Optimizing health workforce performance in reduced resources settings to sustain continuous improvement of patient outcomes: a retrospective, serial, cross-sectional analysis of a comprehensive multidisciplinary approach, with special focus on maternal and neonatal health

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Abstract

Staff attrition and frequent turnover in the clinical areas represent a threat to adequate standards of quality of services and its improvement. We describe an example of comprehensive multidisciplinary approach to strengthen health services delivery based on initiatives to: i) reinforce leadership and management of the clinical team; ii) support evidence-based knowledge and performance of the health workforce (HW) for improved efficiency, standardization and resilience to staff migration and/or turnover; iii) develop tools to measure dimensions of leadership and teamwork spirit, competence and quality of health services delivery. Results from a retrospective serial cross-sectional analysis of 17 months of implementation of the approach are presented, with special focus on maternal and neonatal outcomes, to inspire future approach and expansion. Considering deliveries and outcomes occurred at the same institution during the periods January2019-May2020 (period A – control I), January2021-May2022 (period B – control II) compared to January2023-May2024 (period C - test), we observed significant improvements in clinical outcomes (reduction of institutional perinatal mortality from 18.9:1000 and 27.9:1000 to 7.3:1000). This despite the increase of staff turnover and increased workload in the maternity department (particularly between period C *vs.* period B). These data support that the integrated multidisciplinary approach described may help to promote optimization of HW performance, to assist in increasing competency, and resilience to the threat to quality of services, posed by high turnover of team members, often happening in low-resources and rural settings.

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Key words: health workforce, health systems strengthening, perinatal death, maternal health, leadership and management in health.

Contributions: MM, chief coordinator of institutional activities implementation, principal author; KV, implementation clinical activities, reviewing protocols, quality assurance
RJM, FC, implementation of activities, multidisciplinary study and monitoring of human resources performance; TD, monitoring of human resources performance, reviewing protocols, quality assurance; IC, training and monitoring of human resources performance, reviewing protocols, quality assurance; VC, statistical analysis; PFM, chief coordinator.

Conflict of interest: the authors declare that they have no competing interests.

Ethics approval and consent to participate: not applicable.

Availability of data and material: data presented is available upon request from central database of Ministry of Health of Zimbabwe (DHIS2) – data submitted and recorded by Luisa Guidotti Hospital.

Acknowledgements: special thanks go to the contribution of Prof. Antonio Ragusa, Dr Alessandra Meloni and Dr Claudio Crescini for their fundamental support towards the training of trainers at Luisa Guidotti Hospital with the use of obstetric simulators in the labour ward and towards the continuous development and review of improved institutional evidence-based protocols and checklists.

Received: 1 September 2024.
Accepted: 21 March 2025.
Early access: 1 July 2025.

Healthcare in Low-resource Settings 2025; 13:12999
doi:10.4081/hls.2025.12999

Introduction

Health systems strengthening represents a priority in the global agenda, due to the continuous global health challenges currently present. Over the past two decades, it has been increasingly universally accepted that the international community, as well as national and local authorities, should focus on integrated, multisectoral approaches, which can help to identify and solve problems with holistic and interdisciplinary methodologies rather than sectoral ones. Concepts of "One Health systems", and "system-thinking" approaches, to identify and address weaknesses, strengthening public health systems, received increased consensus from the international scientific community and international organizations, over the past twenty years. Today, the need for health systems to be able to respond and adapt to challenges, as well as learn from ongoing monitoring processes, cannot be overemphasized.[1-7]

Both the World Health Organization in 2007,[6] and later the World Bank/EcoHealth Alliance in 2018,[3] have indicated some building blocks as key elements to focus on, to strengthen health systems, which have strong similarities among them ["(i) service

delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential medicines, (v) financing, and (vi) leadership/governance" WHO 2007; "(i) stakeholders, roles, and responsibility; (ii) financial and personnel resources; (iii) communication and information; (iv) technical infrastructure; and (v) governance" World Bank/EcoHealth Alliance 2018].[3] It is the multiple relationships and interactions among the blocks that convert these blocks into a system.[5] The COVID-19 pandemic highlighted the weaknesses already present in health systems and their responsiveness across the globe, and in the post pandemic period we are experiencing very concerning gaps in terms of meeting the needs for health workforce, with some countries being hit by huge staff migration, therefore the call for an "ethical approach" by WHO. In January 2023, the African regional office of WHO, developed a Charter focused on future investment in the health workforce, highlighting the importance of investing into health workforce in improving prevention, monitoring and responsiveness to strengthen existing systems and improve response to future pandemics. The document also highlighted the importance to strengthen leadership and stewardship at all levels and promote investments in the health workforce guided by evidence-based prioritization.[7]

In line with the above-mentioned rationale of approach, the Zimbabwe National Health Strategies 2016-2020 and 2021-2025, (ZW NHS strategic documents 2016-2020 and 2021-2025), have indicated guiding principles for an operational framework aimed to strengthen the public health system.

In the "2023 WHO Health Workforce support and safeguards list", it was highlighted that the increasing demand for health and care workers in high-income countries, could have increased vulnerability, with countries already suffering from low health workforce densities. The list included countries which faced major health workforce challenges related to universal health coverage and they have: i) a density of doctors, nurses and midwives below the global median (*i.e.*, 49 per 10 000 population); and ii) a universal health coverage service coverage index below a certain threshold. Zimbabwe was included in the 2023 list, among the 37 African countries, for safeguards against active international recruitment. (2023 WHO health workforce support and safeguards list, document).

Staff migration and high turnover rates in teams negatively impact the quality of health services, improvement, and team motivation, therefore affecting outcomes.

In this article, we described a set of multidisciplinary interventions which were implemented at a mission hospital as an attempt to standardize an approach, to enable continuous quality improvement, optimization of the health workforce and mitigate threats posed by staff rotation and attrition in a highly changing settings. The interventions described were introduced progressively from 2019, but it is from May 2022 that from the lessons learnt during the previous phase, a comprehensive multidisciplinary approach was set and finally implemented from January 2023.

We focus our retrospective review particularly on the maternity department as it was the first department in which a full implementation was achieved during this period.

Materials and Methods

Study design

This is a retrospective serial cross-sectional analysis conducted over 3 periods of 17 months each (before the full implementation of the set of interventions), in a single centre of implementation (Luisa Guidotti Hospital – LGH). The 3 periods are represented by: January 2019-May 2020 (period A – control I) January 2021-May 2022 (period B – control II) and January 2023 – May 2024 (period C - test). The period between period B and period C (June-December 2022) is considered as a transition period, in which the implementation of complete set of interventions was under completion, before the full roll-out from January 2023.

Sample and setting

The sample populations are related to the total institutional deliveries (and their outcomes) as recorded in the hospital delivery registers and present in the official database of the Ministry of Health and Child Care of Zimbabwe (DHIS2), conducted at Luisa Guidotti Hospital during the 3 periods under review. For perinatal and maternal deaths, audits were conducted, and individual records were examined. As an outcome indicator for the quality of health services, the "institutional" perinatal mortality was considered to limit variables more related to external factors impacting outcomes. The indicator was calculated as the rate of fresh still births - FSBs (fresh foetal deaths occurred) and early neonatal deaths - ENNDs (within 7 days from delivery) for foetuses >28 weeks of gestation. The formula used was [(FSBs+ENNDs)/(institutional live births+FSBs+ENNDs) x 1000]. For the reasons explained above, we considered only deliveries that occurred within the facility (not home deliveries) and Fresh Still Births (FSBs), as well as all Early Neonatal Deaths (ENNDs), as they are more related to institutional management. We excluded the Macerated Still Births (MSBs) as not linked to institutional management of labour and delivery but influenced by other factors (*i.e.* antenatal and community level interventions), unless if an MSB would have occurred during the period in which mothers were lodging at the waiting mothers' home within the facility and were under the care of HW with daily monitoring, to wait for labour to initiate, and after having reported to the facility with a viable foetus. Maternal deaths are described without statistical evaluation as there we recorded high variability in the scenario in which they occurred. Statistical analysis was performed using the Chi-square test.

Interventions

The set of interventions introduced were designed by a multidisciplinary team composed of Clinical managers, Clinicians, Nurse managers, Nurse educators, Human Resources managers and included an approach focused on the following components.

Leadership and management

As part of a Leadership and Management (L&M) development programme, focus groups discussions on leaderships and management and on principles of leadership oriented by emotional intelligence were conducted, followed by the distribution of anonymous questionnaires compiled by team members to allow constructive feedback to team leaders, followed by single coaching sessions to improve Leadership, management and teamwork, to promote effective teams.

Clinical knowledge and skills development

A continuous programme of simulations and practical sessions in the clinical ward was promoted, to standardize evidence-based protocols and practices, promote adequate knowledge transfer and orientation of new staff and increase team efficiency (including the use of checklists).

Monitoring and evaluation of performance and indica-

tors

The use of managerial checklists to guide support and supervision by nurse managers, in collaboration with nurse tutors in the clinical areas, to verify and support standards, identify gaps, track and measure trends in performance as a percentage of a total score, was regularly promoted (weekly and monthly). Parallel to this, the Human Resources department developed tools to measure the dimensions expressed in the L&M component described above, to assist managers to compose teams to maximize the team's emotional intelligence QI were applicable, in case of needs of staff rotation secondary to turnover. Moreover, a complete review of the working timetable and roster modelling adaptation was done by the Nurse managers, together with the Human Resources department, to increase an even distribution of working hours among staff, prioritize continuity in the patients' assistance, based on the average patients bed stay, and reduce exhausting shifts to promote a positive working environment.

We believe that the interventions described are important components in the aim to improve performance, flexibility, problem solving, creativity and resilience.

Data collection process

Deliveries for the periods A, B and C, as well as outcomes were collected from institutional delivery registers, to elaborate institutional perinatal mortality rates, calculated as a proportion of fresh still births and early neonatal deaths (deaths occurred within 7 days from delivery), over the total number of deliveries occurred in the reporting period. Chi-square test was conducted to evaluate the presence of a statistically significant difference between the deliveries conducted in periods C (test) *vs*. B (control II), C (test) *vs*. A (control I), A (control I) *vs*. B (control II), to measure differences in the outcomes. A second evaluation (Chi-square test) was conducted between period C (test) *vs*. B (control II) to review the team composition of the maternity department, in terms of total HW, resignations, or transfers-out, or new addition to the team to review the amount of rotation of staff. To describe this, we introduce a Team Rotation Index (TRI), to evaluate the proportion of resignations or transfers plus rotations or new staff deployed, out of the total average team composition of the maternity department for the periods. The average staff establishment for the two periods was calculated from monthly data collected. Every staff rotation (internal rotation from other departments/new deployment, or transfer to other facility/resignation) was recorded monthly and a proportion was calculated as the sum of these over the total average team composition for the periods, to have an idea of the total turnover index occurred in the period. The higher the index, the higher the changes experienced (therefore potential team disruptions) in the team composition during the period under evaluation.

Ethical considerations

All questionnaires to staff members, when applicable, were conducted, obtaining verbal consent and in an anonymous manner to promote open and constructive feedback to managers. The study, because of its design, did not require ethical committee's approval as it is based on a retrospective analysis of the number of deliveries and their outcomes, as well as department's workloads and quality of service indicators.

Results

The interventions described above were progressively finalized as a set during the period June – December 2022 and fully implemented from January 2023. For these reasons we decided to compare outcomes from deliveries conducted at facility sampling 17 months from January 2019 to May 2020 (period A – control I), January 2021 to May 2022 (period B – control II), comparing with January 2023 to May 2024 (period C - test).

Results (Table 1) showed that during period A (control I), a total of 1193 institutional deliveries were conducted with an institutional perinatal mortality rate of 18.9:1000, compared to 905 deliveries and perinatal mortality of 27.9:1000 in period B (control II), and 1085 deliveries with a significant reduction (Chi-square test $p<0.001$) of perinatal mortality (7.3:1000) recorded in the period C (test). There was therefore a reduction of perinatal mortality rates of 61.4% between period C (test) and A (control I) and of 73.8% between period C (test) and B (control II). Comparing the deliveries between period C (test), A (control I) and B (control II), the highest workload recorded in the labour ward was period A (control I) with 1193, followed by period C (test) 1085 and period B (control II) with 905. Of note, the amount of home deliveries which was recorded as the highest in period B (control II) with 83, followed by period A (control I) with 41, and by period C (test) with 31. Fresh still births and early neonatal deaths were the lowest in period C (test) compared to both controls (see Table 1). In period A (control I), 2 maternal deaths were recorded secondary to obstetric complications (1 post-partum haemorrhage post caesarean section, 1 suspected HELLP syndrome post caesarean section for pre-eclampsia). In period B (control II), 3 maternal deaths occurred (2 at community level during transportation to facility for post-partum haemorrhage, 1 secondary to complications of COVID19 pneumonia). In period C (test), 1 maternal death occurred at facility level, as late presentation of septic shock, post abortion performed at community level. Bed occupancy level of the maternity department was compared between the three periods. The results show a significant difference between period A (control I) and period C (test) with higher occupancy compared period B (control II) but not between period A (control I) and period C (test). A second evaluation between period C (test) and period B (control II) was done, to evaluate the rotations in the team of the maternity department occurred, using a Team Rotation Index (TRI) as a proportion of rotations of staff in the team, over the overall average of team members for the reporting period. Data collected show that during the period C (test) it was reported a TRI of 0.7, compared to TRI of 0.3 for the period B (control II), indicating a higher significant turnover of staff during the test period (Chi-square $p<0.005$). In conclusion, period C (test) recorded higher workloads, higher staff rotations and reduced mortality than period B (control II) and less workload and reduced mortality than period A (control I). It was not possible to evaluate the TRI for period A (control I) as data on staff rotations were missing. Period C (test) recorded overall a significant reduction in perinatal mortality rates compared to both controls.

Data are summarized in Tables 1, 2, and 3.

Discussion

The main aim of the study was to evaluate in retrospect, the effectiveness of a comprehensive-multidisciplinary approach made to strengthen the HW clinical competence and performance, the

quality of services and the teamwork capacity in the maternity and labour ward such to improve patient outcomes, overcome challenges posed by high turnover of staff and staff migration, which negatively impact continuous improvement and eventually outcomes.

Health systems strengthening represents a priority in the global agenda, due to the

continuous global health challenges currently present. Today, the need for health systems to be able to respond and adapt to challenges, as well as learn from ongoing monitoring processes, cannot be overemphasized.[1-7]

Staff migration and high turnover rates in teams, negatively impact quality of health services, improvement and team motivation, therefore outcomes.

Zimbabwe was included in the 2023 list, among the 37 African countries, for safeguards against active international recruitment (2023 WHO health workforce support and safeguards list, document).

In a review made by Siegel and Young in 2021 about areas for nurses managers to focus on, to improve quality of services and HW performance for better outcomes in nursing homes in the U.S., the authors highlight the importance to move beyond describing patterns, to designing and implementing interventions that improve the structures, processes and outcomes, according to the Donabedian model. This to identify practices for managers to lead and manage the nursing workforce and build capacity to ensure person centered, high-quality care.[10]

In this study, to evaluate the effectiveness of the approach implemented, we focused our attention on the institutional deliveries and outcomes in terms of mortality rates. To reduce biases which may have been caused by external factors (*i.e.* COVID19 waves during the pandemic, and other factors related to community interventions for health), we considered fresh still births and early neonatal deaths, which are more directly related to the management of labour and delivery, and we excluded macerated still birth, unless related to an intrauterine death occurred during the

Table 1. LGH maternity and perinatal outputs and outcomes 2019-2024 stratified by period of analysis.

Service Delivery	Jan 2019-May2020 (A)	Jan 2021 - May 2022 (B)	Jan2023-May2024 (C)	Variance C vs. B	Pvalue (χ2) C-B	Variance C vs. A	Pvalue (χ2) C-A	Variance B vs. A	Pvalue (χ2) B-A
Total institutional deliveries	1193	905	1085	+19.9%		-9.1		-24.1	
Total Home deliveries	41	83	31	-62.7%		-24.4%		+102.4%	
Maternal deaths	2 (institutional: PPH and HELLP)	3 (2 community PPH and institutional COVID19 pneumonia))	1 (institutionalSeptic shock post criminal abortion))						
Fresh Still births FSBs	5	10	3						
Macerated still births MSBs	14	11	5						
Earhy neonatal deaths ENNDs	18	16	5						
Perinatal Death Rate(Still Births/ENND)/Total Deliveries including home deliveries	29.1:1000	36.1:1000	11.5:1000	-68.1%	0.0001*	-60.5%	0.0021*	+24.1%	0.3298
Institutional perinatal death rate (FSBs + ENNDs)/Total Institutional Deliveries - not considering MSBs even among deliveries	18.9:1000	27.9:1000	7.3:1000	-73.8%	0.0003*	-61.4%	0.0156*	+47.6%	0.1658
Bed Occupancy (overall hospital)	66.6%	49.8%	65.6%	+24.1%	<0.001*	-1.5%	0.138	-25.2%	<0.001*

The table summarizes the analysis done comparing three periods (Chi-square test): Period A (Control I), Period B (control II) and period C (test). There has been a significant reduction in the perinatal mortality rate for the period C (test) compared to both controls. Period B (control II) recorded the highest number of home deliveries and highest perinatal mortality rate which, besides the reduction in the consistency of sessions of simulations recorded, the need to strengthen leadership and management and the occurrence of some staff rotations, could be explained by the influence of lockdowns and fear to seek for assistance at hospital level by the population during the COVID19.). (Chi-square test * significant difference p-value < 0.01).

period the mother would have been lodging at the waiting mothers' home under the care of the HW of the hospital (upon admission with a viable foetus), and waiting for the onset of labour.

The data presented show significant reduction in perinatal mortality for the period C (test), compared to the control periods [61.4% reduction vs. period A (control I) and 73.8% reduction vs. period B (control II)]. The increased mortality recorded in period B (control II) vs. period A (control I) may be partially attributed to a disruption observed in the delays, which during the COVID-19 lockdowns, may have amplified disruptions in access to health by the rural populations. This may be also justified by the increased number of home deliveries (83) during this period, compared to 41 of period A (control I) and 31 of the period C (test). We believe that other relevant contributing factors, may be represented by the team members rotations with associated recorded loss of continuity of implementing periodic practical simulations in a systematic manner, and the identified need in that period to strengthen the leadership and management skills. Both these interventions were then strengthened systematically from June 2022, during the transition period described above. These considerations may be supported by the fact that, while LGH recorded a perinatal mortality rate of 27.9:1000 during period B (control II), the overall rate for the same indicator for the entire Mutoko District (where LGH is located) was 15.6:1000 (Table 3). Reviewing the data of the period A (control I), it is of note that the centre of implementation (LGH) recorded an institutional perinatal mortality of 18.9:1000 slightly below the indicator calculated for the overall Mutoko District (19.7:1000), and during period B (control II) as already mentioned, there was a significant increase beyond the overall District mortality (27.9:1000 vs. 15.6:1000). (MoHCC of ZW National Database DHIS2). Comparing the same rates for the period C (test), while the District overall mortality rate remain similar to period B (Control II), Luisa Guidotti Hospital (LGH) reported a significant reduction in the institutional perinatal mortality, reaching 7.3:1000. We recognize some limitations in the analysis of these retrospective data as explained earlier. However, to limit the potential biases, we sampled a consistent period in the cross-sectional analysis represented by 17 months of implementation of the approach, and compared to both pre-pandemic period (control I), when some of the interventions had started to be implemented, and the period B (control II) in which some team members rotated and we lost continuity in some activities. We also compared the institutional data (LGH) with the overall District of Mutoko data, calculated for the same parameter as the institutional perinatal mortality rate

Table 2. LGH *vs* Mutoko District maternity and perinatal outputs and outcomes 2019-2024 stratified by period of analysis.

Service Delivery	MUTOKO DISTRICT – MTK- (overall) Jan 2019- May2020 (A)	LGH Jan 2019- May2020 (A)	MUTOKO DISTRICT (overall) Jan 2021 - May 2022 (B)	LGH Jan 2021 - May 2022 (B)	MUTOKO DISTRICT (overall) Jan2023- May2024 (C)	LGH Jan2023- May2024 (C)	Variance LGH vs. MTK Period A (control I)	Pvalue (χ2) Period A	Variance LGH vs. MTK Period B (control II)	Pvalue (χ2) Period B	LGH vs. MTK Period C (test)	Pvalue (χ2) Period C
Total institutional deliveries	6835	1193	6810	905	5016	1085						
Fresh Still births FSBs	41	5	52	10	24	3						
Earhy neonatal deaths ENNDs	96	18	56	16	54	5						
Total deliveries for institutional mortality rate calculation (live+FSBs+ENNDs)	6972	1216	6918	931	5094	1093						
Institutional perinatal death rate (FSBs + ENNDs)/Total Institutional Deliveries - not considering MSBs even among deliveries	19.7:1000	18.9:1000	15.6:1000	27.9:1000	15.3:1000	7.3:1000	-4%	0.864	+78.8%	0.007*	-52.3%	0.041⇈

Mutoko District overall delivery and "institutional" perinatal mortality rates vs. Luisa Guidotti Hospital (LGH) for the period A (control I), period B (control II) and period C (test). (Chi-square test * significant difference p-value < 0.01; ⇈ significant difference p-value <0.05)

Table 3. LGH staff turnover analysis.

Period (17 months)	Team members (average) (A)	Internal rotations or addition of new staff (B)	Resignations or transfers out (C)	Turnover index (B+C)/A	Difference χ2 p value (<0.005)
Period B	**15**	**3**	**1**	**0,3**	
Period C	**15**	**6**	**4**	**0,7**	
Period C vs. Period B				**+133.3%**	**0.0285**⇈

Summary of the Turnover of staff Index (TSF) (Chi-square test); note that during the period C (test) vs. the period B (control), there has been a significant increase of staff rotation, causing the risk of loss of continuity in performance. Despite the risk of disruption within the team, in the period C (test) the hospital recorded the lowest perinatal mortality compared to both controls (Chi-square test; ⇈ significant difference p-value <0.05).

[(FSBs+ENNDs)/(institutional live births+FSBs+ENNDs)*1000].

To this regard, it is of note that, with the data available, we could also compare the TRI (team rotation index) between the period C (test) and the period B (control II) and we found a significant difference (Chi-square p<0.005), indicating that the test period had a higher index (0.7 for the test period vs. 0.3 for the control II period). This highlights that the test period had higher rotations of staff (+133.3%), therefore more risks for team disruption and associated threats to impair quality and outcomes. On the contrary, the period C (test) had the lowest mortality compared to both controls (-61.4% *vs.* Control I and -73.8% *vs.* Control II).

Finally, it is to note also that among the staff rotating in the period C (test) 4 of the 6 new additions to the team (representing 26.7% of the average team composition), where represented by deployment of new midwives soon after training (therefore with reduced clinical experience) but coming from Luisa Guidotti Hospital School of midwifery, in which the approach to the use of simulators and practical sessions is emphasised. This could support the concept that the systematic regular use of simulators, practical sessions in the clinical areas, clinical checklists, and the promotion of clinical audits, support effectively knowledge transfer and enhance learning and skills development for HW and students.

Further research would be necessary to test the interventions in other clinical set-up and departments for longer periods, to better evaluate its effectiveness and review trends with time.

Conclusions

The present study represent a multidisciplinary comprehensive approach to strengthen health workforce, skills performance, improve patient outcomes and mitigate negative effects caused by staff rotation and migration. The need to develop strategies and interventions to support quality improvement, knowledge transfers, skills development and HW team performance cannot be overemphasised, given the current global situation of lack of HW, especially in low-resource and rural settings where staff rotation and migration is high. Despite higher staff rotations occurred in the test period, the approach led to positive results shown by the significant reduction of perinatal mortality rates for the test period compared to both control periods (-61.4% *vs.* Control I and -73.8% *vs.* Control II). These data support that the integrated multidisciplinary approach described, may help to promote optimization of HW performance, to assist in increasing competency, and resilience to the threat to quality of services, posed by high turnover of team members, often happening in low-resources and rural settings. The data also support that the same approach can be an effective method to enhance learning and skills for students under training.

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