mHealth in the Global Arena: Progress and Promise

Sheana Bull, Ph.D. Chair and Professor in the Department of Community and Behavioral Health, Colorado School of Public Health offers insight on the proliferation of healthcare programming that utilizes mobile devices such as smartphones and tablets.

Mobile Technologies and Health Promotion

Innovative health promotion programs have materialized from the boom of mobile technologies. Applications (apps) for smartphones and tablets targeted for health promotion have become increasingly popular.

Simply searching an app store for the word “health” yields almost 18,000 results. Each app offers a specific service; calorie counters, menstruation trackers, etcetera.

Initially, it seems these high-tech services would only be useful in industrialized, high-income settings. However, with nearly seven billion cellphones in use across the globe, approximately 97 out of 100 people have a cellphone, or access to one.

Worldwide, smartphones and their apps are not as commonplace as cellphones, but high rates of cellphone use allows simple text messaging programs to saturate even low-income populations.

With text messages costing just a few cents, the idea of the “digital divide” that once pointed to limited availability and high cost of technologies is becoming tenuous.

This unprecedented level of access to mobile technology has given rise to the concept of mHealth, short for mobile health.

Dr. Sheana Bull states, “There is really not an area in the world that isn’t experimenting with mHealth. There are great examples throughout the developing world that the U.S. can learn from. We’ve seen a level of sophistication emerge that has been born out of necessity.”

mHealth programs can be delivered through mobile devices in a number of ways.

mHealth modalities vary based on provider or patient usage, and they also vary depending on the goal of the program, be it education, intervention, or surveillance.

However, Dr. Bull believes that mHealth opportunities are not disease-specific, “My inclination is that you can apply lessons from mHealth to any number of considerations.”

mHealth approaches are undergoing rigorous research. As a nascent field, the evidence base is limited but growing steadily.

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CHCO Joins Over Half of the Nation’s Hospitals in Providing Telehealth Services

Fred Thomas, M.S.S.W., Ph.D. is the Director of Telemedicine at Children’s Hospital Colorado and the University of Colorado School of Medicine. Dr. Thomas shares his expertise in telehealth.

Telemedicine, as defined by the American Telehealth Association, “is the use of medical information exchanged from one site to another via electronic communications to improve a patient’s clinical health status.”

Telehealth is used to define a “broader scope” of remotely delivered healthcare that can include non-clinical services such as training. The use of technology to deliver healthcare remotely has become increasingly important to the changing landscape of the US healthcare industry.

Most commonly, telehealth is conducted using video streaming combined with audio. It allows for real time exchange between patient and practitioner.

It has a variety of applications within the healthcare spectrum. Telehealth programming can be used in settings as diverse as emergency rooms (ER) to psychiatry practices.

With increased healthcare coverage as a result of the passing of the Patient Protection and Affordable Care Act, the demand for specialized healthcare has increased.

Telehealth, when effectively implemented, can increase access to specialized healthcare for many, particularly those in previously underserved communities. For example, telehealth initiatives can connect those who live in rural areas to specialists in urban settings hours away.

It can also increase the amount of contact a patient or primary care physician has with a specialist. Telehealth can also lower costs of medical consultations as physicians can see more patients and can sometimes eliminate outreach visits to remote locales.

Telehealth can be used to link multiple practitioners treating the same patient, reducing communication gaps and improving case management quality.

Telehealth is filling a market niche, and as a result, has become a booming industry. In 2013, the industry totaled 240 million. Forbes projects by the year 2018, the telehealth industry will total 1.9 billion, a projected growth rate of rate of fifty-six percent in the next five years.

Hospitals, technology companies and even the U.S. government are investing heavily in telehealth endeavors.

It is estimated that now over fifty percent of all U.S. hospitals utilize some sort of telehealth services.

In July 2014, the Office of Health and Human Services released new guidelines expanding the range of telehealth services Medicare will now cover. IBM and Apple recently announced a collaboration that will include the development of telehealth platforms.

The increased investment in telehealth reflects the successful removal of barriers that impeded its use in the past. Initially, telehealth struggled to get off the ground as the technology and equipment necessary to effectively communicate was expensive and hard to use.

Clear guidelines on ensuring patient privacy and health care reimbursement led many physicians and institutions to avoid attempting its use.

Today, the cost of the technology has dramatically decreased. Telemedicine requires only a camera and a good internet connection- something most physicians and hospitals can easily afford. What’s more, HIPPA approved platforms have been created to ensure patient privacy.

Fred Thomas, M.S.S.W., Ph.D., is the Director of Telemedicine at Children’s Hospital Colorado and University of Colorado School of Medicine. He is no stranger to telehealth.

He came to Children’s Hospital Colorado (CHCO) in July, 2012 after pioneering an innovative telehealth program in Galveston, Texas through the University of Texas Medical Branch.

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Appropriate Modalities for Public Health Programming

In this pioneering area of public health, some approaches are already more well-researched and trusted.

Dr. Bull states, “SMS and text messaging remains one of our lowest common denominators with promise in the health field.” Text messaging or SMS (short message service) sends out medication adherence or scheduled vaccination reminders to patients.

A project conducted by non-profit organization Weltel called WeltelKenya1 was a multisite randomized controlled trial of HIV-positive adults initiating antiretroviral therapy in Kenya. With the assistance of phone providers, this trial assessed whether mobile phone communication between health-care workers and patients improved drug adherence and viral load suppression. Although Dr. Bull did not work on this project, she sites it as a strong example of the growing evidence base around mHealth programs.

Another embedded public health issue, tobacco use, has also realized benefits from text messaging. Smoking cessation text message programs send motivational messages, and strategies for avoiding temptation.

Concerning the smoking issue, Bull states, “I think it ended up being a really good ‘test topic’ for the mHealth community because of its 24/7 accessibility. Phone based programming may address things like cravings more responsively than a support group that happens once a week.

If you are at a bar on Saturday night, you can turn to your phone. With sex and smoking you are often faced with risk at times when other support or interventions are not available.

I think this extends to weight loss and physical activity as well. All of these things happen in real life in ways that are related to setting and timing.”

The five-module program covered content on HIV risk and transmission, condom use, and social communication, among other topics. According to one female participant, “The program was so interesting it helped me to learn a lot especially on the topic of problem solving; it helped me to learn a lot from it especially on how to refuse and avoid sex.”

A male participant stated, “I learnt that we should not keep them [condoms] in our wallet since they can get torn, and you know as youth, we are fond of keeping them in our wallets.” (Ybarra et al. 2013). The CyberSenga program has been shown to help teens abstain from sexual activity.

When it comes to sexuality, Bull sees a logical connection with tech-delivered education. “There is some natural linkage to technology-delivered programs because of the level of anonymity and privacy it affords. You can find the answer to a question without talking about something highly intimate or stigmatized.”

mHealth platforms offer benefits to healthcare providers, too. Dr. Bull has recently observed surveillance literature catching up to intervention-focused research.

Internet based programs and interactive software on smartphones and tablets are commonly used for education initiatives. In a randomized control trial Dr. Bull and her colleagues in California at the Center for Innovative Public Health Research developed and tested “CyberSenga,” a comprehensive sexuality education program for adolescents in Mbarara, Uganda.

From the perspective of the researcher or clinician, geographical information systems (GIS) are used for surveillance and tracking of disease vectors, and open source data systems are used to collect information on the health characteristics of a population.
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GIS may be used to map homes or communities where avian flu or rabies has been detected. Provided the user has been trained correctly, the accuracy and consistency of the data is unequivocal.

Furthermore, the data can be easily culled and employed to answer certain research questions. For population-level data collection, many programs capture information about subjects without being the primary purpose of the program.

Dr. Bull explains, “One emerging area of interest is the opportunity for these mHealth programs to collect big data. In the global health setting this really is available through the back end of all of these programs.”

Referring to the Center for Global Health’s project on health and human development in southwest Guatemala, Bull states, “With our surveillance programs for pregnant women we can hopefully reduce neonatal and infant mortality by increasing the number of prenatal visits.

Through home visits, health workers can identify high-risk women with the assistance of phone-based algorithms. They follow up with the high-risk women more often, and encourage them to deliver in facilities rather than at home.

The data set that results can help us do a better job of understanding the structural or social characteristics that at-risk people are facing. We are peripherally generating data to help us create a public health response to these ongoing concerns.”

Investment, Scale, and Limitations

While the prevalence of cellphones makes implementing mHealth projects more feasible, there are still some setbacks to realizing the benefits of this platform.

Study design must take into account several novel factors, i.e. user interface (ease of navigation), difficulty engaging older populations, and insufficient bandwidth/infrastructure.

Perennial global health challenges, such as the allocation of limited funds are brought into relief by the use of mHealth platforms. Investing in cellphone towers may detract from investments in clean water and sanitation infrastructure, which some may see as more immediate needs.

Dr. Bull points out a major obstacle to study design, “Literacy and numeracy are big problems in mHealth programs, and they are not being addressed at the level they need to be. They get magnified in mHealth although they are problems in all types of healthcare promotion.”

In an educational intervention delivered online with little to no human interaction, the subject cannot work around illiteracy as verbal communication might otherwise allow in a different study design.

“User capacity” is another problem. mHealth requires certain functional knowledge of digital products. In the CyberSenga study, for example, logging into the program presented some obstacles to participants.

“Most participants did not have an email address, and therefore lacked experience with creating and remembering a password, which is why ‘secret questions’ were used instead.

Participants had difficulty remembering answers to their secret questions – even those who logged in weekly as intervention participants – however. In response, we created a password protected page allowing staff to search for the participant’s secret questions, and helping them log in.” (Ybarra et al., 2013).

The point of user capacity is exacerbated in older generations. “Older folks are adopting technologies, but digital natives [people interacting with digital technologies from an early age] pick them up more rapidly and use them regularly.

When it comes to designing a program, you can focus on digital natives, but it will be a full generation before these users are facing chronic illness, and multiple illness that older people are already facing today.”

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Apart from user error, challenges surrounding infrastructure remain. This may be especially true in countries that deal with corruption. A big challenge for phone providers in general is the growing demand for bandwidth, which requires increased telecommunications infrastructure. There are certainly greater upfront costs to implementing a tech-based program, but the opportunities to scale-up are proportionally great.

“The idea is that ultimately technology-based programs are less expensive. The program is standardized and can be delivered en masse, which is where the cost savings are promised. Return on investment is expected by reaching a greater number of people and inciting them to act – to get into a facility for testing and care, or to increase medication adherence.”

Increasing medication adherence is a great example for several diseases, as lapses in medication lead to drug resistant strains that are more costly to treat.

Due to the relative novelty of mHealth initiatives, programs of large scale are not yet implemented.

“Replication and scale are two gaps that currently remain. We don’t have a large number of studies, or studies being replicated,” states Dr. Bull.

“In the global setting there is a possibility for ministries of health and big entities like the United Nations and USAID to support efforts to scale programs. Many existing surveillance systems could be leveraged in this direction.”

**Future directions: intersecting disciplines**

In industrialized countries, the idiom “There’s an app for that” rings true now more than ever. So when it comes to health, how safe and scientifically sound are these nifty gadgets? The Food and Drug Administration in the United States is initiating an approval process for apps that could be considered medical devices.

Although regulatory processes in the global setting work differently, it begs the question how enterprising technology developers can work hand-in-hand with clinical and public health researchers to create informed and effective programs.

Dr. Bull mentions, “There is not a history of technology industry talking to academics.”

In addition to bringing together two distinct disciplines, Dr. Bull also sees opportunities to grow public/private partnerships, as exemplified by the company Vodafone, which is bringing mHealth solutions to both patients and healthcare providers, primarily in sub-Saharan Africa.
While in Texas, Thomas created a virtual “one-stop-shop” network to address the needs of at-risk youth.

Students, often presenting with behavioral issues, could enter this network of care through community-based portals of entry, including: teachers, counselors, hospital-based providers, non-profit agencies, churches, and self-referral. The “care concierges” would perform a needs assessment of the student and his/her family.

The practitioner was connected through the network to key community resources including psychiatric care; substance abuse treatment centers; primary care physicians; family therapists; homeless services; and educational/developmental therapies.

When a full understanding of the student’s needs was determined, the practitioner could link the student and his/her family to a range of services they needed in the community.

All of the providers would be linked in order to provide comprehensive case management for the student and family. Over the course of five years, the system provided over 11,000 visits to students and their families.

Dr. Thomas came to Children’s Hospital Colorado with the experience necessary to enhance CHCO’s burgeoning telehealth program. CHCO telehealth networks primarily target CHCO’s rural patients.

Many of Children’s Hospital Colorado’s patients who live in rural areas and need specialized care rely on costly and time consuming outreach visits CHCO specialists make to those regions. Primary care providers in remote areas also count on the visits to provide essential input/guidance to patient care.

Thomas and his team discovered that if a patient or primary care provider missed an outreach visit, the patients and their families would face the choice of either having to drive to Denver (sometimes impossible) or wait any number of additional months to receive care.

Extended waits often resulted in compounding complications of their condition.

What’s more, they also discovered that some patients were being flown to CHCO at great cost for treatment, only to discover upon arrival that the trip was unnecessary.

The child could have been treated with CHCO supervision by a primary care provider near their own home – improving access, reducing costs and improving outcomes.

Dr. Thomas asked several important questions when developing CHCO’s current telehealth strategy:

- How do patients access CHCO services?
- Where are they coming from?
- How do they access after care treatment?
- How can we keep them from re-entering our facility “too soon”?
- How can we do this more efficiently?

In response to some of the answers to these questions, Dr. Thomas and his team developed telehealth pilot projects in areas such as endocrinology, pulmonary, neurology, orthopedics/rehabilitation and psychiatry.

Early assessments of the effectiveness of using telehealth to address CHCO patients’ needs have been positive. In one study, researchers found that CHCO’s telehealth endocrinology program in Wyoming targeting Type 1 Diabetes patients increased patients’ compliance with American Diabetes Association’s standards of treatment.

Essentially, the telehealth program gave patients the ability to see a specialized endocrinologist every three months more consistently. As an added benefit, patients were less likely to miss school and parents missed work less often.

Another telehealth success was found when assessing a CHCO neurology telehealth initiative in Billings, Montana. Formerly, if a pediatric patient presented in a Billings ER with a head injury, the ER doctor was on his/her own to make the call “should they be transferred to Children’s?” Now, with a teleconsultation with Children’s Colorado neurosurgeons – that decision can be made collectively.

Within 25 minutes after initiating the request, a Children’s Hospital neurologist has reviewed the films and is engaged in a video call with the ER doctor and patient in Billings, performing an assessment of the patient to determine whether or not the patient needs to be sent to CHCO for treatment.

CHCO is operating numerous telehealth programs across the region. In addition, CHCO is conducting 6 pilot efforts and plans to expand further in 2015. New initiatives will include training for practitioners and piloting maternal/fetal telehealth programs.
November 10-21, 2014

Registration is Open!!

This international health course is a two week course offered once a year as part of the University of Colorado School of Medicine Global Health Track. The first week of the course is the Global Health section of the course and the second week of the course is the Children in Disasters section.

This course prepares its participants for international experiences and future global health work. This is an interactive training course which incorporates readings, lectures, small group problem based learning exercises, technical skill sessions, online coursework and a disaster simulation exercise.

Learning Objectives for the Two Week Course

Global Health
- Students will learn to diagnose and treat major tropical diseases, including malaria, dengue, typhoid, and intestinal parasites.
- Students will learn about the major public health issues facing communities in the developing world.
- Students will learn about the impact and management of TB, HIV, and chronic disease in the developing world.

Children in Disasters
- Students will understand what makes a disaster.
- Students will recognize the components of disaster response.
- Students will understand the need for disaster preparedness and training.
- Students will learn about the American Academy of Pediatrics (AAP) and Pan American Health Organization (PAHO) Pediatrics in Disaster training program.

Registration

Students, Residents or Fellows

Students, Fellows or Residents currently in a training program. Please note: if you are a student with the University of Colorado School of Medicine or Colorado School of Public Health and you are taking the course for credit, you must register for the course via your school. You do not complete this registration form and payment.

Week 1 - $50       Week 2 - $50       Both Weeks - $100

External Participants

An external participant is anyone who is not currently in a training program as a student, resident or fellow or taking the course for credit with the University of Colorado School of Medicine or Colorado School of Public Health.

Week 1 - $600       Week 2 - $600       Both Weeks - $1,000

Click here to register and learn more about the course!!
Another new application of CHCO’s telehealth technologies will connect CHCO mentors with CHCO residents and fellows who are see patients in Guatemala.

Fellows, through a partnership with the Center for Global Health, Colorado School of Public Health, see patients in a community clinic as part of the Center for Human Development located in the southwest Trifinio region.

By communicating virtually, CHCO residents and fellows, care extenders and local practitioners will receive advice regarding complex medical care and subspecialty consultation.

In return, students and faculty will get exposure to tropical medicine and the challenges of working with limited resources without requiring foreign travel. The hope is that the international exposure will generate further excitement for young faculty, students, and public health professionals at the University of Colorado Anschutz Medical Campus.

While great gains have been made in using telehealth technology, drawbacks remain. Those most prominent include reimbursement—particularly by private insurance companies; restrictions on site “eligibility”; and state and federal regulations around physician licensure and credentialing requirements for practicing medicine across state lines. However, the tide is turning, the Federation of Medical Boards, The American Academy of Pediatrics, and numerous other national organizations have recently updated their position statements in support of the integration of telehealth into medical models.

Proposed legislation such as the Telehealth Modernization Act of 2013 which would establish a clearly defined federal standard of telehealth programming and the TELehealth for MEDicare Act of 2013 which would allow Medicare providers to practice (virtually) across state boundaries, are also indicators that the regulatory and policy environment for telehealth will become increasingly more supportive.

Dr. Thomas and his team will continue to monitor the changes to telehealth policy and regulation as they grow the CHCO telehealth portfolio. As the future of healthcare provision embraces telehealth, CHCO will be at the forefront of ensuring high quality pediatric care reaches even their most isolated patients.

Beth Kutscher, “Wiring in rural patients: More hospitals are using technology to improve access and expand their networks with other hospitals, physicians,” Modern Healthcare, March 8, 2014.

iAmerican Telemedicine Association: What is telemedicine? americantelemed.org

iiHealthIT.gov: What is telehealth? How is it different from telemedicine? The United States Government Health Resources Services Administration


viBeth Kutscher, “Wiring in rural patients: More hospitals are using technology to improve access and expand their networks with other hospitals, physicians,” Modern Healthcare, March 8, 2014.


viiiTom Sullivan, “Apple, IBM team to work on mHealth apps” mhealth-news.com, July 16, 2014.

Colleen L. Wood1, Scott Clements2, Kim McFann3, Robert Slover4, John F. Thomas5, 6, R. Paul Wadwa7, Telemedicine is Equivalent to In Person Visits to Manage Pediatric Type 1 Diabetes, 1Children’s Hospital Colorado, Dept of Pediatrics, Aurora CO 2University of Utah, Dept of Pediatrics, Salt Lake City UT, 3Colorado School of Public Health, Aurora CO, 4Barbara Davis Center for Diabetes, University of Colorado School of Medicine, Aurora CO

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Bill Fera, MD, “Unleashing The Value Of Virtual Care: Hurdling Telehealth’s Three Biggest Obstacles,” Health IT Outcomes, May 20, 2014.

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To learn more about Dr. Thomas and his work; contact him at john.thomas@childrenscolorado.org
Bringing Family Medicine, Pediatrics and Public Health to the Forefront of Global Health

Kimberly Insel, M.D. and Rebekah Gaensbauer, M.D. are the new global health fellows at the Center for Global Health at the Colorado School of Public Health. Beginning July and September respectively; they bring strong backgrounds in family medicine, pediatrics and public health with extensive training and experience in international health promotion.

Dr. Kimberly Insel grew up in Tucson, Ariz. (and credits this place as the source of her love for cowboy boots).

She began her studies at Brown University in Rhode Island, where she obtained a Bachelor of Science in Neuroscience and went on to Boston University School of Public Health, completing a Master of Public Health in International Health.

Kimberly worked with the Centers for International Health at Boston University (BU) and organized a course in Complex Humanitarian Emergencies and Disasters. She returned to Tucson for medical school, attending the University of Arizona.

Kimberly has extensive work and international experience. She lived in Cameroon where she worked on programming related to the prevention of maternal to child HIV transmission.

She also lived in Turkey for three years, where she worked for the World Health Organization and trained health professionals in disease outbreak investigation and surveillance.

Kimberly also became an Applied Epidemiology Fellow with the Centers for Disease Control and Prevention (CDC) during medical school and focused on projects in polio vaccines in Nigeria and surveillance of diseases for individuals affected by the earthquake in Haiti in 2010.

Kimberly finished a Family Medicine residency at University of Colorado (CU) in the School of Medicine June 30, 2014. The Department of Family Medicine and the Center for Global Health have partnered to fund Kimberly’s Global Health Fellowship.

She is currently working with Gretchen Heinrichs, M.D., D.T.M.H., Director of Maternal Health Programs at the Center for Global Health and the Center for Global Health to design and establish prenatal group visits in our Trifinio maternal health program.

She is also working with Edwin Asturias, M.D. Associate Director at the Center for Global Health and an Associate Professor in Pediatrics, Section of Infectious Diseases at the School of Medicine at CU on vaccine-preventable diseases.

Kimberly’s main interests include maternal-child health, resident and medical student education, capacity building. She will be involved in the design and implementation of a new Family Medicine residency’s global health curriculum.

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Dr. Rebekah Gaensbauer grew up on a farm in rural Minnesota.

Like Kimberly, her academic career also began at Brown University, graduating with honors with a B.A. in Developmental Studies. She went on to obtain a Master of Public Health in International Health from Tulane School of Public Health & Tropical Medicine.

After completing her pre-medical studies at the University of Washington in Seattle, Rebekah attended medical school at the University College Cork School of Medicine in Ireland.

She is the proud mother of two children and has been married for 19 years to James Gaensbauer, M.D., a pediatrician working in Infectious Diseases at the School of Medicine, University of Colorado and Children’s Hospital Colorado.

Every member of her family is an avid reader and they enjoy gardening and canning their own produce.

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Rebekah has traveled quite a bit!

In the course of her career, she has worked and volunteered in Nepal, South Africa, Kenya, St. Lucia, and Guatemala. She has studied several languages as well, including Spanish, French, Nepali, and Hindi.

Her work experience ranges from statistical analysis to care for HIV infected infants.

Rebekah has worked for the Tennessee State Health Department, served in the Peace Corps and has a strong background in malnutrition. She is passionate about the health of refugee children and hopes to focus her career on these needs.

Recently, she completed her Pediatric residency at Children’s Hospital Colorado.

Rebekah’s main interests include taking the short term solutions seen in clinical interventions and marrying them with the long term solutions seen in health policy, which she says is one of her favorite things about global health.

Her long term goals involve working with UNICEF but Rebekah says that medicine is all about flexibility and ultimately she “just wants to help” wherever she can.

Kimberly and Rebekah bring a wide range of talents and expertise in global health, as well as their passion for learning and giving to impoverished communities.

The Center for Global Health welcomes our two new fellows, Kimberly and Rebekah and look forward to the coming year as they take the next step in their careers!

To learn more about the Global Health Fellowship at the Center for Global Health, please contact Molly Terhune at molly.terhune@ucdenver.edu

2014 Global Health Symposium
save the date

Join us on Friday, November 21, 2014 at the University of Colorado Anschutz Medical Campus and learn about the global health work taking place on our campus, other campuses and our community. No registration needed, anyone can attend. Have questions? Click here!
August 27, 2014
12 noon/ED2N 2106
Anschutz Medical Campus

Augusto Miravalle, M.D., Assistant Professor of Neurology, Vice Chair for Education Department of Neurology, Director Neurology Residency Program

Epidemiology of Neuroimmunological Disorders

September 24, 2014
12 noon/ED2N 2307
Anschutz Medical Campus


Villagers and Health: How Local Community can Contribute to Equity in Health Services