five principles of PPC, four work design rules, and eliminating waste. Following the PPC process, work redesign changes were to come from staff and be promoted and facilitated by management. To evaluate the resulting initiatives, first, the work redesign changes are described as case examples; second, employee, resident, and family satisfaction scores are examined. Satisfaction scores were examined because we believed (based on the tenets of PPC) it would be reasonable to expect that the work redesign changes should ultimately positively influence employees, residents, and families.

Implementation of PPC

The Jewish Association on Aging nursing home participating in the TPS program was located in Pittsburgh, Pennsylvania (The Charles M. Morris Nursing and Rehabilitation Center [www.jaapgh.org/residential_1.htm]). This facility is freestanding, faith based, with 159 beds. The nursing home has five skilled care units, with one specializing in dementia care.

During February 2004, the CEO and four members of the management team (i.e., administrator, director of nursing, and two unit supervisors) of the nursing home participated in the Perfecting Patient Care University (www.prhi.org or http://jhf.org/jhf/Programlinks). This consisted of 5 days of training (including lectures, site visits, and exercises) in the principles of TPS adapted to health care, that is, PPC. Following this training, the management team created a PPC implementation committee to plan the rollout of PPC in the nursing home. Weekly meetings were conducted to discuss what changes could be made in the facility, using the principles of PPC. These weekly meetings were attended by two PPC staff (who facilitated the meetings), the CEO, the administrator, director of nursing, and two unit supervisors.

Over the next 12 months, every director and unit supervisor attended the PPC University. Regular communication updates between senior management (i.e., the CEO, administrator, and director of nursing), middle management (i.e., unit supervisors and department heads), and workers were used to inform all staff that the PPC initiative was underway. This included presentations by senior management at unit meetings, mailings distributed with pay-checks, and postings on notice boards in the facility.

A 4-hr PPC training program was designed by the CEO and PPC staff so that a common language and understanding on the initiative could develop. Thus, subsequent to training of all levels of management (i.e., directors and unit supervisors), this 4-hr training program using a train-the-trainer format

was used to teach the principles of PPC to all other nursing home employees. The CEO, director of nursing, and unit supervisors, facilitated by PPC staff, conducted these training sessions.

Over a period of approximately 18 months, more than 350 staff employed by the nursing home, other support programs such as rehabilitation staff, and assisted living staff (in the adjoining building) received training in PPC. This included all full-time and part-time registered nurses, licensed practical nurses, nursing assistants, activities staff, kitchen staff, dietary, rehabilitation, and housekeeping staff. This training was integrated into the normal operations of the facility and occurred in conjunction with other major activities such as union contract negotiations and state survey inspections (Putnam, Tang, Brooks-Danso, Pickard, & Morrow-Howell, 2007).

Method

Process Redesign Initiatives

Following the principle of making small changes, one of the first facility-wide PPC problem-solving activities undertaken focused on a linen problem. The work redesign changes undertaken addressing this linen problem are described as a case example. Nurse aides had complained that they often did not have enough linen when assisting residents with activities of daily living. A culture of accusation between departments and a pervasive perception of lost linen was used as a general excuse for this ongoing problem. Nevertheless, the linen supplier maintained that all linen collected was processed and returned to the facility on a weekly basis. This was clearly a frustration for nurse aides; but, the problem also had potential resident safety concerns. Every morning shift from every unit involved nurse aides' calling laundry for more towels and more wash cloths. The nurse aides were usually instructed to come to the laundry and get what they needed, which took them off the floor and resulted in poor call bell response times. Often, the nurse aides found that the laundry did not have the needed quantity of linen to meet their morning demand. A workaround that many nurse aides used was to hide linens for future use, and this of course exacerbated the linens shortage.

Process redesign was also used to address resident falls, which are arguably a more significant resident issue. The work redesign changes undertaken addressing resident falls are described as a case example. Resident falls are upsetting to staff, and for a resident the resulting injuries can be

life-threatening (Kovacs, 2005; Wagner, Capezuti, Taylor, Sattin, & Ouslander, 2005). Unfortunately, falls occurred at this nursing home despite training and safety equipment. One unit was especially concerned with resident falls and decided to use the principles of PPC to reduce them. This unit had a higher fall rate (i.e., 38% in 180 days) than other units in the facility (i.e., the facility average was 35% in 180 days). These fall rates are similar to the national average, which is approximately 33% (although, published rates do differ, as do definitions of falls; Hill-Westmoreland & Gruber-Baldini, 2005).

Satisfaction Outcomes

It was proposed that it would be reasonable to expect that the work redesign changes should ultimately positively influence employees, residents, and families (Scott-Cawiezell et al., 2005). For example, if staff were enabled to provide more time and better care to residents as a result of PPC, then they should be more satisfied. In turn, with more satisfied staff, and more time and better care, residents and family members should also be more satisfied. Thus, we examined the overall satisfaction of respondents, measured as the number of items with higher and lower scores (comparing Time 1 scores with Time 2). In addition, individual items addressing overall satisfaction were also examined (comparing Time 1 scores with Time 2). Several individual items were also examined (comparing Time 1 scores with Time 2) that well represented specific areas related to PPC activities. We could not a priori include specific items on the satisfaction surveys as the PPC activities were to be developed over time by staff, and no activities had started at baseline (e.g., no specific questions regarding the linen and falls initiatives discussed above were included). However, given the general principles of PPC, we specifically examined items addressing time management and work activities.

In comparing Time 1 scores with Time 2 scores, *t* tests were used. It could be argued that the satisfaction information represented the total sample from this one facility, and thus significance testing is unnecessary. However, it could also be argued that the responses in this sample also have some temporal variation, making *t* tests appropriate. Therefore, we used the findings from the *t* test to gauge whether the satisfaction scores improved, declined, or were stable from Time 1 to Time 2. For all three survey types (resident, family, and employee) we were able to conduct both independent *t* tests (i.e., for respondents in only one of the two time periods—Time 1 or Time 2) and paired *t* tests (i.e., for respondents included in both Time 1 and

Time 2). The results for the independent and paired *t* tests were identical (setting an alpha level of .05). That is, the significant findings were unchanged (at an alpha level of .05) regardless of the *t* tests used.

Several resident and family satisfaction instruments were identified for use (e.g., Levy-Storms & Miller-Martinez, 2005); however, consonant with a review of these instruments (Castle, 2007a) we identified very few meeting our requirements of being developed in long-term care settings, having known favorable psychometric properties, and having available benchmark data. For residents, we chose to use the Nursing Facility Resident Satisfaction Questionnaire, which was developed for nursing home use. This has reported favorable psychometric properties. For example, using 1,000 residents the developers of this instrument cite Cronbach's alpha for all the domains to be above .70 (Castle, 2006). Item nonresponse, score distributions, and item-scale consistency were also favorable. Benchmark data were also available for use with this instrument.

For family members, we chose to use the Nursing Facility Family Satisfaction Questionnaire. This survey was also developed for nursing home use and had available benchmark data. The instrument has reported favorable psychometric properties. For example, using 550 family members the developers of this instrument cite Cronbach's alpha for the domains to be above .70 (Castle, 2004). The reported item nonresponse, score distributions, and item-scale consistency were also favorable.

In addition, these surveys (i.e., Nursing Facility Resident Satisfaction Questionnaire and Nursing Facility Family Satisfaction Questionnaire) were used because they had relatively few questions (which can help improve response rates) and because the questions in both surveys were similar (which allows comparison of resident and family satisfaction scores).

The employee job satisfaction survey used was a combination of questions. First, several questions were used from an instrument developed by PPC staff. The PPC staff had used these questions in several prior initiatives and had high response rates with few missing items. Several items also addressed time management and work activities, which as we discuss above was considered necessary for the evaluation of PPC activities. Second, several questions were used from an instrument developed by Castle (2007b). These questions were used because they were developed for nursing home use and had available benchmark data. The Castle (2007b) instrument had favorable psychometric properties; however, a limitation of using a few items (i.e.,5) from this instrument and others (i.e., 16) from the instrument developed by PPC staff is that the reliability and validity of the resulting questionnaire is unknown.

Table 3
Example Process Redesign Implemented

Problem: There is not enough linen on the nursing units to complete morning care routines with the residents.
Rule 1:[a] The quantity of each item of linen provided to the nursing units was based on how much the laundry staff could assemble in one small linen closet.
Results. Facility had an undersupply of face cloths, causing a substitution of bath towels.
Rule 2:[a] There was no clear connection from supplier to facility. Linens were stored in resident rooms, so supply was uncertain.
Results. Linen closets were introduced on each unit, so supply could be monitored and readily seen by nurse aides.
Rule 3:[a] The pathway for linen starts with the resident's unmet need, to the nurse aides, to laundry staff to outside supplier.
Results. Linen delivery was unreliable, in that it occurred at different times on different days. Exacerbated the linen shortage.
Rule 4:[a] Improvement was designed one unit at a time to ensure staff input, ensure correct "demand" for the specific item to meet the needs for residents, and to purchase shelving to improve the storage of linen on the nursing units.
Results. After improvements were tested on one unit, all other units were changed, using the same methodology.
Elimination of Waste: Less use of large bath towels, reducing the linen cleaning bill. Less inventory (more wash cloths and less bath towels). Less staff time searching for linens. Less "other" linen cleaning from bed sheets.
Other benefits: Possible increase in safety, from falls after bathing.

a. Table 1 provides a detailed description of these rules.

Results

Process Redesign Initiatives

As detailed in Table 3, one unit used the principles of PPC to solve the linen problem. They began by seeking to understand the current condition by examining the entire process from the linen supplier to use on the nursing unit. A process map was created by the people involved in the work with the directors of nursing and environmental services. A large number of steps were involved in the apparently simple task of providing the right quantity of clean linen to the facility. Following the work flow, the team went to the linen contractor company (who demonstrated that the process they used minimized any loss of linens). The first discovery for the team was that the supply levels (often called the par level) from the linen supplier to the facility had not been changed for 8 years (however, resident acuity was now higher, necessitating a need for more linens). Another discovery from the first

meeting with the supplier was that the weekend delivery schedule had changed, so no clean linen was delivered on Saturday or Sunday.

The team continued to review all the steps of the process and identified many reasons for the linen shortage on the units. One issue was not an in house shortage problem but, a shortage at the point of care. Large clean linen supply bins were often available in the laundry department, but items were not available on the units for the staff. Using the principles of PPC, the team examined the linen cabinets on the units at the beginning of a Monday morning shift. It was ascertained that there was not the right amount of linen supplies available to any of the nurse aides on any of the units. Each unit gathered data on what linen was needed for their residents and what items they actually needed for each time of day. While each nursing unit established their needs, environmental services installed appropriate shelving for the linen closets, to safely store what was needed. A replenishment system was established, so that the need on the units was sustained 7 days a week.

Several small solutions were implemented (including specifying a delivery time for the linens) to standardize the process of linen delivery and distribution throughout the facility. None of the solutions implemented was novel and none was expensive. The biggest difference was the change designed by the people who do the work, which created positive morale and better team work across departments.

A second unit was especially concerned with resident falls and used the principles of PPC to reduce them. Staff from this unit (including the unit supervisor and several nurse aides) conducted several meetings to discuss ways to reduce resident falls. The team concluded that falls were the result of many different factors. These factors included resident risk factors, staff training, staffing levels, and care practices. Moreover, it was concluded that no single work design initiative would adequately reduce falls and in general not enough information on falls in the facility was available. That is, it was believed that staff were reluctant to share information on resident falls for fear they would be blamed for the event.

As a means to collect more information on falls and address the many possible reasons for resident falls, the staff (i.e., PPC Team) created an interdisciplinary group: the CSI Falls Team. The acronym CSI for this nursing home means Change the System Immediately. The CSI Falls Team had the goals of improving multiple work processes, changing the falls reporting culture, and to strive for the elimination of all falls. This approach was intended to change the way staff looked and responded to falls.

The staff member who first witnessed a fall, or was first to help a resident after a fall, was labeled as the first responder. The first responder needed to

see his or her role as investigator to discover the root cause for the fall. That is, the member was asked to gather (or remember, if they witnessed the fall) as much information as possible about the resident and the fall. This process was communicated to staff through a series of unit-specific meetings and training sessions (conduced by the CSI team).

After a fall, the first responder was instructed to call for help (from other staff members) and to alert the CSI team. The CSI team went to the site of the fall and reviewed the CRIMES (Cognitive, routine Function, Illness, Medications, Environmental, Sensory). That is, the information collected included whether the fall could be due to cognitive issues, such as dementia (Cognitive); a function the resident was trying to perform, such as toileting (Routine function); a medical condition, such as joint replacement (Illness); the result of medications, such polypharmacy or sleep-promoting medications (Medications); something physical in the environment, such as an obstacle on the floor (Environmental); and/or something impairing the resident, such as low light conditions (Sensory).

The CSI team gathered this information in conjunction with the first responder (and by talking with the first responder). The CSI team then examined each fall as an individual case, and tried to determine the reason (or reasons) for the fall. This information was given back to the first responder along with recommendations to eliminate similar falls in the future. Thus, the fall was neither viewed as the sole responsibility of the first responder nor the first responder seen as culpable. This process followed the principles of PPC by focusing on the needs of residents, giving workers the tools to address the problem, and supporting a blame-free workplace.

Several work design initiatives were introduced as a result of the CSI team recommendations. These work design initiatives included review of residents taking atypical antipsychotic medications, review of residents taking sleep-promoting medications, improved lighting in some areas, involvement of activities staff with specific residents seen as high risk for falls, greater communication with staff about residents determined to be high risk for falling, greater communication with staff about residents who had previously fallen, higher staffing levels in areas with residents at risk for falling, elimination of use of agency staff, and toileting programs specific to resident needs and not the staffing schedule. The falls rate at the nursing home has decreased by half since the implementation of this initiative.

Satisfaction Outcomes

Evaluators external to the nursing home collected satisfaction information from residents, family, and employees at baseline (i.e., spring 2005;

Time 1) and again 1 year after implementation of the PPC initiative (i.e., fall 2006; Time 2). The response rates to these surveys were 95% and 93% for residents, 64% and 68% for family, and 84% and 76% for employees, respectively. For the resident and family surveys, Cronbach's alpha for all of the domains was higher than the usually recommended level of .70 (McHorney, Ware, Lu, & Sherbourne, 1994). For the employee job satisfaction survey, Cronbach's alpha for all of the items was higher than .70. In addition, for all three questionnaires the percentage of nonresponses for each question was low. Following the examination of score distributions recommended by McHorney and associates, the floor and ceiling effects for all three surveys were negligible (results not shown).

For the family satisfaction survey, of the 22 major questions asked it was found that scores improved for 17 questions; five scores were similar to those of 2005; and no scores were lower than those of the 2005 baseline (i.e., Time 1). In addition, 18 of the 2006 scores (i.e., Time 2) were higher than the benchmark scores (from 150 other facilities). The item addressing general satisfaction (Question 22: Would you recommend this facility to someone else?) improved by 0.4, from a score of 6.9 at Time 1 to 7.3 at Time 2.

For the resident satisfaction survey, of the 22 major questions asked, it was found that scores on 13 questions improved compared to 2005 (Time 1), 8 scores were similar to those of 2005, and 1 score was lower score than in 2005. In addition, 18 of the 2006 scores (Time 2) were higher than the benchmark scores. The item addressing general satisfaction (Question 22: Would you recommend this facility to someone else?) improved by 0.9, from a score of 7.9 at Time 1 to 8.8 at Time 2.

For the employee job satisfaction survey, of the 19 major questions, improved scores resulted for 9 questions; 6 scores were similar to those of 2005 (Time 1); and 4 scores were lower than those of 2005. In addition, of the 5 questions with available benchmark data, all 5 scores were higher than these available benchmark scores. The item addressing general satisfaction (Question 13: Generally speaking, I am satisfied with my job) was stable, with scores of 54 at both Times 1 and 2.

Discussion

In summary, our findings show that PPC helped with process redesign to eliminate linen shortages and to decrease by half the resident fall rate. For the employee job satisfaction survey, improved scores resulted for

9 questions; 6 scores were similar to those at baseline; and 4 scores were lower than those at baseline. For the family satisfaction survey, improved scores resulted for 17 questions; 5 scores were similar to those at baseline; and no scores were lower than those at baseline. For the resident satisfaction survey, scores on 13 questions improved compared to baseline; 8 scores were similar to those at baseline; and 1 score was lower than baseline.

Moreover, several of the improved satisfaction scores occurred in specific areas related to PPC activities. The largest improved change score (21) from the employee job satisfaction survey was for the quality of resident care in the past year (Question N5, see Table 4). This may be attributable to the numerous resident care initiatives implemented as part of PPC. A large improved change score for the availability of the director of nursing (13) also occurred (Question N2). This may be attributable to the support for PPC initiatives coming from the director of nursing and the number of meetings, e-mails, and presentations she was involved in as part of PPC. Large improved change scores (7 and 7, respectively) from the employee job satisfaction survey also occurred for the "time needed to do a good job" (Question 2) and the "tools, equipment, and supplies" needed (Question 12). These improved scores may also be attributable to the numerous PPC initiatives; these initiatives frequently involve eliminating wasted time and redesigning (i.e., improving) care processes (that often involve tools, equipment, and supplies).

Improved resident satisfaction scores occurred in specific areas related to PPC activities. The largest improved change score (2.5) from the resident satisfaction survey was for having enough privacy (Question 7, see Table 5). In fact, all three of the Autonomy and Privacy questions showed improved change scores. These improved scores may be attributable to a PPC initiative to respect resident privacy (involving respecting sleep patterns, knocking on doors, and using same sex caregivers). A large improved change score (2.1) for spiritual activities also occurred. We are unable to link this with any specific PPC initiative; however, we speculate that allowing caregivers more time with residents could have facilitated transportation of residents so that they could participate in spiritual events. All three of the Meals or Food questions showed improved change scores. These improved scores may be attributable to several PPC initiatives implemented to improve food services (these initiatives included developing a more varied menu, quicker meal service, and more eating areas).

Improved family satisfaction scores were also identified. For example, as with the resident satisfaction scores, all three of the Meals or Food questions showed improved change scores (see Table 5). All three of the Caregivers questions showed improved change scores. These improved scores

Table 4
Job Satisfaction Scores for Staff

	Score 2006[a,b]	Score 2005[c]	Benchmark[d]	Change Score[e] (2006-2005)
1. I'm satisfied with the services we provide to residents	61	53		8*
2. I have the time I need to do a good job	45	38	40	7*
3. We help each other out when someone has a problem	50	56		–6*
4. We work well with the other departments	49	52		–3
5. It's easy for new staff to feel "welcome" here	42	53	41	–11*
6. My manager listens and responds when I have a concern or suggestion	50	55		–5*
7. I'm free to adjust my daily routine to meet residents' needs	52	53		–1
8. My work is meaningful to me	80	75	84	5*
9. I often think of changing jobs	52	51	44	1
10. The safety and care of the residents is the administration's top priority	54	55		–1*
11. I have adequate training for what I do	74	71		3
12. I have the tools, equipment, and supplies I need to do a good job	46	53		7*
13. Generally speaking, I am satisfied with my job	54	54	50	–0*
Nursing staff only				
N1. I could deliver much better care if I had more time with each resident.[f]	83	76		7*
N2. The director of nursing is visible and available to us.	37	24		13*
N3. My manager respects my views on how to provide better care.	45	50		–5*

(continued)

Table 4 (continued)

	Score 2006[a,b]	Score 2005[c]	Benchmark[d]	Change Score[e] (2006-2005)
N4. How would you describe the quality of care delivered to residents in your work area?	57	51		6*
N5. Over the past year, what has happened to the quality of resident care in your work area?	46	24		21*
N6. Over the past month, how many times have you been pulled to a work area or job other than where you normally work?[f]	51	39		12*

a. Items with average scores available came from the nursing home nurse aide job satisfaction questionnaire (NHNA-JSQ) Cronbach's alphas for the domains ranged from 0.72 to 0.83 (see Castle, 2007b). The other items came from a questionnaire provided by a Perfecting Patient Care (PPC) consultant, with no psychometric properties or benchmark data available.
b. $N = 110$ (response rate = 84%).
c. $N = 98$ (response rate = 76%).
d. Collected Fall 2006 from 150 other nursing homes.
e. Change scores are the 2006 score minus the 2005 score, so that positive change scores represent improved satisfaction scores.
f. R = reverse coded, so that higher scores are more favorable. Thus, for the results presented, in all cases higher scores indicate higher satisfaction.
* significant t test ($p < .05$) for Time 1 compared with Time 2.

Table 5
Resident and Family Satisfaction Scores

Subscales and Individual Items	Resident Satisfaction[a]				Family Satisfaction[e]			
	Score 2006[b]	Score 2005[c]	Benchmark[d]	Change Score[i] (2006-2005)	Score 2006[f]	Score 2005[g]	Benchmark[h]	Change Score[i] (2006-2005)
Admission								
1. The information you were given about the facility	7.9	7.8	7.2	0.1	6.9	7.0	7.2	–0.1
2. The information you were given about payments	7.8	7.7	6.5	0.1	7.4	6.7	6.5	0.7*
3. How satisfied you were with the admission process	8.5	7.9	7.5	0.6*	8.0	7.7	7.5	0.3
Activities								
4. Whether you have enough things to do in the facility	7.3	6.4	6.7	0.9*	6.5	5.3	6.7	1.2*
5. The variety of things to do in the facility	7.2	7.4	6.3	0.2	6.5	5.2	6.3	1.3*
6. The spiritual activities offered in the facility	8.4	6.3	6.5	2.1*	7.3	7.2	6.5	0.1
Autonomy and privacy								
7. Whether you have enough privacy	9.1	6.6	7.9	2.5*	8.0	7.5	7.9	0.5*
8. How able you are to make your room homelike	9.0	7.4	7.1	1.6*	8.3	7.9	7.1	0.4*
9. How able you are to plan daily activities	7.9	6.4	6.2	1.5*	5.5	4.5	6.2	1.0*
Physical environment								
10. The temperature of your room	7.7	7.3	7.0	0.4*	7.2	6.1	7.0	1.1*
11. How clean the facility is	8.7	8.5	7.5	0.2	6.8	6.1	7.5	0.7*
12. How homelike the facility is	7.7	7.4	6.5	0.3	6.7	6.2	6.5	0.5*
Safety and security								
13. The security of the facility	8.3	7.8	7.3	0.5*	7.9	7.7	7.3	0.2
14. The safety of your belongings	7.5	8.1	7.1	–0.6*	6.0	5.6	7.1	0.4*
15. How safe you feel in this facility	8.8	8.9	7.0	–0.1	7.7	7.5	7.0	0.2

(continued)

Table 5 (continued)

Subscales and Individual Items	Resident Satisfaction[a] Score 2006[b]	Score 2005[c]	Benchmark[d]	Change Score[i] (2006-2005)	Family Satisfaction[e] Score 2006[f]	Score 2005[g]	Benchmark[h]	Change Score[i] (2006-2005)
Caregivers								
16. How staff treat you	8.2	8.1	6.8	0.1	7.7	7.2	6.8	0.5*
17. How promptly staff help you	7.3	8.2	7.5	–0.9*	6.4	5.7	7.5	0.7*
18. How well staff listen to you	8.1	7.8	7.3	0.3	7.4	6.5	7.3	0.9*
Meals/Food								
19. The food in this facility	6.6	5.9	6.2	0.7*	7.7	6.0	6.2	1.7*
20. The variety of foods served	7.5	6.0	6.1	1.5*	7.1	6.4	6.1	0.7*
21. Whether you enjoy the food	6.5	6.0	6.4	0.5*	6.5	5.9	6.4	0.6*
General satisfaction								
22. If you would recommend this facility to someone else	8.8	7.9	7.4	0.9*	7.3	6.9	7.4	0.4*

Note: All questions used a 10-point visual analogue rating format scale (1= *very poor*, 10 = *excellent*). Thus, for the results presented, higher scores indicate higher satisfaction.

a. We used the Nursing Facility Resident Satisfaction Questionnaire, which was tested with 1,000 residents and Cronbach's alpha for the domains was all above .70 (see Castle, 2006).

b. $N = 63$ (response rate = 95%).

c. $N = 61$ (response rate = 93%).

d. Collected Fall 2006 from 150 other nursing homes.

e. We used the Nursing Facility Family Satisfaction Questionnaire, which was tested with 550 family members and Cronbach's alpha for the domains was all above .70 (see Castle, 2004).

f. $N = 72$ (response rate = 64%).

g. $N = 83$ (response rate = 68%).

h. Collected Fall 2006 from 150 other nursing homes.

i. Change scores are the 2006 score minus the 2005 score, so that positive change scores represent improved satisfaction scores.

*Significant t test ($p < .05$) for Time 1 compared with Time 2.

may also be attributable to the numerous PPC initiatives. That is, these initiatives may have enabled caregivers to spend more time with family members (i.e., by eliminating wasted time in work activities).

Many quality improvement techniques (such as the Shewhart cycle, control charts, Six Sigma, and continuous quality improvement) came from an industrial base and were modified for use in health care. Thus, TPS represents one further quality improvement technique with an industrial lineage modified as PPC for use in long-term care settings. The principles of TPS modified as PPC translate very well. That is, nursing home residents are not a product (which is clearly objectionable) as would be the case for the application of TPS in most other industries; however, caring for residents clearly entails successful completion of a number of sequential steps (Castle & Engberg, 2008; Raab et al., 2006). These sequential steps are a process and as such can be redesigned.

Conventional quality improvement techniques are useful in pinpointing what needs to be changed; however they often flounder because they do not provide any guidance on how these changes should occur. This is the benefit of PPC (or TPS); it provides a means for process change. We echo the caution that we cannot yet point to any health care provider as the Toyota of health care, in that problems still remain at the nursing home test site. Nevertheless, many improvements were identified (at least as measured by the satisfaction scores).

Limitations

We do caution that these findings should be viewed with due consideration to the limitations inherent to the evaluation. The findings are only from one facility. It may be that some unobserved factor enabled the gains identified to be achieved at this facility. Moreover, the gains themselves can only be loosely tied to the PPC initiative. The use of a stronger methodological design (such as using a control group or randomization) would be advantageous. Also, collecting additional data such as the actual time staff spend with residents would be helpful to show that PPC activities eliminate waste and truly enable caregivers to engage in more time with residents.

The management team responsible for implementing PPC at this nursing home (the CEO, the administrator, director of nursing, and two unit supervisors) was very stable. That is, over the 2-year period evaluated turnover occurred in one position (director of nursing). Stable management teams are somewhat unusual in nursing homes (Castle & Banaszak-Holl, 2003), and this stability likely also contributed to the success of the PPC initiative.

Turnover of caregiver staff may also be important. High staff turnover increases training costs, as new staff will need training in the principles of PPC. However, the PPC initiative may also reduce staff turnover. If staff are more satisfied with their jobs (as our results would indicate), then they may be less likely to seek alternative employment (Castle, 2008). Staff turnover decreased during the time period of the PPC initiative. However, the time period for this evaluation is relatively short and consequently few turnover measures are available; thus they are not reported as part of this research. Moreover, for other facilities considering PPC, it is unclear what level of staff turnover would help or hinder implementation activities.

In addition, other considerations for facilities considering implementing PPC include impacts on occupancy, profits, and quality. To fully evaluate the business case for implementing PPC these are clearly important considerations. However, we are again limited by having a relatively short evaluation period, few available measures, and information from only one facility. Nevertheless, we identified occupancy rates to be high (>90%) at the facility both before and after implementation of PPC. Quality, as measured using 14 Nursing Home Compare Quality Measures, either improved (in 8 cases) or remained stable (in 6 cases) after implementation of PPC. We were unable to examine profitability of the facility.

Conclusion

The PPC provides a means for process change. Using this technique, improvements in work processes were implemented at this pilot facility. Gains in employee, family, and resident satisfaction were also achieved. Such gains themselves are laudable; however further research is needed to address the business case of implementing PPC. This is clearly important as many nursing homes operate close to the margin and cannot afford misplaced or misaligned initiatives. The impact of PPC on staff turnover, occupancy, profits, and quality need further evaluation. Nevertheless, partly based on the improvements identified at this pilot facility, other nursing homes in the region are beginning to implement PPC.

References

Alukal, G., & Chalice, R. (2007). Creating lean healthcare. In R. Chalice (Ed.), *Improving healthcare using Toyota lean production methods* (2nd ed., pp. 213-228). Milwaukee, WI: ASQ Quality Press.

Castle, N. G. (2004). Family satisfaction of nursing home residents. *International Journal for Quality in Health Care, 16*(6), 1-7.

Castle, N. G. (2006). Are family members suitable proxies for satisfaction survey information? *Joint Commission Journal on Quality and Patient Safety, 32*, 452-458.

Castle, N. G. (2007a). A literature review of satisfaction instruments used in long-term care settings. *Journal of Aging and Social Policy, 19*(2), 9-42.

Castle, N. G. (2007b). Job satisfaction of nurse aides. *Journal of Gerontological Nursing, 33*(5), 41-47.

Castle, N. G. (2008). Nursing home caregiver staffing levels and quality of care: A literature review. *Journal of Applied Gerontology, 27*, 375-405.

Castle, N. G., & Banaszak-Holl, J. (2003). The effect of administrative resources on care in nursing homes. *Journal of Applied Gerontology, 22*, 405-424.

Castle, N. G., & Engberg, J. (2008). Further examination of the influence of caregiver staffing levels on nursing home quality. *The Gerontologist, 48*(4), 464-476.

Chalice, R. (2007). *Improving healthcare using Toyota lean production methods*. Milwaukee, WI: ASQ Quality Press.

Decker, F. H. (2006). Nursing staff and the outcomes of nursing home stays. *Medical Care, 44*, 812-821.

General Accounting Office. (1999). *Nursing homes: Additional steps needed to strengthen enforcement of federal quality standards* (GAO/HEHS-99-46). Washington, DC: Author.

Hill-Westmoreland, E. E., & Gruber-Baldini, A. L. (2005). Falls documentation in nursing homes: Agreement between the minimum data set and chart abstractions of medical and nursing documentation. *Journal of the American Geriatrics Society, 53*, 268-273.

Institute of Medicine. (2001). *Improving the quality of long-term care*. Washington, DC: National Academy Press.

Kohn, K. T., Corrigan, J. M., & Donaldson, M. S. (1999). *To err is human: Building a safer health system*. Washington, DC: National Academy Press.

Kovacs, C. R. (2005). Age-related changes in gait and obstacle avoidance capabilities in older adults: A review. *Journal of Applied Gerontology, 24*, 21-34.

Leape, L. L., & Berwick, D. M. (2005). Five years after to err is human: What have we learned? *Journal of the American Medical Association, 293*, 2384-2390.

Levy-Storms, L., & Miller-Martinez, D. (2005). Family caregiver involvement and satisfaction with institutional care during the 1st year after admission. *Journal of Applied Gerontology, 24*, 160-174.

McHorney, C. A., Ware, J. E., Lu, R., & Sherbourne, C. D. (1994). The MOS 36-item short-form health survey (SF-36): III Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Medical Care, 32*, 40-66.

Milstein, A., Galvin, R. S., Delbanco, S. F., Salber, P., & Buck, C. R. (2000). Improving the safety of health care: The leapfrog initiative. *Effective Clinical Practice, 3*, 313-316.

Mohr, J., Abelson, H., & Barach, P. (2002). Creating effective leadership for improving patient safety. *Quality Management in Health Care, 11*(1), 69-78.

Persoon, T. J., Zaleski, S., & Frerichs, J. (2006). Improving preanalytic processes using the principles of lean production (Toyota Production System). *American Journal of Clinical Pathology, 125*, 16-25.

Putnam, M., Tang, F., Brooks-Danso, A., Pickard, J., & Morrow-Howell, N. (2007). Professionals' beliefs about nursing home regulations in Missouri. *Journal of Applied Gerontology, 26*, 290-304.

Raab, S. S., Grzybicki, D. M., Sudilovsky, D., Balassanian, R., Janosky, J. E., & Vrbin, C. M. (2006). Effectiveness of Toyota process redesign in reducing thyroid gland fine-needle aspiration error. *American Journal of Clinical Pathology, 126*, 585-592.

Scott-Cawiezell, J., Main, D. S., Vojir, C. P., Jones, K., Moore, L., Nutting, P. A., et al. (2005). Linking nursing home working conditions to organizational performance. *Health Care Management Review, 30*, 372-380.

Spear, S. J. (2004, May). Learning to lead at Toyota. *Harvard Business Review, 82*(5), 78-86.

Spear, S. J., & Bowen, K. H. (1999, September-October). Decoding the DNA of the Toyota Production System. *Harvard Business Review, 77*(5), 97-106.

Thompson, D. N., Wolf, G. A., & Spear, S. J. (2003). Driving improvement in patient care. *Journal of Nursing Administration, 33*, 585, 595.

Tyler, D. A., Parker, V. A., Engle, R. L., Brandeis, G. H., Hickey, E. C., Rosen, A. K., et al. (2006). An exploration of job design in long-term care facilities and its effect on nursing employee satisfaction. *Health Care Management Review, 31*, 137-144.

Wagner, L. M., Capezuti, E., Taylor, J. A., Sattin, R. W., & Ouslander, J. G. (2005). Impact of a falls menu-driven incident-reporting system on documentation and quality improvement in nursing homes. *The Gerontologist, 45*, 835-842.

Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation*. New York: Free Press.

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