

CommCare

Overview

CommCare is an easily customizable mobile health (mHealth) platform for health workers that tracks and supports their interactions with clients. CommCare replaces the conventional practice of a community health worker (CHW) manually tracking their work via paper registers and carrying large patient education flipcharts. Instead, each CHW is equipped with an inexpensive phone running open-source and easy-to-navigate software. The CHW registers clients using customized electronic forms developed through programs working with low-literate CHWs in several countries and across multiple languages. CommCare automatically submits visit data in 'real-time' to a central cloud server, CommCareHQ. Data on this server is privacy-protected, backed up, and accessible to supervisors and program managers around the world.

CommCare improves care across four areas, shown in Figure 1: **access to care** through client lists on the CHWs' phones and SMS reminders when visits are due; **client engagement** through audio and video clips and improved credibility of the CHW; **quality of care** through checklists, decision support, and delivery of sensitive information through recorded voices; and **accountability of care** through real-time monitoring of the CHWs' activities.

More information including online videos can be found at www.commcarehq.org.

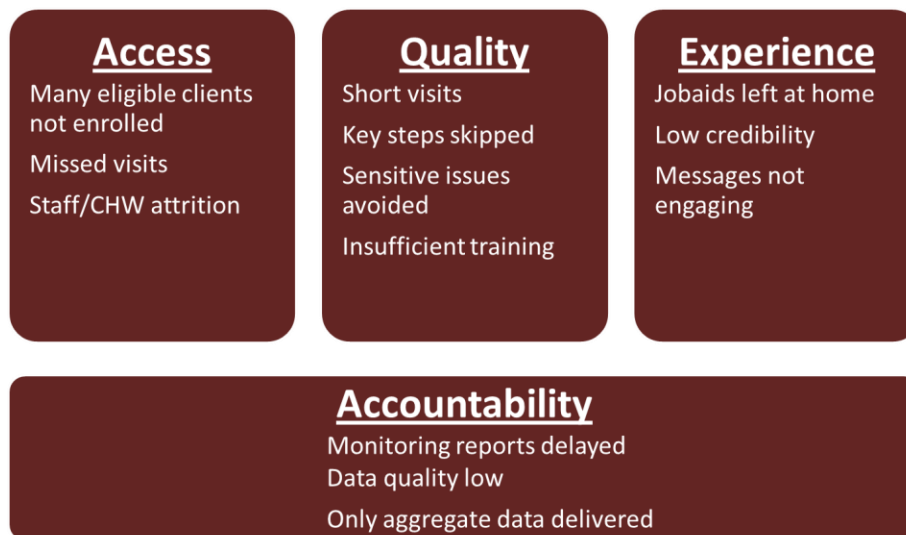


Figure 1: Common Challenges of CHW System Addressed by CommCare

History

CommCare was developed in 2007 through a partnership with D-tree International and the University of Washington in Tanzania. Since its creation, CommCare has been used by many partners and programs in Tanzania, including Pathfinder International, BRAC, Jhpiego, and Catholic Relief Services. CommCare was later deployed in several other countries in sub-Saharan Africa, including Zambia, Malawi, and Mozambique. In 2009, Dimagi partnered with World Vision to equip CHWs in Afghanistan with CommCare as part of their Child Survival grant. When the CHWs were found to have low literacy levels, Dimagi introduced images and audio clips to CommCare, such as those shown in Figure 2 below. These multimedia clips soon became a key facet of CommCare and serve as counseling tools that CHWs can use to engage their clients. In 2011, with a small grant from USAID, Dimagi rapidly engaged 11 organizations to participate in a CommCare trial and develop their own modules. Of these, nine are actively scaling with varying degrees of help from Dimagi. Through this process, we productized CommCare and established it as a “turnkey” system—anybody can go to www.commcarehq.org, open an account, and use the form-building and other authoring tools to develop a CommCare module. Several organizations are now building and scaling CommCare using these tools.



Figure 2: Multimedia in CommCare

Deployments

As shown in Table 1, CommCare has been deployed by numerous organizations to address a number of health areas in many countries, and has received support from a range of funders. Some deployments of note:

- In Tanzania, Pathfinder International and D-tree International have been supporting home-based care providers since 2008. Over 300 home-based care providers have been trained and are using CommCare.
- In Bihar, India, CommCare is being deployed by a consortium of partners including CARE, BBC WST and Grameen Foundation as part of a state-wide initiative with over USD \$120M from the Bill and Melinda Gates Foundation. Initially, 600 CHWs will be provided with handsets running CommCare. Through this effort, CommCare and MOTECH are being integrated as part of a

comprehensive mHealth platform that will be expanded to include other technologies such as OpenMRS.

- In Guatemala, Tula Salud is implementing CommCare for 185 CHWs without engaging Dimagi or any group for paid technical assistance. Tula Salud built their own CommCare application using the online authoring tools and will use Dimagi's cloud hosting services.
- In Uttar Pradesh, India, CommCare is being used as a maternal mortality surveillance system within a large randomized controlled study. Lead by the Harvard School of Public Health, the study aims to evaluate a Better Birth checklist on 170,000 births over two years. CommCare will be used to capture data on birth outcomes in 120 clinics, support a call center to follow-up with women or their families seven days after delivery, and support a field team to follow-up in person when necessary.

Table 1: Overview of CommCare Deployments

Countries	Implementing Partners	Funders	Health Areas
Afghanistan, Bangladesh, Guatemala, Haiti India, Malawi, Mexico, Mozambique, Nicaragua, South Africa, Tanzania, United States, Zambia	BBC WST, CARE, CIDRZ, Catholic Relief Services, Grameen-Intel, Harvard University, IntraHealth JHPIEGO, Millennium Villages Project, PACT, Partners in Health, PATH, Pathfinder International, Real Medicine Foundation, Save the Children, World Health Organization, World Vision.	The Bill and Melinda Gates Foundation, the International Development and Research Center, the UN Foundation, the Norwegian Government, Rockefeller Foundation, USAID, Vodaphone Foundation, Wellcome Trust	Adult Rapid Assessment, Chronic Care, Drug dosing, Emergency Response, Family Planning, HIV home-based support, Maternal and Child Health, Orphans and Vulnerable children support, Pediatric HIV, TB

Evidence Base

Many studies have been conducted or are underway to evaluate the impact of CommCare and related systems. Table 2 summarizes these results. In addition, two large studies are currently in-progress and should produce results by the end of 2013:

- In Bihar, India, Dimagi is partnering with CARE and Mathematica Policy Research on a 12- to 18-month controlled study that will compare 600 CHWs using CommCare to a similarly-sized control group not using CommCare. This study will examine the impact of CommCare on knowledge, uptake of services, and health outcomes.
- In Uttar Pradesh, India, Dimagi is partnering with CRS, Harvard Business School, Massachusetts General Hospital, and the University of Washington to run a randomized factorial study involving at least 130 CHWs using CommCare. The study will evaluate different motivation and supervision techniques to determine the potential impact on CHW behavior and health outcomes.

Table 2: Evidence Base for CommCare

	Research Lead	Experiment	Published	Result
ACCESS	Univ. of Washington	Randomized controlled study on 87 CHWs.	ICTD 2012 ⁱ	<ul style="list-style-type: none"> CommCare reminders increase timeliness of visits by 86%.
	Harvard University	Blinded comparison on 1198 visits.	Int'l J. of Med. Informatics' 2011 ⁱⁱ	<ul style="list-style-type: none"> CommCare supports task shifting to counselors to triage HIV patients with 86.5% sensitivity and 48.3% specificity.
QUALITY	Univ. of Washington	Pre/post study on 24 patient visits.	CHI'2008 ⁱⁱⁱ	<ul style="list-style-type: none"> CommCare Improves adherence to protocols by ~20%.
	Harvard University	Pre/post study on 1221 patient visits	In submission	<ul style="list-style-type: none"> CommCare improves adherence to protocols by ~18%. 1-4% improvement in classification accuracy, compared to expert clinician (not statistically significant).
	IntraHealth International	Pre/post study on 30 CHWs.	World Health Congress, 2012 ^{iv}	<ul style="list-style-type: none"> CHW knowledge of danger signs increased from 48% to 70% after 4 months of using CommCare.
EXPERIENCE	Dimagi	Qualitative multi-country investigation	Mobiles-4-Development' 2012. ^v	<ul style="list-style-type: none"> CommCare greatly improves ability to effectively engage their clients.
	Berkeley	Controlled study	ICTD'2010. ^{vi}	<ul style="list-style-type: none"> Multimedia improved CHW performance, confidence, and client engagement (similar system to CommCare).
	University of Pennsylvania	Qualitative user experience research.	IAMCR 2012 ^{vii}	<ul style="list-style-type: none"> CommCare lent credibility to the message of CHWs. CommCare allowed CHWs to work around cultural and social barriers to discussing sensitive or taboo subjects.
	Microsoft Research India	Formal case study of CommCare deployment in India.	NordiCHI 2012 ^{viii}	<ul style="list-style-type: none"> 9 of 10 CHWs self-report improved social respect in community from using CommCare.
ACCOUNTABILITY				<ul style="list-style-type: none"> Reduced average time to get data to program coordinator from 45 days to 8 hours. Improved data completeness from 67% to 84%.
	University of Washington	10-fold cross validation with known falsified and known true data.	DEV'2012 ^{ix}	<ul style="list-style-type: none"> Outlier detection algorithms shown to detect false data set produced in Tanzania with 80% sensitivity of 90%.

Functionality

To date, there appears to be no other solution with CommCare's functionality that includes client tracking, the ability to store client information offline, multimedia prompts for low-literate users and client engagement, the ability to run on Java-enabled phones for current deployments and on Android phones for future deployments, and authoring tools that allow non-programmers to create CommCare applications.

- **Case Management**
 - Client records stored on phones
 - Business logic customization and authoring environment
 - Complex Decision Support
 - Integrated SMS-based reminder and adherence messaging
- **Mobile Interface**
 - 100% Open-source software
 - Supports J2ME and Android
 - Special low-literacy user interface
 - Support multiple languages/scripts
 - Supports audio clips, images, and video playback
 - GPS and barcode capable
- **Server Management**
 - User activity reports for workforce monitoring
 - Data export
- **Security**
 - HIPAA compliant mobile and server solutions available
 - User-based security on mobile and server
- **Support**
 - Active user community
 - Active Data Management Services
 - Premium Service Level Agreement (SLA) available
 - > 5 person product support team

Figure 3: CommCare Functionality

Scaling

CommCare has been designed to scale to tens or hundreds of thousands of users, and servers can be relocated or clustered to improve performance for a given country. Our system easily allows an external organization to create an account and add users without any action taken by Dimagi staff. CommCareHQ is backed by web-scale database technologies and uses Map/Reduce algorithms popularized by Google to execute massive data operations in a fast and distributable manner.

CommCare has been designed to scale horizontally, meaning the architecture supports easily adding new hardware to support a growing number of users without creating significant change to the overall architecture of the platform.



Technical Partnerships

With support from the Bill and Melinda Gates Foundation, CommCare has been integrated with the MOTECH platform to manage patient information and implement voice- and text-based messaging directly to end users. The combination of CommCare and MOTECH covers a wide range of organizations' mHealth needs. This work laid the basis for a strategic partnership to support the technology needs of the multiple implementation partners, and is expanding to include other technologies such as the OpenMRS electronic medical record system. The initial success of this partnership has generated demand for this integrated, open-source platform in several other countries.

About Dimagi

Dimagi's mission is to integrate innovative technology into global public and private services in order to improve human health and wellbeing. We are a small, diverse, and dedicated team that loves what we do and are market leaders. Since 2002, we have been dedicated to building a wide range of technologies that help deliver quality health care to urban and rural communities in over 25 countries. We are convinced that social, technological, and market forces are aligned now to launch CommCare on a large scale. Dimagi's team leads several initiatives to foster collaboration among engineers and implementers across the globe from technology in community health to open source standards. We have amassed a large network of partners over the last years. We plan to utilize this collaborative environment and years of experience in leading research to transform healthcare delivery for underserved populations. At Dimagi, we care about impact, team satisfaction, and profit (in that order), and seek to maximize our impact per dollar spent while being the leader of technology for community health.

ⁱ B. DeRenzi, L. Findlater, G. Borriello, J. Jackson, J. Payne, B. Birnbaum, T. Parikh, N. Lesh, "Improving Community Health Worker Performance Through Automated SMS", ICTD 2013

ⁱⁱ M. Mitchel, B. Hedt, I Enshun-Wilson, H. Fraser, M. John, C. Meneze, M. Grobusch, J. Jackson, J. Taljaard, N. Lesh, Electronic decision protocols for ART patient triaging to expand access to HIV treatment in South Africa: A cross sectional study for development and validation, International Journal of Medical Informatics, Volume 81, Issue 3, Pages 143-218, 2011

ⁱⁱⁱ B. DeRenzi, N. Lesh, T. Parikh, C. Sims, W. Maokla, M. Chemba, Y. Hamisi, and others, "E-imci: improving pediatric health care in low-income countries," SIGCHI 2008, pp. 753-762.

^{iv} Presented in World Congress in Ethiopia in April 2012

^v Treatman, D., Lesh, N, Strengthening Community Health Systems with Localized Multimedia, Mobiles For Development, 2012.

^{vi} D. Ramachandran, V. Goswami, and J. Canny, "Research and Reality: Using Mobile Messages to Promote Maternal Health in Rural India." ICTD'2010.

^{vii} D. Chittamuru, M. Bhavsar, CommCare: Evaluation Of A Mobile Application for Maternal Health In Rural India, International Association for Media and Communication Research (IAMCR), 2012

^{viii} Medhi I., Jain M., Tewari A., Bhavsar M., Matheke-Fischer M., & Cutrell E., Combating rural child malnutrition through inexpensive mobile phones. Nordic Conference on Human-Computer Interaction, 2012

^{ix} B. Birnbaum, B. DeRenzi, A. D. Flaxman, N. Lesh, , Automated Quality Control for Mobile Data Collection, ACM Computing for Development 2012