utmb Health

# Intellectual Property

## SHOWCASE

EDITION Sf1

Sf1

Medical Devices

Diagnostics

Therapeutics

Vaccines

AI & Software

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utmb Health

# Intellectual Property Showcase | AI & Software

EDITION
Sf1

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# Administrative Chaos Reduction



**PATENT TITLE**

Web Linked Database for Tracking Clinical Activities and Competencies and Evaluation of Program Resources and Program Outcomes

**PATENT # US 7,801,741**

**INVENTORS |** Stephen P. Fracek, Jr., Jon 0. Nilsestuen, Marilyn R. Childers

## PROBLEM

Even in today's fast moving, AI-enabled world, disparate system interoperability is still a significant problem. This problem exists in medical school performance assessments. There is a critical need for a user-friendly, server-based system that allows medical students to directly enter their patient care data and/or laboratory training data, facilitates the tracking and verifying student activities, students' progresses and performances in their programs, and evaluates program efficiency and effectiveness.

Although, some systems exist to automate portions of this process, no system currently allows the unified data entry, validation, certification, tracking and accreditation of medical students and medical training facilities using a single database structure and a single interface.

## SOLUTION

This novel technology provides a program tracking and accreditation system with methods to track student personal educational data (e.g., addresses, telephone numbers, e-mail, exams scores, board scores, or any other relevant personnel information including career progress, internships, residences, specializations, etc.); time spent at training sites and training events, validate and certify student task completions and evaluate student competencies, monitor and report/document student activities, and accreditation organizations statuses. The technology also accommodates performance and evaluation of medical staff in clinical settings. Supervisors can validate and certify medical staff competency for reporting to hospital accreditation agencies.

## POTENTIAL IMPACT

The technology improves a medical school's administrative processes into a single-point administrative solution that will improve the medical school experience for all.

# Burn Therapy Model



**PATENT TITLE**

Decision Assist Method of Resuscitation of Patients

**PATENT #** US 9,061,101
US 7857803 (ASSOC.)
US 7879020 (ASSOC.)
US 8585675 (ASSOC.)
US 8597273 (ASSOC.)

**INVENTORS |** Jose Salinas, George Kramer, Leopoldo Cancio, Kevin Chung, Elizabeth Mann, Steven Wolf, Drew Guy

## PROBLEM

Effective resuscitation of burn injuries is critical for lowering both the mortality and morbidity rates of burn patients. Both treatment and rehabilitation of burn injuries require a large economic investment by hospitals in terms of cost and long-term intensive care requirements for patients with severe and/or large percentage burns.

Each year approximately 45,000 adults and 15,000 children require hospitalizations due to burn injuries with 5,000 dying due to the severity or complications resulting from their injuries. For the military population, injury patterns due to current warfare tactics may include both traumatic and burn injuries that necessitate immediate treatment. Furthermore, recent studies have shown that over resuscitation of burn injury is not uncommon, resulting in significant iatrogenic complications.

The initial 48 hours of post-burn resuscitation are critical to survival. During this phase, patients require prompt initiation of fluid therapy, and around-the-clock care by experienced burn surgeons and intensivists. However, advanced burn care expertise is not found in most hospitals, and the care outside of burn centers can lead to increase morbidity from infusing too much fluid.

## SOLUTION

A novel expectant rate model has been developed to determine infusion rates. Specific decision assisting guidelines and a closed loop system using computer-controlled feedback technology that supplies automatic control of infusion rates using decision assisting guidelines can potentially achieve better control of urinary outputs. Because the system can self-adjust based on monitoring inputs, the novel technology can be pushed to environments such as combat zones where burn resuscitation expertise is limited. A closed loop system can also assist in the management of mass casualties, another scenario in which medical expertise is often in short supply.

## POTENTIAL IMPACT

Effective resuscitation is critical in reducing mortality and morbidity rates of acute burn patients. This novel technology can help avoid unnecessary burn-related complications to the patent and give guidance to in-field non-burn specialists.

# Clostridium difficile Profiling

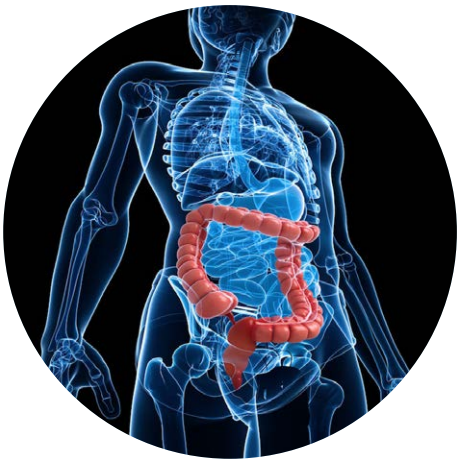


**PATENT TITLE**

Methods and Uses for Metabolic Profiling for Clostridium Difficile Infection

**PATENT # US 10,501,771**

**INVENTORS** | Tor Savidge, Sara Dann



## PROBLEM

In the last 15 years, the incidence of Clostridium difficile infection (CDI) has more than doubled. This increase is largely due to the emergence of a new hypervirulent strain. There is still a major gap in the understanding of why certain patients are susceptible to disease by this pathogen.

Readily available treatment options for CDI include metronidazole and vancomycin, but both drugs are associated with relapse rates as high as 35%, often necessitating surgical intervention. Disease relapse represents the most significant clinical issue in CDI, and there is an urgent need to identify and prophylactically manage high-risk patients.

## SOLUTION

To navigate the complex genetic, proteomic, and environmental interactions that appear to be involved in CDI, a novel technology has been developed that comprehensively categorizes subjects based on molecular and phenotypic variables. Functional metabolites in patient samples are categorized as biomarkers of clinical phenotype, activity, and treatment conditions.

Biochemical profiles have been developed for testing of clinical stool samples in combination with methods applying bipartite network analysis and visual analytical approaches that cluster patients into risk stratifications.

## POTENTIAL IMPACT

This novel technology will help reduce 40%+ hospital infection rates and reduce the 3+ million annual cases in the U.S. The technology can help reduce the CDI-associated annual cost burden of $3.5 billion.

# Correctional Managed Care



**PATENT TITLE**

Pharmaceutical Inventory and Dispensation Computer System and Methods

**PATENT # US 7,813,939**

**INVENTORS |** Leon M. Clements, Glenn G. Hammack, Sean C. Mitchem, Kelly M. Jackson

## PROBLEM

Managed healthcare is an important service that is required by law to be provided to all inmates within correctional facilities. Most correctional facilities do not have the internal resources to fully provide efficient managed health care services. For this reason, most correctional facilities outsource health care to entities that are better suited to handle health care on such a large scale.

Several types of data are required to be retained by each individual correctional facility such as demographic information and medical health records. To keep the contents of different databases accurate, duplicate entries were required because much of the data is the same within the different databases. The databases have been created in separate computing environments for different purposes. Communication between these databases, which are frequently of different database families, is limited and cumbersome. Maintaining the databases has also been difficult because each prison system has its own procedure for updating its demographic and medical record databases.

There is a critical need for a one-stop solution to increase the efficiency and traceability of health care provision and dispensation in the managed correctional environment.

## SOLUTION

This novel technology provides a system and method for computerized monitoring of pharmaceutical inventories and dispensation of prescribed medication to inmates in correctional facilities.

## POTENTIAL IMPACT

The technology enables correctional facilities to monitor and track each dose of medication from the time that it enters the pharmacy until an inmate takes the medication. This streamlined and integrated system will ensure fair and reliable access to medication, cost reduction from redundant data entry, and reduction of errors associated with the current standard.

# Enhanced Data Analysis

**PATENT TITLE**

Subtractive Clustering for Use in Analysis of Data

**PATENT # US 7,043,500**

**INVENTORS** | James F. Leary


## PROBLEM

Analysis of multi-dimensional data presents various problems. When using visualization to analyze such data, the viewing of multi-dimensional data as combinations of lower dimensional views (e.g., histograms and bivariate displays) results in the loss of information in an uncontrollable manner.

Such a loss of valuable information occurs whenever multi-dimensional data is reduced to a collection of bivariate displays to compensate for the difficulties with visualizing data greater than 3 dimensions. When a 3D object is projected down as a projection shadow onto a 2D plane, the shape of this projection shadow depends on the projection angle and may grossly distort the actual shape of the 3D object. While less immediately evident, the reduction of higher dimensional data space to 3D views, as is performed with various 3D renderings, is subject to the same problem, namely loss of information about the shape of the data objects in higher dimensional data space. While some reduction of dimensionality may be required to produce human visualizable 2-D and 3-D displays, the conventional process of displaying all possible combinations of bivariate displays only provides one human visualizable viewpoint and is subject to slight to major distortions, depending on how the data is projected down onto a lower dimensional surface.

## SOLUTION

This novel technology provides a data analysis/data mining system and method which does not require human visualization methods nor direct human supervision of multi-dimensional data analysis.

## POTENTIAL IMPACT

The technology overcomes the limitations of utilizing sparse data spaces by using data events, normalized over a multi-dimensional sub-region of space, subtracted and re-binned according to different algorithms, to best reconstruct the remaining subtracted data points. The subtracted data can then be visualized or further analyzed by other methods. The technology improves the quality and accuracy of the data being analyzed, saving time and money.

# Enterprise Resource Management



**PATENT TITLE**

Method and System for Faculty Resource Management Using a Faculty Database Structure

**PATENT # (PENDING)**

**INVENTORS |** Mark Schultze, Todd Leach, Michelle Moreno, David Callender

## PROBLEM

Typical personnel management systems are based only on business structures and personnel. These personnel management systems do not address the unique characteristics and structure of faculty-based institutions such as colleges, universities, research centers, etc. and their associated resources. For example, faculty job descriptions and metrics may include clinical duties, research duties, educational duties, administrative duties, monetary procurement (e.g., endowments, grants, sponsored research, etc.), recognition (e.g., awards, speaking engagements, publication, intellectual property, etc.), benchmark performance, tenure and collaborative activities. The multitude of these characteristics have been poorly managed on a holistic enterprise level.

## SOLUTION

A comprehensive integrated faculty resource management system has been developed, born out of the University of Texas Medical Branch's need to access, utilize, link, host, and secure disparate data systems such as electronic medical records, financial records, and clinical records to support administrators in making decisions effectively and efficiently on all aspects of the maintenance of the faculty pool and candidates.

## POTENTIAL IMPACT

This novel technology has proven to achieve efficiency gains across all aspects of the enterprise. The development, deployment and utilization of this resource management system has made UTMB more competitive, more marketable, and more quantifiable in resource allocation. This technology is customizable to other enterprises and is currently being deployed at other health science organizations.

# Integrated Telemedicine

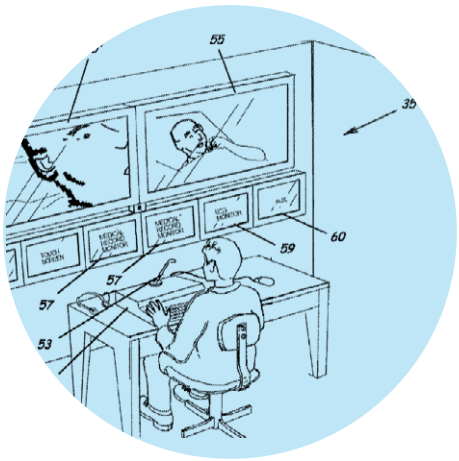


**PATENT TITLE**

System, Method, and Program Product for Delivering Medical Services from a Remote Location

**PATENT # US 8,321,284**

**INVENTORS |** Leon M. Clements, Jason Calhoun, Glenn G. Hammack, Oscar Boultinghouse, Kaye S. Cloutier, Michael J. Davis, William Whipkey, Oliver M. Black




## PROBLEM

Managed health care is an important service provided to various non-medical facilities or institutions, such as correctional facilities, remote military or scientific bases, and cruise ships. These entities have a patient clinic and/or a patient infirmary; however, they do not have the internal resources to fully provide for all the specialties of patient care. Smaller communities may be unable to afford a properly staffed medical facility or hospital, may not have enough population to support medical specialties. Even when there are adequate physician resources, there is generally an insufficient pool of substitute physicians to provide coverage when a physician is unavailable.

The concept of telemedicine has been been used widely for years. Such systems are difficult to use, provide poor imaging quality, and do not allow for real-time interaction between the patient and physician. Because telemedicine in its current form does not properly integrate the use of electronic medical records, pharmacy formularies, or medical protocols that reduce the need for discretion on the part of a patient care provider, they provide for an ineffective and non-standardized utilization of the physician resources.

## SOLUTION

This novel technology provides an integrated health care delivery system capable of providing medical services delivery to patients by a remotely separated physician of such quality and functionality to provide an enhanced substitute for an in-person consultation.

The system can store patient medication administration data in electronic medical records adequate to provide for statistical analysis of various medications dependent upon the various delivery attributes. The electronic medical records allow for a patient cost sub-index to determine costs based on patient attributes. Through data analysis, the system is flexible enough to provide custom tailored facility staffing of medical service providers.

## POTENTIAL IMPACT

The technology overcomes the challenges of physician availability and specialty availability by integrating the concept of telemedicine with electronic medical technology. The technology also integrates billing and pharmacy capabilities. The technology expands limited resources in a cost-effective and equitable manner.

# Pharmaceutical Effectiveness Analysis

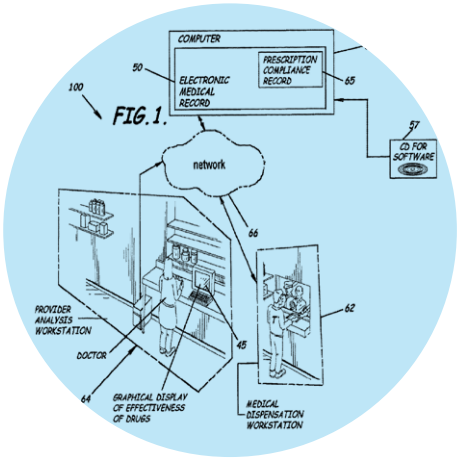


**PATENT TITLE**

Pharmaceutical Treatment Effectiveness Analysis Computer System and Methods

**PATENT # US 8,150,71**

**INVENTORS** | Leon Clements, Glenn G. Hammack




## PROBLEM

Clinical studies help the medical industry determine or verify the effects of pharmaceutical treatments. Clinical studies are typically conducted by universities or hospitals that are either trying to determine how a certain drug or pharmaceutical treatment affects a patient with a particular medical condition or how a certain medical condition can be affected by various pharmaceuticals. Other purposes of clinical studies can include determining side effects of treatment, determining if the benefits outweigh the risks, and determining which patients the treatment is most likely to help.

Before a medication can be sold to consumers, the medication must be rigorously tested on human subjects. To be eligible for approval by the FDA, a medication must be studied, typically in three clinical trial phases. The purpose of the first phase, or Phase I, clinical study is to determine the safety of the medication. Phase II, of the clinical studies typically includes ensuring the safety and effectiveness of the pharmaceutical treatment in the patient population of interest. In Phase III clinical studies, the pharmaceutical treatment is given to a much larger patient population of interest to understand the effectiveness of the pharmaceutical treatment, the benefits and risks of the pharmaceutical treatment, and the range or severity of possible adverse side effects.

Several problems exist with current clinical studies. One problem is that the subjects of the study are typically not monitored on a continuous basis. Another drawback of conventional clinical studies is that typically only the targeted parameter is monitored, as opposed to the overall health of each clinical study participant.

## SOLUTION

This novel technology, born out of clinical needs and reporting requirements within Correctional Facilities, provides a computer implemented system, program devices, program code, and computer implemented methods which analyze the effectiveness of pharmaceutical treatments for medical conditions which uses trend data for target and non-target medical parameters (physiological conditions) correlated with real-time prescription compliance data.

## POTENTIAL IMPACT

The technology can be used to provide better access to care, medication compliance, and adverse event tracking. The technology can also be adapted for use in clinical trial studies to better track and document parameters and metrics critical to the clinical study endpoint.

# Phantom Limb Pain (PLP) Treatment



**PATENT TITLE**

Virtual Reality Entertainment System for Treatment of Phantom Limb Pain and Methods for Making and Using Same

**PATENT # US 8,568,231**

**INVENTORS |** Daneshvari R. Solanki, Thomas K. Doan, William E. McGrady II

## PROBLEM

Phantom limb pain (PLP) is a genuine phenomenon in patients who have undergone an amputation. This pain can occur soon after the amputation or may develop later. The intensity of the pain varies from mild to intractable. PLP can interfere with daily activities of living, sleeping, appetite and concentration. Incidents of patients suffering PLP varies from 60% to 85%. PLP occurs in 50-70% of amputees in the first year after limb amputation. If the patient had severe pain prior to amputation, then the patient will generally have severe pain after the amputation.

There is no single treatment that can alleviate PLP. Various modalities have been tried. So far, the only therapies that have shown promise are mirror box therapy and virtual reality therapy. Both techniques use the normal limb to perform tasks and fool or trick the brain by creating the presence of the phantom limb. This provides visual feedback to the brain, which is the most important aspect in treating and managing phantom limb pain. Since only therapies that provide visual feedback of the missing limb appear effective in dealing with PLP, there is a critical need for enhanced visual feedback systems that are accessible, affordable, and interactive to help the patients.

## SOLUTION

This novel technology provides a system and method for the treatment of phantom limb pain using visual feedback methods. These visual feedback methods include generating a digital proxy representing the patient's missing limb. This digital proxy, in conjunction with motion sensor data of the normal limb and the portion of the body adjacent the missing limb, are input to a game console to simulate motion of the missing limb for use in motion-activated games such as sports games, exercise games, or other games.

## POTENTIAL IMPACT

The technology provides an accessible, affordable, and interactive platform for reducing, treating, or eliminating PLP. The technology is scalable to fit any patient population or location.

# Population Health Management



**PATENT TITLE**

Method and System for Population Health Management in a Captivated Healthcare System

**PATENT # (PENDING)**

**INVENTORS** | Alexander Vo, Stephen Smock, Anthony Williams, Ben Raimer, Owen Murray, Ryan Westberry, David Callender, Kelly Jackson

## PROBLEM

With the explosive growth of the prison population coupled with soaring medical costs, correctional healthcare has severely strained the base of public funding. Moreover, health policy analysts point out that existing health delivery models are not designed to handle the increase in chronic illnesses and infectious diseases seen within the prison population. Faced with these challenges and a legal mandate to improve conditions in its prisons, the state of Texas needed to develop and implement a novel fully integrated population management healthcare system.

## SOLUTION

UTMB through its partnership with Texas Department of Criminal Justice (TDCJ) deploys a correctional telehealth network that combines the videoconferencing capabilities of telehealth with a customized electronic records management system (EMR). The technology enables secure, comprehensive storage of medical records that can be readily accessed by clinicians at the prisons and hub sites. Clinicians also have immediate access to the pharmacy formulary and disease management guidelines. Utilization review and case management are facilitated by sophisticated analytics that ensure compliance with treatment and regulatory guidelines for protected health populations.

## POTENTIAL IMPACT

The system's implementation in Texas has proven that this system can facilitate increased access to care, increased quality of care, and greatly reduce the cost of care within the correctional patient population.

# Virtual Health Network Scheduler/Document Share

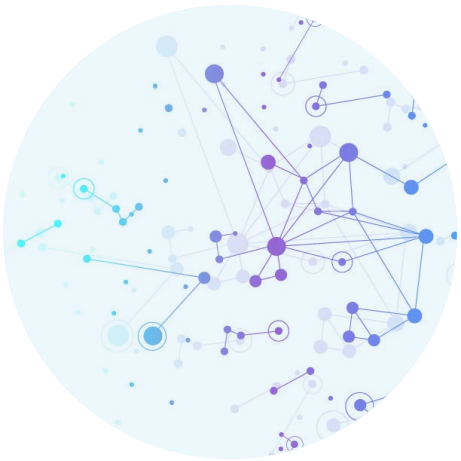


**PATENT TITLE**

Method and System for Scheduling and Document-Sharing Within an Enterprise Virtual Health Network

**PATENT # (PENDING)**

**INVENTORS |** Alexander Vo, Mari Robinson, Oliver Black, Ryan Westberry, David Callender



## PROBLEM

In response to the shortage of medical specialty providers across the state of Texas, the University of Texas System (UT) initiated a bold project to leverage the size of its Health Science Centers to create the UT Virtual Health Network (VHN). One of the challenges was the coordination of care across the enterprise and the sharing of crucial health information in the provision of care. The challenge is particularly evident when different provider groups are using unrelated or unconnected health record systems.

## SOLUTION

As part of the broader project, the VHN was developed with a scheduler and document-sharing platform that allows users to schedule telemedicine and in-office appointments as well as exchange patient information.

The VHN scheduler and document sharing platform provides coordinated outbound and inbound (from connected hubs) support for telemedical services and seamless sharing of medical information across provider systems.

## POTENTIAL IMPACT

The ability to schedule appointments for specialty medical care and transfer of crucial medical information across disparate systems will ensure timely access to specialty care and to coordinate care more efficiently across providers.


# Intellectual Property Showcase:
## AI & Software

For more information, please contact:
**Alexander Vo, PhD at ahvo@utmb.edu**

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