



The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS



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ALLIANCE FOR INNOVATION
ON MATERNAL HEALTH AIM

The AIM Malawi Program – Innovation in Maternal Health

Demonstration Project to Tailor a U.S. Maternal Health Quality Improvement Program
in a Low-Resource Setting

Executive Summary

December 2017

The American College of Obstetricians and Gynecologists (ACOG), Baylor College of Medicine/Texas Children's Hospital (BCM) and the Malawi Ministry of Health (MOH) have collaborated to implement the Alliance for Innovation in Maternal Health in Malawi program (AIM Malawi). AIM Malawi is a modification of the AIM program that has successfully reduced maternal mortality and severe morbidity in the United States.¹ Results of the 18-month demonstration project show that the program has been effectively implemented in three facilities in Lilongwe, reducing the incidence of maternal hemorrhage, increasing the use of life-saving interventions, improving team-based care and referral networks and increasing a culture of safety for maternal health care.



Innovation in Maternal Health Care: The AIM Approach

AIM is an integrated, multi-disciplinary approach to improving maternal safety through a commonly shared data-driven quality improvement process and evidence-based implementation resources to streamline maternal safety bundle implementation. AIM supports:

- Development of a common work culture that fosters communication, team building, team function, multi-disciplinary collaboration and leadership among all health care providers through drills, simulations, and team training.
- Implementation of standardized protocols and checklists within maternity facilities to recognize, treat and prevent obstetrical emergencies.

¹ For more information on AIM, please visit www.safehealthcareforeverywoman.org/aim-program/

- Use of maternal safety “bundles” - sets of evidence-based practices that, when performed with fidelity, will lead to improved patient outcomes - to implement proven quality improvement and best practices.
- Collection and use of data for rapid-cycle quality improvement to create meaningful process and outcome metrics.
- Establishment of timely and efficient referral and transfer protocols and management of anesthesia, blood and antiseptic needs.
- Engagement of the patient and family in the quality improvement process.

The AIM process supports facility-developed protocols to tailor and implement maternal safety bundles. Each bundle consists of Readiness, Recognition, Response and Reporting/Systems Learning to prepare hospital staff for an emergency, provide early recognition of an adverse event, and execute a standardized, effective response.

AIM Malawi Demonstration Project

In partnership with the Malawi Ministry of Health and BCM, ACOG has tailored the successful U.S.-based AIM program to reduce maternal deaths from postpartum hemorrhage (PPH) in Malawi. Malawi has the 13th highest maternal mortality ratio in the world at 634/100,000². AIM Malawi was implemented in three facilities: Kamuzu Central Hospital (KCH), Area 25 Health Center, and Bwaila Maternity Hospital, all in Lilongwe. AIM Malawi targeted postpartum hemorrhage, one of the leading causes of maternal mortality and morbidity in sub-Saharan Africa. ACOG Fellow/BCM staff physician Joseph Sclafani, MD, managed the program in Malawi with technical support from AIM and ACOG experts. Dr. Sclafani worked closely with district health officials, hospital director, chair of the Department of Obstetrics and Gynecology and other leadership at the facilities to foster collaboration and catalyze local ownership of the program for sustainability.

To implement AIM in health facilities in Malawi, ACOG and Baylor College of Medicine:

- Co-created a local steering committee and identified program champions within facilities.
- Conducted skills trainings in communications and obstetric hemorrhage or other bundles as chosen by the steering committee).
- Built upon existing quality improvement programs at facilities and developed ways to celebrate team success.

AIM Malawi participants were trained in emergency leadership, communication skills and the obstetric hemorrhage protocol. Nursing staff and clinical officers received training in the placement of uterine balloon catheters, non-pneumatic shock garments and other life saving measures. Hospital housekeepers, nurses’ aides and ambulance drivers are sometimes incorporated into the emergency team.

AIM Malawi adapted materials developed by AIM to stress preparedness, early recognition, and rapid transfer with excellent hand-off communication to a higher level of care for all Stage 2 hemorrhages or greater. The program introduced fundamental principles of multidisciplinary teamwork and structured communication that are the foundation for implementation of the AIM bundles.

² Maternal mortality in 1990-2015 WHO, UNICEF, UNFPA, World Bank Group, and United Nations Population Division Maternal Mortality Estimation Inter-Agency Group

Over an eighteen-month period:

- A Steering Committee consisting of 23 hospital staff worked in specialized teams to develop ten best practices necessary to manage maternal hemorrhage in a low resource setting. These best practices were adaptations from the U.S. AIM program that focused on the recognition, readiness, response and reporting requirements necessary for an effective emergency response.
- The Committee spent the first months of the program to develop a tailored educational and hands-on training program based on the needs of each facility.
- 391 staff were trained to manage maternal hemorrhage using teamwork and structured communication techniques at Kamuzu Central Hospital, Area 25 Health Center and Bwaila Hospital.
- 14 hands on skills labs were conducted to train all participants in four essential techniques - uterine balloon tamponade, non-pneumatic anti-shock garment, B-Lynch suture, and quantification of blood loss.
- Social media was used to facilitate team communication within facilities and to strengthen the referral network between KCH and Area 25 during patient transfer.
- Obstetric hemorrhage carts were equipped and in use to facilitate a rapid response to maternal hemorrhage.

Results of the AIM Malawi Program: Feasible, Scalable and Effective

In Malawi, ACOG and BCM implemented the AIM program in two phases. In May 2016, AIM Malawi was introduced at KCH and Area 25 Health Center; the program at Bwaila Maternity Hospital was introduced in July 2017. The demonstration project sought to determine if implementation of a U.S. program to reduce maternal mortality and severe morbidity was feasible, effective, and scalable within a low-resource setting. Our preliminary findings indicate that 1) the AIM program can be successfully implemented in Malawi with modifications to adjust for Malawi's limited medical resources; 2) the program is scalable to community health centers, large regional hospitals and a regional perinatal center; and 3) the AIM program can improve maternal outcomes by educating hospital staff about patient safety fundamentals and by providing hands-on training in critical interventional skills.

Program Design

- Between May 2016 and December 2017 AIM Malawi will have provided training and ongoing support at Kamuzu Central Hospital, the regional perinatal center for central Malawi. The hospital performs approximately 3,500 births each year. Ninety percent of patients are referred from other health care facilities throughout the central region of Malawi. The incidence of obstetric hemorrhage at KCH is 9.7% of all births.
- AIM Malawi training was conducted at Area 25 Health Center, a low-resource, rural facility near Lilongwe performing approximately 3,700 low-risk births annually. The incidence of obstetric hemorrhage during the first twelve months of the demonstration period was 1.9%. The AIM program at this small health facility stresses early identification of patients at risk for maternal hemorrhage and preparation for timely referral to a higher level of care.
- In July 2017 AIM Malawi training began at Bwaila Hospital, which performs approximately 17,000 births per year and is the busiest maternity hospital in Malawi. Most uncomplicated deliveries are performed by midwives with backup support for operative deliveries by clinical officers and physicians. The hospital can handle most cases of obstetric hemorrhage.

The clinical staff was trained to place B-Lynch sutures, perform uterine artery ligation, and insert a condom catheter to control hemorrhage. The hemorrhage protocol at Bwaila was modified to facilitate the rapid transfer of life-threatening cases to Kamuzu Central Hospital.

Implementation of the AIM Program: A Five Step Process

Step I: Engage Health System Leadership

The AIM Program was presented to the leadership at the Malawi Ministry of Health, the Lilongwe District Health Officer, the KCH Hospital Director, and the obstetrics and gynecology department head at KCH prior to program implementation. The health management administrative team provided demographic information, assisted in site selection, and identified staffing and resource challenges. Their support and endorsement of the program was critical to its overall success.

Step II: Perform a Baseline Assessment of Unit Safety

The [Agency for Healthcare Research and Quality](#) (AHRQ) Hospital Safety Survey was conducted at all three facilities prior to the implementation of the AIM Program. This survey is extensively used by hospital facilities throughout the United States to measure teamwork between and within hospital units, the level of communication among all caregivers, and the overall perception of safety within units. A follow-up survey was conducted at all three facilities six months and twelve months after implementation. *[Survey results are discussed in the Impact Analysis section of this report.]*

Step III: Introduce the AIM Malawi Training Program

The first day of the two-day AIM Training Program was an interactive session modeled after the TEAMSTEPPS® program developed by AHRQ. **TEAMSTEPPS** trains participants in team dynamics and structured communication. Each training session was organized to include representation by all clinical disciplines to foster multidisciplinary cooperation and focused on the AIM Malawi postpartum hemorrhage protocol and the use of the hemorrhage protocol checklist.

The second day consisted of a **skills lab** to train hospital staff on the essential interventional skills that reduce morbidity and mortality from obstetric hemorrhage, which include:

- Placement of a non-pneumatic anti-shock garment (NASG).
- Placement of a condom catheter (uterine balloon tamponade).
- Placement of a B-Lynch suture.
- Uterine artery ligation.
- Accurate quantification of blood loss.

The Program also included a two-hour **simulation** of an obstetric hemorrhage followed by a debriefing session. This exercise provided participants with supervised training in team skills in a clinical setting that prepared them for a true emergency hemorrhage.

Step IV: Follow-up Surveys to Measure Change

Follow-up surveys were conducted after the introduction of the training program to measure changes in the safety culture and collect clinical data to assess changes in clinical performance. *[Results are discussed in the Impact Analysis section of this report.]*

Step V: Long Term Support for Sustained Systems Change

ACOG and BCM are providing long-term collaboration with KCH, Area 25, and Bwaila to provide technical assistance with data collection and analysis to support continual improvements in clinical performance and safety culture. As demonstrated in the U.S., the transition to a culture of safety takes time. Staff engagement by AIM leadership is necessary throughout the change process to train new staff, ensure high quality implementation of bundles, and to identify positive and negative performance trends. During this period of culture change, social media platforms are often used to broadcast success stories, disseminate program information, and share feedback from participants. Each clinical unit is expected to transition through a two- to three-year maturation process and progression to a fully developed, self-sustained safety culture.

Data collection and analysis is key to supporting systems change and quality improvement. Instituting data feedback loops, including mandatory, structured PPH reviews in morning meetings and severe morbidity reviews will allow for more rapid-cycle and longer term quality improvement in facilities.

Impact Analysis of the AIM Malawi Program May 2016 – November 2017

The AIM Malawi program directly impacted maternal hemorrhage by addressing four specific goals:

- Implementing the Best Practices Included in the AIM Hemorrhage Bundle
- Establishing a Safety Culture in maternal healthcare
- Improving Readiness, Recognition and Response to maternal hemorrhage
- Teaching clinical staff practical clinical interventions and skills that can reduce maternal morbidity and mortality
- Training in Life-Saving Technical Skills

1. The AIM Malawi Hemorrhage Bundle

The AIM Hemorrhage Bundles consists of 13 best practices that improve outcomes when implemented together. AIM Malawi successfully implemented 10 of the 13 best practices (Table 1). A chronic shortage of blood products was a major obstacle to providing blood transfusions in a timely manner. Inconsistencies in clinical documentation caused challenges in providing rapid cycle feedback to the clinical sites.

Implementation of AIM Malawi Best Practices			
1. Hemorrhage cart in key clinical care areas	✓	8. Active Management of the 3rd Stage of Labor (AMTSL)	✓
2. Training in Quantification of Blood Loss (QBL)	✓	9. Stage based Hemorrhage Management plan with checklists	✓
3. Training in team leadership and team development	✓	10. Support program for patients, families and staff	✗
4. Establishment of an Emergency Transfusion Protocol	✗	11. Huddles and debrief training for high risk patients	✓
5. Unit training on hemorrhage protocol, simulations and debriefs	✓	12. Review of serious maternal hemorrhages*	✓
6. Assessment of Hemorrhage Risk	✓	13. Monitor outcome and process measures*	✗
7. Access to Hemorrhage Medications	✓		

* *Partial Implementation*

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BUNDLE

Obstetric Hemorrhage

Table 1. Implementation of the AIM Malawi Maternal Hemorrhage Bundle

2. Establishing a Safety Culture by Promoting Teamwork and Communication Skills

In May 2016 patient safety attitudes at KCH and Area 25 Health Center were poor (Table 2). Six months after the implementation of the AIM Malawi Program, clinical and nursing staff attitudes regarding overall safety, teamwork, and communication skills had significantly improved. The perceptions of overall safety remained high twelve months after program implementation, although there was some decline in attitudes towards teamwork and communication. This decline was likely due to staff turnover and underscores the need for ongoing training, mentoring and supportive supervision if attitudinal changes are expected to change over time.

AIM Malawi Program KCH and Area 25 AHRQ Hospital Safety Culture Survey	Steering Comm. May 2016 (N=17)	Steering Comm. Dec 2016 (N=18)	All Staff Jan 2017 (N=128)	All Staff Oct 2017 (N=154)
	I. Overall Grade Of Patient Safety	%	%	%
“Very Good” or “Excellent”	0	44	40	39
Acceptable	47	28	52	45
Poor	53	28	7	15
Failing	0	0	1	0
II. Teamwork within units and between units	44	67*	67*	48
III. Communication, Handoffs and Reporting of Clinical Errors	22	47*	42*	35
IV. Continuous Improvement/Organizational Learning	37	59*	60*	43

* p <.05

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BUNDLE

Obstetric Hemorrhage

Table 2. AHRQ Hospital Safety Survey May 2016 – October 2017

3. Improved Readiness for a Maternal Hemorrhage

- A hemorrhage cart or emergency tray was in use at only one of the three labor wards prior to the AIM Malawi program. After program implementation, emergency equipment was in use in all three labor wards.
- Between October 2016 and October 2017 56 maternal hemorrhage simulations were conducted at all three facilities. These simulations stressed communication skills, teamwork, team execution of the Hemorrhage Protocol and practice debriefing after emergencies.

“In ten days, I have managed to save two mothers.”
AIM project member

4. Improved Recognition, Prevention and Response to Maternal Hemorrhage

- Prior to the AIM Malawi program, there was no formal mechanism at any of the three facilities to identify patients at risk for maternal hemorrhage. A risk assessment checklist was adapted from the U.S. AIM Program and was implemented at all three facilities. Area 25 Health Center demonstrated the highest utilization rate of the risk assessment checklist tool, where it was used in 64% of admissions.
- Quantification of blood loss has been shown to identify maternal hemorrhage more accurately and reduce delays in recognition. All participants received classroom education and hands-on training in the quantification of blood loss (Figure 1).
- The active management of the third stage of labor (AMTSL) with uterotonic agents has been shown to reduce the rate of maternal hemorrhage. During the period under study, oxytocin was used in the third stage of labor in 94% and 98% of cases at KCH and Area 25 Health Center respectively.



Figure 1 QBL Skills Lab

5. AIM Malawi Skills Lab for Maternal Hemorrhage

- Fourteen skills labs were conducted over a 12-month period to train all 391 participants in five emergency lifesaving procedures: 1) B-Lynch suture; 2) Uterine Artery Ligation; 3) Uterine balloon tamponade; 4) Use of a Nonpneumatic Anti-Shock Garment (NASG) and 5) Quantification of blood loss.

Clinical Outcomes of the AIM Malawi Program

- The incidence of maternal hemorrhage was reduced after completion of the AIM Malawi Program at both KCH and Area 25 Health Centers (Table 3). There was a greater impact at Area 25 Health Center, where most patients underwent a formal risk assessment on admission.
- The greatest reduction in maternal hemorrhage occurred in cases of uterine atony (Table 4). This may have resulted from a more proactive approach to patients at risk for PPH from uterine atony.
- Prior to the AIM Malawi Program only 3.7% of patients experiencing uterine atony at KCH were managed with a lifesaving intervention (Uterine Balloon Tamponade, B-Lynch suture, Uterine artery ligation and NASG). After AIM training the utilization rate of these skills had risen to 34.4% (p< .001) (Table 5).
- The NASG was readily available on the KCH labor ward for over six months prior to the program but had rarely been utilized because of inadequate training. After the AIM training the NASG, was utilized on 10 occasions over an eight-month period for placenta previa (1), uterine atony (5), ruptured uterus (1), placenta accreta (1), and unknown causes (2).
- After skills lab training, there was a marked improvement in provider knowledge and confidence in performing all technical skills as self-reported by program participants (P< .001).

**TABLE 3. IMPACT OF THE AIM PROGRAM
ON MATERNAL HEALTH (2016-2017)**

	N	Baseline	N	After AIM Program	Percent Decrease
AIM (Malawi) - Rate of Obstetric Hemorrhage					
KCH	890	9.7%	2,563	9.1%	- 6.1%
Area 25	909	3.2%	2262	2.5%	-21.8%
AIM (United States) Rate of Severe Maternal Morbidity (AIM vs non-AIM Sites)					
<i>Control sites</i>	14,227	28.6%	1,601	28.2%	1.2%
CA	57,320	22.7%	8,220	18.0%	-20.8%
Site 1	9,301	32.1%	1,596	25.9%	-19.3%
Site 4	28,858	26.2%	5,132	21.5%	-18.0%

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Obstetric Hemorrhage

TABLE 3. The incidence of maternal hemorrhage was reduced after completion of the AIM Malawi Program at both KCH and Area 25 Health Centers.

**TABLE 4. MATERNAL HEMORRHAGE
KAMUZU CENTRAL HOSPITAL**

	Pre-AIM N=66	Post-AIM N=152	
Uterine Atony	41%	36%	NS
Ruptured Uterus	3%	12%	NS
Abruption	5%	8%	NS
Placenta Previa	8%	6%	NS
Vaginal or cervical lacerations	5%	7%	NS
Placenta Accreta	3%	1%	NS
Abortion /RPOC	3%	9%	NS
Surgical bleeding	0%	2%	NS
DIC	0%	1%	NS
Other/Unidentified	33%	19%	NS

TABLE 4. The greatest reduction in maternal hemorrhage occurred in cases of uterine atony. This may have resulted from a more proactive approach to patients at risk for PPH from atony.



**TABLE 5. THE USE OF CONSERVATIVE INTERVENTIONS
FOR TREATMENT OF UTERINE ATONY (KCH)**

	Pre-AIM Program Mar-May 2016	Post-AIM Program Nov 2016-May 2017	
Uterine Atony	27	64	
Condom catheter	1	7	
B-Lynch suture	0	7	
UA Ligation	0	3	
NASG	0	5	
Total Interventions	1 (3.7%)	22 (34.4%)	P<.01

TABLE 5. The utilization of life saving skills increased from 3.7% to 34.4% as a result of AIM training.

Four Key Drivers of a Successful Quality Improvement Program

I. Engage the Ministry of Health, District, and Facility Leadership

The leadership at all levels of the Malawi Health System was instrumental in the program's success. Their ongoing support was also essential to the success of the program.

II. Engage the Hospital Staff in the Program Design Phase

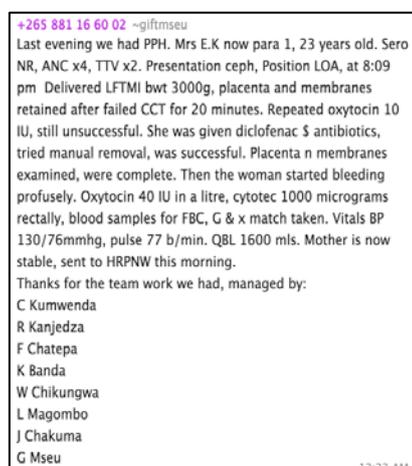
There were 393 hospital staff trained to manage maternal hemorrhage over a twelve-month period. This represents a participation rate of more than 95% of the obstetrical staff at KCH and Area 25 Health Center and 81% of staff at Bwaila Hospital. The initial forum to engage the staff was the **AIM Malawi Steering Committee**, which provided physicians, clinical officers, midwives, and anesthetists with a venue to take local ownership of the program. Twenty-three members of the medical staff from KCH and Area 25 participated on the Steering Committee. The committee staff modified the U.S. AIM hemorrhage protocols to align them with available resources and existing Malawi clinical protocols. The committee also created screening tools and checklists and served as speakers and skills lab trainers, all of which were at the core of the AIM Malawi Training Program. The staff at Bwaila Hospital modified the KCH hemorrhage protocol to adapt it to their facilities and resources. They also created an admission form that integrated AIM Malawi screening tools and checklists into their clinical workflow. The engagement by local staff facilitated their acceptance of many critical changes and enabled them to claim ownership of the program.

III. Identify Program Champions

AIM Malawi identified individuals who played an important role in the success of their unit. Program Champions can be a catalyst that motivates others to lean in and support the program through their words and actions.

IV. Celebrate the Program's Success Using Social Media

Research demonstrates that communication and adoption of best practices is critical to successful team-based care. Effective clinical performance should be spotlighted to serve as an example for others. Aim Malawi team members use social media to highlight success stories and give public recognition to all team members.



A "Success Story" Submitted by Bwaila Hospital staff on the AIM Malawi *WhatsApp* Group

Conclusions and the Next Phase of Implementation

The results of the demonstration project have led to several conclusions about the scalability and replicability of the program:

- The AIM program can be successfully adapted for use in a low resource setting.
- The AIM Malawi Program improves teamwork, staff communication and can promote a sustainable culture of safety.
- AIM Malawi is a successful program that can significantly increase the utilization of life-saving interventions.
- Data demonstrates that implementation of the AIM Malawi program is associated with a reduction in PPH. Results from the US AIM program show that a sustained, state-wide effort can impact severe maternal morbidity and mortality resulting from PPH and other complications.
- To institutionalize a safety culture and strong referral networks, the AIM program should be implemented for two to three years to allow time for sustained behavioral and clinical changes.
- Deficiencies in documentation create challenges to data collection and rapid cycle quality improvement.
- Shortage of blood remains a significant challenge to treatment of maternal hemorrhage in low resource settings.

ACOG presented preliminary results of this work to Andrew Likaka, MD, Head of the Quality Management Directorate at Malawi's Ministry of Health. Dr. Likaka expressed eagerness to see the AIM Malawi program implemented in all facilities within the greater Lilongwe region with a long-term goal of implementation across Malawi. AIM Malawi has also received the support of the Ministry of Health Reproductive Health Unit, the Lilongwe District Health Officer and the KCH Hospital Director. ACOG and BCM will continue to work with the MOH and hospital leadership to refine and extend the program.

In order to ensure sustained improvement, ACOG and BCM are seeking additional funding to support continuous data collection and analysis, refresher training of staff and ongoing training of new staff, enhanced support from healthcare leadership, including the federal Ministry of Health, hospital and unit leadership, to enhance and sustain data review and reporting.

ACOG and BCM will continue to work with KCH, Area 25, and Bwaila and will to introduce the program to other poorly performing hospitals in Lilongwe district. It is our goal to expand AIM to the entire country. Results from Malawi and the US demonstrate that a sustained effort can impact tens of thousands of births and change the culture of safety to ensure that all mothers receive the highest quality care, thereby reducing preventable maternal mortality and morbidity.

For more information on AIM Malawi, please contact:

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