Delivering Digital X-Ray Services in Rural Nepal

Nyaya Health and World Health Imaging Alliance
July 2008

Sanfe Bagar, Achham, Nepal
1 Introduction

Most of the world’s rural citizenry lack access to essential diagnostic radiography services. This is particularly true for x-ray, critical in diagnosing the fractures, pneumonias, tuberculosis, and cardiac conditions that are common in rural areas. Scalable models are critically needed that deliver reliable, effective, and affordable x-ray imaging in these settings. Analogue x-ray technologies have failed to meet the vast need, owing to problems with maintenance, processing, environmental hazards, safety, quality assurance, and personnel. Digital x-ray, combined with teleradiology for complex cases and quality assurance, promises to meet the need by decreasing long-term operating costs, improving programmatic quality, and mitigating environmental and safety hazards. The World Health Imaging Alliance has developed a digital version of the popular WHIS-RAD system and is partnering with Nyaya Health to deploy a system in rural Nepal. Together, we will conduct clinical operations research to develop a scalable model that can be used in similar settings.

Nyaya Health’s clinical program in Achham, Far Western Nepal, is an ideal scenario for implementing such a system. Achham suffers from many of the problems faced in rural communities throughout the world—mass unemployment, large seasonal migration among men, poverty (per capita income is less than 50 cents a day), and minimal healthcare, transportation, or communication infrastructure. The nearest functional operating theater and blood transfusion center is over ten hours away. In this setting, Nyaya Health has recruited and employed the first allopathic physician for a district of 250,000 people, has established the first internet connection in the area, and has trained a team of community health workers to reach patients across Achham’s challenging terrain. Nyaya Health has deployed the first portable ultrasound program in the region. Over the coming year, Nyaya Health will be scaling up services to include essential inpatient and surgical capacity. The primary mission of Nyaya Health is to meet the medical needs of some of Nepal’s poorest citizens while developing scalable models for expanding healthcare access in rural communities.

The purpose of this document is to provide a detailed description of the needs and uses for X-ray radiography at the Nyaya Health clinic in Achham, Nepal, for the World Health Imaging Alliance (WHIA). In this document, we discuss: background to Nyaya Health’s health services; local epidemiology and demography; details related to implementation of radiographic services; a timeline for implementation; and human and physical resources available for the project.

2 About Nyaya Health

Nyaya Health is a 501(c)(3) non-profit organization with offices in New Haven (USA), Kathmandu (Nepal), and Achham (Nepal), working with communities in Nepal and with the Ministry of Health and Populations of Nepal to develop healthcare services in the poor, western regions of the country. The district of Achham is a rural agricultural area with some of Asia’s highest poverty, infant mortality, maternal mortality, and HIV incidence rates. Our mission in Achham is two-fold: to establish essential public health services in one of the world’s most underdeveloped areas, and to develop a model program that establishes how to scale-up and manage comprehensive healthcare services in remote, resource-deprived areas.
The heart of present Nyaya Health activities in Achham is a four-bed, five-room clinic focusing on primary care, maternal and child health, HIV, and tuberculosis. Our clinic is run by an all-Nepali staff consisting of a physician, community healthcare workers, midwives, lab technicians, and project managers. We are expanding a network of community health workers who provide essential outreach and triage services to our geographically dispersed population. These services have been developed in collaboration with the government of Nepal; our ultimate goal is full integration of our services with the developing public-sector health program. Presently, the Sanfe Bagar clinic treats about 100 patients per day. Over the next year, we are constructing a community telemedicine center, applying information and communication technologies in innovative ways to improve the effectiveness and equity of our health services. We are developing innovative management programs to improve our community ownership, accountability and responsiveness. Additionally, we are exploring mechanisms of sustainable, accountable financing through microfinance and community-based insurance. Our long-term vision is to work with local communities as part of a global healthcare movement that: (1) facilitates resource distribution to resource-denied areas; (2) fosters grassroots collective action; (3) involves the central government in pro-poor health infrastructure; and (4) achieves transparency and collaboration in global health delivery.

The healthcare problems of the region are severe, with the patients we see typically in dire need of health services. The primary emergent reason for the need for X-Ray services is that they are critical for providing comprehensive HIV/AIDS services. Our district of Achham suffers from the highest prevalence of HIV in Nepal. The government is providing us with antiretroviral medicines that they have procured through the Global Fund and other sources, and they are cooperative with all aspects of our diagnostic radiology program. Furthermore, community members, government officials, clinic staff, and patients are all advocating that we rapidly, efficiently, and effectively expand our high-quality services to include inpatient and surgical capacity, given the extensive need in the area. This requires the introduction of X-ray technology.

Sanfe Bagar Medical Clinic Delivery Suite.
Nyaya’s organizational structure:

**Collaborators**

**Ministry of Health**
- Pharmaceutical supply
- Medical equipment
- Staffing
- Integration with other public sector services
- Long-term ownership

**Nyaya Health**
- Managerial oversight
- Large items
- Financial support
- Medical equipment donations
- Technical assistance
- Service Delivery Innovations

**Community boards and leaders**
- Ethical oversight
- Accountability to local citizens
- Grassroots Advocacy
- Financial support

**Services Delivered**

**Community health worker network**
- Point-of-care treatment and referral
- Outreach to marginalized communities
- Local-level advocacy
- Preventive medicine delivery
- Antenatal care delivery

**Primary care and maternity clinic**
- Conducting normal deliveries
- Provision of primary and emergency care
- Treatment of pediatric conditions
- Training of community health workers
- Referral center for community health workers’ patients

**Bayalpata Hospital**
- Management of complicated pregnancy
- Surgical services
- Blood transfusion
- Training of health workers and clinic staff
3 Demography and epidemiology

Achham has a population of 231,000 divided into 75 village development committees, with populations typically between 2,000 and 4,500 people. Economic activity is almost exclusively agricultural. The transportation infrastructure is limited throughout the district, with only one paved road, which reaches only a small fraction of the district. Achham is located at latitude 29N and longitude 81E, at a locale with temperate climate having annual temperature variations between 3 to 42 degrees Celsius, no snow fall but heavy rains. During the early morning of the winter months, 5-10°C is typical, but the temperature then rises over the day to up to 25°C. The peak summer months’ temperature is typically up to 40 degrees Celsius. Rainfall is approximately 1250mm per year. The region experiences monsoon rains from June to September. The site is not located in a flood plain, being situated at the top of a hill about 600 vertical meters above the river level.

Given the underdeveloped roads, the average transportation time to the Sanfe Bagar clinic is approximately two hours by foot for most patients, though many patients must travel 4 hours or more. This is not because the clinic is located in an out-of-the-way location, but rather because of the nature of the remote, hilly geography with poor transportation infrastructure. The clinic is actually in the largest transportation hub for the region, making it more accessible than other locations. Though most persons are accustomed to long walking distances, community healthcare workers (CHWs) are being trained and equipped with communications technology by Nyaya Health to develop an effective triage and mobile home-based service system. The hospital at Bayalpada faces similar transportation challenges that can be feasibly and effectively addressed through a community-based strategy employing CHWs to facilitate patients’ arrival for surgical procedures or inpatient referrals from the clinic.

Location of Achham.
Nyaya Health has specifically adapted its services to this community, focusing on mobile health teams, providing training opportunities to Nepali healthcare workers, and integrating appropriate communications technologies to provide healthcare services to a dispersed region. We have been able to provide care to those who migrate, are unable to afford medicines and private medical providers, or are often distant from health centers. Health services in Achham were among the least developed in the country prior to Nyaya’s operation. There is one additional physician, trained in ayurvedic medicine, who runs the district’s one functioning hospital in Mangelsen (a six hour drive from Achham over unpaved roads). Workers at the hospital perform vacuum-assisted deliveries, manual removal of placenta, incision and drainage, suturing of lacerations, and external reduction and casting, but do not perform C-sections or any other surgical procedures, blood transfusions, thoracentesis, or paracentesis. The hospital has an inpatient unit with 8 beds, which are typically occupied. While there are a series of health posts, primary health centers, and sub-health posts that are closer-by, almost none of these are staffed; those that are staffed lack basic supplies and medicines, and have sometimes been wrongly used as private offices instead of public health centers [3]. Only 3% of births are attended by a trained health worker, reflecting the poor state of health services in the district [2].

As is typical for most of South Asia, approximately 80 to 90% of healthcare services are provided by private medical practitioners, few or none of whom have formal medical training. They often work or have worked as low-level practitioners (auxiliary health workers, health assistants, or auxiliary nurse midwives). These practitioners are completely unregulated and unaccountable to any government authorities. Private services are also rendered by traditional healers, although these are less widely utilized in our particular area. The other 10 to 20% of healthcare services include vaccines, tuberculosis treatment, and occasional health camps. X-ray technology is almost completely unavailable for the vast majority of persons in this region, though trauma, tuberculosis, and pneumonia are among the most common causes of death.
4 Implementing radiographic services

X-Ray Applications
Chest, abdominal, and skeletal x-ray are critical diagnostic modalities for the generalist rural setting. X-Ray is an appropriate technology to guide diagnosis, treatment, and referral. The primary uses of the X-Ray will consist of:

1. Evaluating childhood and adult pneumonia
2. Assessing traumatic long-bone fractures
3. Diagnosis of tuberculosis

Each of these applications can be effectively integrated within our primary care programs by our generalist healthcare staff. Effectively applying X-Ray in the evaluation of respiratory tract infections will help to prescribe antibiotics in a safe and rational manner and to triage sick patients for referral. X-Ray for tuberculosis will be essential owing to the lack of services in the area and the acute need. Traumatic bone fractures are exceedingly common considering the geographic terrain and high incidences of fall injuries, and X-Ray is the limiting factor in providing effective treatment. Our staff are equipped and trained to provide setting and casting of long-bone fractures, but appropriate radiologic diagnosis is first required.

Additional applications include:

1. Evaluation of congestive heart failure due to cardiovascular disease or rheumatic heart disease
2. Evaluation and triage of the acute abdomen
3. Evaluation and triage of intestinal obstruction
4. Diagnosis of less common respiratory tract illnesses, such as fungal infections
5. Abnormal bone conditions such as osteoarthritis or scoliosis
6. Arthritis
7. Ulcerative colitis
8. Bronchiectasis
9. Deep bone infection
10. Chronic obstructive pulmonary disease
11. Tuberculosis pleurisy
12. Suspected tension pneumothorax
13. Asthma

These applications will be undertaken as the need arises and as our capacity expands. We are ready to expeditiously implement effective and efficient X-Ray services.

Through the AMD/OAN telecommunications center, we will be conducting telemedicine applications for improving our staff’s diagnostic reliability and accuracy. This is critical given the difficulty in recruiting specialists to our rural site. These will be achieved through a store-and-forward strategy whereby we send images via our secure telemedicine portal with Rural Health Online Nepal over the internet to Kathmandu-based consultants (primarily through a collaboration with Kathmandu Model Hospital). They will provide consultations, quality assurance, and feedback to our staff. Additionally, these consultants will occasionally make site visits with obstetrical teams to provide further training and technical assistance.
Implementation Capacity of Nyaya Health

Nyaya Health has the capacity to implement these services responsibly. Nyaya is an organization that combines a community-driven on-the-ground approach to health services with technology-driven fundraising and technical assistance to roll-out high-quality health services. The efficiency with which we can scale up services was seen in our very first two months of operation of the Nyaya Health primary care clinic, where our team treated over 2500 patients and performed over 350 laboratory investigations. We have been able to rapidly but effectively expand our relationship with the government so that the government supplies essential medicines including vaccines, contraception, antenatal vitamins, antibiotics, anti-tuberculosis medicines, and antiretroviral therapy. Our community advisory and management boards ensure local ownership and accountability. They also form the basis of our grassroots advocacy network that facilitates approval processes and collaborations with the government.

We have also demonstrated a strong ability to generate funds and in-kind donations for our activities. We have received generous grants from the Ford Foundation, America Nepal Medical Foundation, William Prusoff Foundation, The Shelley and Donald Rubin Foundation, The International Foundation, Yale University, and numerous independent donors. We started a sustainable, market-based fundraising organization called EquityEdit. We have received a blood analyzer machine from QBC Diagnostics and an ultrasound machine from International Aid/General Electric. We have an agreement within Nepal for free air cargo shipments with Buddha Air. Our volunteer network of dedicated students, activists, and technical consultants continues to inject the ideas and support required to rapidly and effectively roll-out services. Our working groups connect like-minded individuals to work on a specific project requested by our Achham-based team. Our telemedicine team, for example, recently won first prize in the Yale Entrepreneurial Society’s business plan competition. We were awarded the Open Architecture Network’s grand prize for Asia, which has opened us to a large pool of designers, architects, and engineers. One of the design teams, Max Fordham, LLP, will be coming to Achham to build a telemedicine and community center, where people from the district will be able to access Internet-based educational activities, and where we will be able to interface with international physicians for radiology, pathology and similar telemedicine services.

Nyaya Health community health worker interviewing a family
5 Timeline

The timeline for the project is as follows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>8/08</th>
<th>10/08</th>
<th>12/08</th>
<th>2/09</th>
<th>4/09</th>
<th>6/09</th>
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</thead>
<tbody>
<tr>
<td>Fundraising and Financing</td>
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<tr>
<td>Clarification of Nepal X-Ray Regulations</td>
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<tr>
<td>Recruitment of Yale Faculty</td>
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<td>Development of Clinical Protocols</td>
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<tr>
<td>Machine Testing at Yale</td>
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<tr>
<td>Outfitting of the X-Ray Room</td>
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<tr>
<td>Training of Local X-Ray Technician</td>
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<tr>
<td>Shipping of the Machine</td>
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<tr>
<td>Implementation of the Program</td>
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<tr>
<td>Monitoring and Evaluation</td>
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6 Layout and physical space design

The room will be integrated into our telemedicine center. The room should be over 18 square meters of space with a height above 2.5 meters. It should be weatherproof, ventilated, and have easy access to beds and trolleys. It should contain sufficient space for a permanently built protective cubicle. The access door should be a sliding door with a clearing of 1.5 meters, and an overlap of 100 mm on each side, lined with a lead sheet of 2 mm thickness. The walls are 230 mm kiln baked solid clay brick. Walls should be protected up to a height of 2.2 meters. The change cubicles included in the room lined with 1.5 mm lead sheet with the access doors lockable from the x-ray room side to prevent entrance during radiation exposure.

The X-ray control station will be fixed at least 1.02 meters from any open edge of the cubicle wall. At least one viewing window will be included so the operator can view the patient during exposure, with a size of at least 30 cm x 30 cm. The lead glass will overlap protective material by at least 25 mm on all sides. The minimum height of the cubicle will be 2.2 meters. The protective cubicle will also have adequate space needed for a computer workstation and CR unit in order to operate the scanner, view and verify image integrity safely.
Warning lights will be connected to the generator in such a way that it will illuminate during activation of the tube. A radiation warning notice will be displayed at all entrances to X-ray rooms. Above the sliding access door is wiring for an Emergency Light.

There is sufficient space for the x-ray unit, generator, and a radiographer workstation with this set-up. The final room design will be completed with assistance from a panel of radiographers in the near future. The clinic rooms also have sufficient room for digital lightboxes. Changing rooms already exist with direct access to the X-ray room.

We have a 24-hour security guard posting and are located directly across from a police barracks. We have the support of all local and national political parties through connections of various executives and staff members.

Design of the Nyaya Health Telemedicine and Community Center.

7 Power and Technology

Power Supply
The WHIS-RAD has an 11 kW power supply bundled that may be continuously charged by a 5 amp, 110/220V wall outlet. The computers and CR unit are constantly powered to be operational. Nyaya Health is connected to grid electrical power with a backup 5 kW generator, a 4.6 kW inverter/rectifier, an 80 W capacity photovoltaics, and a battery system capable of storing approximately 660 AH. More information is available on our wiki's Energy Page.
Internet Connection

We have Very Small Aperture Terminal (VSAT) Satellite connection over a 0.96 meter VSAT dish delivering 64 kbps wireless internet service. We have a backup system over wireless CDMA. Two laptops are available for use by staff, in addition to laptops brought temporarily by volunteers.

Dell:
OS Name Microsoft Windows XP Professional
Version 5.1.2600 Service Pack 2 Build 2600
OS Manufacturer Microsoft Corporation
System Name DELL-D800
System Manufacturer Dell Computer Corporation
System Model Latitude D800
System Type X86-based PC
Processor x86 Family 6 Model 9 Stepping 5 GenuineIntel ~1598 Mhz
BIOS Version/Date Dell Computer Corporation A07, 3/1/2004
SMBIOS Version 2.3
Total Physical Memory 1,024.00 MB
Available Physical Memory 665.67 MB

IBM/Lenovo machine:
OS Name Microsoft® Windows Vista™ Business
Version 6.0.6000 Build 6000
Other OS Description Not Available
OS Manufacturer Microsoft Corporation
System Name OWNER-PC
System Manufacturer LENOVO
System Model 8932A17
System Type X86-based PC
Processor Intel(R) Core(TM)2 Duo CPU T5250 @ 1.50GHz, 1500 Mhz, 2 Core(s), 2 Logical Processor(s)
BIOS Version/Date LENOVO 7OET24WW (1.03 ), 6/28/2007
SMBIOS Version 2.4
Total Physical Memory 2,037.69 MB
Available Physical Memory 1,023.75 MB
8 Program Monitoring and Evaluation

A simple-to-use form that is integrated with our existing clinical records system will be filled out by the provider on each digital image submitted. This will follow a similar protocol to that currently undertaken for our digital ultrasound program. A group of Yale-based volunteer radiologists will undertake external quality assurance on these images. The following are the three key outcomes that will be assessed:

1. number of encounters, by provider, clinical indication, and ultimate disposition (to home, delivery, referral)
2. quality and appropriateness of digital images provided (assessed by a standardized quality assurance protocol by external specialist reviewers)
3. appropriateness of the treatment plan based on the diagnosis

Nyaya Health will compile reports with the detailed performance markers, case reports, estimates of clinical impact, X-Ray images, and photos of the machine in use. To the extent possible in keeping with research ethics and publication guidelines, these reports will incorporate whatever operations research has been conducted at the clinic. These reports will be submitted electronically as PDF files to WHIA and Yale team members on a quarterly basis.

9 Risks and their Mitigation

The largest risk is that the machine is used improperly or not used at all. This risk is mitigated by Nyaya’s strong management structures, training strategy, and performance monitoring programs. The biggest risk is that the machine is not put to optimal use because of lack of human resources. To mitigate this risk, we have a superb Nepal-based team overseeing the project and we have procured external funding for paying of a radiologic technician. A related risk is that the machine would be broken, stolen, or lost in transport to our rural clinic. This risk is minimized by our experience and rigor with which we undertake logistical operations. Over the last year, we have transported over $100,000 worth of medical equipment to Achham, both from in-kind donations and from purchases made within Nepal. A final risk is that the machine will malfunction due to issues pertaining to electricity. We have established a safe and reliable energy system in collaboration with the Nepal-based company Lotus Energy that will effectively protect the machine.
10 Contact Information

USA:
Duncan Maru
Nyaya Health
135 College Street, Suite 323
New Haven, CT 06510
Ph: ++1-203-687-8615
Fax: ++1-630-604-8615

Nepal:
Sanfe Bagar Medical Clinic
Haat Bazaar, Siddeswor VDC #1
Achham
PO Box 8975, EPC 2941
Lalitpur
Ph: 977-9803487917
977-9741105885
977-0946904040

Internet:
Email: info@nyayahealth.org
Site: www.nyayahealth.org
Wiki: nyayahealth.pbwiki.com
Blog: nyayahealth.wordpress.com
Appendix A: WHIA Site Selection Criteria Interview

Section 1: Profile of Facility

1. What is the official name of your organization? Nyaya Health
2. How many sites does your organization have? One
3. What are the names of these sites? Sanfe Bagar Medical Clinic
4. Where are they located? Achham, Nepal
5. Can you describe the patient populations that each of these sites serves? (catchment area, rural/urban, etc.) The immediate catchment area is approximately 45,000 people spread out in rural farming communities. There is minimal transportation or communication infrastructure in the district. The nearest functioning operating room is 10 hours away.
6. Can you describe the referral relationships within your organization? To which facilities do you refer patients? District Hospital of Doti From which facilities do you receive referrals? District Hospital of Achham
7. How does your organization interact with the Ministry of Health? We receive vaccines, trainings, antituberculosis medicines, antiretroviral medicines, family planning technologies, and other essential medicines through the District Health Office of Achham, which operates under the Ministry of Health and Populations of Nepal.
8. Are your hospital(s) public or private? Private
9. What is the average exam cost? 5(0.08USD) Rs registration fee
10. How is patient care funded at each of the sites? (% self-pay, % NGO, % government, % other, etc.) 90% our NGO, 10% government
11. How are health professionals on site trained? Through collaborations with trainers within NGOs and the government, as well as through expatriate volunteers from Yale and other academic institutions who rotate through the clinic.
12. How many total people are involved with care of patients at each site?
   - Doctors - Specialists 0
   - Doctors - Medical Officers 1
   - Radiographers 0
   - Nurses / Sisters 5
   - Other Patient Care Staff 10
13. At each site, we’d like to know more about access to consistent electricity, refrigeration and phone access.
   - Is electricity available? Yes. We are connected to the grid, which is on-line approximately 50% of the time (including unexpected brownouts and scheduled load-shedding). We have a 4.5 KW inverter that draws off the grid or our backup 5 KW generator to supply 12 120AH 12V batteries.
   - How often is the electricity interrupted per day, if at all? 0 Hours
   - Is there a back-up generator? Yes
   - Does your site have access to the internet? Yes
   - What type of internet access does your site have? Very Small Aperture Satellite (VSAT) via a 0.96 meter dish. It is 64 kbps.
   - Which company or organization provides you with internet access? STM Nepal
   - How often is the internet interrupted per day, if at all? 1 Hours
14. How is more expensive equipment in the organization secured? Locked in the clinic which has 24 hour guards.
Section 2: Patient Volume

Note: We will be expanding to inpatient hospital services over the coming year, at which point we expect to have a daily census of 8-12 inpatients. The following numbers, however, are for our present clinic.

15. How many beds are in each of your organization’s hospital(s)? 0
16. How many patients are seen daily in each of your organization’s hospital(s)? 0 inpatient / 70 outpatient
17. What is average length of stay in each of your organization’s hospital(s)? N/A
18. Does your organization’s hospital(s) perform 5-40 procedures per day? Yes
19. What is the approximate % of your patients require x-ray services? 10%
20. Does your facility have operational x-ray equipment? No If no, then go to Section 3. If yes, then go to Section 4

Section 3: No X-Ray Equipment at Facility

21. Why does your facility not have operational x-ray equipment? We have only recently begun to scale-up health services in the region.
22. How often do you refer patients elsewhere for x-rays? 60 per week
23. What alternatives technologies are used at your site instead of x-rays? Physical Examination, Sputum Test for TB
24. Where are patients directed for x-rays? District Hospital of Doti, approximately 3 hours away by bus
25. When a patient is referred elsewhere for an x-ray, who ultimately pays for the service and what is the payment? Patient, 120NRs for service, 250 NRS for travel
26. How far is the nearest site that performs x-rays? 3 hours by vehicle
27. How do patients get to the nearest site that performs x-rays? Bus
28. We would like to find out who services the referral facilities x-ray equipment. Can you share any contact information for this facility? No
29. When equipment breaks at your facility, how do you go about getting it repaired? Who pays for the equipment repair? Send equipment to biomedical engineer in Kathmandu, if under warranty, the supplier, otherwise Nyaya Health.
31. What would you use an x-ray machine for? (top 5 diagnoses) TB, Fractures, Rheumatic Heart Disease, Pneumothrax, Kidney Stones
32. How would your facility treat these top 5 diagnoses? TB – DOTS, Fractures – immobilization in cast, Rheumatic Heart Disease – If in cardiac failure, diuretics, Pneumothrax – ICCTD, Kidney Stones – Conservative treatments for small stones.
33. Where would you put the x-ray equipment? How big is the room? Yes In the clinic office, 16 x 16 sq. meters
34. Do you have someone at your facility that can be trained to read x-ray films? Yes What is their availability? Our physician is trained to read X-Rays. Our health assistants (like physician associates) can be trained. Together they provide 24/7 call services.
Section 6: Practical Use of X-Ray Equipment

35. In order of volume at your site, what are the most common clinical interventions resulting from x-ray results?
   Fracture Management; Antibiotics for Pneumonia; ATT for TB; Management of Heart Failure;

36. How many radiological chest exams are (or would be) performed / week?
   - 50 Adults
   - 15 Children
   - 3 Infants

37. How many extremities, spines, and skulls are (or would be) x-rayed / week?
   - 30 Adults
   - 8   Children
   - 1   Infants

38. Are many abdomen and contrast exams performed?
   - 5   Adults
   - 1   Children
   - 0   Infants
65. Version A: High Level – Please indicate which x-ray diagnosis your facility frequently makes? Indicate annual volume if available. Note that the following reflect our clinical experience of the first four months of operation.

<table>
<thead>
<tr>
<th>X-Ray Diagnosis</th>
<th>Has your facility diagnosed using x-ray?</th>
<th>Has your facility treated?</th>
<th>Has your facility referred for diagnosis using x-ray?</th>
<th>Has your facility referred for treatment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fractures and/or dislocations</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Infections</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<td>Arthritis</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>Haemopoietic and Lymphoreticular Disorders</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Congenital and Developmental Disorders</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

65. Version B: Detailed - Please indicate which x-ray diagnosis your facility frequently makes? Indicate annual volume if available.

<table>
<thead>
<tr>
<th>X-Ray Diagnosis</th>
<th>Has your facility diagnosed using x-ray?</th>
<th>Has your facility treated?</th>
<th>Has your facility referred for diagnosis using x-ray?</th>
<th>Has your facility referred for treatment?</th>
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<tbody>
<tr>
<td>Trauma (fracture or dislocation)</td>
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<td>Shoulder</td>
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<td>Humerus</td>
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