Into practice

Developing and deploying a community healthcare worker-driven, digitally-enabled integrated care system for municipalities in rural Nepal

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ABSTRACT

Integrating care at the home and facility level is a critical yet neglected function of healthcare delivery systems. There are few examples in practice or in the academic literature of affordable, digitally-enabled integrated care approaches embedded within healthcare delivery systems in low- and middle-income countries. Simultaneous advances in affordable digital technologies and community healthcare workers offer an opportunity to address this challenge. We describe the development of an integrated care system involving community healthcare worker networks that utilize a home-to-facility electronic health record platform for rural municipalities in Nepal. Key aspects of our approach of relevance to a global audience include: community healthcare workers continuously engaging with populations through household visits every three months; community healthcare workers using digital tools during the routine course of clinical care; individual and population-level data

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generated routinely being utilized for program improvement; and being responsive to privacy, security, and human rights concerns. We discuss implementation, lessons learned, challenges, and opportunities for future directions in integrated care delivery systems.

1. Background: integrated care in a globalized world

Integrating the systematic measurement, monitoring, analysis, and application of key population health data to improve service delivery over time[1–6] is a critical yet neglected function of healthcare delivery systems. Effective integrated care approaches demand clear definitions and understandings of patient populations, combining population-level data across multiple sources, and integrating clinical workflows across facility and community sites. We choose the phrase integrated care here to highlight the bringing together of community-based care and counseling with facility-based services, and to provide clarity vis-à-vis related terms like surveillance, population health, or population health management. There are few examples in practice or the academic literature of affordable, digitally-enabled integrated care approaches embedded within healthcare systems in low- and middle-income countries (LMICs). Here, we describe the development of an integrated care delivery system involving community healthcare workers (CHWs) that utilize a home-to-facility electronic health record platform in rural Nepal. We discuss its design and implementation, lessons learned, and challenges and opportunities for future directions in population-based approaches to integrated care in LMICs.

As economies grow, populations age and expand, and new threats emerge, there is increasing recognition within LMICs for the need to advance principles of integrated care. Real-time data for healthcare systems integrated across time and space can help to better manage the healthcare of populations. Exclusively facility-based "passive" healthcare systems, while essential, may miss engaging with people suffering from or at risk for conditions that either never present or delay in presenting to a clinic or hospital. Demographic health surveys aimed at capturing regional or national prevalence are often of insufficient temporal or spatial resolution to offer real-time guidance to healthcare providers and planners.[7,8,9] The 2014 outbreak of Ebola that spread globally from West Africa stands as a glaring reminder of the need for a renewed effort around 'sensitive' health information systems that are predictive and responsive, and integrated into the routine course of delivering care for even the most remote populations.[10] Simultaneously, a growing burden of non-communicable diseases demands a population-based approach to enable an appropriate and affordable shift from systems organized around acute problems to those able to address longitudinal care needs.[11]

A key opportunity to address these challenges lies in two inter-related developments in global healthcare systems design: 1) the expanded scope of CHWs in healthcare delivery systems; and 2) digital systems for longitudinal care. Professionalized CHWs are increasingly recognized as essential to robust and adaptive healthcare delivery and population-level data systems.[7,12–16] They are on the frontlines, in communities and homes, of both communicable and non-communicable epidemics. Equipping them with digital tools can help provide near real-time information with greater temporal and spatial precision. Developing data systems and feedback loops that can effectively integrate the people-centered care work of CHWs, while safeguarding the privacy and dignity of communities, particularly vulnerable populations, presents both a challenge and an opportunity.

2. Organizational context: municipal public-private partnership in rural Nepal

Nepal is one of the world's newest democracies, having abolished a 240-year old monarchy in 2006 following the cessation of a decade-long Maoist "People's War" against the Nepali state. Eventually

spreading throughout all 75 of Nepal's districts, a conservatively estimated 13,000 were killed in direct conflict.[17] Nepal's public healthcare sector—weak from decades of underinvestment, conditional aid, and neoliberal economic policies;[18,19] an emergent fee-for-service industry;[20] and internecine political perturbations[21,22]—was further decimated by the conflict.

In parallel, Nepal's healthcare sector is at a critical juncture. The 2015 earthquakes saw significant devastation to healthcare facilities throughout the country, and amidst the aftermath and reconstruction efforts, political parties signed a new Constitution, a full seven years after the monarchy had been abolished. This also initiated a process of devolution of centralized political and economic power in the form of the creation of seven new federal states and 744 village and town municipalities. The new Constitution includes healthcare as a fundamental right of its citizens[23]; though operationalizing this legislation into practice remains an enduring challenge. In November 2017, the Nepal Health Insurance Act was signed into law, formalizing a new mode of payment for the promotion of social protection and health financing; though, here too, there remains uncertainty about what this will look like in implementation.[24]

With these two political changes—decentralization on the one hand and a new federal financing structure on the other—new modes of healthcare delivery are being established. One such model involves public-private partnerships (PPPs) at the municipal level to strengthen care delivery alongside the government in these new localized structures. Here, we discuss one such PPP, between Nepal's Ministry of Health (MoH) and the non-profit healthcare organization *Possible*. Bayalpata Hospital in Achham District was the first facility established as part of the PPP, which operates as a regional training facility that treats over 100,000 patients a year, has full-spectrum inpatient, outpatient, laboratory, radiology, and surgical care, and is linked to a network of full-time employed CHWs. Achham, once a stronghold of the Maoists during the conflict, is one of Nepal's poorest districts.[25] A similar partnership was established upon invitation by the MoH at Charikot Primary Health Center in Dolakha District, not too far from the epicenter of the second major earthquake on May 12, 2015.

3. Problem: municipal integrated care in a LMIC context

There was a clear national and local opportunity for developing an integrated care delivery system, one that focused on the municipal level as the primary organizational unit in the healthcare sector going forward. The PPP's approach to CHW-centered, population-based healthcare delivery provided the opportunity and necessity for a digitally-enabled, integrated care system. There are three core technical functions that this platform needed to solve for: 1) serve as a reliable data collection source for monitoring community-based care and tracking patient outcomes at the municipality level, such as mortality rates; 2) integrate with a hospital-based EHR system; and 3) identify patients to facilitate longitudinal care using unique numerical IDs and biometrics. The goal is that this modular system could be deployed in other municipalities, within or outside of a PPP framework.

4. Solution: CHW-centered integrated care system

Nepal currently has a cadre of around 50,000 Female Community Health Volunteers, who, since the late 1980s, have been central to community-based reproductive, maternal, and child health throughout the country. This is a bedrock of the public healthcare system; the team comes from the orientation that, in building off the successes of the