Collaborative improvement project to decrease maternal mortality rate across five hospitals in Saudi Arabia

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ABSTRACT

Maternal morbidities and mortalities remain high globally, yet are preventable events. Maternal haemorrhage is a primary cause of both maternal morbidity and mortality. In this collaborative project, multipronged evidence-based interventions, inclusive of embedded morbidity surveillance trigger tools were implemented to increase maternal morbidity reporting and improve the safety culture, while structured morbidity and mortality reviews aided in the reduction maternal mortality.

The Institute for Healthcare Improvement's (IHI) Collaborative Model for Achieving Breakthrough Improvement[1] was used as the project's quality improvement framework (online supplemental appendix 1). Interdisciplinary interventions implemented included daily safety huddles; Leadership Walkrounds; labour and delivery safety boards; evidence-based maternal haemorrhage risk screening; an evidence-based maternal haemorrhage clinical pathway, simulation of mock haemorrhage codes and required case reviews based on the American College of Obstetricians and Gynecologists (ACOG) active surveillance trigger tool for severe maternal morbidity (SMM).

Across five hospitals, the maternal mortality rate (MMR) decreased from 10.5 per 100 000 live births (baseline 2018) to 4.6 per 100 000 live births (2020) and reporting of SMM increased by 32-fold. Three out of the five hospitals reported an improvement in their composite scores in at least one of the three measured Agency for Healthcare Research and Quality's (AHRQ) Culture of Safety domains.

In conclusion, MMR decreased while, during the same time period, maternal morbidity reporting increased through an integrated, interdisciplinary, cross-organisation Maternal Safety Quality Improvement Initiative. One hospital, the pilot hospital, reported a substantial increase in the Culture of Safety survey results in two identified domains: non-punitive response to errors and perception of staffing.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The known causes and effective interventions to both maternal morbidity and mortality are well known, yet globally, both remain a persistent area for improvement. Despite well-published interventions, combining specific interventions in a collaborative change package, in an Institute for Healthcare Improvement breakthrough model for improvement, tested among specific subpopulations (Saudi Arabia) and across a hospital system is a novel approach.

WHAT THIS STUDY ADDS

⇒ Following this study across five military hospitals in Saudi Arabia, there is additional evidence to support specific combination of interventions to decrease maternal mortality and improve maternal morbidity reporting, specifically in the Middle East.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Healthcare organisations can implement the change package in whole or partially among the same population or different populations for improved outcomes as well as additional research.

PROBLEM

The Kingdom of Saudi Arabia's Ministry of Defense Health Services (MODHS) engaged 5 of its 23 hospitals (table 1) in its Maternal Safety Quality Improvement Initiative with the hospital inclusion criteria: (1) having high rates of maternal mortality, (2) low rates of morbidity reporting and (3) high numbers of deliveries. In 2018, MODHS reported among the five hospitals a MMR (number of maternal deaths per 100 000 live births) of 10.5 per 100 000 live births. This rate was more than double the selected benchmark against Western Europe and almost triple that of the United Arab Emirates[2] (online supplemental appendix 2). The consensus to select Western Europe's rate as the project's benchmark was made primarily as it was an ambitious yet achievable goal compared with the participating hospitals' baseline rates.

Table 1 Participating hospitals' details

Hospital	City	Location	Ownership	No of hospital beds	No of maternal beds	
					L&D beds	**Antenatal and postnatal beds**
A	Riyadh	Urban	Governmental	1606	12	108
B	Jeddah	Urban	Governmental	530	15	53
C	Alhada	Urban	Governmental	371	13	41
D	Tabuk	Urban	Governmental	542	30	75
E	Najran	Suburban	Governmental	100	8	19

L&D, labour and delivery.

Western Europe's MMR rate reported in 2019 was 5 maternal mortalities per 100 000 live births.[2]

In 2018, the same five MODHS hospitals reported maternal morbidities of 7.8 per 10 000 delivery hospitalisations. Despite the rate being higher than the Kingdom's national rate,[3] it was still 19 times lower than the USA's 2015 reported maternal morbidity rate (146.6 per 10 000 delivery hospitalisations).[4]

The considerable under-reporting of maternal morbidities was attributed to a compromised culture of safety in the maternity units of the participating hospitals. According to the IHI, a culture of safety with balanced accountability is an essential element for staff to report adverse events, including self-disclosures.[5] This lack of a culture of safety was reflected in each hospital's 2018 AHRQ Culture of Safety survey results. The AHRQ survey enables healthcare organisations to assess how their healthcare providers and staff perceive various aspects of patient safety.[6] Across the hospitals, the three selected obstetric departmental composite domain results were as follows: (1) Staffing which assesses the perception of whether there are enough staff to handle the workload and work hours are appropriate to provide the best care for patients[7] was 71% below the benchmark, (2) Nonpunitive response to errors which assesses if staff feel their mistakes and event reports are not held against them and mistakes are not kept in their personnel file[7] was 60% below the benchmark and (3) Communication openness which assesses if staff feel they can freely speak up if they see something that may negatively affect a patient and to question those with more authority[7] was 40% below benchmark.

The IHI Collaborative Model for Achieving Breakthrough Improvement was utilized. The model is an improvement structure designed to help healthcare organisations make 'breakthrough' improvements in quality by engaging participating facilities in a short-term (6–15 months) learning system that brings together a large number of teams to seek improvement in a focused topic area.[1] As the problem, high MMR rates and low SMM reporting, existed among the five participating hospitals, a shared learning model with accelerated improvement capabilities across multiple sites was required. As such, the improvement team selected the IHI model as the preferred improvement methodology. In attempt to apply the IHI improvement model effectively, a faculty team of subject matter experts started the initiative by formulating the answers for the model's three fundamental questions: (1) What are we trying to accomplish? (2) How will we know that a change is an improvement? and (3) What changes can we make that will result in an improvement?[1] (online supplemental appendix 3). The project aims were to reduce maternal mortality while increasing the reporting of maternal morbidities and improve the culture of safety. A set of outcome and process measures were developed to confirm when a change was an improvement (table 2). A complete set of interventions in an evidence-based package was developed by the faculty team to achieve the project's aims including active reporting of SMM, daily safety huddles, Leadership Walkrounds, safety boards to enhance communication among the interdisciplinary care team, at the presentation of labour and selected intervals the midwife or nurse assessed the patient's risk of haemorrhage, and activation of a clinical pathway for the management of maternal haemorrhage based on the California Maternal Quality Care Collaborative's (CMQCC).[8]

The IHI's framework included the faculty team's guidance of hospital-level teams. Each hospital-level team was led by a consultant Obstetrics & Gynecology (OB/GYN) physician. The faculty team and hospital-level interdisciplinary teams had three learning sessions each followed by a 90-day action period.

With AHRQ Culture of Safety results consistently below the benchmark and high mortality rates, the faculty team focused on addressing the low rates of morbidity reporting. The team used evidence-based and best practices in designing the project's change package interventions, primarily reflecting (CMQCC) obstetric guidelines for maternal haemorrhage risk assessment and management.[8] The interventions also included an active surveillance system using the two ACOG SMM triggers to guide morbidity and mortality reporting, case reviews and discussions systematically at the departmental level.[9] In addition, integrated structures and processes across disciplines and services (safety huddles, Leadership Walkrounds and safety boards) were implemented to improve the culture of safety.

Table 2 Outcome and process measures

Measure	Numerator	Denominator	Method of collection	Data source	Frequency of collection	Frequency of analysis
Outcome measures						
Maternal mortality ratio	No of cases of maternal death that occurred for a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from unintentional or incidental causes.	Total no of live births in the same measurement period.	Retrospective Document Review	Mortality registry	Quarterly	Annual
Severe maternal morbidity (SMM) rate	No of hospital discharges for females with any listed diagnosis code of SMM as in the numerator inclusions.	Total no of delivery hospitalisations in the same period.	Retrospective Document Review	Obstetrics Admission registry/log, Medical Records Review, blood bank registry/log, ICU/HDU registry/log.	Monthly	Monthly
Maternity units composite measures for the 3 Domains of; Openness of Communication, Non-Punitive Response to Errors, and staffing.	Composite level average % positive responses by respondent work area/unit (Maternity wards)		Retrospective Document Review.	Baseline Corporate level repository of safety culture survey results. Postintervention national online platform for safety culture survey results	Annual	Annual
Process measures						
Percentage of compliance with unit based safety Huddles	No of maternity unit-based safety huddles conducted and documented as per policy and documented in the measurement period	No of maternity shift changes that occurred in the same measurement period.	Retrospective Document Review.	Patient safety huddle forms.	Monthly	Monthly
Percentage of Compliance with Chart Review of Cases Flagged by ACOG criteria	No of cases reviewed by the chart review team in the measurement period.	No of cases that were flagged by ACOG criteria, Pregnant, peripartal or postpartum woman: (1) receiving four or more units of blood products and (2) who had unplanned admission to an ICU/HDU in the measurement period.	Retrospective Document Review.	Blood outgoing logs in blood bank, unplanned admission log in ICU/HDU and SMM findings done by the chart review teams.	Monthly	Monthly
Percentage of Compliance with Haemorrhage Risk Assessment at Admission	No of admitted cases for labour that had completed haemorrhage risk assessment in the measurement period.	No of admitted cases for labour that were reviewed (sample size) regardless of the stage of labour in the measurement period.	Retrospective Medical Records Review.	Maternity admission log & patients' medical records (haemorrhage risk assessment forms).	Monthly	Monthly

ACOG, American College of Obstetricians and Gynecologists; HDU, high-dependency unit; ICU, intensive care unit.

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The primary aim was to reduce the participating hospital's MMR collectively by 50% by March 2021. Secondary aims were to increase the identification and reporting of SMMs by 10% and to increase the selected AHRQ Culture of Safety survey domains to meet or exceed benchmarks.

BACKGROUND

According to the ACOG, SMMs and MMR have an associated high rate of preventability.[9] Per ACOG, hospitals should consider maternal morbidities a 'near miss' for maternal mortality, without morbidity identification and treatment, morbidities eventually lead to maternal death.[9] Reporting SMM is an essential priority of any patient safety programme to prevent harm, injury and death.[9] A positive safety culture with robust SMM reporting leads to a reduction in maternal mortality. Moreover, the Joint Commission International Accreditation Standards for Hospitals (seventh edition) and the Saudi Patient Safety Centre both updated their definition of sentinel events to include any SMM that results in permanent or severe temporary harm.[10 11] This expanded definition necessitates organisational commitment to identify, report and mitigate SMM.

Maternal morbidity and mortality remain at unacceptable rates of preventable harm.[12] In the last half-century, the global MMR has decreased by 38%.[12] However, improved outcomes are still needed in specific geographic areas and among certain populations. Saudi Arabia, a high-income country with continually expanding percentage of GDP as healthcare expenditure, has unfortunately not achieved corresponding actualisation of improved individual and population health outcomes, particularly maternal health.[13–17]

There is a lack of transparent, standardised and reliable data on maternal morbidity and mortality within the kingdom[16] including within the MODHS system. It was unclear how many maternal deaths were attributable to preventable or manageable morbidities or maternal haemorrhage. Maternal haemorrhage is one of the main causes of maternal morbidity, occurring primarily through an unplanned hysterectomy, unplanned intensive care unit (ICU) or higher level of care admission and a requirement of blood/blood products.[8 16] There is a direct cyclical correlation between abnormal placental conditions and caesarean section rates to maternal haemorrhage risk, morbidities and mortality.[18 19] The majority of all known risk factors for caesarean sections, abnormal placental disorders and maternal haemorrhage, are highly prevalent in the kingdom and include: (1) early age of marriage and first delivery; (2) high and increasing rates of medically necessary and medically unnecessary caesarean section rates, including prima gravida elective caesarean sections; (3) high parity across a woman's lifetime; (4) low birthing literacy and (5) unregulated high fertility.[12 16 18]

With clear evidence of rising rates of caesarean sections and abnormal placental conditions—the most significant factors that increase maternal haemorrhage and thus maternal mortality—it was essential to identify maternal haemorrhage risk and effectively manage haemorrhage when it occurred.[16 18] The WHO reported that skilled care provided across the continuum of care (before, during and after childbirth) decreases maternal death.[12]

MEASUREMENT

The impact of the interventions was assessed using a comprehensive measurement system, with each indicator having a clearly defined profile and data collection sheet (table 2). Outcome indicators included MMR per 100 000 live births, SMM per 10 000 delivery hospitalisations and AHRQ Culture of Safety survey results. Process indicators included compliance with haemorrhage risk assessment on admission/presentation of labour, chart review of ACOG criteria flagged cases and compliance with safety huddles.

DESIGN

The change package interventions, implemented over 9 months, addressed the project's three aims. First, to improve maternal morbidity reporting, the team designed an active surveillance system using ACOG trigger tools to flag cases of SMM with required chart review and official morbidity and mortality review at the departmental level. The two most sensitive ACOG trigger events were (1) receiving four or more units of blood/blood products and (2) an unplanned admission to a higher level of care.[9] Both triggers have a high positive predictive value (0.85) for identifying SMM.[9]

Second, the team implemented structured interventions and processes to improve the culture of safety. These included active reporting of SMM, daily safety huddles, Leadership Walkrounds and safety boards to enhance communication among the interdisciplinary care team.

Finally, and third, at the presentation of labour, the midwife or nurse assessed the risk of haemorrhage based on the CMQCC. This quantifiable assessment included required standing order interventions based on low-risk, medium-risk or high-risk levels, thus reducing delays in care. In the event of any excessive maternal bleeding or change in condition, a clinical pathway for the management of maternal haemorrhage was initiated with nurse, midwife and physician led interventions. Furthermore, there were specific triggers for blood loss volume, changes in vital signs and changes in condition, prompting the care team to advance at each of the three levels of haemorrhage severity.

STRATEGY

The faculty team included three OB/GYN consultants; two corporate-level nurse executives; one midwife/midwife leader; one performance improvement division director; one patient safety division director and one healthcare quality consultant. The hospital-level improvement teams

were led by OB/GYN department directors and included all relevant stakeholders (ie, midwives, nurses, obstetricians, patient safety champions and quality representatives).

Collaboration between hospitals was facilitated by conducting three collaborative learning sessions using the IHI's Collaborative Model for Achieving Breakthrough Improvement.[1] Between learning sessions, teams provided progress reports every 6 weeks (Action Period Call). During learning sessions, team members shared successes, barriers and lessons learnt via workshops, storyboard presentations, informal dialogue and cross-hospital site visits (table 3).

RESULTS
Primary outcome
Over the initiative's May 2020–December 2020 period, 17 153 delivery hospitalisations occurred in the 5 hospitals. The MMR was reduced from 10.5 per 100 000 live births to 4.6 per 100 000 live births with a p value of 0.45 (95% CI) and an Odds Ratio (OR of 0.44.

Considering the rare event nature of maternal mortality occurrences, a g-control chart, primarily used for monitoring the number of cases between hospital-acquired infections or other adverse events[20] was used to calculate the number of live births that occur between incidents of maternal mortality. The g-chart (figure 1) shows an increase in the number of live births between incidents of maternal mortalities.

Secondary outcomes
An increase in the reporting of SMM occurred from an average of 7.8 per 10 000 delivery hospitalisations to an average of 259.3 per 10 000 delivery hospitalisations in December 2020 with a p<0.001 (CI 95%) and an OR of 17.

The control chart (figure 2) shows a consistent and significant increase in SMM reporting with a special cause variation in December 2020 due to a significant increase in reporting of SMM in hospital C (reasons for improved reporting are outlined in table 3).

In addition, a two-way table Fisher's exact test was used to calculate the statistical significance and determine p values for reported SMM rates. In comparison to the baseline, incident reporting of SMM in 2020 (Q2, Q3 and Q4) revealed a statistically significant improvement with a p<0.001 (using χ^2 two-way table statistics, Fisher's exact test) (online supplemental appendix 6).

The most reported SMM were postpartum haemorrhage (41%), eclampsia and pre-eclampsia (29%) and hysterectomy (12%) (online supplemental appendix 7).

Baseline AHRQ Culture of Safety survey results (2018) were compared with the 2020 results in three composite domains (staffing, non-punitive response to error and communication openness). Three out of the five hospitals reported an improvement in their composite scores in at least one of the three domains (online supplemental appendix 8). Hospital B achieved the most significant improvement in two domains (non-punitive response to error and staffing). Hospital A, even with no 2018 obstetric baseline data due to a low response rate (less than 50%), demonstrated a positive development of enhanced engagement and survey participation.

The process measures: safety huddle compliance, haemorrhage risk assessment and the review of ACOG flagged criteria showed improvement overtime (figure 3). A special cause variation was noted in the chart of 'compliance with chart review of flagged cases by ACOG criteria' in September 2020 due to reduced compliance from hospital A (reasons for low compliance are outlined in table 3).

A multiple regression analysis model of the reported SMM rate as a function of patient safety huddles, the review of cases flagged through ACOG and the haemorrhage risk assessment were conducted with a high R^2 value of 76.4%. The patient safety huddles predictor is shown to be significant with its respective p<0.05, followed by the haemorrhage risk assessment with p=0.08 (online supplemental appendix 9).

LESSONS AND LIMITATIONS
Summary and Interpretation
MMR reduction
The primary aim to reduce the participating hospitals' MMR by 50% was achieved. Two incidents of maternal death attributed to COVID-19 were excluded from the numerator per the exclusion criteria. The maternal mortality measure excluded cases of maternal death that occurred from unintentional or incidental causes, following the WHO definition of maternal death.[21] Of the maternal deaths that occurred, none were related to maternal haemorrhage. The MMR reduction was statistically insignificant due to the low sample size of maternal deaths. However, the MMR reduction was an important result. First, the aim was achieved, and second, it reflects improved patient outcomes as a reduction of maternal harm and death. Moreover, the 9-month period of MMR reduction corresponded simultaneously with a noteworthy and statistically significant increase in SMM reporting. This result is considered a confirmation of a more accurate mortality reporting, an identified area of concern.

The risk screening and haemorrhage management clinical pathway may have impacted the MMR and the result of no maternal deaths related to haemorrhage. The risk screening quantified each woman's haemorrhage risk level. This quantification and documentation raised the level of awareness and was directly linked to standing orders for proactively securing blood products and notification of the operating room (OR) and anaesthesia teams. To ensure staff compliance, a process measure was initiated in which a sample of medical records was reviewed monthly to ensure completion of the risk assessment and its required actions.

Table 3   Summary of the change strategies in each improvement cycle and lessons learnt

PDCA Cycle #	Date	Cycle activities	Modifications to the change package based on the cycle feedback
Pilot	18/03/2020 – 17/06/2020	▶ For 3 months, the entire change package interventions were piloted in Hospital B maternity wards supervised by the hospital local improvement team members, the project clinical lead and the executive of nursing operations.	▶ The forms related to haemorrhage risk assessment, and maternal haemorrhage clinical pathway were fine-tuned according to the workflow in the maternity wards and the valuable feedback received from the end user experts/direct patient care staff (online supplemental appendixs 4; 5)
First cycle	13/07/2020 - 30/09/2020	▶ The first learning session was conducted over 3 days; 5, 6 July 2020 the faculty team explained the change package interventions and reflected on the pilot completed in Hospital B. ▶ On 12 July 2020, the participating hospitals were given the chance to present their action plans and recommendations for change package interventions modifications.	▶ Improvement teams quickly adopted the change package due to early project engagement.
Second cycle	02/10/2020 - 23/12/2020	▶ The second learning session was conducted on 1/10/2020 where participating hospitals' teams presented their key performance indicators (KPIs) results, updated action plans, implementation barriers and lessons learnt. ▶ It was noted that hospital E did not report any cases of maternal morbidity in their results, The faculty team emphasised the role of the trigger tool in identifying morbidity cases and directed the team to validate the sources of data used. ▶ Hospital B, being the pilot venue showed the best performance in both the outcome and process measures. ▶ Due to transition from paper based medical record to Electronic Medical Record in hospital A, the team found some difficulty in retrieving the medical records of flagged cases by ACOG criteria for review in September which led to low compliance in the chart review KPI. ▶ Faculty team provided feedback and guidance based on each hospital's progress status.	▶ Medical record forms implementation was delayed due to logistical and printing problems in hospitals A, C and D; addressed immediately. ▶ It was noted that there was inter-hospital difference in interpretation and action regarding the ACOG trigger criterion for unplanned admission to higher level of care. All cases requiring higher level of care regardless of the physical location of their admission were flagged as mandatory triggers of SMM, after initially were excluded from the numerator in hospital E. ▶ Some SMM cases (postpartum haemorrhage) had inadequate antenatal care (incorrected iron deficiency anaemia) in Hospital B, addressed in the next cycle. ▶ Instances of excluding admissions to high-dependency unit (HDU) were corrected. On review, 79% of unplanned HDU admissions had SMM in hospital A; corrected in the following cycle.
Third cycle	25/12/2020 - 05/04/2021	▶ The third learning session was conducted on 24 December 2020 where participating hospitals' teams presented their KPIs results, updated action plans, implementation barriers and lessons learnt. ▶ Hospital C showed positive outlier in reporting SMM that was attributed to leadership enforcement of the implementation of trigger tools and enhanced communication with the blood bank to flag cases with four or more units of blood transfusion. ▶ All hospitals showed improvement in SMM reporting and to capitalise on this, hospitals were advised to identify their most frequent SMMs and start local improvement projects addressing clinical care. ▶ The faculty team provided feedback and guidance based on each hospital's progress status.	▶ Hospital A team observed intentional physicians' underestimation of blood loss manipulating the triggers for the haemorrhage pathway. The faculty team suggested to add a KPI that monitor physician compliance with the pathway implementation through retrospective medical record review for a representative sample and include it in the Ongoing Physician Performance Evaluation. ▶ Hospital B recommended to share the results of the maternal haemorrhage risk assessment with the patient antenatally to enhance patient engagement and compliance which was supported by the faculty team. ▶ To promote shared learning, establish maternal safety network and validate low reporting rates, the faculty team suggested on site visits among hospitals' teams in which high performing teams were matched with low performing teams (two visits were conducted).

Continued

Table 3 Continued

PDCA Cycle #	Date	Cycle activities	Modifications to the change package based on the cycle feedback
Summative congress	06/04/2021	▶ In the Summative Congress the faculty and the participating hospitals' teams reflected on the entire project covering the following points; review of the project progress in achieving the aims, The best performing hospital (hospital B) shared its success factors, brainstorming sessions tackling the issue of sustaining improvement after concluding the project, lessons learnt and future recommendations presented by the project clinical leads, and planning for project publication and celebration of the project conclusion.	▶ The faculty team along with hospitals' teams agreed on keeping track of the project KPIs as part of the departments' quality monitoring systems to ensure sustainability of improvement and initiate local improvement projects when needed. ▶ Due to the success of the project a recommendation was raised to the governing body to approve a strategic improvement roll out of the project change package to all the network's hospitals providing maternal care.

ACOG, American College of Obstetricians and Gynecologists; SMM, severe maternal morbidity.

The maternal haemorrhage clinical pathway included three levels of management, each level with trigger events (blood loss and vital signs/patient condition changes) to be activated by any member of the care team. The pathway also included immediate and independent actions for the midwives and obstetric nurses as standing orders, as well as physician-driven order sets. Non-physician staff were empowered while patient care was standardised, and necessary interventions expedited.

The hospital teams independently initiated mock haemorrhage codes and simulations with midwifery, nursing and medical staff, as well as the OR and anaesthesia teams. The mock codes aided the staff across the continuum of a labouring woman's care to proactively understand the clinical pathway triggers and interventions. In addition, the mock codes increased the clinical staff's confidence, teamwork, communication and collaboration.

It was reported that physician members in hospital A intentionally underestimated blood loss to avoid the clinical pathway's triggers. Reawareness was conducted, and a new process measure was adde; Compliance with maternal haemorrhage clinical pathway via a retrospective medical record review of clinical staff's compliance with the pathway interventions. The new measure added an additional level of accountability.

The requirement to regularly conduct interdisciplinary morbidity and mortality reviews and departmental meetings was a key factor in the initiative's success. Monthly departmental meetings were conducted to discuss all flagged cases. ACOG flagged cases were initially written on the labour and delivery safety board in real-time to ensure both visibility and accountability. All safety board cases required review and discussion at departmental meetings.

Severe maternal morbidity

The second aim was to improve the reporting of morbidities by 10%. Morbidity reporting rates exceeded expectations with SMM reporting increasing by more than 32-fold. The implementation of ACOG trigger tools assisted in the identification and reporting of morbidities followed by a medical record review to identify the type of morbidity, assessing whether it was preventable or not. Findings were then discussed in departmental meetings
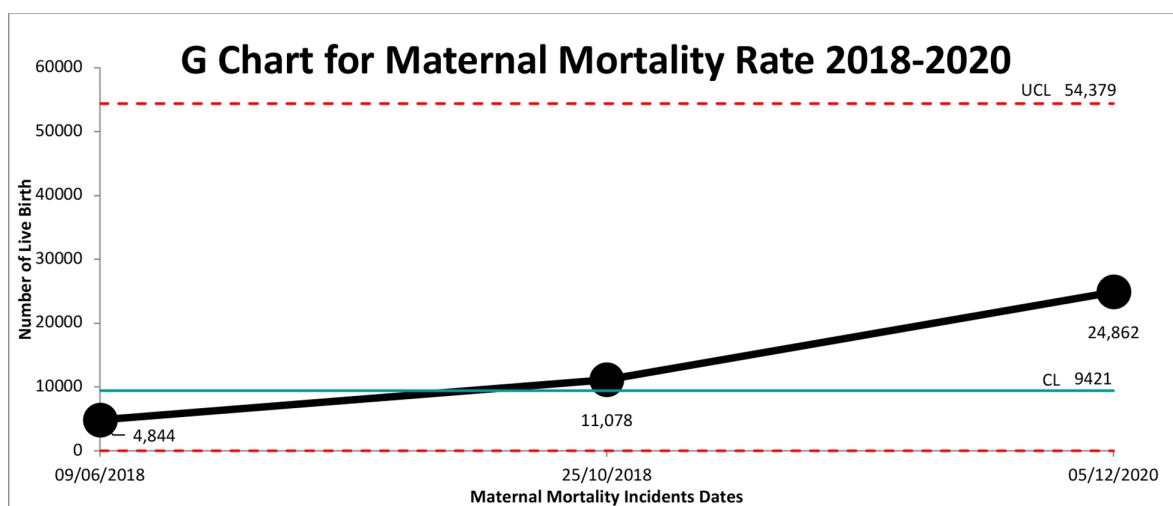

Figure 1 G-chart for MMR showing the number of live births among maternal mortality incidents, 2018–2020. MMR, maternal mortality rate.
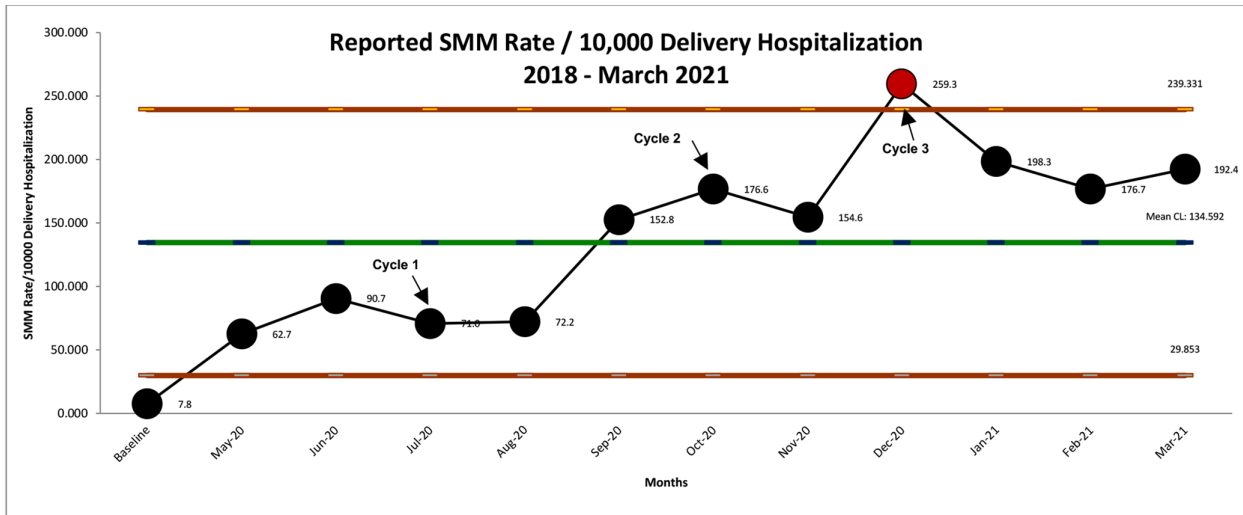
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Figure 2 Control chart for reported Severe Maternal Morbidity (SMM) per 10 000 delivery hospitalisations, baseline (2018) until March 2021.
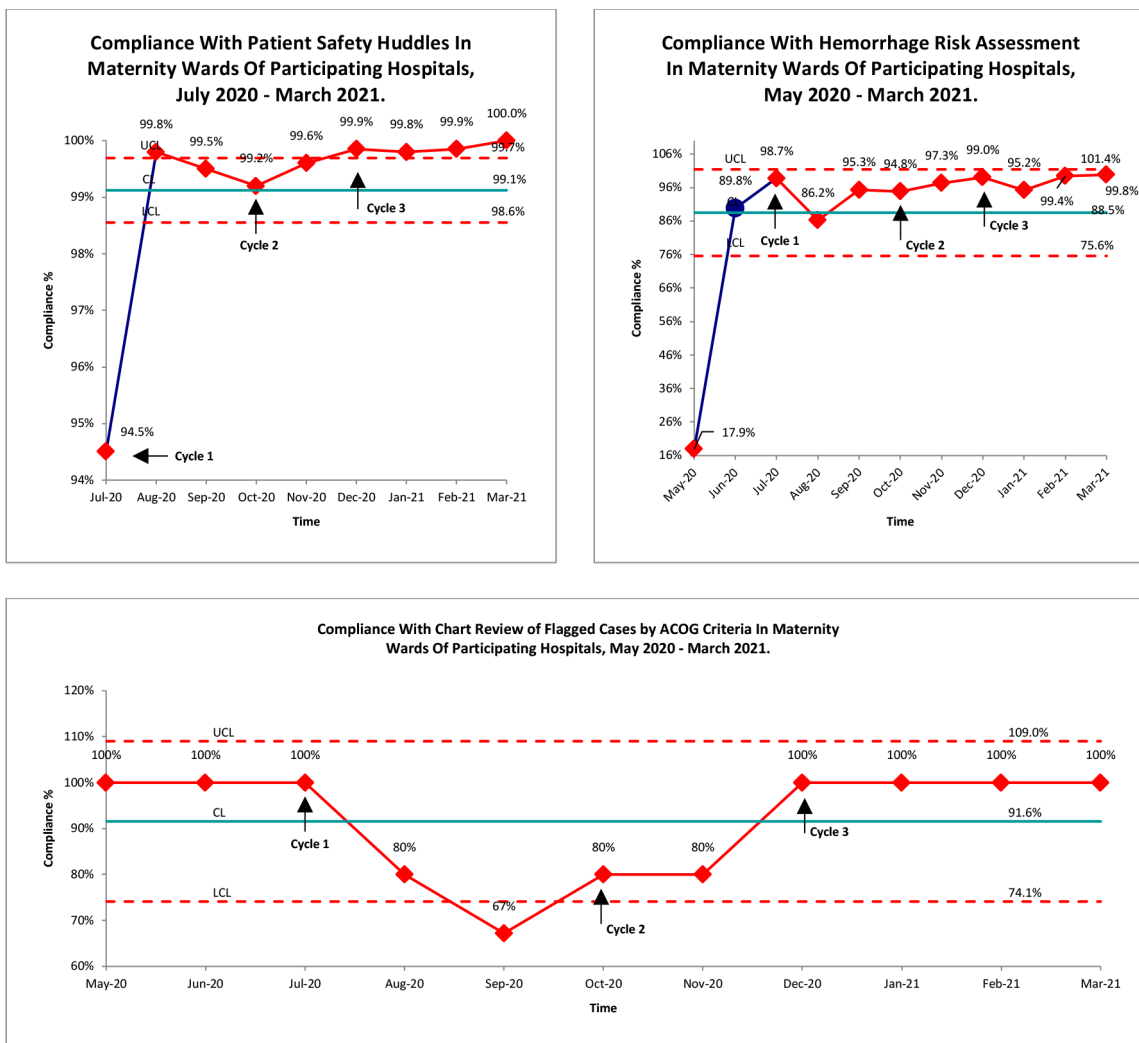

Figure 3 Control charts for process KPIs showing; compliance with patient safety huddles, compliance with maternal haemorrhage risk assessment upon admission and compliance with the chart review of cases flagged through ACOG criteria in the obstetric wards of participating hospitals. ACOGs, American College of Obstetricians and Gynecologists; KPIs, key performance indicators.

to identify opportunities for improvement and develop preventive corrective actions.

The chart review team was composed of the project's senior physician, nurse/midwife manager, patient safety champion and quality department representative. The interdisciplinary nature of the team helped to better identify cases of morbidities and opportunities for improvement. To ensure compliance with all ACOG-flagged morbidity criteria, the process measure examining the percentage of medical records reviewed from all records flagged was used.

Culture of safety

The aim was to improve selected Culture of Safety composite domains to meet or exceed AHRQ benchmarks. The positive safety culture results, particularly in hospital B, were attributed to the inclusion of the medical department heads on the project improvement teams. Each department head individually reported the project's metrics in each learning session. This enhanced leadership accountability and visibility while strengthening the sustained adoption of the change package by all staff.

In addition, a policy regulating safety huddles with clear escalation procedures was initiated along with a process measure to ensure proper implementation. This was also key to improving the culture of safety in the obstetric wards. Hospital-level feedback identified the safety board as a valuable intervention. The combination of safety boards and safety huddles, when interdisciplinary and supported by leaders, was reported as extremely effective in terms of both staff engagement and the continuous focus on patient safety, morbidities, mortalities and the ACOG triggers.

Safety boards were placed in highly visible sections in labour and delivery and were fully integrated into the daily change of shift safety huddles. Required safety board elements included the following: (1) patients who received four units of blood or more, (2) had an unplanned transfer to any higher level of care, (3) the next mortality and morbidity meeting date, (4) any improvement opportunities from the safety huddles, (5) number of Leadership alkrounds completed and (6) number of maternal haemorrhage mock codes conducted (online supplemental appendix 10).

In hospital B, the physician head of department and project lead would 'speak to' the safety board in the mornings and actively engage the staff by asking: 'What events need to be added to the safety board?' Discussions and event reporting were positively acknowledged and verbally rewarded by all levels of the team. This level of leadership visibility, structure and transparency supported the full-cycle of all ACOG trigger events which were (1) reported in safety huddles and on the safety board; (2) reported as incident reports; (3) subjected to expedited medical record review, and, finally, (4) discussed at departmental meetings as a morbidity and mortality case with turn-around times of 30–45 days.

Limitations

Due to the COVID-19 pandemic, the project's planned 'in-person' learning sessions and action period calls could not be implemented. The project was conducted 100% virtually via ZOOM meetings, which was challenging and a novel approach at the time.

The project's original intention was to compare departmental and unit-level data for five AHRQ Culture of Safety survey domains. However, due to technical issues in the raw data exported by the national platform and the transition to a kingdom-wide centralised database, departmental and unit-level data were not available. Only data on three AHRQ domains were successfully generated manually.

In the last learning session, the concern was raised that some physicians intentionally underestimated the amount of blood loss to avoid activating the clinical pathway and haemorrhage code. A new key performance indicator focused on measuring physician compliance through a closed medical record review with the results integrated in physician performance evaluation was created.

On completion of the pilot, all interventions and performance measures remain in place. A scale up of the project commenced in the 2022 to implement all intervention across the remaining MODHS 12 maternal care hospitals.

Using the IHI breakthrough improvement model held many advantages to this project and to all improvement projects that would follow the same model, benefits included; establishing the faculty subject matter expert team in the start of the project as per the breakthrough model recommendation, helped in creating evidence-based interventions package that combined the wisdom of direct patient care staff with the recommendations of best practice from literature, the structured approach of the breakthrough model with continuous measurement helped the improvement teams accelerate improvement in their facilities, also, the structure of the learning sessions and action period calls along with the on-site visits in which high performing teams were matched with low performing teams promoted shared learning among the improvement teams.

CONCLUSION

A multidisciplinary approach inclusive of interventions that simultaneously address the culture of safety, incident reporting, evidence-based clinical practice and standardisation enhanced the culture of safety and SMM reporting while also reducing maternal mortality.

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