
ABSTRACT
Falls are common and preventable adverse events that occur in a hospital setting. Falls can cause pain, damage, increase cost and mistrust in the health system. Inpatient fall is a multifactorial event which can be reduced with multistrategic interventions.
In this project, we aimed to reduce the fall rate in paediatric ward of Jigme Dorji Wangchuck National Referral Hospital, Bhutan by 25% from the baseline over a period of 6 months by focusing on fall risk assessment, staff education on fall prevention measures and devoting more attention to patients at high risk of fall.
We tested three sets of interventions using the Plan–Do–Study–Act approach. For the first cycle, emphasis was on staff education in terms of proper use of fall risk assessment form, risk categorisation and fall prevention advice. In the second cycle, in addition to the first we introduced the ‘high risk of fall package’ and the third cycle focused on early and easy identification of high-risk patients by continuous fall risk assessment and use of high risk of fall sticker.
We observed that at the start of the quality improvement project despite our intervention the fall rate of our ward went up but as we continued adding more ideas focusing on high risk patients, we could achieve a fall reduction of 49.3% from the base line by end of third cycle. Our ward saw fall free days of almost 90 days at the end of project.
We conclude that inpatient falls occur due to multiple factors therefore a multi-pronged strategy is needed to prevent it. One of the prime preventive strategy is identifying patients who are at high risk of fall and concentrating attention to those patients.

PROBLEM STATEMENT AND RATIONALE
The increasing fall incident rate at the paediatric ward of Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) was of great concern to all those involved in the patient care. It questioned the safety domain of care we were providing to our patients. JDWNRH is a 350 bedded tertiary level government Hospital in Thimphu, capital city of Bhutan. JDWNRH receives patients from different parts of the country for diagnostic and management care. The 33 bedded paediatric ward admits patients from 1 month to 12 years of age. The ward is manned by 3–5 nurses and paediatric residents and consultants on rotation basis. Paediatric ward had a baseline fall rate of 3.08/1000 patient-days which is noticeably higher than the fall rate reported from other countries. Keeping in mind that clinical safety is an essential component in delivering safe healthcare services, we planned this inter-professional quality improvement (QI) initiative with an aim to reduce the fall rate in paediatric ward by 25% from the baseline over a period of 6 months.

BACKGROUND
A fall is ‘an unplanned descent to the floor, either with or without patient injury’. Falls
are common adverse events that occur in any hospital setting and it accounts for 42% of all cases in paediatric ward. In paediatric patients, the fall rate has been reported as 1.36, 0.57 and 0.56 to 2.19. The formula ‘falls × 1000/patient-days’ is used to calculate the fall rate. Falls in a healthcare system reflect failures in organisational process and structures. Falls lead to negative consequences like pain, injury, increase costs and lack of trust in the health system.

As children go through various developmental stage with difference in their physical and cognitive abilities to approach mobility, this puts them at higher risk of fall. Medical equipment which are attached to them, sedative medication and unattended toileting needs further increases the risk of falls when they are admitted in hospital.

Clinical safety, as one of the crucial dimensions of quality healthcare, focuses on identifying patients at risk of fall and mitigating the risks factors. Study shows that almost half of the falls can be prevented with proper design of the process and the system. Fall risk assessment, categorisation of patients into high risk and low risk and appropriate intervention for different groups is the foundation of any falls prevention programme. Identifying patients at risk of fall by proper fall risk assessment and diverting more attention to them leads to decline in the fall rate by approximately 19%. The Humpty Dumpty Fall Scale (HDFS) is one of the tools used in paediatric patients to assess fall risk. The tool consists of components such as age, sex, diagnosis, cognitive impairments, environmental factors, response to surgery/anaesthesia/sedation, and medication usage for which different scores are given. Score of <12 categorises a patient as low risk and score >12 categorise as high risk. Basic fall prevention measures for the those at low risk of fall consists of patient orientation to the room, environment safety by clearing of clutters around the patient bed, use of non-skid slippers while ambulating, patient and family education on fall risk prevention measures. For the high-risk patient additional measures are use of a high-risk signage/sticker (‘Humpty Dumpty’ sticker) on the patient’s bed and chart for identification, frequent rounding of patient, ambulation with assistant and moving the patient closer to the nursing station.

Overall, evidence strongly suggests that implementation of a paediatric fall prevention programme using an effective tool such as the HDFS leads to increased awareness among the healthcare providers in identifying patients at risk for fall and there by act on preventive measures to reduce the fall incidences in inpatient paediatric population. Falls in hospital cannot be entirely prevented however we can work on reducing the fall rate by putting in different measures as above.

Specific aim
This QI initiative aimed at reducing fall rate among patients in paediatric ward by 25% from the baseline within 6 months (From July to December 2021).

METHOD
This QI study was carried out in the paediatric ward of JDWNRH, Thimphu. JDWNRH is a 350 bedded tertiary level government hospital in Thimphu, capital city of Bhutan. JDWNRH receives patients from different parts of the country for diagnostic and management care. The paediatric ward had 33 beds and admits patients from 1 month to 12 years of age. The average monthly patient admission is about 80–110 patients. The ward is manned by 3–5 nurses and paediatric residents and consultants on rotation basis. The common problems seen among the admitted patients are pneumonia, gastroenteritis, urinary tract infection, glomerulonephritis, nephrotic syndrome, meningitis, encephalitis, seizure disorders, failure to thrive and surgical condition like abscess, burns, appendicitis and gastrointestinal obstruction.

Measurement
This QI project looked into the outcome measure which was ‘fall incident rate’. Fall rate is reported as per 1000 patient-days.

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\text{Fall rate} = \frac{\text{number of inpatient falls}}{\text{total patient-days} \times 1000}
\]

At the start of project, the data for last 6 months were extracted from fall excel sheet maintained by the ward in-charge and from the admission register and baseline fall incident rate calculated as 3.08/1000 patient-days.

During the QI period, data on number of daily fall and daily patient-days were collected from the ward fall and admission excel sheet and entered into predesigned daily data collection sheet. At the end of the each month, data were compiled in a monthly data compilation sheet and fall rate calculated.

Design
The following steps were implemented phase wise during the project: (1) Formation of interprofessional team comprising of ward in-charge, paediatrician, paediatric resident and paediatric nurses; (2) Studying the baseline fall rate by collection of data from the admission register and fall excel sheet of the unit; (3) Root cause analysis using fishbone diagram and literature review; (4) Meeting of QI members and the ward nurses to decide on the doable intervention and (5) Testing change ideas using multiple Plan–Do–Study–Act (PDSA) cycles.

Strategy
The root cause analysis pictured multiple cause for high fall rate in our ward. We targeted our intervention on causes which were implementable and doable at our level as highlighted in figure 1.

Three PDSA cycle were tested with different change ideas as below (tables 1–3). figure 2

Total patient admission for July was 137 with Fall incidence rate of 3.11/1000 patient-days.
The total patient admission for August was 103 with fall incidence rate of 2.5/1000 patient-days. This was about 28% reduction from the baseline.

September: In September, we continued with the above interventions to see how it will work. The total patient admission in September was 99 with fall rate of 3.8/1000 patient-days. Due to increase in fall rate, we planned third PDSA cycle with addition change idea for October.

The total patient admission in October was 101 with no fall incident reported in the entire month.

For the month of November and December, the total patient admission was 94 and 109, respectively, and there was no fall incident for November and December too.

RESULTS

Paediatric ward, JDWRH had a baseline fall incident rate of 3.08/1000 patient-days during last 6 months prior to this QI project. In July (first PDSA cycle), the total admission was 137 with 39 patients (28.46%) categorised as high risk of fall and fall rate reported was 3.11/1000 patient-days, a marginal increase from baseline. In August, the total admission was 103 with 20 patients (29.12%) categorised as high risk of fall and fall rate reported was 2.5/1000 patients. By the end of second PDSA cycle, there was reduction in fall rate by 28% from the baseline. The total admission in September was 99 with 34 patients (34.3%) categorised as high risk for fall and fall rate reported was 3.8/1000 patient-days. Due to increase in fall rate in September, a third PDSA cycle was planned for October. In October, the total admission was 101 with 35 patients (34.6%) categorised as high risk of fall. There was no fall incident in October. The QI project was continued till the end of December incorporating the change ideas of all three PDSA cycle. For November and December, the total

Table 1 First PDSA cycle (July 2021)

<table>
<thead>
<tr>
<th>What</th>
<th>Rationale</th>
<th>Who</th>
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<tbody>
<tr>
<td><strong>Plan</strong></td>
<td>To educate Staffs on proper use of paediatric fall assessment form (Humpty Dumpty fall chart) and fall risk categorisation and fall prevention advice after risk assessment</td>
<td>Root cause analysis highlighted that there was no uniformity in the use of fall risk assessment form, documentation and the fall prevention advice given.</td>
</tr>
<tr>
<td><strong>Do</strong></td>
<td>Humpty dumpty fall chart were printed out and staffs were educated to use it in a uniform way and to document the risk category in patient file</td>
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<tr>
<td></td>
<td>One hour presentation was given to the ward staffs and paediatric residents covering fall prevention advices to be given to the patient and their attendants</td>
<td></td>
</tr>
<tr>
<td><strong>Study</strong></td>
<td>The fall incident rate for July was studied. There was no decline in the fall incidence rate</td>
<td></td>
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<tr>
<td></td>
<td>Patient’s charts were reviewed</td>
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<tr>
<td></td>
<td>Lack of attention to patients at high risk of fall was identified as one of the cause of inpatient falls in our ward</td>
<td></td>
</tr>
<tr>
<td><strong>Act</strong></td>
<td>Called a meeting with all the QI members</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reviewed all the fall incidents form</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussed about interventions which can help in providing special/extra attention to high risk of fall patients.</td>
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</table>

QI, quality improvement.
admission was 94 and 109, respectively, with high-risk patient percentage of 26.59% and 32.1%, respectively, with no fall reported in both the months. By the end of the project we had a fall free days of almost 90 days. The average fall rate for the QI period (July to December 2021) was 1.56/1000 patient-days (around 49.3% reduction from the baseline). The month wise trend of fall incident rate is depicted in the run chart (figure 2).

**DISCUSSION**

This goal of this QI project was to reduce the fall rate in paediatric and improve the safety domain of the healthcare services. There are multiple risk factors for falls in hospitalised patients including intrinsic and extrinsic factors and associated comorbidities. As per literature review, the fall reduction needs multiprofessional team approach, proper fall risk assessment and implementation of preventive measures and communication of fall episodes. This QI project also had a multiprofessional team approach with focus on proper fall risk assessment using HDFS and implementation of fall preventive measures. Similar to other QI projects on falls, with the use of the HDFS and by focusing on high risk patients, we also saw a reduction in fall rates from 3.08 to 1.56/1000 patients. Initially as we started the QI project, there was an increase in the fall rate and this can be explained by the increased awareness on fall reporting and uniform reporting of fall incidents, even those without injuries. One of the previous study gives a similar report that falls in children are sometimes considered normal, and if not associated with injury are unlikely to be reported. The reported rate of incidents can go up with proper education, awareness and interventions.

The increase in the fall rate (3.8/1000 patient-days) in the month of the September could be explained by having more high risk for fall patients in this month (34.3% were high risk) and not yet having a system of easily identifying them for intervention. Once the additional idea of using a visual signage (high risk sticker) for high-risk patients was started from October, we had a consistent result with no fall reported for October to December.

Studies have highlighted that to prevent and reduce fall rates, multiple kinds of ideas and intervention like nurses and parents education, use of a validated fall risk assessment tool and focusing on high-risk patients is the key to success. Likewise our QI project had a positive impact in reducing fall rate with implementation of similar ideas and interventions.

**LESSONS**

Forming a multidisciplinary team is of paramount importance in making any project successful and bringing change to the system. Having the ward in-charge and paediatric resident as the members of our project added...

strength to the project as they could disseminate the new change ideas to their colleagues working in the ward more effectively. This project also taught us the significance of doing things systematically in order to achieve our target. Preventing falls is not a single person’s task. Rather, fall prevention requires the active engagement of many individuals and teams involved in caring for the patients. The support and cooperation rendered by all the staffs of paediatric ward while implementing the QI initiative was instrumental in achieving the success.

LIMITATIONS
Although this QI project was successful, there are some limitations and challenges. (1) Collecting a baseline data on fall rate was very taxing as there was no separate fall incident report form and no uniform reporting system in the unit. (2) The project only looked into the outcome indicator (fall rate) but looking into process indicators is equally important to have a bigger impact on fall reduction. (3) As we reflect back we wish we could have given more time for each new ideas to sip into the system and studied the result but due to time constraint we landed up testing several ideas together within a short span of time. (4) The project was carried out in the midst of the COVID-19 pandemic and each member were occupied with their own duties so we confronted trouble in organising meeting in person never the less we overcame this challenge by using virtual means/social applications for discussion.

CONCLUSION
Patient safety in the hospital setting is a priority in any healthcare. The hospital environment places patients at increased risk of fall. Inpatient fall is one of the
Keeping this in mind, we have put in some simple cost-effective and undemanding measures to sustain the positive impact this project. (1) Reviewing of fall incidence data and taking corrective measures on quarterly basis. (2) Briefing of all new nursing staffs and residents on fall assessment tools and fall prevention measures and advices when they join our unit. (3) Appointing a ‘fall champion’ for our ward who will look after fall related matters and coordinate the quarterly fall review meeting. (4) Incorporating the new change ideas in our existing fall SOP standard operating procedure so that it is uniformly practiced by all.

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Contributors KC, UR, GL, BK and SD contributed in designing the overall QI project and studying the root cause analysis. UR, BK and SD Contributed in data collection. KC, GL and BK participated in developing the tables and figures. All the authors participated in drafting and revising the manuscript. All authors reviewed and approved the final version. Guarantor: KC

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Patient consent for publication Not applicable.

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Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information. ‘Not applicable’ data are included within the article.

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REFERENCES


Table 4 Intervention package for ‘high risk of fall’ patients

<table>
<thead>
<tr>
<th>Sl. no</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To provide bed with side rails to patients who are at high risk of fall.</td>
</tr>
<tr>
<td>2</td>
<td>To shift high risk patients nearer to nursing stations so that nurses can keep an eye on them.</td>
</tr>
<tr>
<td>3</td>
<td>To have frequent rounding (two hourly) by nursing staffs for high risk patients.</td>
</tr>
<tr>
<td>4</td>
<td>To have a system of handing over of high-risk patients during nursing shift change.</td>
</tr>
</tbody>
</table>


16 Baixinho CL, Dixe MA. Team practices in fall prevention in institutionalized elderly people: scale design and validation. Texto Contexto Enferm 2017;26:e2310016.