Mapping the Advancement of Safe Surgery

Jeff Blossom, MA
Dr. Atul Gawande, MD, MPH
Priya Desai, MPH

ESRI International Users Conference - July 13, 2010
“…to improve the safety of surgical care around the world…”

- Organized a team of international experts to improve surgical care worldwide

“…to advance public health through learning, discovery, and communication…”

- Selected by the WHO to lead the effort

“…to support research and education that relies on geographic information…”

- Approached by HSPH to provide mapping
The Surgical Safety Checklist

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

- 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?

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?
Checklist implementation pilot sites

PAHO I
- Toronto, Canada

PAHO II
- Seattle, USA

EURO
- London, UK

EMRO
- Amman, Jordan

AFRO
- Ifakara, Tanzania

SEARO
- New Delhi, India

WPRO I
- Manila, Philippines

WPRO II
- Auckland, NZ
The WHO Surgical Safety Checklist reduced the rate of deaths and complications by more than 33% in the eight pilot hospitals.
Worldwide Dissemination led by the Safe Surgery Saves Lives Team
Yes, a map

1) For use by the Safe Surgery Saves Lives Team
   • Track checklist dissemination
   • Maintain database of checklist registrants

2) For use by hospitals to get a sense of participating hospitals/checklists in the surrounding area.
   • On the web
   • Pilot site markers
   • Operations per country thematic overlay.
   • Participating hospitals and organization locations
   • Clickable information window pop-ups for each location

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate (Surgeries per 100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>215.0110028</td>
</tr>
<tr>
<td>Albania</td>
<td>3180.07126</td>
</tr>
<tr>
<td>Algeria</td>
<td>1899.772097</td>
</tr>
<tr>
<td>Andorra</td>
<td>14279.59897</td>
</tr>
<tr>
<td>Angola</td>
<td>252.3188208</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td>4034.091973</td>
</tr>
<tr>
<td>Argentina</td>
<td>7254.021752</td>
</tr>
<tr>
<td>Armenia</td>
<td>2358.84741</td>
</tr>
<tr>
<td>Australia</td>
<td>9048.877832</td>
</tr>
<tr>
<td>Austria</td>
<td>13992.45175</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1637.4803</td>
</tr>
<tr>
<td>Bahamas</td>
<td>7202.957275</td>
</tr>
<tr>
<td>Bahrain</td>
<td>6185.927387</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>192</td>
</tr>
<tr>
<td>Barbados</td>
<td>6621.720365</td>
</tr>
<tr>
<td>Belarus</td>
<td>3654.545347</td>
</tr>
<tr>
<td>Belgium</td>
<td>10414.24222</td>
</tr>
</tbody>
</table>
Initial Surgical Safety Web Map

- Built on the Google Maps API (javascript, html)
- Hospitals geocoded using Batchgeocode.com
- Point markers in KML format - imported Batchgeocode.com lat/long values to ArcMap, exported to KML
- Participating hospitals counter KML screen overlay

- Surgical Rates map created in ArcMap, loaded into Global Mapper, exported as a tile cache.
Initial Surgical Safety Web Map

BENEFITS:

• The Safe Surgery Saves Lives team can visualize active checklist users and institutions that have expressed interest in using the checklist.
• Allows the team to strategize their dissemination efforts and make plans to target areas that have not been introduced to the Surgical Safety Checklist.

CHALLENGES:

• Updating the map to reflect the rapid adaptation of the checklist
  • New registrants want to see their hospital on the map
  • Safe Surgery Saves Lives team relies on the map for the latest registration information
  • Limited data display with KML format
• Display basic hospital info to the public, and ALL hospital information to the SSSL team.
Enabling user updates to the map

- Migration from KML to PostGIS / WMS
- Batchgeocode.com training for SS team.

Geocoding and Batch Upload Instructions for Surgical Safety Web Map
April 28, 2009

Geocode the new Hospitals and Orgs (obtaining latitude, longitude values)
1. Open the Hospitals to be added in a blank Excel file, and sort by Country.
2. Select all U.S. addresses, and copy / paste into a new workbook.
3. Select all non-U.S. addresses and copy / paste into a new workbook.
4. See http://batchgeocode.com

- Web forms for uploading new hospitals in CSV format, and updating the hospital counter.

Enter the values to display on the map banner:
- Actively using the checklist:
- Total Registrants:
- Data:
- User Name:
  Create Images
Enabling user updates to the map (cont.)

- Allowing editing of individual hospital information
Additional enhancements

- Displaying the hospitals by participation status

Surgical Safety Web Map

+ Actively using the checklist: 1640
+ Total Registrants: 3847 5-27-2010

- Zoom Box
- Google search bar
- WHO logo, disclaimer, and map overlay
- Banner redesign, sidebar addition
- Dynamic hospital list display
More…

- Highlight WHO Regions
- Database query
- Map symbology
- Cluster display
More…cluster display
Conclusions

- A team of public health research professionals empowered by geographic information.

- Incorporates the map into daily workflow
- Enables better communication, information distribution

Technologies used:

- Google Maps javascript API
- Mapserver
- ArcGIS Server
- Global Mapper
- Java
- PostGIS
- ArcGIS Desktop
- Batchgeocode.com
The Checklist Manifesto - How to Get Things Right

...managing complexity through the use of simple checklists....

Contact Info:

Surgical Safety web map:  http://maps.cga.harvard.edu/surgical_safety
Or Google “surgical safety web map”

Jeff Blossom, MA
jblossom@cga.harvard.edu

Dr. Atul Gawande, MD, MPH
safesurgery@hsph.harvard.edu

Priya Desai, MPH
pdesai@hsph.harvard.edu