



Donation of Medical Equipment | Belhi, Nepal

Project Report by Access Health Care | April 2017

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Preface

This report illustrates the work related to the donation of hospital equipment to Social Eco Innovative Trust (SEIT) from their Danish partner-organisation “Belhi Group,” a branch of Danish NGO Seniors Without Borders (In Danish: “Seniorer uden Grænser, SuG”. Hereon the donor is simply referred to as SuG/BG).

Donations of medical equipment and supplies to hospitals in resource-poor communities have the potential to save lives. However, in such communities usually a substantial knowledge gap exists in the technical field, and as a result, well-meaning donations often end up unused. The purpose of Access Health Care (AHC) in association with the donation to Belhi in Nepal, was to provide biomedical engineering expertise to ensure that the donation which is the scope of this report would be ideally utilized.

In Nepal, SEIT is responsible for the distribution and utilization of the donation. The two main health care institutions to receive donations as originally intended were Janaki Health Care and Research Centre (JHCRC) and Belhi Health Clinic (BHC). However, on site it became clear, that more than two health institutions could benefit from the sizable donation. As a result, an assessment of the government health care facility Janakpur Zonal Hospital (JZH) was performed on site and it was decided to make JZH a third immediate benefactor of the donation. In addition to JZH, several smaller health clinics, will be able benefit from parts of the donation.

Much of the work of Access Health Care is focused on health care research, technical aspects and innovation. Meanwhile, it remains important for us to show that our organisation exists to improve health care for the people of the poorest and most remote areas of the world. In December 2015, we created a photo-exhibition in Denmark with this very purpose, and we intend to maintain this tradition wherever we can, in this case by keeping this report rich in imagery of the people we work for and the places they live.

April 28, 2017
David Kovacs



Acknowledgements

The AHC team did not initiate the described donation of medical equipment to SEIT Nepal, and, save a few weeks of work, almost all efforts have been done by others than AHC. The goal of AHC is to bring health care services to remote areas of the world. Participating in this work has contributed to this purpose, and hence we wish to thank the involved parties.

We are grateful to following individuals, who through this project have now contributed for two years to help improve access to life saving health care services for many of the poorest of Nepal:

Dan Charly Christensen, Flemming Topsøe, Vagn Frikke Schmidt and Nanna Topsøe for initiating the donation to Nepal and for the trust they have shown the AHC team.

The Haldor Topsøe company and warehouse manager Lars Stig Andersen for his collaboration and help storing the equipment for an extended period of time in Denmark.

The Engineering World Health chapter at the Technical University of Denmark (EWH DTU) for testing and registering the donation items. For helping us testing and completing an inventory list in Denmark, we would like to thank biomedical engineering students (in random order) Hilal Erdogan, Johannes Kruse, Zahra Al-Turfi, Jakob Øystein Simonsen, Nuria Hissabu, Patrick Janowski, Habib Z. Bahrami, Mohamad Barad, Marie Normann Gadeberg, Rana Al-Tayar, Sana Ahmed and Caroline Harder Hovgesen.

Govind Shrestha, Sunil Baniya, and Laxman Bhusal for working with us in country and for always readily helping with seemingly unlimited dedication when we work in Nepal. We are proud to be your friends and honored to receive your help.

Amit Shah, his family, Guru Prashant, Sandesh Roy and the local community, for making us feel at home during our time in Belhi and for being a consistent Nepali counterpart of this project for more than two years.

Surendra Yadav, and Umesh Kumar Mahato for providing the necessary support to ensure the success of the our field work in Janakpur.

Jacob Bølling Hansen and Cecilie Jespersen for helping us in Janakpur and for contributing with their knowledge and of experience.

Sami John Said Baioumi, for facilitating the connection between donor hospitals Kalundborg Sygehus and Holbæk Sygehus and BG/SuG.

Chief Radiographer Johnny Madelung, for arranging the donation of X-Ray equipment from Rigshospitalet, Copenhagen University Hospital.

Flemming Jens Jørgensen and Lasse Hillbrandt for continuing to provide specialized advice about medical imaging x-ray systems.

It is our hope, that we will have the opportunity to work together with you all again in the future. The greatest differences are made when many join forces to reach a common purpose.

Executive Summary

Access Health Care participated to provide technical and engineering aid to ensure the successful donation of medical equipment to the Janakpur area in Nepal.

- The donation successfully arrived in Janakpur, Nepal. All items were collected into storage to be accounted for. Almost three times as many items arrived than originally expected creating additional pressure with regard to timely registration and testing.
- 79.7% of the donated medical equipment was tested and is now stored safely within a warehouse rented by SEIT in Janakpur. Some of the equipment has been installed at the receiving site. AHC continues to support SEIT remotely in the further distribution and installation process.
- 20.3% of the donated items are in use by BHC and an additional 27.5% are intended to be used by BHC within the next two years. Regarding the remaining equipment, agreements by AHC and SEIT have been entered about the specific actions necessary to ensure the successful utilization of the donation. One Operating Theatre (OT) light was installed during the stay of the expert team at JZH, illustrating the ability of the local community in Janakpur to successfully install and use the donated equipment.

Between the original donors, Kalundborg Sygehus, Holbæk Sygehus (Hospitals in the Region of Zealand, Denmark) and the participating organizations BG/SuG, Haldor Topsøe A/S, EWH DTU, AHC, SEIT and DANIDA/Genbrug til Syd (GTS [English name: Recycling and Development]), this two-year long project resulted in the successful donation of medical equipment, which along with SEIT, BHC and JHCRC as originally intended, has also come to the benefit of several other hospitals in the Janakpur region than originally intended. It is considered likely, that neighboring districts Mahottari, Siraha and Sindhuli will also benefit from the donation.



Figure 1: Some challenges occurred in the field including mechanical issues with the jeep fuel pump and fuel shortage due to regional strikes. *Left:* David Kovacs, Sana Ahmed and Patrick Janowski pushing to start the jeep engine. *Left:* Patrick Janowski (in the background) in the process of buying 20 liters of fuel from local reserves.

Civil Societal and Organisational Involvement

In the following, the recipient Nepali organization SEIT and health care institutions JHCRC and BHC as well as the Danish organizations SuG/BG and AHC are briefly introduced. As an addition to the original project proposal, Janakpur Zonal Hospital (JZH) is included. For purposes of brevity, we have left out the involved larger and well-known organizations, namely the Region of Zealand, Haldor Tops A/S and GTS. For more information on these we refer to the official websites of each organization.¹

Social Eco Innovative Trust Nepal and Belhi Health Clinic

Adopted from the SEIT website, <http://www.seitnepal.org.np/author/introduction>

SEIT is a non-profit, non-governmental and social development organization working in a poor rural community with the primary objective of encouraging socio-economic growth and optimal management of natural resources. Since its establishment in 2011, the organization has served the people of the community by working to create new of improved sources livelihood and enhanced productivity. Through its programs in education, agriculture, health as well as women and youth empowerment, SEIT works with an aim to balance society and environment. SEIT is active in Belhi, Tole and Laliya, a narrow village community in the Dhanusa District in the Terai Region of Nepal. The region has close to 9000 inhabitants. Belhi is located close to the capitol of Dhanusa, Janakpur, and the Indian border.



Figure 2: The health clinic in Belhi (BHC) constructed by SEIT in 2015. Approximately half of the donation will benefit of BHC either right away or as a part of SEIT's two-year plan for the clinic.

¹ The Capitol Region of Zealand: <http://www.regionsjaelland.dk/Kampagner/English/About-Region-Zealand/Sider/default.aspx>

Haldor Topsøe A/S: <https://www.topsoe.com/about>,

Recycling for Development/Genbrug til Syd (GTS): <https://www.genbrugtilsyd.dk/english/>

Belhi Health Clinic (BHC) was established by SEIT in 2015 and is one of two health clinics in the local village community. In addition to providing primary health care services to the local population, SEIT uses BHC to arrange health camps with the aim to promote rural health. Most recently, camps for screening for gynecological conditions and dental disorders were conducted in April 2017. BHC also teaches courses on maternity and nutritional health.

The services at BHC are available to all villagers in the area, covering a population estimated at 9000 people. However, during health camps, patients emerge from further away, and the clinic covers a broader demographic of an estimated 30,000 people. Almost all the villagers are agriculturalists and typically they cannot afford basic health care services.

A common issue in the Janakpur region is patients receiving excessive treatment, in some cases to an extreme degree. One goal of the founders of BHC is to ensure evidence based and correct treatment for patients, who would otherwise risk undergoing unnecessarily long and expensive treatment. Approximately half of the donated equipment directed towards BHC is to be used either at their current clinic or in their two-year plan².

Janaki Health Care and Research Center

Adopted from the SuG website, <http://www.seniorerudengraenser.dk/blogs/region-oests-projekter/hospitalsudstyrjhrcr/> and AHC assessment from 2015.

SEIT offers a health insurance program for their workers in collaboration with Janaki Health Care and Research Centre (JHCRC), a hospital facility approximately 15 km from Belhi. The goals of the partnership are to strengthen JHCRC and to improve health care in rural areas where SEIT is active. JHCRC was established in 2006 by a small group of health professionals, under leadership of Dr. Surendra Kumar Yadav. The main motivation was to provide quality health services to the people of the Janakpur region, as the government facilities available were in need of support to meet the population health care needs. JHCRC is a 24 hour facility, serving a total population of 150,000 patients and includes an in-patient capacity of 100, and an out-patient capacity of 50 per day. Typical occupancy rates are 90%. The hospital is also a teaching facility for health assistants. Specialities include ophthalmology, general medicine, gynecology, general surgery, orthopedics, pediatrics, and pathology.

In order to strengthen JHCRC, the donation items will be installed to increase the capacity of the Intensive Care Units, Operation Theatre and general medical departments. JHCRC continues to be committed to supply either free or reduced cost of treatment to the SEIT village community. For SEIT workers, the donated items will secure a health insurance model for SEIT employees, who JHCRC is committed to treating free of charge.

Janakpur Zonal Hospital (JZH)

During the time of the field work in Janakpur, the AHC team was introduced by Amit Kumar Shah (SEIT) to medical superintendent at JZH, RP Yadav and hospital electrician Surendra Yadav. In this section, the findings of the AHC team at JZH are described. The findings are based on interviews with the hospital medical superintendent, surgical staff and hospital technicians.

JZH is a public institution with 250 beds and an out-patient capacity of approximately 250 patients per day. Typically, the hospital has more admitted patients than beds, resulting in an occupancy rate that is above 100%. Patients within all specialties are accepted, and 2-5% of patients are referred to higher institutions. The service region of JZH covers 6 districts with a total population of 3 million. People of the area produce a living as agricultural workers (90%) while the remaining work force moves abroad, typically to India and Qatar. The most common reasons for hospitalization, is physical injury. While the staff was now knowing of the exact prevalence, it was noted that many return from the Arab Gulf having suffered psychological harm.

The hospital has no permanent biomedical engineers and if advanced assistance is needed, the hospital is able to access Kathmandu-based biomedical engineering (BME) assistance from private companies 3-4 times per year. JZH permanently employs two technicians (2-year degree) and two technician assistants (high school

² BHC has a two-year plan for building a larger health clinic or a smaller district level hospital with 25 beds and an OT. Details of the hospital design are included in Appendix III.

degree), however, none of them have any specific BME training. During work hours, the staff does not have any access to internet resources. So far, the hospital equipment has been provided exclusively by the government of Nepal, and at the time of the interview, the donation of an OT light was the first of its kind to potentially reach the institution. The hospital does not have an inventory of all of its equipment, and hence was not able to tell how much of their equipment was out of order. However, the medical superintendent as well as local surgeons were immediately able to mention essential equipment, which was broken. Among these were the hospital electrosurgical unit, portable X-ray, OT lights, bedside monitors, the defibrillator, the anesthesia machine, and an autoclave. Upon inspection, these, along with several other pieces of equipment, were indeed found out of order.

JZH is considered likely to benefit greatly from parts of the donation. While the hospital lacks severely in terms technological resource, they were not deficient of man-power, and an agreement was made between SEIT and the Medical Superintendent, that in return for organizing the donation of medical equipment from Denmark, JZH would provide man-power to health camps organized by SEIT, for a number of work-hours corresponding to the value of the equipment donated. In addition to this, a very talented local technician of JZH, Surendra Yadav, will be able to oversee and maintain donations that are given to the hospital.



Figure 3: Top three: Patrick Janowski, Sana Ahmed and David Kovacs working at the warehouse in Janakpur. Bottom three: Patrick Janowski, Sana Ahmed and Surendra Yadav (JZH) preparing and testing surgical lights.

Belhi Group - A Branch of Seniors without Borders

Adopted from the BG and SuG websites, <https://www.bgnepal.dk/index.php?id=1> and <http://www.senioretudengraenser.dk/>

Seniors without Borders (Sug) is a Danish NGO established in 2004 for seniors who want to be engaged in voluntary work. The aim of the NGO is to create a network for active seniors in order to be able to share their experience and competencies, which can contribute to improve living conditions among inhabitants in developing countries. The driving force for the members of Seniors without Borders is the common vision to develop a community with no famine and poverty, where there is equal access to education, health care and an ecologically friendly and sustainable economic production.

Their contribution/effort is based on the philosophy that people need help to help themselves, and hence the local support and involvement is pivotal. The organization arranges projects and local activities which promote improved living conditions in the world's poorest areas. The Belhi Group is a branch of SuG which, in cooperation with SEIT, has started projects within education, healthcare, construction and sustainable development. The main purpose of the BG is to combat poverty and, in a number of areas, ensure development as well as improved and stable living conditions — primarily for the population of a village in Nepal's Danusha

District with Belhi as the central village, as well as establishing effective democratic structures in collaboration with relevant public and private organizations.

Access Health Care

Access Health Care (AHC) was founded in November 2014 to mobilize health care professionals and medical resources in regions of developing countries isolated from the reach of health care services. The mission of AHC is to improve health care in rural, resource poor areas through technological innovation and research. AHC is an international, multidisciplinary team of academics in the fields of biomedical engineering, public health, medicine and computer science. It is one of the core values of AHC to preserve unique cultures of rural areas.

Introduction and Overview

In 2010 a modification of health care facility Kalundborg Sygehus was adopted by the Region of Zealand in Denmark³, leading to the discontinuation of surgical services at the hospital. Medical equipment was released for donation by the Region at the end of 2014, when the changes were implemented, and a decision was made to donate equipment that could be of value in other hospitals around the world.

At the time, BG/SuG was in search of equipment for their partner organization in Nepal, SEIT. It was agreed with the Region of Zealand, that this equipment would be collected by the BG/SuG and stored at a Haldor Topsøe warehouse. Members of BG/SuG went on to establish a collaboration with AHC and the EWH DTU in the first months of 2015.

Once the items had been collected at the Haldor Topsøe warehouse, registration and testing was performed by student members of EWH DTU. To help SEIT evaluate the suitability of the equipment for the Janakpur region images were included of the items. Furthermore, EWH DTU carried out equipment repairs, and a list of the most important parts necessary for future maintenance. In mid-2015, GTS approved an application by BG/SuG for the shipment of the equipment to the Janakpur region. In Nepal, importing of the donation, tax exemption paperwork



Seniors without Borders Hospital inventory for Nepal

Prepared in collaboration by Dan Charly Christensen, Adam Gerff, David Kovacs, Maria Hissawi, Patrick Jancowski, Sana Ahmed and Nanna Topsøe
Lyngby-Tårnby, Haldor Topsøe A/S, Denmark




Item	Equipment type	Manufacturer	Model	Serial Number	Status	Issue	Notes/Description	Weight (kg)	Image
1	Vaporizer	Resprotronics	Class II Type BF	2006FN291198	Working	Missing Consumable	Tested. Missing consumables: mask and tubing.	3	
2	Vaporizer	Medic-Aid	Class II Type BF	2001PN162232	Out of service	Missing Consumable	See Status	3	
3	Infusion pump	Terufusion	TE-171	5010003	Working	Missing power cable C-13 (N.V.) - 100-240 V.	Tested.	7	

Figure 4: SuG/BG collected medical equipment as well as other items for donation in January 2015. AHC was invited to the storage location at Haldor Topsøe A/S for an initial inspection of the donation. AHC created an inventory list at the time, and at a later stage, as more equipment was added to the donation, volunteer biomedical engineering students from EWH DTU would update the inventory. Students also tested the equipment on several occasions in 2015. *Top left:* Adam Øigaard and David Kovacs (AHC). *Bottom left:* Section of inventory by AHC in February 2015 (see also Appendix I). *Right:* Dan Charly Christensen (BG/SuG) and Flemming Topsøe (BG/SuG).

³ Source: <http://www.regionsjaelland.dk/Sundhed/samarbejde-og-indsatser/Sundhedsplan/Regionens-sygehusvaesen/Sider/Sygehusplan.aspx>

and customs were handled by SEIT. In the following sections we provide an overall timeline since the involvement of AHC in the project, and a detailed timeline of the field work in Nepal in April 2017.

Overall Project Timeline

In the following timeline, project activities subsequent to the involvement of AHC in February 2015, are detailed. At the time, BG/SuG had organized collection and storage of the items at a Haldor Topsøe warehouse.

February 2015	Donation inspected by AHC at Haldor Topsøe warehouse and inventory list created for the first batch of equipment (See Appendix I).
March 2015	Two student volunteers from EWH DTU visited the closed emergency department of Kalundborg Sygehus in order to identify further useful medical equipment. It was decided to collect a second batch of equipment.
November 2015	EWH DTU arranged two workshops to these and repair operation theatre (OT) lighting.
March 2016	A third workshop was conducted by EWH DTU and the final inventory list was created.
April 2016	An application by BG/SuG asking GTS to provide funding for transportation of the donation to Nepal was approved.
May 2016	An additional donation of a fluoroscopy unit (C-arm) from Rigshospitalet, Copenhagen University Hospital was received and transported to the packing site at GTS/Multicenter Syd.
July 2016	Co-founder of SEIT, MBBS Guru Prashant and Technician from JHCRC Umesh Kumar Mahato participated in the AHC-EWH Summer Institute in Nepal, where they learned about medical equipment use, repair and maintenance for a month along side with engineering students primarily from the Technical University of Denmark.
September 2016	Equipment packed in container by GTS/Multicenter Syd.
November 2016	Container shipped from Copenhagen, through Antwerpen to Kolkata, where it was received on December 18.
January 2017	The Donation is received by SEIT and stored in storage rooms.
April 2017	Field work in Nepal by AHC.
May 2017	Field work follow-up by AHC and continued support of SEIT: Collection of manuals, technical manuals, maintenance guidelines, specifications, and supplementary donations.



Figure 5: At the warehouse in Janakpur much of the donation including valuable such as the Siemens mobile X-Ray Unit and endoscopy washing machines were not safely stored. We directed our work towards organizing the warehouse and providing SEIT an overview of the donation. Later we would work on testing, repairs and preparing installations.



Figure 6: A sand storm had occurred the day before we arrived, so before we could start work everything had to be cleaned thoroughly. In the four images, David Kovacs, Patrick Janowski, Sana Ahmed and Amit Shah are cleaning the floor of the warehouse.

Field Work Timeline

In the following a day-to-day summary of activities of AHC in Nepal between April 6 and April 17, 2017, is provided.

Day 1 and 2	Known missing spare parts for the donation were acquired in Kathmandu. Commercial internet accessibility options were acquired in order to investigate feasibility of telemedicine applications in the Janakpur region. Some medicine and surgical gloves left over from the earthquake emergency relief efforts had been obtained by Jacob Bølling Hansen and were collected from the restaurant in Kathmandu.
Day 3	Transportation from Kathmandu to Belhi.
Day 4	Necessary accessories for testing equipment in the warehouse were acquired including stickers for registration and parts to construct a grounded extension cord. At the warehouse the floor and medical equipment was cleaned thoroughly and covered with plastic. OT-lights were unpacked and inspected. Identification, registration and testing was initiated. Sacks of hospital clothing (used for safe packaging during transportation to Nepal) were organized by type and size.
Day 5	Visited three additional (smaller) store rooms in Janakpur where additional equipment was kept. Upon inspection all equipment was gathered in one warehouse. Six OT-lights were tested. Help was received during the day from JZH technician Surendra Yadav. Taking into account filament type, a list of bulbs necessary for the OT-lights was created. A meeting between JZH and AHC was arranged to discuss the donation of OT light ALM ECL 751 (serial number "AHC-51"). A survey of "Janakpur Zonal Hospital" was completed.
Day 6	Continued organizing equipment and other donated items at the warehouse. The equipment from the other three store rooms were moved to the main warehouse. The initial plans for the distribution of the equipment were discussed with Guru Prashant (SEIT). The large coupled OT-light was transported to JZH. The lamp was tested at JZH and a construction plan for the mounting of the lamp was prepared by Sunil Baniya and Patrick Janowski.
Day 7	Final labelling and organizing of items that had not been on the original inventory list created at the Haldor Topsøe warehouse in Denmark (hereon referred to as "non-original" items). Boxes were placed in categories "office supplies," "medical consumables" and "expired [dispose]". About half of the non-original items were screened to identify missing equipment without further categorization. The remaining items were registered in detail. Mounting of the OT-lights was initiated at JZH.
Day 8	Meeting was conducted between BHC, BG/SuG and AHC. It was decided that a board of electives consisting of one member from each group would be formed and that distributions of equipment of special interest such as X-ray apparatus would be donated only with the consent of this board (see section "special agreements"). In Zonal Hospital mounting the OT-light, design of wire bypass and completion of the plan for the distribution with SEIT.
Day 9	Transportation from Belhi to Kathmandu.
Day 10	Meetings in association with future AHC programs in Nepal related to innovation and biomedical engineering. Morning: Dr. Lohani - Head of National Health Insurance Program, Department of Health Services. Noon: Dinesh Rajbhandari - Director of Volunteer Society Nepal. Evening: Mahabir Pun - Founder of National Innovation Center of Nepal.

Day 11	Departure from Kathmandu to Copenhagen
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Methods

When the donation container was delivered in Janakpur in early 2017 it was stored at four different locations in Janakpur. In April 2017, registration, installation and testing of the equipment was performed on-site by AHC in collaboration with SEIT and JZH staff. Additionally, safe storage of all sensitive equipment was ensured and agreements about distribution of the equipment were made.

Store Room Organization and Testing

The donation equipment was relocated in the warehouse to ensure ease of access. All sensitive equipment was cleaned and repackaged in plastic to prevent damage resulting from fine dust particles. The items were labelled with a unique serial number according to the template “AHC-#”. Equipment that was already in use at BHC was not relabeled.

All equipment was entered in an inventory list including general inventory information (general category, item type, manufacturer, model, serial number, test status, equipment status, type of problem/solution, notes/description, estimated weight), information about equipment distribution, estimated costs, as well as maintenance and instructions.

General Inventory Information

The items were divided into four general categories:

- Medical and Hospital-related Equipment
- Medically Related Consumables and Spare Parts
- Office and Kitchen Equipment
- Item Not Part of the Original Donation

Equipment in the first three categories were known from the original inventory created in Denmark (appendix I). For these items, the location of the items in the warehouse in Janakpur were found. The identification of equipment was done based on information provided in the original inventory list (“Item Type”, “Manufacturer”, “Model”, and “Serial Number”).

Additional and Missing Equipment

During the donation process a number of items that were not in the original inventory list were added to the delivery. In order to ensure that no items would be mistakenly categorized as missing, all non-original items were



Figure 7: *Left:* On the first day a sufficiently long extension cord for testing was not available at the warehouse and necessary parts had to be acquired at one of the local electronics stores. *Right:* Fine dust-particles can be extremely destructive to medical equipment. During the recent sand storm in Janakpur and a thick layer of sand and dust had blown into the warehouse and the equipment. In order to ensure safe storage all equipment was cleaned thoroughly and to covered with plastic.

screened for content. To the extent possible given the project time frame, non-original items were also registered and categorized.

Equipment testing

All items were tested and accordingly grouped into five test categories:

- Tested - on site and origin (the item was tested in Nepal as well as in Denmark).
- Tested - origin (the item was only tested in Denmark)
- Tested - on site (the item was only tested in Nepal)
- Not tested (that the item was not tested at all)
- n/a (a test of the item was not relevant, such as it is the case for consumables).

For each item one or two statuses were determined, as multiple statuses were relevant in some cases. For example, the electronics in a machine might have been in working condition while missing necessary consumables. Often such missing and consumables are available locally in Nepal. The possible status categories used were:

- Working
- Needs repair
- Irreparable
- Missing part
- Missing consumable
- Power supply problems
- Other (the reason for using "Other" was provided in the column for notes/description)

If the equipment was not in working condition or was repaired, we reported the type of problem identified. The possible categories were:

- Plumbing
- Motor
- Electrical
- Mechanical
- Power Supply
- Installation (used when working equipment is identified but local staff needs assistance to install equipment)
- Training (used with equipment is installed but local staff is in need of training to use the the equipment correctly)

Equipment distribution

SEIT was prepared suggestions for local donation sites for each item choosing between BHC, JHCRC, Janakpur Zonal Hospital and private clinics. This list was re-evaluated in collaboration with AHC. Each equipment was placed in one the following recipient-categories:

- SEIT Office
- JHCRC
- BHC
- Zonal Hospital
- Other Hospital (can be donated to any hospital without further consideration)
- Private Clinic (can be donated to any private clinic of considered to be swapped for parts that are useful to SEIT)
- BHC - Now (is already in use at BHC, or intended to be used at BHC in the near future)
- BHC - 2 Year plan (is intended to be used by BHC in within the next two years)
- Dispose (used for expired consumables or irreparable equipment)
- BHC/JHCRC/Zonal Hospital (to be distributed equally between the three institutions as soon as possible to ensure use before expiry)
- School (items might be donated to any of the schools in the local community).

- Non-Existent On Site (item was a part of the original inventory, but was not found in the store room).

Estimated value of the donation

To estimate the value of the whole donation, the items were found online in used condition. If multiple results were found, the lowest available price was used to calculate the estimate. In cases where used equipment was not found, half of the price of new equipment was used. If the exact model was not found, the price of a corresponding model was used for the estimate.

Maintenance and Instructions

Details necessary for AHC to support SEIT remotely have been noted. If maintenance guidelines or instructions for use are needed, SEIT has the option to consult the inventory document. In case this does not supply the sought answers, AHC will support SEIT remotely about technical topics related to the donated medical equipment. In addition, the consumables and parts needed for using the equipment were added under “Necessary parts and consumables”.

Manuals

User and technical manuals were included in the donation or found online and collected in a shared folder made available for SEIT and the final recipients of each donation. Manuals that were not found online were acquired either by contacting the original donor, the manufacturers or through the network of AHC in Denmark. After the field work AHC has continued work on collecting necessary manuals.



Figure 8: *Top:* Patrick Janowski, David Kovacs, Guru Prashant and Amit Shah testing OT lights. *Bottom:* David Kovacs, Patrick Janowski, Sunil Baniya, Guru Prashant, Sana Ahmed and Amit Shah covering beds and clothes with plastic and testing OT lights.

Technical Considerations

Considerations to be taken into account before implementation and installation of new medical equipment include acquiring access to spare parts, installation details as well as education in maintenance and correct use. It is beyond the scope of this report to detail technical specifications and consideration as well as instructions, manuals, user guides, however the most important information on all these topics are listed in Appendix II. Here will remain with shortly elaborating on the surgical lighting.

Operation Theatre Lights

The donation contained 11 sets of OT lights of which details are included in the inventory list. The necessary spare, mostly transformers and lightbulbs, were purchased in Kathmandu and organized in packages ready for installation. With each package a specific document describing installation instructions as well as the parts necessary for maintenance was included. Enough transformers were acquired to ensure that the recipients could configure the lighting setup in a way that will be suitable for their needs.



Figure 9: Non-original items turned out to feature mainly consumable medical supplies. During the evening hours of the third day at the ware house, the team screened all boxes, and registered about half before darkfall.



Figure 10: Top left: an example of a broken filament in a halogen light bulb. Top right: Guru Prashant, Patrick Janowski and Surendra Yadav setting up the transformer to test the OT lights. Bottom: David Kovacs and Patrick Janowski Trouble shooting an OT light that had a connection issue. The light was repaired and later it was donated to JZH.

Results

In the following the results of the work of the field work of AHC in Janakpur in April 2017 is described. The first page of inventory list created on site is shown in Appendix II. The full version can be provided separately to the reader upon request to the authors.

Store Room Organization

General Inventory Information

Of the original 120 items, 57.5% were medical and hospital-related equipment, 23.3% were medically related consumables and 19.2% were office and kitchen equipment (see Figure 1, left). On site, an additional 157 items were identified (see figure 1, right). Approximately half of these additional items were registered. Some of the items were boxes containing a number of items in each. Due to time pressure, about half of the boxes were not registered, however all boxes, including unregistered boxes, were screened. During this process it became clear that the additional boxes mainly contained either medically related or office consumables.

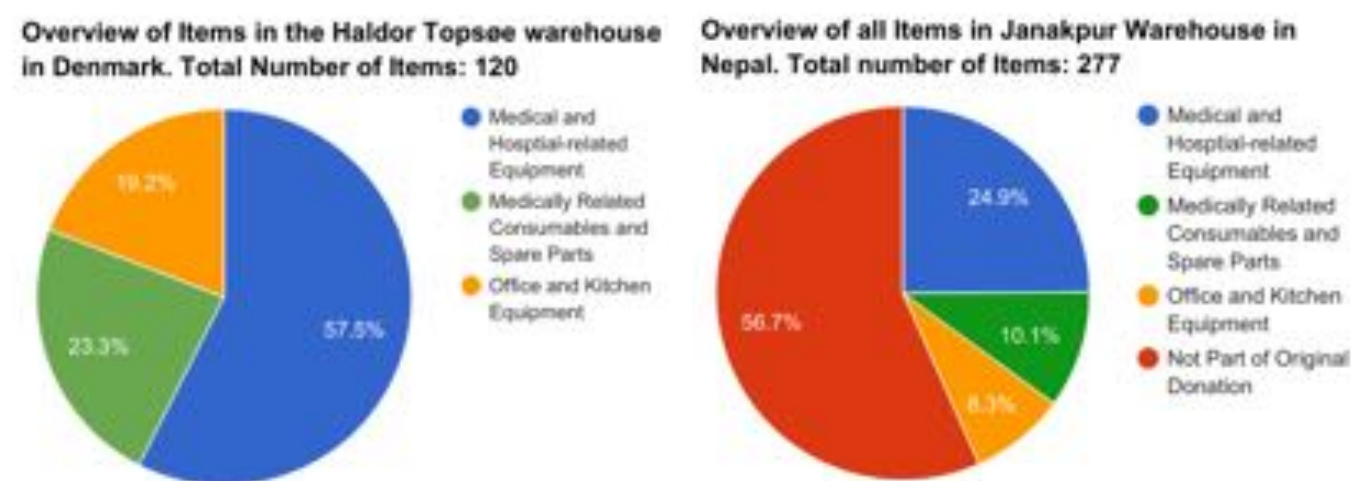


Figure 11: Overview of Donation at Haldor Topsøe warehouse in Denmark and in the warehouse in Janakpur, Nepal. 157 were non-original items were registered on site, most of them containing a number of additional items. The items in half of these boxes were registered. Seven pieces of medical equipment that had originally been a part of the inventory were missing from the donation in Nepal.

Missing Equipment

Seven pieces of equipment were not found in Nepal. The missing equipment is listed in Table 1. The total value of the missing parts were.

AHC-#	Equipment type	Manufacturer	Model	Serial Number
21	Small muscle stimulator	Biometer Denmark	Elpha 2000	n/a
22	Small muscle stimulator	Biometer Denmark	Elpha 2000	n/a
24	Small muscle stimulator	Danmeter	Elpha 1000	n/a
76	Photocopy machine	Minolta	Di351	21734713
35	Printer	HP	LaserJet 1300 n	n/a
37	Wheelchair	Atec	n/a	19B2774
93	X-ray quality control (dose)	RTI electronics AB	Type: PMX - III. Ver 5.21	1580

Table 3: Medical equipment not found at the donation site.

Test Status

It was not possible to test and repair all equipment on-site and focus was kept on the most sensitive, that was likely to have become damaged during transportation. Most of the equipment had been transported safely, and was in working condition on site. In total, 73.5% of the medical electrical equipment was tested (26.5% was only tested in Denmark, 2.9% was tested only in Nepal and 44.1% was tested in Denmark and in Nepal). 16.2% of the equipment was not tested and hence the status of the equipment remains unknown. Sensitive parts such as thin filament light bulbs were damaged during transportation to Nepal. None of the tested equipment was in irreparable condition.

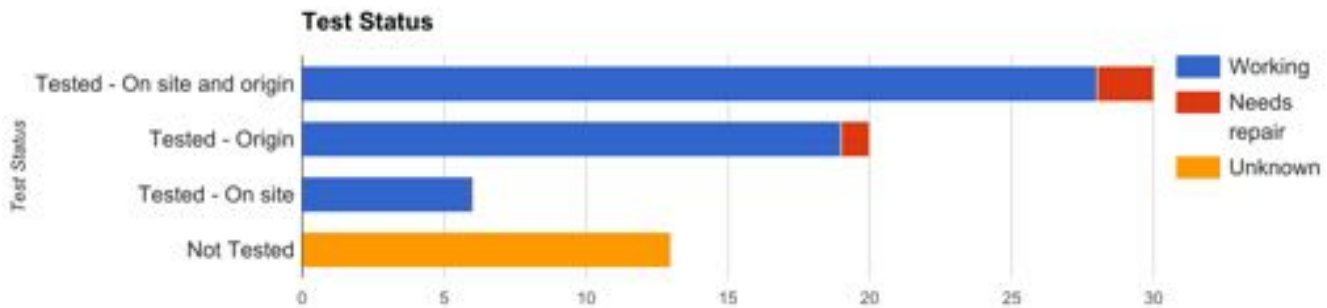


Figure 12: Most equipment was tested (blue). Most equipment was found working in Nepal and no signs were found showing that equipment was damaged during transportation. As testing was performed mainly for the more sensitive equipment, equipment that was not tested can be likely to be in working condition as well.

Distribution of the equipment

Figure 13 shows the planned distribution of the donation items as discussed between SEIT and AHC. 20.3% of the equipment is in use by BHC today, while 47.8% of will be used by BHC in the next two years. 17.4% of the equipment was eligible to be donated to any health care institution in the area. 13% of the equipment will be donated to JZH, while 11.6% will be donated to JHCRC. The remaining equipment was either not found (“Non-Existent On Site”) or intended to be donated to a private clinic, which was known to be in need the specific item in question. Items that were not on the original inventory are not included in Figure 13 and will be distributed equally between BHC, JHCRC, JZH.

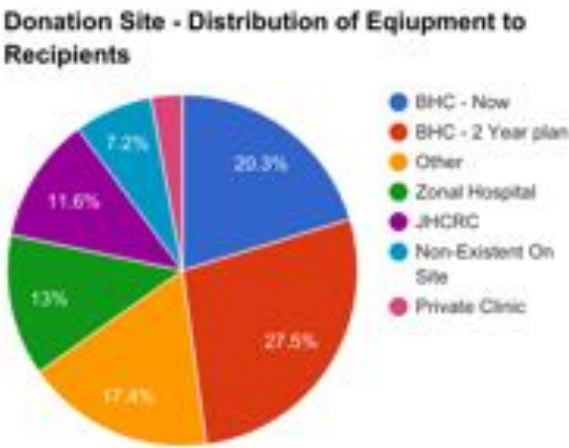


Figure 13: Distribution of donation Items in Janakpur area. It is clear in appendix II exactly who is intended to receive thich donation item.

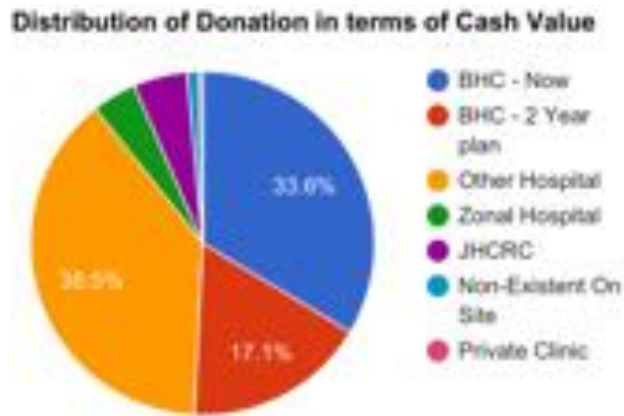


Figure 14: Distribution of donation in terms of cash value. Most of the donation value has been given to BHC while the more advanced institutions registered in category “Other Hospital” will receive equipment for which only they have the necessary infrastructure.

In terms of cash value, 49% of the donation will be given to BHC, while the remainder will benefit other hospitals in the region (see Figure 14). Considering some of the most advanced equipment, the appropriate infrastructure is only available at some of the most advanced hospitals in all of Nepal such as Dhulikhel Hospital, Bir Hospital and Patan Hospital. These hospitals belonged to the category “Other Hospital” and accordingly, in Figure 14 four this category is very dominant (37.6%).

The types of items for each category is broken down in Figure 15. The figure illustrates clear the strategy, that most consumables would be divided equally between BHC, JHCRC and JZH is clear. In addition to the distribution shown in figure four, office items that were found in the extra boxes would be given to the local schools.

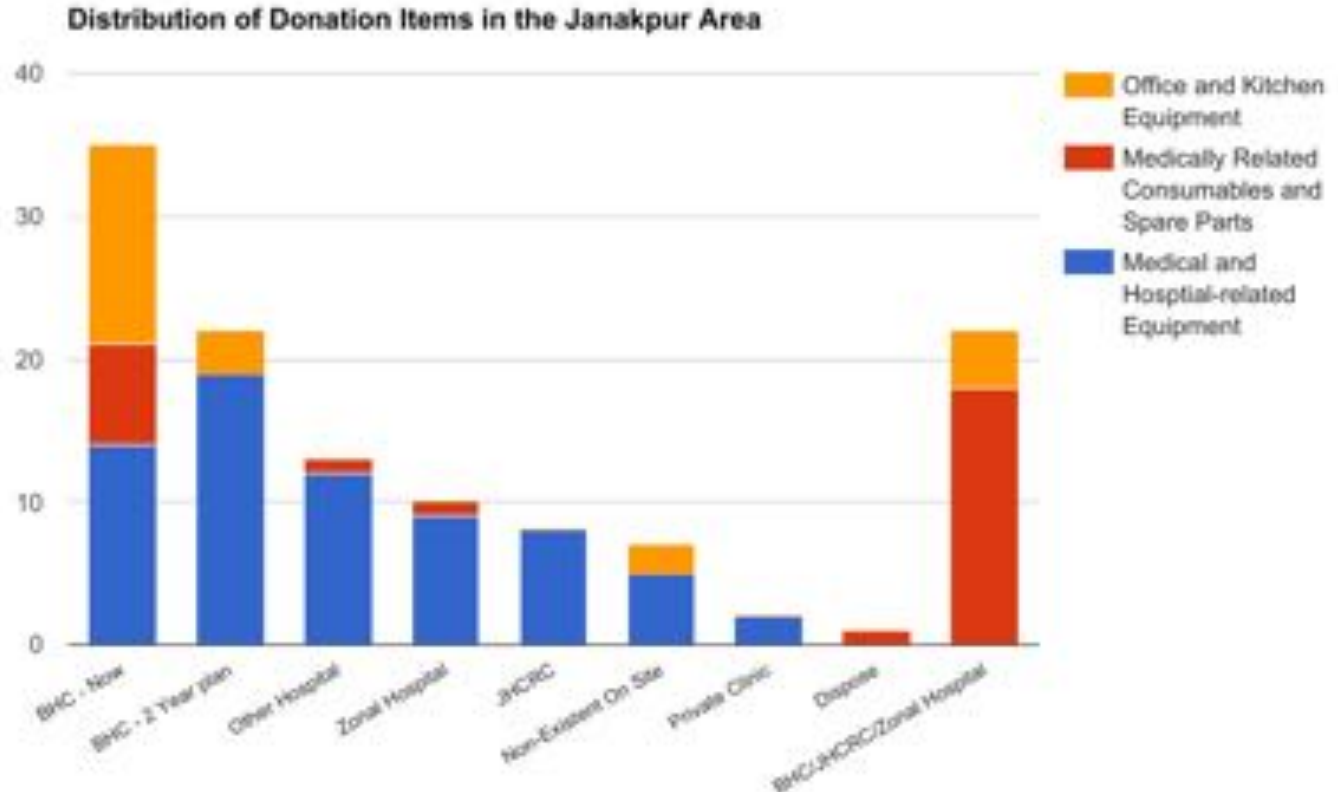


Figure 15: Distribution of Items in the Janakpur Area with subgroups indicating the type of equipment donated to each institution. A version of this figure that includes the non-original equipment is included in Appendix V.

Special Agreements

The donation contained some advanced equipment which could not be used at the BHC within the comping two years. Meanwhile the warehouse in Belhi is not an enclosed space, and the heavily dusty, hot and humid environment of Janakpur poses a risk to this equipment. Storing the equipment for longer periods of time poses an unnecessary risk to the over all value and potential of the donation.

In order to aid SEIT in the distribution process of this equipment, it was decided that a board of electives must approve decisions regarding the distribution of equipment for which special agreements have been made. The electives that must to approve each donation are

- Guru Prashant, SEIT
- Dan Charly Christensen, BG/SuG
- Cecilie Jespersen, MD from Denmark
- David Kovacs, AHC

It is the role of the board of electives to assess the ability of the recipients of to use this equipment correctly and safely. The equipment listed in this section should be treated with special caution during installation and operation. Special agreements have been made about the equipment that is listed in the remainder of this section. For the scope of this report only the main points are noted.

11 Operation Theatre (OT) Light Sets, Various Manufacturers

BHC does not feature an OT at this time, however, a smaller procedure light (AHC-44) was installed and BHC which can be used for dental and gynecological examinations. BHC is planning to use two additional lights within two years in a small OT. Three OT lights were donated to JHCRC and two were donated to JZH. One OT



Figure 16: Making decisions bout the distribution of donation items SEIT, AHC, and BG/SuG to ensure maximal potential utilization of the equipment.

light was installed at JZH by AHC during the project. The remaining four OT lights may be donated to any of the hospitals in need hereof.

Two Endoscope Washing Machines, Olympus

JZH provides basic endoscopy services, however, the infrastructure necessary to use the endoscopy washing machines is not available at the hospital. Patan Hospital in Kathmandu is known to provide advanced endoscopic services and is likely to benefit from a potential donation.

Hydrogen Peroxide Sterilization System, Johnson & Johnson

The sterilization system is designed for sterilization of equipment that is not able to withstand the high temperature and pressure environment generated during sterilization with an autoclave. AHC has provided installation specifications, routine maintenance guide and a service guide for the unit. A 207 VAC three-phase CBA power configuration is necessary to use the unit. Dhulikhel Hospital is likely to feature the appropriate infrastructure and equipment to utilize the machine.

High Flow Water Purification System, ELGA, MEDICA-Pro

The ELGA water purifier uses the reverse osmosis technique to purify water. The reverse osmosis technique uses high pressure to force water across a semi-permeable membrane opposite to the direction of the osmotic pressure gradient. Reverse osmosis removes most contaminants and dissolved salts when the membrane is new, however the system does not guarantee removal of bacteria and viruses, especially as the filter membrane pores age and expand. Water purified by reverse osmosis is not as pure as distilled water, and this water should not be used for applications, where distilled water should be used, such as in infant incubators. Among the intended use of the MEDICA-Pro is to supply clean water for clinical laboratory applications. Notably, the supply water for the purification system should be drinking water with contaminant levels no higher than described in the supplied manual. Generally for district level hospitals and health clinics in Nepal, we recommend using distilled water.

Compressor from Granzow A/S

The compressor supplies oil-free compressed air and can be installed at a hospital that features the necessary infrastructure. The compressor must be supplied with water that has been treated with reverse osmosis. The machine may be used together with the ELGA MEDICA-Pro water purification system (listed above). The compressor needs to be connected to an earthed 3-phase power supply. Additional infrastructural requirements that are listed on page 18 in the user manual for the compressor.

Mobile X-Ray Unit from Siemens

In Nepal, medical officers and general physicians are trained in X-ray assessment and diagnosing of fractures. It is usual, that treatment of fractures is performed at health clinic level. Chest X-ray images are also used to look for inflammation in the lungs. Hence the mobile x-ray unit was intended for use at BHC. An X-ray detector was not included in the donation, and this must be acquired separately. Accordingly, SEIT will need to establish either a digital x-ray detector or dark-room facilities⁴. When using the mobile X-Ray, staff should also use lead aprons for radiation protection⁵.

Fluoroscopy Unit from Ziehm (C-arm)

The mobile C-arm fluoroscopic X-ray system is used for a range of surgical applications, in Nepal most commonly including gastroenterological and orthopedic surgery. SEIT will consult with orthopedic and trauma surgeons Dr. Ram Kewal Shah about an optimal donation site.

⁴ AHC has provided SEIT with a manual for dark room technique.

⁵ AHC has started procedures to apply for a donation of lead aprons for SEIT.

Discussion

The estimated value of the donation is extremely conservative. In all cases we selected the cheapest cost we could find online and in addition many of the cost estimates come from auctioning site e-bay, where we listed the current action value of the equipment, which mostly is lower than the final selling value. For example our cost estimate Sterrad 100s sterilization system was USD 9000 (found on <http://www.medwow.com/used-plasma-sterilizer/asp-advanced-sterilization-products/sterrad-100s/770953206.item>), while the exact same unit is available at http://www.remarketmedical.com/Sterilizers_Autoclaves/Sterrad_100S_Sterilizer_System for USD 23900.

Among the items that were not in the original inventory, some included advanced medical consumables for robotic surgery. It was unknown to the authors if these contain parts of supplies that are useful in Nepal, and if that is the case, it should be clarified by the donor.

Generally speaking, and unless donations are a part of emergency aid efforts, medical equipment is preferable for donation in contrast to consumables due to expiry considerations, and because local hospitals can only rely on consumable parts, that they can acquire locally.

When new items are included in the shipment container this may cause significant issues with regard to local storage space. Problems are also likely to arise with customs authorities, as items that are not considered in the tax exemption procedure will not be allowed into the country untaxed.

It is important to underline, that some of the non-original equipment that was added to the donation to Nepal, namely eight electrical beds, turned out to be of great value locally. While these were of great additional value, we suggest for future reference that original donors are consulted before additional items added to a donation and that consumables are not donated unless it is specifically asked for.

Conclusion

Overall, the donation of medical equipment to Belhi, Nepal was a successful endeavor, mainly thanks to the qualified project participants in Nepal as well as Denmark. Before the project can be called a complete success however, there is some work must be done to finalize installation of the equipment at local health care institutions. Based on experience, it could be last 6-24 months before year before all the equipment is successfully installed at the recipient. At the current stage, the success of the remainder of the donation process depends the ability of SEIT and the community of the Janakpur are to facilitate the necessary technical expertise to ensure successful installation, operation and maintenance at the final donation sites.

Appendix I

Full document available as separate file "Appendix_I_Donation_Inventory.pdf".



Seniors without Borders Hospital inventory for Nepal

Prepared in collaboration by Dan Charly Christensen, Adam Garff, David Kovacs, Nuria Hissabu, Patrick Janowski, Sana Ahmed and Nanna Topsøe
25.05.16
Lyngby-Taarbæk, Haldor Topsøe A/S, Denmark

Item	Equipment type	Manufacturer	Model	Serial Number	Status	Issue	Notes/Description	Weight (kg)	Image
1	Vaporizer	Respironics	Class II Type BF	2006PN291198	Working	Missing Consumable	Tested. Missing consumables: mask and tubing.	3	
2	Vaporizer	Medic-Aid	Class II Type BF	2001PN162232	Out of service	Missing Consumable	See Status	3	
3	Infusion pump	Terufusion	TE-171	5010003	Working	Missing power cable C13 (4,7) - 100-240 V.	Tested.	7	
4	Bloodpressure sphyg. (Mercury)	PyMaH	Trimline	not found	Working	Missing parts	Need new blood pressure cuffs, possibly available in Nepal	45	
5	Bloodpressure sphyg. (Mercury)	PyMaH	Trimline	not found	Tested	Missing Part	Need new blood pressure cuffs, possibly available in Nepal		
6	Bloodpressure sphyg. (Mercury)	PyMaH	Trimline	not found	Tested	Missing Part	Need new blood pressure cuffs, possibly available in Nepal		See row 4 and 5
7	Bloodpressure sphyg. (Mercury)	PyMaH	Trimline	not found	Tested	Missing Part	Need new blood pressure cuffs, possibly available in Nepal		See row 4 and 5
8	Bloodpressure sphyg. (Mercury)	Riester	empire N	27358	Out of service.	Missing parts	Tested. Needs new tubing on cuff, is spoiled due to aging.	1	
9	10 x Architect lamps	unknown	unknown	not found	Working		Tested and working. 1 lamp can not turn off. Requires 40 watt bulbs. In "Denmark" boxes in the warehouse.	20	
10	Electronic patient bed	Nordjysk Dentalfabrik	St-200	586	Working		Tested. Folded together.	100	
11	2 x Table on wheels, different sizes, one in stainless steel	unknown	unknown	not found	Working			5	

Prepared Access Health Care Field Team: David Kovacs, Patrick Jankowski, Sara Ahmed, Sunil Buriya, Govind Sureshna. Published version Edited by David Kovacs

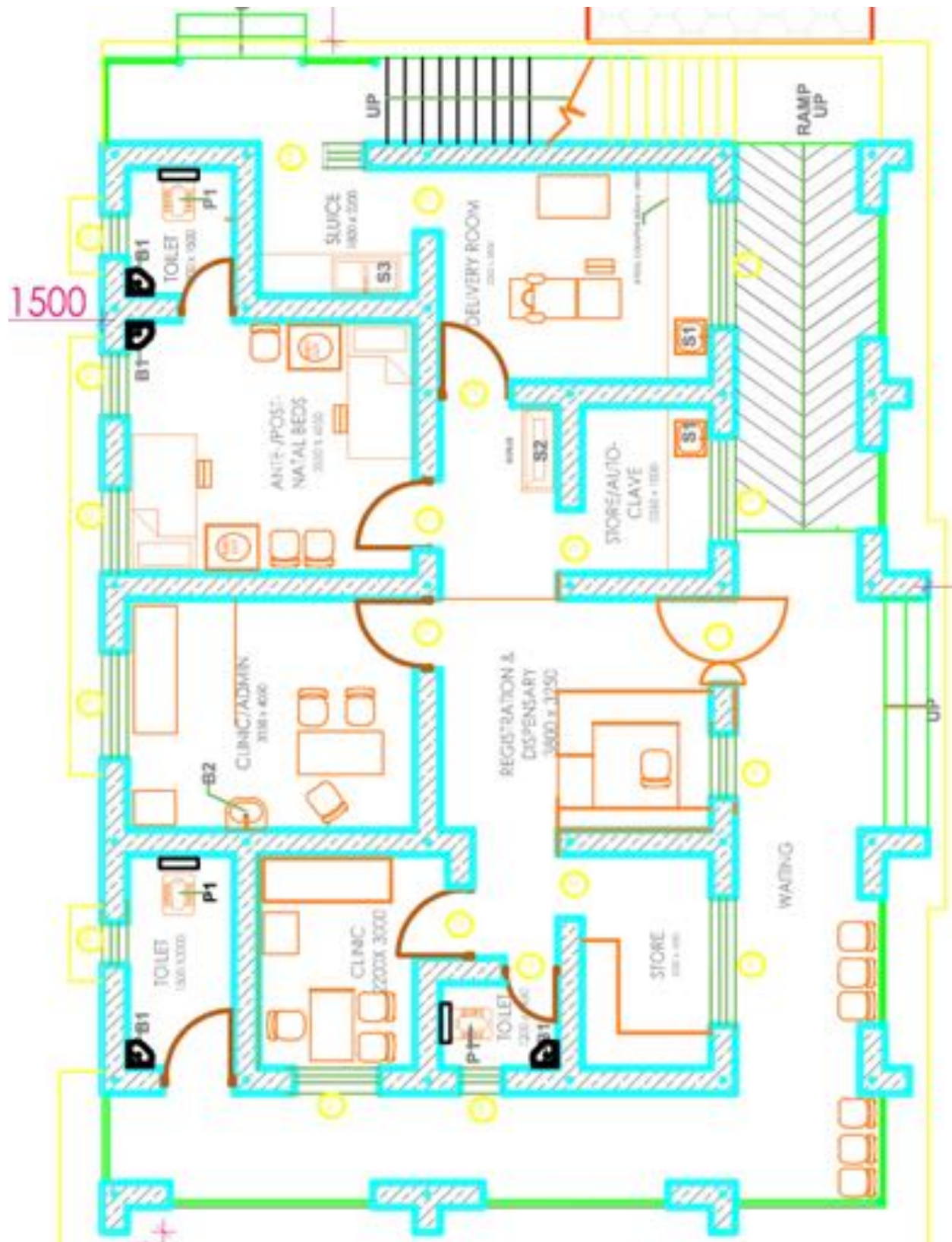


Proposed design for hospital for Belhi.



Appendix IV

Proposed design for hospital for Belhi, close up.



Appendix V

An version of 15 that includes the non-original equipment, which will be distributed equally between BHC, JHCTC and JZH.

