A Continuing Medical Education Program for Community Health Workers in Underserved Regions of The World

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KEYWORDS:

CME, Clinical Knowledge, Continuing Medical Education, Mobile App, Outreach

ABSTRACT

Continuing medical education (CME) is vital to maintaining knowledge and expanding the skills of medical professionals. It is also vital to medical *para-professionals*, such as community health workers (CHWs), who increasingly are providing essential clinical services and prevention training in underserved communities around the world. This article describes an emerging program to prepare CHWs with a standardized curriculum that is localized for individual communities. One means of localizing the training is through a CME program that allows CHWs to focus on medical and health conditions they face every day. Further, over time, this CME program enables the health workers to stay current with medical developments and to grow their skills in new areas. The CME resources are delivered by way of a free mobile app with which to download self-contained training programs and to upload records of the CHW's earned credits. In addition, this CME program uses CHWs cell numbers and email addresses to deliver critical health alerts and immediate access to relevant tutorials. This outreach tool serves as an early alert system to reach CHWs anywhere in the world.

INTRODUCTION

Physicians, nurses and other medical professionals globally are obliged to engage in a continuing medical education (CME) program to retain their certifications. Staying up-to-date on scientific developments offers professional satisfaction, leading to better practice behavior and clinical practice outcomes. A blessing to most, maybe a burden to some, CME is an integral part of the successful practice of medicine, and especially so in recent years, as the European Society of Cardiology notes:

> [W]ide ranging biomedical innovation has provided powerful new approaches for prevention, diagnosis and management of diseases. In order to translate such innovation into effective practice, physicians must frequently update their knowledge base and skills through continuing medical education and training.

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DOI: 10.38206/150109

The literature offers ample evidence about the effectiveness of CME in updating physicians and nurses and influencing their practice of medicine and health care. This article offers a summary of what we know.

APPROACHES TO CME

Many training technologies are available for CME today, and all approaches stand to enhance knowledge, skills and attitudes. Studies show that better learning occurs when the interventions are interactive, use multiple methods and are designed for a small group of physicians from a single discipline. Participants attribute the satisfaction of a training program to ease of use, ease of access and interactive content.

Most recently, electronic methods have dominated CME delivery approaches. They are easy to access, offer more variety of source and content, take less time and are often less expensive. Studies show that CME through electronic media is at least as successful at training as other methods. Smartphone applications can improve a physician's knowledge, attitude and practice, with outcomes as effective as more conventional CME methods (e.g., classroom or small group training). Asked about preferences, many physicians like the smartphone (mobile phone) approach over other delivery methods, and some express a strong preference for online and on-demand options, including video, podcast and online written materials.

It's important to confirm the efficacy of learning by the increasingly popular electronic media, but no matter how the training is conducted or how outcomes are measured, the lion's share of studies acknowledge the benefits of CME, and that is not surprising, nor should it be. The bottom line: CME requirements are associated with improvements in clinical knowledge. We're not sure where medical practice would be if research offered contrary conclusions.

COMMUNITY HEALTH WORKERS

CME enables medical professionals to acquire and maintain knowledge — especially when accelerating advances in medical and health sciences — and we argue that continuing training is also essential for an entire class of paraprofessional health practitioners. Specifically, in this article, we will discuss community health workers (CHWs), but our interests reach a broader group that receives some level of initial training and has responsibilities to deliver health services. Examples include lab technicians, paramedics, physician and dental assistants, physical therapists and nutritionists.

TABLE 1.
Medical Professionals per 10,000 People[9]

	High Income	Middle Income	Low Income
Physicians	31	8	3
Nurses	110	18	9

The Need for CHWs

While the number of physicians per capita does not line up conveniently with national income, in most low- and middle-resource countries, there is an inadequate number of physicians and nurses to address population needs. Surveys conducted over the years by the World Organization (WHO), the World Bank, the Pan American Health Organization and other global agencies reveal the disparity. (Table 1)

The disparity in numbers of physicians and nurses between rich and poor countries is striking, and the measures are reasonably consistent across regions.

There is little hope of increasing the number of medical professionals within the next several decades, a fact openly recognized by WHO, which has long advocated for the cultivation of CHWs, a paraprofessional corps to fill the gap, not as substitutes but as supplements for physicians. WHO identifies CHWs as healthcare providers who live in the community they serve and have enormous potential to extend healthcare services to vulnerable populations living in remote regions with historically marginalized people. CHWs provide "unmet health needs in a culturally appropriate manner, improve access to services, address inequities in health status and improve health system performance and efficiency."

CHW Preparation

In practice, CHW services are wide and varied and differ significantly from place to place. Some CHWs receive merely an hour of training focusing on specific activities, such as survey data collection or task-specific, physician assistance. Others go through more rigorous and comprehensive training in classes that run for weeks and months. The term CHWs gives an impression of standard training and practice — like scaled-down university-educated medical professionals — but, CHW becomes a catch-all label for people who, as we stated earlier, fill gaps in the health system. In low- and middle-income regions, CHWs offer a constellation of health services as needed to accommodate communities deprived of adequate medical and health resources.

Among the better-trained corps, CHWs provide basic clinical services and referrals to higher levels of care, disease prevention training, mother and child health monitoring, health advocacy, medication management and health surveillance. Serving as critical links within the healthcare system, they bring information from official medical agencies to local communities and from those communities back to the official medical agencies. During COVID, we saw CHWs fill an even more expanded role as they stepped in to provide scaled-up prevention and treatment services to accommodate ailing communities facing pandemic-diminished numbers of medical professionals.

A CHW Training Program

With guidance from a panel of 12 physicians and nursing professors, WiRED International developed an extensive WHO-compliant, CHW curriculum comprising 26 modules that can be downloaded to phones and tablets. Local physicians and nurses teach the 140-hour training course in classrooms and clinical settings. The course, which has been tested successfully in Kenya, Honduras, Peru and India, includes:

- Basic health issues. Anatomy and physiology; infectious diseases prevention and control; non-communicable diseases, causes and prevention; health promotion; mental health
- Clinical issues. Vital signs and basic assessment; first aid and assessment; medications management; patient assessment
- Health Communications. Communication skills; teaching health topics; health surveillance skills

A daunting challenge for CHW training courses is how to provide a standard curriculum covering universal health topics while adapting the course to local differences in health conditions, cultural norms, government requirements, resource availability and other qualities that distinguish local communities. The WiRED curriculum addresses universal medical and health topics through its standard curriculum, and it affects *localized* CHW training in two ways.

First, local medical professionals teach the CHW course. WiRED introduces the instructors to the material and works with them on appropriate teaching methods. The instructors, using the modules, bring the lessons to the local level in their CHW classrooms. For instance, in discussions of infectious diseases, the local doctors reference illnesses common in that community and address effective local treatments. Further, they describe local protocols for referrals, discuss higher-level treatment facilities and detail other resources CHWs will need in their field activities. So, the instructors present the academic material from the modules while casting the lessons in a local frame. In sum, local doctors and nurses teach local CHWs.

The second way we localize CHW training is through a CME program. After CHWs earn their certificates, they are automatically enrolled in an online CME platform that offers hundreds of modules related to health and medicine. The program is available through a smartphone/tablet app that enables CHWs to browse the topics alphabetically or by topic category. Users can choose and download as many modules as they wish, study them offline, and freely share them with others. This helps localize training by allowing CHWs to select the topics of greatest relevance to their communities. Certain infectious diseases, as well as non-communicable diseases, may be found in some populations but not in others. Ebola has been a serious threat in Ghana but not in Nicaragua; diabetes is a great concern in Pakistan but much less so in Argentina. CHWs can select modules relevant to the conditions they encounter in their region.

CME PROGRAMS

Apart from helping localize CHW basic training, CME programs play a critical role in sustaining and growing the skills and competencies of CHWs over time. A paper on health worker training in rural areas argues that continuing training for providers at all levels of health care is essential to successful healthcare systems, providing opportunities

to maintain, update, develop and enhance professional skills. Ionescu, *et. al.* conclude from a literature review that CME via electronic media can be important to health workers in low-income countries, but very little has been studied on available learning systems or outcomes. In O'Donovan's, *et al.* scoping review of follow-up training programs, most CME training methods used in-person forums although several employed mobile technologies. With only a few exceptions, the literature does not offer much detail about the availability or impact of CME programs for CHWs in rural and low-income regions. This lack of evidence suggests that rigorous and widely available training programs are far and few between.

WHO, as well as most official health systems, favors CME training for as long as the CHW serves in the community, although few agencies in low-income regions provide the resources needed to carry out CME. That promotion of principle but failure to provide CME resources drives WiRED's work to advance a strong, reliable, and effective CME program.

WiRED's CME approach, whether CHWs adapt it to focus on local health conditions, build additional skills, or stay current on emerging illnesses and treatments, is a requirement for everyone we train. Researchers found, in one small study, that physicians who didn't participate in CME said they avoided it because they were too busy, they had no interest in it, they didn't like the fees involved and they couldn't locate suitable providers. This list was instructive in the development of our CME program for CHWs, and while we couldn't do much about the users' lack of time, we could do something about the other points. As for users' interest in CME content, we strive to keep our training modules interesting and engaging. We offer visuals and interactive features in our lessons and follow all key concepts with brief quizzes that directly involve users in the content. Further, we address the last two issues on the doctors' CME-avoidance list and several other obstacles that might reduce participation by ensuring that:

- The program is free.
- Accessing training material does not require sustained online connections (reducing cost).
- The program is easy to discover. We actively market the program and open it to all CHWs.
- Modules employ a consistent, structured, interactive format that becomes familiar to users and allows them to engage easily with the material.
- There are minimal barriers to accessing the training material. We accomplish this by making the app easy-to-use--it serves as a one-stop portal to all health training modules.
- Module access and use are not limited or blocked by legal, economic or complicated technical requirements. All modules are portable (and shareable) for use without cost on smartphones and tablets on Windows, Mac and Android platforms.

In addition to providing a platform to access CME training material, the program keeps track of credits earned each year and reminds users about the credits they need to meet their annual requirements.

CME Program, Rationale and Delivery Tools

Over the years, a major impediment to CME and other training programs has been distributing educational material. Until the late 1990s, when the Internet matured beyond the novelty stage and became a more practical and functional medium, CME programs — training programs of any kind — were offered in print, typically involving the physical distribution of books and pamphlets. In many locations, especially in remote and low-income regions, poor infrastructure and the cost of printing and transporting heavy books made it all but impossible to provide CME material.

WiRED began working in underserved regions in the late 1990s, and we grew our health training programs simultaneously and in sync with communication technologies that were rapidly evolving. In just a few years, the electronic delivery of information removed geographic barriers faced by physical media and allowed us to offer health training tools in increasingly distant and challenging environments. The following offers a brief account of our work in light of evolving technologies over the past 20 years:

- The first distribution model involved copying and transferring health modules from our computer libraries to recipient computer systems (usually desktops) that operated within the community health information centers we set up worldwide. The process involved physical media, starting with the transfer of the library from our servers to CD-ROMS (and later to flash drives). We then physically transported these

media to user computers around the world. The capacity of small flash drives to store large quantities of information eliminated the need for bulky CDs, but flash drives still required physical transfer of the information; someone had to hand-carry the drives into the field.

- As Internet connections proliferated globally and underserved communities gained access to information resources, WiRED established a website for the delivery of our modules. The website library was structured very much as it is today, with titles listed alphabetically and sorted into appropriate topic categories. This allowed users to browse the collection and select any modules that interested them. Access online was a vast improvement over physical media because it was fast and easy and didn't require someone packing CDs or flash drives in a suitcase and get on a plane. Still, website access lacked many of the distribution qualities we wanted for CME in underserved regions. We found problems inherent to online study:
  - Users needed steady, reliable Internet connections, which was impossible in most target communities.
  - Users needed computer equipment that few could afford, so the program was tethered to a dedicated computer facility, usually in a larger town.
  - Not everyone knew how to use computers, which led to an increased number of support requests and user frustrations.
  - Maintaining detailed usage records was difficult, so health trainers and officials were unable to capture users' progress toward requirements for continuing education.

By 2022, advances in technology and the widespread public adoption of sophisticated smartphones and tablets, even in low-resource regions, have allowed WiRED to shrink the distance from faraway places and offer a wide variety of CME programs. WiRED's current training programs make use of the latest generation of Internet communication features that allow:

- Module downloading (and thus minimal required Internet access)
- Easy module sharing among users
- Real-time tracking programs that enable users to monitor their progress for annual credit requirements
- Back-end recordkeeping that allows official institutions to examine aggregate module selection by time and place

WiRED's CME Infrastructure

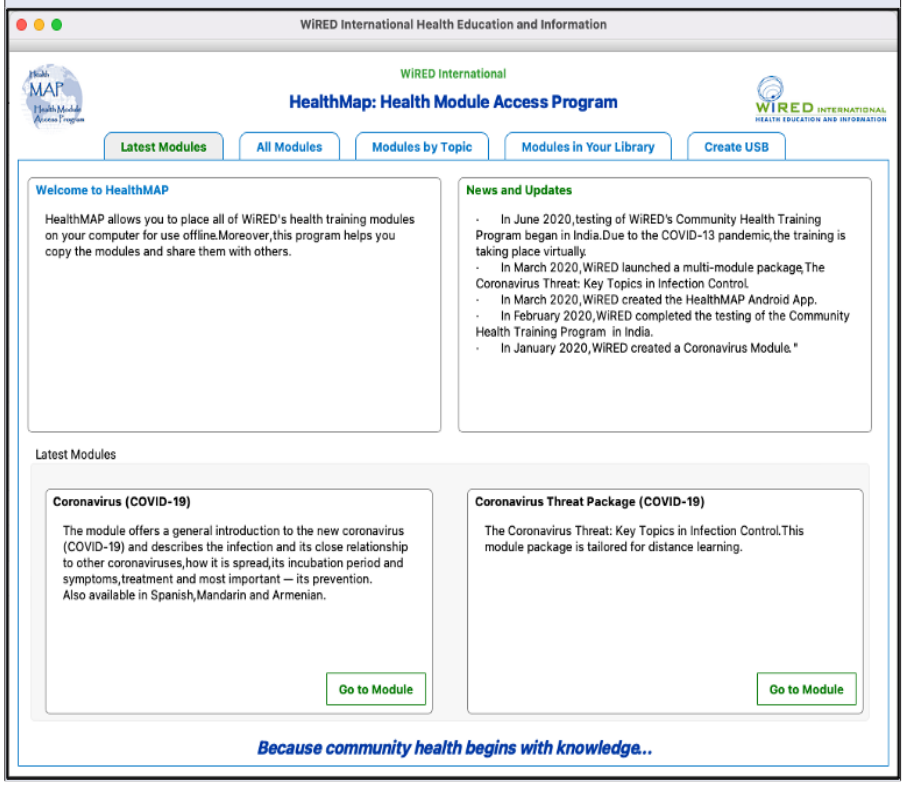
Accuracy and usefulness of CME content are essential, but of nearly equal importance is the effective distribution of that content. That is especially so in our focus areas — remote and low-income regions, where few CME options are available. Consequently, the distribution and tracking tools that serve WiRED's CME program are essential for this discussion.

WiRED's most recent delivery software is an application that can be downloaded to any smartphone, tablet, or computer. It is an integrated program that offers several key features:

- It requires very little time to download and install the app.
- Users access the app program with an ID and password, and while occasional Internet access is needed to obtain and use the program, the required time online is brief.

FIGURE 1.

WiRED Health Module Access Program (HealthMap)



- Users log on to download new modules and to report CME credits earned.
- Downloading modules builds a portable collection, requiring no further connect time. All content, lessons, embedded quizzes and final module exams are onboard the user's device.
- On our Windows and macOS platforms, the modules are loaded in the web browser from the library interface. On the Android version there is an integrated module reader.

Three Key CME Delivery and Tracking Components

WiRED's CME app infrastructure consists of three components:

1. WiRED Health Module Access Program (HealthMap)
2. WiRED CME Tracking Service
3. WiRED CME Data Services

WiRED HealthMap

Versions of HealthMap exist for the Windows, macOS, and Android platforms and implement five core application features:

The *Latest Modules* feature provides users with a quick view of recently added or updated modules.

The *All Modules* feature allows the user to browse through modules alphabetically, where each module is tagged based upon its primary topical areas (i.e., Introduction to Cancer would be found under C.)

The *Modules by Topic* feature allows users to search for modules based upon Categories (e.g., Body Location and Systems; Disorders and Conditions; Diagnosis and Therapy) and then Topics (e.g., Blood, Heart and Circulation; Bones, Joints, and Muscles; Digestive System). Topic categories match the typology used by the National Library of Medicine.

The *Modules in Your Library* feature allows users to manage their module library, check version numbers and retrieve updated versions.

The *Create USB Module* feature (for Windows and macOS X platforms) allows users to copy all modules to a USB storage device for field distribution to community health center systems. (Note that third-party, free programs are available for Android platforms to move content from one device to another easily.)

FIGURE 2.

WiRED CME Tracking Service

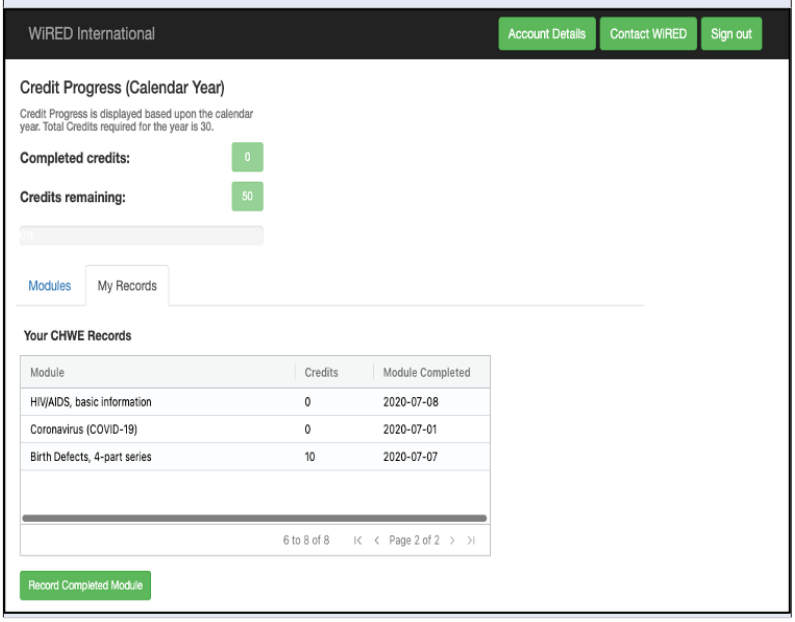
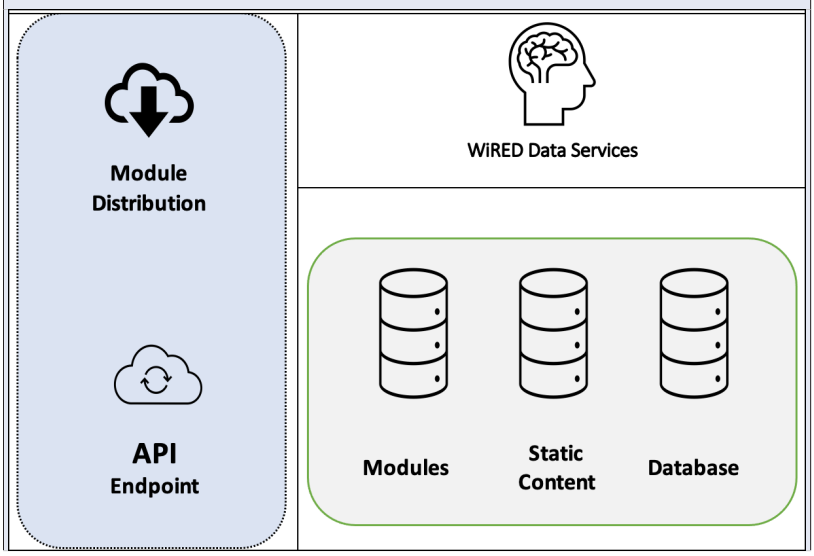


FIGURE 3.

WiRED CME Data Services



One additional element available on the app is an "urgent flag." While this isn't a functional element, like the items above, it is nonetheless an important feature, especially in communication-limited regions where news from the outside is often restricted. Users opening the app for a new session will see access points for the five core applications, and they also will see a text area announcing any critical health alerts. This section may have little or no content, as urgent health alerts are thankfully not everyday occurrences. At other times, it may contain details about an urgent health issue CHWs should know about. This section also may offer a direct link to a relevant WiRED module that provides CHWs with immediate access to a tutorial on the topic. Such was the case for the Ebola and COVID outbreaks and a spate of polio cases in the Middle East several years ago.

Given that CME registration requires a CHW's email address and mobile number, we will be able to send alerts to everyone on the contact list who might be affected by an emergency condition. The alert might be little more than "check your app," but it would serve as an active alert system in rural and low-resource regions where few such communication tools are available. This additional feature is unavailable, but it is on our agenda for program developments.

When a user chooses a module from any feature lists (1-4), module details are displayed, including the current version number, package size, and short description (Figure 4). *The Download Module and Open Your Library* buttons offer users a one-click interaction to retrieve modules from the WiRED Data Services. When users employ the *Modules by Topic* feature, they can download all modules within a topic or download each module separately. The Open your Library button allows the user to see all of the modules downloaded on their devices in one location and launch them into the browser for use.

FIGURE 4.

Module Details as Viewed in the App

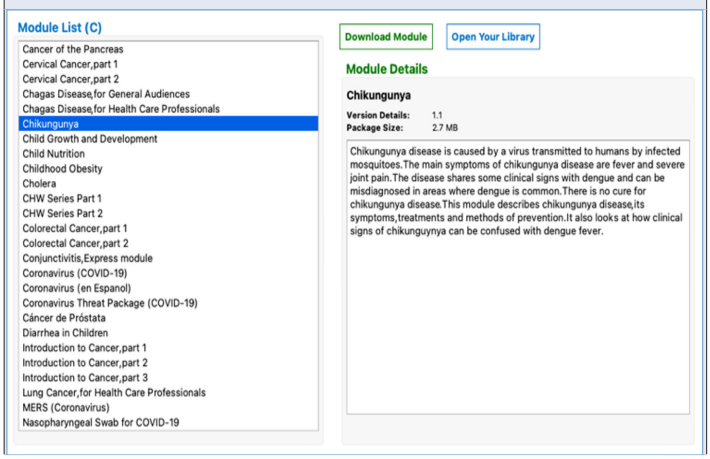
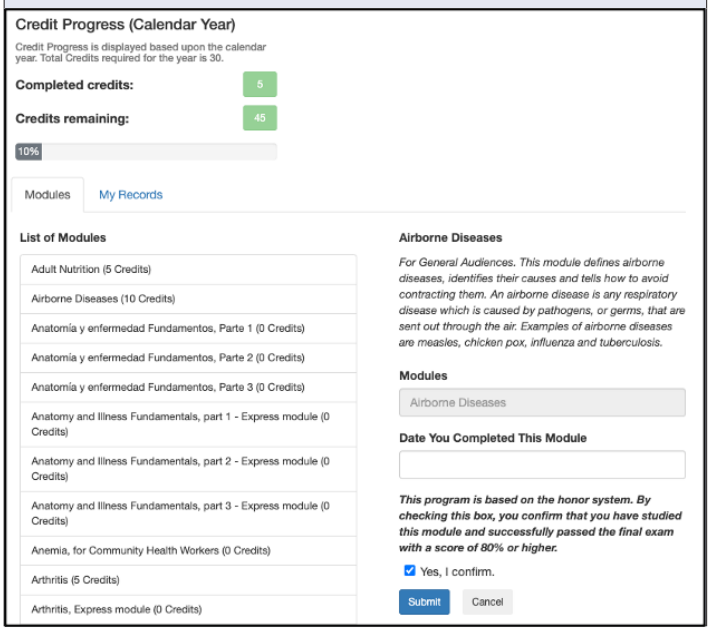


FIGURE 5.

Credit Progress as Viewed in the App



Wired Continuing Health Worker Education Tracking Service

The WiRED CHWE Tracking Service was implemented in 2020 to provide HealthMAP users the ability to track CME credits on a calendar year basis. This application is fully integrated with the WiRED Data Services such that when a WiRED Module Administrator updates module attributes, they can, at the direction of the medical writing staff, set the number of credits the user will receive for completion of the module.

Observing protocols of most CME programs, the current implementation uses an honor system where users self-report their progress throughout the year, confirming they have studied a module and successfully passed the final exam with a score of 80% or higher.

The interface for self-reporting allows the user to choose a module from the list and attest to completing the module on a specified date. These data are saved to the database via the WiRED Data Service.

FIGURE 6.

WiRED Data Services Databases Source Code

widm.wiredhealthresources.net/api/topics

Name
topics

Headers | Preview | Response | Initiator | Timing

[{category: "Language Translations", id: "5af9d924d134a865504b92c7", name: "Armenian",…},…]
0: {category: "Language Translations", id: "5af9d924d134a865504b92c7", name: "Armenian",…}
1: {category: "Special Series", id: "5a28fdf8d0056a5c37591fcd", name: "Autoimmune Disorders",…}
2: {category: "Body Location and Systems", id: "5a28fbe8d0056a5c37591fa0",…}
3: {category: "Body Location and Systems", id: "5a28fbf4d0056a5c37591fa1",…}
4: {category: "Body Location and Systems", id: "5a28fbfed0056a5c37591fa2", name: "Brain and Nerves",…}
5: {category: "Disorders and Conditions", id: "5a28fc77d0056a5c37591fae", name: "Cancer",…}
6: {category: "Demographic Groups", id: "5a28fcf4d0056a5c37591fb8", name: "Children and Teenagers",…}
7: {category: "Diagnosis and Therapy", id: "5a28fd97d0056a5c37591fc6",…}
8: {category: "Disorders and Conditions", id: "5a28fc80d0056a5c37591faf", name: "Diabetes",…}
9: {category: "Special Series", id: "5aedf5cbd134a865504b92c2", name: "Diabetes Series",…}
category: "Special Series"
description: ""
id: "5aedf5cbd134a865504b92c2"
name: "Diabetes Series"
_id: "5aedf5cbd134a865504b92c2"
10: {category: "Diagnosis and Therapy", id: "5c5aa51c0338133864306571", name: "Diagnostic Tests",…}
11: {category: "Body Location and Systems", id: "5a28fc08d0056a5c37591fa3", name: "Digestive System",…}
12: {category: "Health and Wellness", id: "5a28fd27d0056a5c37591fbd", name: "Disasters",…}
13: {category: "Diagnosis and Therapy", id: "5a28fdb2d0056a5c37591fc8", name: "Drug Therapy",…}
14: {category: "Body Location and Systems", id: "5a28fc13d0056a5c37591fa4", name: "Ear, Nose and Throat",…}
15: {category: "Body Location and Systems", id: "5a28fc1dd0056a5c37591fa5", name: "Endocrine System",…}
16: {category: "Body Location and Systems", id: "5a28fc25d0056a5c37591fa6", name: "Eyes and Vision",…}
17: {category: "Body Location and Systems", id: "5a28fc5dd0056a5c37591fac",…}
18: {category: "Health and Wellness", id: "5a28fd33d0056a5c37591fbe", name: "Fitness and Exercise",…}

1 requests | 7.8 kB tr

Users can access their records under the *My Records* tab and view a list of the modules they completed, the credits they received and the date they completed each module.

WiRED's existing platforms allow our CHWs to access WiRED's library of modules and record their progress over time. We plan to extend the CME tool to all CHWs globally in the coming year, whether they were trained by WiRED or through other programs. People can sign up individually or arrange for access through a group. Each person will need to supply basic information in signing up, enabling WiRED to construct a general profile of its CME audience.

In addition, the WiRED Technology Platform will allow healthcare ministries and clinical organizations to establish their own CME programs using our applications and data services. This implementation would allow an organization to establish a curriculum of required and optional modules, along with a credit system compliant with their existing requirements, and then offer it to their user community through a branded partnership site and model.

Wired Data Services

Details on WiRED Data Services involve concepts and systems relevant to online data storage and global distribution. While this article concentrates on CME, an essential feature of our training programs is an infrastructure that makes program delivery, reporting, and recordkeeping possible.

WIRED'S DATA SERVICES ACCESS

For readers interested in the back-end technology, the following describes the operation of WiRED's CME activities in detail.

Last year WiRED deployed our fourth generation CME Infrastructure built on Amazon Web Services (AWS) to take advantage of a global edge distribution model with built-in resiliency of operations. The WiRED Data Services are accessed via three primary pathways: a *Module Distribution Endpoint, an Application Programming Interface (API) Endpoint,* and a *Static Content Endpoint.*

The *Module Distribution Endpoint* allows our users and applications such as HealthMap to retrieve WiRED module archives. These archives are stored on AWS S3 Storage volumes and offer reliable access to our global community of users. As modules are stored on WiRED's S3 instance, a unique access URL is generated and updated in our database, allowing for ease of module management and version access over time.

The *API Endpoint* allows WiRED applications to query data endpoints to retrieve the latest data from our database. These endpoints include a*rticles, topics* and *modules* and return JSON formatted data for ease of use by our client applications. One additional benefit to this approach is that our open API healthcare application developers who would like to develop their own client applications can easily integrate with the WiRED Data Services, extending the reach of our user communities.

The WiRED Data Services Databases are implemented using AWS DynamoDB and contain records for each WiRED module and each WiRED course record. The interfaces to these data are provided via custom applications developed to manage our module creation process and utilize AWS API Gateway that exposes our data to the API Endpoints as described in the previous paragraph.

The *Static Content Endpoints* are provisioned via AWS Lightsail, which offers access to our traditional web resources. This includes two WordPress sites for WiRED International and Pandipieri (a Website we maintain for our partner NGO in Kenya) and a gateway proxy used to handle the multiple API versions that we have deployed over the past few years.

CONCLUSION

Affordable end-to-end digital CME services are not prevalent within the global healthcare ecosystem, and we believe that offering this service will supply a distribution channel for health modules in under-resourced communities. That, we believe, will provide a critical service that enables CHWs and other medical and health paraprofessionals to stay current, advance their knowledge, and build new skills that render them even more valuable resources in underserved communities. Helping to fulfill WiRED's mission to provide health education tools to low-income regions will broaden the WiRED user community even further. Finally, this program will provide an additional layer of global health observation as we watch for emerging health challenges and seek to understand healthcare workers' capacity and needs in our planning for future services and crisis management.

ACKNOWLEDGMENT

The authors wish to thank Allison Kozicharow and Dr. Elizabeth Fine for their expert review and editing of this manuscript. Both are familiar with WiRED's CHW and CME programs; their suggestions were invaluable in developing this paper.

AUTHOR DISCLOSURES:

No relevant financial affiliations or conflicts of interest.

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