

Transforming Obstetric Safety: The BDMS Safe OB Program as a System-Level Model for Sustainable Improvement in Maternal and Neonatal Outcomes

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Abstract

OBJECTIVES: To describe the implementation and outcomes of a system-level quality improvement program designed to reduce postpartum hemorrhage (PPH), neonatal sepsis, and neonatal mortality across the Bangkok Dusit Medical Services (BDMS) network.

MATERIALS AND METHODS: This multicenter quality improvement report describes the Safe Obstetrics and Delivery (Safe OB) Program, implemented across 44 BDMS hospitals in 2024 in response to increasing rates of PPH, neonatal sepsis, and neonatal mortality during 2022–2023. The program incorporated standardized clinical protocols, simulation-based training, maternal health education, telemedicine, and digital monitoring. Process and clinical outcomes were monitored through a centralized Business Intelligence system, and program compliance was incorporated into hospital performance evaluations.

RESULTS: Among 3,792 deliveries reviewed in 2024, 67% of cesarean deliveries and 38% of vaginal deliveries involved high-risk pregnancies. Screening rates increased for gestational diabetes mellitus (GDM) (89% to 94%), Down syndrome (68% to 85%), fetal chromosomal abnormalities (50% to 100%), and group B *Streptococcus* (43% to 53%). Neonatal sepsis decreased from 4.69% to 3.57%, while the combined neonatal mortality and stillbirth rate decreased from 1.15 to 0.75 per 1,000 births. PPH decreased by 40% following cesarean delivery and by 15% following vaginal delivery.

CONCLUSION: The BDMS Safe OB Program demonstrates that structured risk management—combining standardized clinical care, technology-enabled monitoring, and multidisciplinary collaboration—can improve maternal and neonatal outcomes across a large private healthcare network.

Keywords: maternal safety, neonatal outcomes, risk management, quality improvement, clinical protocol, BDMS, obstetric care

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Thailand's evolving sociocultural landscape has been associated with delayed childbearing and a rising proportion of pregnancies¹ among women of advanced maternal age (≥ 35 years), reflecting trends observed globally.^{2,3} Advanced maternal age has been consistently linked to increased risks of GDM, hypertensive disorders of pregnancy, and adverse fetal outcomes, including intrauterine growth restriction and chromosomal abnormalities.^{4,5} These demographic and clinical shifts contribute to greater complexity in obstetric care and require more coordinated, risk-based management approaches.

Within the BDMS network—comprising over 10,000 deliveries annually—approximately 30% of pregnancies occur in women of advanced maternal age, many of whom present with pre-existing or pregnancy-related medical conditions. Between 2022 and 2023, internal quality surveillance identified upward trends in key obstetric and neonatal complications, including PPH, neonatal sepsis, and neonatal mortality. These findings raised concerns regarding variations in clinical practice, inconsistencies in protocol adherence, and the growing burden of high-risk pregnancies across hospitals within the network.

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Globally, improving maternal and neonatal outcomes has increasingly relied on system-level interventions, including the standardization of clinical protocols, strengthening of multidisciplinary care, and implementation of continuous quality monitoring systems.⁴⁻⁸ Such approaches are particularly relevant in large healthcare networks, where variation in care delivery may impact patient outcomes.

In response to these challenges, BDMS launched the Safe OB Program in January 2024 as a system-wide quality improvement initiative. The program was designed to integrate risk management principles into obstetric care by harmonizing clinical standards, enhancing workforce competency, and leveraging digital health technologies for real-time monitoring and coordination. By aligning care processes across 44 hospitals, the program aims to improve maternal and neonatal safety in a sustainable and scalable manner.

Materials and Methods

Program Description and Objectives

The Safe OB Program was implemented in 2024 as a structured, system-level quality improvement initiative across 44 hospitals in the BDMS healthcare network. The program was designed to:

1. Standardize obstetric clinical protocols based on international guidelines.
2. Establish an integrated care model covering the antenatal, intrapartum, and postpartum periods.⁹⁻¹⁵
3. Reduce PPH, neonatal sepsis, and neonatal mortality compared with the 2023 baseline rates.
4. Leverage telemedicine and digital health tools to enhance continuity of care.
5. Empower patients through structured maternal health literacy and education programs.

Organizational Framework

A multidisciplinary task force comprising maternal–fetal medicine (MFM) specialists, obstetricians, and quality managers

was established. Hospital teams were trained through simulation workshops, virtual conferences, and case reviews.

Clinical compliance data were tracked via the BDMS Business Intelligence (BI) dashboard, enabling benchmarking across hospitals. Executive accountability was strengthened by integrating compliance into leadership performance reviews.

Standardization and Implementation

Key standardized protocols included:

- **Antenatal care:** Screening for GDM, chromosomal abnormalities, and infectious diseases, including GBS, syphilis, and hepatitis.
- **Intrapartum management:** Use of the Modified Early Obstetric Warning System, emergency cesarean activation, and PPH prevention bundles.
- **Postpartum follow-up:** Structured discharge education, vaccination tracking, and digital self-monitoring.

Teleconsultation systems were developed to support hospitals without in-house MFM specialists, while the Safe OB mobile application (Figure 1) enabled mothers to record health data, view ultrasound results, and access educational materials on fetal development and newborn care.

Safe OB Operational Workflow

The program was implemented through a five-step maternal care pathway:

1. Early risk identification and stratification.
2. Standardized antenatal care and screening protocols.
3. Multidisciplinary consultation and referral support.
4. Intrapartum preparedness and emergency response.
5. Monitoring, feedback, and continuous quality improvement.

The recommended investigations, gestational periods, and responsible clinical personnel are summarized in Table 1. The overall operational pathway is illustrated in Figure 2.

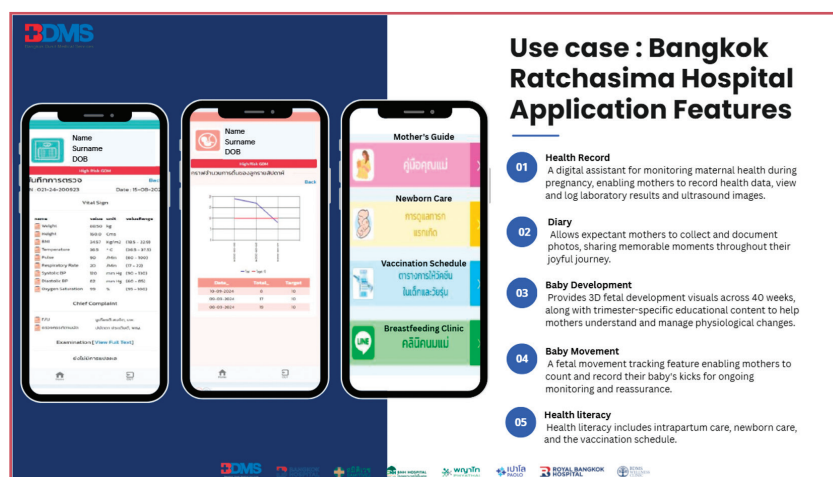


Figure 1: Key features of the maternal health application, including health monitoring, pregnancy journaling, fetal development information, fetal movement tracking, and maternal health education.

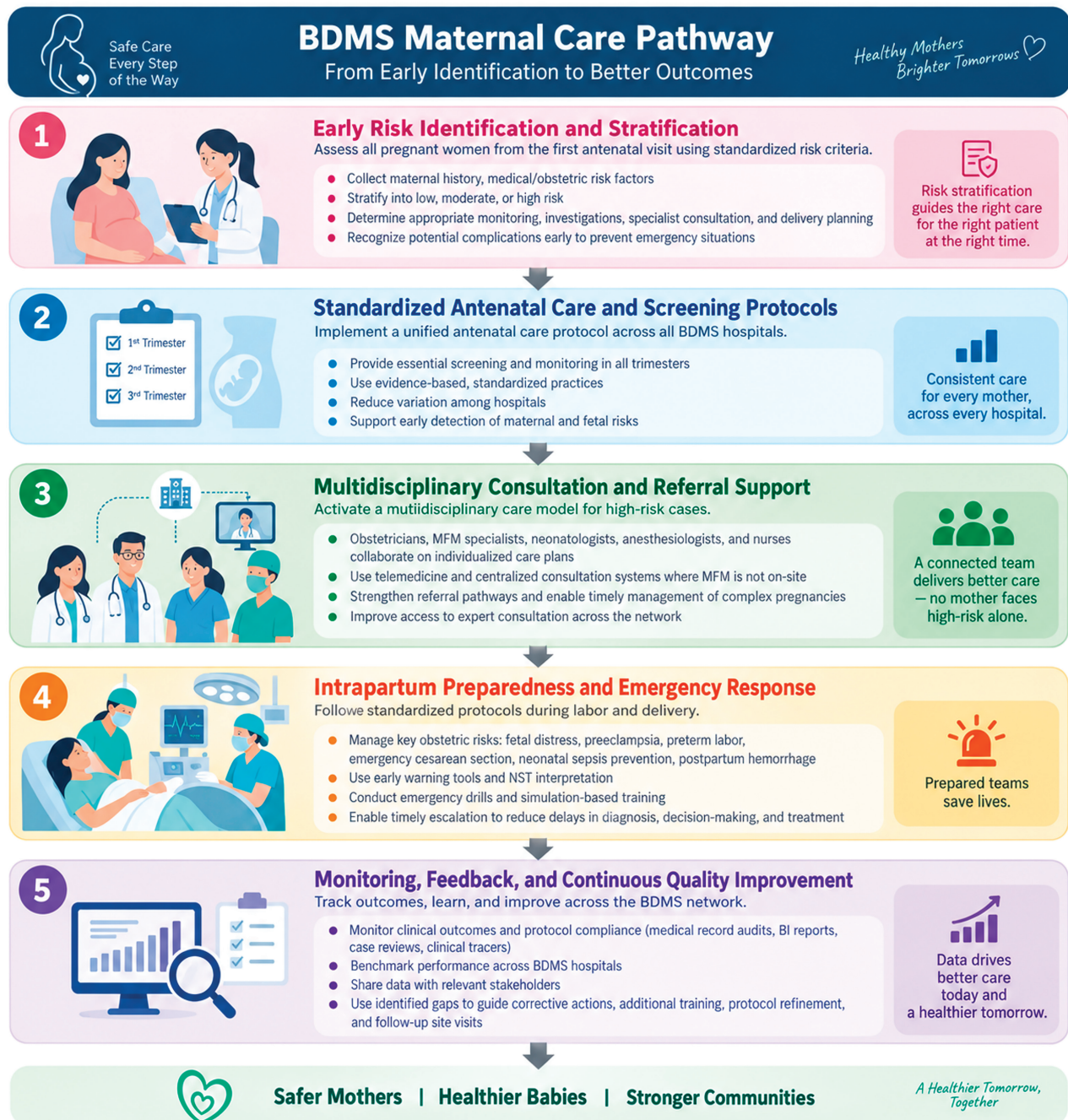


Figure 2: Five-step BDMS maternal care pathway integrating early risk identification, standardized care, multidisciplinary support, emergency preparedness, and continuous quality improvement.

Five-Step Maternal Care Pathway for Early Risk Identification, Coordinated Management, and Continuous Quality Improvement

- **Step 1:** Early Risk Identification and Stratification: All pregnant women are assessed at the first antenatal visit using standardized risk assessment criteria. Risk stratification enables care teams to determine the appropriate level of monitoring, specialist consultation, diagnostic testing, and delivery planning. This step ensures that potential complications are recognized before they progress to emergency situations.

- **Step 2:** Standardized Antenatal Care and Screening Protocols: Hospitals implement a unified antenatal care protocol covering essential screening and monitoring throughout all trimesters. These standardized practices reduce variation among hospitals and support the early detection of maternal and fetal risks. Clinical personnel follow this standardized antenatal workflow for laboratory and diagnostic investigations, with modifications permitted when clinically indicated by individual maternal or fetal risk factors. The recommended investigations and corresponding gestational periods are summarized in Table 1.

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- **Step 3: Multidisciplinary Consultation and Referral Support:** For high-risk cases, a multidisciplinary care model is activated. Obstetricians, maternal–fetal medicine specialists, neonatologists, anesthesiologists, and nurses collaborate to develop individualized care plans. In hospitals without on-site MFM specialists, telemedicine and centralized consultation systems are used to support clinical decision-making. This process improves access to expert consultation, strengthens referral pathways, and enables the timely management of complex pregnancies across the network.
- **Step 4: Intrapartum Preparedness and Emergency Response:** During labor and delivery, care teams follow standardized protocols for key obstetric risks, including fetal distress, preeclampsia, preterm labor, emergency cesarean delivery, neonatal sepsis prevention, and PPH management. The use of early warning tools, nonstress test (NST) interpretation, emergency drills, and simulation-based training strengthens team readiness and supports timely escalation of care. This process helps reduce delays in diagnosis, decision-making, and treatment during critical obstetric events.
- **Step 5: Monitoring, Feedback, and Continuous Quality Improvement:** Clinical outcomes and protocol compliance are monitored through medical record audits, BI system reports, case reviews, and clinical tracers. Performance data are benchmarked across BDMS hospitals and shared with relevant stakeholders. Identified gaps are used to guide corrective actions, additional training, protocol refinement, and follow-up site visits.

Table 1: Standardized Antenatal Laboratory, Diagnostic, and Fetal Surveillance Schedule by Gestational Period

Characteristic	Recommended laboratory or diagnostic testing	Responsible personnel
First visit/booking	- Maternal risk assessment - Early GDM screening in high-risk women - CBC, UA, UC, ABO/Rh typing, rubella IgG, VDRL, HBsAg/anti-HBs, HIV antibody testing, and thalassemia screening - Optional risk-based tests: CT/NG, CMV, toxoplasmosis, HCV, TSH, PPD, genetic screening, antibody screening, and vitamin D - Pap smear* and ultrasonography*	Obstetrician
First trimester: 11–14 weeks	- First-trimester Down syndrome screening and counseling, including NT measurement by a certified sonographer or MFM specialist, if available - First-trimester combined screening or NIPT - Early diagnosis of multifetal pregnancy - Assessment for abnormal pregnancy and coexisting gynecological conditions - Thalassemia counseling by an MFM specialist for couples at risk	Obstetrician; sonographer or MFM specialist
Second trimester: 15–20 weeks	- Down syndrome screening if not previously performed - Amniocentesis for women aged >35 years at the estimated date of delivery or when indicated by medical history or ultrasonographic abnormalities - Thalassemia diagnosis	Obstetrician
Second trimester: 18–23 weeks	- Routine ultrasonography for fetal anomaly screening by an MFM specialist, if available - Fetal morphological assessment	Obstetrician; MFM specialist
Second trimester: 24–28 weeks	- GDM screening in women with risk factors - Anti-D immunoglobulin administered at 28–34 weeks of gestation to unsensitized Rh-negative women with a negative antibody screen	Obstetrician
Third trimester: 28–32 weeks	- Repeat CBC; target hemoglobin level ≥ 10.5 g/dL at 28 weeks - VDRL and HIV testing - HBsAg testing if the previous result is unavailable or was obtained >3–6 months earlier - GDM screening if not previously performed - Ultrasonographic assessment of fetal growth and anomalies by an MFM specialist, if available - Tdap vaccination	Obstetrician; MFM specialist
Third trimester: 35–37 weeks	- Vaginal–rectal culture for GBS - Weekly NST until delivery, based on the obstetrician's clinical judgment, particularly in high-risk pregnancies	Obstetrician; MFM specialist
39 weeks	Consider elective cesarean delivery after 39 completed weeks* or before 39 weeks based on the obstetrician's clinical judgment	Obstetrician
Late-term/postterm: ≥ 40 weeks	- Modified BPP, including NST and AFI, twice weekly until delivery - Consider induction of labor or elective cesarean delivery at 41 weeks*	Obstetrician; MFM specialist

Abbreviations: AFI, amniotic fluid index; BPP, biophysical profile; CBC, complete blood count; CMV, cytomegalovirus; CT/NG, Chlamydia trachomatis/Neisseria gonorrhoeae; GBS, group B Streptococcus; GDM, gestational diabetes mellitus; HBsAg, hepatitis B surface antigen; HCV, hepatitis C virus; MFM, maternal–fetal medicine; NIPT, noninvasive prenatal testing; NST, nonstress test; PPD, purified protein derivative; Tdap, tetanus, diphtheria, and acellular pertussis; TSH, thyroid-stimulating hormone; UA, urinalysis; UC, urine culture; VDRL, Venereal Disease Research Laboratory test.

*As clinically indicated.

Education and Capacity Building

Comprehensive training included classroom and online modules, simulation-based emergency obstetric training, interdisciplinary conferences, clinical tracer reviews, and public education initiatives promoting maternal health literacy and self-care (Figure 3).

Data Collection and Outcome Measures

Program monitoring data were obtained from 3,792 deliveries across BDMS hospitals in 2024. For the compliance analysis, January–March 2024 was defined as the baseline period (N = 695), while April–December 2024 was defined as the post-implementation period (N = 3,097), following full program implementation in April 2024. Maternal and neonatal outcomes included PPH following cesarean and vaginal deliveries, neonatal sepsis, neonatal mortality, and stillbirth. Data were continuously monitored through the centralized BDMS BI system.

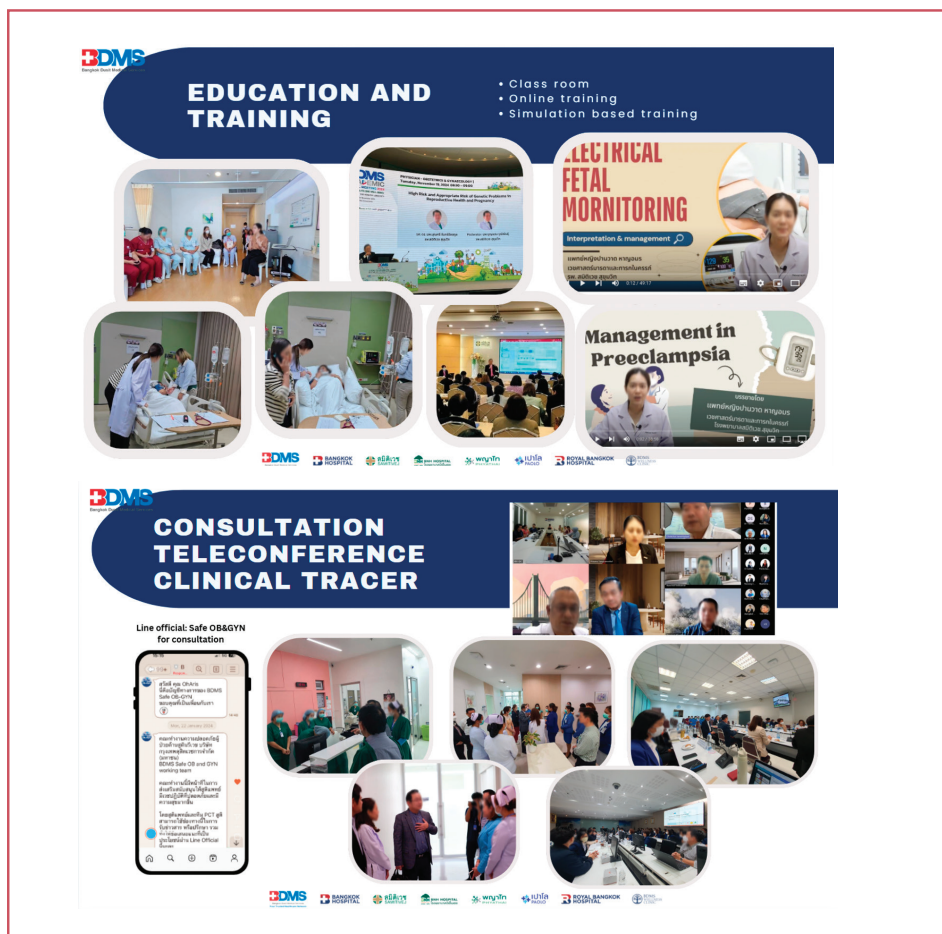


Figure 3: Education, simulation-based training, teleconsultation, and clinical tracer activities supporting multidisciplinary competency development across the BDMS network.

Results

Maternal Risk Profile

Among 3,792 deliveries reviewed in 2024, 38% of vaginal deliveries and 67% of cesarean deliveries involved high-risk pregnancies. The most common high-risk conditions were previous uterine surgery (28%), diabetes (20%), and chronic medical illnesses (17%), reflecting the increasing complexity of obstetric care within the network.

Compliance with Standardized Care Protocols

Improvements in compliance with standardized antenatal and perinatal care protocols were observed across all stages of pregnancy. First-trimester screening increased for GDM from 89% to 94% and for Down syndrome from 68% to 85%. During the second trimester, fetal chromosomal testing increased from 50% to 100%, fetal morphological screening from 86% to 95%, diabetes rescreening in high-risk pregnancies from 84% to 93%, and Tdap vaccination from 80% to 88%. During the third trimester, GBS screening increased from 43% to 53%, antibiotic prophylaxis for GBS-positive cases from 95% to 99%, and fetal surveillance for postterm pregnancies from 96% to 100% (Table 2).

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Maternal and Neonatal Clinical Outcomes

Following program implementation, maternal and neonatal outcomes improved, with reductions in neonatal sepsis, the combined neonatal mortality and stillbirth rate, and PPH.

Neonatal sepsis decreased from 4.69% to 3.57%, while the combined neonatal mortality and stillbirth rate decreased from 1.15 to 0.75 per 1,000 births. PPH decreased by 40.0% following cesarean delivery and by 14.5% following vaginal delivery (Table 3).

Table 2: Changes in Compliance with Key Antenatal Care Indicators Following Implementation of the Standardized Maternal Care Pathway

Indicator	Baseline Jan–Mar 2024 (N = 695), n/N (%)	Post-implementation Apr–Dec 2024 (N = 3,097), n/N (%)	Absolute change (percentage points)
First trimester			
GDM screening	59/66 (89)	2,666/2,825 (94)	+5
Down syndrome screening	463/684 (68)	2,520/2,956 (85)	+17
Second trimester			
Fetal chromosomal testing	30/60 (50)	39/39 (100)	+50
Fetal morphological screening	592/685 (86)	2,918/3,073 (95)	+9
Diabetes rescreening in high-risk pregnancies	550/652 (84)	2,763/2,979 (93)	+9
Tdap vaccination	556/692 (80)	2,706/3,074 (88)	+8
Third trimester			
GBS screening	296/684 (43)	1,629/3,076 (53)	+10
Antibiotic prophylaxis for GBS-positive cases	18/19 (95)	86/87 (99)	+4
Fetal surveillance for postterm pregnancies	45/47 (96)	25/25 (100)	+4

Table 3: Maternal and Neonatal Clinical Outcomes Before and After Program Implementation

Indicator	2023 (Baseline)	2024 (Post-implementation)	Relative reduction
Neonatal sepsis (%)	4.69	3.57	↓23.9%
Combined neonatal mortality and stillbirth rate (per 1,000 births)	1.15	0.75	↓34.8%
PPH following cesarean delivery (%)	0.15	0.09	↓40.0%
PPH following vaginal delivery (%)	3.03	2.59	↓14.5%

Discussion

Following implementation of the Safe OB Program, improvements were observed in protocol compliance and key maternal and neonatal outcomes, including reductions in neonatal sepsis, neonatal and stillbirth mortality, and PPH. When interpreted alongside international reference benchmarks, these program-level outcomes suggest that the BDMS network has progressed toward a high standard of obstetric safety within a private healthcare setting.

The Safe OB Program can serve as a replicable model for healthcare organizations seeking to improve maternal and neonatal outcomes. Its success depends not only on clinical guidelines but also on governance, data transparency, staff competency, patient engagement, and continuous quality improvement.

Key success factors

Embedding standardized protocols into daily workflow. WHO antenatal guidance supports structured, time-specific opportunities for screening, diagnosis, prevention, and

education, while the 2025 WHO/FIGO/ICM PPH guideline emphasizes rapid recognition and bundled first-response treatment rather than fragmented sequential care. The Safe OB concept of assigning activities to defined gestational periods and responsible personnel is therefore evidence-concordant.^{16,17}

Enhancing competency through ongoing training and simulation. A systematic review of 21 studies by Brogaard et al.¹⁸ found that obstetric emergency team training may improve selected outcomes, such as brachial plexus injury in observational studies, but effects on several major maternal/neonatal outcomes were inconsistent. Importantly, a multicenter cluster RCT by Fransen et al. found that a single one-day, off-site simulation program did not reduce the overall composite rate of obstetric complications, although shoulder-dystocia trauma decreased.

Leveraging telemedicine to expand access to MFM expertise. A 2024 systematic review and meta-analysis of antenatal telehealth found broadly comparable maternal and neonatal outcomes with conventional care, supporting its use as an alternative or complement in appropriate settings.¹⁹ A 2025 systematic review and meta-analysis of remote blood-pressure

monitoring found reductions in antenatal outpatient visits and hospital admissions without an increase in adverse maternal or fetal outcomes.²⁰ A 2026 systematic review and meta-analysis of remote fetal monitoring in high-risk pregnancies reported improved fetal surveillance and reductions in selected neonatal complications, although further high-quality evidence is needed.²¹

Using BI systems for real-time performance tracking.

In the California Maternal Quality Care Collaborative, implementation of a hemorrhage safety bundle across participating hospitals was associated with a 20.8% reduction in severe maternal morbidity among women with hemorrhage, compared with a 1.2% reduction in comparison hospitals; regular drills and post-event debriefing were common implementation elements.²² The Cochrane audit-feedback literature likewise supports benchmarked, actionable feedback and local champions.²³ However “real-time performance tracking via BI systems” should be expanded conceptually to “measurement, benchmarking, feedback, and corrective action.” A dashboard alone is not the active ingredient demonstrated in the literature; the likely active mechanism is the behavior-change cycle generated when performance information leads to ownership and specific action.

Empowering pregnant women through structured education and evidence-based self-care tools. Such interventions may help reduce maternal complications by improving health literacy, supporting preventive and self-management behaviors, facilitating early recognition of warning signs, and promoting timely escalation of care. A recent systematic review and meta-analysis of 17 randomized controlled trials demonstrated significant improvements in health literacy, empowerment, and health behaviors following antenatal empowerment interventions.²⁴ In addition, digital self-management interventions for gestational diabetes have been associated with improved glycemic control and reductions in cesarean delivery and fetal macrosomia.²⁵

Future implications

Future pathway development should include evidence-based first-trimester preeclampsia risk assessment and prevention, adapted to local feasibility. FIGO supports first-trimester screening for preterm preeclampsia using maternal factors combined, where feasible, with mean arterial pressure, uterine artery Doppler findings, and placental biomarkers.²⁶ In the ASPRE randomized trial, high-risk women identified through combined screening who received aspirin 150 mg daily had a significantly lower incidence of preterm preeclampsia than those who received

placebo.²⁷ A future Safe OB module could standardize risk identification and prevention according to locally adopted Thai or institutional guidelines.

Future expansion should also consider standardized midtrimester cervical-length assessment and a broader evaluation framework. SMFM identifies transvaginal midtrimester cervical length as an important predictor of spontaneous preterm birth and gives a GRADE 1A recommendation for vaginal progesterone when an asymptomatic singleton pregnancy has a cervical length ≤ 20 mm before 24 weeks; importantly, this supports standardized assessment and management but should not be misquoted as proving that every health system must undertake universal cervical-length screening.²⁸

Conclusion

The BDMS Safe OB Program demonstrates that sustained improvements in maternal and neonatal safety are achievable through an integrated approach that unites standardization, technology, and human capacity. This initiative underscores BDMS’s commitment to continuous quality improvement and risk management, ensuring that every mother and newborn under its care receives the highest standards of safety and clinical excellence.

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Conflict of Interest

The authors are affiliated with Bangkok Dusit Medical Services and its network hospitals. They declare no other conflicts of interest related to this report.

Ethical Considerations

This report describes a system-level quality improvement initiative using aggregated, de-identified operational data collected through routine quality monitoring. No individually identifiable patient information was used.

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