Diagnostic accuracy of chest X-rays acquired using a digital camera for low-cost teleradiology

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Problem

Two chest x-ray images removed due to copyright restrictions.

Source: emedicinehealth.com

Source: studentBMJ 2000;08:303-346
Incidence of TB

Communicable Diseases -> Tuberculosis (as of 22 March 2006) -> Estimated TB -> Estimated TB incidence -> TB incidence, all forms (per 100,000 population per year). Total, Max of all Periods, 2004
Source: WHO Stop TB Department, website: www.who.int/tb

Courtesy of the World Health Organization. Used with permission.
## Prevalence of Physicians

<table>
<thead>
<tr>
<th>Country</th>
<th>Doctors/100,000 people</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>279</td>
</tr>
<tr>
<td>South Africa</td>
<td>56.3</td>
</tr>
<tr>
<td>Peru</td>
<td>93.2</td>
</tr>
<tr>
<td>Haiti</td>
<td>13</td>
</tr>
</tbody>
</table>

14 countries in Africa have 0 radiologists
Solution

- Store-and-Forward Telemedicine
  - Take digital photo of Chest X-ray
  - Edit
  - Compress file
  - Email photo with text to physician
  - Wait for DX
Research

- What is the most compressed image format that can be used that still allows for reliable diagnosis of TB?

- Compared DX of
  - Original image
  - JPEG ~ 400 KB
  - JPEG2000 ~ 98-120 KB
Results

- JPEG and JPEG2000 images were diagnosed similarly to the original images.

- Overexposure in the digital processing actually increased detection of calcifications.
Highlights of Paper

- Good understanding of medical imaging
  - Gray-Scale
  - Window and Level
  - Exposure
- Good understanding of TB DX
- Study did not use top-end cameras
Questions

How do you think results would change if study had been performed in the field and not Boston?

What context does your own project take place in and how can you use that to your advantage?