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Achieving Restraint Reduction in a State Psychiatric Hospital: A Lean Six Sigma Project

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Abstract
This paper details a project initiated and performed by staff at a state psychiatric hospital to reduce the use of physical restraints on one unit using Lean Thinking and Six Sigma quality improvement facilitation principles (LSS). It was hypothesized that the use of these principles would overcome some of the institutional barriers which have reduced the effectiveness of previous change efforts to reduce physical restraint. The article discusses the implications of this project for both the hospital and the state hospital system.

Keywords: Lean Thinking, Six Sigma, Restraint reduction, psychiatric hospital

Introduction:
One of the most challenging issues that face psychiatric hospitals is the issue of violence on the units. The prevention of violence in psychiatric hospitals has been a well-documented area of concern for many years (Cornaggia et al., 2011). At one time about one in every three psychiatric hospital staff are assaulted every year (Applebaum & Dimieri, 1995). The risk of injury in public mental health hospitals is estimated to be greater than the injury rates from agriculture, mining, manufacturing, transportation, and construction combined (Dinwiddie & Briska, 2004). Consequences of violence include staff and consumer injury, increased use of restraint, reduced staff and consumer morale (Wildgoose et al., 2003; Bonner et al., 2002), and even deaths. There have been numerous efforts to reduce violence and restraint episodes but many have been either unsuccessful or short-lived. Some efforts have been geared towards training the staff (Aberhalden et al., 2007), others toward changing the physical environment, and still others have involved external consultation (Sclafani et al., 2008). What all of these

change efforts had in common is that they used the hospital's existing structure to attempt to change the problem of violence.

Lean Six Sigma (LSS) is a hybrid of Lean Thinking and Six Sigma (de Koning et al., 2006). Lean Thinking was developed by the Ford Motor Company of the 1920s and has become a staple in manufacturing since the 1990s (de Koning et al., 2006). Lean Thinking's primary concern is the detection, measurement, and elimination of non value-added activities, or activities which add no benefit to the customer (Jacobson, 2006). A tool used to do this is the value-stream map, where every step in a process is detailed and divided into value-added and non value-added. Some non value-added pieces are necessary and others may be unnecessary. Completion of the value-stream map leads to the "5 S method", which stands for sort, straighten, scrub, standardize, and sustain. The map involves arranging and changing (and possibly deleting) these processes in such a way that turns waste into increased productivity (de Koning, 2006). Lean Thinking's methods are described in more detail in the literature (George, 2003; Standard & Davis, 1999).

Six Sigma began as a Quality Improvement project at Motorola in 1987 and has been further developed by General Electric in the late 1990s (Breyfogle, 1999; de Koning & De Mast, 2006; Black & Revere, 2006; Harry 1997; Pyzdek, 2001). Six Sigma is characterized by its development of a structure of change initiatives and a corresponding structure of "bottom up" change agents called alternately "Black Belts, Green Belts, or Champions", as well as its synthesizing of a company's mission into measurable goals. A notable feature of Six Sigma is DMAIC, which stands for the five sequential phases of define, measure, analyze, improve, and control. Each of these phases has specific structures and goals before the next phase can begin (de Koning & De Mast, 2006). The first stage of DMAIC is Define the problem, wherein the team selects problems to work on. Measure refers to evaluating the data being collected. Analyze means evaluating the data to seek out the root cause of the defect under investigation. There should not be more than three root causes. The third stage is Improve, which means optimizing the current process by eliminating or controlling the cause of the inefficiency. The final stage, Control, refers to maintaining the change by continuously monitoring the new process. Table 1 illustrates these stages in greater detail.
Both Lean Thinking and Six Sigma have documented weaknesses. De Koning (2006) describes Lean Thinking as having deficits in the areas of structure, tools, and measurement while Six Sigma can be ponderous in its process and overlook practical solutions while it runs its course. Lean Thinking also fails to take into account the pressure it puts on other parts of the system while implementing its very specific projects. Goh (2002) also criticizes Six Sigma for its reliance on its system to make change, eliminating employee creativity and its lack of regard for "knowledge work", or quality of professional experience not easily measured by Six Sigma's data collection tools.

To address weaknesses of the two methods identified in the literature (Goh, 2002: de Koning, 2006), many organizations in business and in healthcare have embraced a combination of Lean Thinking's focus on efficiency into Six Sigma's DMAIC process to yield faster, yet comprehensive and measurable change. In fact, the combined focus is called "Lean Six Sigma" or LSS. The literature is beginning to show numerous examples of outpatient and private inpatient medical facilities benefitting from LSS implementation (de Koning, 2006; Viau, 2007; Kearney, 2010; Kim, 2006; Stahl, 2003; Craven, 2006). For example, through its 2000 strategic partnership with General Electric in 2000, Virtual Hospital brought in LSS (Black, 2006) and its principles to be the driving force behind its process improvement initiatives. Virtua was one of the first healthcare organizations to adopt LSS. They have experienced measurable positive results in such areas as delivery of care, employee morale, and the organization's "bottom line". To date, Virtua has seen results of more than $27 million since implementing the LSS methodology (Virtua, n.d.). In 2008, Rich Miller, the CEO and President of Virtua Hospital was recognized by Worldwide Convention and Business Forums as the Lean Six Sigma CEO of the Year for his leadership of the Lean and Six Sigma business models. (Virtua, n.d.).

Thus far, the existing literature has discussed primarily private medical facilities, both outpatient and inpatient. There is no documented effort of implementing Lean Six Sigma at a state-run psychiatric hospital. A state psychiatric hospital provides a unique challenge to change initiatives in restraint reduction. These hospitals are occupied by people with severe and persistent mental illness, often accompanied by substance abuse issues,

cognitive deficits, intellectual disabilities, severe medical problems, traumatic brain injury, as well as forensic and legal issues. There are also numerous obstacles from the staff's side, including: unions which have historically tended to value job security over change, departmental "silos" which divide care, the civil service process which can lead to promotion by seniority and can result in positions being vacant for years (Smith & Bartholomew, 2006). State hospitals are frequently over their stated patient capacity and are unmotivated to change until there is a high-profile escape or incident of violence resulting in media attention (Geller, 2000). The net result of this is an enclosed culture that tends to be unaware of new practices and reacts with suspicion if not with overt resistance to change initiatives (Institute of Medicine, 2001; Bartholomew & Kensler, 2010).

This paper reports on the application of LSS techniques and principles in a state psychiatric hospital unit to reduce restraint usage, time in restraints, and staff injury.

Method

Participants

The LSS strategy targeted a 30 bed unit within the 600 bed state psychiatric hospital. This particular unit was female and many consumers were diagnosed with developmental disabilities in addition to mental illness. As previously mentioned, the hospital was 25% over capacity at the beginning of this project. The pilot unit was comprised of 24 female with a mean age of 41.54 years and a mean length of stay of 3.33 years. Twenty-two of the twenty-four consumers were diagnosed with Mental Retardation, 15 were diagnosed with thought disorders, nine with mood disorders, and seven with Borderline Personality Disorder and there were also diagnoses of Dementia, Substance Abuse, Factitious Disorder, and Impulse Control Disorder. The implementation was unit-wide within a state psychiatric hospital and was also explained that, if successful, the initiative was intended to be permanent and would be expanded to other units.

Procedure

Two staff trained in LSS at Virtua Hospital proposed a pilot project to test these methods in a state psychiatric hospital. Hospital Administration supported the grass-roots interest in developing a new change initiative based on the LSS model. The hospital CEO and Deputy CEO of Clinical Services reviewed the proposal and gave the work group approval to move forward. Education was provided to the project sponsors (management leaders) and to the selected stakeholders (team members). The plan was to use several LSS techniques, such as workout meetings, benchmarking, process mapping, DMAIC, and the use of a dashboard to create "bottom-up" interventions to be created by the people who would actually be implementing them.

The Intervention Stage of the project began September of 2009 with baseline measurements and training taking place the six months previous. The first step was the initiation of Quantum Change Sessions (QCS): two-day brainstorming sessions in which the work groups explored and reengineered hospital processes to reduce waste and deflect opportunities for errors. The QCS meetings were run by the two LSS-trained facilitators and the work groups consisted of a 10 member team which included three charge nurses, six direct care staff representing all three shifts, and one Behavioral Support Technician.

The LSS facilitators oriented the team to LSS methodologies and techniques and provided them with national ward-specific restraint data and related staff injury data. Restraint reduction literature such as MANDT TM and other programs currently promoted and taught by the hospital training department were reviewed for integration purposes and to increase team member knowledge about current restraint reduction research and methodologies.

Lean Six Sigma Strategies

A comprehensive strategy and implementation plan was developed by the workgroup. The team spent two weeks prior to the September, 2009 start date preparing training materials, reengineering physical ward space, and training staff from all three shifts. The training materials included a procedure manual called "Tools to Replace Two- and Four- Point Restraints" which was written by unit nurses (Givens & Boisseau, 2009). The physical ward

space was altered to accommodate the setting up of a de-escalation area known as the "Walk It Off Zone" (see Figure 1.). Part of the staff training involved the development of the "Point Person" position, an assignment only given to a seasoned Human Services staff member who is free at all times to respond to a potential crisis. The primary responsibility of the Point Person was "to recognize…identify…and intervene…to promote patient and staff safety" (p. 4). This was done via monitoring on all three shifts and access to an array of interventions (e.g. quiet room access, active listening). Another benefit of the Point Person was to have a single "go-to" person for agitated clients access, rather than getting conflicting messages from other staff who may be already occupied in other duties.

After 6 months, a one-day follow-up team meeting was held to discuss the progress of the plan and make adjustments. The "Script", a loosely structured conversation designed to emphasize consumer choice to avoid violence was introduced by staff to assist the Point Person or Human Services staff to use with a person in crisis. The Script and the Walk It Off Zone were combined to create a supportive environment that offers options to the consumers, the belief being that having the freedom to make a choice helps the person in crisis reestablish their sense of control. The team also trained new staff.
During the pilot period (September 2009 – March 2010), restraint data and staff injury data were retrieved daily from the Quality Improvement and Risk Management Departments on existing hospital documents. Severity and frequency of staff injuries were monitored daily to minimize the risk of continuing to implement a flawed plan. Monthly statistics were posted on the wall in the nurse station with large poster paper.

Results

A single-case design was used to analyze the data (Carr & Burkholder, 1998; Lundervold & Belwood, 2000). The results of this project (see Figure 2) showed restraints decreasing from an average of 44 per month to 19 per month, a 58% reduction within a 7-month period. In addition to this, the time consumers spent in restraints was reduced from 39 hours per month to 18 hours per month, a 54% reduction (see Figure 3). An unexpected finding indicated that staff injuries also were greatly reduced, from 16 during the 8-month baseline evaluation to 1 during the 7-month intervention period, a 93% reduction (see Figure 4).
It was also found that of the 131 restraint episodes that occurred during the Implementation Phase, no Point Person was available during 58 (44%) of the restraint episodes due to staff shortage.

Discussion

Utilizing LSS methods initiated significant reductions in restraint usage. As predicted, restraints were reduced, with the month of highest restraint being 38% below baseline. The drastic reduction in staff injury was also not expected. The significance of staffing issues also became evident, as the data indicated a strong relationship of Point Person availability to incidents. There was suggestion of a cultural shift of the staff through participation in the process as indicated by a nurse who had been involved in the most restraints actually became a champion of the process after increased involvement in the project.

The reduction in restraint began at the conclusion of training, two months prior to the formal start of the initiative, where the number of monthly restraints dropped from 54 to 7. The staff had been trained on the new methods and immediately began implementation prior to the formal start date. Whether this change is partially attributable to a Hawthorne Effect or entirely due to the training is a matter for further evaluation in future projects.

Integral components of the success of this project were identified as: multi-level redesign involving giving the project its own structure within the hospital hierarchy, a committed team, the development of the training/procedure manual, the development of the "Point Person" position, training all three shifts on the restraint reduction concepts utilizing seasoned Human Services staff members to model the training, education for consumers about the availability and purpose of the Point Person, posting of monthly statistics on the Nurses Station walls to provide project feedback and maintain staff morale, the development of the "Walk It Off Zone"

and “Script” to de-escalate crises and the support of the LSS Implementation Team who believed in the project and stayed with it throughout the one year assignment.

Other reasons for success were, we believe: the adherence to the concepts of Lean Thinking and Six Sigma as methods to increase efficiency and quantify hospital processes so that quality of care and safety could be enhanced and the idea that this change came from the staff, which enhanced buy-in as opposed to change processes which are imposed by Administration or from outside the hospital. One implication of this study confirms Black and Revere’s (2006) assertion that “if a healthcare organization does not completely change its culture to total and continuous quality improvement, then the quality effort is doomed to failure” (p. 261). This project was an example of the organization at all levels, backing a quality improvement project with proven facilitation methods and is a model for further change at this hospital and elsewhere.

Limitations

A potential limitation of this study is the possibility that restraint reduction was related to consumer transfers or discharges, or new consumers being introduced to the unit. No consumers with repeated restraint episodes were discharged during the intervention period; however one such consumer was transferred off-unit during the baseline period and returned during the intervention period. Another such consumer was discharged during the baseline period.

Another potential limitation to the generalizability of the methodology and result is related to the specialized population served by this ward. While it would be hoped that the Lean Six Sigma process could improve restraint usage with all populations, this evaluation is limited to women with dual diagnoses of developmental disabilities and severe and persistent mental illness. Also, in a hospital of this size, at any given time, there are numerous change efforts going on, many not coordinated with each other. There was no way to control for those in this study.

Future Research

LSS can be an effective practice in promoting change in state psychiatric hospitals. Due to the success of this project, there was more buy-in from staff members who generated ideas for additional projects. Areas of future research include: replicating this project on male and co-ed units, and on units with people without intellectual disabilities, as well as in other state psychiatric hospitals.

Conflict of interest: None.

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