Pulse Oximeter Distribution and Training: A Journey to Anesthesia Safety in Rwanda

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Comprehensive national analysis of emergency and essential surgical capacity in Rwanda

- East African country of 26,338 km²
- Population: ~11 million inhabitants

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Uganda to the North

Democratic Republic of Congo to the West

Tanzania to the East

Burundi to the South
Rwanda

The Land of a Thousand Hills.
DECENTRALIZED HEALTH ORGANIZATION

- **Central Level**: 5 National hospitals
- **District Level**: 44 hospitals
- **Sector Level**: 469 Health centres
- **National Level**: 5 National hospitals
- **District Level**: 44 hospitals
- **Sector Level**: 469 Health centres

Roles:
- Physician Specialist
- Physician Generalist
- Nurse Generalist
- Community health workers
SURGERY AND ANESTHESIA

Need for Safety in low-resource countries
PATIENT SAFETY
Need for Minimum Monitoring

International Standards for a Safe Practice of Anesthesia 2010

Alan F. Merry, FANZCA · Jeffrey B. Cooper, PhD · Olaitan Soyannwo, MMed · Iain H. Wilson, FRCA · John H. Eichhorn, MD
Global operating theatre distribution and pulse oximetry supply: an estimation from reported data

Luke M Funk, Thomas G Weiser, William R Berry, Stuart R Lipsitz, Alan F Merry, Angela C Enright, Iain H Wilson, Gerald Dziekan, Atul A Gawande

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage of operating theatres without pulse oximetry</th>
<th>Population (millions)</th>
<th>Number of operations (millions; 95% CI)</th>
<th>Operations without pulse oximetry (millions; 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australasia, North America (high income), Europe (western), and Asia-Pacific (high income)</td>
<td>&lt;1%</td>
<td>949.9</td>
<td>131.6 (127.0–136.5)</td>
<td>0.1 (0.06–0.2)</td>
</tr>
<tr>
<td>Latin America (southern), Latin America (tropical), and Europe (central)</td>
<td>1–10%</td>
<td>373.3</td>
<td>14.2 (10.5–19.2)</td>
<td>1.1 (0.6–1.8)</td>
</tr>
<tr>
<td>Sub-Saharan Africa (southern), Latin America (central), and Middle East, North Africa</td>
<td>11–30%</td>
<td>700.2</td>
<td>22.8 (16.7–31.3)</td>
<td>4.9 (3.3–7.4)</td>
</tr>
<tr>
<td>Caribbean, Asia (east), Europe (eastern), Asia (southeast), Latin America (Andean), Asia (central), and Asia (south)</td>
<td>31–50%</td>
<td>3831.5</td>
<td>63.3 (33.4–120.0)</td>
<td>23.5 (11.4–48.4)</td>
</tr>
<tr>
<td>Oceania, sub-Saharan Africa (west), sub-Saharan Africa (central), and sub-Saharan Africa (east)</td>
<td>51–70%</td>
<td>717.4</td>
<td>2.9 (2.5–3.4)</td>
<td>1.9 (1.6–2.2)</td>
</tr>
<tr>
<td>Total</td>
<td>--</td>
<td>6572.3</td>
<td>234.9 (191.7–278.0)</td>
<td>31.5 (18.3–54.3)</td>
</tr>
</tbody>
</table>

See webappendix p 1 for details of countries in the subregions. -- = not applicable.
Lifebox Foundation = Equipment + training

Lifebox distribution of pulse oximeters 2011-2013
Proof of concept

Evaluation of a large-scale donation of Lifebox pulse oximeters to non-physician anaesthetists in Uganda

L. C. Finch, R. Y. Kim, S. Ttendo, J. K. Kiwanuka, I. A. Walker, I. H. Wilson, T. G. Weiser, W. R. Berry and A. A. Gawande

- Oximeters stay in place
- Knowledge is retained
Pulse Oximetry Gap in Rwanda
PULSE OXIMETRY
ADDRESSING THE GAP IN RWANDA

Canadian Anesthesiologists' Society
International Education Foundation

+
3 Phases

• 1st Phase, March 2012
  50 pulse oximeters (CHUK, CHUB)

• 2nd Phase, January 2013
  SAFE Obstetrical Anesthesia Course
  89 pulse oximeters to 20 district hospitals
PULSE OXIMETERS DISTRIBUTION IN RWANDA
PHASE 3

Surgical Safety Checklist

Before induction of anaesthesia (with at least nurse and anaesthetist)

- Has the patient confirmed his/her identity, site, procedure, and consent?
  - Yes
  - Not applicable

- Is the site marked?
  - Yes
  - Not applicable

- Is the anaesthesia machine and medication check complete?
  - Yes

- Is the pulse oximeter on the patient and functioning?
  - Yes

- Does the patient have a:
  - Known allergy?
    - No
    - Yes
  - Difficult airway or aspiration risk?
    - No
    - Yes, and equipment/assistance available
  - Risk of >500ml blood loss (7ml/kg in children)?
    - No
    - Yes, and two IVs/central access and fluids planned

Before skin incision (with nurse, anaesthetist and surgeon)

- Confirm all team members have introduced themselves by name and role.
- Confirm the patient’s name, procedure, and where the incision will be made.
- Has antibiotic prophylaxis been given within the last 60 minutes?
  - Yes
  - Not applicable

Anticipated Critical Events

To Surgeon:
- What are the critical or non-routine steps?
- How long will the case take?
- What is the anticipated blood loss?

To Anaesthetist:
- Are there any patient-specific concerns?

To Nursing Team:
- Has sterility (including indicator results) been confirmed?
- Are there equipment issues or any concerns?

Is essential imaging displayed?
- Yes
- Not applicable

Before patient leaves operating room (with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- The name of the procedure
- Completion of instrument, sponge and needle counts
- Specimen labelling (read specimen labels aloud, including patient name)
- Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:
- What are the key concerns for recovery and management of this patient?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.
The result: Safer monitoring, safer anaesthesia, safer surgery
CONCLUSIONS

• Operating rooms in Rwanda, like many Sub-Saharan Africa countries, have limited equipment
• Lack of proper monitoring contributes to surgical and anesthesia mortality
• All operating rooms in Rwanda are now equipped with a pulse oximeter
• It is our hope that we will see significant improvements in monitoring patients undergoing surgical care
THANKFUL TO:

- The Canadian Anesthesiologists’ International Educational Foundation (CASIEF)
- Faye M. Evans, MD
- Angela Enright, MD