Surgery and Global Health

Prepared by
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UCSF Global Health Sciences, and the Bellagio Essential Surgery Group

Part of an educational project for the Global Health Education Consortium
Objectives

• What are the major surgical conditions globally and how big a problem are they?

• How costly is surgery? Are there cost-effective strategies to treat these surgical conditions?

• What are the obstacles to surgical care in low-income countries? How can they be overcome?
Outline

- Introduction
- Role of Surgery in Global Health
  - Global Burden of Disease
  - DALYs
  - Categories of surgical diseases
  - Cost-effectiveness of interventions
  - Bellagio Conference
- Core Challenges to International Surgery
  - Infrastructure
  - Health Workforce shortage
  - Patient factors
- Changing Concepts in Surgery
- UCSF in Uganda
- International Initiatives
- Conclusions
Surgery has not been perceived as a part of “public health”, particularly in low and middle income countries
Surgery

- “Curative”
- Focuses on the Individual
- Addresses rare problems
- Needs high-tech, highly skilled personnel
- Not cost-effective
Public Health:

- Prevention approach
- Focuses on Populations
- Uses low-tech, variable skill levels
- More cost-effective
- Believes in Equity
The Operating Room
The Bare Bones

Note the differences between the modern operating room and this “bare bones” operating room which serves as the operating room in the casualty ward in Mulago Hospital, Kampala, Uganda. While the contrast is large, very little is actually needed to address many of the most common surgical problems.
Global Burden of Disease

• First Estimates of Surgical Burden of Disease
  – Disease Control Priorities, 2nd ed. World Bank
  – Debas, Gosselin, et al. Chapter 67

• Tool to quantify GBD
  – “Disability-Adjusted Life Year” (DALY)
    • YLL (years of life lost) + YLD (years of life lived with disability)
    • Unique as a composite measure of mortality and morbidity

• Estimate: Surgical conditions account for 11% of the world’s DALYs

See Notes
Table 67.1 Estimated Surgical DALYs by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Total DALYs (millions)</th>
<th>Estimated surgical DALYs (millions)</th>
<th>Estimated surgical DALYs as a percentage of total DALYs</th>
<th>Estimated surgical DALYs per 1,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1.468</td>
<td>104</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Africa</td>
<td>358</td>
<td>25</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>Americas</td>
<td>145</td>
<td>18</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>137</td>
<td>15</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>Europe</td>
<td>151</td>
<td>22</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>419</td>
<td>48</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>258</td>
<td>37</td>
<td>16</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: WHO 2002 and authors' estimates.

Table 67.2 Burden of Common Surgical Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Estimated DALYs (millions)</th>
<th>Percentage</th>
<th>Estimated surgical DALYs as a percentage of total DALYs</th>
<th>Estimated surgical DALYs per 1,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injuries</td>
<td>63</td>
<td>59%</td>
<td>4.3</td>
<td>10</td>
</tr>
<tr>
<td>Malignancies</td>
<td>31</td>
<td>19%</td>
<td>2.1</td>
<td>5</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>14</td>
<td>9%</td>
<td>1.0</td>
<td>2</td>
</tr>
<tr>
<td>Obstetrical complications</td>
<td>10</td>
<td>6%</td>
<td>0.7</td>
<td>2</td>
</tr>
<tr>
<td>Cataracts and glaucoma</td>
<td>8</td>
<td>5%</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Perinatal conditions</td>
<td>7</td>
<td>4%</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>31</td>
<td>19%</td>
<td>2.1</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: WHO 2002 and authors' estimates.

a. Estimated surgical DALYs refers to our conservative estimate of DALYs averted by surgical treatment in the most likely diseases for the most likely indications.
Categories of Surgical Diseases

• SIX conditions* result in 81% of all surgical disease burden
  – Injuries – contributes to 38% of surgical DALYs
  – Malignancies – 19%
  – Obstetrics complications – 9%
  – Congenital anomalies – 6%
  – Cataracts and glaucoma – 5%
  – Perinatal conditions – 4%

• Conditions NOT included in the Global Burden of Disease include: certain surgical emergencies (appendicitis, bowel obstruction, & strangulated hernia) and surgical infections.

*These are not mutually exclusive but all influence one another
The Global Burden of Injury

Claims **over 5 million lives** worldwide every year

Leading cause of death and disability worldwide in people <60

There has been a slight drop in DALYs from injury (in percentages) from 1998 to 2005.

Source: WHO, 2005
Leading Causes of Death Both Sexes - 2000

<table>
<thead>
<tr>
<th>Rank</th>
<th>0-4 years</th>
<th>5-14 years</th>
<th>15-29 years</th>
<th>30-44 years</th>
<th>45-59 years</th>
<th>≥ 60 years</th>
<th>All Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower respiratory infections</td>
<td>Childbirth</td>
<td>HIV/AIDS</td>
<td>Hypertensive heart disease</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>2</td>
<td>Diarrhea</td>
<td>Road traffic injuries</td>
<td>Tuberculosis</td>
<td>Lower respiratory infections</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>3</td>
<td>Childbirth</td>
<td>Tuberculosis</td>
<td>Road traffic injuries</td>
<td>Tuberculosis</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Lower respiratory infections</td>
<td>Lower respiratory infections</td>
</tr>
<tr>
<td>4</td>
<td>Low birth weight</td>
<td>Lower respiratory infections</td>
<td>Self-inflicted injuries</td>
<td>Ischemic heart disease</td>
<td>HIV/AIDS</td>
<td>Lower respiratory infections</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>5</td>
<td>Malnutrition</td>
<td>Diarrhea</td>
<td>Intentional self-harm</td>
<td>Self-inflicted injuries</td>
<td>Tuberculosis</td>
<td>Tuberculosis</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>6</td>
<td>Birth asphyxia and birth trauma</td>
<td>Maternal</td>
<td>Intentional self-harm</td>
<td>Intentional self-harm</td>
<td>Cancer of the liver</td>
<td>Hypertensive heart disease</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>7</td>
<td>HIV/AIDS</td>
<td>HIV/AIDS</td>
<td>Tuberculosis</td>
<td>Lung cancer</td>
<td>Lower respiratory infections</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>8</td>
<td>Congenital heart anomalies</td>
<td>Cardiac</td>
<td>Lower respiratory infections</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Lower respiratory infections</td>
<td>Lower respiratory infections</td>
<td>Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>9</td>
<td>Pneumonia</td>
<td>Tuberculosis</td>
<td>Lower respiratory infections</td>
<td>Stomach cancer</td>
<td>Stomach cancer</td>
<td>Road traffic injuries</td>
<td>Road traffic injuries</td>
</tr>
<tr>
<td>10</td>
<td>STD's excluding HIV</td>
<td>Injuries</td>
<td>Lung cancer</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Colorectal cancer</td>
<td>Typhoid fever, typhus fever</td>
<td>Typhoid fever, typhus fever</td>
</tr>
<tr>
<td>11</td>
<td>Diarrhea</td>
<td>Flies</td>
<td>Pneumonia</td>
<td>Liver cancer</td>
<td>Diarrheal diseases</td>
<td>Diarrheal diseases</td>
<td>Diarrheal diseases</td>
</tr>
<tr>
<td>12</td>
<td>Anemia</td>
<td>Intentional self-harm</td>
<td>Renal disease</td>
<td>Self-inflicted injuries</td>
<td>Cirrhosis of the liver</td>
<td>Low birth weight</td>
<td>Low birth weight</td>
</tr>
<tr>
<td>13</td>
<td>Malaria</td>
<td>Leukemia</td>
<td>Leukemia</td>
<td>Leukemia</td>
<td>Leukemia</td>
<td>Leukemia</td>
<td>Leukemia</td>
</tr>
<tr>
<td>14</td>
<td>Road traffic injuries</td>
<td>Perinatal</td>
<td>Nephritis and nephrosis</td>
<td>Renal disease</td>
<td>Breast cancer</td>
<td>Liver cancer</td>
<td>Liver cancer</td>
</tr>
<tr>
<td>15</td>
<td>Tuberculosis</td>
<td>Self-inflicted injuries</td>
<td>Tuberculosis</td>
<td>Breast cancer</td>
<td>Hypertensive heart disease</td>
<td>Congenital heart disease</td>
<td>Diabetes mellitus</td>
</tr>
</tbody>
</table>

Source: Global Burden of Disease Project for 2000, Version 1

See Notes
Injury Mortality

Chart 2. Leading causes of death, both sexes, 1998. Low and middle-income countries, by age.

Road Traffic Injuries alone cost $65 billion/year in low/middle income countries - exceeding the total development assistance received.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Death</th>
<th>DALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IHD</td>
<td>HIV</td>
</tr>
<tr>
<td>2</td>
<td>HIV</td>
<td>Perinatal</td>
</tr>
<tr>
<td>3</td>
<td>CVD</td>
<td>Depression</td>
</tr>
<tr>
<td>4</td>
<td>COPD</td>
<td>RTC</td>
</tr>
<tr>
<td>5</td>
<td>LRI</td>
<td>IHD</td>
</tr>
<tr>
<td>6</td>
<td>Perinatal</td>
<td>LRI</td>
</tr>
<tr>
<td>7</td>
<td>RTC</td>
<td>Diarrhea</td>
</tr>
<tr>
<td>8</td>
<td>Diarrhea</td>
<td>CVD</td>
</tr>
<tr>
<td>9</td>
<td>DM</td>
<td>Cataracts</td>
</tr>
<tr>
<td>10</td>
<td>Malaria</td>
<td>Malaria</td>
</tr>
</tbody>
</table>

**RTC**: Road Traffic Crashes

See Notes
Injury in Africa

- Third leading cause of death
- 7th and 5th of 15 leading causes of death in men and women, respectively; in 15-44 year old age group
- Limited Access: only 1/3 of injured patients ever reach a health facility

Road to Bujagali in bad state

IMPASSABLE: Passengers push a taxi back to the road. The taxi got stuck in a ditch after a heavy downpour. The Budondo-Bujagali road, which leads to one of the country’s major tourist destinations (Bujagali Falls), was rehabilitated several months ago but it becomes impassable whenever it rains because the surface becomes slippery.

burnt to ashes in Najjembe accident

At Najjembe along the Kampala-Jinja Highway yesterday. Photo by Geoffrey Sseuye. 

7th Street now impassable due to potholes

A truck struggles to get out of one of the biggest potholes along 7th Street Industrial Area on Saturday. Some of the biggest taxpayers Shell, Celtex, Capco among others have their offices on this street. They have called on relevant authorities to repair the road in vain. Courtesy photo.

Overloading causes accidents

A boda boda cyclist waits for traffic to flow along 6th Street Industrial Area yesterday. Overloading on vehicles and motorcycles is among the leading causes of road accidents in Uganda. The habit is also a traffic offence punishable by imprisonment. Photo by Willy Tumale.
UGANDA

- Population: ~ 25 million
- 80-90% rural
- Human Development Index 146 of 177
- Life expectancy 48 (M) /51 (F)
- Total Health expenditure/capita $18-> $75
  - WHO recommends: $35/capita
  - USA spends: $5000/capita

Uganda is the least urbanized country in sub-Saharan Africa, creating unique challenges for access to health facilities. The WHO estimates are to have a basic minimum package of health services as estimated by the Commission on Macroeconomics and Health (2001). Recent health expenditure in Uganda has increased from $18 to $75/per capita/year.
## Uganda Health Infrastructure

<table>
<thead>
<tr>
<th>Health Unit</th>
<th>Location</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC I</td>
<td>Village</td>
<td>1000</td>
</tr>
<tr>
<td>HC II</td>
<td>Parish</td>
<td>5000</td>
</tr>
<tr>
<td>HC III</td>
<td>Sub-County</td>
<td>20,000</td>
</tr>
<tr>
<td>HC4</td>
<td>County</td>
<td>100,000</td>
</tr>
<tr>
<td>District Hospital</td>
<td>District</td>
<td>100,000 to 1 million</td>
</tr>
<tr>
<td>Regional Referral Hospital</td>
<td>Region (3-5 districts)</td>
<td>1-2 million</td>
</tr>
<tr>
<td>National Referral Hospital</td>
<td>National</td>
<td>Over 20 million</td>
</tr>
</tbody>
</table>

See Notes
Infrastructure for Trauma Care in Uganda

• No mobile pre-hospital system
  – The injured are brought in by bystanders, police, or relatives
  – Often arrive at a significant delay from time of injury

• One 24 hour casualty ward: Mulago Hospital - 1200 beds
Surveillance: Measuring Injury in Uganda

• National survey was performed
  – With qualitative and quantitative methods
  – Households in rural and urban areas were randomly selected

• 88% of population live in rural areas

• 220% increase in motor vehicles recorded from 1985 to 1995

This is from data collected by the Injury Control Center in Uganda, a non-profit entity which was formed through the Canadian Network for International Surgery (www.iccu.org). It is one of the two WHO Collaborating Centers for Injury and Trauma in Africa. Reference: Kobusingye et al. “Hospital-based Trauma Registries in Uganda” (2000) J Trauma 48 (3): 498-502.
Injury Mortality

• Urban: 217/100,000
  – Traffic crashes and violence
• Rural: 92/100,000
  – Drownings are a tremendous issue in the lake regions (rural)
  – Burns and falls affect children
• Conflict: 990/100,000 (north)

• 99% of world maternal deaths occur in Africa, Asia, Latin America and the Caribbean

• In developing countries, pregnancy related complications are the *leading cause* of maternal death and disability for women between 15–49

• 15% of pregnant women develop life-threatening complications around time of birth

• 1-3% of all deliveries require major intervention to prevent maternal mortality

Obstetrics in Uganda

- Rate of pregnancy is high - only 15% of women use contraception
- Trained health personnel attend just 38% of births
- In 1998, only 4% of women with obstetric complications were treated in emergency facilities
- FIGO (International Federation of Gynecology and Obstetrics) started Save the Mothers Initiative to address these findings
Obstetrics

• FIGO’s interventions included:
  – Increase in number of facilities in the district offering emergency obstetric services
  – Skills upgrade of existing health professionals
  – Improved availability of essential drugs & supplies
  – Better record keeping

• Complications treated in facilities increased from 4% to 46.8%
Acute Surgical Emergencies

• Acute abdominal conditions
  – Strangulated hernia, intestinal obstruction, intestinal perforation, appendicitis, abscess

• Conditions not caused by trauma

• Diagnoses and treatment of these problems do not require advanced tools.

• Treatment may require advanced experience in fluid resuscitation & peri-operative intensive care
Acute Surgical Emergencies

• Types of surgical procedures in small hospitals:
  – Similar in wide range of settings: Mozambique, Tanzania, Bangladesh
  – 62% of operations were emergencies
  – More than 90% of DALYs averted were due to emergency operations

• These procedures can be done with basic equipment and correct staff at the district hospital level

Non-acute & Congenital Conditions

• Examples:
  – Congenital anomalies
    • cleft lip/palate, hernias, ano-rectal malformations, clubfoot
  – Cataracts
  – Breast cancer
• The district or lower level centers can provide effective screening, diagnosis and treatment or referral for these conditions
Messages from the Disease Control Priorities Project

• Cost-effectiveness of interventions:
  – Measles Vaccine: $1-5/DALY averted
  – ARVs for HIV: $300-500/DALY averted
  – Surgery: $7-200/DALY averted

These data use countries with high HIV prevalence & high adherence with ARV treatment. Should surgery be a greater priority?
Cost-effectiveness of Surgical Care

• Estimates for cost per surgical DALY gained at a district hospital
  – Sub-Saharan Africa $19-102
  – Latin America, Caribbean $47-164

• Low costs in Africa are due to low infrastructure costs and high burden of avertable disease

• Cost estimates at the community clinic level is $212-241 per surgical DALY averted

See Notes
Global Health Priorities

• Research $/DALY (1990 figures, WHO)
  – HIV $85
  – Road Traffic Accidents $0.83

• Despite the burden of injury and road traffic accidents, it is 100 times under-funded compared to HIV/ AIDS

See Teaching Modules Appendix:
http://globalhealtheducation.org/Modules/Teaching%20Modules%20Appendix/104.aspx
Increasing Funding for Global Health Initiatives

- **US Development Assistance**
  - $11 to 28 billion (2001-2005)
  - PEPFAR (2003) $15 billion over 5 years

- **Global Fund for HIV/TB/Malaria (2002)**
  - $3 billion over 3 years

- **World Bank: $2 billion (2006) -> health**

- **Gates: $6.6 billion/ 6 years**
  - Buffett: to add $1.5 billion/year

Almost all of this support is directed to infectious disease despite the possible cost-effectiveness of surgical care. Gates Funds: 1/3 are to TB/HIV and STIs.
Main Points

• 90% of Burden of Disease exists in Developing Countries (low & middle income)

• 15% of GBD could be avoided with surgery

Source: Laxminarayan et al. (2006) “Advancement of Global Health: key messages from the Disease Control Priorities in Developing Countries Project” Lancet 367 (9517) 1193-1208;
Debas, Gosselin et al. Chapter 67, Disease Control Priorities in Developing Countries 2nd ed. 2006.
Messages from the Disease Control Priorities Project

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Bellagio Essential Surgery Group

• Conference by UCSF-Karolinska-WHO-World Bank-Fogarty International, June 2007
  – To increase access to surgical services in resource-constrained settings in sub-Saharan Africa
  – Funded by Rockefeller Foundation

• 6 East African Nations

• Key Areas of discussion/challenges identified
  – Burden/Access/Workforce/Economic Evaluation/ examples of Successful initiatives

• Dissemination of information planned

The conference convened a multidisciplinary group of experts in Bellagio, Italy.
Reference: http://globalhealthsciences.ucsf.edu/bulletins/bulletins.aspx
Core Challenges for Access to Global Surgical Care

• Infrastructure
• Health Workforce shortage
• Patient-related factors
New Health Centers in the periphery

Sub-district Health Center Operating Room

See Notes
Infrastructure

• A large portion of health expenditure is on hospital services
  – However, there are few studies that have analyzed the efficiency and performance of hospitals
• District hospitals tend to produce good results at surprisingly low cost
  – Cost per surgical DALY gained at a district hospital in Sub-Saharan Africa is in the range of $19-102
• Existing facilities need to be evaluated for efficiency and optimal use
  – Inappropriate new facilities may increase the cost of service
  – Sustained funding needs to be ensured for well-planned expansion

Background paper, Bellagio Essential Surgery Group, June 2007
Various Models of Surgical Care

- International NGOs
- “Surgical Camps” (Uganda)
  - Domestic university surgeons make week long trips to rural areas to perform operations
  - Primarily “general surgery”
- Specialist Outreach
  - Orthopedics/plastic surgery/ophthalmology/ENT
  - Domestic or international surgeons
- Moving services to periphery
  - Building operating rooms at district/sub-district
- Training Paramedical Cadres

Some of the more well-known International NGOs include Operation Smile, Interplast, MSF, etc. These are all various “models” of delivering surgical services. Very little is known about their relative effectiveness or appropriateness for various contexts.
Paramedical Cadres

• Case in point: Mozambique
• Cost of training surgeons may be > 10 times that of training mid-level clinicians
• New Paradigm:
  – Experienced medical assistants were trained for three years on surgical skills
  – Hernias account for 32% of their elective operations once in practice
  – 70% of their interventions were in the emergency setting
  – Total mortality rates of 0.4% and 0.1% were recorded for emergency and elective operations respectively.

Paramedical Cadres

• Comparison of 1000 consecutive Cesarean sections in Mozambique by surgeons vs. trained medical assistants showed no difference in indications or interventions
  — Superficial wound hematoma rates were higher in the medical assistant group

• Data was encouraging - despite lacking advanced experience, medical assistants had equivalent results

• Questions remain about quality of care, outcomes, and ethics

**Total Population**

In Spring 2000 world population estimates reached 6 billion; that is 6 thousand million. The distribution of the earth’s population is shown in this map.

India, China and Japan appear large on the map because they have large populations. Panama, Namibia and Guinea-Bissau have small populations so are barely visible on the map.

Population is very weakly related to land area. However, Sudan, which is geographically the largest country in Africa, has a smaller population than Nigeria, Egypt, Ethiopia, Democratic Republic of Congo, South Africa or Tanzania.

The size of each territory shows the relative population of the world’s population living there.

“The size of each territory shows the relative population of the world’s population living there.”

Hania Zlotnik, 2005

Map 002

www.worldmapper.org © Copyright 2005 UC Berkeley (University of California) and Worldmapper, University of Kent at Canterbury

**MOST AND FEWEST PEOPLE**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Territory</th>
<th>Value</th>
<th>Rank</th>
<th>Territory</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
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<td>China</td>
<td>1,395</td>
<td>181</td>
<td>Saint Helen’s</td>
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<tr>
<td>2</td>
<td>India</td>
<td>1,050</td>
<td>190</td>
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<td>3</td>
<td>United States</td>
<td>291</td>
<td>192</td>
<td>Liechtenstein</td>
<td>33</td>
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<td>4</td>
<td>Indonesia</td>
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<td>San Marino</td>
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<td>5</td>
<td>Brazil</td>
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<td>195</td>
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<td>6</td>
<td>Pakistan</td>
<td>150</td>
<td>196</td>
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<tr>
<td>7</td>
<td>Russian Federation</td>
<td>144</td>
<td>197</td>
<td>Tuvalu</td>
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<tr>
<td>8</td>
<td>Bangladesh</td>
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</tbody>
</table>

(For the purposes of this map, the population of China, India and Japan is 36 per cent of the world’s population. The territories are ranked in size order, starting with the largest territory. The population is shown as area on the world map.

Data sources:
- UN/UNICEF Global Health Report
- Population data from 2000
- UN/DESA and WorldBank/Worldpop database.
- All data is current as of 2000.
- All data is rounded to the nearest 1 million.
- See website for further information."

“Out of every 100 persons added to the population in the coming decade, 97 will live in developing countries.”

Hania Zlotnik, 2005

Map 002

www.worldmapper.org © Copyright 2005 UC Berkeley (University of California) and Worldmapper, University of Kent at Canterbury
Key questions remain: what exactly is the world’s SURGICAL workforce? What training do they have? What training SHOULD they have? There has been very little work done on any “specialist” human resource capacity.
Note the very small percentage of the global health workforce in Africa despite the high burden of disease.
Surgical Workforce in Uganda

- Most surgery is not performed by specialist surgeons
  - This is typical of low-income countries
  - No clear data on who is performing surgery in the rural areas
- Uganda: 8 surgical trainees graduated in 2006
  - Difficulties in recruitment and retention
- Migration
  - External – “Brain Drain” to developed countries
  - Internal – to better paying areas: urban vs. rural, private vs. public hospitals

Problems in the Training & Retention of Surgeons

• Galukande, 2006
  – Estimated total number of surgeons in Uganda: 100 for population of 26 million people
  – Medical trainees and surgical faculty were surveyed to identify barriers to recruitment
  – Trainees:
    • Inadequate supervision, intimidating learning environment, poor course content, inadequate facilities, poor assessment methods
  – Surgeons:
    • High expectations, inadequate equipment to practice and teach, inadequate funding for research, risk of acquiring HIV/hepatitis, poor compensation for demanding work

See Teaching Modules Appendix:
http://globalhealtheducation.org/Modules/Teaching%20Modules%20Appendix/104.aspx
Patient-related factors affecting access

- Distance to surgical facility
- Cost of transportation
- Cost of surgical care
  - Surgery is often not a part of public health services, so under-funded hospitals often have substantial user charges for surgical care
  - Catastrophic health care costs can lead to poverty
- Decision to seek medical care
  - Patients may see inexperienced local providers first, leading to a delay in getting necessary care
- Can surgical disease be prevented? Lack of data.

See Notes
Changing Concepts of Global Surgery

• Past Models of Surgery and Global Health
  – Volunteerism and Service
  – Short-term Missions

• The “New Surgery and Global Health”
  – Sustainable Partnerships
  – The role of academic institutions: Research, Training, and Capacity Building
Lessons from Dr. Denis Burkitt’s work in Uganda
What Did Burkitt’s Lymphoma Teach Us?

- Development of a staging system and curative regimen for a common childhood lymphoma
- Recognition of tumor “debulking” as an important adjunct to therapy
- Creation of Burkitt lymphoma cell lines for laboratory study
- Discovery of a viral etiology (Epstein Barr virus)
- Discovery of the MYC oncogene translocation as a molecular driver of cell proliferation

Slide courtesy of Dr. John Ziegler
Model for Sustainable Research in Africa

- Create an equal research partnership
- Studies relevant to local medical priorities
- Teach and train students and physicians
- Engage in local and regional medical meetings
- Transparency and cultural sensitivity
- Innovate “low tech” diagnostic and treatment methods that can be translated to upcountry hospital settings

Slide courtesy of Dr. John Ziegler
UCSF-Makerere University Partnership: An example of Academic Surgical Collaboration

- Research
- Training
- Service

See Notes

Mulago Hospital
Educational Benefits for American Surgical Trainees

- Improved history and physical examination skills
- Economy and creativity
- Broader spectrum of disease
- True general surgery
- Socio-cultural challenges
- Public Health
- Opportunities for research
Possible Benefits for Ugandan Physicians

• Collaboration with other physicians
• Access to new resources
• Potential for faculty/staff exchange
• Increased momentum for research activities
• Possible method for attracting domestic medical graduates into surgery
Initial Visits

- To define interest in collaboration
- Evaluate the clinical setting
- Develop relationship with surgical counterparts

See Notes
Operating Room

Anesthesia

See Notes
Clinical pathology

Massive Goiter

Buruli Ulcer

See Notes
An Example of Collaborative Research: The Introduction of FAST (Focused Abdominal Sonography for Trauma)

- WHO Guidelines of Essential Trauma Care 2004: ultrasound is “desirable”
- Identified in a April 2005 UCSF-MU meeting to be area of interest for Ugandan surgeons
- Innovations Grant from UCSF Global Health Sciences
- Portable US machine donated by Sonosite
Study

- Evaluate feasibility of FAST training for surgeons at a major Ugandan trauma center.
- Compare management & outcomes of Ugandan trauma patients before and after the use of FAST
- Assess cost-effectiveness.
- Training: 20 hours of lectures, hands-on sessions & practical exam were given to 19 clinicians & ultrasonographer in Nov, 2006
Ongoing work

- Surgeons continuing to acquire FAST images (need 25 each)
- Data collection on trauma outcomes underway- 83 subjects from Dec 1 to mid Jan.
- 1st 4 weeks of images
  - In 13/23, instructors agreed with all 4 images
  - In 10/23, instructors agreed with 3/4 images

See Notes
The Two Research Teams

- The UCSF team: Dr. Jennifer Wang, Dr. Peggy Knudson, Dr. Rochelle Dicker, Dr. Jeremy Durack, Eric Chen, UC Davis MS3
- Our colleagues at Mulago: Dr. Jackie Mabweijano, Mr. Victor Angajoubi, Mr. Isaac Ezati, Mr. Geoff Lavoy
International Initiatives

• FIGO
  – Organized collaborations between 5 high income and 5 low income countries to address deficiencies in Ob/gyn care

• Anesthesia
  – WFSA training centers in South Africa, Ghana, South Pacific, Thailand, Latin America

• Canadian Network for International Surgery (CNIS)
  – Essential Surgical Skill course - integrated into medical curriculum in Ethiopia, Uganda, Tanzania, others

• Urolink
  – Urology faculty working on small-scale projects to support colleagues in developing countries
Conclusions

• Surgery has long been neglected in public health
• The Global Surgical Burden of Disease is significant particularly in
  – Injury, emergency surgery, obstetrics & non-acute surgical diseases
• Surgery may be as cost-effective as other essential health interventions
• Challenges to improving access to health care in developing countries include
  – Availability of services, trained workforce, demand-side barriers to access
• Global collaborations can result in sustainable change
• Extensive research agenda
We sincerely thank the following UCSF faculty and residents for their remarkable contributions to work in this field:

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William Schecter
Richard Coughlin
Richard Gosselin
Rochelle Dicker
M. Margaret Knudson
Saam Morshed
Lori Uyeno
Jennifer Wang
John Ziegler

We are also deeply grateful to Dr. Jackie Mabweijano and colleagues at Mulago/Makerere Hospitals for their willingness to participate in this collaborative endeavor with UCSF.

All photos courtesy of UCSF and Mulago Hospital Departments of Surgery.

See Teaching Modules Appendix: GENERAL REFERENCES

http://globalhealtheducation.org/Modules/Teaching%20Modules%20Appendix/104.aspx
Credits

Sudha Jayaraman MD, Doruk Ozgediz MD MSc, Laura Goetz MD, Alex Ayzengart MD

with collaborators in the UCSF Department of Surgery, UCSF Global Health Sciences, and the Bellagio Essential Surgery Group
The Global Health Education Consortium and the Consortium of Universities for Global Health gratefully acknowledge the support provided for developing teaching modules from the:

**Margaret Kendrick Blodgett Foundation**
**The Josiah Macy, Jr. Foundation**
**Arnold P. Gold Foundation**

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Along the way, there will be data from Uganda as an example to illustrate some of the challenges which face low-income countries as UCSF Surgery has a collaboration with the Department of Surgery at Makerere University in Kampala, Uganda, and some of this data was analyzed as a part of joint projects.
There are limitations of the burden of disease construct with controversy mainly around methodology especially life expectancy and disability weights which are beyond the scope of discussion here. Nonetheless, it remains a primary “currency” for major international donors.
Note all colored categories are injuries and the very high burden in the 5-44 age group, especially in the income-earning portion of the population. WHO Report: Injury: a leading cause of the global burden of disease, 2000, eds. Peden et al.
Slide 16: Low-income Countries: Projections to 2030

Most patients cannot access surgical care (ie: operating room) at any level below the district. This is a challenge given uniquely rural population. There is an initiative to build operating rooms at lower levels (ie: HC IV) of the health system. This policy was developed primarily to improve maternal mortality rates (a Millennium Development Goal) through providing access to emergency obstetric care. The district hospital in particular is a unique focus for the WHO for interventions for the population level due to its potential cost-effectiveness. There are approximately 50 district hospitals in Uganda.
Slide 28: Acute Surgical Emergencies

References:
Slide 31: Cost-effectiveness of Surgical Care

References:
Debas, Gosselin, et al. Disease Control Priorities in Developing Countries 2nd Ed. Chapter 67. Dean Jamison, editor.
These data suggests that surgical care is more cost-effective at the level of the district hospital over the community clinic. There may be some conditions for which this is not the case, but very little is known about cost-effectiveness at different levels of the health system and guidelines for what should be treated/which procedures should be done at different levels of the health system. Very few studies exist on surgical cost-effectiveness however data supporting its relative cost-effectiveness come from the following two papers:
There is a move to build operating rooms at peripheral hospitals and health centers such as this one in Uganda with equipment being installed.
These are similar to barriers for other health services as well. (nicely summarized in Ensor and Cooper 2004 “Overcoming Barriers to health service access: influencing the demand side.” Intl JI Health Policy and Planning 19 (2) 69-79.) There is a need to better understand some of these which may be specific to surgery, and to capitalize on what we know about successful programs to increase access to other forms of health services in resource-poor settings. Discussion of iatrogenic poverty: Meesen et al. (2004) “Iatrogenic Poverty” in Tropical Medicine and International Health (8) 7 581-584.
Dr. John Ziegler, emeritus oncology professor at UCSF was involved with Dr. Burkitt in the research on effectiveness of chemotherapeutic agents on Burkitt’s lymphoma which had been to that time an untreatable surgical disease. This is a great example of seminal advances in surgical care and medicine which have come from research in low-income countries.

Photo on left courtesy of Dr. Ziegler.
Photo on right courtesy of 
Slide 53: UCSF-Makerere University Partnership: An example of Academic Surgical Collaboration

References:

The photo illustrates a common problem: due to health workforce shortages, families bear much of the burden of bedside care and cost of care in hospitals. This burden and its impact on poverty have not been well-defined to date.
Anesthesia: lack of monitoring and high-tech machines; all patients are hand-ventilated through operations.
Buruli ulcer is a great example of a surgical disease with clear prevention component. It starts as a nodule which if excised early avoids development into large ulcers that need skin grafting. The cause is a mycobacterium. See Wansborough-Jones et al. (2005) “Buruli Ulcer” BMJ 330 (7505) 1402-3.
As typical of many global health projects, the goal of the project revolves primarily around training/teaching, evaluation of the training, feasibility, and cost effectiveness. The cost-effectiveness aspect can have important policy implications, as this is a government/public hospital and proper evidence can demonstrate to the Ministry of Health that it is cost effective to have US machines.
Final factor in progress is increasing accessibility to the Sonosite machine while maintaining its security. Based on the tight control over their regular US machine, we are fairly confident that their new Sonosite machine will be kept quite safe. However an important aspect of the feasibility of FAST is whether it can be kept both safe and available for use.