

# Country-wide Implementation of WHO Surgical Safety Checklist in Madagascar: Project report

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## **INTRODUCTION:**

Mercy Ships is a non-governmental organisation which operates the *Africa Mercy*, a surgical hospital ship delivering free surgical care, healthcare training and quality improvement projects to the national population. From August 2015 to June 2016 the *Africa Mercy* was stationed in Madagascar at the invitation of the government and Minister of Health. The country of Madagascar has a population of 23.57 million people<sup>i</sup>, and was ranked by the World Bank in 2014 as the world's 7<sup>th</sup> poorest nation. There are no published reports on anaesthesia capacity, despite the fact that injury and non-communicable causes have overtaken communicable diseases as the major causes of morbidity and mortality<sup>ii</sup>.

Critical deficiencies in the availability of safe surgery is a growing global health emergency requiring urgent attention. A lack of access to safe, affordable surgery causes more deaths worldwide than HIV, TB, and malaria combined<sup>iii</sup>, <sup>iv</sup>. Stark geographic disparities in surgical services persist despite clear evidence that their development in resource-poor settings is feasible<sup>v</sup>, cost-effective and integral to effective health systems(lancet ref).

The World Health Organisation (WHO) Surgical Safety Checklist (SSC), is a low cost intervention which increases compliance with basic surgical safety standards. The SSC is associated with reductions in mortality and infections by up to 47% and other complications by 37%<sup>vi</sup>. However, several of the checklist's basic safety processes are frequently absent in parts of sub-Saharan Africa, where an estimated 70% of operating rooms lack pulse-oximeters, and swab and instrument counting is not always routine.

Mercy Ships have developed a 3-day course specifically designed to teach implementation of the SSC in low income countries. Informed by experience in Guinea and Republic of Congo, the course tailors the SSC to each hospital's unique environment and develops local leadership and teamwork. The teaching of surgical swab and instrument counting and the use of pulse-oximetry are integrated into the course, which was piloted in 2 regional hospitals in Madagascar between December 2014 and February 2015.

The Minister of Health (MoH) of Madagascar gave his support for Mercy Ships to undertake a Quality Improvement Study (QIS) to train 20 regional hospitals, aiming to:

- 1) Implement the SSC
- 2) Provide pulse-oximeters to each operating room;
- 3) Evaluate the resultant change in safety culture;
- 4) Conduct a nationwide snapshot survey of anaesthesia capacity.

## **METHODS:**

### WHO Surgical Safety Checklist course:

Hospital teams were contacted in advance and requested not to schedule non-urgent procedures during the course to ensure the entire theatre team was able to participate in training. The course was run in each regional hospital over 3 days. The timetable remained flexible to accommodate emergency cases and the usual working patterns of each team. The usual course outline is described below:

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Day 1	
	<ul style="list-style-type: none"><li>- Introduction to patient safety and SSC.</li><li>- Workshop adaptation of the SSC for the hospital</li><li>- Simulation of adapted hospital SSC</li><li>- Hospital Survey on Patient Safety (HSOPS)</li></ul>

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Day 2	
Morning:	<ul style="list-style-type: none"><li>- Specific teaching on key components of the SSC:<ol style="list-style-type: none"><li>1. Counting of compresses and instruments training</li><li>2. Lifebox pulse oximeter training</li></ol></li></ul>
Afternoon:	<ul style="list-style-type: none"><li>- SSC is discussed and further adaptations are made as necessary</li><li>- Additional counting or Lifebox training as necessary</li><li>- Simulations as a whole OR team, in the operating room if possible</li><li>- If feasible and according to caseload, use of checklist in theatre with real cases, supported by team.</li></ul>

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Day 3	
	<ul style="list-style-type: none"><li>- Final discussions and practice using checklist in theatre</li><li>- Feedback forms are distributed to participants</li><li>- Formal ceremony and handing over of donated equipment and certificates.</li></ul>

### Course Follow Up:

3 to 4 months after each course, a Mercy Ships team revisited each hospital, facilitating the following activities:

- Strategic donations of needed monitoring and resuscitation equipment identified on initial visit, such as bag valve masks, and sphygmomanometer.
- Conduct a focus group discussion with the theatre staff to assess facilitators and inhibitors to implementation and behaviour change.
- Repeat HSOPS questionnaire
- Repeat questionnaire on the use and implementation of the SCC
- Provide further training, assistance, and troubleshooting in implementation of the checklist in their hospital.

### Safety culture assessment:

No tool for assessing attitudes to safety culture has been validated in the Malagasy cultural context, however in other contexts has supporting psychometric evidence for reliability and predictability. Mercy Ships worked with Malagasy partners to adapt a shorter version of the validated 42-item hospital Survey on Patient Safety (HSOPS) questionnaire to produce 23

questions which were translated into the Malagasy language. Questionnaires were conducted with hospital staff both during initial training, and at follow up visits after 3 to 4 months.

**Pulse Oximetry training and distribution:**

‘Lifebox’ pulse-oximeters have been developed with the challenges of surgery in low-resource settings in mind. Mercy ships conducted a needs assessment of every regional hospital prior to the course and purchased sufficient Lifebox pulse-oximeters to donate to every operating room and recovery area without pulse-oximetry. Anaesthetic and recovery staff at each hospital underwent training using Lifebox training materials on the physiology of hypoxia, pulse-oximetry use and maintenance, and hypoxia management. Pre and post training MCQs were conducted where possible to help with assessment of knowledge acquisition.

**Anaesthetic capacity assessment:**

A questionnaire addressing anaesthesia drug and equipment availability was formulated using the World Federation of Societies of Anaesthesiologists (WFSA) ‘International Standards for a safe practice of anaesthesia’<sup>viii</sup> and recent Lancet Commission indicators for availability, accessibility and affordability of surgery. This was conducted at every site using electronic data capture on mobile devices in the field.

**RESULTS:**

**Project Goal 1:** Delivery of Surgical Safety Course to 20 regional Hospitals in order to assist implementation nationwide of WHO SCC use.

**Project Outcome1:** Training delivered to 27 hospitals, including one-day accelerated training run in the capital Antananarivo for 6 further hospitals following requests for training from these sites after word about the course spread.

**Table 1: Summary of sites and participants in WHO SCC training course.**

Hospital	Dates	Participants	Hospital level
A	14 – 16 September 2015	13	1 - CHHR
B	22 – 24 September 2015	24	1 - CHRR
C	30 September – 02 October 2015	17	1 – CHU
D	07 – 09 October 2015	12	1 – CHRDR
E	07 – 09 October 2015	14	1 – CHRDR II
F	14 – 16 October 2015	11	1 – CHRR
G	19 - 21 October 2015	20	1 – CHRR
H	27 – 29 October 2015	20	1 – CHRR
I	02 – 04 November 2015	25	1 – CHRR
J	11 – 13 November 2015	17	1 – CHRR
K	16 – 18 November 2015	18	1 – CHRR
L	24 – 26 November 2015	12	1 – CHDR II
M	02 – 04 December 2015	12	1 – CHRR
N	07 – 09 December 2015	19	1 – CHRR
O	12 – 14 January 2016	28	1 – CHRR
P	18 – 20 January 2016	15	1 – CHRR
Q	09 – 11 February 2016	18	1 – CHRR
R	16 – 18 February 2016	23	1 – CHRR

S	22 – 24 February 2016	53	1 – CHRR
T	29 February – 02 March 2016	20	1 – CHRR
U	07 – 08 March 2016	36	1 – CHU
Hospital sites in Antananarivo	Hospital sites below attended focussed 1 day course		
1	19 – 22 April 2016	94	1 – CHU
2	19 – 22 April 2016	26	1 - Military
3	19 – 22 April 2016	20	1 - CHU
4	19 – 22 April 2016	3	1 - CHU
5	19 – 22 April 2016	9	1 - CHU
6	19 – 22 April 2016	6	1 - CHU
Other represented	19-22 April 2016	6	

**Grand Total: 27 hospitals**

- **427 participants in regional hospitals participated in the three-day training**
  - **164 participants in Antananarivo participated in the one-day training**
- = 591 healthcare participants**

*CHU – Centre Hospitalier Universitaire*

*CHRR – Centre Hospitalier de Reference Régional*

*CHRD – Centre Hospitalier de Reference District*

*CHD – Centre Hospitalier de District*

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**Project Goal 2:** Provide pulse oximeters where needed, along with appropriate training.

**Project Outcome 2:** 83 Lifeboxes distributed to 23 hospitals around the country.

In several of the sites surveyed, no pulse oximetry whatsoever was available. No site visited had sufficient pulse-oximeters for all operating rooms. Many specific stories of lives saved by use of pulse oximetry were heard on follow up visits. As a result of equipment donations received, one hospital was able to open a second operating room that now gets used on average 4 times per week.

All anaesthesia provider participants were given a pre- and a post-training knowledge assessment on hypoxia management, physiology, and pulse oximetry, before being given Lifebox pulse-oximeters. Results listed below represent 137 total participants from the 20 regional hospitals who took both a pre- and a post-test. Those who missed one or the other were not counted in the total. Antananarivo participants were not offered Lifebox training.

**Table 2: Pulse-oximetry assessment MCQs**

	Pre-test	Post-test
Average Score	17/30	24/30
Percentage	56%	80%

This indicates, country-wide, a statistically significant ( $p < 0.001$ ) 25% increase in knowledge of this information, critical to providing safe surgery. In many cases, the most-improved scores were shown by theatre and recovery staff who participated in the training rather than anaesthetic specialists.

**Project Goal 3:** Follow up with participants 3-6 months after course completion, including repeat assessment of survey on hospital safety culture using HSOPS.

**Project Outcome 3:** Follow up visits were conducted approximately 3 months after each course to 20 out of 21 regional hospitals. One site was not visited due to difficulties in travel and lack of time.

Primary study outcome:

Use of the Surgical Safety Checklist was the primary outcome of our Quality Improvement Study. A full report of this is planned for publication in due course, but summary results are listed in the table below.

**Table 3: Summary of reported Checklist use at follow up. Numbers shown are actual numbers of responses, followed by the percentage of total responses.**

	Always, in full	Always, in part	Sometimes	Occasionally	Never	No response
<b>Are you using the checklist in the OR?</b>	95 (66%)	20 (14%)	6 (4%)	4 (3%)	1 (1%)	17 (12%)

Secondary study outcome:

Data on hospital safety culture was collected at the beginning of the checklist course and again at 3-4 month follow up in hospitals outside of Antananarivo.

Themes covered by the questionnaire include:

- Teamwork
- Organizational learning
- Management support for patient safety
- Overall perceptions of patient safety
- Communication and openness
- Non-punitive response to errors

Country-wide, all hospitals showed an increase in the perceived safety across all themes, with a statistically significant ( $P < 0.05$ ) difference improvement in teamwork, management support for safety, overall perceptions, and communication and openness. Additional statistical analysis of these results will be forthcoming.

**Project Goal 4:** Assess national surgical infrastructure and delivery

**Project Outcome 4:** Capacity assessment was conducted at 21 hospitals. Anaesthesia capacity assessments included information about anaesthesia workforce density, infrastructure, functioning equipment, and medication availability.

Information gathered during capacity assessment allowed focused donation of essential monitoring and resuscitation equipment during follow up visits. No hospitals included in

assessment met recommended standards for monitoring, and over 50% of hospitals lack reliable electricity, oxygen, pulse oximetry, functioning anaesthesia machines, opiate analgesia, and essential paediatric supplies.

The Madagascar Ministry of Health is committed to improving health services, and the Lancet Commission on Global Surgery arranged a meeting in Dubai in March 2016 towards national surgical plan development. This meeting was attended by the Malagasy Minister of Health along with two other representatives, as well as representatives from Mercy Ships. Anaesthesia capacity assessment data from this project has been made available to the Ministry of Health in order to facilitate formulation of national health service planning.

#### **PUBLICATIONS:**

Abstracts published as a result of this project also presented in poster form at Euroanaesthesia conference in London, May 2016:

**‘National cross-sectional survey of the availability of essential anaesthetic drugs in Madagascar’** Baxter L, Bruno E, et al  
European Journal of Anaesthesiology Volume 33, e –supplement 54, First Author, presented at Euroanaesthesia **June 2016**

and

**‘Quantifying anesthesia equipment needs in Madagascar as part of a National Surgical Plan’** Baxter L, Rakotoarison H, et al.  
European Journal of Anaesthesiology Volume 33, e –supplement 54, First Author, presented at Euroanaesthesia **June 2016**

Anaesthesia capacity assessment data is currently in draft form pending submission for publication.

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<sup>i</sup> <http://www.worldbank.org/en/country/madagascar>  
<http://data.worldbank.org/country/madagascar?display=graph> (Accessed 4/4/16)

<sup>ii</sup> WHO World Health Statistics report part II 2015 Global Health Indicators: Accessed 3 May 2016  
[http://www.who.int/gho/publications/world\\_health\\_statistics/EN\\_WHS2015\\_Part2.pdf?ua=1](http://www.who.int/gho/publications/world_health_statistics/EN_WHS2015_Part2.pdf?ua=1)

<sup>iii</sup> Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development, Meara, John G et al. The Lancet , Volume 386 , Issue 9993 , 569 - 624

<sup>iv</sup> Weiser TG, Regenbogen SE, Thompson KD, Haynes AB, Lipsitz SR, et al. (2008) An estimation of the global volume of surgery: A modeling strategy based on available data. Lancet 372: 139-144.

<sup>v</sup> Ivers L, Garfein ES, Augustin J, Raymonville M, Yang AT, et al. (2008) Increasing access to surgical services for the poor in rural Haiti: Surgery as a public good for public health. World J Surg 32: 537-542.

<sup>vi</sup> Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global patient population. *N Engl J Med*. 2009;350:491–499.

<sup>vii</sup> International Standards for a safe practice of Anaesthesia 2010 Can J Anesth/J Can Anesth (2010) 57:1027-1034 DOI 10.1007/ s12630-010-9381-6