



Reproductive health services in Malawi: An evaluation of a quality improvement intervention

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ABSTRACT

Objective: this study was to evaluate the impact of a quality improvement initiative in Malawi on reproductive health service quality and related outcomes.

Design: (1) post-only quasi-experimental design comparing observed service quality at intervention and comparison health facilities, and (2) a time-series analysis of service statistics.

Setting: sixteen of Malawi's 23 district hospitals, half of which had implemented the Performance and Quality Improvement (PQI) intervention for reproductive health at the time of the study.

Participants: a total of 98 reproductive health-care providers (mostly nurse–midwives) and 139 patients seeking family planning (FP), antenatal care (ANC), labour and delivery (L&D), or postnatal care (PNC) services.

Intervention: health facility teams implemented a performance and quality improvement (PQI) intervention over a 3-year period. Following an external observational assessment of service quality at baseline, facility teams analysed performance gaps, designed and implemented interventions to address weaknesses, and conducted quarterly internal assessments to assess progress. Facilities qualified for national recognition by complying with at least 80% of reproductive health clinical standards during an external verification assessment.

Measurements: key measures include facility readiness to provide quality care, observed health-care provider adherence to clinical performance standards during service delivery, and trends in service utilisation.

Findings: intervention facilities were more likely than comparison facilities to have the needed infrastructure, equipment, supplies, and systems in place to offer reproductive health services. Observed quality of care was significantly higher at intervention than comparison facilities for PNC and FP. Compared with other providers, those at intervention facilities scored significantly higher on client assessment and diagnosis in three service areas, on clinical management and procedures in two service areas, and on counselling in one service area. Service statistics suggest that the PQI intervention increased the number of Caesarean sections, but showed no impact on other indicators of service utilisation and skilled care.

Conclusions: the PQI intervention showed a positive impact on the quality of reproductive health services. The effects of the intervention on service utilisation had likely not yet been fully realized, since none of the facilities had achieved national recognition before the evaluation. Staff turnover needs to be reduced to maximise the effectiveness of the intervention.

Implications for practice: the PQI intervention evaluated here offers an effective way to improve the quality of health services in low-resource settings and should continue to be scaled up in Malawi.

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Introduction

The majority of Malawi's 13 million people live in rural areas, where access to good quality health care is limited. Mortality among children under age five has been steadily declining and is on a trajectory to meet the United Nations Millennium Development Goal 4 to reduce child mortality by two-thirds by 2015. Yet maternal and neonatal health indicators are not improving as quickly. The maternal mortality ratio in Malawi remains among the highest in the world, at 807 per 100,000 live births (NSO and UNICEF, 2008). In recent years the proportion of births at health facilities where skilled attendance is available has jumped, moving from 55% in 1992 to 72% in 2010 (NSO and ICF Macro, 2010). However, the quality of emergency obstetric care remains poor according to a national needs assessment (Leigh et al., 2008). Although contraceptive use has increased steadily since 1992, the rate of unplanned pregnancy also remains persistently high (NSO and ICF Macro, 2010).

Nurses and nurse–midwives play a critical role in saving the lives of mothers and young children in sub-Saharan Africa. In Malawi, they comprise the largest group of health professionals (AHWO, 2009) and provide the majority of reproductive health services at the district and sub-district levels (Picazo and Martineau, 2004). With few physicians available, they form the backbone of basic services proven to reduce maternal and neonatal mortality, such as family planning, antenatal and post-natal care, and skilled attendance at birth (Darmstadt et al., 2005; Campbell and Graham, 2006). However, a severe shortage of midwives, nurses and other health professionals has crippled the ability of the health-care system in Malawi to adequately address maternal and neonatal mortality and other pressing health issues (MoH, 2004; Palmer, 2006).

In 2004 the Ministry of Health (MoH) launched an Emergency Human Resources Programme (EHRP) to help revitalise the health system (MoH, 2004). It offered financial incentives to recruit and retain health workers, expanded the capacity of pre-service training institutions, and strengthened human resources management (Palmer, 2006; O'Neil et al., 2010). A recent evaluation found that the EHRP has had a considerable impact both on the number of health workers and also on their commitment to remaining in the profession and in Malawi. From 2004 to 2009, the number of health workers grew by 53%. There are now 37 nurses (including midwives) per 100,000 population in Malawi, compared with 29 per 100,000 population in 2004 (O'Neil et al., 2010).

While the EHRP directly addressed chronic understaffing, it did less to overcome deep-seated problems in the work environment that undermine the quality of health services in Malawi. Job performance depends not only on good pre-service education and adequate staffing, but also on a host of other factors ranging from the availability of supplies and equipment to systems providing for continuous learning, supervision, and recognition (Rowe et al., 2005). In their analysis of efforts to reduce maternal mortality, Fauveau and colleagues (2008) have argued that a focus on increasing the number of birth attendants has drawn attention away from the need to improve the quality of care by strengthening their proficiency in key midwifery skills.

The rapid influx of newly trained workers into Malawi's health system makes performance issues especially pressing. The quality of training and supervision offered to nursing and midwifery students has suffered because the EHRP failed to overcome some key problems, such as a shortage of tutors and the difficulty of recruiting qualified students into training programs (Picazo and Martineau, 2004; O'Neil et al., 2010). Pass rates at the 13 training institutions for midwives and nurses in Malawi are declining steeply, with less than half of nursing and midwifery students in

the 2010 cohort expected to graduate, according to a report by the Nursing and Midwives Council of Malawi at the 2010 mid-term SWAP review. Given the weaknesses in the education system, inexperienced new nurses entering the workforce are increasingly in need of close support, supervision, and mentoring on the job to raise their skill levels.

However, a series of studies have described a dysfunctional work environment in Malawi's health system that reduces providers' motivation and ability to offer good quality care (Picazo and Martineau, 2004; Muula and Maseko, 2005; Bradley and McAuliffe, 2009; Manafa et al., 2009; McAuliffe et al., 2009). Most health workers lack written job descriptions and must cope with shortages of drugs, supplies, and equipment. There is inadequate mentorship, supervision, recognition, and rewards for service providers. Written standards, targets, and timelines for appraising performance are also largely missing.

Performance and quality improvement (PQI) in Malawi

The MoH has long recognised the need to improve provider performance and service delivery, and its quality improvement efforts predate the EHRP. In 2001 the MoH launched a Performance and Quality Improvement (PQI) initiative to improve infection prevention practices in hospitals. In 2006 the MoH and the ACCESS Program¹ extended the PQI initiative to reproductive health (RH) services in hopes of reducing maternal and newborn morbidity and mortality. The PQI RH intervention has since been scaled up to all 23 district hospitals in Malawi and 33 health centres in four districts.

PQI is based on the Standards-Based Management and Recognition (SBM-R) approach to quality improvement developed by Jhpiego and used in over 30 developing countries worldwide. SBM-R sets evidence-based performance standards and then empowers health-care managers and providers to assess and address gaps between actual and desired performance at their facility (Necochea and Bossemeyer, 2005). The approach is well suited to low-resource settings like Malawi because it is facility-based and focuses on practical solutions, requires little additional manpower or resources, helps transfer learning and motivate health workers, and results in steady improvements.

In Malawi, a Quality Improvement Support Team (QIST) at each facility leads the PQI RH intervention. An external team working in collaboration with the QIST conducts a baseline assessment of services. Then QIST team members and additional hospital personnel analyse the data, determine the causes of performance gaps, design interventions to address gaps, and conduct quarterly internal assessments to assess progress. Results from internal assessments are shared across facilities in a collaborative approach, and progress at individual facilities is benchmarked against baseline measures and the performance of other facilities. Once a facility scores 80% on an internal assessment, it can request an external verification assessment. A score of at least 80% on that assessment earns national recognition as a centre of excellence for reproductive health. The external verification process is repeated annually to monitor adherence and institutionalise good practices.

Study rationale and objectives

Despite the widespread application of quality improvement approaches in health-care applied in low-resource settings, relatively

¹ The ACCESS Program was funded by United States Agency for International Development and led by Jhpiego; it operated globally from 2004 to 2009 and in Malawi from 2007 to 2009.

little rigorous evidence is available on their effectiveness in those settings. Yet systematic evaluations suggest that standards-based interventions can improve provider performance and the quality of care in developing countries, especially when skill levels are low to start with (Wagaarachchi et al., 2001; Jamtvedt et al., 2006; Bailey et al., 2010). For example, criteria-based audit, which assesses clinical practices against best practice guidelines, has been successfully used to improve the management of postpartum haemorrhage and woman-friendly maternity care at dozens of health centres in Malawi (Kongnyuy et al., 2009a, 2009b).

To add to this evidence base and provide insights for scaling up the PQI process in Malawi, an evaluation of the PQI RH intervention was conducted in 2009. The objective was to determine the intervention's impact on the quality of care and reproductive health outcomes. At the time of the evaluation, no facilities had yet reached the recognition stage of the PQI process.

Study hypotheses were as follows:

1. Facility readiness for reproductive health services, in terms of supplies, equipment, and infrastructure, is better at intervention facilities than comparison facilities.
2. Observed quality of antenatal care (ANC), family planning (FP), labour and delivery (L&D), and postnatal care (PNC) is better at intervention facilities than comparison facilities.
3. Reproductive health outcomes are better at intervention facilities than comparison facilities.

Methods

Design

The evaluation employed two designs. Firstly, a post-only quasi-experimental design compared observed service quality at facilities that had implemented the PQI RH intervention (intervention group) with facilities that had not yet implemented the intervention (comparison group). Secondly, a time-series analysis of service statistics examined trends in delivery care, such as the provision of caesarean sections and the use of partographs, and service utilisation at intervention and comparison facilities.

Sample

Sixteen district hospitals were selected for the evaluation. Eight intervention facilities (six in the southern region, one in the northern region, and one in the central region) were randomly selected, by being drawn from a hat, out of the 14 government district hospitals that had initiated the PQI RH intervention in 2007 or earlier. Eight comparison facilities (four in the central region, two in the northern region, and two in the southern region) were randomly selected from among the nine government district hospitals that had not yet implemented the intervention. All facilities in both study groups had previously implemented the PQI intervention for infection prevention.

Data collection

The evaluation teams included 10 clinical experts who served as PQI Master Trainers and did not work at the facilities being evaluated. They had received training on both infection prevention and RH clinical standards and had at least two years of experience in implementing the PQI RH standards. Additional training focused on the assessment tools and objective scoring to foster inter-rater reliability.

Evaluation teams visited participating facilities between 29 July 2009 and 10 August 2009. They conducted structured clinical

observations of client–provider interactions in four RH service areas: ANC, PNC, FP, and L&D. Within each service area, each observation involved a different provider. Evaluators used the same observation checklists and performance standards that QIST teams used for internal PQI assessments. From 16 to 20 standards were assessed in each service area. For example, ANC standards included offering a cordial reception and treatment, taking a medical history, providing HIV testing and counselling, and managing pre-eclampsia. For each standard, assessors noted whether providers performed as many as 29 specific clinical steps, or verification criteria.

The assessment teams also conducted an inventory of infrastructure, supplies, and equipment in each service area; interviewed RH providers, and reviewed facility records and service statistics. The inventories employed existing PQI checklists, but a provider interview guide and record review form were developed especially for this study. The record review included service registers, monthly facility summary reports from the Health Management Information System (HMIS), and charts for maternity patients. In most cases, service statistics dating back to 2004 were examined.

Ethical considerations

The evaluation study was approved by the National Health Sciences Research Committee in Malawi and by the Western Institutional Review Board (WIRB) in the United States. Following the approved study protocol, informed consent was obtained from all participating providers and clients whose care was observed.

Data analysis

Clinical observation data were used to calculate a performance score for each PQI standard. The score equals the number of verification criteria performed for each standard and can also be expressed as the percentage of criteria achieved. The unit of analysis was the client–provider observation, and the sample size for each service area ranged from 32 to 38 observations. A summary score was created for each of the four service areas by totalling the scores for all verification criteria for each PQI standard within that service area and calculating the mean.

A further analysis divided the standards for each service area into three types of clinical tasks: counselling, client assessment and diagnosis, and clinical management and procedures. Each set of tasks comprised 2–11 standards. For each service area, the percentage of verification criteria achieved in each skill set was calculated.

The evaluation sought to compare results between two groups: intervention and comparison sites. The stratified cluster design was used to address the research questions. Selection of clusters was stratified by intervention group. Data were collected within a health facility (the primary sampling unit), and the health facility was treated as a cluster. Among intervention hospitals, 8 were selected out of 16 for a probability weight of 2. Among comparison facilities, all 8 were selected for a probability weight of 1. To address the stratification and clustering and to adjust standard errors, our analytical approach used complex survey commands ('svyset' in Stata 9.0).

Mean scores were compared between intervention and comparison facilities to look for significant differences. Adjusted *p*-values were generated by regression models that used a *t*-test; each outcome was regressed on the intervention group status, controlling for region of the country (central, northern, and southern). Separately, jackknife variance estimation was used

for the intervention group variable coefficient to account for any residual clustering of observations within health facilities.

To examine trends in service utilisation, monthly service statistics were aggregated and graphed by quarter for intervention and comparison groups. Researchers visually inspected the line graphs for changes in service utilisation after the PQI process was launched, as well as differences in service utilisation trends between the intervention and comparison groups.

Findings

Description of participants

Interviews and observations were conducted with 98 providers, equally divided between intervention and comparison facilities. There were no significant differences in sex, age, cadre, and work experience between the study groups (Table 1).

At each facility, a minimum of two client–provider interactions were observed in each service area; a few additional observations of L&D and PNC services were made at some hospitals. A total of 139 interactions were observed: 68 at comparison facilities and 71 at intervention facilities.

Facility readiness to provide reproductive health services

ANC service delivery areas were most likely to meet the readiness standard for clinical records and least likely to meet the standard for counselling and examination areas (Table 2). Intervention facilities were more likely than comparison facilities to have working toilets, adequate counseling, and examination areas, and necessary equipment and supplies in the ANC service area.

Regarding L&D, most facilities in both study groups lacked a system to rapidly assess women in labour to identify complications and prioritise admissions.

FP service delivery areas were most likely to meet the readiness standard for the reception/waiting area and least likely to meet the standard for equipment and supplies. Intervention facilities were more likely than comparison facilities to have working toilets and adequate counselling and examination areas in the FP service area.

Observed quality of reproductive health care

After controlling for region, the intervention group had significantly higher clinical observation scores in two service areas, FP (89.0 vs. 70.5 in the control group, $p < .01$) and PNC (144.2 vs. 135.2 in the control group, $p < .01$) (Table 3). Results for ANC did not

Table 1
Characteristics of providers who participated in the evaluation by study group.

	Intervention group (n=49)	Comparison group (n=49)	Total (n=98)
Per cent female (%)	90	80	85
Mean age (range) (years)	36.7 (24–55)	36.2 (23–66)	36.5 (23–66)
Per cent distribution by cadre			
Registered nurse/midwives (%)	24	20	22
Enrolled nurse/midwives (%)	33	22	28
Nursing/midwifery technicians (%)	41	43	42
Medical assistants (%)	0	8	4
Clinical officers (%)	2	6	4
Mean number of years worked at current facility (range) (years)	7.2 (1–26)	9.0 (1–42)	8.6 (1–42)

Table 2
Number of facilities achieving readiness standards in specific service delivery areas, by study group.

Facility readiness standards	Number of facilities meeting all verification criteria for standard	
	Intervention group	Comparison group
ANC service delivery area	(n=8)	(n=8)
Adequate reception/waiting area	6	6
Working toilets for clients and providers	7	3
Adequate counselling area and examination/procedure area	4	3
Equipment, supplies, and materials for ANC services	8	2
Antenatal clinic uses specific clinical records in conjunction with HMIS	8	8
L&D service delivery area	(n=7)	(n=7)
System to perform a rapid initial assessment of women in labour to identify complications and prioritise admissions	3	2
FP service delivery area	(n=8)	(n=8)
Adequate reception/waiting area	6	5
Working toilets for clients and providers	6	3
Adequate counselling area and examination/procedure area	5	3
Equipment, supplies, and materials for FP services	4	3*

* No data available for one facility; $n=7$.

Table 3
Mean performance score for specific service areas, by study group.

Service area (number of verification criteria)	n	Mean performance score (95% CI)		
		Comparison group	Intervention group	Adjusted p-value ^a
FP (120 criteria)	32	70.5 (51.9, 89.1)	89.0 (71.7, 106.3)	**
PNC (200 criteria)	37	135.2 (117.4, 153.1)	144.2 (128.6, 159.7)	**
ANC (215 criteria)	32	172.8 (159.3, 186.3)	183.8 (171.5, 196.1)	
L&D (215 criteria)	38	164.9 (145.1, 184.8)	164.6 (148.4, 180.8)	

** $p < .01$; CI = confidence interval.

^a The adjusted model controls for region (central, northern, and southern).

achieve statistical significance at .05 in this analysis. Results were similar and remained significant when the effect of the intervention on overall service scores was estimated using jackknife variance. This suggests that the effect of the intervention was robust.

A closer examination of performance scores for each PQI standard was undertaken to identify specific strengths and weaknesses in providers' performance and to identify areas where the intervention had the greatest impact. Key findings are summarised below, although the dataset is too large to present in its entirety. The results are presented as the percentage of verification criteria achieved, rather than raw scores, to permit comparisons across standards and service areas.

Quality of care was generally good in FP: both study groups complied with at least 80% of the verification criteria for 9 of the 16 standards. The intervention group scored significantly higher than the comparison group on two standards: establishing a cordial relationship with the client and identifying her needs (99% and 84% respectively, $p < .05$), and identifying the need for protection against sexually transmitted infections (STIs), including HIV (73%

and 26%, $p < .01$). Both study groups performed less than half of the verification criteria for the four standards related to inserting implants.

The findings also show strong performance in ANC: both study groups achieved 80% or more of the verification criteria for 11 out of the 18 standards. Scores for 3 of 17 standards were significantly higher in the intervention than the comparison group: rapid initial evaluation, which helps the provider triage ANC clients who need urgent attention (63% and 23%, $p < .05$), cordial reception and treatment (99% and 84%, $p < .05$), and conducting the physical and obstetric exam (89% and 73%, $p < .01$). Both study groups performed less than half of the verification criteria for requesting laboratory tests.

In the L&D service area, both study groups complied with at least 80% of the verification criteria for 7 out of the 16 standards. In both study groups, scores were nearly perfect (ranging from 96% to 99%) for conducting the obstetric exam and for performing infection prevention practices during labour according to standards. There were no significant differences between study groups. Both study groups performed only about one-third of verification criteria for monitoring postpartum women during the 2 hrs after the birth.

Quality of care was not as good for PNC: both study groups complied with 80% or more of the verification criteria for just 4 of 20 standards. Scores were especially high for assessing the condition of the neonate (96% and 93%, respectively). There were no significant differences between study groups.

A further analysis subdivided the standards into three clinical task sets – counselling, client assessment and diagnosis, and clinical management and procedures – and examined the effect of the intervention on each task set (Table 4). When adjusted for region in regression analyses, the intervention group scored significantly higher than the comparison group on counselling in PNC. Results for counselling in ANC did not achieve statistical significance ($p = .056$). The intervention group scored significantly higher on client assessment and diagnosis in three service areas: FP, PNC, and ANC. The intervention group also scored higher in clinical management and procedures in two service areas: FP and PNC.

Service statistics

Five years of service statistics suggest that the PQI intervention had an effect on deliveries performed by Caesarean section. As Fig. 1 shows, the number of Caesarean sections increased in both study groups, but more dramatically in the intervention group than in the comparison group. Data were collected on two aspects of routine skilled delivery care: the percentage of deliveries in which a partograph was used and active management of the third stage of labour. There was no evidence that the intervention made an impact on either (data not shown), but concerns about the

quality of the data suggest the results may not fully reflect the real situation.

The two study groups exhibited similar trends in service utilisation, such as the number of return ANC visits, the number of deliveries, and the number of postpartum care visits within 2 weeks after birth (data not shown).

We also examined service data related to obstetric and newborn complications diagnosed and treated, including severe pre-eclampsia/eclampsia, postpartum haemorrhage (PPH), abortion complications, all obstetric complications combined, newborn sepsis, and all newborn complications combined. No differences in trends were observed between intervention and comparison facilities (data not shown). Data quality was also a concern for these statistics.

Discussion

Although quality of care was high at comparison as well as intervention facilities, the evaluation found that the PQI intervention significantly improved the management of PNC and FP clients. These findings are supported by other evaluation studies showing a positive impact of quality improvement interventions on providers' compliance with clinical standards (Hermida and Robalino, 2002) and on provider performance in service delivery (Luoma et al., 2000; Bradley et al., 2002; Lande, 2002). Intervention facilities were also more likely to have the necessary infrastructure, equipment and supplies for RH services, which may increase staff motivation as well as the quality of care.

Although no significant change in the overall quality of L&D services was detected, the intervention was associated with greater provision of caesarean sections. This can be interpreted as an improvement in the quality of care, given that percentage of births delivered by caesarean in Malawi (2.8%) is below the internationally recommended minimum of 5% (Leigh et al., 2008; WHO et al., 2009). Programme effects on L&D services may also have been delayed by the nature of the PQI process, which encourages implementers to focus first on areas that are easier to address, such as FP or ANC, and only then to move on to more complex areas, such as L&D, in order to acquire and strengthen change management skills.

The evidence of impact, while limited, is especially encouraging given that the intervention was still in its initial phases. Internalising and mastering new standards takes time and practice. However, this evaluation was conducted 2–3 years after the intervention was launched, before any facilities had achieved recognition for the quality of their services. Public recognition is an integral part of the PQI process and the component most likely to have a direct effect on service utilisation since it makes potential clients aware of improvements in service quality. Thus, the effects of the intervention on service utilisation had probably not yet been realized.

Table 4
Per cent of standards performed by clinical task set and study group.

Service area	Counselling			Client assessment and diagnosis			Clinical management and procedures		
	Intervention group (%)	Comparison group (%)	Adjusted p -value ^a	Intervention group (%)	Comparison group (%)	Adjusted p -value ^a	Intervention group (%)	Comparison group (%)	Adjusted p -value ^a
FP	97	95		86	55	***	75	59	*
PNC	64	55	*	81	75	*	72	70	*
ANC	92	83		81	67	**	85	84	
L&D	65	75		81	84		78	75	

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

^a The adjusted model controls for region (central, northern, and southern).

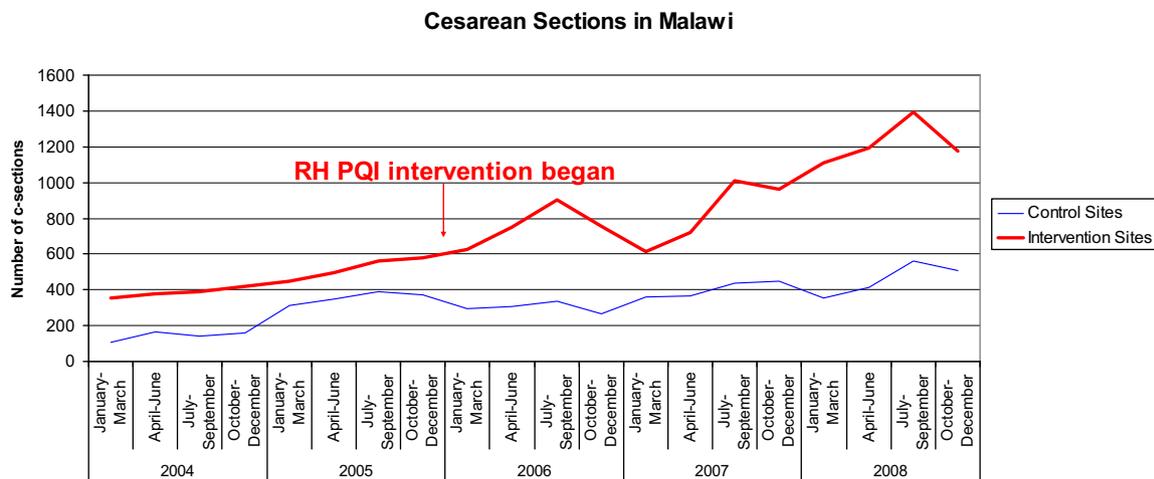


Fig. 1. Trends in caesarean sections by study group, 2004–2008.

Events after the evaluation have demonstrated the importance of formal recognition. Four facilities have since achieved recognition for their reproductive health services, and the national recognition ceremony, which is attended by high-level officials, is proving to be a big incentive. Managers take great pride in showcasing the strides their facilities have made in offering better quality services. The emphasis on recognition has also spilled over to the facility level, where managers have established internal reward systems for departments that perform well on internal PQI assessments. Winning departments may receive trophies or cash incentives that can be used to supplement their salaries or to procure additional equipment.

High turnover and inexperience among providers may have blunted the effects of the PQI intervention, especially in the labour and delivery ward. High-performing personnel – including those that have benefited from the PQI intervention – tend to be promoted by the MoH to the central level or may be transferred to other hospital departments that are not part of the PQI initiative. One-third of the providers in the study had been at their current facility for one year or less. The assessment team noted that some L&D observations involved midwifery students who were doing a clinical practice rotation, while others involved new providers with less than six months experience in the department. In general, one would expect facilities with less staff turnover to benefit more from the PQI process, since it is a group effort requiring group commitment to make changes.

Low caseloads may also have posed a challenge for the intervention. Providers may forget the skills needed to carry out specialized procedures, such as vacuum extraction, when they perform them infrequently. Anecdotally, supervisors in Malawi have noted that some providers who lack confidence in their knowledge and training actively avoid conducting certain procedures, reducing their practice – and performance – still further.

It should be noted that the EHRP complemented the PQI intervention: while the EHRP worked to increase the number of providers on staff, PQI worked to strengthen their skills and motivation by establishing systems that provide for regular performance appraisal, recognition, and rewards. Regular and detailed monitoring of provider performance through self- and peer assessment followed by feedback is built into the PQI process. While PQI does not explicitly provide for external supervision, dedicated QJST teams often focus on strengthening mentoring and supervision onsite in order to improve staff performance. However, the continuing shortage of skilled providers remains a challenge: according to a 2010 National EmONC Assessment, only 57% of district-level positions for nurse/midwife

technicians, 39% for registered nurses, and 37% for medical assistants were filled (MoH, 2010).

Study strengths and limitations

The study had two strengths: direct observations were used to assess performance on the job, and the observers were highly qualified clinical experts who were external to the facility and hence less likely to be biased. They were also well trained in PQI assessments. This approach yields a more objective and more consistent assessment of performance than either provider self-reports or client interviews. Because providers may make a greater effort when under observation (the Hawthorne effect), this study may reflect providers' best possible performance rather than their average performance. This does not matter for the purposes of comparison; however, since the providers at comparison and intervention facilities would likely have reacted in the same way.

There are some limitations. We cannot be certain that the facilities selected are comparable on every condition that might potentially affect the findings. In addition, the small number of observations for any one service area limits the ability to detect differences between groups. As described in the methods section, efforts were made to account for some of these problems in the statistical analysis, for example, by controlling for region.

Exposure to the earlier PQI infection prevention intervention – which was implemented at all comparison as well as intervention facilities – may have affected the evaluation results. Participation in the earlier round of PQI may have strengthened RH scores because they include infection prevention practices. In addition, the earlier round of PQI may have prompted subtle changes in the way providers approach their jobs that could have spilled over to the rest of their work. However, since all facilities had received the infection prevention intervention already, this would have affected both intervention and comparison facilities.

Service statistics for some indicators (e.g., use of partographs, active management of the third stage of labour, and eclampsia diagnoses) were not always of good quality. Recordkeeping at some facilities was incomplete. This makes it difficult to interpret some service statistics with confidence.

Conclusion

The PQI process has proven effective in improving the quality of care of reproductive health services in a low-resource setting. Since providers at both intervention and comparison facilities

may have been influenced by the Hawthorne effect, observed quality of care may have been better than the norm. However it is unlikely that observed differences between the two groups in quality of care scores were due to this effect since both sets of providers would likely have been affected in the same way. Moreover, if a provider does not know how to properly perform a best clinical practice, his/her care will not improve if someone is watching. Nevertheless, efforts should be made to measure quality of care through service statistics and patient outcome measurements as well as observation of provider–client interactions.

Given the positive impact of the PQI process, it should continue to be scaled up in Malawi. Special attention needs to be paid to reducing staff turnover in order to maximise the effectiveness of the intervention. Demand generation is also important to increase service utilisation and ensure that providers apply the skills they learn through training. The MoH is continuing to champion the PQI process and has endorsed it as a best practice for quality assurance. With funding from USAID's Maternal and Child Health Integrated Program (MCHIP), the MoH is scaling up a combined PQI approach for infection prevention and reproductive health at the health centre level and is expanding PMTCT standards along the continuum of care. The MoH is also applying PQI to other areas, such as laboratory services.

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