Abstract
Introduction: Employee safety and the reduction of Days Away, Restricted, or Transferred are a focus of the Solutions for Patient Safety Network. One significant contributor to the Days Away, Restricted, or Transferred rate at Children’s National Hospital is employee slips, trips, or falls. Methods: Children’s National Hospital implemented a multidisciplinary quality improvement with executive leadership vision and support. We implemented quality techniques (including Key Driver Diagrams, Pareto Charts, and continuous Plan-Do-Study-Act) and designed novel Environmental Services interventions. Results: Children’s National Hospital achieved a 44.3% reduction in monthly average reported slips, trips, or fall events from baseline and sustained over a 2-year study period. Conclusion: A leadership-driven multidisciplinary approach to quality initiatives with team leaders capable of making and enacting real-time policy changes led to novel interventions and a successful reduction of employee slips, trips, and falls events over time, which are broadly generalizable. (Pediatr Qual Saf 2022;7:e550; doi: 10.1097/pq9.0000000000000550; Published online March 30, 2022.)

INTRODUCTION
Employee safety has trailed advances in patient safety. In the late 1980s, Paul O’Neill revolutionized employee safety by creating a system for reporting accidents and injuries and analyzing root causes to identify deficiencies. He believed and ultimately proved that a focus on employee safety would increase overall productivity and profitability.1,2 In healthcare, serious, non-fatal workplace injuries total 2 billion dollars nationwide in workers’ compensation, with 6.8 work-related injuries and illnesses for every 100 full-time employees in 2011.3 Groups such as the Institute for Healthcare Improvement have credited Mr. O’Neill for establishing the basic tenants of employee safety that continue to guide their philosophy today.4 The Children’s Hospital’s Solutions for Patient Safety (SPS) Network includes 145+ member hospitals working together to eliminate serious harm across all children’s hospitals.5 Excitingly, SPS partnered with and consulted with Mr. O’Neill to draw employee and staff safety in hospitals to the forefront of their work. As a result, SPS formally launched the work on employee and staff safety in 2016, where quality and safety leaders came together to accomplish several objectives, which included: creating awareness of the scientific evidence linking employee/staff safety to patient safety, reviewing best practices from other industries related to employee/staff safety work, and presenting and recommending SPS Network-wide goals.6 One of the stated goals of the SPS collaborative is to achieve a 25% reduction in network Employee/Staff Days Away, Restricted, or Transferred rate,6 a safety metric tracked by the Occupational Safety and Health Administration.3 SPS recognizes Slips, Trips, and Falls as a focus area contributing to the overall Days Away, Restricted, or Transferred rate.6

Previously published works have demonstrated the success of leadership-driven programs to improve patient safety and eliminate preventable harm. For example, Nationwide Children’s in 2008 developed the “Zero Hero” program to provide a face to their message of improving patient safety.7 In 2017, following the footprint established by other institutions, Children’s National Hospital’s President and Chief Executive Officer, along with the Board of Directors and Executive Leadership encouraged and supported management to...
launch a centralized, hospital-wide Employee and Staff Safety (ESS) Program\(^4\) to create a safer work environment for employees and decrease the institutional Days Away, Restricted, or Transferred rate, which at 1.48\(^6\) was above the national benchmark of 1.15.\(^9\) The group reviewed baseline data and identified five employee injury focus areas based on the frequency of events and staff most vulnerable to harm. The focus areas included sharps injuries, blood and body fluid exposure, workplace violence, slips, trips, falls, and overexertion injuries.\(^8\) We have previously reported on the success of our broad employee staff safety work to create a safer work environment.\(^7\)

The prior article was overarching; it demonstrated the role of a system-wide programmatic effort to tackle the problem of employee staff safety and addressed sharps injuries, blood and body fluid exposures, workplace violence, overexertion, and slips, trips, falls from a macro perspective.\(^9\) The current report details the specific quality improvement initiative aimed to decrease the number of slips/trips/falls by 20% initially in the first 6 months of FY 18 and sustain for 1 year within Children’s National Hospital owned and operated facilities. The group chose a target of 20% as an attainable goal to target in the first 6 months. Anecdotally, it has become apparent that hospitals struggle in specific focus areas under the employee staff-safety work. Therefore, it is imperative to present shared learnings in this area of the employee staff-safety work. The results demonstrate the institutional leadership and multidisciplinary approach required to make significant improvements to employee safety, acknowledging that this work is generalizable within an organization’s employee safety operations other organizations.

**METHODS**

This project was deemed exempt from Institutional Review Board approval as a quality improvement project. Children’s National Hospital, located in Washington, DC, is an urban, tertiary-care, 323-bed free-standing academic children’s hospital, with approximately 8000 employees.

The quality and safety initiatives at Children’s National Hospital have undergone many iterations, starting in 2006 and again embarking on the second iteration in 2012.\(^10\) The framework in 2014 for patient safety led to significant organizational improvements in patient safety and quality. As a result, executive leadership challenged the organization to create similar employee and staff safety processes. Initially, the Employee and Staff Safety Steering (ESS) Committee\(^8\) was created, tasked with advancing the safety culture at Children’s National Hospital, and reducing harm to employees. The multidisciplinary committee, chaired by the Vice President, Chief Quality and Safety Officer, and the Vice President, Chief Risk Officer, included representatives from Risk Management, Patient Safety, Workers’ Compensation, Nursing, Security, Environmental Services (EVS), Occupational Health, Human Resources, and Performance Improvement. As described previously,\(^9\) the group highlighted five employee injury focus areas based on the frequency of events and staff most vulnerable to harm: sharps injury, blood, and body fluid exposure, workplace violence, slips/trips/falls, and overexertion. In addition, the committee chose team leads based on expertise and appropriate oversight for instituting change in real-time to address each area.

The ESS Committee named the Environmental Services (EVS) Director team lead of the slips/trips/falls focus area; team members included EVS managers and supervisor. The safety and quality team provided support, guidance, and insight. The team followed OSHA definitions: slip is the lack of traction between footwear and walking surface; a trip impedes lower extremity movement. A fall is a total loss of balance from the same or lower level.\(^3\) Before inclusion in the data, the team leader carefully reviewed and evaluated the events. Ongoing injury data came from safety event reports, Occupational Health records, and Worker’s Compensation events.

At Children’s National Hospital, the ESS slips/trips/falls subgroup performed baseline analysis and identified 91 injury incidents in FY 2017. The team created a Pareto chart (Fig. 1) to categorize the areas of injury for intervention. In addition, they created key driver diagrams (see figure 1, Supplemental Digital Content 1, http://links.lww.com/PQ9/A369) through data analysis, review of best practices, and staff feedback. The group met quarterly to assess intervention success; the team analyzed Pareto charts and developed subsequent Plan-Do-Study-Act cycles based on data gathered for the previous quarter. In addition, the EVS team met weekly to provide immediate feedback to the group leader.

**Wet Floors**

Based on initial data, wet floors caused 41% of slips, trips, and falls. Next, the team investigated individual cases and identified several areas for improvement and intervention (Table 1). First, the team installed large moisture mats at all transition points and extended outward and inward following PDSA re-evaluation to address entrances. Second, EVS placed stands with plastic bags strategically at main entrances; security officers instructed visitors to use those bags on PDSA re-evaluation. Third, we aggressively placed wet floor signage surrounding select high-traffic restroom areas. Additionally, we installed push button alert technology to report unsafe conditions in these areas. When pressed by the user, the button alerts the EVS staff to an area requiring attention, allowing faster response time. Finally, elevator areas utilized more mats and signage for transition points.

In areas of active EVS cleaning, we implemented multiple interventions over several PDSA cycles. Initially, EVS workers placed wet floor signage at either end of the work area. Despite the signage, staff continued to enter work areas unintentionally through the alternative entrance and exit points within the work. EVS subsequently proceeded to rope off the entire work area,
preventing this phenomenon. In addition, EVS informed the charge nurses of pending work to alert bedside staff in clinical areas. Finally, in addressing elevators, the EVS staff partnered with the security department to stop and rope off active areas until floors were dry to minimize the chances of injury.

The team launched the “Lid On” campaign to promote using lids on drink containers and saran wrap to cover all food and drink products, leaving the cafeteria area to address cafeteria slips. In addition, Saran wrap stations were increased and made more visible, and wet floor signs were proactively placed around the cafeteria to bring attention to the high-risk areas.

Other Areas
Obstacles causing injury were primarily parking garage speed bumps and uneven ground trips. We addressed these obstacles by painting the speed bumps bright yellow to make them more noticeable addressed old areas of uneven pavement. During the winter months, outdoor weather conditions related to icy conditions were especially prevalent at various outpatient outreach centers. These centers mainly were properties that the organization did not own; instead, they were leased. To address this, the group proactively reached out to landlords to request the salting of sidewalks before the known risk of snow and ice buildup. On the institutional campus, EVS proactively salted outdoor areas before the risk of snow and ice. The balance category included instances of injury where a review identified no modifiable cause, and the reason for the slip was human error.

Injury Prevention Kits
To augment the specific interventions, the EVS installed multiple “kits” to assist staff in high-risk areas to minimize the possibility of injury. The first was a “Spill Kit.” This kit consisted of rapidly deployable wet floor signs and absorbent pads to soak up wet areas until EVS staff

**Table 1. Wet Floor Injury Areas of Focus**

| Area Needing Attention | Description |
|------------------------|-------------|
| Entrance areas         | Entrance areas with transition points connecting outdoor to indoor were noted to be high frequency areas of injury |
| Umbrellas              | During rainy days, the frequency of injury increased and water dripping from umbrellas were identified as the cause |
| Restrooms              | Constant wet floors from use of water in restrooms caused frequent injury |
| Cafeteria              | Spills from drinks and food onto the floor of the cafeteria and surrounding areas were identified as source of injury |
| EVS cleaning           | Areas being actively cleaned by EVS were often wet and slippery, causing injury to EVS employees themselves as well as passers-through |
| Elevators              | Elevators were noted to be an area of wet floor injury during EVS cleaning as people transitioned on and off |
arrived at the scene. In addition, the welcome desk staff deployed this kit at major entrances when necessary.

To address injury within the EVS staff during cleaning, we created a “Floor Care Kit.” When deployed to an area of interest, it included a checklist of items: non-slip shoe covers, wet floor signs, absorbent pads, caution tape, gloves, painter’s tape, and a mop head.

Organizational Awareness
In 2018, Children’s National Hospital launched a “Your Safety Matters Too” campaign to raise awareness of organizational commitment to reducing employee harm, similar to the concept established by the “Zero Harm” campaign.7 Team leads and the ESS Steering Committee regularly rounded with staff to raise awareness. The Daily Check-In safety briefing incorporated reports on injury or safety events to increase awareness and escalate concerns. In addition, we integrated ESS content into new hire training, which ensured that all new staff, including select vendors, coming into the organization understood the importance of employee safety and the processes in place to minimize injury.

Statistical Analysis
A statistical process control c-chart tracked the monthly number of safety events and informed the progress. We started the process improvement in June 2018 using Nelson’s Shift Rule.11 We use data points following the new process implementation to calculate a new centerline. We apply the Pareto Chart, an intuitive quality tool based on ordered frequencies and accumulation, to each fiscal year to identify the top reasons that caused the injuries. Finally, we used statistical tests based on Poisson distribution to compare the total number of events in a fiscal year to the total number in an earlier year to check if the difference (reduction or improvement) is statistically significant or not.

RESULTS

Outcome Measures
Children’s National Hospital had a 44.3% reduction in the average monthly count for the slips/trips/fall events after the baseline period of FY17 according to the centerline shift as noted on the c-Chart (Fig. 2), from 7.348 to 4.091 with a statistically significant difference of -3.257 (95% CI: -4.887, -1.627; P < 0.001). Of note, January and February 2019 saw a significant jump in falls in parking lots due to icy conditions caused by successive snowstorms. However, these incidents did not occur within the scope of a Children’s National Hospital-owned and managed facility and are excluded from the analysis.

Process improvement was also compared with the overall count of slips, trips, and falls for different fiscal years, as shown in Table 2. The annual total count decreased from 91 in FY17 to 83 in FY18 by 8.8% and from 83 in FY18 to 61 in FY19 by 26.5% in stepwise increments with an insignificant difference of -8 (95% CI: -33.9, 17.9; P = 0.545) and marginal difference of -22 (95% CI: -45.5, 1.5; P = 0.067), respectively. The decrease from 91 in FY17 to 61 in FY19 by 33% is a statistically significant difference of -30 (95% CI: -54.2, -5.8; P = 0.015). We base the significance on Poisson distribution because the data are the counts of rarely occurring safety events.

The makeup of injury events evolved over the 2-year study period as well. Compared with baseline data from FY17, as seen in Figure 1, the Pareto charts for FY 18 (Fig. 3) and FY 19 (Fig. 4) detail the composition of the reason for falling. For example, initial data from FY 2017 showed that the highest percentage (50%) of injuries were attributable to wet floors; by FY2019, wet floors no longer caused the largest percentage of injury, accounting for only 16% of cases.

DISCUSSION

This report details a single free-standing Children’s Hospital experience improving organizational slips, trips, and falls. We accomplish this within a comprehensive Employee Staff Safety program driven by hospital leadership previously described.8

Mitchell et al’s October 2012 commentary from the Institute of Medicine’s Best Practices Innovation collaborative highlighted the importance of high-functioning teams in health care.12 They establish that shared goals, clear roles, mutual trust, effective communication, and measurable processes and outcomes are the fundamental principles of team-based health care.12 The importance of a multidisciplinary team structure cannot be overstated; it requires content expertise with authority to carry out real-time changes and quality experts providing guidance.

This concept is seen in Fred Lunenburg’s description of power and leadership.13 He lays out the five sources of power in two categories: organizational power and personal power.13 Organizational power contains three subtypes: legitimate power that comes from the position an individual holds within an institution and their authority over other members of the institution; reward power is a person’s influence over others’ behavior by providing them with things they want; coercive power is a person’s ability to influence others’ behavior by punishing them or by creating a perceived threat to do so. Personal power has two subtypes: expert power is a person’s ability to influence others’ behavior because of recognized knowledge, skills, or abilities; referent power is a person’s ability to influence others’ behavior because they like, admire, and respect the individual.

It is important to have a leader and members who possess various power forms to ensure the group is productive and successful in a multidisciplinary team structure. In this experience for slips/trips/falls, the Director of EVS oversaw the workgroup. His expertise in the area gave him expert power to make well-informed decisions. His direct supervision of managers and legitimate power that
provided direct communication with EVS employees allowed for a real-time change in practice and feedback. This model can be applied to building a team to address any focus area within employee safety or, more broadly, across quality improvement initiatives hospital-wide, where an inefficient team can impede progress.

The EVS partnership with other disciplines, including nursing, security, and food services representatives, facilitated a unified and consistent message and a plan for slips/trips/falls prevention in high traffic areas of the hospital. The quality experts regularly reconvene the workgroup to review progress and update key driver diagrams in real-time to adjust the strategies effectively. In addition, due to this collaboration, the group was able to create “kits” to tackle areas of high injury rate, including the “Spill Kit” and “Floor Care Kit.”

As the work progressed over time, the impact was reflected in the total number of overall Slip/Trip/Fall injuries and the etiologies of those injuries. There was a natural evolution in the area’s initial focus, vis-a-vis the area with the highest percentage of injury, wet floor transitions. As such, it became clear the importance of continued analysis using Pareto charts to allow a more broad and real-time understanding of where the injuries continued to occur with the highest frequency. Key Driver Diagrams are modified to address these updated identified areas of interest. Overall, the process identified several critical areas tackled in a sequence of highest priority based on frequency as identified by Pareto chart analysis. It is crucial to constantly evolve the Key Driver Diagram to ensure it remains relevant and actionable.

Importantly, we believe this work is novel in its approach to addressing Slips/Trips/Falls; it is also generalizable to two broad areas: continued ESS work within the institution in other areas of employee injury outside of Slips/Trips/Falls and other institutions looking for a process map for making improvements to benefit employee safety. For example, at Children’s National Hospital, similar processes are taken to address sharps injuries, overexertion injuries, fluid exposures, and verbal and physical violence.

The limitations of this study include the inability of the group to control all aspects of the causes of injury, most notably injury attributed to an accident on the fault of the
Reducing Employee Slips, Trips, and Falls

Fig. 3. Pareto chart FY 2018, slips/trips/falls

Fig. 4. Pareto chart FY 2019, slips/trips/falls
employee that was unrelated to the environment, as well as injury at locations where Children’s National Hospital was not the landlord and therefore had no direct ability to modify the environment. However, with an appropriate selection of group leaders able to directly intervene in the areas of interest and the support of a multidisciplinary group and quality improvement experts, change can be implemented to improve one domain affecting employee safety and sustained over a multiyear period.

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DISCLOSURE
The authors have no financial interest to declare in relation to the content of this article.

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