In 2005, inpatient falls at our tertiary care hospital reached 4.0 per 1,000 inpatient days. To reduce inpatient falls in a tertiary care hospital, a Fall Prevention Initiative (FPI) was implemented in early 2006. In response to the Hospital’s highest recorded inpatient fall rate the Hospital’s Board, the Chief Executive Officer and the Vice President of Quality Management, in their ongoing review of key quality indicators, highly prioritized inpatient fall reduction and associated injuries. The goal of the fall prevention initiative (FPI) is provision of a safer patient environment by significantly reducing the hospital inpatient falls and related injuries incidences, and to improve relative to national and our local healthcare system fall benchmarks.

This goal was accomplished through a cultural transformation emphasizing safety awareness, critical thinking, and greater staff accountability for fall prevention. In addition to the cultural transformation, the fall prevention policies and procedures were reviewed, and limited key improvements were implemented within the new cultural paradigm.

A 50% reduction in inpatient falls demonstrates that the FPI created a safer inpatient environment. In addition to statistically significant inpatient fall and associated injury reductions, a review of the literature did not identify any fall prevention program that focused on cultural transformation in a tertiary care hospital. We successfully changed the culture at our hospital, by fostering greater safety awareness, critical thinking and accountability to fall prevention, and which resulted in significantly reduced inpatient falls and associated injuries. The hospital culture has transformed from where fall prevention was not highly effective, and viewed by the staff as burdensome and time consuming, to now where outcomes are greatly improved and fall prevention strategies are energetically and enthusiastically embraced by staff that has developed high morale because of their success. Fall prevention prioritization has improved the effectiveness of new and old falls prevention policies and procedures, as now meaningful compliance is much improved.

In late 2005, during the assessment period, the Chairman of Rehabilitation Medicine and the Chief Nurse Executive assumed the role of Co-Chairs of the Hospital Falls Prevention Committee. As fall associated
injuries increased in the first quarter of 2006, the Co-Chairs being accountable to the board and senior executive management, implemented the FPI by mandating greater committee attendance by Inpatient Unit Care Nurse Managers, Associate Vice Presidents of Nursing, Quality Management Nurses, Nurse Educators, representatives from Staff Nurses, and Patient Care Assistants.

Since it was felt that the main reason for the high falls rate was inadequate adherence to policies and procedures, rather than revamping them, the primary goal of the FPI was to create a culture where rigorous and effective compliance was the norm. However, on a limited basis, opportunities were identified to improve the fall prevention policies and procedures, and a few important new ones were implemented during the FPI.

**Leadership Involvement:**

The Hospital Board of Directors, the Chief Executive Officer, and the Vice President of Quality Management commissioned the initiative. Keenly aware of the importance of patient safety and cognizant of the Joint Commission’s addition of fall prevention to its list of National Patient Safety Goals, these organizational leaders assigned, held accountable, and strongly supported the Chairman of Rehabilitation Medicine and the Chief Nurse Executive to lead the initiative. These two initiative leaders, Co-Chaired the hospital Falls Committee and held ongoing meetings with all of the Inpatient Care Unit Nurse Managers to critically review fall related policy breeches. Initiative leaders monitored data, enhanced staff awareness, and stimulated cultural change with FPI updates to the hospital Board of Directors, the medical and nursing staff, and to PICG committees. They also lead the review and spearheaded the limited modifications of the pre-existing fall prevention policies and procedures. In addition, the Associate Chairperson of the Department of Medicine, a strong supporter of the initiative, educated the medical house staff physicians about the FPI, patient safety, and mandated that all house staff follow fall prevention policies and procedures.

**Execution:**

Prior to the FPI, fall prevention was pro forma at the hospital. When patients fell, incident reports were completed, causal analysis and corrective actions were documented, but none of these activities was vigorously or effectively carried out. With the FPI, all staff and managers were now expected to critically evaluate individual patient falls and trends, identify potential corrective measures to reduce future falls, foster collaboration, share best practices, and take ownership and accountability for fall prevention. Starting in early 2006, Unit Care Nurse Managers received a unit specific report of their unit’s fall index (falls per 1,000 patient days). After implementing the FPI, critical analysis of each fall was required. Monthly reviews of inpatient falls were held and attended by the Inpatient Unit Care Nurse Managers, the staff providing patient care, and the Co-Chairs. At these meetings, the root cause of major falls were investigated with the involved staff to identify the cause of each fall, identify missed preventive opportunities, engender critical evaluation of falls, identify accountability and protocol breeches, enhance the fall prevention protocols, and facilitate our efforts to promote a new culture. One expectation of the FPI was that the Inpatient Unit Care Nurse Managers perform effective concurrent fall incident report investigations and immediately implement any needed corrective action. At the fall review meetings, any inability to present a high quality concurrent fall review by the Unit Care Nurse Managers was deemed unacceptable and improvement was expected and achieved as the FPI evolved.

In addition, to foster rigorous adherence to the FPI, in March 2006, Inpatient Care Unit Managers were assigned daily fall prevention rounds to assess all unit admissions and to insure that appropriate fall risk assessments and appropriate fall prevention strategies were implemented. Similarly, in July 2007, Assistant Directors of Nursing were required to use a new fall investigation tool to determine the appropriateness of the patient’s plan of care and what fall prevention safety measures were instituted versus what should have been in place. By including multiple levels of management in the FPI, fall prevention protocols breeches were quickly identified and not only were the staff caring for the patient accountable for fall prevention, now the new cultural paradigm extended more involvement and accountability to the Inpatient Unit Care Nurse Managers and the Assistant Directors of Nursing.
In March 2006, bed alarm use, the most important new fall prevention policy, was introduced. Bed alarms sound when a patient attempts to get out of bed and summons staff for assistance. Objective fall risk assessment criteria were developed to evaluate bed alarm need. The nurses assessed bed alarm need upon admission to an inpatient unit and daily thereafter. To reinforce critical evaluation, nurses could override assessment results and either use or not use a bed alarm by documenting their justification. After a review of data identified a trend of falls among bed alarm users sitting in chairs, the bed alarm policy was expanded to include chair alarms.

Continuous performance improvement data also identified a high prevalence of toileting related falls. As a corrective action, an important toileting protocol was adopted in March 2006. To prevent toileting related falls, patients with a high fall risk were offered assisted toileting every two hours during the day and every four hours at night, if awake, thus, reducing the likelihood of unassisted toileting and potential falls. A few toileting related falls were also noted among patients taking the diuretic Furosemide, which led to a Furosemide administration protocol in September 2006. Furosemide was administered three hours earlier at 6 PM, reducing the likelihood that a patient would need to void in the middle of the night, when they might have higher risk of unassisted toileting. Also, in September of 2006 Diphenhydramine and Hydroxyzine use was restricted as a sleep aid in patients over 65 in response to a small trend identified in elderly patients who fell after taking one of these medications.

To maximize the FPI success and to emphasize an institutional culture shift across all disciplines, physicians were recruited into the FPI, and in March 2007, a post fall physician progress note was introduced, requiring house staff physicians to determine whether patients were taking medications that increase risk of falling and for them to consider medication adjustments. Similarly, to insure that other non-nursing personnel working in inpatient care areas were part of the cultural transformation, a fall prevention video was shown to all pertinent staff as part of a house-wide in-service. The video also has also been incorporated into New Hire orientation. General safety precautions, such as orienting the patient/significant other to environment, were also implemented for all inpatient admissions and all staff were instructed that appropriate equipment such as the call bells, phones, and urinals were to be kept within reach of the patient. These actions not only directly improved fall prevention strategies, they also promoted cultural transformation with the expectation that patient safety and fall prevention is critical and is everyone’s responsibility.

Achievements:

Qualitatively the FPI has been highly successful. We have successfully transformed the culture of our hospital. Now there is greater awareness of the importance of fall prevention, more critical thinking when developing treatment plans and other fall prevention strategies, and accountability to prevent falls. Busy staff have transformed from the point where fall prevention was burdensome and superficial, to now where it is highly effective, a source of pride, and engenders high morale and enthusiasm for continued improvement. Pre-existing policies and procedures and key new ones, especially the “Bed/Chair Alarm” and “Toileting” protocols, were more effective in reducing falls as they were vigorously complied within the hospital’s transformed culture.

Quantitatively, inpatient falls and associated injury have significantly decreased and continue to decline as the effectiveness of the FPI evolves. The falls rate has also greatly improved relative to national (confidential report) and benchmarks from our healthcare multi hospital system. Detailed statistical outcome analysis is discussed below.

Commitment To Cost Efficacy:

Equipment costs were limited to Personal Alarm and Sitter Select bed and chair alarms and their associated mattress and chair pads. Although the Personal Alarm and Sitter Select have a lifetime warranty, for purposes of this analysis we assumed alarms require replacement every 3 years. Thus, the annual cost for the alarm units can be estimated at one third of the first year cost. The mattress and chair pads need frequent replacement, so the first year cost is a good estimate of the ongoing annual cost. Based on the first year costs of
the alarms and pads, it is estimated that the ongoing annual equipment and supplies cost of the initiative is $26,485.03, as shown in Table 1. The cost of the initiative is minor compared to the hospital saving associated with our decreased falls and injuries. Direct costs per non-injurious falls (includes “minor” injuries as defined below) were calculated to be $48.95 based on the actual costs of the fall related work up. Cost per fall associated with injury (significant injuries only: “moderate” and “severe” as defined below) was estimated to be $16,255.59, as the product of average cost per inpatient day ($1,500) and the difference between observed and expected length of stay based on DRG and CMG codes for Medicine/Surgery and Rehabilitation admissions respectively, and average length of stay in the Psychiatric unit. This includes cost per inpatient day of any subsequent admission at our hospital (i.e. our Rehab Unit) related to the fall. As can be seen in Table 2, a conservative estimate of the annual savings based on the reduction in falls and significant injuries is $173,963. We believe this a low estimation and the actual savings is likely to be much higher, as the estimate does not include savings associated with injury related care post discharge from our hospital, reduced liability claims, nor mortality. It also does not factor savings associated with reducing extended length of stays needed for work ups in patients who did not sustain significant injury. The cost reduction associated with decreased falls will be of even more important to the hospital once Medicare implements the “Hospital Acquired Complications Program” as there will no longer be reimbursement for treating the injuries associated with inpatient falls.

**Impact On The Organization’s Efficiency:**

The FPI positively impacted organizational efficiency. The FPI did not require additional staff. In fact, the FPI involved staff that had fall prevention responsibility prior to the initiative. Notwithstanding additional mandatory meetings, we believe staff time spent on fall prevention actually decreased as the time required to investigate, evaluate, and provide treatment for falls lessened when the number of falls and associated injuries decreased. FPI procedures were readily integrated into existing systems, which made them more efficient. For example, the FPI successfully integrated the preexisting Hospital Fall Prevention Committee, and the cultural transformation enabled the fall prevention policies and procedures already in place to become more efficient, as the time spent adhering to them resulted in great reductions in falls and injuries.

**Permanent Process And Outcome Data Management And Results, Including Operational Definitions, Qualitative and Quantitative Data, and Evidence of Sustainability:**

Analysis of FPI data were stratified into three stages: the pre-intervention phase corresponded to the year preceding the implementation of the intervention program (2\textsuperscript{nd} quarter of 2005 – 1\textsuperscript{st} quarter of 2006) and included a two month assessment period that confirmed a hospital culture with inadequate prioritization of and compliance with fall prevention protocols. The intervention phase corresponded to the first year of the implementation of the FPI (2\textsuperscript{nd} quarter of 2006 – 1\textsuperscript{st} quarter of 2007) and included many activities geared towards cultural transformation through increasing safety awareness, encouraging critical thinking among the staff for fall prevention, and to hold them accountable for complying with fall prevention protocols. Also, during the intervention phase, existing policies were evaluated and modified on a limited basis in response to data driven identified trends associated with increased fall risk. The evolution phase is ongoing and to date includes three quarters (2\textsuperscript{nd} quarter of 2007 - 4\textsuperscript{th} quarter of 2007), and during which a continuous performance improvement philosophy has been sustained to increase the quality of the FPI. During the FPI, data were continually collected and FPI effectiveness was measured using inpatient fall and associated injury incidences and benchmarks as the quality improvement indicators. All inpatient falls, among adults aged eighteen or older, with an inpatient stay of one-day or longer, were included in the analysis. Benchmarks included sequential pre-post internal comparisons of the hospital and specific inpatient units, comparisons to the other hospitals in our healthcare system, and comparison to an external national benchmark (confidential report).

In the pre intervention year there was a total of 868 overall inpatient falls which increased by approximately 6.0% from 191 inpatient falls to a 224 inpatient falls per quarter (Figure 1), and the overall inpatient fall rate reached 4.0 per 1,000 inpatient days (Figure 1). At a national level, in the 4\textsuperscript{th} quarter of 2005, there were 8.47 per 1,000 inpatient days in selected inpatient units (confidential report), significantly higher
than the national comparative mean of 3.90 inpatient falls per 1,000 inpatient days (upper quartile to lower quartile ranged from 2.01 to 5.17 per 1,000 inpatient days).

After the intervention, overall inpatient fall rates per 1,000 inpatient days significantly decreased (p<0.0001). The largest sequential decrease was between the pre-intervention and evolution phases where a 41.2% decrease in average overall fall rates was observed (3.7/1,000 inpatient days at baseline vs. 2.2/1,000 inpatient days in evolution period (Figure 1)). Our overall inpatient falls rate has continued to decrease during the evolution period. For the fourth quarter of 2007 compared to the last six months of the pre-intervention phase, there has been a significant (P<0.0001) 50% reduction in the overall falls rate as seen in Figure 1. Between the pre-intervention and the post-intervention phases, both the frequency of inpatients with single and multiple falls significantly decreased. The greatest relative reductions were among inpatients with multiple falls, a strong indicator of the effectiveness of the FPI in preventing multiple inpatient falls (Table 3).

A very significant reduction in fall related injury was observed between the evolution and the pre-intervention phases (p<0.0001). Patients without injury were classified as “no injury”. “Minor injury” was defined as wounds and laceration not requiring sutures or contusions requiring ice packs. Significant injuries included “moderate injury” defined as fractures, lacerations requiring sutures or injuries that resulted in surgery or transfer to a higher level of care and “severe injuries” which were those resulting in death. As compared to pre intervention, in the evolution phase minor and moderate injury rates had the greatest reduction, 65% and 35% decreases respectively, and very low major injury rates precluded comparisons (Table 3).

During both the intervention and the evolution phases, we exceeded our internal 20% per year inpatient fall reduction benchmark and also greatly improved compared to national benchmark data (confidential report). Also, in rank comparison to the nine other acute care hospitals in our local health care system, our hospital had the second to worse inpatient fall rate in 2005 (3.9 inpatient falls per 1,000 inpatient days), twice as high as the lowest rate, and the worse rate among the three tertiary care hospitals. In contrast, our hospital with rates currently trending lower, now has the second lowest inpatient fall rate (2.15 inpatient falls per 1,000 inpatient days) in our local health care system and the lowest among the tertiary care hospitals.

Evidence supports the sustainability of the FPI in preventing inpatient falls and associated injuries. Not only has the incidences of inpatient falls and associated injuries remained much improved for the almost two years, the data demonstrates that the FPI has become even more effective during the evolution period with progressive reductions in inpatient fall rates. The 50% reduction in overall inpatient falls and the significant decline in associated injuries is evidence that the cultural transformation that has occurred at our hospital has been institutionalized and will be sustained. The staff and management responsible for inpatient fall prevention have become energized and are enthusiastically committed to the success of the FPI. Staff Morale is high because of the success of the FPI, and the Board of Directors and senior management of the hospital are firmly committed its continuation, further insuring the sustainability of the FPI.

Lessons Learned:

- Cultural transformation, with improved staff safety awareness, critical thinking, and accountability for fall prevention, was a powerful tool in improving patient safety and reducing inpatient falls/injuries.
- The Hospital Board’s leadership role, and the inclusion of a broad range of personnel including management, nursing, and non-nursing staff were key to achieving cultural transformation.
- Achieving effective compliance with fall prevention policies and procedures, while only adding a limited few new ones, was important to the success of the FPI.
- Improved patient safety through the reduction of falls/injuries is cost effective.
- Data collection, analysis, and a continuous performance improvement philosophy were important for the success of the FPI.
Table 1. Annual Equipment Cost of Falls Prevention Initiative.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Per Item</th>
<th>Number Purchased</th>
<th>Cost First Year</th>
<th>Estimated Lifetime</th>
<th>Estimated Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Alarm</td>
<td>$37.13</td>
<td>289</td>
<td>$10,730.57</td>
<td>3 Years</td>
<td>$3,576.86</td>
</tr>
<tr>
<td>Sitter Select</td>
<td>$70.00</td>
<td>600</td>
<td>$42,000.00</td>
<td>3 Years</td>
<td>$14,000.00</td>
</tr>
<tr>
<td>Mattress Pads</td>
<td>$26.53</td>
<td>777</td>
<td>$20,613.81</td>
<td>6 Months</td>
<td>$20,613.81</td>
</tr>
<tr>
<td>Chair Pads</td>
<td>$23.87</td>
<td>256</td>
<td>$6,110.72</td>
<td>6 Months</td>
<td>$6,110.72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$79,455.10</strong></td>
<td></td>
<td><strong>$26,485.03</strong></td>
</tr>
</tbody>
</table>

Table 2. Estimated cost of inpatient falls based on pre-intervention and ongoing intervention.

<table>
<thead>
<tr>
<th>Time</th>
<th>Falls</th>
<th>Cost with injury</th>
<th>Cost without injury</th>
<th>Total average cost</th>
<th>Average annualized cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>06Q1</td>
<td>224</td>
<td>$113,789.13</td>
<td>$10,600.45</td>
<td>$103,188.68</td>
<td>$412,754.72</td>
</tr>
<tr>
<td>07Q4</td>
<td>113</td>
<td>$65,022.36</td>
<td>$5,324.65</td>
<td>$59,697.71</td>
<td>$238,790.84</td>
</tr>
</tbody>
</table>

Savings: $173,963.88

Figure 1. Quarterly inpatient falls and falls per 1,000 inpatient days.

Table 3. Inpatient fall, stratified by number of repeat falls within a hospital stay and by injury level.

<table>
<thead>
<tr>
<th>Number of Falls*</th>
<th>Pre-Intervention</th>
<th>Intervention</th>
<th>Evolution</th>
<th>Relative incidence ratio</th>
<th>t-test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Falls</td>
<td>Rate per 1,000 ID</td>
<td>Falls</td>
<td>Rate per 1,000 ID</td>
<td>Falls</td>
<td>Rate per 1,000 ID</td>
</tr>
<tr>
<td>*Includes inpatients, admitted and discharged in one phase; †Inpatient days; ‡Uses pre-intervention phase as the reference group; ¶Unequal variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>