



Request for GE LogicBook XP

Nature of the Request

This is a request for a GE LogicBook XP provided as a one-year loan to Nyaya Health. GE will receive quarterly reports with detailed performance markers, estimates of clinical impact, ultrasound images, and photos of the machine in use. At the end of one year, GE will review the material submitted and decide whether to terminate the project, extend the loan, or donate the machine.

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 accountable 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. The district suffers from some of the highest maternal and child mortality rates in South Asia. 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.

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 (comparable to a Physician's Associate), 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. In the long-term, we are renovating, restocking and restaffing a hospital that was abandoned 25 years ago to expand our medical, obstetric, and surgical capacity.

Obstetric Ultrasound: Service Component

Ultrasound is a diagnostic modality critical to effective obstetrical management. Although basic obstetric ultrasound can be performed reliably, accurately, and cost-effectively by trained generalist physicians, mid-level practitioners, and midwives, it is typically not available in resource-poor settings.

Our clinic is situated in an area that suffers from many of the challenges faced by impoverished rural areas throughout the world. The area that we work, one of the strong-holds of the Maoist insurgency during the civil war, is extremely lacking in healthcare infrastructure. **There are no ultrasound machines in Achham nor any of the surrounding districts covering over a million people.** Kathmandu, the capital city, is a full two days' journey away. The population is dispersed through the hilly, remote region.

In this context, we are looking for a rugged, portable machine with a 3.5 MHz convex transabdominal transducer to perform basic obstetric ultrasound. In the beginning, with our generalist physician-led clinical team, obstetric ultrasound will serve to answer the following three core clinical questions. The ability of the clinical team to answer these questions will enable timely, efficient, and cost-effective triage and referral (our obstetric referral hospital is 10 hours away over difficult terrain):

- Is there a viable intrauterine pregnancy? This is critical in evaluating for possible fetal demise and ectopic pregnancy.
- What is the placental location? This is essential in evaluation of bleeding in pregnancy and ruling out placenta previa.
- What is the fetal lie? Given the unreliability of Leopold's maneuvers and our extreme distance from an operating theatre, identifying fetal lie will be essential in the decision to deliver on site or to refer.

These simple clinical questions can be answered by a generalist physician-led team without the need for specialized radiological staff. More complex diagnostic questions can be addressed by this machine as clinical need demands and resources permit. In particular, we hope to quickly add a transvaginal transducer and identify trainers so that ectopic pregnancies, important in our area where a history of pelvic inflammatory disease and septic abortions are common, can be effectively diagnosed. The portability of the machine is critical for servicing and for performing outreach to villages. Travel to Achham from Kathmandu is expensive and long, and getting on-site technical consultations is challenging. For outreach, the clinic is located centrally, but given the dispersed nature of the villages, many communities that we serve are located over two to five hours by foot.

Finally, although low quality images are sufficient for the initial basic applications, for quality assurance and training purposes, high-resolution images are needed. Through the [AMD/OAN telecommunications center](#), we will be conducting telemedicine applications for improving our staff's diagnostic reliability and accuracy and for conducting research (see below). 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 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.

We believe that the GE LogicBook XP will best meet our service needs for a durable, reliable, inexpensive portable ultrasound machine. It is also sufficiently sophisticated that, as we expand

operations, we will be able to layer on additional obstetric, surgical, and medical applications. The high image quality of this machine is suitable for telemedicine applications.

Obstetric Ultrasound: Research Component

Obstetric ultrasound, although widely practiced in rich countries, is largely unavailable throughout the developing world where it is needed most. The fundamental reason for this is a lack of human resources. Although the up-front cost of ultrasound equipment is significant to resource-strapped governments, the donors and governments are unwilling to invest in ultrasound due to the lack of trained personnel for maintenance, servicing, and implementation. In addition, there is a lack of operations research that identify scalable models that can inform health planners to roll-out sonographic services. Patient-oriented clinical research that is feasible in our setting is critical to developing such models.

For this purpose, we will use the machine to develop a clinical research program in collaboration with faculty and resident physicians at the Yale University School of Medicine. The basic aim of this research would be to develop strategies to increase the feasibility of delivering effective obstetric ultrasound to rural, resource-poor areas. For Nyaya Health, Yale University, and the people of Achham, this would be a mutually beneficial program. Yale resident physicians can enjoy excellent research opportunities while contributing to training and program development. The Nyaya Health team consists of several epidemiologists and public health researchers who can assist in the design of such projects.

Some initial research topics of interest may include:

- design and evaluation of a telemedicine-based quality assurance program in obstetric ultrasound in rural Nepal
- evaluation methodologies for obstetric ultrasound skills assessment of rural generalist practitioners
- training strategies in obstetric ultrasound for rural midwives
- efficacy and cost-effectiveness of obstetric ultrasound for the triage of third trimester bleeding in rural Nepal
- efficacy and cost-effectiveness of obstetric ultrasound for the triage and management of complex fetal presentations in rural Nepal

The pilot phases of each of these research topics could be feasibly undertaken during a four-to-eight week rotation by senior Yale resident physicians or sonography fellows. Nyaya will provide strong organizational support since these studies are consistent with our goals of creating and evaluating scalable models that bring the tools of advanced technology to resource-poor settings. Larger, long-term studies can be undertaken by training clinic-based staff in data collection and providing data via a secure internet VPN connection. Provided sufficient time in advance (typically two months), Nyaya Health colleagues in Kathmandu can ensure the appropriate approvals with the Nepal Medical Research Council prior to the arrival of the research team to Nepal. The initial obstetrical focus will eventually expand to other applications, as further experience, resources, and interest develop. The flexibility of the LogicBook XP allows for such expansion.

Workplan and Timeline

For the initial ten weeks of the program, the Executive Vice President of Nyaya Health and a student at Yale School of Medicine, Mr. Bibhav Acharya, 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 and communication with GE.

The timeline for the project is as follows.

February 15-February 28, 2008. Medical director Dr. Bishnu Kattel while in Kathmandu will receive a five-day training in basic obstetric ultrasound at Kathmandu Model Hospital.

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

June 15-20, 2008. Nyaya Health Executive Vice President Bibhav Acharya will arrange for transportation to Nepal during his trip. A Yale Emergency Resident and/or a Kathmandu-based generalist physician trained in basic obstetric ultrasound will accompany him to Achham.

June 20-30, 2008. On-site training will be provided to Dr. Kattel.

July 1-September 1, 2008. Initial three-month pilot phase will be conducted. The first quarterly report will be compiled and submitted electronically to the GE representative. During this phase, applications will be restricted solely to the obstetric purposes described above; the machine will only be used by the physician. Data collected during this pilot phase will be used to develop proposals for prospective research; during this time, proposals will be submitted to the Nepal Medical Research Council and the Yale University Internal Review Board for approval.

September 1-November 30, 2008. Four midwives on staff at the clinic will be trained by the physician in obstetric ultrasound. The second quarterly report will detail these activities. Pending ethics boards' approval, operations research will commence.

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 GE.

April 1, 2009. In the ensuing four weeks upon receipt of the third quarterly report from Nyaya Health, the GE 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 GE.

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 the 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 ultrasound examination. This form includes space for relevant electronic ultrasound images. A group of Yale-based volunteer clinicians 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 images provided (assessed by a standardized quality assurance protocol by external specialist reviewers)
- appropriateness of the treatment plan based on the ultrasound diagnosis

Nyaya Health will compile reports with the detailed performance markers, case reports, estimates of clinical impact, ultrasound 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 GE representative on a quarterly basis.

Risks and their Mitigation

The largest risk to GE 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. As described above, physician recruitment and retention is challenging in our area, and we do not anticipate having a single physician staffing the clinic for more than two years at a time. Indeed, our goal is to develop the health systems infrastructure that does not rely on a single individual physician. Part of our operations research program is to explore training and staffing for the utilization of ultrasound in rural settings where physicians only serve in temporary postings. This will involve trainings for physicians and for midwives. The collaboration with Kathmandu Model Hospital and the Yale School of Medicine Emergency Department will assist in ensuring that adequate training is available on-site. 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 GE LogicBook.

A final risk, unique to the South Asian context, is that the ultrasound machine might be stolen or otherwise used inappropriately for sexual selection by some individual for commercial gain.

Although this risk is exceedingly unlikely, it is worth mentioning here because it is the most grave outcome that could happen with this machine. This risk is in fact vanishingly small given that 1) such a use violates Nyaya Health's staff policies on appropriate medical care and would result in immediate termination and prosecution under Nepali law of the perpetrator; 2) rigorous oversight of the machine will be undertaken by on-site Nyaya leadership who are fundamentally opposed to sexual selection; 3) the practice is almost non-existent in our particular community given extreme poverty [sexual selection more common among somewhat higher-income groups].

Benefits to GE

Nyaya Health will take the following steps to ensure that the donation will further GE's mission. On our website, we will list GE 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 GE for marketing purposes or for use in improving other charitable programs. The name of Nyaya Health may be used by GE for such purposes.

Our research will hopefully identify models that can be replicated in similar settings. In addition, this project will bring the only ultrasound 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. GE's 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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