BMJ Open Quality

Sustaining a culture of safety and optimising patient outcomes while implementing zero harm programme: a 2-year project of the nursing services – SBAHC

Lina Mohammed Obaid ,[1] Ibrahim Ali,[2] Ahmad Al Baker,[1] Wisal Othman Al Shiekh Abdallah,[1] Rhez Legaspi Plando,[1] Mohammed Elian Khawaldeh,[1] Ria Kharen Joy Panaligan[1]

To cite: Obaid LM, Ali I, Al Baker A, *et al*. Sustaining a culture of safety and optimising patient outcomes while implementing zero harm programme: a 2-year project of the nursing services – SBAHC. *BMJ Open Quality* 2023;**12**:e002063. doi:10.1136/bmjoq-2022-002063

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjoq-2022-002063).

Received 24 July 2022
Accepted 21 September 2023

[1]Nursing Department, Sultan Bin Abdulaziz Humanitarian City (SBAHC), Riyadh, Saudi Arabia
[2]Quality Management Departement, Sultan Bin Abdulaziz Humanitarian City (SBAHC), Riyadh, Saudi Arabia

Correspondence to
Lina Mohammed Obaid;
lobaid@sbahc.org.sa

ABSTRACT

This quality improvement report details how Sultan Bin Abdulaziz Humanitarian City (The City), the largest rehabilitation facility within Middle East with a capacity of 511 beds and more than 20 nursing in-patient units improved the quality and patient safety culture in nursing services after successfully adopting and implementing the zero harm programme.

In healthcare settings, the idea of zero harm including zero incidents, zero injuries and injury-free are commonly used to highlight the importance of patient safety. Patient injuries and deaths resulting from hospital-acquired illnesses such as medication administration errors, falls, central line-associated bloodstream infections, hospital-acquired pressure injuries and catheter-associated urinary tract infection are largely preventable and grossly unacceptable occurrences. Achieving zero incidents of such critical measures can significantly impact treatment plan and enhance patient experience.

The projects' purpose was to build a new culture of safety by implementing innovative strategy designed to protect patients from preventable harm while maintaining an extraordinary high standard of quality patient care. Additionally, the programme was established with the aim of instilling a sense of commitment to every nurse working in this organisation to anticipate potential harms and to be vigilant to prevent it before it reaches the patient.

This document also describes a set of initiatives aimed at mitigating preventable incidents and ultimately achieving zero harm on our organisation. The result showed a significant increase by 95% between the percentage of nursing units that had 365 days of zero harm in 2020 and 2021. This improvement indicates that the concept of zero harm had been successfully inculcated among nursing units and had motivated nursing staff to uphold a higher culture of patient safety. Furthermore, by incorporating the Just Culture model into the electronic reporting system, the reporting rate of occurrences in the zero-harm programme was supported and sustained.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Maintaining an exceptionally high standard of providing high-quality patient care requires creating a new culture of patient safety.
⇒ Zero harm programme is a cutting edge approach designed to protect patients from preventable harm, however, given that error is unavoidable, the concept of zero harm is not widely embraced.

WHAT THIS STUDY ADDS

⇒ Robust data analysis, implementation of evidence-based strategies to clinical practice and continuous monitoring of patient outcomes are essential to achieve zero patient harm.
⇒ A solid just and learning culture of an organisation would greatly contribute to the effective adoption of zero harm programme.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Zero harm is a conceivable goal through four essential components that require effective system reform: adopting best practices, fostering culture of safety, engaging patients/staff and cultivating learning system.

INTRODUCTION

Opportunity description

In alignment to our organisation's strategic objective, 'to attain the best patient experience and to make The City the first choice of healing', we adapted the zero harm concept as an innovative approach to prevent the risk of incidents, their severity if they do occur, and, if possible, avoiding workplace accidents first and foremost. A multidisciplinary team was formed to identify potential and most crucial risk factors affecting general population in The City as a rehabilitation facility.

Available knowledge

Every healthcare facility aims to provide high-quality and exceptional patient experience and outcome with no patient harm. A number

of patient safety strategies have been adapted to achieve this seemingly difficult objective including the zero harm programme. Over the last decade, zero harm concept emerged to shine in the healthcare industry because of its huge and valuable impact in cultivating a safe environment for the organisation, employees, patients and their families. The Joint Commission International (JCI) defines zero harm as zero complications of care, zero falls, zero infections, zero missed opportunities for providing effective care, zero overused and even zero lost revenue. In other words, zero of any kind.[1] Likewise, the Environmental Health and Safety Insight Resources defines zero harm as a new safety culture movement that focuses on what it says: providing a completely safe environment for workers, contractors and visitors on a daily basis.[2]

However, not all organisations favour the concept of zero harm because they believe that to err is human and errors are inevitable, thus, eradicating danger is impossible. On the other hand, the JCI supports the adoption of zero harm concept with an achievable goal to a substantially better result of improvement in the healthcare industry.[3]

Rationale

The zero-harm idea in healthcare has been one of the most well publicised global safety drives. A core team was developed to identify nursing practices with potential or high risk for errors. The action was followed by analysing the available data in our facility, review of current nursing strategies and by searching related evidence-based studies for implementation of new practices. After vigorous investigation, the team identified the following preventable harms caused by human errors comprising the zero harm programme.

First, injuries from falls. Falls are common adverse events experienced by patients in hospitals and continue to pose challenges to healthcare quality.[4] The Centers for Medicare & Medicaid Services (CMS) identified hospital falls as sustaining trauma such as fracture, discolouration, intracranial injuries and crushing injuries as one of the preventable hospital-acquired conditions. Thus, it is necessary for every healthcare facility to build their strategies and tools to prevent such incidents.[5]

Second, harms caused by medication errors (MEs). Medication administration error (MAE) is defined as 'any difference between what the patient received or was supposed to receive and what the prescriber intended in the original order'.[6 7] MEs have vast negative implications such as extended length of stay, higher financial burden and a risk to patients' lives Thus, MEs have been employed as an indicator of patient safety,[8] moreover medication safety is a multifaceted topic and errors occur at different phases such as the administration processes.[9] Several factors could lead to MEs such as factors related to professional practice, healthcare products, procedures and systems, including prescribing, order communication, product labelling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use.[9]

Third, patient harms related to hospital-acquired pressure injury (HAPI). HAPI is categorised as a high risk harm or a serious complication that can impact patient hospitalisation period.[10] The Agency for Healthcare Research and Quality reports that more than 2.5 million people in the USA develop pressure injuries which are associated with pain, infection risk and increased healthcare utilisation.[11] Development of a pressure injury during hospitalisation period is categorised as patient harm. According to the CMS, stages 3, 4 and unstageable pressure injuries are considered 'never events'[12] and all healthcare organisations shall use their resources, knowledge and employee skills to prevent such event from reaching the patient.

Lastly, patient risks due to catheter-associated urinary tract infection (CAUTI). CAUTIs are a major patient safety problem contributing to patient morbidity, mortality and healthcare costs.[13] The most important risk factor of CAUTI is prolonged use of the urinary catheter. The longer the catheter remains in the bladder, the greater the risk of acquiring infection with the risk ranging from 3% to 7% per day.[14]

Specific aims

The primary aim of the zero harm programme is to adapt innovative strategy to prevent the occurrence of any patient harms in our facility to improve patient safety culture and to optimise patient outcomes.

METHOD

Context

The concept of zero harm was introduced to test the effectiveness of the interventions. The team decided to compare 2021 outcome data vs 2020 baseline data. All 20 nursing in-patient units (surgical and medical, rehabilitation, intensive care unit) and one outpatient unit (emergency room) were included during the implementation of the project. The operating room and outpatient clinics were excluded due to inapplicability of the programme to these areas.

A dedicated project team members were identified based on their relativity to the project with specific roles and responsibilities as outlined below:

1. Zero harm programme team leader—nursing quality supervisor.
2. Programme sponsor—director of nursing
3. Facilitator—quality manager.
4. Team member—continence nurse specialist.
5. Team member—charge nurse paediatric.
6. Team member—nursing services manager.
7. Team member—staff nurse.
8. Team member—wound care specialist.

Leader engagement

As cited by many articles, the healthcare system is a complex system requiring leaders to be more engaged in system performance and unit operations. Thus, effective

clinical leadership is linked to a wide range of functions including achievement of organisation strategy initiatives and safe care delivery.[15] In addition, the primary function of leaders in healthcare is to influence their 'followers' to develop behaviours, habits, processes and technologies that result in outstanding and everlasting improving performance.[16] Owing to this, intensive leadership education programme via online and face-to-face workshops exploring the zero harm concept was conducted by the nursing quality supervisor to different levels of nursing leadership such as the nursing service managers, unit charge nurses, nursing unit key performance indicator (KPI) custodians and clinical resource nurses.

The hospital Prioritisation Matrix Tool (online supplemental file 1) is a standard tool commonly used in The City. The criteria of the tool and respective weights are decided according to what matters most to our organisation through multivoting by the Hospital Quality Council. This tool was employed by the team to identify critical measures with the highest priority and impact to patients' safety in the zero harm programme. Out of seven suggested measures, four were prioritised and selected because they had the highest scores based on the prioritisation matrix.

Measures

Finding the perfect measure of safety is a challenging task as zero harm goal could vary based on the type of harm. Some articles classified zero harm as either unpreventable harm or preventable harm event.[17] Preventable harms could include those events due to human errors such falls, ME, HAPI and CAUTI. After completing the Prioritisation Matrix Tool, the team concluded the following based on their prioritisation score:

- # of falls with moderate to severe injuries/1000 patient days:
  - Prioritisation score 14.0.
  - Baseline average rate of injuries from falls in 2020 was 0.74/1000 patient days (SD=0.4).
- # of MAE/1000 patient days:
  - Prioritisation score 13.0.
  - Baseline average rate of ME in 2020 was 0.06 (SD=0.08).
- # of HAPI stage 2 and above/1000 patient days:
  - Prioritisation score 12.5.
  - Baseline average rate of HAPI stage 2 and above in 2020 was 0.37 (SD=0.28).
- # of CAUTI/1000 patient days:
  - Prioritisation score 11.1.
  - Baseline average rate of CAUTI in 2020 was 1.06/1000 catheter days (SD=1.62).

In order to determine whether a new strategy for patient safety enculturation needs to be introduced, the team used 2019 data to analyse the zero harm days. On the other hand, 2020 data were used to establish the baseline of each measure after using the prioritisation matrix to identify the spark of start in fast approaching actions or interventions based on results.

Four key critical performance measures were classified based on scientific identification from the approved sources as described in online supplemental file 2 (level of harm). Moreover, the team sought well-founded references to determine the level of harm of each measure as follow:

- Falls with moderate to major injuries—National Database of Nursing Quality Indicator.[4]
- HAPI—Agency for Healthcare Research and Quality.[18 19]
- CAUTI—Centers for Disease Control and Prevention.[20]
- MAE—Agency for Healthcare Research and Quality.[21]

In addition to this measure, the number of incident reports from each unit was used as a balancing measure to the goal of reducing the four types of harm. The number of reported incidents should stay the same or possibly rise in 2021 compared with 2020 in order to ensure sustainability of the safety culture.

Interventions

The initiation and execution of zero harm programme passed through several processes and phases. Zero harm is not only a programme that can be implemented through policies and procedures but it is also a culture that the organisation needs to develop to create quality and safe delivery of patient care. Thus, the integration of zero harm programme with performance improvement methodologies from the Institute for Healthcare Improvement Model, PDSA (Plan, Do, Study, & Act) framework and evidence-based practices were adapted for a more reliable and effective outcome.

On top of that, performance improvement projects (PIPs) were initiated by the team based on the four identified critical measures as follows:

- Project #1: prevention of falls adverse event PIP.
- Project #2: safe medication administration PIP.
- Project #3: prevention of HAPI stage 2 and above by improving staffs' skills and knowledge in pressure injury prevention PIP.
- Project #4: prevention and control of CAUTI PIP.

The role of each PIP team is to identify the cause of each patient harm and to suggest preventive and corrective solutions to improve patient outcome. They were also responsible in educating nursing staff on the new changes affecting their clinical practice. Below is the summary of the PIPs:

Prevention of falls adverse event PIP

A committed interdisciplinary team worked in the falls prevention project which included the following: adult and paediatrics occupational therapists, adult and paediatrics physical therapist, nursing quality supervisor, risk management officer, charge nurses and staff nurses.

Eleven major actions were executed by the team from June to December 2019 as follows:

1. Collaboration with the hospital falls prevention committee and the risk management section to

enhance staff engagement in the fall prevention programme.
2. Intensive education sessions of the fall prevention programme for leaders and frontline staff.
3. Integration of fall prevention strategies in the weekly education session of caregivers in paediatric population.
4. Establishment of the falls patrol sheet among staff nurses and nurse aids to increase their awareness regarding safety issues in the unit.
5. Systematic chart review to ensure completion of falls assessment, to check if patient education is timely done and if a nursing care plan is properly carried out.
6. List of 'medication with falls risk' was attached in the medication administration records folder as a reference for staff.
7. Use of floor red mattress in patients' room to patients with high risk for falls.
8. Improved carry-over skills process among rehabilitation and nursing staff within 48 hours on admission including safe transfer skills at bedside participated by the caregiver.
9. Developed a falls prevention poster in Arabic and English languages is placed in each patients' room.
10. Emphasised on patient and family education regarding safe use of wheelchairs.
11. Referrals to psychology to seek professional support for behavioural modifications in collaboration with the patient relation officer, if necessary.

Safe medication administration PIP

Medication management is a complex process requiring multidisciplines involving the doctors, clinical pharmacist, nursing quality supervisor, medication safety officer, risk management officer, charge nurses and staff nurses.

During the PIP, seven main tasks were carried out as follows:

1. Ninety-day campaign of medication without harm in all nursing units with various activities such as unit in-service education, distribution of freedom wall poster to engage front line staff in the day-to-day challenges and needs related to medication management process.
2. Comprehensive shadowing of nursing staff and medication demonstration practices during a systematic unit visit.
3. Series of education sessions on the safety of medication administration within nursing settings.
4. Educational posters for staff, patient and their families were distributed to all nursing units.
5. Standardised practice of key holders of the floor stock medication and the narcotic medication in all units.
6. Introduced a new technique on improving patient identification with identical first names prior to medication administration by activating the NAME ALERT in the hospital information system (HIS).
7. List of 'medication-related high-risk abbreviations list' was attached in the medication administration records folder as a reference for staff.

Prevention of HAPI stage 2 and above by improving the staffs' skills and knowledge in pressure injuries PIP

A multidisciplinary team led the HAPI project comprising the following disciplines: wound and stoma care specialists, nursing quality supervisor, risk management officer, charge nurses and staff nurses.

The following tasks were implemented during the PIP:

1. Activation of system alert for high-risk patients and the daily checking of patients' rounding by using the patient hourly rounding form.
2. Intensive education sessions for all nursing staff to enhance their knowledge and skills on HAPI prevention strategies.
3. Redesigned the layout of patient health records to include several types of medical devices in the HIS, skin care and pressure injuries monitoring tool.
4. Implementation of the 'nurse-to-nurse' skin checking during hand over (outgoing and incoming nurse).
5. Unannounced unit audit visit and shadowing by the practice development nursing team to monitor nursing staff compliance on proper documentation of skin assessment.
6. Review of competency and check-off during staff shadowing.
7. Wound care in-service education during unit operational meeting.
8. Patient and family education materials in English and Arabic languages were posted in patients' room for those at risk in pressure injury development.
9. Effective communication among interdisciplinary team (wound care specialist, patient relation, health educators, etc) to non-compliant patients, such as refusal to skin assessment and implementation of preventive measures.
10. Reviewed carry-over skills process among rehabilitation staff and nursing staff to include skin care and monitoring.

Prevention and control of CAUTI PIP

CAUTI is one of the most common hospital-associated infections. The presence of Foley's catheter and the duration it stays in the bladder increases the risk of developing CAUTI.

The PIP aimed at decreasing the number of catheter days in order to decrease the risk of infection. An interdisciplinary team composed of the infection prevention and control team, continence nurse specialist, infectious disease consultant, medical resident, quality performance manager, charge nurses and staff nurses were in charge of the project.

The team completed eight major tasks from June to December 2019 as follows:

1. Intensive nursing staff education on the proper utilisation of the CAUTI surveillance form.

2. Monthly CAUTI surveillance on all adult in-patient units with systematic feedback provided by the infection prevention and control nurses to the concerned units.
3. Comprehensive analysis in the event of CAUTI.
4. Staff, patient and family education regarding alternatives of indwelling urethral catheterisation.
5. Monthly CAUTI care bundle point prevalence and reporting of the result to the unit charge nurses.
6. Assessment and identification of gap from staff, patient and family non-compliance on the CAUTI care bundle.
7. Incidental teaching to all non-compliant staff, patient and family.
8. Implementation of an evidence-based strategy in the prevention and control of CAUTI by adapting the nurse-driven Foley's catheter removal protocol (HOUDINI process).

Study of the interventions

A zero harm checklist (online supplemental file 3) was developed by the core team to ensure the completeness and accuracy of the data and to track the number of days each nursing unit has incurred patient harms within a 365-day period. The team aimed at getting a reliable and valid outcome by using a scientific level of harm supported by a well-stablished tool for data collection as the adoption of scientific knowledge will help to satisfy many basic human needs and improve the quality-of-care standards.[22] In anticipation of possible staff resistance to the implementation of zero harm, the team designed a poster placed on each nursing unit quality board to promote staff awareness and engagement. Further to this, to ensure staff compliance and buy in of the idea, nursing units who achieved the target of zero harm in all four identified measures were acknowledged with a certificate of recognition to celebrate their efforts and success.

Analysis

The four measures were individually analysed using three parameters.

First, the incident rates using the statistical process control, 'process behavioural charts'[23] to evaluate the outcome of the project interventions. The team used established rules in differentiating common cause variation and special cause variation as follows:

- Rule 1: any data point outside the limit.
- Rule 2: eight consecutive points on the same side of the central line.
- Rule 3: three out of four consecutive data points that are closer to the same limit than they are to the central line.

If any of the three rules occur, it will be considered as a special cause variation and will be denoted with red dots in the displayed process behavioural chart.

Process behavioural chart guided and supported the team to react less, lead better and improve more.

The project was considered successful because of the special cause variation in the process behavioural chart towards the improvement side or P value that was less than 0.05 comparing 2020 vs 2021.

Second, the SD of the incident rate to measure the reduction in variation.

Third, the number of days free from harm. The team evaluated the nursing units' performance and the initial analysis showed that only three units were able to achieve zero harm over the period of January–June 2019 in the selected KPIs while other units sustained different kinds of incidences on the same period.

ETHICAL CONSIDERATION

Culture of reporting

One of the key factors in the zero harm pillars is the reporting culture of healthcare providers after an unfortunate event. Unfortunately, nurses were found to be under-reporting an adverse event,[24] near misses and other levels of harm. To avoid this, we added KPI which is the 'number of incident reports submitted per unit on a monthly basis'. Data were used as a balancing measure or KPI in reducing the four types of harm. This allows us to closely monitor the impact of a zero harm programme on the culture of reporting.

Additionally, to ensure that frontline staff nurses and leaders are knowledgeable about using the system-based incident reporting, a series of educational sessions was provided on different occasions. Staff were also given an option to report the incident anonymously should they prefer to hide their identity.

Enhance reporting culture strategy

Although a new indicator on the balance score card was added to track the frequency of nursing staff reporting practices, the integration of Just Culture guidelines into the incident reporting system was implemented in 2019 and was further emphasised by risk management in the first quarter of 2020. Just Culture improves patient safety by empowering employees to proactively monitor the workplace and participate in safety efforts in the work environment. Improving patient safety reduces risks by focusing on managing human behaviour (or helping others to manage their own behaviour) and redesigning systems.[24] Therefore, safety culture is a vital component in the implementation of a zero-harm concept and is strengthened and promoted by trusting, reporting and improving practice. Staff at all levels are encouraged to speak up when processes are not working as expected or an error is about to occur to address the problem. A safety culture provides the feedback loop for continuous improvement.[25]

RESULT

Zero harm programme result

After completing all the interventions of the project, zero harm days of selected measures were collected using the

Table 1 Zero harm comparison table (2020 vs 2021)

% of units completing 365 days with zero harm		
Zero harm measure	2020	2021
All measures	14.20%	27.70%
Falls measure	64%	72%
MAE measure	78.50%	94.40%
HAPI stage 2 and above measure	28.50%	44.40%
CAUTI	64%	89%
t-test: paired two sample for means		
	2020	2021
Mean	0.4984	0.655
Observations	5	5
P(T≤t) two tailed	0.004667	

CAUTI, catheter-associated urinary tract infection; HAPI, hospital-acquired pressure injury; MAE, medication administration error.

Table 2 Number of days the nursing units were free from the four identified harms

Unit	2020	2021	% Variance
Unit 1	66	365	453
Unit 2	365	53	85
Unit 3	46	141	207
Unit 4	46	122	165
Unit 5	316	365	16
Unit 6	88	167	90
Unit 7	276	152	45
Unit 8	338	76	78
Unit 9	30	323	977
Unit 10	365	107	71
Unit 11	28	15	46
Unit 12	52	365	602
Average	168.0	187.6	+11.7

defined Zero Harm Checklist. To engage the leaders and to keep them updated on their unit performance, a quick view of zero harm progress and unit performance during the nursing management committee meeting and the services advisory and coordinating council meeting were added.

The collection of zero harm data was concluded on the fourth quarter of 2021. The initial result showed a significant improvement in the percentage of units who achieved zero harm in the 365-day calendar on all four measures in comparison to the year 2020 vs the year 2021.

The trend in the number of electronic incident reports did not reflect a decline in the reporting level in our facility but it had shown significant improvement (online supplemental file 4).

Table 1 shows that during the year 2020, 14.2% of nursing units sustained 365 days zero harm in all four measures while in the year 2021, the percentage remarkably increased to 27.7%. In addition, the p value reflects the statistically significant difference of p=0.004. Although the percentage of completing 365 days of zero harm varies, we can say that the improvement in each measure is sustainable and the zero harm days is doable and achievable.

Table 2, reflects the average number of days the nursing units were free from the four identified harms. There was a non-significant increase of +11.7% from 168 days in 2020 to 187.6 days in 2021. The t-test: paired two sample for means shows p=0.77.

Also, the number of electronic incident reports in 2021 when compared with 2020 do not show a decline in the trend of case reporting in our facility but it had shown significant improvement. We can, therefore, conclude that there is no negative impact on the culture of reporting incidences (online supplemental file 4).

Statistical analysis of the four projects

Table 3 shows the summary comparing the incidence rate of baseline data in 2020 and outcome data in 2021. There is a noted insignificant reduction in the rate of the four measures.

Injuries from falls/1000 patient days

The process behavioural chart of injuries from falls/1000 patient days (online supplemental file 5) did not show any significant change (p=0.19), however, the statistical analysis of SD within nursing units reflects a noticeable reduction in SD from 0.41 to 0.21.

MAE/1000 Patient days

The process behavioural chart (online supplemental file 6) showed a significant improvement of unit performance from January 2021 to June 2021 and August 2021 to November 2021, respectively, in the form of minimum of three out of four consecutive data points in the lower half towards the lower control limit (refer to rule 3 under analysis). Also, one astronomical value was detected on October 2020 and was prevented to occur through the implementation of safety measures and PIP interventions. The SD of MAE reflects an observable reduction from 0.087 to 0.038.

HAPI stage 2 and above/1000 patient days

Online supplemental file 7 shows the percentage of surveyed patients with HAPI stage 2 and above using the process behavioural chart. The chart does not show significant change per month (p=0.09), however, the SD rate reflects a noticeable reduction from 0.28 to 0.18.

Refer to online supplemental file 8—SD of HAPI stage 2 and above.

CAUTIs/1000 Catheter days

The process behavioural chart (online supplemental file 9) showed a significant improvement from August 2021

Table 3 Comparison of incidence rate

SN	Measure	Baseline in 2020	Outcome in 2021	Variation	P value
1	Falls	0.75	0.53	28.6%	0.193
2	ME	0.06	0.02	72.9%	0.154
3	HAPI	0.37	0.22	40.5%	0.093
4	CAUTI	1.07	1.02	4.8%	0.918

CAUTI, catheter-associated urinary tract infection; HAPI, hospital-acquiredpressure injury; ME, medication error.

to November 2021 in the form of minimum of three out of four consecutive data points in the lower half towards the lower control limit (refer to rule 3 in the Analysis section). The SD of CAUTIs reflects a reduction from 1.63 to 1.1.

DISCUSSION

At the completion of the programme, a significant improvement in the MAE and CAUTI incidence rates were noted as evidenced by the special cause variation episodes in the process behavioural charts. However, injuries from falls and HAPI stage 2 and above did not show similar improvement. A prolonged period of case monitoring can be considered in the future to demonstrate a statistically remarkable improvement in incidence rate.

In particular, a reduction in the SD of the four measures was observed because of the standardised and more controlled processes.

As a result of the project, out of 12 nursing units, 7 had improved the number of zero harm days while the remaining 5 were unable to sustain longer periods of zero harm due to unforeseen events associated with the COVID-19 pandemic which, like other healthcare organisations, greatly impacted our delivery of care and limited our resources including the workforce. Further studies are needed to evaluate how the COVID-19 pandemic affected patient safety measures in healthcare facilities.

As to the incident reporting, data showed an increase in the number of reported incidents in 2021 when compared with 2020, which is the balancing measure used to guarantee that the culture of reporting is not adversely damaged.

While many organisations believe in zero harm programme such as the JCI, there are also those who disagree and think that the concept is risky because humans are prone to committing mistakes. They suppose that it is best to focus on improving safety practices to increase the probability of successful outcomes as eradicating danger is impossible.

However, based on the data presented and taking everything into account, along with the leadership support, integration of Just Culture, patient safety enculturation and robust process improvement, we believe that zero harm programme is achievable and highly applicable in any healthcare setting in ensuring the delivery of safe and quality patient care.

The healthcare system is a complex system which certainly requires the buy in of everyone providing direct care and even in the non-clinical staff. The number of steps, protocols and guidelines in each process could affect the progress and outcome of the treatment plan.

Misperception of zero harm concept is a serious challenge. It is not a set of over expectations of performance, but it is a goal to reduce serious safety events to improve hospital overall performance if every nursing unit commits to zero harm as a core value. Meanwhile, zero harm does not mean zero risk, there are other more beneficial things we can invest our resources in minimising potential harm and risk to patients.

Limitation

The interventions that were implemented in the zero harm programme were developed according to the gaps and challenges within our organisational processes. They are city-specific and cannot be generalised to other healthcare facilities. However, referenced KPI definitions can be adopted by other facilities. Also, it is highly recommended to keep track of patient outcomes over a longer length of time in order to clearly demonstrate statistically significant differences in the outcome.

The use of health information technology (HIT) is vital to observe patient safety.[26] In addition, patient safety measurements can be improved with better outcome by using HIT and readily available electronic clinical data. However, the integration of HIT with zero harm programme was a bit challenging because it requires building new features with special layout and design in order to track the number of days free from harm. Thus, the team alternatively used Microsoft Excel for tracking the days and the analysis of graphs.

Sustainability

Because of its intricacy and to ensure sustainability of positive outcomes of the zero harm programme, a comprehensive plan was developed by the team. The actions include the following:

- Incorporating of the newly introduced interventions into the relevant policies and procedures whenever applicable.
- Conducting continuous staff education and training on specific projects.
- Developing a control plan to measure the projects' KPIs continuously.

- Internally marketing the programme through departmental meetings, brochures/emails and staff monthly forum.
- To regularly audit or trace initiatives in order to assess how well they are working.

Lessons learnt

(What went well on these projects? vs what needs improvement?)

1. Customer feedback: Staff and patient preferences and customer voice were taken into consideration while formulating the action plan as preimplementation of new changes is critical to the success of the project. Gathering customer voice in more structured way such as surveys and/or focus group were identified as area for improvement.
2. Engagement of frontline nurses: We had guaranteed that nurses participated actively as end users. Frontline nurses made substantial contributions in providing feedbacks and sharing opportunities for improvement all throughout. The only challenge identified in the initiation of the project was the resistance of a few staff during the implementation of new or changes in the nursing practices which as mitigated by focusing on building their resilience and change management skills.
3. Leadership support: The availability of leadership assistance was a critical motivation for the successful implementation of the zero harm. Units with 365 days zero harm were duly recognised with certificate of recognition given by the nursing leaders to honour and celebrate their efforts and success. However, there was a late engagement of other interdisciplinary leaders causing delay in the implementation of a few actions.
4. Risk management: The culture of reporting was maintained through staff engagement and implementation of the simple electronic incident reporting system with an option of anonymous reporting.

CONCLUSION

It is highly possible to achieve zero harm in any healthcare setting as an innovative strategy that promotes a culture of safety and supports the improvement of patient outcomes on preventable harms caused by human errors. A well-established just and learning culture of an organisation would greatly contribute to the successful adaptation of zero harm programme. However, the authors recommend monitoring the patient outcomes on a longer period to clearly indicate statistically significant difference in the result, as well as using the results and priority points from the patient safety culture survey to confirm the well-structured zero harm programme.

Acknowledgements To Mr. Abdullah Bin Zara'ah, Chief Executive Officer of Sultan Bin Abdulaziz Humanitarian City for the endless support and encouragement to reach Zero Goal. To Rehabilitation Department, SBAHC for their contributions in Fall Adverse Event PI Project. To Pharmacy Section, SBAHC for their contributions in Safe Medication Administration PI Project. To Infection Control Section, SBAHC for their contributions in CAUTI Prevention PI Project. To Quality Management Department, SBAHC for their contribution in Quality Improvement and Risk Management.

Contributors LMO contributed to the conceptualisation and design of the study and responsible for the overall content as the guarantor. LMO, IA, AAB, WOAA, RLP, MKH and RKP contributed to the study conduct. LMO and IA contributed to data analysis and interpretation of results. All authors contributed to revising the paper critically for intellectual content. All authors approved the final version to be published and agreed to be accountable for all aspects of the work.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

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.

ORCID iD

Lina Mohammed Obaid http://orcid.org/0000-0002-7948-0611

REFERENCES

1 *LEADING the way to ZERO*. 2022. Available: https://www.jointcommission.org/resources/patient-safety-topics/zero-harm/
2 EHS Insight Resources. The zero harm culture. 2022. Available: https://www.ehsinsight.com/blog/the-zero-harm-culture
3 Joint Commission International. Zero harm in health care is possible. 2022. Available: https://www.jointcommission.org/-/media/tjc/documents/lwz/jci-lwz-flyer.pdf
4 Garrard L, Boyle DK, Simon M, *et al*. Reliability and validity of the NDNQI® injury falls measure. *West J Nurs Res* 2016;38:111–28. 10.1177/0193945914542851 Available: https://doi.org/10.1177/0193945914542851 PMid:25023824
5 Winters BD, Bharmal A, Wilson RF, *et al*. Validity of the agency for health care research and quality patient safety indicators and the centers for Medicare and Medicaid hospital-acquired conditions: a systematic review and meta-analysis. *Med Care* 2016;54:1105–11. 10.1097/MLR.0000000000000550 Available: https://doi.org/10.1097/MLR.0000000000000550 PMid:27116111
6 Lee E. Reporting of medication administration errors by nurses in South Korean hospitals. *Int J Qual Health Care* 2017;29:728–34. 10.1093/intqhc/mzx096 Available: https://doi.org/10.1093/intqhc/mzx096 PMid:28992153
7 Machen S, Jani Y, Turner S, *et al*. The role of organizational and professional cultures in medication safety: a Scoping review of the literature. *Int J Qual Health Care* 2019;31:804. 10.1093/intqhc/mzz136 Available: https://doi.org/10.1093/intqhc/mzz111 PMid:31822887 PMCid:PMC7097989
8 World Health Organization. Medication without harm. 2022. Available: https://www.who.int/patientsafety/medication-safety/medication-without-harm-brochure/en/
9 Medication errors: technical series on safer primary care. Geneva: World Health Organization, 2016.
10 Rondinelli J, Zuniga S, Kipnis P, *et al*. Hospital-acquired pressure injury: risk-adjusted comparisons in an integrated Healthcare delivery

system. *Nurs Res* 2018;67:16–25. 10.1097/NNR.0000000000000258 Available: https://doi.org/10.1097/NNR.0000000000000258 PMid:29240656 PMCid:PMC6013055
11 Agency for Healthcare Research and Quality, Rockville, MD. Teamstepps® 2.0: introduction. 2019. Available: https://www.ahrq.gov/teamstepps/instructor/introduction.html
12 Agency for healthcare research and quality. Never events. 2019. Available: www.psnet.ahrq.gov/primers/ primer/3/never-events
13 Rondinel Robles M, Sheridan C, Coyle C, *et al*. The drive toward zero CAUTI's (catheter associated urinary tract infections) eliminating harm. In: *InD22. QUALITY IMPROVEMENT: ADMISSION TO DISCHARGE 2014 May*. American Thoracic Society, A5441.
14 Lo E, Nicolle LE, Coffin SE, *et al*. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:464–79. 10.1086/675718 Available: https://doi.org/10.1017/S0195941700095382 https://doi.org/10.1086/675718 https://doi.org/10.1017/S0899823X00193845
15 Chassin MR, Loeb JM. High-Reliability health care: getting there from here. *Milbank Q* 2013;91:459–90. 10.1111/1468-0009.12023 Available: https://doi.org/10.1111/1468-0009.12023 PMid:24028696 PMCid:PMC3790522
16 Frankel A, Haraden C, Federico F, *et al*. *A framework for safe, reliable, and effective care. White Paper*. Cambridge, MA: Institute for Healthcare Improvement and Safe & Reliable Healthcare, 2017.
17 Thomas EJ. "The harms of promoting 'zero harm'" *BMJ Qual Saf* 2020;29:4–6.
18 European Pressure Ulcer Advisory Panel. National pressure injury advisory panel and pan Pacific pressure injury Aliance. prevention and treatment of pressure ulcers/injuries: quick reference guide. 2019.
19 Agency for Healthcare Research and Quality. How to measure pressure injury rates and prevention practices. 2017. Available: https://www.ahrq.gov/patient-safety/settings/hospital/resource/pressureinjury/workshop/guide5.html
20 Centers for Disease Control and Prevention. Urinary tract infection (catheter-associated urinary tract infection [CAUTI] and non-catheter-associated urinary tract infection [UTI]) and other urinary system infection [USI]) events. In: *Device-associated Module CAUTI*. 2015.
21 Agency for Healthcare Research and Quality, Rockville, MD. Table 6: categories of medication error classification. 2012. Available: https://www.ahrq.gov/patient-safety/resources/match/matchtab6.html
22 Chassin MR. *High reliability in healthcare: Working toward zero harm*. Somerset, KY: MedPlus Staffing, 2015.
23 Graban M. Measures of success: react less, lead better, improve more. In: *Constancy, Inc*. 2019.
24 Boysen PG. Just culture: a foundation for balanced accountability and patient safety. *Ochsner J* 2013;13:400–6.
25 Clapper C, Merlino J, Stockmeier C. Zero harm: how to achieve patient and workforce safety in Healthcare: how to achieve patient and workforce safety in Healthcare. In: *McGraw Hill Professional*. 2018.
26 Sittig DF, Singh H. Electronic health records and national patient-safety goals. *N Engl J Med* 2012;367:1854:1854–60.:. 10.1056/NEJMsb1205420 Available: https://doi.org/10.1056/NEJMsb1205420 PMid:23134389 PMCid:PMC3690003