

# The effect of providing resuscitation training to front-line staff on rates of maternal and trauma mortality in two health districts in Malawi

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## Background and Goals

Malawi has one of the highest maternal mortality rates in the world, between 807<sup>1</sup> to 1120<sup>2</sup> maternal deaths per 100,000 live births, per year. Only 31% of children born to mothers who die in the peri-partum period survive infancy<sup>3</sup>. It is Malawian government policy to actively encourage women to deliver in either health centres or hospitals with a skilled attendant. However a considerable number of women still deliver in villages with no skilled attendant.

Malawi, in common with much of Africa, also has a very high Road Traffic Accident fatality rate at 26 deaths per 100,000 inhabitants per year; the comparable figure for The Netherlands is 4.1.<sup>4</sup>

A district hospital usually only has 1-2 doctors on staff, a health centre none. Care is provided by nurse midwives or medical assistants (three years training) or clinical officers (four years training). The three day High Dependency, Obstetrics and Trauma management (HOT) training program evolved over a number of years to provide knowledge and skills to first responders at health centre and district hospital level. The course focuses on effective management of women with obstetric emergencies and also trauma patients, especially road traffic accident (RTA) victims. The course has been run sixteen times since 2005 and a total of 391 health care workers have successfully completed training. We set out to evaluate whether this training has impacted on care and maternal (MMR) and trauma (TMR) mortality rates.

problems that had been identified as important in Malawian healthcare. Service delivery issues which were identified as particular problems in Malawi were also addressed. These included issues such as the safe effective transfer of a sick patient; problems with poor communication; teamworking and effective use of the skills and resources that were available in a resource- poor setting.

## Material and Methods

The course was modeled on some of the courses that already exist in other countries. The MOET (Managing Obstetric Emergencies and Trauma) and ALSO (Advanced Life Support in Obstetrics) courses were considered to most closely approach the needs that had been identified in Malawi. In addition to the management of obstetric emergencies and trauma however it was also considered important to emphasise the importance of high dependency care, to maximize survival of patients who had been successfully resuscitated. A 210 page course manual was devised, based on other resuscitation course manuals but revised and rewritten to reflect local needs and practices. This manual was printed locally and distributed to course delegates three weeks before the commencement of the course, to allow adequate time for them to read it. The delegates were encouraged to use the manual throughout the course and to make notes in it, so that they became familiar with it and could use it later as a familiar reference text for emergencies.

The courses were of three days duration. This is a duration that is used in other countries and has been found to be optimal in terms of concentration and learning by the delegates.

	Number of courses held	Doctors trained	Midwives /nurses trained	Clinical Officers trained	Medical Assistants Trained	Instructor potential identified	Total Delegates trained
2005-07	4	3	21	69	0	12	93
2009	3	3	38	21	14	11	76
2010	9	3	125	57	37	21	222
<b>Totals</b>	<b>16</b>	<b>9</b>	<b>184</b>	<b>147</b>	<b>51</b>	<b>44</b>	<b>391</b>

Table 1 Basic Statistics

The Blantyre district and two non-urban health districts, Thyolo and Chiradzulu were initially targeted. Consultation with District Health Officers in these areas confirmed that there were high maternal mortality and RTA mortality in their districts, and that training aimed at helping staff to manage these problems would be appreciated.

As resuscitation protocols for the management of common obstetric emergencies such as haemorrhage and eclampsia have a lot in common with general resuscitation protocols for trauma, a short training program was developed that addresses general resuscitation principles as well as specific

The courses were organized so that either the first or the last day was on a weekend day, to minimize the disruption that taking so many delegates out of a district would have. The teaching faculty consisted mainly of Malawian instructors, who were medical anaesthesia trainees (MMeds), non-medical Anaesthesia Clinical Officers, and midwives and intensive care nurses. There were also 2-3 medical anaesthetists from the Irish College of Anaesthetists on the faculty; the Irish College together with Irish Aid funded the courses. The course material consisted of a combination of lectures, small group discussions and skill stations where

practical resuscitation skills were first demonstrated and then each delegate learned and completed the skill. This was felt to be very important for the practical management of an emergency, as theoretical knowledge is of no use if it cannot be translated into practical intervention. The skills that were taught, and that each delegate successfully completed to graduate from the course are described in Table 2. The lecture topics are described in Table 3, and the small group discussion topics are in Table 4. In addition the faculty role-played several emergency situations for the delegates, such as cases of severe multiple trauma and obstetric emergencies; and demonstrated correct management including logical diagnosis, teamwork, allocation of specific tasks, constant re-evaluation and the importance of follow-on high quality care.

were invited to observe on later courses; and several later became full instructors on further courses.

Maternal mortality rate (MMR) is an internationally recognized measure of basic obstetric care, and allows for between country comparisons, and for monitoring improvements in care provision within an area. There is no equivalent internationally recognised Trauma mortality rate. Rates may be quoted as fatalities per head of population, per kilometer of road, per number of vehicles or other such indices. For the purposes of this paper we have defined the Trauma Mortality Rate (TMR) as the number of in-hospital deaths after a road traffic accident, per 1000 admissions for road traffic accidents, per year. We have chosen this formula as the raw data that was available to us was the number of Road Traffic Accident (RTA) cases admitted per year, and the number of RTA in-patient deaths per year. Obviously RTA deaths that occur before admission are missed, as are RTA cases that are not deemed sufficiently serious to warrant in-patient care. However we felt this TMR index could be used as a useful marker of the quality of trauma care delivered by the health care staff.

*Table 2 – Practical skills taught on the HOT course*

Insertion of a chest drain on a fresh goat cadaver model
Airway management using oropharyngeal airways and bag-mask-valve devices on a mannequin
Cardio Pulmonary Resuscitation (CPR) including chest compression on a mannequin
Technique of cervical stabilization, spine immobilization and log rolling
Technique for safe vaginal breech delivery taught on a mannequin pelvis
Techniques for safe management of shoulder dystocia, taught on a mannequin pelvis
Neonatal resuscitation including airway management and CPR taught on a neonatal mannequin

*Table 3 – Lecture topics delivered on the HOT course*

The structured approach to all emergencies
Triage of multiple emergencies
How to effect the safe transfer of a patient
Evaluation and management of shock
Management of head injuries
Massive Obstetric haemorrhage
Management of pre-eclampsia and eclampsia

*Table 4 – Small group discussion topics on the HOT course*

Sepsis
Eclampsia
Haemorrhage
High Dependency Unit care
Common complications of anaesthesia
Placental abruption

Delegates were then invited to practice a number of resuscitation scenarios in teams of two, and were subsequently marked on a standard resuscitation test scenario. A 50 question MCQ was also administered at the end of the course to test acquisition of theoretical knowledge.

Of the 391 delegates who had completed the course by November 2010 386 passed initially and the other 5 passed after some supplementary instruction. A total of 44 instructor potential candidates were identified; most of these

During the period in question a number of changes occurred in the Malawian healthcare system, general healthcare spending increased, and there were improvements introduced in malaria and HIV care. There were also some specific improvements in obstetric care - notably provision of basic obstetric equipment for vacuum extraction in some health centres, and other more obstetric based basic skills training. In order to establish whether the reductions seen in maternal mortality in Thyolo and Chiradzulu could be attributed to the

HOT training or represented a more general improvement in care we looked at comparable data from a health district where no HOT training had occurred. Machinga health district was chosen as it is also in the southern region of Malawi. Data was collected for each health district for the years 2005 to 2009, and for the first 9 months of 2010. This data was routinely collected by monthly enquiry by the inhouse Hospital Management Information Systems (HMIS) in each hospital. This data is routinely collected for the health ministry and we acknowledge the help of the HMIS staff in giving us access to this data.

## Results and Discussion

Numbers of maternal deaths, and numbers of live births with a skilled attendant present (i.e. in a health centre or district

hospital) are shown in table 5, together with a computation of the MMR. This data is depicted graphically in Graph 1. The reduction in MMR seen in all health districts is all the more significant when one considers that the number of births that occurred in a health centre or district hospital increased by more than 50% in each district reviewed over the years in question.

Similar data for RTA trauma is shown in table 6 and displayed in graph 2.

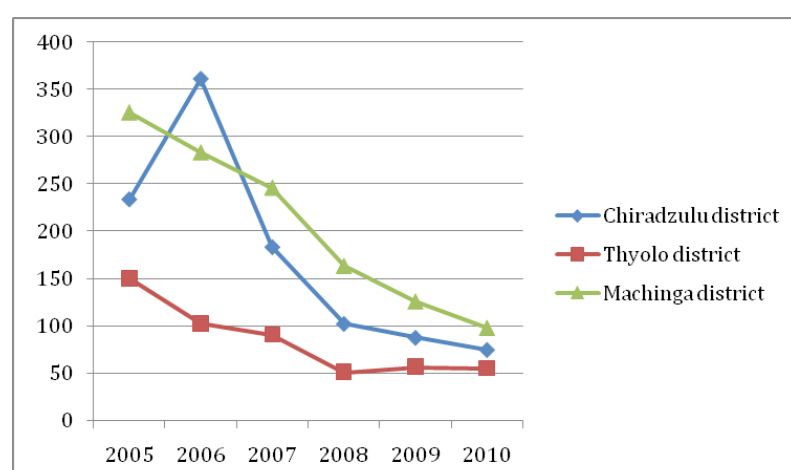
Table 5 – number of live births and MMR for the three health districts 2005-2010

	Thyolo District				Chiradzulu District				Machinga District		
	Live births	Maternal deaths	MMR		Live births	Maternal deaths	MMR		Live births	Maternal deaths	MMR
2005	9,313	14	150		6,406	15	235		11053	36	326
2006	9,758	10	102		6,640	24	370		10934	31	284
2007	11,028	10	91		8,167	15	180		12179	30	246
2008	13,763	7	51		8,767	9	101		15266	25	164
2009	15,830	9	57		9,088	8	89		17441	22	126
2010 (1 <sup>st</sup> 9mo)	8,181	5	55		7,977	6	76		17337	17	98

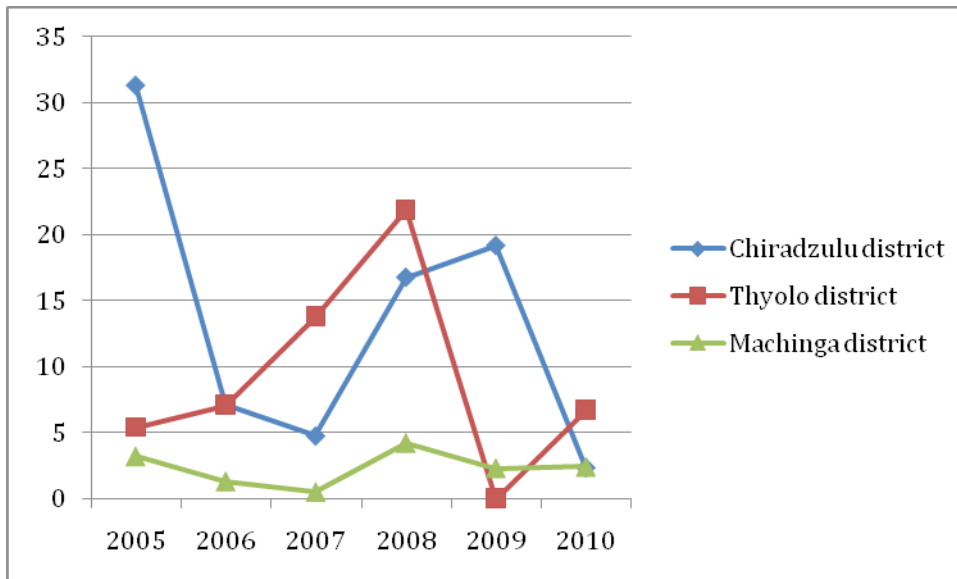
Table 6 – number RTA admissions and TMR for the three health districts 2005-2010

	Thyolo				Chiradzulu				Machinga		
	RTA admissions	RTA deaths	TMR		RTA admissions	RTA deaths	TMR		RTA admissions	RTA deaths	TMR
2005	552	3	5.43		465	13	27.96		2170	7	3.2
2006	564	4	7.09		536	3	5.58		1588	2	1.3
2007	650	9	13.84		554	0	0		2220	1	0.5
2008	594	13	21.88		580	7	12.07		1179	5	4.2
2009	617	0	0		586	8	13.65		885	2	2.3
2010 (1 <sup>st</sup> 9mo)	150	1	6.7		416	1	2.4		830	2	2.4

Graph 1 - Maternal Mortality Rate (2010 data Jan-Sept only)



Graph 2 – Trauma Mortality Rate, deaths per 1000 RTA admissions  
(2010 data Jan-Sept only)



These figures show a steady reduction in maternal mortality over the years in question in all three health districts, however the maternal mortality for Machinga for the first nine months of 2010 is still nearly twice that of Thyolo and a third greater than that of Chiradzulu.

The trauma death rate for Machinga is fairly consistent, whereas the rate for Thyolo and Chiradzulu shows considerable variability from year to year. This may be because the number of trauma cases from these two districts was a lot smaller, so the death rate may be more vulnerable to episodic peaks in trauma occurrence.

The leading causes of maternal mortality in developing regions<sup>5</sup> are haemorrhage (35%) and hypertension (18%), which together account for half of all deaths in expectant or new mothers. Indirect causes, including malaria, HIV/AIDS and heart disease, result in 18 per cent of maternal deaths. Other direct causes, such as obstructed labour, complications of anaesthesia or caesarean section, and ectopic pregnancy, lead to 11 per cent of all deaths during pregnancy or childbirth.

Complications of abortion and miscarriage account for 9%, sepsis for 8% and embolism for 1% of deaths.

The vast majority of these deaths are avoidable. Haemorrhage, for example, which accounts for over one third of maternal deaths, can be prevented or managed through a range of interventions administered by a skilled health-care provider with adequate equipment and supplies at health centre or district hospital level. Delegates to the courses were asked to reflect on what barriers existed in their workplace to the delivery of optimal care to these patients. Some of their comments are included in Table 7. Discussion of these issues however sometimes revealed that appropriate equipment and drugs might exist in the hospital, but might not necessarily be in the most appropriate place, for example where emergency cases might be admitted. After the course many delegates indicated that they felt more confident in dealing with emergency cases, and felt better able to address issues of triage, communication and teamwork.

Table 7. – Barriers to effective care delivery – as described by course delegates

Poor triage
Poor communication between health workers
Poor teamwork
Lack of knowledge
Lack of equipment, IV fluids and drugs
Lack of a High Dependency Unit

A formal review of the efficacy of the course in empowering health care workers with resuscitation knowledge and skills was carried out by members of the Irish College of Anaesthetists in April 2010<sup>6</sup>. They visited the health districts and evaluated 32 health workers who had been trained on HOT courses. The evaluation consisted of a participant questionnaire, focused interview with the participants and case history reviews. Based on the questionnaire participants reported the following levels of satisfaction with these aspects of the courses:

Presentation 82%; Content 88%; Relevance 100%; Teaching technique 84%; Applicability 82%

The participants reported improvements in practice in the following areas:

airway, trauma, obstetrics, eclampsia, haemorrhage and sepsis management; neonatal resuscitation; spinal stabilisation; mass casualty management; team work and organizational prioritization.

All participants also recorded improvements in their work practice both in obstetrics and trauma. These improvements were presented by way of case studies in the case of each participant.

## Conclusion

We conclude therefore that while there have been gratifying reductions in maternal mortality in all three health districts, HOT training may have played a role in reducing this rate further in Thyolo and Chiradzulu as the MMR in these districts is significantly less than that in Machinga.

We feel that it is too early to draw significant conclusions regarding the impact of HOT training on trauma mortality.

## References

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