Compendium of new and emerging health technologies

World Health Organization

WHO/HSS/EHT/DIM/11.02

Under development

Assisted vaginal delivery instrument

Blood collection drape estimating postpartum blood loss

Fetal heart rate monitor by mobile phone

Infant warmer

Isolator system for laparoscopic surgery

Lab-in-a-backpack: point of care screening/diagnostic

Low-technology child restraint car seat

Microbial water testing kit

Mobile health record system for pediatric HIV

Mobile phone image transmission for diagnosis

Mobile phone pulse oximeter

Off-grid refrigerator

Orthopaedic external fixator

Pedograph

Point-of-use water purifier

Portable cell sorting and counting device

Portable system for pre-cancer screening at point of care

Portable telemedicine unit

Portable transcutaneous haemoglobin meter

Single-size contraceptive diaphragm

Subcutaneous drug delivery device

Woman's condom

World Health Organization

http://www.who.int/medical_devices/en/index.html

Commercialized

Birthing simulator for training

Fetal heart rate monitor

Isothermal nucleic acid amplification system for POC diagnosis

Manual wheelchairs and mobility devices

Medical data communication system

Mobile technology to connect patients to remote doctors

Newborn simulator for resuscitation training

Non-pneumatic anti-shock garment

Oxytocin in prefilled auto-disable injection system

Parasitological test system

Phototherapy for neonatal jaundice treatment

Point-of-use water disinfection system

Portable haemoglobin meter

Portable ventilator

Prefilled auto-disable injection system

Reusable neonatal suction device

Self-powered pulse oximeter

Solar thermal cooking and autoclave device

Transcutaneous bilirubin measurement system for infants

Treatment response software application

Ventilator using continuous positive airway pressure

Water filter

World Health Organization

http://www.who.int/medical_devices/en/index.html

Compendium of new and emerging technologies that address global health concerns, 2011

The compendium of new and emerging technologies that address global health concerns has been created as a neutral platform for technologies which are likely to be suitable for use in low-resource settings. It is released to encourage the dialogue between ministries of health, procurement officers, donors, technology developers, manufacturers, clinicians, academics and the general public. In doing so, WHO aims at raising awareness of the pressing need for appropriate design solutions, and for further development and technology dissemination.

The compendium 2011 is a first snapshot of several health technologies which might have the potential to improve health outcomes or to offer a solution to an unmet medical need in low-resource settings. The compendium specifically focuses on innovative technologies that are not yet widely available in developing countries, and product concepts under way.

Technologies in the compendium are presented in one page summarizing the health problem addressed, the proposed solution and product specifications, based on data and information provided by the developers of the technologies concerned.

Eligibility for inclusion in the compendium has been evaluated by EuroScan member agencies and WHO. However, the evaluation by EuroScan member agencies and WHO has been solely based on a limited assessment of data and information submitted in the developers' applications and, where available, of additional sources of evidence, such as literature search results or other publicly available information. There has been no rigorous review for safety, efficacy, quality, applicability, nor cost acceptability of any of the technologies. Therefore, inclusion in the compendium does not constitute a warranty of the fitness of any technology for a particular purpose. Besides, the responsibility for the quality, safety and efficacy of each technology remains with the developer and/or manufacturer. The decision to include a particular technology in the compendium is subject to change on the basis of new information that may subsequently become available to WHO.

WHO will not be held to endorse nor to recommend any technology included in the compendium. Inclusion in the compendium solely aims at drawing stakeholders' attention to innovative health technologies, either existing or under development, with a view to fostering the development and availability of, and/or access to, new and emerging technologies which are likely to be accessible, appropriate and affordable for use in low- and middle-income countries.

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2. the technologies which are included in the compendium will be embodied in future editions of the compendium; and/or that
3. the use of the technologies listed is, or will be, in accordance with the national laws and regulations of any country, including but not limited to patent laws; and/or that
4. any product that may be developed from the listed technologies will be successfully commercialized in target countries or that WHO will finance or otherwise support the development or commercialization of any such product.

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World Health Organization

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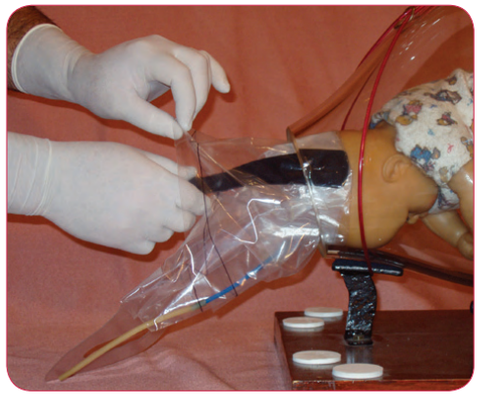
Under development

Assisted vaginal delivery instrument

Country of origin | Argentina

Health problem addressed

World-wide, 10-20% of deliveries require some form of intervention, frequently a Caesarean section. Instrumental vaginal deliveries (forceps and vacuum extraction) account for 2–23% of deliveries. This profile makes the introduction of a new device which would prioritise maternal and fetal safety, is easy to use, disposable and - particularly relevant - does not require a highly skilled attendant.



Product description

This device has been designed on the basis of a double physical phenomenon consisting of a conveyor belt and an air clamp. It consists of a polyethylene sleeve with a cuff-like fold on the fetal insertion edge, which fits the fetal head diameter. This sleeve is introduced using two flexible plastic spatulas 3-mm thick that allow placing the device in the adequate final position around the foetus' head.

Product functionality

The atmospheric air entering during the sleeve introduction and application is generally enough to produce the air clamp and fix the sleeve around the fetal's head. However, this effect may be enhanced by insufflating a small amount of air through an insufflation cannula. This adds to the sliding effect occurring between the inner parts of the fold upon force exertion.

Developer's claims of product benefits

Medical advantages: The devices decreases the risk of fetal-maternal injury, contributes to the physiologic development of the second stage of labour, contributes to contraction forces and maternal pushing efforts, could reduce prolonged second stage, could reduce postpartum hemorrhage (uterine atony) through a reduction in the second stage of labor, could significantly decrease operative delivery, could reduce the incidence of perineal damage, and could decrease perinatal infections acquired through the birth canal.
Technical advantages: The device does not require expertise or individual training, is an easy-to-learn technique as insertion is easy, rapid and smooth, has very low production costs and is disposable.

Operating steps

1. Apply one of the insertion spatulas against the inner cuff on one side of the sleeve. 2. Perform a sliding motion following the fetal cephalic curvature. 3. Repeat steps on opposite side, as well as at positions 12 and 6 o'clock. 4. Withdraw spatulas. Pump air into the air chamber through the insufflation cannula. Use the traction handle to pull until the fetal cephalic pole is extracted. 5. Remove and discard the device.

Development stage

Phase 0 of the research was performed in a childbirth simulator (simulator S 575 – "Noelle") at the Obstetric Simulation Laboratory in Des Moines University (DMU), WHO collaborating center, Iowa, USA, October 21–23, 2008. Trials were successful. Action physical mechanisms (A- the air clamp and B- conveyor belt) generated upon device placement were objectively proved in the simulator obtaining the expulsion of the cephalic pole.

Future work and challenges

The device is currently undergoing processes for regulatory approval. A phase I study to evaluate feasibility and safety is currently being developed in Buenos Aires, Argentina.

Use and maintenance

User: Nurse, midwife, physician

Training: Pelvic trainer and short length of training.

Maintenance: None

Environment of use

Requirements: None

Product specifications

Dimensions (mm): 385 x 205 x NA

Weight (kg): 0.025

Shelf life: 1 year

Other features: Portable and single-use.

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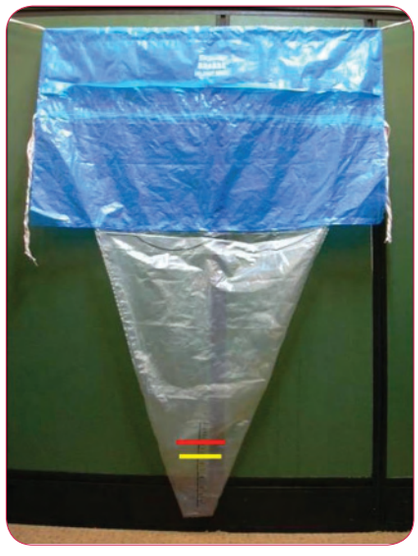
Blood collection drape estimating postpartum blood loss

Country of origin | United States of America

Health problem addressed

Postpartum hemorrhage (PPH) is the most common cause of maternal deaths worldwide. Ninety-nine percent of maternal deaths occur in resource-poor countries where most deliveries take place at home or in rudimentary health facilities. Inaccurate blood loss estimates often delay recognition of PPH and interventions in low-resource settings.



Product description

The calibrated blood collection drape was designed to assist in estimating postpartum blood loss in low-resource settings.

Product functionality

The blood collection drape consists of a funneled and calibrated collecting pouch attached to a plastic sheet that is placed under the woman's buttocks immediately after delivery. Two belts attached to the upper end of the drape are tied around the woman's abdomen to optimize blood collection.

Developer's claims of product benefits

The blood collection drape consists of a funneled and calibrated collecting pouch attached to a plastic sheet that is placed under the woman's buttocks immediately after delivery. Two belts attached to the upper end of the drape are tied around the woman's abdomen to optimize blood collection

Operating steps

The current standard of practice is visual estimation, which has been shown to be inaccurate. Our product shows potential to improve the accuracy and is easy to use.

Development stage

The blood collection drape was developed for use in a randomized clinical trial in village India in 2002.
A randomized, controlled hospital-based study was conducted in India in 2003 which showed that the blood collection drape was more accurate than visual estimation.

Future work and challenges

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Use and maintenance

User: Nurse, midwife

Training: None

Maintenance: single use

Environment of use

Setting: Rural areas, at home and in primary health care facilities.

Requirements: None

Product specifications

Retail Price (USD): 1.2

Other features: Portable and single-use.

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Fetal heart rate monitor by mobile phone

Country of origin | Australia

Health problem addressed

The interpretation of the fetal heart rate and activity requires expensive equipment operated by a trained midwife. Thus for women in resource-poor locations the options for regular screening of fetal well-being are limited.

Product description

The solution consists of a software application that can be run on a mobile phone. This software transforms inexpensive fetal monitoring devices that merely let the user 'hear' the fetal heart beat into a system that calculates fetal heart rate, stores it over time, tracks fetal movement, and provides this data to a remote midwife in the same form as standard hospital equipment.

Product functionality

The software on the phone analyses the sound of the fetal heart to calculate the heart rate using a beat-to-beat accuracy algorithm. Data is sent to a server, and can then examined by a midwife using a web browser.

Developer's claims of product benefits

Fetal cardiotocography can currently only be undertaken in a centre with the appropriate equipment and staff. Devices used 'in the field' are limited to producing either just the sound of the fetal heart beating, or displaying an instantaneous heart rate on an LCD screen. Accurate assessment of fetal well-being requires more than this in terms of examining heart rate over time to determine a baseline, variability, and response to fetal movement. This product offers improvements in that it records heart rate over time, correlates it with fetal movements, and can communicate this data for remote diagnosis or confirmation. Being a software solution, the system uses existing mobile phone hardware, and existing portable fetal monitors, vastly reducing the cost.

Operating steps

Instructions are provided on the mobile phone screen. Once the program is started, these instructions consist of: 1. Connect the portable monitor to the phone. 2. Position the probe and listen for the fetal heart, then press 'start'. 3. Press the 'movement' button when the baby kicks. 4. Press 'Stop' to finish and upload. Once upload is complete, an automated email is sent from the server to the midwife with a link to the plot of fetal heart rate and activity.

Development stage

The system has been trialled at Mercy Hospital Mount Lawley, Western Australia in a pilot trial with 15-20 mothers. All could use the system with minimal training and the diagnosis from the system matched the one from simultaneous monitoring by the hospital monitor.

Future work and challenges

The current challenge is to conduct a larger scale trial in the field. Funds are needed to buy equipment for trials and to tailor the application for a specific country. The main challenge in terms of low and middle income countries is the distribution of the device. In high income countries mothers would perform self-scans at home with their own equipment. For lower income countries, a more suitable model is to provide the device to local health workers who can use one device on many patients.

Use and maintenance

User: patient, nurse, midwife, physician

Training: Usage instructions provided via the phone screen. Instructions take the mother step-by-step through the process.

Maintenance: Patient, nurse, physician, manufacturer

Environment of use

Setting: Rural and urban, at home and in primary health care facilities.

Requirements: Access to a network (either cell phone, wifi, or fixed line Internet), ideally at point of use, or within easy reach. (i.e.. Visiting health worker can perform scans in people's homes, saving the data to the phone, then upload from a health post with network access.)

Product specifications

Consumables: None

Other features: Runs on batteries, uses software and is a telemedicine system.

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Infant warmer

Country of origin | United States of America, India

Health problem addressed

20 million low-birth-weight babies are born yearly; 4 million die, and those that survive, grow up with severe problems, like low IQ, early onset of diabetes, heart disease. Incubators are costly and usually available in urban areas. Home solutions include wrapping hot water bottles around their bodies, placing them over hot coals or under light bulbs.

Product description

We have developed a low-cost infant warmer that can work without electricity and provides heat to an infant at a constant temperature, the key factor needed for survival. Our product costs less than 1% of traditional incubators, has no moving parts, is portable and is safe and intuitive to use. It also complements skin to skin care.

Product functionality

The re-usable warmer provides heat to infants weighing 1.5-3.0 kg. It is comprised of: a phase-change material (PCM) pouch; a heater that heats the pouch to 37° C; a sleeping bag that holds the infant and the pouch in adjacent compartments to promote sustained warming. The pouch will remain above 35°C for 4-6 hrs, providing heat to the infant.

Developer's claims of product benefits

Other technologies include Kangaroo Mother Care (KMC), Indian and Chinese low-cost incubators and radiant warmers, donated traditional incubators, and at-home remedies. While these solutions assist in saving the lives of some low-birth weight babies, the infant warmer described here aims to achieve greater results. KMC can enable thermal stabilization, but it can only assist in saving a premature baby if it is done continuously. Incubators and radiant warmers require electricity, and are designed for a hospital setting only. In-home remedies such as tying hot water bottles to the baby or placing it close to a stove or an electric lamp are extremely dangerous.

Operating steps

The pouch is heated up to approximately 37°C by placing it in the electric heater, which runs off 240V AC power, and beginning the heating cycle which takes approximately 20 minutes. Then, the pouch is removed and placed into the sleeping bag with the infant. The pouch will remain above 35°C for over 4 hours, providing heat to the infant.

Development stage

Design and clinical testing of the device has been completed. Currently, our product is being manufactured for launch in April 2011. Additionally, we have filed for CE approval. The product will initially be available in India, and then available to the rest of the world.

Future work and challenges

Our technology will initially be available in India where use will be carefully assessed. Monitoring and evaluation will allow for product iteration (if needed), the product will be made available to the rest of the world subsequently. Ideally, we would like to sell to Governments and NGOs; establishing contacts requires time. Additionally, this is a novel concept; people in rural settings want the product to be recommended by doctors (so we are selling to clinicians first).

Use and maintenance

Environment of use

Setting: At home or in health care facilities.

Requirements: Requirements depend on what model of the heater is used (electric or non-electric), The electric infant warmer can be used in areas with access to electricity supply. The rural version does not require electricity. Our design is simple to use and therefore does not need specialized operation or operators.

Product specifications

Dimensions heater (mm3): 440 x 290 x 60

Weight heater (kg): 2.6

Dimensions pouch (mm3): 380 x 220 x 20

Weight heater (kg): 1.3

Dimensions sleeping bag (mm3): 520 x 250 x 50

Retail Price (USD): 150-200

Other features: The infant warmer is portable and reusable.

Year of commercialization: Expected 2011

Currently sold in: To be launched in India.

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Isolator system for laparoscopic surgery

Country of origin | The Netherlands

Health problem addressed

In upcoming economies (China, India) the demand for better health care is on the rise, however variation in facility quality across these countries is extreme. Outside a sterile environment patients are not protected from infection sources outside the body. Also the medical staff is not protected from potentially harmful exposure to the patient. (Hepatitis B, HIV).

Product description

The patented trocar system for minimally invasive surgery creates a barrier between the trocar site and the surrounding environment by creating a small local 'clean room' that prevents gas leakage around the trocar and instruments. Now, the patient is protected against infection sources outside the body. Also the medical staff is protected against potentially harmful exposure to the patient.

Product functionality

After the tip of a trocar is inserted, the sticky pad of the "trocar balloon" is pressed to the skin around the incision. At this point the trocar tube is fixed in the abdominal wall and the incision and tube are completely isolated. Now, isolated instruments can be locked on and unlocked from the isolated trocar. The coupling prevents outflow of CO2 gas or inflow of surrounding air during coupling or decoupling at all times.

Developer's claims of product benefits

The MSIS trocar system enables the surgeon to perform laparoscopy on infected patients while the Isolator drastically reduces the risk on contamination of the environment and personnel. Furthermore, the MSIS trocar system protects the patient against contamination sources if the environment is not (completely) sterile. Finally, the gas leakage is reduced to a minimum since the gas outflow is stopped by the protective foils/ trocar balloon and unique coupling mechanism of the Isolator.

Operating steps

After insertion, the special trocar balloon shields the incision and trocar while the coupling and sleeve foil shields the tip and shaft from the surrounding air and potentially contaminating surfaces. If uncoupled, a safety valve/pin prevents that the instruments penetrate the coupling. If correctly locked on the trocar, the coupling releases its safety pin and the instrument can now enter the abdomen.

Development stage

In vitro test series were performed: when an isolator system is used on a pressurized (20mmHg) contained small environment (that mimics the abdomen), the pressure stays constant after the gas supply is stopped and the instrument was used to grab some internal elastic bands. Based on the early tests results, STW covers a large part the costs for expanded Workflow and clinical tests. The other part is funded by Erasmus MC Rotterdam and LUMC Leiden and TU-Delft.

Future work and challenges

In Dec 2010 the Dutch government approved a 2nd valorization grant for the evaluation studies, workflow studies and clinical studies. We need to find contacts involved with laparoscopic surgery in low and middle income countries. General surgeons, military surgeons, Hospital managers or others experts in the field of laparoscopy in extramural settings or developmental area's can help us to set up a first pilot study after the system is certified.

Use and maintenance

User: Physician

Training: Short instruction about the system to scrap nurse and surgeon.

Assembly: Nurse, physician

Environment of use

Requirements: CO_2 gas supply, light source for endoscope, (portable) endoscopic camera with monitor

Product specifications

Dimensions (mm): 40 x 45 x 200

Weight (kg): 0.3

Year of commercialization: Expected 2013

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Lab-in-a-backpack: point of care screening/diagnostic

Country of origin | United States of America

Health problem addressed

According to MicroClinic, 70% of people in sub-Saharan Africa live in rural areas, while 90% of their healthcare facilities are in urban areas. Many people in Africa, Latin America, and Asia do not have ready access to healthcare facilities where diseases can be diagnosed. At the same time, most diseases from which people in the developing world suffer are preventable.

Product description

The Diagnostic Lab-in-a-Backpack contains tools to perform physical exams and laboratory tests in a point-of-care setting; tools include an oil immersion microscope, centrifuge, otoscope, ophthalmoscope, glucometer, pulse oximeter, sphygmomanometer, rapid diagnostic tests, and first aid supplies. An integrated battery, charged via wall power or a solar panel, provides power for more than 8 hours.

Product functionality

In response to challenges provided by healthcare providers working in resource-poor settings, a backpack was designed for point-of-care health providers in rural areas in the developing world. The Diagnostic Lab-in-a-Backpack contains tools to diagnose major health issues such as malaria and tuberculosis.

Developer's claims of product benefits

The existing technologies to diagnose disease in developing countries are located in medical lab facilities. These resources are not readily accessible in low- and middle- income countries, especially for those who must travel great distances at personal expense to reach a hospital or health clinic. The Diagnostic Lab-in-a-Backpack allows health care personnel to travel to remote locations with the tools necessary to diagnose diseases and provide basic health care in areas without ready access to power and infrastructure. This assembly of tools is innovative for it enables point-of-care diagnosis of neglected diseases common to the developing world, such as malaria and tuberculosis, eliminating the need for an advanced medical lab facility and patient travel to distant hospitals for basic diagnostics.

Operating steps

The user sets up backpack in a remote area where medical care is needed and uses the diagnostic tests and basic first aid materials to screen for, diagnose, and treat illness

Development stage

The backpack has been used in rural clinics and by medical brigades in 14 developing countries and US rural areas. A long-term feedback project in Ecuador is underway for final product development prior to commercialization. US manufacturers of custom components are being contracted. Once feedback is incorporated into design, the backpack will be ready to be manufactured for commercialization in LM countries.

Future work and challenges

The capital to establish an entity to oversee the large-scale assembly and distribution of the backpacks has not yet been secured. Approval of the device will need to be obtained (from country's government / individual healthcare entities), to enter new markets. There is also the need to provide end-user training. Supply chain issues may disrupt regular utilization. Replacement parts need to come from the US.

Use and maintenance

User: Nurse, physician, technician

Training: A manual and instructional DVD, paired with a half-day training, fully introduces user.

Maintenance: Nurse, physician, technician

Environment of use

Setting: Rural health posts and health centers.

Requirements: Occasional sunlight or access to electricity to recharge the batteries that power the medical devices.

Product specifications

Dimensions (mm): 460 x 815 x 330

Weight (kg): 18

Consumables: Glucometer test strips, lancets, otoscope covers, urinalysis test strips, gloves, cotton-tipped applicators, face masks, tongue depressors, cotton balls, pregnancy tests, gauze, band-aids, microcapillary tubes, microscope slides, microscope cover slips

Life time: 2 years (backpack)

Other features: Portable and reusable.

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Low-technology child restraint car seat

Country of origin | United States of America

Health problem addressed

Children travelling in a vehicle are at an increased risk for injury or death if they are unrestrained, especially in low- and middle-income countries which account for 93% of child deaths. Therefore, child restraint systems (CRS) are an effective way to mitigate the risk of injuries in a crash.

Product description

The device is a low-tech child restraint made from materials readily available in developing settings (steel, plywood and cotton). The design was evaluated against the U.S. Federal standards crash safety for child restraints. The primary innovations are the use of low-cost materials and low-tech manufacturing processes, and the novel open-source design promotion.

Product functionality

The device distributes restraint forces over the torso of the child and reduces the likelihood of contact with the interior. The system is designed to be used with either two- or three-point vehicle safety belts to secure the device to the vehicle. The device can be used rearward facing for infants or forward-facing for appropriate age ranges.

Developer's claims of product benefits

The restraint is intended to be a sustainable technology to improve road safety for child vehicle occupants in developing settings. It is designed using widely available materials so that the fabrication can occur within the country for which it is intended. It is a low-tech device that requires minimal capital investment – the manufacturing process does not depend on expensive techniques. This would allow for the child restraint to be sold at low cost. The integrity of the design is validated using the dynamic testing methods described by the Federal Motor Vehicle Safety Standard of the U.S. The child restraints will be readily available since they will be manufactured in country.

Operating steps

The restraint is placed in a rear seat of the vehicle and is put in the rear or forward facing configuration based on the size and weight of the child. Then, it is secured to the seat of the car using the seatbelt through the belt routings on the device. The harness is adjusted and locked in place at the buckle.

Development stage

We have fabricated and dynamically tested an initial prototype. It was tested in the forward and rear facing configurations in a 49 km/hour test in accordance with Federal Motor Vehicle Safety Standard 213 (FMVSS 213). The prototype passed all of the major FMVSS injury criteria with the exception of the head excursion limit. We are currently developing a second prototype to address this issue, to be tested in February 2011.

Future work and challenges

We need to develop a prototype that successfully passes all U.S. FMVSS 213 and ECE R44 criteria. Subsequently multiple prototypes need to be tested to ensure they pass consistently. Business contacts in the region of interest fit for implementation need to be established and a business and cultural implementation plan developed. Another challenge will be raising awareness of the importance of using child restraints.

Use and maintenance

User: Self-user

Maintenance: User

Environment of use

Requirements: The child restraint can be used in any vehicle in which a safety belt is available to secure the restraint to the vehicle seat. The child restraint should not be used in a front seating position that is equipped with an airbag.

Product specifications

Dimensions (mm): 730 x 430 x 630

Weight (kg): 7.36

Life time: 5 years

Retail Price (USD): Expected max. 20 (mass manufactured)

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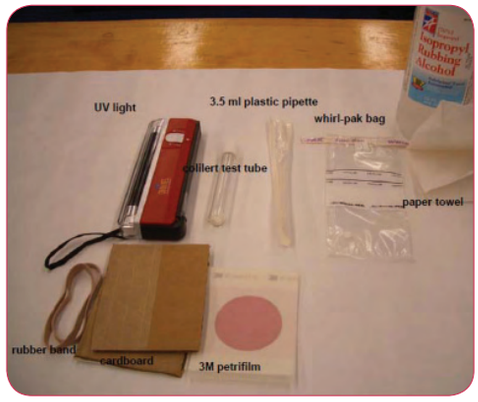
Microbial water testing kit

Country of origin | United States of America

Health problem addressed

According to WHO, 1.8 million people die each year of diarrheal diseases, the majority of whom are < 5 years old. One step towards addressing this problem is having simple, low-cost methods to determine drinking water safety. Current methods of testing are expensive, require complex lab set-ups and trained technicians to conduct tests.



Product description

The kit is designed for users to easily complete microbial water testing under field conditions in the developing world. The kit consists of the 10 ml colilert test, 1ml petrifilm test, sterile sampling bag, sterile, individually-wrapped, graduated 1 mL pipettes, a blacklight, cooler bag, icepack, a wastebelt incubator and simple instructions.

Product functionality

The product contains two tests that together check for total colifoms and E. coli, standard indicators for microbial water quality in a statistically significant manner. The colilert test consists of a tube to which 10 ml of water is added where the petrifilm requires just a 1ml addition to its film. Both tests are incubated for 24 hours.

Developer's claims of product benefits

This product can be used by professionals and untrained individuals alike, empowering communities to take control of their own water sources. Both tests and the kit as a whole have been demonstrated to correlate in a significant way to the other product standard at a fraction of the cost.

Operating steps

Collect a sample water using the sterile sampling bag. Keep on ice if not tested immediately. Open the Colilert tube and add 10 ml of the sample. Cap and shake. Using a 1ml pipette, add sample water to the petrifilm. Roll the cover over the surface to minimize air bubbles. Place both tests in your wastebelt incubator for 24 hours. Read results.

Development stage

The original invention is by Prof. Robert Metcalf, with contributions made by Susan Murcott to improve to portability of the kit. The product has been promoted in Kenya and distributed widely among student and faculty groups at MIT, Harvard & SUNYover the past three years for testing in developing countries. In 2010, Chuang, P., a MIT Masters student, compared the results of this kit to others in over 550 samples from the Philippines and Boston, MA. Currently these kits are being distributed on a small scale by Susan Murcott; there are efforts underway to move toward commercialization and increased capacity of production.

Future work and challenges

Currently we are looking for assembly facilities in China or India in order to be able to meet large scale demand by the fall of 2011.

Use and maintenance

User: Professionals and untrained users alike

Training: Basic demonstration of proper execution and interpretation of the test. Approx. 20 min.

Maintenance: Technician

Environment of use

Setting: At home and primary health facilities in rural and urban settings.

Requirements: No lab facilities required. If a lab is available, an incubator can be used instead of the waistbelt incubator, electric incubation is not required for obtaining proper test results.

Product specifications

Dimensions (mm): 300 x 150 x 180

Weight (kg): 1.36

Consumables: All items in the kit except the cooler, icepack, blacklight and waistbelt incubator are consumables.

Shelf life: Months

Retail Price (USD): Varies on kit size. $47 (10 tests), $146 (25 tests), $253 (50 tests), up to $466 (100 tests).

Other features: Portable; cooler, icepack, blacklight and waistbelt incubator reusable.

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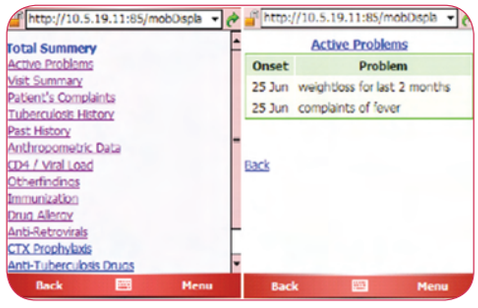
Please see disclaimer on following page

Mobile health record system for pediatric HIV

Country of origin | India

Health problem addressed

2.5 million children globally are living with HIV infection. Most live in resource limited settings. The global community has committed to make HIV targeted therapy available to infected children. With this, HIV infection can become a chronic manageable medical condition for these children. Unfortunately these children often face a fragmented health system that is not designed for chronic care management.



Product description

The device is a web based electronic health record system embedded with a comprehensive pediatric HIV knowledge base and clinical decision support system, including automated weight based dosing of ART. It allows clinicians to integrate vital pieces of clinical information to manage pediatric HIV at the point of care. It has a novel architecture to ensure secure access over a desktop or mobile device.

Product functionality

The system is installed on a remote server. Users access it over the internet or mobile phone network. Access is password protected. One can use a PC, PDA, or mobile phone to retrieve or record patient data from the point of care. Data can be text, image, dicom, audio, or video. SMS alerts can be sent as well. Off-line browsing, data capturing store and forward technology allow for use in low speed internet settings.

Developer's claims of product benefits

A lack of patient centered point of care information is a major barrier to the provision of quality care. Pediatric HIV is a chronic disease; it requires the collection, preservation, evaluation and synthesis of a large amount of data over time. This information has to be available at the point of care. Making this possible is crucial. Electronic health records (EHRs) can help organize clinical information systems, and provide point of care clinical decision support. Smart EHRs can be a vital tool when health care delivery is fragmented and providers have varying expertise. With that in mind we designed this smart, web based EHR, with built in clinical decision support and an interface for mobile devices, for the management of pediatric HIV.

Operating steps

Users are doctors, data-entry operators, counsellors, and administrators. Use is password protected. Users access the system with desktop, PDA or mobile phone to retrieve and enter patient data including medical images. The modular design of the system reflects the clinical encounter. For example, a patient's weight is automatically used to prompt the clinician in choosing appropriate dosing of drugs.

Development stage

Currently the system is being piloted at the Regional Pediatric ART Center Medical College Kolkata. Over three hundred children are registered in the system. Evaluation of the effectiveness of the system is planned on four dimensions: system quality, information quality, service quality and user satisfaction.

Future work and challenges

We would like to pilot test the system in other centers that provide care for children with HIV infection. Our major challenge is to make the connections with interested stakeholders. Capital for sustaining manpower to work on the project is also a major challenge.

Use and maintenance

User: Nurse, midwife, physician, technician

Training: Orientation to the use of the system.

Maintenance: Technician

Environment of use

Requirements: Standard domestic power and clean environment for computers, internet connection of minimum 256 kbps, UPS for power backup. In the absence of dedicated LAN connectivity for the server, dial-up or mobile phone-based link to the internet.

Product specifications

Other features: System comprises software and is compatible with telemedicine systems.

Portable and reusable.

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Please see disclaimer on following page

Mobile phone image transmission for diagnosis

Country of origin | Italy

Health problem addressed

Limited training and geographical isolation of laboratory technicians (and health workers in general) in remote, underserved areas severely affect quality of diagnosis, hence of control and therapy of many diseases. In most cases, diagnostic confirmation relies on slow, unaffordable, unpractical or inappropriate technologies.

Product description

Our solution allows to directly capture high quality images from optical eye piece of a microscope or other optical devices with a camera-integrated m-phone (with no additional adaptors or devices) and to send them as MMS via mobile phone network to distant diagnostic centres for prompt diagnosis or second opinion.

Product functionality

The m-phone with integrated camera functions as image transmission unit. It offers a possibility to connect basic health care facilities in remote areas with more specialised health care facilities in the field of medical image diagnostics.

Developer's claims of product benefits

Existing integrated optical-digital devices and digital cameras, requiring a computer with access to broad band internet connection, are not readily available, bulky, complex to use and expensive, especially in low resourced contexts. Alternative ad hoc devices, such as microscopic optical extensions of m-phones and m-phone-to-microscope connectors are unnecessary and unpractical. Our solution presents a cheap, appropriate option, requiring only the existing microscope (or other optical instrument) and any camera-integrated m-phone with access to MMS network. User-friendly, readily available and easy to maintain, it represents an appropriate solution in most isolated settings.

Operating steps

The image of the field under observation is taken by slowly approaching the lens of the m-phone's camera to the eyepiece of the microscope (or other optical instrument) until a satisfactory image is shown on the screen. Once taken, the picture is sent as an MMS to a distant diagnostic centre for second opinion.

Development stage

The application of the methodology to tele-microscopy has been first described by Bellina L. and Missoni E. in 2009. Subsequent field studies (Bellina L. and Missoni E. 2010) demonstrated its feasibility in most disadvantaged rural settings (Uganda and Bangladesh). Testing of further clinical applications is underway.
Regulatory process: The technique relates to the combined use of existing and readily available products. The regulatory framework of those products applies.

Future work and challenges

The mobile diagnosis has to be integrated in the normal diagnostic procedures and data flow of local health systems including availability of expertise for remote second opinion
and immediate feed-back. Further studies are required for the development of the appropriate ITC network and management system.

Use and maintenance

User: Nurse, midwife, physician, technician

Training: Basic instructions (approach to light beam, centering image, avoiding external light interference, etc.) and less than half an hour trials for good results are needed.

Maintenance: Nurse, physician, technician

Environment of use

Requirements: The technology requires stable power supply for microscope and mobile cell phones, and access to a cell phone network providing MMS.

Product specifications

Consumables: None

Other features: Portable and reusable. Runs on batteries and is compatible with telemedicine systems.

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http://www.who.int/medical_devices/en/index.html

Please see disclaimer on following page

Mobile phone pulse oximeter

Country of origin | Canada

Health problem addressed

Hypoxemia is a common complication of childhood infections, particularly pneumonia. Pneumonia impacts developing countries disproportionately, and accounts for over 2 million deaths a year worldwide. Hypoxemia is a recognized risk factor for death, and correlates with disease severity and is difficult to detect until onset of cyanosis.

Product description

The phone oximeter has been developed using a commercial wireless pulse oximeter and custom software for smartphone or laptop computer. User friendly software has signal processing algorithms for oxygen saturation, respiratory rate, and heart rate from the plethysmographic waveform. Clinical rules and the training module are under development.

Product functionality

The phone oximeter combines a pulse oximeter sensor and module with a mobile phone. Our pulse oximeter device conveys the quality and trend of physiological data through its user interface. The ease of use, presentation of warning signals and reliance on symbols mean that it can aid clinicians in detecting clinical events and clinical decisions.

Developer's claims of product benefits

Pulse oximetry is not widely used in developing countries. Current devices are expensive and designed for use by clinical experts. Inadequate financial resources, infrastructure and a trained workforce are factors that have impeded adoption. The cost could be significantly reduced by using personal communication devices such as mobile phones to process and display information. The goal of this project is to demonstrate the potential for automated interpretation of information collected from a pulse oximeter. The display will minimize the need for training in interpretation, optimize the use of information in the pulse oximetry signal and provide intelligent interpretation of results.

Operating steps

The phone oximeter is a pulse oximeter that uses a mobile phone to intelligently analyze and creatively display the information received from a sensor placed on the finger.

Development stage

The device has undergone interface usability testing in Vancouver, Canada. For further usability tests, we have sent a team to Mulago Hospital in Uganda. There is development on the software and hardware aspects to include other physiological parameters. The decision support tools are functioning. Automated capillary refill time algorithms and interface have been developed. Publications, conference posters and presentations have all been well received by the academic community.

Future work and challenges

Further financing for development and evaluation of the device and software is required. Funding is currently limited to seed funding for the development and evaluation of the prototype for use during anesthesia in a hospital setting. Grant applications have been submitted. Development of a low cost sensor is of utmost importance. We are currently conducting R&D to create this sensor.

Use and maintenance

User: All

Training: None

Maintenance: Local support services for phones.

Environment of use

Requirements: Mobile phones are widely available in many developing countries. Mobile phones have high efficiency power storage, an integrated display and processing power to analyze the pulse oximeter signals.

Product specifications

Dimensions (mm): 100 x 50 x 10

Weight (kg): 0.25

Consumables: None

Life time: >5 years

Other features: Portable and reusable. Runs on batteries, uses software and is compatible with telemedicine systems.

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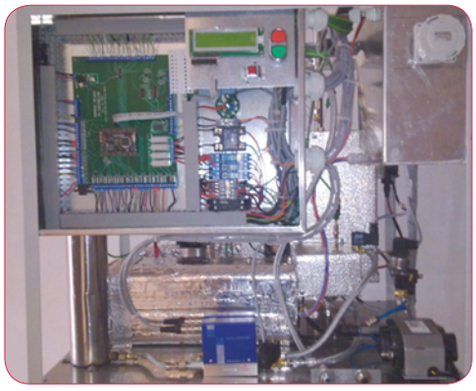
Please see disclaimer on following page

Off-grid refrigerator

Country of origin | Greece

Health problem addressed

In many areas of the globe, especially Africa and Asia, many towns and communities are without electricity network, while in others it is very weak. This creates problems in the long -term storage of pharmaceuticals, reagents, blood, vaccines, samples, etc.



Product description

The product consists of a refrigerator powered by batteries which are continuously charged by a fuel cell. The fuel cell uses hydrogen produced on the spot from LPG (Liquefied Petroleum Gas) which is widely available, safe, easy to transport and handle, and with which nearly all people are familiar.

Product functionality

A power system of approximately 300 W, consists of a fuel cell and a fuel processor. The fuel processor produces hydrogen by reaction of LPG with water (recycled) and feeds the fuel cell, producing the required power which feeds the battery. The system powers continuously the refrigerator and other applications, as needed (i.e.. telephone center).

Developer's claims of product benefits

The proposed system offers significant advantages over diesel generators (three times higher electrical efficiency, no noise or vibrations, low maintenance requirements, high reliability, etc.) or photovoltaics (continuous power supply, independent of weather conditions, more economical). The refrigerator - battery - fuel cell power system are highly integrated and controlled in an automatic fashion, while they can be monitored remotely. Maintenance is minimal (no moving parts) and is done in pre-defined intervals while reliability is high. The power system can be used simultaneously by other applications. The device is safe and requires no skilled personnel.

Operating steps

The system is autonomous, requiring only periodic supply of LPG. Water is recycled within the system. It operates with automatic control, requiring no personnel involvement. Maintenance is done at specific intervals, every few years. A plug power outlet (110 or 220 VAC) is available for other uses.

Development stage

Proof of concept has been completed successfully by prototype systems. Testing of the systems took place at normal as well as extreme conditions (of heat and humidity). The next step is field testing. It is proposed to build a number of such systems and place them in various locations. Furthermore, industrialization studies will be completed and regulatory approvals and permits will be obtained.

Future work and challenges

The next step toward implementation of the proposed system application is field testing. The challenge is to obtain the necessary funding and collaborating institutions to place units in remote locations in Africa and Asia. Successful field testing should be followed by mass production in order to decrease cost. For this step it is anticipated that investors will be found, especially since many other applications can be identified.

Use and maintenance

User: Nurse, physician, technician

Training: None

Maintenance: Technician

Environment of use

Setting: Rural. Primary and secondary health care facilities.

Requirements: System requires only supply of LPG. Location of installation must be accessible by truck to transport LPG bottles.

Product specifications

Dimensions (mm): 600 x 600 x 1000

Weight (kg): 50

Consumables: Liquefied Petroleum Gas (LPG)

Retail Price (USD): 4000 - 4500 (at manufacturing stage)

List price of consumables (USD): 0.4 /kW-h or 2 /day

Other features: Not portable. Reusable.

Year of commercialization: 2012 (expected)

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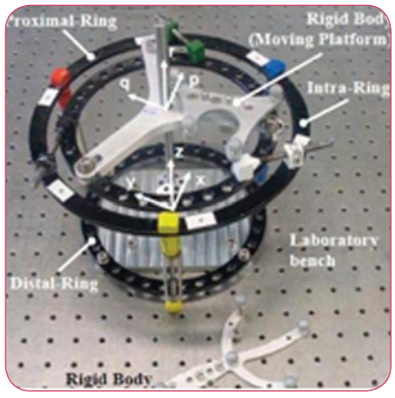
Please see disclaimer on following page

Orthopaedic external fixator

Country of origin | Germany

Health problem addressed

The use of an external fixator for fracture reduction as well as correction osteotomies of deformed long bones represents an established method in the area of orthopaedic and traumatologic surgery. The aim is the reconstruction of a physiologic bone geometry and a preferably fast, save and painless bone healing.



Product description

The device is an external fixator design concept for bone fracture stabilization and gradual deformity correction based on a 3RPS spatial + 3RPR planar manipulator that can be locally produced in developing countries. The struts length can be adjusted to software that takes into account the biomechanical limitations of tissues. A hand-made laboratory sample was manufactured with a cost of the materials of 9€.

Product functionality

After fracture or correction osteotomy the external fixator is connected to the bone segments with pins and/or wires. In case of a correction of the bone geometry, the position and strut lengths of the fixator system are entered in the open source-software that computes the required movement of the bone segments via change of strut lengths with respect to biomechanical limitations.

Developer's claims of product benefits

The developed system is much cheaper compared to external fixator systems with six degrees of freedom in industrial countries. The technical detail data and the computation program will be provided as open source, so the complete system can be locally produced and operated in developing countries.

Operating steps

Connect the wires and/or pins to the bone segments, connect the fixator parts to the wires/pins until the structure is complete, in case of deformity correction: measure the geometry of the fixator and the bone segments, enter the data in the software, software computes the strut lengths for the treatment, change strut lengths, remove fixator after the bone healing is completed.

Development stage

The concept was developed for the use in least developed countries (LDCs). A hand-made laboratory sample was manufactured with low tech materials. The price for the required material was about 9,- €. Software for the computations of the strut lengths was developed and experiments were performed to prove the capabilities of the design using an optical tracking system. The accuracy of the systems was satisfying.

Future work and challenges

In the study it could be shown that the positioning and mechanical properties of the fixator is satisfying. The next steps should include clinical trials to evaluate the biomechanical properties. After continuative clinical trials the applicant is willing to provide all required technical information as well as the computation program as an open source and the patent license for use in LDCs.

Use and maintenance

User: Patient, physician

Training: The positioning of the pins and wires requires the knowledge of an orthopedic physician.

Maintenance: patient, medical staff, technician

Environment of use

Requirements: Radiology device, orthopedic physician, sterile environment

Product specifications

Dimensions (mm): max 350 x 350 x 500

Weight (kg): max 3

Consumables: Sterile pins and wires

Life time: Several years

Other features: Portable and reusable. Uses software, compatible with telemedicine.

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Please see disclaimer on following page

Pedograph

Country of origin | Bangladesh

Health problem addressed

Diabetic patients lack nerve sensation and hence develop ulcers in soles due to localised high pressure. Eventually these turn to gangrene and need leg amputation. If the high pressure points can be located and assessed early, shoe soles can be designed to spread the pressure which may prevent ulceration.

Product description

An optical sensor has been improvised which together with a computer provides a video of colour coded dynamic foot pressure distribution. A composite image is also provided. At selected points (6 points in the prototype) the time variation of pressure is shown graphically

Product functionality

Light is passed through a thick transparent plate having a white cover above. At points of pressure on the cover, total internal reflection breaks down and light rays coming out are scattered down to a video camera placed below. The software processes the video data and creates an artificially colour coded contour image and graphs of pressure.

Developer's claims of product benefits

Commercial pedographs are difficult to afford and access in the Third World. The improvised version presented here can be made in the Third World and offered cost-effectively. It is also simple to use and robust. A diabetic hospital in a Third World country is using a prototype for patient assessment regularly for more than a year. It uses a standard Personal Computer. Maintenance and repair are also simple.

Operating steps

First a video of the pressure distribution of a walking foot is taken through computer command. Next the software is initiated to give the desired dynamic colour contour images and the time variation of pressure at points selected by mouse clicks. Patient ID is also entered.

Development stage

The prototype is under field trial in a hospital for about a year and is working satisfactorily. The hardware and the software both are mature. No regulatory approval has been sought so far. Product trial: Since January 2010 at Baqai Institute of Diebetology and Endocrinology, Baqai Medical University, Karachi, Pakistan. More than 150 patients have been studied so far. No comparison could be made with available commercial equipment. Calibration performed using basic principles of Physics.

Future work and challenges

It is ready to be commercialised. However, it needs to be compared with a standard device regarding its absolute values of pressure calibration. There is no risk involved. The device is not well known in low and medium income countries. Therefore, promotion of its necessity and use is necessary among the doctors in these countries.

Use and maintenance

User: Technician

Training: On job training, one day.

Maintenance: Technician

Environment of use

Setting: Urban in secondary and tertiary health care facilities.

Requirements: Typically mains ac power supply, 220V +/-15%. It includes a personal computer (desktop or laptop). However, battery operation (using a rechargeable battery) is possible if using a laptop computer. (Power requirement: 15W at 12V excluding that for the laptop).

Product specifications

Dimensions (mm): 750 x 500 x 500

Weight (kg): 25

Consumables: none

Life time: 15 years

Retail Price (USD): 6000

Other features: Reusable. Runs on batteries, uses software and is compatible with telemedicine devices.

Currently sold in: Pakistan (product trial)

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Please see disclaimer on following page

Point-of-use water purifier

Country of origin | Switzerland

Health problem addressed

Endemic diarrheal disease, caused by waterborne bacteria, viruses and protozoan parasites, is a leading cause of mortality or morbidity in the developing world, affecting 4 billion people leading to 1.8 million lives lost (WHO 2007, combating waterborne diseases at the household level).

Product description

The water purifier physically removes waterborne bacteria, viruses and protozoan parasites from water flow circulating in the device (antimicrobial efficacy LRV: Escherichia coil > 6; MS2 virus> 4; Cryptosporidium oocysts > 3). Furthermore, the water purifier reduces turbidity by filtering particles larger than 0.02 microns.

Product functionality

The water purifier employs a backwashable hollow fiber ultrafiltration membrane and is designed to mechanicaily remove enteric pathogenic bacteria, viruses, protozoan cysts and turbidity from drinking water without electric power. Water is pushed though the ultrafiltration membrane through gravity (1m water column).

Developer's claims of product benefits

The inside-out flow characteristic of the hollow fibers in the water purifier allows an optimal longevity of the product. This specific configuration together with a specific design of the product allows an easy cleaning of the ultrafiltration membrane. The device therefore works efficiently with turbid water, over the long term.

Operating steps

Prefilter removes particles larger than 80_m. Gravity pushes the water down the plastic hose towards the purification cartridge. The purification cartridge, which contains an ultrafiltration (hollow-fibre) membrane of 2Onm porosity, stops all solid particles (microbes: bacteria, viruses, protozoan parasites and turbidity).

Development stage

The water purifier is commercially available and has been used in emergencies such as in Indonesia, Haiti, Pakistan as well as programs in Kenya. It has been technically evaluated and tested in low-income settings. Regulatory approval is completed. Free sales certificate available in Vietnam.

Future work and challenges

-

Use and maintenance

User: Self-user.

Training: Owner's manual.

Maintenance: Self-user.

Environment of use

Setting: Rural and urban. At home.

Requirements: Attach the device to the wall or to the ceiling at home.

Product specifications

Dimensions (mm): 1700 x 190 x 170

Weight (kg): 0.53 (dry)

Life time: 3 years

Shelf life: 2 years

Other features: Portable and reusable.

Please see disclaimer on following page

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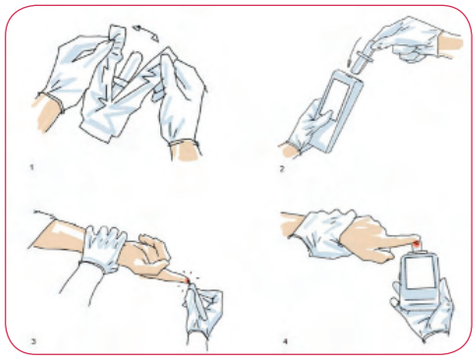
Portable cell sorting and counting device

Country of origin | Italy

Health problem addressed

Developing countries are suffering most from the two global diseases HIV/AIDS and malaria. A great bottleneck is the lack of dedicated, mobile, robust, easy-to-use and low cost diagnostic equipment for CD4+ T cell enumeration and for the counting of parasitized erythrocytes in the blood, respectively.



Product description

An integrated solution for cell counting is proposed to bring innovative techniques directly to where they are needed most. It relies on dielectrophoresis, a method for cell handling and sorting without physical contact, exploiting the dielectric properties of cells suspended in a microfluidic sample under the action of electric fields.

Product functionality

A silicon-based platform has been developed with microfabricated electrodes customizable for specific diagnostic needs; the non-uniform electric field for cell manipulation is generated by microelectrodes, patterned on the silicon substrate of microfluidic channels, using microelectro-mechanical-systems (MEMS) technology.

Developer's claims of product benefits

The number of CD4+ T cells per microliter of blood is used for HIV staging. The standard for cell enumeration is flow cytometry of lymphocyte subpopulations using antibodies. Although high throughput and accurate, its cost and technical requirements have limited its use in resource-limited areas worldwide. A simple and portable microfluidic lab-on-chip device would be of great benefit.

Malaria diagnostic indicator is the counting of parasitised erythrocytes in the blood. Microscopic inspection of blood smears for parasitised cells is the most applied diagnostic method. Integrated mobile diagnostic lab-on-chip instruments, small, robust, automatic and low-cost would be of great benefit.

Operating steps

The lab-on-chip will be pre-charged with the requested reagents. A drop of blood will be introduced and processed by dielectrophoresis. Integrated electronics will elaborate and show the results. The lab-on-chip core will be a disposable cartridge, while the handheld reader will be reusable for the following diagnostic tests.

Development stage

A modular platform based on a silicon substrate has been developed. It is composed of functional units with different electrode geometries. Characterization modules allow the determination of cells' dielectric properties, while manipulation stages perform basic operations as cell filtering, focusing, caging, deviation and concentration. The modules can be rearranged on a single chip and produced with a standardized, cost-efficient technology. Custom electronics for electrodes excitation have been developed, with a custom optical unit for replacing the traditional microscope and observing cells on chip. Preliminary testing experiments were performed using yeast cells and blood cells.

Future work and challenges

The solution is at a research stage and organized in functional modules for cell analysis, sorting and concentration arrangeable on a single chip depending on the target application. The company working on the project currently holds patents covering the technological background. For the specific applications of AIDS and malaria detection, further development is under evaluation and the role of possible third parties involved in the development of the project considered.

Use and maintenance

User: Nurse, physician, technician

Maintenance: No training will be required for maintenance of the technology: the lab-on-chip core will be a disposable cartridge, while the handheld reader will be reusable for the following diagnostic tests.

Environment of use

Setting: Rural and urban health care facilities, in the field.

Requirements: The lab-on-chip core operates cell separation. A sensor for cell detection can be included in the same package. Driving electronics can be assembled in a compact and battery powered handheld device.

Product specifications

Consumables: The lab-on-chip core will be a disposable cartridge.

Other features: The technology is portable, the cartridges single-use, the handheld reader reusable.

The technology utilizes software and may be battery-powered.

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Please see disclaimer on following page

Portable system for pre-cancer screening at point of care

Country of origin | United States of America

Health problem addressed

Today, more than 70% of the world's cancer deaths occur in developing countries, where more than 80% of patients present with advanced disease at the time of diagnosis. Advanced imaging tools are generally only available at regional centers in industrialized countries; in low- and middle-income countries, most diagnoses are based on clinical signs and symptoms. There is a demand for objective point-of-care cancer screening tools.

Product description

The device is a portable, battery-powered system to screen for pre-cancer at the point of care. The device is essentially a wide-field epi-fluorescence microscope coupled with a flexible fiber-optic imaging bundle (1 mm in diameter) that can identify the differences between normal and pre-cancerous epithelial tissues in situ.

Product functionality

After applying a fluorescent dye to the tissue to be imaged, the tip of a flexible fiber-optic bundle is placed on the tissue. Light emitted from the tissue returns through the same fiber and is imaged onto a digital camera. Images of cellular detail can be viewed in real-time on a computer screen and interpreted by a trained user for diagnosis.

Developer's claims of product benefits

In high-income countries, cytology or biopsy collection followed by histopathology processing is used to diagnose, and, in some cases, screen for disease. The process involves sampling, sectioning and staining tissue specimens prior to microscopic evaluation, which is highly resource intensive and provides diagnostic information at a single location and point in time. The high resolution microendoscope integrates in vivo microscopy and optical labelling to provide anatomical and functional indications of disease, enabling similar cellular-level diagnostic information to be acquired without the need to remove and process the specimen, and streamlining the process of diagnosis. Using the microsendoscope is cost-effective and has the potential to diagnose cancer in its early stages. Additionally, the device is portable and battery-powered.

Operating steps

A contrast agent is applied to the tissue site. The fiber-optic probe is placed on the site to obtain images of the cellular morphology. The images are presented on a computer screen in real time and interpreted by a trained user. The fiber optic probe is disinfected between each patient.

Development stage

Technical aspects of the product have been evaluated in the laboratory. Preliminary field testing of prototype versions of the product has been conducted in the US, China, Guatemala, and Botswana, establishing feasibility of the technique. In vivo cervical imaging studies have involved over 250 patients to-date, with microendoscope images and biopsies acquired at sites considered to be normal and abnormal by expert visual impression. Current evaluation of data from these sites aims to establish the diagnostic accuracy of the device relative to biopsy. Results are not yet available. The current version of the device is an advanced prototype. A patent is pending.

Future work and challenges

To make this technology available in the developing world, we need to secure the appropriate regulatory approval, and identify financing, manufacturing, and distribution partners. Depending on the site of the cancer, barriers to cultural and social acceptability would be similar to those associated with a standard gynecological exam.

Use and maintenance

User: Physician, technician

Training: Medical personnel experienced in cancer screening techniques will need additional training in interpreting the images to form a diagnosis. Personnel would also need training in proper cleaning and sterilization of fiber-optic probe end.

Maintenance: Technician, engineer

Environment of use

Requirements: The microendoscope can operate under existing infrastructure constraints. It is powered by a single 12V rechargeable battery for up to 6 hours. It requires connection to a laptop, personnel trained to interpret the images for diagnosis, and a method to sterilize the fiber optic probe.

Product specifications

Dimensions (mm): 254 x 203.2 x 50.8

Weight (kg): 2.27

Consumables: Contrast agents; cleaning supplies for fiber optic probe.

Other features: Portable and reusable. Runs on batteries, uses software, and is compatible with telemedicine systems.

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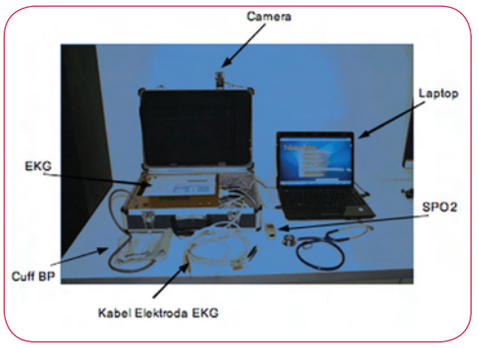
Please see disclaimer on following page

Portable telemedicine unit

Country of origin | Indonesia

Health problem addressed

Community healthcare services in rural areas are impeded by the scarcity in transport infrastructures, poor facilities, lack of medical experts, and limited communication means. This state leads to problems such as a high maternal mortality rate. And if there is a disease outbreak, it may not be easy to alleviate the situation.



Product description

The device is a portable telemedicine unit to be used in a mobile telemedicine system in conjunction with a PC server as a base unit. They communicate with each other via multi communication means, via GSM, CDMA, internet, and satellite. The device can be used for many health services, such as recording and reporting, and teleconsultation.

Product functionality

The device is set up with medical instruments, a camera, a notebook, and communication means. It can be placed in an ambulance or in remote community healthcare centres. The system operates in real time or indirect mode. Data transmission is done via a selected communication link which can be adjusted according to the communication facility available on site.

Developer's claims of product benefits

This device offers a number of advantages, i.e. the device is developed in a modular way, so it increases cost effectiveness since the user may select medical instruments based on her/his requirements. In addition, this portable telemedicine unit is provided with multi application features that can be developed together with the user, so it is more acceptable to the local context. Availability of multiple communication links within the device enables the system to transmit medical data via a variety of communication channels. Hence it alleviates the telecommunication infrastructure barrier that is usually found in rural areas. This will increase better healthcare accessibility for people in rural areas.

Operating steps

Set up the device which is linked to the base unit. The monitor will display the applications menu. Pick recording and reporting menu. Fill in the patient medical record. Measure patient biosignals and save the data. Select a communication link. Recorded data is sent to the base unit. A doctor will evaluate the data and give a response to the patient in the rural area.

Development stage

The system is currently being tested by users. A local hospital in Sukabumi serves as base unit. Community healthcare centres and a moving ambulance are the testing grounds. The test results show that the system is beneficial for supporting local community healthcare services. This year a limited number of devices will be produced by a local manufacturer. Mass production is planned for next year. Regulatory approval application is in preparation.

Future work and challenges

The biggest challenge to commercialize the product is to find a reliable investor who is willing to give financial support for mass production. Moreover, to deploy the product and the technology will require government policy to set up a national telemedicine network which lead to an eHealth application. In order to ensure user and patient safety, there must be a legal framework.

Use and maintenance

User: Nurse, midwife, physician, technician

Training: Required for training are the portable telemedicine unit, a PC and access to internet. Duration of the training is 5 days.

Maintenance: Technician, engineer, manufacturer

Environment of use

Setting: Ambulatory, primary and secondary health care facility in urban and rural settings.

Requirements: Stable power supply, maintenance personnel, specialized operator, access to internet, access to a cell phone network, laptop, hospital information system.

Product specifications

Dimensions (mm): 460 x 323 x 158

Weight (kg): max. 5

Life time: 5-10 years

Retail Price (USD): 5545

List price (USD): 5000

Other features: Portable and reusable. Uses batteries and software.

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http://www.who.int/medical_devices/en/index.html

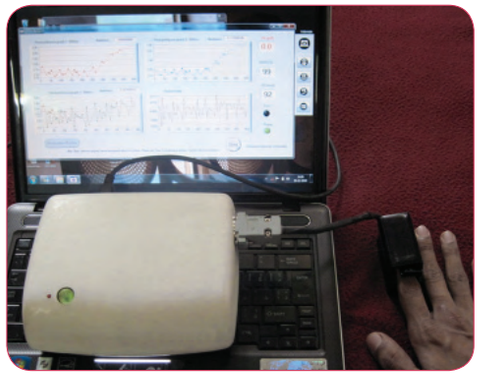
Please see disclaimer on following page

Portable transcutaneous haemoglobin meter

Country of origin | India

Health problem addressed

Anaemia affects nearly 1.62 billion people globally. It is responsible for nearly a million maternal and child deaths annually, mostly related to complications during pregnancy. Half of these are due to nutritional deficiencies and can be prevented by providing supplements, but blood transfusion is indispensable for the severely affected.



Product description

The proposed solution is a needle-free hand held device that can be used by a doorstep healthcare worker or a midwife to screen people for anaemia in low resource settings. With a negligible recurrent battery cost, it can scan for hemoglobin in less than a minute, classify the severity of anaemia that can be read out by even a low skilled personal.

Product functionality

Near infrared light scatters and penetrates the soft tissue well, making hemoglobin a good absorber. Using photo plethysmography and reflectance spectroscopy in a process similar to scanning, we establish the Hb absorption pattern for the patient that is mapped against a reference set and the corresponding value displayed as an objective reading.

Developer's claims of product benefits

Being non-invasive is the biggest advantage. No blood, no pain, no infections and instant results suggest better patient compliance, compliments anaemia surveillance and door-to-door screening. It is cost effective since it eliminates the need of consumables, processes like sterilization, lab and skilled human resource. Moreover, a hand crank and rechargeable battery system almost eliminate recurrent costs. It simplifies reporting by having an objective read-out that is easily comprehensible also by a mid-wife, to determine the severity of anaemia. Empowers the healthcare worker by reducing dependency on experts. A projected efficacy of 80% ensures its potential.

Operating steps

The patient sits in an upright position resting the hand close to the heart level. The finger is clean, dried and placed in the finger probe covering the base of light emitters and receiver. The patient is asked not to move or talk. The device is switched on and scans for a few seconds. Within a minute, the result is displayed on a screen.

Development stage

The device is in form of a testing kit that is plugged into a laptop. Data acquired through the device is transferred to the laptop for processing. In January 2011, we concluded pre-clinical testing; the initial results were encouraging but demand another sensor design iteration before entering clinical trials. Our next step is to introduce computational capacity within the device and make it independent of a PC. Prior to entering the recently concluded development cycle, validation studies were performed to demonstrate a proof of concept.

Future work and challenges

We need to generate sufficient funds to support a plethora of activities like clinical trials, furthering IP protection, manufacturing and testing. Finding partners who can collaborate with us, support us for pilot programs is a challenge along with in-house team expansion. Distribution of the technology is another challenge that we foresee.

Use and maintenance

User: Nurse, midwife, physician

Training: Training can be done in less than 30 minutes with introductions to use and handling of the device, which can be administered through a graphical brochure.

Maintenance: Technician, engineer, manufacturer

Environment of use

Requirements: Our experience tells us that the device does not perform well in air-conditioned or environments with significantly low ambient temperatures. We are working to improve upon it. Effects of humidity are yet to be studied.

Product specifications

Dimensions (mm): 203 x 153 x 51

Weight (kg): approx. 0.7 kg

Consumables: None

Other features: Portable and reusable. Runs on batteries and is compatible with telemedicine systems.

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Please see disclaimer on following page

Single-size contraceptive diaphragm

Country of origin | United States of America

Health problem addressed

Millions of women have an unmet need for family planning. Existing contraceptives are not appropriate or acceptable for all women. Some women cannot or do not want to use hormonal methods or intrauterine devices. Diaphragms can provide safe and effective contraception but are not widely promoted for a variety of reasons.

Product description

The diaphragm is a reusable, single-size, cervical barrier made of medical-grade silicone. Its nylon spring folds easily with half the force of a standard diaphragm, making it easy to insert and remove. User input in the design process led to unique features such as the grip dimples and a finger dome to improve ease of handling and use.

Product functionality

The diaphragm is inserted into the vagina before sex to cover the cervix. It is used with a contraceptive gel to block sperm and prevent pregnancy. The single-size device fits most women. Unlike traditional-sized diaphragms that come in multiple sizes, a pelvic exam is not needed to assess size and fit of the device.

Developer's claims of product benefits

The diaphragm is a reusable, single-size, cervical barrier designed to offer the same barrier protection as a standard diaphragm with improved user acceptability. The one-size device simplifies service provision; no pelvic fit exam required to assess size. The rim bends with gentle spring force that makes the device easy to insert and remove and comfortable to wear. The fingertip removal dome allows a finger or thumb to hook the rim for removal. Silicone is more durable than latex diaphragms. The device has an overall length of 75 mm and width of 67 mm.

Operating steps

Add contraceptive gel to the cervical cup. Compress the rim by squeezing at the grip dimples. Insert the diaphragm deeply in the vagina to cover the cervix. Push the front of the device up behind the pubic bone. Wear the diaphragm at least 6 hours after sex, but no longer than 24 hours before removing to wash the device.

Development stage

The diaphragm is at late-stage clinical validation translating into early introduction and market development activities. The design is the output of a user-centered development process including women and couples from multiple sites. Safety and acceptability studies have been completed in multiple countries. The contraceptive effectiveness study has been completed; results are anticipated in 2011. Regulatory applications for Europe and the United States are in process. Production scale-up under way at manufacturing facility.

Future work and challenges

Before inserting the diaphragm women are encouraged to wash hands. Women may need coaching/training to learn about vaginal anatomy to identify the cervix and the pubic bone, the two vaginal landmarks needed for positioning. Diaphragms are recommended for use with contraceptive gel to increase effectiveness. After removing the diaphragm, the woman washes the device with soap and water, and dries it before storing it in the carrying case. Storage temperature should be between 0-40 degrees Celsius.

Use and maintenance

User: Self-user, nurse, midwife, physician

Training: Clinical studies show that women can learn to insert and correctly position the diaphragm by reading the instructions for use. However, most women report they prefer some coaching from a health care provider or another woman who has used the device to confirm correct position and use.

Maintenance: Self-user

Environment of use

Requirements: Before inserting the diaphragm women are encouraged to wash hands. Diaphragms are recommended for use with contraceptive gel to increase effectiveness. After removing the diaphragm, it needs to be washed with soap and water, and dried before storing it in the carrying case. Storage temperature should be between 0-40 degrees Celsius.

Product specifications

Dimensions (mm): 75 x 67

Weight (kg): 0.008

Consumables: Contraceptive gel

Life time: 5 years

Other features: Reusable

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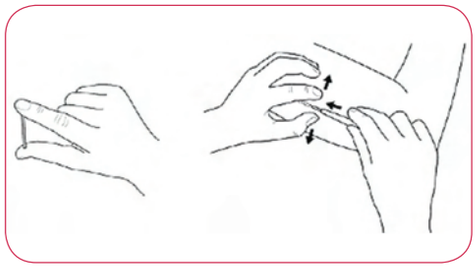
Please see disclaimer on following page

Subcutaneous drug delivery device

Country of origin | United Kingdom

Health problem addressed



Non-adherence to treatment is considered a major cause of inadequate tuberculosis (TB) treatment by the WHO. The problem of drug resistance arises from patients not completing the treatment course. There is a huge need felt for an assured way of increasing compliance; this will reduce the number of patients developing resistance and improve tuberculosis control programmes.

Product description

The need to enforce therapeutic compliance is addressed by creating a drug delivery system that can release the appropriate therapy over the full treatment period. The subdermal delivery system will release the proper drugs at a controlled rate, assuring proper treatment of affected patients at a target cost competitive with current treatment costs.

Product functionality

The multi-drug reservoir will contain the TB drugs arranged in the appropriate monthly dosage regimen for the treatment of tuberculosis. The implantable system will contain TB drugs encapsulated into responsive nanoparticles, which in turn release the TB drugs into the circulation in a continuous and controlled manner.

Developer's claims of product benefits

There exists no foolproof solution for assuring patient compliance. Without proper compliance to TB treatment there is increasing development of resistant TB strains. Multi-drug therapy for TB typically consists of two phases: the intensive phase, which is the first 2 months of treatment, and the continuation phase, which is the following 4 months. Our product will be targeted at the latter 4 months when lower and sustained drug doses are needed.

The technology is based on encapsulating the TB drug Isoniazid (INH) in a biodegradable polymeric matrix with slow drug release. We plan for the device to be biocompatible and biodegradable with compartments in a polymeric-based implant to release the drug in a sustained and controlled manor.

Operating steps

A local anaesthetic (2% xylocaine) may be injected in the area just before inserting the device to make it pain free. For the insertion of the device, the local health worker/nurse previously involved in delivering the TB drugs can be trained to insert the device. Designs are in process to make removal rapid with no complications.

Development stage

The product is in an early stage of the development process.

Future work and challenges

As an early stage concept, the biggest barrier we face is introducing a concept into developing countries and professionally training healthcare workers for inserting the device. We also believe that some education will be required to communicate the benefits of a subdermal drug delivery device versus the traditional oral medication to patients.

Use and maintenance

User: Nurse, physician

Training: 2-3 hour training session with demonstration.

Maintenance: Nurse, physician

Environment of use

Setting: Ambulatory, primary and secondary health care facilities in rural and urban settings.

Requirements: Access to a professionally trained healthcare provider.

Product specifications

Other features: Single-use

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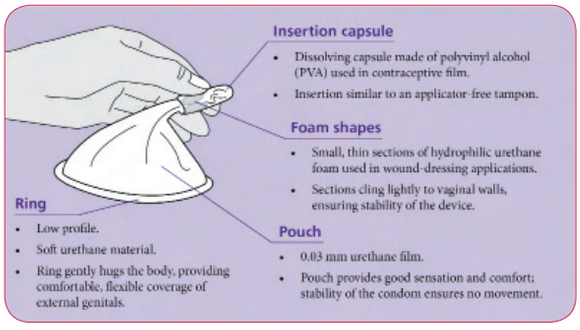
Please see disclaimer on following page

Woman's condom

Country of origin | United States of America

Health problem addressed

Couples need protection from sexually transmitted infections (STI) and unintended pregnancy. Women in particular need better protection options since they are more vulnerable to STI/HIV infection and bear the consequences of pregnancy. Many women cannot negotiate safe sex. Female condoms offer alternative protection when men refuse male condom use.



Product description

Product description (350)Woman's condom has a polyurethane pouch, a dissolving capsule made of polyvinyl alcohol, soft foam shapes adhered to the pouch, and an outer ring that keeps the pouch stable and protects the external labia. The device is a single-use device in a foil package. It comes with water-soluble lubricant applied at point of use.

Product functionality

The woman inserts the capsule into her vagina, it dissolves allowing the pouch to unfold. Small foam shapes on the pouch gently cling to the vaginal wall and keep the device from moving during sex. A ring at the open end of the pouch protects the external labia. The device is packaged with water-soluble lubricant applied at point of use.

Developer's claims of product benefits

The Woman's Condom is designed to be easy to handle and insert, stable in the vagina during use, comfortable for both partners, and with good sensation. The slim capsule makes the device easy to insert and holds the pouch discreetly until needed. It comes with lubricant, so the woman can apply the amount of lubricant she and her partner want.

Operating steps

Inserted into the vagina before sex. The Woman's Condom is designed to protect from both pregnancy and STIs. It is removed after sex. It is intended for only one use. The Woman's Condom is packaged unlubricated. User applies lubricant to inside of pouch before sex.

Development stage

The Woman's Condom is at late-stage clinical validation transitioning into early introduction and market development activities. CE Mark approval was granted in December 2010 based on compliance with ISO production standards. A clinical trial was completed in China and a regulatory dossier is under review. Clinical studies underway in the US include a comparative performance and failure mode study and a contraceptive effectiveness study. Production scale-up is underway to increase production and reduce product cost.

Future work and challenges

(1) Develop sustainable supply at a cost that meets price points required by the public sector for large scale procurement. (2) Balance production volume scale-up with private sector market development, as well as social marketing, and public sector programming. (3) Invest in market development, develop alternative distribution networks; invest in promotion/advocacy to effectively reach key market segments. (4) Develop coordinated mechanism for regulatory approvals to increase access. (5) Develop mechanism to aggregate.

Use and maintenance

User: Self-user

Training: Training tools are available from PATH.

Environment of use

Requirements: Female condoms require some coaching and counseling to learn to use comfortably and confidently.

Product specifications

Shelf life: 3 years

Other features: Single-use

Please see disclaimer on following page

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Commercialized

Birthing simulator for training

Country of origin | Norway

Health problem addressed

Appropriately skilled birth attendants could save the majority of the annual 350,000 maternal deaths. In order to achieve the UN Millennium Development Goal 5 of dramatically reducing maternal mortality by 2015, there is an urgent need to train large numbers of birth attendants in developing countries in Basic Emergency Obstetric Care.

Product description

The birthing simulator supports efficient training in Basic Emergency Obstetric and Newborn Care in developing countries. It allows the instructor to create very compelling simulations of normal to more complex birthing scenarios, and is particularly suitable for training control of post partum hemorrhage, the leading cause of maternal deaths.

Product functionality

Behind the birthing suit, the instructor can manually control: cervix dilatation, position of the baby, delivery of the baby, delivery of placenta, bleeding (amount and nature), uterus condition, and fetal heart sounds. These parameters can be combined to create situations and responses to interventions in all stages of labour.

Developer's claims of product benefits

The simulator is distinctively different from other birthing simulators available in the market. It aims to respond to the needs of a supportive device that can improve quality of BEmOC as presented in "International Journal of Gynecology & Obstetrics, by being highly realistic where essential (particularly in simulating post partum hemorrhage and uterus contraction) and culturally adapted. It facilitates effective communication training and integrated training with newborn routine care and resuscitation. It is flat packed for easy transport and storage, highly affordable, durable and easy to use.

Operating steps

The simulator is strapped on the instructor, who acts as the mother and sets the scenario and responds to the student's performance by manually controlling: cervix dilatation, position of the baby and placenta, delivery of the baby, delivery of placenta, bleeding (amount and nature), uterus condition, and fetal heart sounds.

Development stage

The simulator will be available for ordering in April 2011. It has been field tested in several countries, among others ind USA, Norway and (by Jhpiego) in Ethiopia andTanzania.

Future work and challenges

Financing: Although the product is highly affordable and available on not-for-profit basis, individual health care facilities and educational institutions in low-and middle income countries often have limited financial resources and may need to obtain funding from governments or international aid organizations.
Distribution channels: Bureaucracy and often prohibitive customs rates in importing such material to the countries where the need for these products is greatest.

Use and maintenance

User: Family member, midwife, nurse, physician

Training: None required.

Maintenance: Instructor in courses.

Environment of use

Setting and Requirements: Any setting, no specific infrastructure requirements. Access to 3-4 liters of water would be desirable to create simulated blood and to fill the newborn simulator with water.

Product specifications

Dimensions (mm): 400 x 260 x 520

Weight (kg): 1.6 (simulator), 4.2 (complete kit)

Consumables: None

Life time: 3 years

Retail Price (USD): 100

List price (USD): 100

Other features: Portable and reusable.

Year of commercialization: 2011

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Please see disclaimer on following page

Fetal heart rate monitor

Country of origin | United Kingdom

Health problem addressed

Every year 1 million babies die during childbirth. Complications during childbirth kill half a million mothers, and a further 1 million babies within a month of birth. Over 99% of these deaths occur in the developing world and many are preventable with timely detection of complicaitons.

Product description

Using advanced Doppler ultrasound technology the monitor detects and measures the fetal heart rate. This vital indicator of fetal stress allows rural healthcare workers to make life-saving decisions during childbirth. Destined for use in low resource settings, its design focuses on simplicity of use, durability and electrical power independence.

Product functionality

The fetal heart rate monitor is designed for ruggedness and simplicity of use, but its most distinguishing element is the human-powered electricity solution. By using the well-proven self-powered technology, simply winding a handle will charge the batteries. Each minute of winding provides about 10 minutes of monitoring time.

Developer's claims of product benefits

Fetal monitoring methods in low income countries are limited to Pinard fetal stethoscopes. Current availability of monitoring in the majority of primary and district care facilities in middle and especially low income countries being limited makes this monitoring unreliable. The accuracy of the Pinard is without much evidence indicating improved outcomes in situations of fetal distress. Doppler ultrasound fetal heart rate monitors are recommended but only 1 % of these devices worldwide are available in low income countries. Our device aims at a reduction in perinatal mortality and neonatal encephalopathy.

Operating steps

The powerful narrow beam Doppler head is placed on a pregnant woman's abdomen. The fetal heart rate is delivered as an audio signal and displayed as a number in beats per minute.

Development stage

Our fetal heart rate monitor won the Index Global Design Award in 2009 and has the potential to dramatically improve health outcomes especially for babies. Pilot field testing was carried out in 9 South African primary care maternity facilities run only by midwives (without doctors). The majority of the midwives who used the monitor preferred it to the Pinard as the device was easy to charge; it was very easy to obtain a reading and quick to identify the fetal heart rate within 30 seconds.

Future work and challenges

The fetal heart rate monitor is currently available and in production.

Use and maintenance

User: Nurse, midwife, physician.

Training: none.

Maintenance: Technician

Environment of use

Setting: Rural. Primary and secondary health care facilities.

Requirements: none.

Product specifications

Dimensions (mm): 170 x 85 x 75

Weight (kg): 0.7

Consumables: none.

Life time: 5 years

Shelf life: 3 years

List price (USD): 350

Other features: Portable and reusable. Runs on batteries. Uses software.

Year of commercialization: 2010

Currently sold in: United Kingdom, South Africa and other African countries.

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Please see disclaimer on following page

Isothermal nucleic acid amplification system for POC diagnosis

Country of origin | China

Health problem addressed

One major limitation of effective tuberculosis control is the lack of a suitable diagnostic technology. Current technologies, such as sputum smear microscopy, are insensitive; Immuno tests are indirect, and the available molecular tests are complex and expensive. It is the responsibility of scientific and business communities to provide rapid, simple, accurate and affordable technologies and products.

Product description

Our TB diagnostic is based on 5 core technologies: 1. Glass transition of reagents for ambient temperature transport/ storage; 2. Instrument free sample preparation; 3. Isothermal Nucleic-acid amplification; 4. Visual read-out: a DNA lateral-flow device (LFD); 5. Cross-contamination control device. The TB DNA test with these integrated technologies can be delivered and performed at almost any location.

Product functionality

Sample preparation: using syringe and a membrane unit, no centrifugation;
Amplification: proprietary Cross Priming Amplification (CPA) technology, water bath is the only instrument needed;
Lateral-flow strip detection: visual readout in an enclosed device, cross contamination proof;
Glass transition of reagents: the entire kit can be transported/stored at ambient temperature.

Developer's claims of product benefits

The amplification method (CPA) and cross-contamination proof detection device are the primary inventions. The glass transition method and sample preparation device are improvements on existing technology:
Cost effectiveness: No setup cost, almost no instrument cost;
Ease of use and Maintenance: Single test package, simple operation;
Reduced training Requirements: No highly trained personnel required;
Labour and time saving: Sample to result in 2 hours;
Reduced resource Requirements: The only equipment needed is a water bath maintaining a temperature around 63ºC;
Technical superiority: Detected 10 or less pathogens with high specificity;
Better accessibility: Shipped and stored at ambient temperatures;
Cross-contamination control: Sealed cartridge ensuring amplicon is never exposed.

Operating steps

Step 1: Sample preparation - Use our instrument-free nucleic acid extraction device. The process takes 15 minutes after sputum specimen liquefied and boiled;
Step 2: Amplification - Amplification can be accomplished with any incubator that keeps a constant temperature. CPA takes 60 minutes at 63 ˚C.
Step 3: Detection and read-out - Place the CPA reaction tube into the cartridge and lock. Read result in 10 minutes.

Development stage

The Isothermal Amplification Diagnostic Kit was approved by TUV for CE marking. The manufacturing facilities are EN ISO 9001:2000 and EN ISO 13485+AC:2007 approved.
One example of product trials conducted: Taipei Medical University - Municipal Wan Fang hospital. Sensitivity: 99%, Specificity: 94%, PPV: 97%, NPV: 97%

Future work and challenges

Market education: The technologies are new and little known. It requires significant effort to educate users, promote products and gain acceptance. Regulatory approval: The product obtained CE mark for our TB tests. Entry approval from individual governments is still needed requiring time and resources. Network: A network for distribution and demonstration, covering health centers in developing countries, needs to be established.

Use and maintenance

User: Nurse, physician, technician

Training: Product brochure, instruction for use, actual testing kits. Training takes about 3 hours.

Maintenance: Nurse, physician

Environment of use

Setting: Rural and urban health care facilities.

Requirements: The assays can be used at community health centers with minimal or no lab infrastructure, and can be performed by personnel with minimal training; water and method to boil for bacteria decontamination, water-bath to maintain temperature between 58 to 65C, and temporary electricity (battery/solar) are required. Long-term storage at larger clinics would need to transport the devices to hard-to-reach areas.

Product specifications

Weight: 500g/20 tests

Shelf time: 1 year

Consumables: Pipette tips

Retail Price (USD): $6 (including sample preparation, amplification and detection)

Other features: The diagnostic test is portable and single-use.

Year of commercialization: 2009

Currently sold in: China, Thailand, Singapore, Taiwan, Canada and USA (research only).

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Please see disclaimer on following page

Manual wheelchairs and mobility devices

Country of origin | United Kingdom

Health problem addressed

An estimated 20 million people in need of a wheelchair in low-income countries do not have one. Many donated wheelchairs are unsuitable for the local terrain, do not fit properly and do not provide adequate comfort or postural support. These factors can restrict a person's mobility, hinder their health and well-being and even cause life threatening secondary complications such as pressure sores.

Product description

The technology encompasses a range of affordable, good quality 3-wheel and 4-wheel wheelchairs, sports wheelchairs, supportive seating and tricycles specifically designed for use in less resourced settings. The products are available in a range of sizes and have many adjustable features. Each product is flat-packed, requires local assembly and must be distributed through a wheelchair service.

Product functionality

Products in the range require assembly by trained local staff. Basic hand tools are required and pictorial assembly instructions for each product are provided. Once assembled to the client's prescription, the client is fitted comfortably and given instructions on how to use the product safely and carry out basic maintenance. The products are manual and easy to maneuver by the client or an attendant.

Developer's claims of product benefits

The complete product range can be uniquely shipped in any volume to service centres around the world and provides a means to facilitate and expedite the provision of appropriate manual wheelchairs in low-income countries. Providing a range promotes choice for people with disabilities and ensures they receive a product that is most suited to their need and aids their rehabilitation. The products are affordable, high in quality and durability and use locally available components. The adjustable features optimize comfort. The majority of products are supplied with a pressure relieving cushion, a life saving device that is often not provided with other donated wheelchairs. Training is provided to local staff to ensure they have the skills to assemble, fit and adjust the products correctly and competently.

Operating steps

The products are assembled according to the assembly instructions. Once set up the client is fitted with the wheelchair or mobility device. If necessary, adjustments can be made to maximize comfort, for example the footrest, backrest height or seat depth can be altered. Once the client is happy, he or she is then able to self-propel manually or can be assisted by an attendant.

Development stage

The first product commercialized is the wheelchair for rough terrain, on the market since 2005. However, design reviews and upgrades are carried out periodically. Studies were carried out in South Africa to measure the impact the product has had on the quality of life of users. Two international NGOs have performed their own successful trials in Angola and the Philippines over a six and two months period respectively. The product is distributed to over 20 countries. The range includes other commercialized mobility devices and accessories. The product has regulatory approval.

Future work and challenges

Challenges include: Provision of products to the end user (client) is heavily dependent on donated funds; competition from other products on the market that are donated to organizations and end users free of charge; capital to maintain stock of products to enable quicker dispatch from factory.

Use and maintenance

User: Patient, familiy member, clinician, technician

Training: Training is required to assess the client and assemble the product. Training for the full product range is a minimum of three days. Basic workshop hand tools and clinical equipment such as a therapy bed and foot blocks are required.

Maintenance: Patient, technician

Environment of use

Requirements: The product must be distributed through a service centre where local staff have been trained to assess wheelchair users and assemble and fit the products. A workshop and clinical assessment areas are required. The centre will act as a point for clients to return to for follow up and product maintenance or repairs. The products are manual and do not have any special operational requirements. The ease of use of the product can depend on the local infrastructure i.e. often buildings are inaccessible so may prevent the user from independently accessing the building.

Product specifications

Dimensions (mm): approx. 1212 x 740 x 865

Weight (kg): 22

Life time: 5 years

Retail Price (USD): 171

Year of commercialization: 2005

Currently sold in: Argentina, Australia, East Timor, Ethiopia, Ghana, India, Kiribati, Lebanon, Lesotho, Liberia, Malawi, Nepal, Pakistan, Papua New Guinea, Serbia, Sierra Leone, Solomon Islands, South Africa, Sri Lanka, Sudan, Thailand, Uganda, Zimbabwe

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Please see disclaimer on following page

Medical data communication system

Country of origin | United States of America

Health problem addressed

Access to medical opinion by cardiovascular specialists can be difficult to obtain in rural or poor areas. As a result, medical data obtained at the point of care such as EKG's, medical images, lab results or any other type of information cannot be adequately reviewed by the required clinicians and appropriate treatment cannot be prescribed.

Product description

The medical communication system is a technology that allows any type of medical data to be transmitted from the point of care to the desired specialist(s). The data is transmitted securely and rapidly for delivery to mobile devices or computers so that physician's can review the data and provide opinions.

Product functionality

The system is a proprietary push delivery and review platform allowing remote review using the internet and cell phone network of EKG's/medical images. Medical data is recorded at the point of care and then uploaded to the system's server from which it is then delivered to a physician's smartphone or PC. The transaction is fully traceable and secure.

Developer's claims of product benefits

Current practice includes mailing video tapes, DVD's or faxing data to desired physician. These methods suffer from systemtic insufficiencies and are slow and non-traceable. Our system offers a technically sound and more accessible solution. Given the prevalence of cell phone networks and the internet it is easily reachable.

Operating steps

Data is acquired at the point of care and uploaded to a secure server. Physician reviews data and has the option to respond back to the point of care or forward to a colleague. Physician can review data on their smartphone or PC as convenient.

Development stage

Has been in technically evaluated. Has been in production for over two years. System is classified as a hospital IT product. System conforms to DICOM standards.

Future work and challenges

Product is commercialized.

Use and maintenance

User: Nurse, physician, technician.

Training: Web based and/or self training CD.

Maintenance: Technician, engineer, manufacturer.

Environment of use

Requirements: Sending side: EKG and/or imaging systems and connectivity to internet/ phone line, connection to a laptop preferred;

Receiving side: access to cell phone network on a smartphone and/or access to internet and PC.

Product specifications

Other features: Portabel and reusable. Uses software. Telemedecine system.

Year of commercialization: 2009

Currently sold in: USA

Please see disclaimer on following page

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Mobile technology to connect patients to remote doctors

Country of origin | United States of America

Health problem addressed

The bottom of the pyramid population in the developing world continues to face fundamental challenges in healthcare, due to lack of access, low affordability, low quality and exploitative care, and a reactive, emergency-driven system. Existing solutions lack financial and human resources and show suboptimal use of limited resources.

Product description

We developed an Integrated Mobile Health Technology Platform that enables frontline health providers (community health workers, rural nurses and doctors) to connect patients to remote doctors in order to obtain timely medical diagnosis and administer effective treatment for underserved patients. Selected awards: Winner at the 2008 MIT 100K Entrepreneurship Competition and Best Telemedicine Innovation at the 2009 World Health Care Congress.

Product functionality

Frontline health providers use the mobile application to perform health risk screening and medical triage to identify health concerns. The diagnostics application on the phone instructs health providers with immediate actions to care for the patient, or transmits the case to remote doctors for further diagnosis and treatment advice.

Developer's claims of product benefits

This solution is cost-effective as it requires no additional equipment or infrastructure by using available mobile phones, mobile connectivity and local health providers. Training for local health providers takes less than an hour because all users are already familiar with the use of mobile phones. Maintenance is minimal as local phone stores are capable of maintaining the mobile devices. The service reduces travel costs, minimizes time to obtain treatment (from weeks to minutes), and is accessible locally to underserved patients via health workers or close-by rural clinics.

Operating steps

Frontline health providers use mobile phones to access the diagnostics application. They enter patient symptoms information by going through a series of decision-tree based medical algorithm. For cases requiring remote doctor consultation, the phone transmits the patient symptoms information via mobile broadband or SMS/MMS to the remote doctor.

Development stage

The product was technically evaluated and tested for clinical effectiveness via concordance rates between in-person and mobile-transmitted remote diagnosis in Egypt, Ghana, Botswana, the US. We pursue various partnerships. Partners include mHealth Alliance, BRAC, Sajida Foundation, Mobinil Egypt, Orange Botswana, University of Pennsylvania Medical School, Harvard, MIT, American Academy of Dermatology.

Future work and challenges

Our applications and business model were tested through pilots in over 10 countries. The basic technology proposition was proven and patient acceptability demonstrated .We are now ready to test commercial scalability by 1) improving our technology platform to support large scale usage from current ~500,000 beneficiaries to >1 million, 2) expanding distribution channels, 3) refining service models to suit our markets.

Use and maintenance

User: Patient, family member, nurse, midwife, physician

Training: 30-60 min walk-through of the mobile application.

Maintenance: Technician, engineer, manufacturer

Environment of use

Requirements: Mobile connectivity, access to a power source to charge mobile phones.

Product specifications

Dimensions (mm): 110 x 47 x 14 (approx.)

Weight (kg): 0.008

Life time: Varies by phone model

Retail Price (USD): Varies

Year of commercialization: 2009

Currently sold in: US, Botswana, Bangladesh

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Please see disclaimer on following page

Newborn simulator for resuscitation training

Country of origin | Norway

Health problem addressed

UN Millennium Development Goal (MDG) 4 aims at reducing child mortality by 2/3 from 1990-2015. To date, the improvement is far from sufficient, particularly for neonatal mortality. To reach MDG 4, there is an urgent need to train large numbers of birth attendants in developing countries in neonatal routine care and resuscitation.

Product description

The proposed solution is a highly realistic and affordable newborn simulator. The baby's status can be simulated as desired to facilitate effective role playing in relevant scenarios covering basic newborn care as well as standard resuscitation measures. The simulator is available with affordable therapeutic tools.

Product functionality

By squeezing the bulbs connected to the simulator, an instructor can simulate three vital signs: Crying; spontaneous breathing; and palpable umbilical pulse. Depending on how the learner assesses the situation and acts, the instructor can easily provide feedback to the learner by changing the vital signs.

Developer's claims of product benefits

The simulator facilitates effective and affordable simulation training in low-resource settings that can improve quality of neonatal resuscitation as it is: Very low cost (available at USD 50); Allows assessment of key competencies (e.g. ability of trainee to ventilate adequately); Durable, easy to take apart/reassemble/transport; Culturally sensitive (available in dark or light complexion).

The simulator is also highly realistic. It has the size and appearance of a newborn baby, and natural weight, feel and touch when filled with water. As it comes deflated in a compact container and can be emptied between uses, distribution and transport of the simulator is convenient.

Operating steps

The simulator is easily prepared for use by filling the body with 2 liters of water (alternatively by air). An instructor can simulate vital signs by squeezing the simulation bulbs. The simulator facilitates practice in effective bag-mask-ventilation as the chest only will rise with correct technique.

Development stage

The product was introduced in 2009. It is available on a not-for-profit basis for projects in the 68 developing countries identified by UN as focus countries for MDG4. The use of the Simulator was validated in pilot tests in Kenya, Tanzania, Pakistan and India and is today a fundamental part of several courses in developing countries in basic newborn resuscitation.

Future work and challenges

Financing: Although the product is low-cost and available on not-for-profit basis, individual health care facilities and educational institutions in low-and middle income countries often have limited financial resources and may need to obtain funding from governments or international aid organizations.
Distribution channels: Bureaucracy and often prohibitive customs rates render import to countries where the need is greatest difficult.

Use and maintenance

User: Nurse, midwife, physician, course instructors, students, all other health care personnel needing refresher training

Maintenance: Any user

Environment of use

Setting and Requirements: The product can be used in any setting, there are no specific requirements to the infrastructure.

Product specifications

Dimensions during transport (mm3): 300 x 200 x 70 (simulator deflated in a kit with accessories)

Dimensions in use (mm3): 480 x 230 x 120

Weight during transport (kg): 0.8

Weight filled (kg): 2.2

Life time: 3 years

Retail Price (USD): 50

Other features: The simulator is portable and reusable.

Year of commercialization: 2009

Currently available in: 68 countries identified by UN as focus countries relative to UN Millennium Development Goal 4.

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Please see disclaimer on following page

Non-pneumatic anti-shock garment

Country of origin | United States of America

Health problem addressed

Postpartum hemorrhage (PPH) in developing countries continues to be the single most common cause of maternal morbidity and mortality, accounting for approximately 25 percent of maternal deaths globally. Over 90 percent of these deaths occur in developing countries.

Product description

For women suffering from uncontrollable PPH, a method to control the bleeding, reverse the shock, and stabilize the patient for safe transport to a comprehensive obstetric care facility could be lifesaving. One method to manage PPH is the use of a non-pneumatic anti-shock garment (NASG).

Product functionality

The NASG is a lightweight neoprene garment that is made up of five segments that close tightly with Velcro. The NASG applies pressure to the lower body and abdomen, thereby stabilizing vital signs and resolving hypovolemic shock. When fitted correctly, the reusable NASG forces blood to the essential organs - heart, lungs, and brain.

Developer's claims of product benefits

This garment provides an improvement over existing products in that is a validated, low-cost, high-quality garment. This is achieved by providing direct access to qualified manufacturers who can supply the garment at the price of US$54 (purchaser is responsible for freight forward from China and import regulations, minimum order is 1,000 units).

Operating steps

1. Place NASG under woman; 2. close segments 1 tightly around the ankles; 3. close segments 2 tightly around each calf; 3. close segments 3 tightly around each thigh, leave knees free; 4. close segment 4 around pelvis; close segment 5 with pressure ball over the umbilicus; 6. Finish closing the NASG using segment 6. Segments 1, 2, 3 can be applied by two persons simultaneously, segments 4, 5, 6 should only be applied by one.

Development stage

Clinical trials led by Suellen Miller at the University of California, San Francisco are on-going. Currently, the large-size device is cleared by the US Food and Drug Administration and has been tested in low-income settings. The device is ready for manufacturing and sale in China.

Future work and challenges

NASG Sizes: The NASG is not a one-size-fits-all PPH tool. Three sizes (small, medium, and large) of NASG have been developed to accommodate the significant population-dependent anthropomorphic variations around the world. In interviews in Nigeria, the company also learned that an extra-large-size NASG was desired to accommodate larger women in that region. Only the large-size NASG has been qualified with manufacturers.

Cleaning of the NASG: Cleaning is another challenge. There is no established method of accurately tracking the number of uses and cleanings, thus it is difficult to identify when sufficient degradation has occurred to retire the NASG and replace it with a new one.

Use and maintenance

User: Familiy member, nurse, midwife, physician, technician

Training: Pathfinder International has developed course curriculum and training materials which vary in length depending on target audience, and whether the intended user is applying or removing the garment.

Maintenance: Hospital orderlies are generally responsible for cleaning.

Environment of use

Setting: At home and in health care facilities in rural or urban settings.

Requirements: Water and bleach for cleaning.

Product specifications

Life time: Approx. 40 uses

List price (USD): 53.76

Other features: Portable and reusable

Currently sold in: United States of America

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Please see disclaimer on following page

Oxytocin in prefilled auto-disable injection system

Country of origin | United States of America

Maternal health

Commercialized

Compendium of new and emerging technologies that address global health concerns 2011

Health problem addressed

Postpartum hemorrhage (PPH) is the leading cause of maternal death worldwide. Women delivering outside of health facilities or in facilities with constrained resources may not receive the WHO-recommended dose of 10 IU of oxytocin for the prevention of PPH. There is a need for an easy-to-use delivery system for oxytocin that increases access.

Product description

An easy-to-use, compact, prefilled, auto-disable injection system is used to deliver Oxytocin. A time-temperature indicator on each package indicates heat exposure. Oxytocin in this device can enable minimally trained health workers to provide the PPH prevention dose in low- resource facilities, emergency situations, or remote locations.

Product functionality

As a prefilled system the easy-to-use device allows caregivers to safely inject drugs or vaccines with minimal training. The system prefilled with Oxytocin ensures that an accurate dose is delivered to a patient with minimal preparation, minimum waste, and a guarantee that the syringe and needle will not be used again.

Developer's claims of product benefits

Current practice is to use a syringe and two 5-IU ampoules or one 10-IU ampoule of Oxytocin. Oxytocin in described injection system is prefilled with 10 IU and ensures an accurate dose by minimally skilled health workers. It is individually packaged and sterile in an injection-ready format, optimal for low-resource settings. It is compact and prefilled so generates minimal waste.

Operating steps

1. Check the time-temperature indicator; 2. Open the foil pouch; 3. Activate the device; 4. Remove the needle shield; 5. Continue to hold the injection device by the port and insert the needle into the patient; 6. Squeeze the reservoir to inject the oxytocin; 7. Do not re-cap; 8. Dispose according to medical waste procedures.

Development stage

Oxytocin in conjunction with described injection device is currently being produced in Argentina and India. Oxytocin in Uniject is commercially registered in Argentina, Guatemala, Honduras, Paraguay, and India. Additional registrations in Latin America and Africa are being pursued.

Future work and challenges

The value of oxytocin in conjunction with described injection system has been demonstrated in the field. More and more countries are recognizing the need to reduce maternal mortality, and the easy and safe delivery of oxytocin has been identified as an important tool, but more must be done to raise awareness. The next phase of work will include efforts to raise awareness, increase demand, and ensure a sustainable supply.

Use and maintenance

User: Nurse, midwife, physician, technician

Training: User instructions are included in the box and on the primary packaging: additional materials are available from PATH at: http://www.path.org/projects/uniject-oxytocinresources.php#training. Training requires no more than 1 day.

Environment of use

Setting: At home and in health care facilities in rural and urban settings.

Requirements: Cold chain is ideal, but the time-temperature indicator on the package allows for brief excursions outside the cold chain, like to low-resource health posts or to a woman's home.

Product specifications

Dimensions (mm): (foil pouched product) 148 x 56 x 10 (reservoir height)

Weight (kg): 0.0025 (filled, excluding pouch)

Shelf life: 24 months

Retail Price (USD): Varies by country

Other features: Portable and single-use.

Year of commercialization: 2009

Currently sold in: Argentina, Guatemala, India

Please see disclaimer on following page

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Parasitological test system

Country of origin | Brazil

Health problem addressed

Intestinal parasites - types of helminthiasis and protozooses - are endemic and afflict more than 1 billion people all over the world, particularly affecting the mental and physical development of our children. Affected children are unable to develop their abilities which consequently compromises the Human Development Index of the respective country.

Product description

We developed a product to easily detect the extent of parasite infestations. The product allows for accurate and economic analysis integration into national health plans in communities of low and medium incomes. The product is a prefilled container used for filtering, concentrating and recovering parasites from fixed/ preserved body waste.

Product functionality

In a vial with preservative solution, a stool sample is collected by the patient. At the laboratory, the technician places the vial upside down in a tray and waits for 15 minutes, allowing the preserved sample to pass through the filter system. Subsequently, the sample can be directly analysed under the microscope.

Developer's claims of product benefits

Our product, unlike other methodologies, does not need any equipment or reagents to perform the parasitological examination of feces. The system includes a special filter inside, made of polyester with 266 micra, which renders the sample much cleaner and makes it easier to find the parasites. In just one step the sample is ready to be analysed under the microscope. Another important difference is the new preservative liquid that does not use formalin or any other toxic and aggressive reagent, an exclusive development to preserve the environment and the people that work directly with this kind of process.

Operating steps

By the patient: Open the vial, and with the help of a spoon (provided) collect a portion of feces and put it inside the vial, directly into the preservative liquid. Close the vial and bring it to the laboratory.
By the Technician: Homogenize the sample by shaking the vial, turn over the vial and put it in the tray (provided) for 15 minutes. Place two drops directly on glass microscope plate.

Development stage

The product is on the market since 2007, and it number of laboratories that choose this method is growing.
Conformity assessment: ISO 9001-2008 / ISO 13485-2003 / CE Mark / FDA.

Future work and challenges

The technology is ready to be used in any country. It is accessible, affordable, available and applicable. The company needs to find funding to move to the next stage (supply worldwide).

Use and maintenance

User: Patient, technician

Training: none.

Maintenance: none.

Environment of use

Requirements: Product should be stored at room temperature (15°C to 30°C).

Product specifications

Dimensions (mm): 35 x 35 x 70

Weight (kg): 0.02

Consumables: none.

Shelf time: 3 years.

Retail Price (USD): 1.5

Other features: Portable. Single use.

Year of commercialization: 2007

Currently sold in: Brazil, Saudi Arabia, United Arab Emirates

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Please see disclaimer on following page

Phototherapy for neonatal jaundice treatment

Country of origin | Brazil

Health problem addressed

Neonatal jaundice (hyperbilirubinemia) is a frequent issue in newborns. Approximately 60% of newborns become clinically jaundiced. It is a clinical condition generally benign and reversible if properly treated, but its exacerbated intensification may generate serious sequela into the central nervous system, which may lead patient to death.

Product description

Phototherapy is an efficient mean to treat hyperbilirubinemia. By emitting blue light over the patient's skin, it converts toxic bilirubin molecules in the blood into less toxic isomeric forms, by photo-oxidation and photoisomerization. The device uses high power LEDs for a high efficiency treatment and negligible emission of UV / IR radiation.

Product functionality

The phototherapy uses a set of 5 high power LEDs, positioned 30 cm above the patient. The treatment is efficient due to high radiation emitted at the blue range of the spectrum, from 400 to 550 nm (the most recommended for jaundice treatment). The device also provides extra functions, such as integrated radiometer and treatment time counter.

Developer's claims of product benefits

Traditional devices use fluorescent or halogen lamps, or many conventional LEDs. Lamps may require filters to attenuate UV / IR rays and have a low life expectancy (around 2.000h). Conventional LEDs are low power devices. To work effectively, hundreds of LEDs must be used, making the phototherapy complex and prone to failure. The proposed technology uses only 5 high power LEDs, which is equivalent to more than 250 conventional LEDs. The result is a compact, highly efficient, long life time (20.000 h) and low cost phototherapy. It provides new resources: output radiation level adjustment, embedded radiometer and irradiance measurement reports. In addition it is compact, saving space in the intensive care unit.

Operating steps

Place the device over the newborn, 30 cm away. Turn it on and press 'Menu' to go to the irradiance level screen. Set the irradiance using the 'up'/'down' keys and press 'Enter' to confirm. Be sure the newborn is exposed to the light at the chest and abdomen area. Protect the newborn's eyes.

Development stage

The product is being manufactured and commercialized. It has been fully validated and clinically tested. Studies verify that the blue high power LEDs are more efficient for jaundice treatment. The market confirms those studies. It has the Brazilian ANVISA regulatory approval, the CE marking and it is currently obtaining the UL recognition approval.

Future work and challenges

Promoting the technology's easy-of-use, efficient treatment system and affordable cost in low and middle income countries is the greatest challenge. Assistance herein is required, e.g. through workshops by professionals to explain the importance and advantages and to make users familiar with new functions that improve the treatment quality, like the embedded radiometer and the timer.

Use and maintenance

User: Nurse, physician

Training: Concept presentation (2 hours training).

Maintenance: Technician

Environment of use

Setting: Secondary and tertiary hospitals.

Requirements: Power supply (100 to 240 Vac), 50 or 60Hz; ambient temperature between 18°C and 28°C; air humidity between 10% and 95%; eye protection for the patient.

Product specifications

Dimensions (mm): 230 x 116 x 50

Weight (kg): 1

Consumables: Eye protector

Other features: Portable and reusable. It utilizes software.

Year of commercialization: 2005

Currently sold in: Algeria, Australia, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Spain, Finland, France, Indonesia, Iran, Iraq, Jamaica, Lithuania, Malaysia, Mexico, Nicaragua, Paraguay, Peru, Poland, Portugal, Russia, Syria, Sudan, Sweden, Uruguay, Venezuela, Vietnam, Yemen.

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Please see disclaimer on following page

Point-of-use water disinfection system

Country of origin | United States of America

Health problem addressed

Worldwide, gastrointestinal illness (GI) is estimated to cause over 1.5 million deaths annually. In addition, an estimated 4 billion cases every year make GI the third highest cause of morbidity globally. Unsafe drinking water is recognized as one of the major pathways responsible for the transmission of GI causing pathogens.

Product description

The UV tube is a low-cost, easy to operate and maintain point-of-use water disinfection system that uses ultraviolet light to inactivate pathogens at a fast flow rate of 5 liters per minute, without producing unpleasant or harmful disinfection by-products. The UV Tube is appropriate for households, schools, clinics, and small communities.

Product functionality

The UV tube uses a 15 watt germicidal lamp to deliver a UV-C (254nm) dose of 900 J/m^2 to inactivate virus, protozoa, and bacteria suspended in water. The dose is more than twice the minimum recommended by the US NSF/ANSI Standard 55, providing a safety factor that guarantees its effectiveness even in certain non-ideal conditions.

Developer's claims of product benefits

The UV tube was developed by an interdisciplinary team of students and professors, who recognize that a wide array of safe water options are urgently needed in order to address the severe and widespread health problems caused by drinking water contaminated with pathogens. Through rigorous laboratory and extensive field testing, the UV Tube was designed to be an effective, easy to use, low-cost, and adaptable point-of-use safe water solution.

Operating steps

To disinfect water, a user has to: (1) turn on the switch; (2) confirm that the lamp is on; (3) open the water valve; (4) wait for the safe storage container to fill up, 1 minute for each 5 liters; (5) close the water valve; (6) drain the system; (7) turn off the switch. No consumables required, but every 1-3 years some components need replacement.

Development stage

The product was validated in the laboratory and a prototype tested in 24 households in Mexico in 2005. Positive water quality and user acceptance results led to piloting the technology in 150 households, 3 schools and 13 communities between 2007 and 2008. Successful results motivated the development of a scalable model in 2009. In 2010, 450 household systems were installed in Mexico as part of a stepped-wedge cluster randomized trial. In 2011 the UV tube will be installed in at least 8 schools and 38 community systems serving approx. 10,000 people.

Future work and challenges

As most water treatment technologies seeking to make real improvements, the device must be implemented as part of a program that allows for needs assessment; adaptation to local conditions; hygiene education; operation and maintenance training. For this reason, the company sees the UV tube being scaled up through partnerships with institutions, organizations, and/or companies that have local presence and are committed to improving the health of the populations they serve.

Use and maintenance

User: Self-user, family member, nurse, technician

Training: Although the system is easy to use and most people can learn how to operate it from a manual, it is recommended that they participate in a basic (20-30 minute) training session.

Maintenance: Trained nurse / community member, technician

Environment of use

Requirements: Access to electricity. The product consumes 20 watts. To disinfect 1,000 liters it only uses 0.1 kilo watt hours of electricity. The source can be direct current (e.g. 12-24 volts from a solar powered battery) or alternate current (e.g. 110-220 vols from the grid). If water is turbid or contaminated, pre-disinfection filtration is required.

Product specifications

Dimensions (mm): 600 x 150 x 150

Weight (kg): 3

Life time: 3-5 years

Retail Price (USD): 45

Other features: Reusable, can run on batteries.

Year of commercialization: 2009

Currently sold in: Mexico, but projects can be established in new countries.

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Please see disclaimer on following page

Portable haemoglobin meter

Country of origin | Brazil

Health problem addressed

Anemia is one of the most common blood disorders globally. Iron deficiency anemia is the most prevalent nutritional disorder in the world. Anemia diagnosis is frequently not performed or the test results are delayed, causing aggravations or even sequels in the most vulnerable population, children and pregnant women.

Product description

Portable, low-cost hemoglobin meters that are user-friendly and reliable can be a great aid to change the global anemia scenario. Avoiding the displacement of patients and shortening the diagnostic process, this solution can spread this clinical test to people with low access to health services.

Product functionality

The portable hemoglobin meter is a micro processed photometer. In a disposable vial, containing Drabkin´s reagent, 10 uL of blood sample are dropped . Reaction follows inside the vial, also used as the lecture cuvette. Hemoglobin content is read and calculated by a microprocessor and proprietary software. Results are presented in a LCD display.

Developer's claims of product benefits

The portable hemoglobin meter shows the same accuracy of the golden standard methods with more toughness and low cost reagents. Also the reagents are stable for a long periods and extreme environmental conditions. The use of the injection vial, containing the reagent, as a cuvette, reduces the number of operations, reduces costs, speeds lecture and allows portability. The equipment is battery (rechargeable) driven allowing the use in any environment.

Operating steps

After cleaning the skin, a puncture is done and a 10 uL blood sample is collected with a micropipette and transferred to the reagent vial. After 30 seconds of mixing, the vial is inserted in the equipment and a button is pressed. The sample hemoglobin content is exhibited in the display in g/dL.

Development stage

The device is fully developed and extensively tested (over 20.000 patients). In Brazil validation was performed by PP-SUS program, a governmental trial of innovative technologies for public health care. PAHO and IPTI are performing tests (process nº BR/LOA/1000065.001). Researchers from São Paulo University and FIOCRUZ Foundation are performing tests in anemia trials.

Future work and challenges

For the moment, it is commercialized only in Brazil, in compliance with the standards from Brazilian national regulatory legal demands (ANVISA). The company needs to perform international certifications; additionally they also need investors and/or commercial partners interested in business improvement.

Use and maintenance

User: Nurse, physician, technician

Training: One to two days, blood collection practice by puncture and pipette.

Maintenance: Manufacturer

Environment of use

Requirements: Powered by batteries and designed for a global environment use, there are no special requirements. The tests are disposable and previously sterilized.

Product specifications

Dimensions (mm): 167 x 108 x 37

Weight (kg): 0.358

Consumables: Hemoglobin meter reagent vial, tips

Life time: several years

Retail Price (USD): 41000

List price (USD): 1500

List price of consumables (USD): 1.0/vial

Other features: Portable and reusable. Runs on batteries, uses software.

Year of commercialization: 2010

Currently sold in: Brazil

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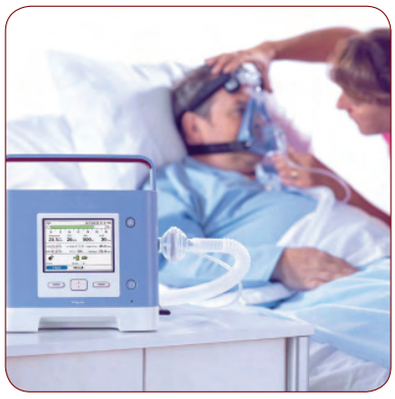
Please see disclaimer on following page

Portable ventilator

Country of origin | United States of America

Health problem addressed

Patient groups most likely to benefit include those with COPD, Cardigenic Pulmonary Edema, Immunocompromised patients (e.g. HIV), and COPD patients weaning from mechanical ventilation. COPD is one of the fastest growing causes for death today worldwide. Over the next 20-30 years, it is poised to become the 3rd or even 2nd leading causes of death.



Product description

The device will transform ventilatory care through its small size, portability, ease of use, versatility and extended battery life. By costing as little as a third of other ICU ventilators and offering both invasive and noninvasive capabilities, the device is ideally suited, no matter what their location or severity.

Product functionality

The device's primary innovation is owed to its use of micro-blower technology and unique gas control algorithms. In combination the device is able to meet the needs of a wide variety of ventilatory demands, including high leaks seen in noninvasive ventilation while still maintaining patient-ventilator synchrony.

Developer's claims of product benefits

Most ventilators are large, complex, difficult or impossible to move around, extremely expensive and above all, extremely uncomfortable. Invasive ventilation also carries significant risks of its own including Ventilator Associate Pneumonia which often accompanies intubation and is one of the leading causes of death for ventilated patients. This is also a major reason why immunocompromised patients should, whenever possible, be ventilated noninvasively. At low cost it offers both invasive and noninvasive capabilities, therefore our device is ideally suited for patients in respiratory distress, no matter what their location or their severity.

Operating steps

The device employs a micro-blower to generate airflow and connects directly to oxygen supplies to provide between 21-100% oxygen enriched, pressurized gas. Pressure and flow sensors provide signals to a very sophisticated controls algorithm to precisely meter pressure, flow and volume even in leak prone, noninvasive applications.

Development stage

The device was market released July 2010 and is sold worldwide. Several investigators have compared the device's performance to other ventilators, in various patient populations, and under different clinical conditions such as leak-prone noninvasive applications. The results of such studies show the relative superiority of the device's design elements and precise gas delivery. One bench study demonstrates the unique ability of the device to maintain accurate volume control mode delivery even while using cheap and simple intentional leak breathing circuits.

Future work and challenges

None.

Use and maintenance

User: Nurse, physician, technician

Training: Interactive CD-ROM (self paced), User's Manual (reference material), various slide presentations.

Maintenance: Technician, engineer, manufacturer

Environment of use

Settings: Ambulatory, secondary, and tertiary health care facilities.

Requirements: Basic electrical power 100 – 240 VAC, 50/60 Hz, 2.1 A, 5-40C temperature range and high pressure oxygen source (40-87 psi) via compressed gas tanks or wall outlets. Optional: available equipment to disinfect breathing circuits if reuable circuits are preferred.

Product specifications

Dimensions (mm): 21.3 x 28.5 x 23.5

Weight (kg): 5.6 (including batteries)

Consumables: Breathing circuit and patient interface (artificial airway or facemask)

Life time: several years

Retail Price (USD): 11,500

List price (USD): 11,500

List price of consumables (USD): 80 (Std. Adult reusable circuit), 14 (disposable circuit)

Other features: Portable and reusable. Runs on batteries, uses software and is compatible with telemedicine systems.

Year of commercialization: 2010

Currently sold in: US, Eastern and Wester Europe, all Scandinavia, most countries in Asia/Pacific, India, Africa, Japan, Latin America and Middle East.

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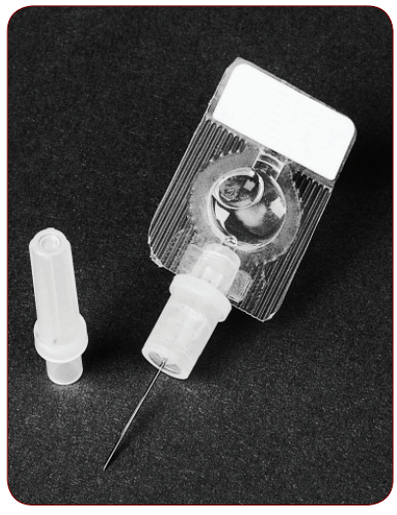
Please see disclaimer on following page

Prefilled auto-disable injection system

Country of origin | United States of America

Health problem addressed

Solutions are needed in low-resource settings to increase access to drug and vaccine delivery. It is also necessary to prevent reuse of syringes, helping to prevent transmission of bloodborne disease and to minimize waste in these settings.



Product description

The device developed to address this health problem is a compact, sterile, prefilled, nonreusable injection system for delivery of vaccines or drugs.

Product functionality

The prefilled, sterile, simple-to-use injection system may allow minimally trained health workers to safely and accurately inject drugs or vaccines that they would not otherwise be allowed to deliver. The autodisable feature prevents reuse, helping prevent transmission of bloodborne disease between patients. The compact, prefill device also minimizes waste.

Developer's claims of product benefits

Compared with standard syringes and ampoules (depending on the drug delivered), the developed injection system is prefilled ensuring an accurate dose by minimally skilled health workers. It is individually packaged and sterile in an injection-ready format, optimal for low-resource settings. It is compact and prefilled so generates minimal waste.

Operating steps

1. Open the foil pouch; 2. Push the needle shield into the port; 3. Push until you close the gap between needle shield and port; 4. Remove the needle shield; 5. Hold the device by the port and insert needle into patient; 6. Squeeze reservoir firmly to inject; Discard according to medical waste procedures.

Development stage

The injection system was developed around 15 years ago and as a viable container for drugs is fully developed. The availability of important drugs in the injection device for use in low-resource settings is established in some areas and developing in others. Oxytocin, hepatitis B vaccine, and tetanus toxoid vaccine are availalable in some countries; other drugs and vaccines are in early stage development. Injectable contraceptives are in their final stage of regulatory approval. Betamethasone and gentamicin are still in research stages.
The unfilled device is available for purchase by pharmaceutical manufacturers worldwide.

Future work and challenges

The injection system itself is designed to be portable and requires minimal resources for preparation. Depending on the drug or vaccine applied, cold chain may be needed. Some applications can include a time-temperature indicator which allows brief excursions out of the cold chain, like to low-resource health posts or for rural/home delivery.

Use and maintenance

User: Patient, family member, nurse, midwife, physician

Training: User instructions are included in the box and on the primary packaging; additional materials for some applications are available from PATH. Please contact Steve Brooke at sbrooke@path.org for more information.

Environment of use

Setting: At home and in health care facilities in rural and urban settings.

Requirements: The device itself is designed to be portable and requires minimal resources for preparation. Depending on the drug or vaccine applied, cold chain may be needed.

Product specifications

Dimensions (mm): max.100 (excl. pouch) x 23 x 10 (reservoir height)

Weight (kg): 0.002 - 0.0025 (filled, excluding pouch)

Shelf life: 5 years

Retail Price (USD): Varies by drug/vaccine and country

Other features: Portable and single-use.

Year of commercialization: 1998

Currently sold in: Indonesia, India, Argentina, Belgium

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Please see disclaimer on following page

Reusable neonatal suction device

Country of origin | Norway

Health problem addressed

Nearly 1 million newborns in developing countries die from birth asphyxia each year. A similar number are disabled due to compromised breathing at birth. To stimulate spontaneous breathing, or bag-mask ventilate effectively, an open airway is mandatory. Often this requires clearing the mouth and nose of mucous and meconium using vacuum.

Product description

The proposed solution is a bulb suction device that is particularly suitable for use in developing countries. It is clinically effective, easy and safe to use, available at a low price and reusable when disinfected in accordance with instructions, over the product's lifespan. The device is also suitable for large scale training of birth attendants.

Product functionality

The product benefits newborns suffering from birth asphyxia and in need of clearing the upper airways. Squeezing the bulb generates vacuum so that the birth attendant can extract mucus and meconium froim the baby's mouth and nostrils.

Developer's claims of product benefits

This product is an improvement over the neonatal suction devices typically used in low-resource settings (i.e.mouth suction or hand bulb suctions, available in non-cleanable versions and mainly intended for single patient use) as it can be easily opened, cleaned and boiled for disinfection after use, it is made of very durable silicone and withstands several hundred times of reuse. The transparent material makes it easy for the user to see whether it has been cleaned since last use situation; the low price (available on a not-for-profit basis) combined with number of use situations dramatically reduces the cost per use compared to existing products.

Operating steps

Ensure that the device is clean before use on patient. Squeeze bulb to generate vacuum, and place the nozzle tip into the newborn's oral or nasal cavity. Slowly release bulb squeeze to extract the mucus, discharge contents into a water container, towel or similar. For repetitive suctioning, keep the body squeezed until suctioning again.

Development stage

The product has been available on a not-for-profit basis for newborn resuscitation projects in developing countries since April 2010. It has been FDA device listed, and is developed to applicable standards and regulation required for CE-marking. Self-declaration for CE-marking is imminent within March 2011.

Future work and challenges

Financing: Although the products is highly affordable and available on not-for-profit basis, individual health care facilities and educational institutions in low-and middle income countries often have limited financial resources and may need to obtain funding from governments or international aid organizations.
Distribution channels: Bureaucracy and often prohibitive customs rates in importing such material to the countries where the need for these products is greatest.

Use and maintenance

User: Family member, midwife, nurse, physician

Training: None required.

Maintenance: Any person responsible for disinfection.

Environment of use

Requirements: The only requirement is that it must be possible to clean and disinfect the device (before first use and between patient uses). Cleaning can be performed by boiling the one-piece device in water, or by more advanced methods.

Product specifications

Dimensions (mm): 40 x 40 x 130

Weight (kg): 0.06

Consumables: None

Life time: 5 years

Retail Price (USD): 3

List price (USD): 3

Other features: Portable and reusable.

Year of commercialization: 2010

Currently availabe in: 68 countries identified by UN as focus countries relative to UN Millennium.

Please see disclaimer on following page

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Self-powered pulse oximeter

Country of origin | United Kingdom

Health problem addressed

10.8m children die every year. 99% of these deaths are in developing countries and 2.7m are due to congestive diseases that result in hypoxemea. Early detection of hypoxiemia is essential in reducing mortality and morbidity. S_pO_2 monitoring facilitates this. S_pO_2 monitoring is also essential during anesthesia. It is called the 5th vital sign.

Product description

Our pulse oximeter is a portable, easy to use monitor that measures blood oxygen saturation levels and the pulse rate. It is designed for use in low resorce settings and is rugged, reliable and has its own on board human powered energy source.

Product functionality

The oximeter offers the highest quality pulse oximetry on the market. It analyses the entire p'graphic wave form, locating the onset of a pulse and resulting in extreme pulse detection. It has excellent low perfusion and motion -compensating performance, warning the user and preventing inaccurate readings.

Developer's claims of product benefits

This a monitor specifically designed for use in low resource settings or where electricity supply is a problem. The S_pO_2 monitor is rugged and reliable and has its own on-board power generator. Human energy is converted into electricity and saved in rechargeable batteries. The monitor gives 10-15 minutes of monitoring per minute of winding. The monitor may also be recharged using grid power when available. The pulse oximeter is designed to be compatible with a wide range of probes to take advantage of generic offerings when available. Unlike monitors designed for mainstream medical markets, it is very simple to use at low cost.

Operating steps

The S_pO_2 monitor is a solution to the problem of measuring blood oxygen saturation in developing world health environments. By turning the crank human energy is efficiently converted into electricity and stored in rechargeable batteries.Generic probes ranging from pediatric to adult provide accurate pulse and saturation levels.

Development stage

The pulse oximeter is currently available and in production. It is manufactured in India. Pilot field testing was carried out in South African secondary hospitals and its performance was congruent with "gold standard" high-end pulse oximeters.
Regulatory approval is completed.

Future work and challenges

Product is commercialized.

Use and maintenance

User: Nurse, midwife, physician.

Training: none.

Maintenance: Nurse, physician, technician

Environment of use

Setting: Rural. Ambulatory, primary and secondary health care facilities.

Requirements: none.

Product specifications

Dimensions (mm): 170 x 85 x 75

Weight (kg): 0.7

Consumables: none.

Life time: 5 years

Shelf life: 3 years

List price (USD): 600

Other features: Portable and reusable. Runs on batteries. Uses software.

Year of commercialization: 2011

Currently sold in: South Africa

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Please see disclaimer on following page

Solar thermal cooking and autoclave device

Country of origin | Malaysia

Health problem addressed

Currently almost half the world's population has no access to safe drinking water and the situation is expected to worsen with increasing global pollution. When water is heated to 65°C for at least 6 minutes, it is pasteurized and rendered free from most water borne pathogens (e.g. responsible for diarrhea, dysentery, cholera) and thus safe for human consumption. It is a challenge to provide pasteurized water in a renewable and sustainable way.

Product description

Solar kettle/thermos flask and solar vacuum tube oven: a solar thermos tube based system deployable in all climate so long as sunlight intensity is viable (only need diffused and not necessary strong direct sunlight). Can also be used to boil water, cook, bake and autoclave as the stagnating temperature is 220C. Also a thermos.

Product functionality

On the average, 1kW of gratis solar energy hits 1m2 of land. The reason why we are not grilled by the sun is because as soon as solar heat hits the ground, it dissipates into the ambience. In making it viable for any cooking use, solar heat must be accumulated over time and conserved from being leaked into the ambience; concentration is unnecessary.

Developer's claims of product benefits

Empirical field test proves a stagnating temperature of 220°C and a liter of water in a 1 liter capacity device boils unattended within 1 to 3 hrs depending on the local and incidental intensity of sunlight. Being a vacuum or evacuated vessel, the device keeps hot water and food hot with a mere 3°C overnight loss. It therefore can even deliver the much appreciated cup of hot beverage early in the morning even when the sun is still asleep, a disadvantage that plagues most solar devices.

Operating steps

As simple as assemble, pour in the water, cork it, place in direct sunlight with the bottom of the tube pointing towards the Equator. Can be left unattended. Come back later to harvest the solar heated/boiled water.

Development stage

Commercialized and sold in the market already.

Future work and challenges

none.

Use and maintenance

User: All persons in need of pasteurized/hot water.

Training: none.

Environment of use

Requirements: Nothing really, can even be deployed to the most remote areas of the world and space, so long as there is infra-red light although sunlight is best being an abundant, ubiquitious and gratis resource.

Product specifications

Dimensions (mm): 750 x 60 x 60

Weight (kg): 1.0

Consumables: none.

Life time: Several years.

Retail Price (USD): 150

List price (USD): 50

Other features: Portable and reusable.

Year of commercialization: 2003

Currently sold in: Malaysia, Singapore, New Zealand, Germany, Portugal, USA.

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Please see disclaimer on following page

Transcutaneous bilirubin measurement system for infants

Country of origin | United States of America

Health problem addressed

Hyperbilirubinaemia is a common condition in many newborns, affecting nearly 1 in 10 newborns and nearly 90% of premature infants in the first week of life. If undetected and untreated the levels of bilirubin may rise high enough to pass through the blood brain barrier and is deposited in the brain causing kinikterus and brain damage.

Product description

The device provides a numerical measurement of predicted bilirubin count in mg/dL or mol/L within a clinically beneficial range that has been correlated with total serum bilirubin concentration measured by High Pressure Liquid Chromatography (HPLC).

Product functionality

The device works by directing white light into the skin of the newborn and measuring the intensity of the specific wavelengths that are returned. By knowing the spectral properties of the components within the skin, one can subtract out the interfering components and determine the concentration of bilirubin.

Developer's claims of product benefits

The technology of the device evaluates melanin, collagen, hemoglobin and bilirubin in a patient's subcutaneous tissues through a proprietary algorithm and optics system. Existing technologies measure the yellowness of the skin as it relates to jaundice.

Operating steps

Simple button push for calibration, place on infants head or sternum and press the measurement button 5 times in succession and the results appears on the screen. Test taken in minutes.

Development stage

This product has been sold globally since 2002. To date over over 5000 units have been delivered to hospitals, clinics, physicans and community health workers.
Technical evaluation and health technology assessment review: FDA 510K # k010052.
Regulatory approval complete. Conformity assessment has been carried out (USA).

Future work and challenges

The product is not registered as a medical device in all countries. Depending on the country of use, the product may need to be registered before it is used.

Use and maintenance

User: Nurse, midwife, physician

Training: Technique education on how to properly take a measurement.

Maintenance: Manufacturer

Environment of use

Setting: Rural and urban health care facilities.

Requirements: Power supply to charge the battery, disposal of calibration tip and cleansing products for pre-patient use.

Product specifications

Dimensions (mm): 204.5 x 50.23 x 59.4

Weight (kg): 0.346

Consumables: Disposable calibration tip (per test)

Life time: 5 years

Shelf life: 20 months

Retail Price (USD): 3500

List price (USD): 4295

List price of consumables (USD): approx. 360 (bag of 50)

Other features: Portable and reusable. Runs on batteries and uses software.

Year of commercialization: 2009 (first version in 1996)

Currently sold in: Most of Europe, as well as in Australia and several African, Asian, North- and South-American countries (65 countries).

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Please see disclaimer on following page

Treatment response software application

Country of origin | Canada

Health problem addressed

Tracking patient response to specific treatments other than measurable physiological changes (laboratory test results), survival or death remain a matter of clinical judgment. Diagnostic validity and reliability is an ongoing problem in applying evidence-based practice. The system application presented here provides a gold RCT standard to this problem.

Product description

This application may be used to track and graphically represent individual patient responses to treatments over time. Additionally, patients may be assigned to up to four specific treatment groups (RCT) to compare treatments. Students can compare the diagnostic accuracy of their assessments and interventions with experts.

Product functionality

Download and open – this is an Excel/VBA based application. It may be used to track and represent individual patient responses to
treatments over time. Additionally, patients may be assigned to specific treatment groups. User defined variables representing treatment and response parameters may be defined across clinically relevant domains.

Developer's claims of product benefits

The application is intended to support physicians or nurses in tracking patients responses to treatment. It will permit outcome measurement for any treatment for any disease or health concern. The application and manual are available free of charge.

Operating steps

This is a Microsoft Excel software program that is user completed.

Development stage

The current program is complete and self-contained.
Regulatory approval status of the product is completed. Conformity assessment has been carried out in Canada.

Future work and challenges

Since posted on the web approximately 1000 individuals have either visited or downloaded the application. Future versions will have more robust operability (e.g. automated amalgamation of data from individual cases).

Use and maintenance

User: Nurse, midwife, physician

Training: Manual – 1 hour

Maintenance: none

Environment of use

Requirements: A compatible computer is required. Visual Basic for Applications, Microsoft Excel 11.0 Object Library, OLE Automation, Microsoft Office 11.0 Object Library, Microsoft Forms 2.0 Object Library, Microsoft Calendar Control 11.0.

Product specifications

Dimensions (mm): N/A

Weight (kg): N/A

Consumables: none

Retail Price (USD): 0

List price (USD): 0

Year of commercialization: 2010

Currently sold in: Available for all.

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Please see disclaimer on following page

Ventilator using continuous positive airway pressure

Country of origin | Vietnam

Health problem addressed

Every year hundreds of thousands babies die because of respiratory failure. Infant mortality could be reduced by application of CPAP – relatively simple therapy addressing 90% of cases. Diseases treated: pneumonia, apnea, hypoxia, and respiratory failure - main cause of infant mortality worldwide.

Product description

CPAP is one of the methods used to support infants with respiratory distress and assist them in maintaining continuous positive airway pressure while breathing on their own. Our solution is customized for the use in hospitals with basic infrastructure and limited resources. It is simple in use with only short training required.

Product functionality

CPAP provides mixed gas flows down the inspiratory limb to nasal cannula while expired gas returns via the expiratory limb to the pressure bottle. The medical staff is able to control appropriate mix of gases as well as desired temperature, humidity and flow.

Developer's claims of product benefits

Complete CPAP system is design to be used in the low resources settings. The only requirement is power supply and oxygen. The system provides its own air compressor, humidifier, oxygen and air blender, air heater. All the functions can be controlled by the user through simple interface requiring minimum training. The system is fully reusable and washable limiting the need for consumable parts to nasal connectors. It allows to keep running expenses at very low level keeping the treatment costs at less than a few dollars per patient.

Operating steps

Connect the system to oxygen and power source; Connect the tube circuite to the patient; Turn the system on, Set the desired oxygen concentration and flow rate; set the temerature and humidity.

Development stage

The device is based on the concept of the CPAP technology developed by Colin Sullivan at Royal Prince Alfred Hospital, Australia, 1981. The company added the adaptation element to low resource settings. The system has been proven by extensive use in countries such as Vietnam, Laos, Cambodia and East Timor following initial studies at National Hospital of Pediatrics in Hanoi in 2006/2007. By now it is a national standard in countries mentioned above being used in over 200 public hospitals treating thousands of patients every year.

Future work and challenges

The company is not able to generate enough sales through commercial channels because of lack of funds in public healthcare. Our strategy is to introduce the technology using charity money and leverage from such demonstration in the future. The biggest challenge is to convince local authorities to start spending public funds on such solutions which could make the whole system sustainable.

Use and maintenance

User: Nurse, physician

Training: CPAP set, 3 days.

Maintenance: Nurse, physician, technician

Environment of use

Settings: Rural as well as urban secondary and tertiary health care facilities.

Requirements: Stable power supply, oxygen supply (wall, cylinder, concentrator).

Product specifications

Dimensions (mm): 330 x 330 x 1400

Weight (kg): 15

Consumables: none.

Life time: 5 years

Retail Price (USD): 2,500

List price (USD): 2,300

Other features: Reusable. Uses software.

Year of commercialization: 2006

Currently sold in: Vietnam, Laos, Cambodia, East Timor

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Please see disclaimer on following page

Water filter

Country of origin | United States of America

Health problem addressed

"Infectious diseases caused by pathogenic bacteria, viruses, protozoa and helminthes are the most common and widespread health risk associated with drinking water." (WHO, 2004). In Ghana where the ceramic pot filter is made, 50% of people lack access to improved water supply. Ghana has the 4th lowest worldwide rate of sanitation coverage.

Product description

The filter unit consists of a fired clay pot filter element, a plastic bucket storage unit, a "ring lid" to support the ceramic pot, a tap and a cover lid. These filters are made from red clay and wood saw-dust or rice-husk which gets mixed, pressed in mold and fired in a kiln.

Product functionality

Particles, bacteria, guinea worm cyclops and protozoa are removed by physical straining, and also by the mechanisms of sedimentation, adsorption, diffusion, inertia, and turbulence. The filter element is treated with colloidal silver which may act as a bactericide and viricide.

Developer's claims of product benefits

The cermic pot filter, made of terracotta clay, can be produced in most countries around the world because of the simple component parts and the universality of clay and combustable material inputs. Moreover, there is the potential to create local, self-sustaining businesses from this endeavor.

Operating steps

1. Settle turbid water in a storage vessel before filling the ceramic pot; 2. Keep the ceramic pot filled to the top. This will improve filtration rate; 3. Clean filter with brush provided when flow rate becomes too slow; 4- Clean storage unit with soap and filtered water if necessary. Disinfect with chlorine bleach, iodine or boiling water.

Development stage

The product is being manufactured in >20 countries. In Ghana, in 2007, it has been approved by UNICEF and the government for emergency distribution during a flood emergency. In 2008, it was approved for emergency distribution during a guinea worm outbreak. The product is being locally manufactured and sold in the region with the highest rates of diarrhea in Ghana. The technology has become known through efforts of several international aid organizations and the work of several reknown academic institutions.

Future work and challenges

In Ghana our current challenge is to build a self-sustaining enterprise. The company is 6 years into this effort and still struggle to reach those who lack improved water at an affordable price. Willingness to pay ranges from $2 - $15, but our product price is $25. Moreover, emergency distribution of the product is free, which distorts the market further, even while making the product familiar to a wider customer base. We need a reliable stream of buyers, support for technical training, human resources and financial management and support for further R&D to improve the product.

Use and maintenance

User: Self-user, family member

Training: Each filter comes with an educational sticker. Hands-on demonstation training takes 1 hour in groups.

Maintenance: Self-user

Environment of use

Requirements: This filter removes microbes from unclean water. It does not require any power supply, internet, cell phone, etc. . There is no specialized personnel needed to operate the filter.

Product specifications

Dimensions (mm): 500 x 42 (diameter)

Weight (kg): 7

Consumables: The ceramic pot filter element needs replacement after 2-3 years.

Life time: 3 years

Retail Price (USD): 25

List price of consumables (USD): 8 (to replace the pot element after three years)

Other features: Portable and reusable.

Currently sold in: The filter is commercialized in certain countries (Guatemala, Cambodia, and largely promoted by NGOs in other countries)

Please see disclaimer on following page

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http://www.who.int/medical_devices/en/index.html

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World Health Organization

Compendium of new and emerging health technologies

World Health Organization