



Request for 100 to 300mA X-Ray Machine

Beneficiary: Nyaya Health, Achham, Nepal

ABOUT NYAYA HEALTH

Nyaya Health is a 501(c)(3) nonprofit organization working to improve the health of poor communities in Nepal through the provision of medical and public health services. Our organization is a unique assembly of Nepal- and USA-based public health experts and healthcare providers who use our collective expertise to develop long-term, system-level improvements in healthcare delivery in impoverished areas. Through the innovative application of epidemiological methodologies, information and communication technologies, and community-based management structures, we seek to develop scalable models for expanding health equity and access to marginalized populations.

WHERE WE WORK

Achham is one of the poorest districts in Nepal and has been severely affected by war and poverty. It is home to 250,000 people who are served by only one doctor. Achham has limited healthcare infrastructure that is presently not able to meet the needs of its citizens. The district suffers from some of the highest maternal and child mortality rates in South Asia. Treatable respiratory tract infections are a major killer of children. The annual per capita income is \$150, and many people migrate to India for work. Migration has fueled an HIV epidemic with 8-10% of returning migrants testing positive for HIV. Tuberculosis is an increasing public health problem; although exact figures are not available, one recent study suggested the prevalence of smear-positive tuberculosis to be several times higher than the 300 per 100,000 figure nationwide. The nearest functioning X-Ray machine is several hours away. Kathmandu, the capital city, is a full two days' journey.

WHAT WE DO

The heart of Nyaya Health activities in Achham is a primary healthcare center focusing on maternal and child health, HIV and tuberculosis. The clinic is run by an all-Nepali staff consisting of a physician, a health assistant, four midwives, a lab technician, a clerk, and a project manager. We are developing 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; the long-term goal is full integration with public-sector health programs. Over the next year, with support from Advanced Micro Devices and the Open Architecture Network, we are developing a community telemedicine center to apply information and communication technologies in innovative ways to improve the effectiveness and equity of our health services. We are also renovating, restocking and restaffing a hospital that was abandoned 25 years ago to expand our medical, obstetric, and surgical capacity.

X-RAY MACHINE: THE NEED

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:

- Evaluating childhood and adult pneumonia
- Assessing traumatic long-bone fractures
- 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:

- Evaluation of congestive heart failure due to cardiovascular disease or rheumatic heart disease
- Evaluation and triage of the acute abdomen
- Evaluation and triage of intestinal obstruction
- Diagnosis of less common respiratory tract illnesses, such as fungal infections

These applications will be undertaken as the need arises and as our capacity expands.

TELEMEDICINE APPLICATIONS

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.

FURTHER CONSIDERATIONS

For our initial purposes, a 100 mA portable or standing X-Ray machine will suffice. Digital or analogue devices are appropriate. If, however, higher resolution X-Ray machines are available, Nyaya Health would be able to deploy the machine in the short-term at the clinic and utilize its full capacity when we expand operations to the hospital. The machine should have been manufactured within the last three years, should come with detailed specifications and maintenance manual, and should be relatively rugged to survive in our remote and rural area. Prior to deploying the machine, Nyaya Health will identify and hire a technician who can service the particular make and model and will request costing estimates of this service. Details as to the machine's weight and dimensions will also be required for shipping and for outfitting at the clinic

WORK PLAN AND TIMELINE

For the initial six weeks of the program, the President of Nyaya Health a resident physician at UCSF School of Medicine, Dr. Jason Andrews MD, will be overseeing the program. On-site, he will work with the Program Manager Mr. Tenzing Tekan, who has expertise in healthcare financing and in analyzing healthcare delivery systems, and the Medical Director Dr. Bishnu Kattel to ensure the smooth operation of the project. Subsequently, the Program Manager will be responsible for the oversight of the program.

The timeline for the project is as follows.

March 1-June 1, 2008. A radiology technician will be recruited and hired and will work locally with our Logistics Director, Ms. Ana Serralheiro, MSc, to develop his/her core capacity in radiologic diagnostics.

June 01-15, 2008. Siemens to deliver the machine on a one-year loan to Nyaya Health in New Haven.

June 15-20, 2008. Nyaya Health Director of Public Health Planning, Shaan Chaturvedi, along with Executive Vice President Bibhav Acharya will arrange for transportation to Nepal during his trip. A Kathmandu-based radiologic technician will accompany him to Achham.

June 20-30, 2008. On-site training will be provided to the radiologic technician

July 1- November 30, 2008. Initial six-month pilot phase will be conducted. The first and second quarterly report will be compiled and submitted electronically to the Siemens representative.

December 1, 2008-February 28, 2009. This is the consolidation phase, in which the number and variety of cases increases and additional problems and applications are identified. The third quarterly report will be sent to Siemens. Depending upon local capacity and ethics board approval, pilot operations research will commence.

April 1, 2009. In the ensuing four weeks upon receipt of the third quarterly report from Nyaya Health, the Siemens team will discuss the merits of the project. By this date, they will provide an answer electronically to Nyaya Health as to whether: 1) the loan will be renewed for an additional year, subject to additional constraints and suggestions; 2) the machine will be donated to Nyaya Health and additional projects will be explored; 3) the project will be terminated, and the machine will be returned to Siemens.

April 1-May 31, 2009. This will be the transition phase, in which plans are made for appropriate, responsible, and safe expansion, continuation, or termination of the project. Additionally, the results of any initial descriptive, pilot research projects will be prepared for publication.

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. 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:

- number of encounters, by provider, clinical indication, and ultimate disposition (to home, delivery, referral)
- quality and appropriateness of digital images provided (assessed by a standardized quality assurance protocol by external specialist reviewers)
- 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 the appropriate Siemens representative on a quarterly basis.

Risks and their Mitigation

The largest risk to Siemens is that the donated 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. We have, for example, successfully transported and implemented a CBC diagnostics machine worth \$11,000 that was donated by a faculty member at Yale and is of a similar size and durability to the digital microscope.

Benefits to Siemens

Nyaya Health will take the following steps to ensure that the donation will further Siemens' mission. On our website, we will list Siemens as one of the benefactors of Nyaya Health, and will post photographs, evaluation tools, and reports online. The intellectual property pertaining to these materials will be licensed under a Creative Commons License 3.0. As such, any photos, reports, or evaluation instruments provided online or via other form of electronic communication may be used by Siemens for marketing purposes or for use in improving other charitable programs. The name of Nyaya Health may be used by Siemens for such purposes.

Our research will hopefully identify models that can be replicated in similar settings. In addition, this project will bring the only X-Ray machine in an extremely impoverished part of the world. For both of these reasons, we expect several opportunities to describe this project in the news media and academia. Siemens' involvement in this project will be appropriately acknowledged in press releases, program reports, and any publications.

In general, Nyaya Health hopes that our benefactors stay involved through ongoing updates, discussions, and, ideally, site visits. This does not necessarily mean that they are required to provide ongoing funding. Rather, we aim to provide transparent feedback to our donors to decrease the risk and maximize potential social returns on their investment. From our perspective, we greatly benefit from the ideas, connections, and feedback of our donors. Finally, sustaining long-term relationships brings a degree of personal satisfaction and connection to all parties involved.

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