

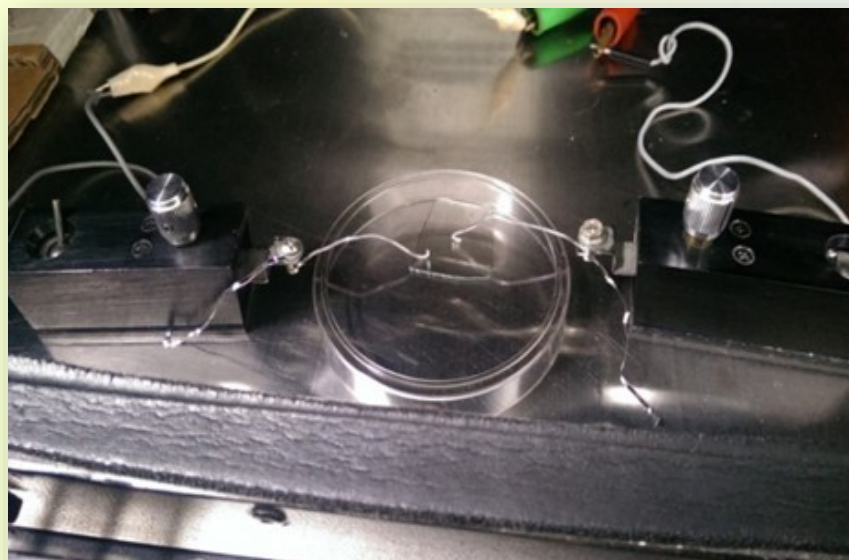


eDNAAnalyzer / eRNAAnalyzer

The **eDNAAnalyzer / eRNAAnalyzer** technology enables detection of DNAs and RNAs samples from different sources, which include bacteria, virus, fungus, cancer stem cells, plants and etc. This pioneering effort demonstrating the discovery of characteristic electronic signatures of these organisms for the first time and would be important in the fields of medical biotechnology. It will eventually pave the way forward towards fabrication of cheap, rapid and effective detection kits and sensors of trace amounts of pathogenic nucleic acids without the need for any laboratory equipment.

Dr. Vengadesh and his team aim to create an electronic database of all living organisms using the conserved region as well as the whole genome for classification purposes. This will be the first electronic organism's databank created. The platform efficiently allows anyone to study various DNA molecules in an extremely detailed and in-depth manner and also eliminates the need for complex and expensive laboratory equipment.

eDNAAnalyzer and eRNAAnalyzer are quantitative tools for analyzing DNA/RNA molecules using various solid state parameters. Each parameter defines certain characteristics of the highly specific base pair sequences upon slight variations in the base pairs. The technology involves metal/DNA or RNA/metal structures, which acts as rectifying Schottky barriers demonstrating characteristic semi-conductive behavior under room conditions. Quantitative measurements pertaining to solid state semi-conducting parameters, involving series resistance, barrier height, ideality factor and etc. can then be carried out to investigate the characteristic properties and improve the accuracy and detection limits or sensitivity.



1st generation prototype eDNAAnalyzer/eRNAAnalyzer based on a bench top platform.



Concept of mobile detection kits

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AUTOMATED METHADONE DISPENSER FOR DRUG ADDICTION TREATMENT PROGRAM

RESEARCH BACKGROUND

Methadone is a controlled medicine which can reduce withdrawal symptoms in drug addicts at a predetermined dosage. The current practice is to monitor the intervals manually by a skilled person. Methadone dosages are typically measured by pouring the medication into a measuring device to be taken by the patient. Perceptibly, human intervention may lead to discrepancies thereby resulting in erroneous measurement and it is highly crucial that the dosages are controlled and regulated prudently so as to avoid inaccuracies that can lead to unfavourable clinical outcomes. Similar to the current administration methods, records of all controlled medication are retained and maintained manually by authorised staff. Any inconsistencies or missing information in the records can lead to undesirable incidents and errors.



Manual dispense technique at Methadone Research Clinic, University of Malaya Center of Addiction Sciences (UMCAS)

MANUAL TECHNIQUE

The Methadone Guidelines (May 2016) allow the specially licensed methadone-prescribing physician to prescribe so-called 'take-home doses' for up to 7 days under certain conditions. The intent of this policy is to support and strengthen the rehabilitation of a responsible patient during treatment. Using this strategy, it is hoped that the patient will learn to take control of his addiction and will take the medication only as a way of preventing withdrawal symptoms.



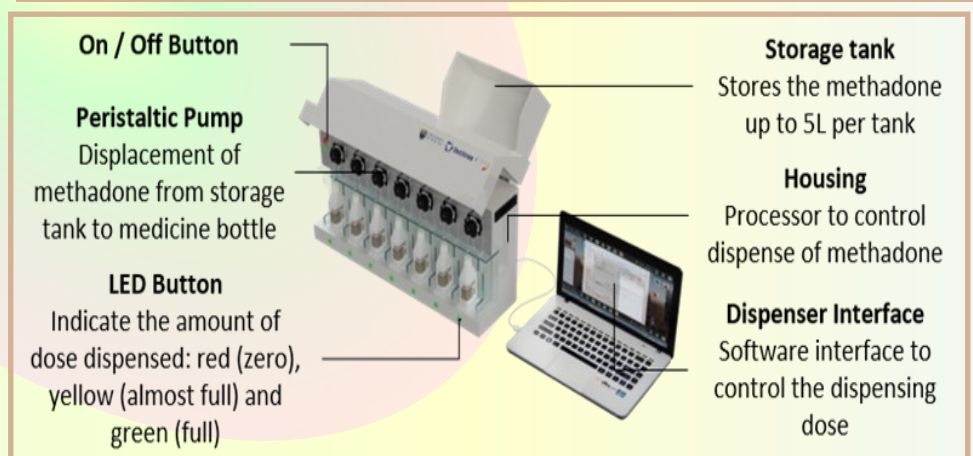
Seven "take-home doses"

AUTOMATED TECHNIQUE

The present invention is a simplistic low - cost methadone dispenser with seven dispensing portions that can be operated by any authorised person but not necessarily skilled or trained. Broadly described, the present invention is developed to provide a dispensing apparatus that is equipped with an identification or recognition mechanism to detect the patient, and dispensing the medication based on the stored medication records of the respective patient.

With the present invented apparatus, a patient or user can easily access the dispenser. However only the prescribed amount can be dispensed, as to prevent misuse of drugs or medication.

AUTOMATED METHADONE DISPENSER



DISPENSER FEATURES

Invention

Seven dispensing portions to meet the guidelines of seven take-home doses

Reliability

Precision and accuracy can be ensured for dispensing low dosage of methadone syrup

Secure Database System

Assist in record keeping, patient recognition and automated dispense

User Friendly

Simple interface and setup ease the user to handle the dispenser

Productivity

Increased the work flow during peak hour

Save Time

Alternative methods for current manual dispensing methods

TARGET MARKET

TARGET MARKET

Focused on 300,000 registered drug addicts with AADK to undergo MMT programme

SPECIFIC MARKET

Estimated 205,000 addicts and 78,419 of them were infected by HIV out of 28.3 million Malaysian population

TOTAL MARKET

Around 208 million population consume illegal drug estimated to be around 4.9 % of the world's population

**AADK– Agensi Anti Dadah Kebangsaan

**MMT– Methadone Maintenance Treatment

TARGET COMMUNITIES

Hospital, clinic, cure & care service centres (CCSC)

Drug addicts registered with MMT Program

Medical officer & clinical assistant

Manual Dispensing Technique

Retention rate of patients on methadone is 80 %

Implementation of Automated Methadone Dispenser

Retention rate of patients on methadone is expected to increase by 10 %

AWARD

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ITEX 2017 – Gold Medal for the invention of “Automated Methadone Dispensing Machine with Integrated Secure Database System for Individualized Methadone Maintenance Treatment (MMT)”

PARTNER - PARTICIPATORY ACTION RESEARCH THROUGH NEGOTIATION AND EMPOWERMENT OF THE RESIDENTS

PARTNER (Participatory Action Research Through Negotiation and Empowerment of the Residents) is a 3-phase project involving the process of actively engaging in a community to improve health and wellbeing whilst conducting research.

A household survey was conducted in the **first phase** of the **PARTNER** project in 2012 at Lembah Pantai area. A total of 3,722 respondents from 833 households were interviewed. The medical screening was participated by a total of 1,377 eligible participants above 18 years old, with 39.3% of them were hypertensive, 51.5% were hypercholesterolemic (high blood lipid), 38% were at high risk of being diabetic, 54.8% were obese and 16.3% were smokers. It was predicted that 20.5% of the respondents are at high risk while 38.4% are at moderate risk of cardiovascular diseases within 10 years.



Community aerobics training and exercise session

Community based Interventions stated below were conducted during the **second phase** of the project:

- Digital blood pressure monitors were distributed in groups to those identified as having hypertension to enable lifestyle modification and peer support of home blood pressure monitoring and control.
- About 20 participants from the community were recruited as aerobic instructors and an hour long aerobics session was conducted by trained aerobic instructors each week.
- *Projek Perumahan Rakyat (PPR)* communities as a means of promoting physical activity and introducing aerobic exercise within the community.
- The amount of salt intake among the residents was recorded to monitor their daily salt consumption.
- The methadone (a synthetic analgesic drug that is similar to morphine) programme at the Ar-Rahman mosque helped drug-users to treat addiction and it has prompted the government to introduce a similar programme that eventually could reduce the spread of HIV among intravenous drug-users.
- The tailor-made interventions have somewhat reduced the level of hypertension and salt intake among the residents as well as improved the fitness level of the community besides increasing awareness on substance abuse.



Oral health screening and health education

The **third phase** of the project focuses on giving back to the community. Upon the completion of a 4-year community based participatory action research project at six *Projek Perumahan Rakyat (PPR)*, the *PARTNER* project decided to take this opportunity to give back to the community as the project has brought to understand the true needs and humble pleas of the low income community. The free health screenings, health promotion and health awareness events conducted would benefit the community and we hope that the community will take more initiatives in conducting health promotion and prevention activities by themselves in the future. UM will serve as a “PARTNER” for the community in terms of any professional input for capacity building in achieving a healthy community.

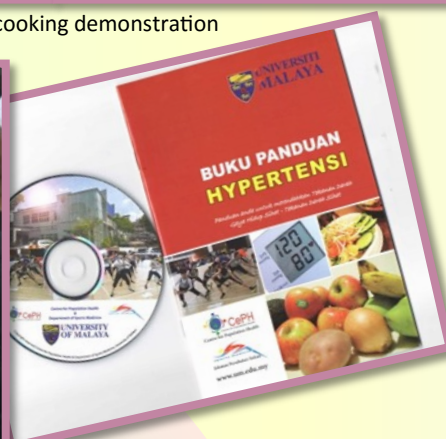
The *PARTNER* project has published 10 papers and 6 manuscripts are currently under review. The project leader, Dr. Tin Tin Su, received “UMCares Certificate of Excellence Award 2014” conferred by University of Malaya for her contribution to the community.



Healthy cooking demonstration



Lifestyle modification and peer-support home blood pressure monitoring



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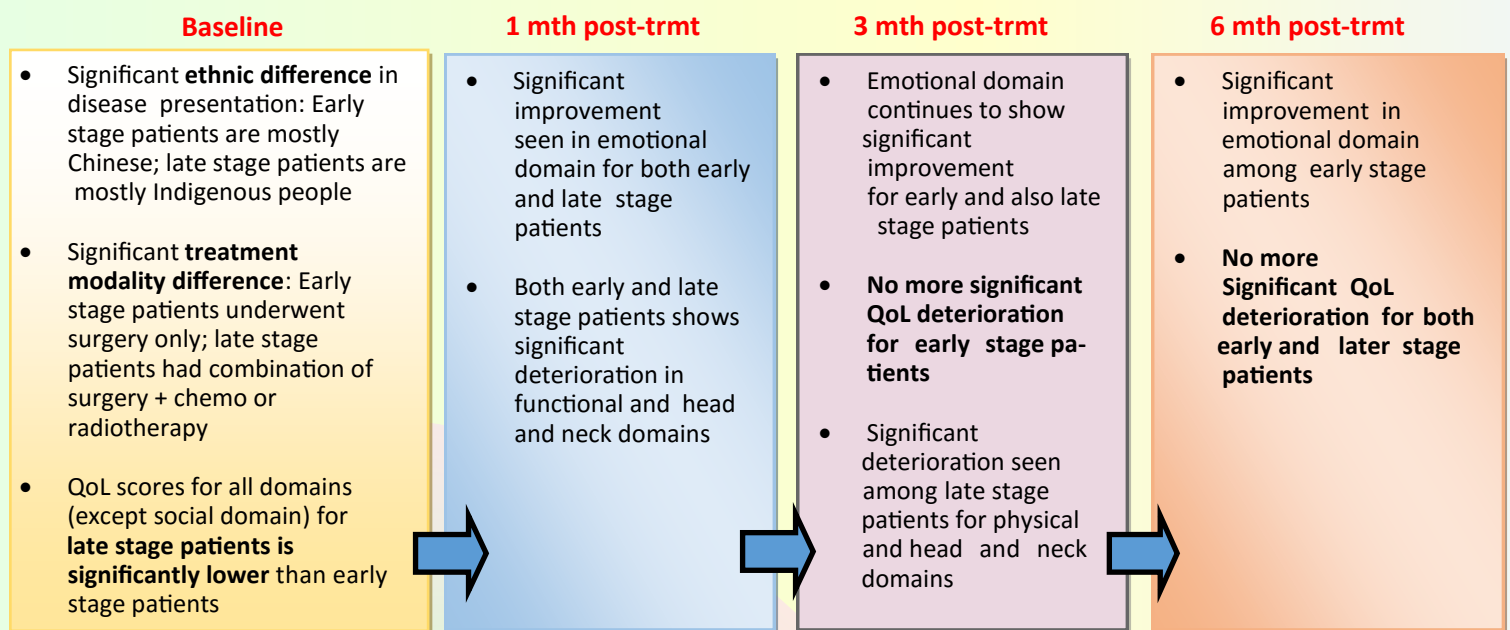
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Giving back to the community
(Free Medical Screenings and Health Awareness Days)

QUALITY OF LIFE (QoL) CHANGES AMONG EARLY AND LATE STAGE ORAL CANCER PATIENTS

Oral cancer is one of the top 20 most common cancers among Malaysians, with one new case being diagnosed every day. It is most prevalent among the Indians, whereby it is ranked among the top 10 most common types of cancer. Oral cancer survivors often carry a profound physical burden in aspects of communication, ability to swallow, facial disfigurement and psychosocial sequelae that can adversely affect their QoL. One of the main predictors of patient's QoL is their disease stage at the point of diagnosis. Thus, Assoc. Prof. Dr. Jennifer Doss and her team at the Oral Cancer Research and Coordinating Center (OCRCC) conducted a longitudinal study to assess the quality of life changes between early and late stage oral cancer patients from the point of diagnosis, up to 6 month post-treatment (post-trmt). The findings from the study are as presented:



In conclusion, oral cancer patients with advanced stage disease suffer greater impacts, which lead to poorer overall QoL than those who seek treatment at an early stage. Although significant ethnic differences were observed in the presentation of disease stage, the influence of ethnicity on patient's QoL was not evident. QoL domains most commonly affected are the functional, physical and head and neck concerns. In contrast, significant improvement is seen in the emotional well-being of patients as early as 1 month post-treatment.

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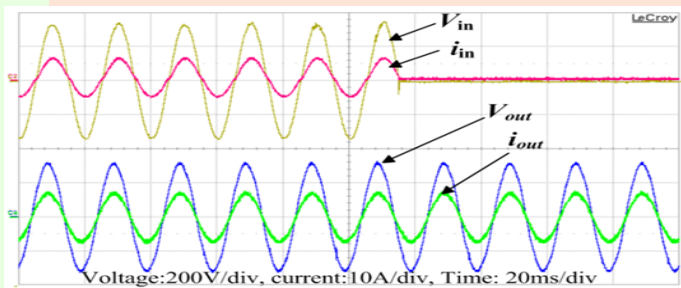
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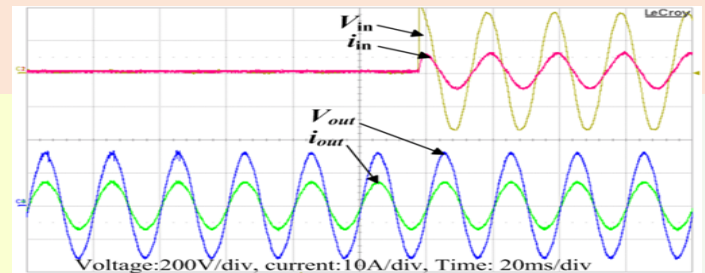


Health-Related Quality of Life (HRQoL) (47 items) for head and neck/oral cancer patients

ONLINE TRANSFORMERLESS UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM WITH A SMALLER BATTERY BANK FOR LOW POWER APPLICATIONS



Transition from Normal to Battery Powered Mode and vice versa



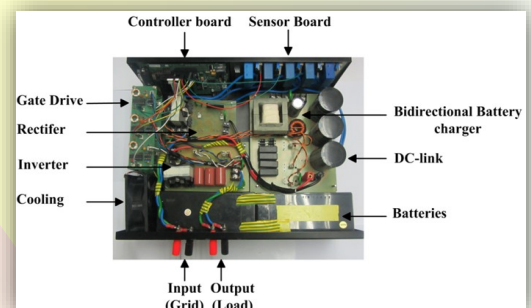
Uninterruptible power supplies (UPS) provide clean, conditioned, and reliable power to critical loads such as communication systems, network servers, medical equipment and etc. in all grid conditions. Typically, the UPS provides unity power factor, high efficiency and high reliability, yet low cost and low transients' response time from grid mode to battery mode. Generally, the batteries are connected in series to achieve high battery bank voltage. However, battery in series arrangement has major drawbacks and limitations in charging and discharging. Small imbalance in voltages occurs across the battery cells during charging and discharging since battery cells are not equal. Hence, these cannot provide the same performance during operation. Overcharging will cause severe overheating, low performance, and even destruction. Thus, small battery bank with batteries operating in parallel significantly improves the performance of the battery bank.

This article proposed a novel *transformerless* online UPS. The proposed UPS employs a high gain bidirectional converter which operates between the dc-link voltage and battery bank. Using bidirectional charger/discharger, the battery bank is reduced to only 24V (single battery), which has eliminated the drawbacks related to large string of series connected batteries. The bridgeless boost rectifier provides the regulated dc-link voltage to feed inverter and maintains the power factor correction. A new controller combining slide mode and proportional-resonant (PR) control has been implemented for the inverter control which shows good performance with low total harmonics distortion (THD) and high stability for both non-linear and impulsive loads. The cost of this proposed system is comparatively low with the small size battery bank and it is highly efficient without bulky transformer. Hence, the developed UPS system is an excellent choice for low power application with low cost and reduced weight.

The important features of the developed UPS system are:

- 1) New battery charger and discharger have been introduced which reduce the size of the battery bank significantly.
- 2) High input power factor.
- 3) New robust inverter control scheme for non-linear and impulse load.
- 4) High efficiency and low cost of the system.

The need for safe and reliable power is important for many applications in medical, military and data centers. Commercializing the product will economically help Malaysian industry in capturing the growing UPS market in Asia.



Prototype Developed in the PEARL Lab, UM

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