HARVARD MEDICAL SCHOOL
BRIGHAM AND WOMEN'S HOSPITAL

CASES IN GLOBAL HEALTH DELIVERY

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Project ECHO: Expanding the Capacity of Primary Care Providers to Address Complex Conditions

"Medical knowledge is exploding, but it's often not traveling the last mile to ensure that patients get the right care in the right place at the right time. If we can leverage technology to spread best practices through case-based learning and mentoring of providers, we can move knowledge—instead of patients—to get better care to rural and underserved communities across the country."

—Sanjeev Arora, MD, Project ECHO Founder and ECHO Institute Director

In December 2016, Sanjeev Arora, MD, spoke to a group of primary care and specialist physicians from across the globe interested in joining Project Extension for Community Healthcare Outcomes, or Project ECHO®. Arora had developed Project ECHO—a web-based guided practice model—at the University of New Mexico in 2003 to address the tremendous need for hepatitis C care, particularly in medically underserved areas. At the time, he was one of the only liver specialists in New Mexico, and patients were waiting for months and traveling hundreds of miles to see him. Using videoconferencing, Arora began training primary care providers in remote areas to manage and treat their hepatitis C patients.

Arora and his team worked hard to spread and grow the model, using grants to fund their work. By December 2016, more than 100 institutions in over 20 countries were using the Project ECHO model to train primary care providers to treat more than 55 complex medical conditions. Dozens of peer-reviewed studies showed Project ECHO was improving provider self-efficacy and job satisfaction, increasing patient access to specialty care, and, in some cases, saving costs by reducing emergency room and hospital visits.

In December 2016, the United States Congress passed the ECHO Act, mandating that the federal government study the implementation and impact of Project ECHO's collaborative learning model. Arora and his team had been thinking hard about how to balance fidelity to the model with ensuring local partners could adapt it as needed. He was unsure how the results of the government study might impact his ability to scale Project ECHO to meet the demands of new and current partners.

Amy Madore, Julie Rosenberg, and Rebecca Weintraub prepared this teaching case with assistance from Claire Donovan for the purpose of classroom discussion rather than to illustrate either effective or ineffective health care delivery practice.

The United States of America

The United States of America is located in North America, bordered by Canada to the north and Mexico to the south (see **Exhibit 1** for map). It comprises 50 states and several unincorporated territories. In 2016, it was the world's third-largest country in terms of population and land area (9,147,420 km^2).

History

During the 16th and 17th centuries, Europeans colonized the eastern territory of North America, displacing indigenous populations (known as "American Indians" or "Native Americans"). After settlers established the United States of America (US; see **Appendix** for common abbreviations) in the late 18th century, the agricultural industry in the southern part of the country grew rapidly. Americans imported more than 100,000 African slaves to work the land.[1] In the 19th century, the federal government forcibly moved Native Americans to "reservations" to make way for expansion. Following a civil war (1861–1865), the US ended slavery and gave Native Americans citizenship; however, these groups continued to be treated as second-class citizens.[2]

The US became increasingly powerful and wealthy during the 20th century; however, not all Americans benefitted equally. Discriminatory policies curtailed the rights of Americans of color, particularly black Americans. Organized protests against this treatment, known as the Civil Rights Movement (1954–1968), culminated in the Civil Rights Act of 1964.[3] The Act outlawed discrimination based on race, color, religion, sex, and nationality.[4] Nevertheless, discrimination continued through *redlining*—the denial of services to certain areas based on their racial or ethnic makeup—in the decades that followed. Inequities persisted between ethnic groups and geographic regions.[5]

Demographics and Economy

In 2014, most of the US population was white (77.4%); the remainder was black (13.2%), Asian (5.4%), Native American or Alaskan Native (1.2%), or mixed-race (2.5%). About 17% were of Hispanic or Latino origin.[6] Almost one-fifth of Americans lived in rural areas,[7] which tended to be poorer than suburban and urban areas.[8]

In 2015, 88% of adults had a high school education; less than one-third held a bachelor's or higher degree.[9] More than 46 million Americans, including 11 million "working poor,"* lived below the US poverty line (USD 11,670 per year for an individual; USD 23,850 per year for a family of four).[11,12] Median household income was USD 53,657 in 2015.[13] Income inequality was on the rise: In 2014, the average income of the top 10% of households was nearly nine times higher than the bottom 90%.[14] White households had 13 times more wealth than the median black household and 10 times more than the median Hispanic household.[15] In 2015, unemployment was 5.3%, down from 9.6% in 2010.[16,17] The US was the largest national economy in terms of gross domestic product (GDP).[18]

* The US identified anyone who spent more than half the year working or looking for work and whose income was below the poverty line as "working poor."[10]

Basic Socioeconomic and Demographic Indicators[†]

INDICATOR		YEAR
UN Human Development Index ranking	8 out of 188	2014
Population (thousands)	318,857	2014
Urban population (%)	81	2014
Population using improved drinking water sources (%)	98	2012
Households with children living under USD 2 per day (millions)	1.65	2011
Gini index	41.1	2013
GDP per capita (current USD)	55,837	2015
Adult literacy (%)	86	2013

New Mexico

In 2015, New Mexico was the 5th largest US state, roughly the size of Vietnam, and the 15th smallest in terms of population (2,085,109).[19] One-third of the population was rural,[20] and 18% lived in poverty.[21] Most New Mexicans were white (82.8%), 10.4% were Native American or Alaskan Native, and 2.5% were black. Nearly half were Hispanic or Latino.[22]

Health in the United States

In 2014, the top causes of death were heart disease and cancer, followed by chronic lower respiratory diseases; accidents; stroke; Alzheimer's disease; diabetes; influenza and pneumonia; kidney disease; and suicide.[23] Drug overdose deaths were rising; opioid-related deaths increased 200% from 2000 to 2015.[24]

Health System

The US health care system was decentralized, fragmented, and complex. A variety of public and private institutions handled payment, insurance, and delivery functions.

Governance

The Department of Health and Human Services was the federal agency responsible for health promotion and service delivery.[25] It oversaw other agencies that addressed public health (the Centers for Disease Control and Prevention) and health care quality and safety (the Agency for Healthcare Research and Quality), the two main public health insurance programs (Medicare and Medicaid), and the needs of indigenous populations (Indian Health Service; IHS).[26–28]

The Veterans Health Administration (VHA) was the largest integrated health system in the country in 2016, with 152 medical centers serving 8.76 million military veterans at 1,700 outpatient clinics annually.[29]

[†] Compiled by case writers using data from World Bank, the World Health Organization, UNESCO, UNDP, and the US Department of Education.

States were also responsible for health services, including epidemiological surveillance; public health emergency response; health promotion and disease prevention; environmental health; prison health care; federal program administration; and some lab services.[30]

Service Delivery

Private providers delivered a majority of health care in the US, even when publicly financed. Americans typically received primary health care from private outpatient clinics or community-based health centers. Specialist clinics or hospitals provided secondary care and typically required patients to obtain a referral from their primary care provider. Large hospitals delivered tertiary care.

Federally qualified health centers (FQHCs), rural health clinics, and other qualifying facilities received federal funding to deliver preventive and primary health care services to underserved populations.[31] In 2013, there were more than 1,200 FQHCs serving more than 21 million patients.[32] Half of FQHC patients were members of ethnic or minority groups, and 28% had no health insurance.[33]

In 2016, over 80% of physician offices used electronic health records.[34] Clinicians also had access to computerized reminders, clinical guidelines, patient data reports, and diagnostic support.

Financing

In 2014, just over half of US health spending was private; the rest was public.[35] Although Americans could purchase private health insurance, most participated in voluntary employer-sponsored health insurance plans, sharing premium costs with their employers.[27] In 2015, over two-thirds of people under age 65 had private health insurance.[36] About 36.5% of the population relied on government-sponsored health insurance—primarily Medicare and Medicaid.[37] People age 65 or older or those with certain disabilities or end-stage renal disease qualified for Medicare.[38]

Medicaid, one of the largest payers for health care, provided coverage to qualifying low-income families, the elderly, people with disabilities, and residents of institutional programs.[39] Each state ran its own Medicaid program and determined its payment model. States were moving away from fee-for-service models toward private managed care organizations (health management organizations; HMOs) and paying HMOs a capitation rate (per patient, per period of time). HMOs then negotiated compensation plans with providers. Specialist providers often received more than general practitioners. Medicaid payments to providers often were lower than private insurance payments.

Certain Medicaid recipients (e.g., children, the terminally ill) were exempt from out-of-pocket costs; the rest paid a small copayment.[40] Medicaid "super-utilizers" (about 5% of enrollees) with complex needs accounted for half of total Medicaid spending in 2011.[41]

In 2015, the number of uninsured Americans was the lowest it had been in decades (34.5 million, or 10.7% of the population). This was due in part to the 2010 Affordable Care Act (ACA),[42] which increased the income cap for Medicaid eligibility. Between 2013 and 2016, Medicaid enrollment grew by over 15 million (27%). In 2016, more than 72 million Americans were insured through Medicaid.[43]

Many newly insured Americans suffered from chronic conditions, had had little to no previous contact with health care providers, and lived in underserved rural areas.[44] Many private providers did not accept Medicaid. Congress expanded the FQHC system to support the Medicaid-eligible population.[44]

In 2014, the US had the highest per capita and total health expenditures globally (USD 9,403 and USD 3 trillion, respectively).[45,46] Health spending represented 17.5% of GDP and was climbing,[47] but the US had poorer access, equity, and health outcome measures than other high-income countries.

Most primary care payment in the US was fee for service, typically ranging from USD 90 to USD 230 per visit at FQHCs, with additional fees for tests.[27] FQHCs offered a sliding fee scale to patients.[48]

Health System and Epidemiologic Indicators[‡]

INDICATOR		YEAR
Average life expectancy at birth (total/female/ male)	79/ 81/77	2015
Maternal mortality ratio (per 100,000 live births)	14	2015
Under–five mortality rate (per 1,000 live births)	7	2015
Infant mortality rate (per 1,000 live births)	6	2015
Vaccination rates (% of DTP3 coverage)	94	2014
Undernourished (%)	<5	2015
Adult (15–49 years) HIV prevalence (per 100,000)	650	2012
HIV antiretroviral therapy coverage (%)	37	2011
Tuberculosis prevalence (per 100,000)	3.8	2014
DOTS coverage (%)	100	2015
Malaria cases (per 1,000)	.005	2012
Government expenditure on health as % of total government expenditure	20.7	2013
Government expenditure on health per capita (PPP international dollars, USD)	4,307	2013
Total health expenditure per capita (current USD)	9,146	2013
Physician density (per 10,000)	24.5	2011
Nursing and midwifery density (per 10,000)	98	2010
Number of hospital beds (per 10,000)	29	2011

Health Workforce

Medical school graduates in the US had to declare their medical focus and complete a 3–4 year residency program in that area before practicing. The median debt for medical graduates was USD 180,000 in 2014; the average annual salary for residents was USD 55,300.[49] Residency programs developed clinical knowledge and skills through rounding, the practice of assessing patients and creating treatment plans with other residents and an experienced supervising physician;[50] discussion of patient cases ("case-based learning"); and didactic lectures.[51] Federal funding for graduate medical education went primarily to teaching hospitals and exceeded USD 15 billion in 2012. Medicare (USD 9.7 billion) and Medicaid (USD 3.9 billion) were the largest sources. Private support was difficult to measure but thought to be significant.[52]

National medical boards certified qualified physicians to practice medical specialties (e.g., dermatology, psychiatry) and subspecialties (e.g., pediatric dermatology, addiction psychiatry). The number of specialty and subspecialty boards grew from 18 in 1960 to 158 in 2011.[53] In 2013, specialist visits outnumbered primary care visits in the US for the first time.

Family medicine, internal medicine, and pediatrics residents frequently became primary care physicians (PCPs) and accounted for roughly one-third of all US doctors in 2014. Medical students who went into primary care often did so out of a desire to develop relationships with patients and help them navigate the health system.[54] PCPs were responsible for patients' comprehensive care and referring them to

[‡] Compiled by case writers using data from World Bank, WHO, FAO, and UNAIDS.

specialists as needed. A 2007 study of 776 primary care patients across 30 states found that around 80% of patients referred to a specialist followed through within three months.[55]

There was no regulation of physicians regarding their scope of practice once trained; however, most PCPs did not treat or diagnose complex conditions. Furthermore, at FQHCs there was no financial incentive to accept more complex patients because Medicaid and Medicare usually reimbursed a fixed amount per patient visit. "A patient who comes to your office for a flu shot and a general checkup," one physician explained, "earns the clinic USD 150. A patient with heart failure or hepatitis C also earns the clinic USD 150."[§] Some states limited primary care providers' ability to prescribe certain specialty drugs (e.g., hepatitis C drugs, chemotherapy) due, in part, to medication shortages.

Most PCPs operated in small practices with fewer than five full-time physicians. However, larger practices were becoming more common because they offered physicians the opportunity to pool risk and expenses.[56,57] Nurse practitioners and physician assistants received less education and training than PCPs but could perform many primary care functions. In 2015, PCPs earned an average of USD 195,000 annually; three of the five lowest-paid physician groups—internal medicine, family medicine, and pediatrics—were in primary care (see **Exhibit 2** for comparison of average salaries).[58] Nurse practitioners and physician assistants averaged around USD 98,000.[59–61]

Community health workers (CHWs) played a growing role in the US health system. Their duties included educating patients and liaising with health and social services. In 2015, CHWs earned an average of USD 40,150 per year.[62]

Clinical knowledge, treatment protocols, and best practices were continuously evolving. In 2014, scientific and medical journals published more than 2.5 million articles.[63] Most states required providers to complete 20 to 150 credit hours of continuing medical education (CME) in clinical, ethical, and management topics every one, two, or three years to maintain their license.[64] In 2014, there were over 147,000 accredited CME activities in the US, ranging from free online courses to conferences costing over USD 1,000.[65] The CME industry generated USD 2.6 billion in 2015 from various sources, including government grants, private donations, institutional allocations, commercial support, and user registration fees.[66] More than one-quarter of all CME credit earned was internet-based that year. Interactive CME techniques (e.g., role play, case discussions) increased physician motivation and improved patient outcomes but were used less frequently than didactic presentations and printed materials, which had no or little effect on patient care.[67]

There was a growing shortage of providers across medical fields.[68] In 2016, the US was meeting less than 60% of its need for PCPs (see **Exhibit 3** for shortages by state).[69] The shortage was most severe in rural areas; in 2013, only 4.8% of medical school graduates chose to practice in rural areas.[70]

Estimates of the future PCP shortage varied widely, ranging from 20,000 by 2020 to 159,300 by 2025,[71] and the specialist gap was expected to reach 46,100 by 2020 (see **Exhibit 2** for physician-to-population ratios by specialty). Government agencies offered various incentives to raise the number of providers in these areas (see **Exhibit 4** for examples)[72] and encourage providers to go into primary care.[73]

Factors contributing to the PCP shortage included pressure on medical students to specialize and the perception that PCPs had more administrative responsibilities than specialists.[74] Primary care and emergency physicians faced the highest levels of burnout due to stressful working conditions and demanding schedules with relatively low pay.[75]

[§] These are estimates; reimbursement varied by geographic area. For more on reimbursement at FQHCs and rural health clinics, see https://www.cms.gov/Center/Provider-Type/Federally-Qualified-Health-Centers-FQHC-Center.html.

Health in New Mexico

In New Mexico, chronic liver disease and cirrhosis prevalence were the highest in the US and twice the national average. The northern part of the state had the highest per capita drug overdose rate in the US.[76]

The percentage of New Mexicans without health insurance declined from 21.3% in 2002 to 12% in 2014. The state had the second-highest percentage (28%) of Medicaid recipients in the US.[77]

New Mexico ranked 46 out of 50 states for unmet primary care needs in 2014.[69] "We need providers," a rural clinic administrator said. "If any of our doctors left, it would be very difficult to replace them. It's hard to recruit people to the middle of nowhere, and everything has become so specialized that the primary care provider pool is now very small." A large proportion of specialists worked at the University of New Mexico (UNM) Health Sciences Center in Albuquerque, the one academic medical center serving the entire state.[78]

Hepatitis C

Discovered in 1989, hepatitis C virus (HCV) spread primarily through infected blood or body fluids and caused a liver infection known as hepatitis C.[79] In 2005, standard treatment for HCV was 24–48 weeks of weekly injections combined with twice-daily oral medication. Dosing and treatment length depended on patient weight and HCV genotype, of which three had been identified.[80] Treatment was expensive, had several negative side effects, could produce life-threatening complications, and had low success rates.[81]

There was a national shortage of liver specialists. While testing for HCV was simple, generally only specialists, including hepatologists, gastroenterologists, infectious disease physicians, and nurse practitioners specializing in liver disease, treated the condition.[82]

By 2013, more successful HCV treatments with fewer side effects were available. Prevalence was not well known because most people with acute HCV (a short-term illness that occurred within the first six months of exposure) were asymptomatic and not tested.[83] Of the estimated 3 million people with HCV in the US in 2012, an estimated 38% were linked to care, 11% were being treated, and 6% were cured.[84] Indigenous populations had the highest incidence of acute HCV, and injection drug use was the most common mode of transmission in the US.[85] Around 80% of people with HIV who injected drugs had HCV.[86]

In 2010, nearly 25,000 adults in New Mexico had HCV.[87] Average annual health care spending for Medicaid recipients with HCV was USD 26,832, compared with USD 6,521 for other patients.[88] Prevalence was high in prisons, and the state-run prison health system could not afford to provide treatment.[89]

In 2003, access to specialists trained in HCV management was extremely limited for rural New Mexicans.[78] Patients waited months and drove for hours to see the state's top liver specialist, Sanjeev Arora, MD, at the UNM Health Science Center HCV clinic, one of only a few in the state.[90]

Teaching Primary Care Providers to Treat HCV

Arora grew up and studied in India before moving to the US for residency and fellowship training in gastroenterology and hepatology. In 1993, he left a prestigious teaching position and clinical practice in Boston to run UNM Hospital's section of gastroenterology and HCV clinic, on the condition that UNM expand the endoscopy** suite's daily capacity from 10–15 cases to 50 cases.[91]

** A nonsurgical procedure used to examine a patient's digestive tract.

The volume of patients presenting with severe HCV deeply concerned Arora. Patients typically had to wait eight months to get an appointment once referred by their primary care provider, by which time many had developed liver cancer or failure. "The problem was that knowledge was trapped in the heads of 'super experts' at academic medical centers like UNM, creating a monopoly," he said. "Patients needed options close to home, from doctors who could monitor their health during the rigorous HCV treatment regimen."

In late 2003, Arora had an idea: What if he could train primary care providers to treat and manage HCV?[91] He had worked with many primary care providers who had referred patients to him and believed that, with the right knowledge, training, and mentorship, they could provide safe, effective HCV care. Helping primary care providers treat their patients would reduce his patient load and the wait for appointments, and Arora would be there to help with the most complicated cases.

Arora was unsure how primary care providers would respond: "I knew it could work in theory, but I didn't know if it would work in practice." He wondered, *Would they have the desire and time to learn new skills? Would they do it without being paid?* Arora also would need specialists who were willing to participate without compensation. He imagined using videoconferencing to conduct weekly "rounds" that combined case-based learning with input from the HCV clinic team.

In 2004, Arora began visiting FQHCs, IHS and other primary care clinics, and prisons around the state to present his idea to providers and clinic administrators, many of whom he already knew through his clinical work. He presented on HCV epidemiology, treatment, and access to care and his plan to train primary care providers. Arora then signed up primary care providers who wanted to become HCV experts: "I told them my hope was that their patients could get treatment in their local communities right away."

Not everyone was interested in participating, but Arora was hopeful. "If there were 20 clinicians in an FQHC, all I needed was one to become my mentee," he said. "If one decides to do it, it changes the game for everyone because now that provider can accept HCV referrals from their colleagues."

Interested providers had to get permission from their clinic directors to dedicate clinic time to participating in the videoconference sessions. "This was usually providers' primary concern," Arora explained. "Some FQHC directors worried that increasing the complexity of patients in the clinic would hurt productivity because reimbursement rates for office visits were pretty standard." Arora did not have funding support for his new project, so he used personal time to recruit participants, develop a curriculum, and train providers.

While providers initially traveled to UNM for a few days to receive informal and ad hoc HCV training, Arora soon offered a more organized two-day training on the HCV treatment protocol, videoconferencing technology, and case presentation format. The multidisciplinary UNM HCV clinic team facilitated the weekly two-hour "knowledge network" sessions. Before each session, providers completed a case presentation template—excluding identifying patient information in accordance with US health information protection laws—and then uploaded and shared it via a web-based UNM database. Arora dedicated the first 90 minutes of each session to patient case discussions. Primary care providers took turns presenting their cases and asking each other and the specialist team for input on treatment initiation and dosing, side effects, and psychiatric conditions and substance abuse. Arora facilitated the discussion and then did a 30-minute didactic presentation on an aspect of HCV management.

Arora used UNM's Polycom® communications system to host the videoconference calls. He preferred video to build trust and encourage providers to become more comfortable presenting cases and sharing questions and ideas. Some participating clinics already had Polycom systems; others had to purchase hardware, software, and/or additional internet bandwidth. Participants could call in by phone if needed.

Approximately 20 providers, including nurse practitioners, PCPs, and physician assistants regularly participated in the initial sessions. Arora's team entered patient data into a central database to monitor patient progress and outcomes. It often took providers several sessions to become comfortable presenting cases, asking questions, and sharing their opinion. "I was anxious when I first started participating," a family physician recounted. "The specialists don't try to put us on the spot, though. They suggest things we might do differently next time, but then they remind you that they didn't expect you to have done all these things before presenting your case. It's all part of the learning process." Providers billed insurance for HCV treatment at their usual patient visit rate, not at the rate specialists treating HCV billed. The primary care providers remained liable for patient care.

Providers typically started treating HCV within a few weeks of joining the weekly "knowledge network" sessions. They periodically shared case updates, and the specialist team recommended midcourse corrections as needed. After five or six months of weekly sessions, most providers were, according to Arora, "very knowledgeable" and felt confident initiating treatment on their own. At that point, they usually reduced their "knowledge network" participation to every two or three weeks. Arora gave his phone number to participants in case they needed to reach him directly.

A year after starting the HCV sessions, Arora and his team named their initiative the Project Extension for Community Healthcare Outcomes, or Project ECHO®. They were inspired by the "cooperative extension" programs that state universities had developed in the 19th century to transmit agricultural best practices to rural farmers by sending an "extension agent" to different farms to provide customized recommendations based on the local challenges.

Project ECHO

When Arora told people about Project ECHO, he emphasized that it was not telemedicine or a webinar. Instead, it was "a guided practice model" that allowed primary care providers to continue managing their patients, operating with increasing independence as their skills and confidence grew. He explained, "It's one specialist to many primary care clinicians instead of one specialist to one patient." While the volume of patients in Arora's clinic remained the same, those cases were often more complex. Over an 18-month period, the average wait time to initiate treatment with Arora fell from eight months to two weeks.

The HCV team worked with UNM's undergraduate medical education evaluators to create an evaluation plan that could demonstrate Project ECHO's impact. The plan included observation of ECHO clinics, monitoring a database of provider participation and case presentations (including patient outcomes data), and routine surveys—initially paper-based—about providers' knowledge, self-efficacy, experience with ECHO clinic facilitators, and barriers to using ECHO.[92] Ideas from social cognitive theory, situated learning theory, and communities of practice also supported what Arora began calling "the ECHO model."

Arora and his HCV team began referring to weekly sessions as "teleECHO clinics" (see **Glossary** for Project ECHO terminology) and awarded CME credit for participation through UNM's Office of Continuing Medical Education.

Arora began looking for funding to support the HCV team's time and offset some of the clinics' start-up costs. In 2004, he received a three-year USD 1.45 million grant from the federal Agency for Healthcare Research and Quality that helped clinics pay for software, hardware, internet bandwidth, and a CHW to assist with data entry for case presentations. More than 20 health centers and clinics across New Mexico were participating in the HCV TeleECHO Clinic. Arora's team surveyed participants to solicit feedback on session content and structure and incorporated feedback into the model; for example, primary care providers noted that patients were reluctant to answer questions on UNM's HCV screening tool about

sexual and illegal drug activity because everyone in their community knew each other. One of the rural clinics suggested offering a list of common HCV risk factors that patients could read, followed by the question, "Based on these factors, would you like to have an HCV test?" Arora's team adopted the change.

Arora hired infectious disease specialist Karla Thornton to consult on patients who were co-infected with HCV and HIV in the HCV TeleECHO Clinic.

Beyond HCV and New Mexico

While leading the HCV TeleECHO Clinic at UNM, Arora continued to recruit new primary care providers across the state. At one FQHC, family medicine physician and addiction specialist Miriam Komaromy was interested in Project ECHO for substance abuse. "There was nothing specific to HCV about the model; it was just the first condition they used it for," Komaromy said. "Using the model for addiction seemed like a natural next step because injection drug use is behind so many cases of HCV infection."

Arora invited Komaromy to observe the HCV program and develop an ECHO for substance use and behavioral health disorders. Komaromy recalled, "A big part of starting the new ECHO was driving around this large rural state to give lunchtime talks and grand rounds, and staying afterwards to talk to people who wanted to get involved." One primary care provider was immediately interested in joining, noting, "Doctors tend to be people who like to learn. You spend all this time learning in medical school, and then you graduate and that's it. You do CMEs each year, but they don't usually teach new skills. Project ECHO was a chance to learn something new while addressing a critical problem in my community."

In 2005, Arora and Komaromy launched the Integrated Addiction and Psychiatry (IAP) TeleECHO Clinic at UNM. The IAP specialist team included Komaromy, a psychiatrist, a clinical social worker with addiction expertise, a psychiatric nurse, and a CHW.

From June 2003 through 2005, the HCV teleECHO clinic presented hundreds of patient cases, giving participants hundreds of training hours and no-fee CME credits. Resources for Arora, his team of 4–6 paid staff and 2–3 volunteers, and participating clinics became stretched. Arora approached the New Mexico State Legislature to solicit funding for his "low-cost, high-impact" approach to improving health care access. "He was a relentless salesman," one state senator recalled.

In 2006, the legislature approved USD 1.5 million in annual funding to expand Project ECHO's HCV work in New Mexico, and then to tackle other diseases affecting New Mexicans (e.g., diabetes) and to develop CHW programs to support those efforts.

The following year, Arora and his team won a USD 1.5 million grant from the Agency for Healthcare Research and Quality to support pilot research for four additional health conditions. They published their first peer-reviewed journal article in *Academic Medicine*, identifying their criteria for disease selection: (1) high prevalence; (2) complex management; (3) evolving treatment; (4) high societal (health and economic) impact; (5) serious consequences when untreated; and (6) significantly improved outcomes from treatment.[78]

On the HCV TeleECHO Clinic's annual survey, providers reported greater confidence and competence in their ability to diagnose, treat, and monitor HCV-infected patients whom they previously would have referred to a specialist. Most providers also said Project ECHO diminished their professional isolation and increased their job satisfaction (see **Exhibit 5** for survey results). Clinics wanting to grow saw Project ECHO as an opportunity to attract new patients and retain patients they otherwise would have referred to a specialist. Komaromy explained, "A lot of people who decide to work in community health centers and FQHCs do so because they really care about the health of the population they're serving, so many of them are enthusiastic about ECHO even though they're not being reimbursed directly for providers'

participation." The biggest challenge participants faced was allocating two hours each week—usually their lunch hour and an hour they would have used to see patients—to participate. This applied especially to clinics at or over capacity, which found it more difficult to justify spending time on teleECHO clinics.

Philanthropic Support

In 2007, Arora applied to a global competition called Disruptive Innovations in Health and Health Care, hosted jointly by the US-based Robert Wood Johnson Foundation (RWJF) and Ashoka, an organization that promoted social entrepreneurship. A RWJF senior adviser, Nancy Barrand, and the other competition judges were excited by "the idea that Arora was moving knowledge down the clinical chain of command," Barrand said. ECHO was one of three winners from more than 300 entries from 27 countries.

When RWJF invited the winners to submit in-depth proposals for up to USD 1.5 million, Arora submitted a "conventional proposal," Barrand said. But she believed there was more there. She convinced a fellow reviewer to fly with her to Albuquerque to observe an HCV TeleECHO Clinic. Barrand recalled:

> We were blown away as we watched a PCP from the IHS in Montana discuss his patient's case via videoconference with a PCP and a nurse practitioner from two different parts of New Mexico and the specialist team at UNM. We were watching the learning as it happened, and you could start to imagine it—how the world of medical practice might change if there were teleECHO clinics across the world discussing best practices for different diseases and networking providers for the purpose of learning.

RWJF asked Arora to submit a new proposal that "gave us *his* vision rather than what he thought we wanted," Barrand said. In 2008, RWJF awarded Project ECHO a three-year USD 5 million grant to expand in New Mexico and to test its potential to replicate elsewhere, starting with the University of Washington (UW), which had approached Arora about starting its own project.

Arora's team further developed the IAP program—including the addition of buprenorphine waiver training for providers who wanted to be certified in prescribing the opioid addiction medication. Using their disease selection criteria and available epidemiological data, they launched new Project ECHOs in asthma, diabetes, rheumatology, chronic pain, and high-risk pregnancy. They trained UW to set up and run teleECHO clinics. A Project ECHO staff member noted, "The learning process at that time was very ad hoc. People came to observe some of our teleECHO clinics, and Dr. Arora told them how he ran them."

UW adapted Project ECHO to meet its needs, capturing teleECHO clinics on video and creating an archive of didactic and case presentations participants could search. Arora asked UW to share how they did it so that UNM could develop its own searchable archive.

Arora promoted Karla Thornton to associate director to manage HCV teleECHO clinics and create a peer health education ECHO for state prisoners. Arora also approached UNM autism experts about starting a Project ECHO to support teachers, therapists, and other providers at three schools in India specializing in developmental disabilities. The University of Chicago became the first Project ECHO site focused on urban areas, helping FQHCs treat hypertension in black males.

As news of Project ECHO spread, more organizations contacted Arora for advice on how to start their own programs with local primary care clinics. He began calling Project ECHO a "hub and spoke" model; the facilitating organization was the hub, and its teleECHO clinic sites, the spokes.

Some ECHO staff suggested creating legal documents to formalize partnerships between UNM and hubs and to build a consistent brand. Arora was reluctant: "I didn't want to create any barriers to replication."

Communications

In 2009, Arora hired an assistant to help him prepare publications and comply with UNM marketing and communications guidelines, and RWJF hired Washington, DC–based Burness Communications to support Project ECHO communications, policy, and strategy. With expansion on his mind, Arora wanted to approach large federal health agencies such as the Centers for Medicare and Medicaid Services. Ben Milder, Burness's public policy team director for Project ECHO, was well connected and generated meetings between Arora and health agency leaders. Milder helped draft the strategy and agenda for these meetings, explaining, "An important part of our work was knocking on doors and building relationships for ECHO."

In early 2010, after several meetings, Arora and the VHA agreed to pilot Project ECHO at select VHA sites. Arora also wanted to see if the New Mexico Medicaid program might reimburse providers when they presented Medicaid patients in teleECHO clinics. Arora believed Project ECHO could lower Medicaid costs by enabling primary care providers to treat patients in their communities, reducing the need for higher-cost specialty care and hospitalization. RWJF and Burness introduced Arora to leadership at the Center for Health Care Strategies, a nonprofit health policy organization that connected him to state and federal leaders. When the head of the Centers for Medicare and Medicaid Services at the time, Don Berwick, met Arora, he said, "I was swept away," and joked, "I became the president of the Sanjeev Arora fan club."[93] Berwick believed Project ECHO could help US health care achieve the "Triple Aim."[††94]

Research

Providers told Arora that participating in Project ECHO motivated them to expand their clinical skills and made them feel less isolated professionally by connecting them with like-minded practitioners. A family physician noted, "Oftentimes, the patients we're discussing through Project ECHO—those with HCV, chronic pain, or addictions—are patients nobody wants to care for. Other providers are surprised to hear that I'm spending time on these patients, so it's nice to connect with people in the state who realize how important it is to care for them."

Between the positive feedback he was hearing from primary care providers and his own observations, Arora was confident about the impact of Project ECHO, but he needed better proof. He wanted to show funders that patients in the care of Project ECHO-trained primary care providers were doing as well those under specialists' care.

With USD 3 million from the Agency for Healthcare Research and Quality, RWJF, and the New Mexico State Legislature, Arora worked with UNM researchers and Project ECHO program directors to design a prospective cohort study of the HCV program. "One of the benefits of hepatitis C treatment protocols was that we had patient lab values over time in the database," the Project ECHO research director explained. "It would have been more difficult to do this kind of study for chronic pain or IAP because they do not have similarly standardized, biological treatment measures."

Looking at 407 patients with chronic HCV infection without previous treatment (controlling for patient characteristics), the study found that 57.5% of patients treated at the UNM HCV clinic and 58.2% of patients treated at one of 21 ECHO sites had no detectable HCV viral load for at least 24 weeks following treatment. Serious adverse events occurred more in UNM patients (13.7%) than in ECHO site patients (6.9%). Other studies showed that providers trained through Project ECHO to treat HCV outperformed both VHA providers and community-based hepatologists. In June 2011, Arora and his coauthors published their

[††] The Institute for Healthcare Improvement's Triple Aim framework for optimizing health system (*Health Affairs,* 2008) suggests that health systems should simultaneously pursue three dimensions: improving the patient experience of care (quality and satisfaction), improving the health of populations, and reducing the per capita cost of health care.

findings in the *New England Journal of Medicine* (NEJM).[95] Burness promoted the article and introduced Arora to the editor of another peer-reviewed health policy journal, *Health Affairs*. Soon thereafter, the journal published the first national health policy piece about Project ECHO, which Burness helped compose.[44]

Building a Reputation

In addition to publishing in journals, Arora and other Project ECHO program directors presented at conferences and meetings. Inquiries from academic medical centers and other organizations increased dramatically. "Communicating about Project ECHO became more and more work," an ECHO team member said, "and we realized someone needed to review everything to ensure our messaging was consistent." Arora made his assistant the new communications coordinator.

By the fall of 2010, Project ECHO hubs were using the model for 13 diseases: asthma and pulmonary disease; child, adolescent, and family psychiatry; chronic pain and headache; diabetes/cardiovascular risk reduction; HCV; high-risk pregnancy; HIV/AIDS; IAP; medical ethics; occupational medicine; pediatric obesity; psychotherapy; and rheumatology. Roughly 25 full-time Project ECHO employees at UNM provided logistical support to hubs and spokes and helped with curriculum development, research, communications, and fundraising.

As RWJF started to think toward the end of its funding for Project ECHO, which would come after its second and final grant, it suggested Arora charge a fee for the initial training he provided partners. Arora refused: *How could I advocate that others give away their knowledge for free*, he thought, *and then turn around and charge for mine?* Barrand worked with Arora to identify other possible funding sources.

New Funding

In 2011, a managed care organization (MCO) in New Mexico began reimbursing clinics USD 50 each time a provider presented a Medicaid patient insured through the MCO in a teleECHO clinic to offset a portion of the revenue clinics lost when providers were in teleECHO sessions. When the MCO noticed that few providers were billing for their presentations, it increased the reimbursement to USD 150; however, providers continued to bill infrequently. Many clinics applied for grants to cover the costs of providers' participation in Project ECHO.

GE Foundation, the philanthropic arm of US-based multinational corporation General Electric (GE), was looking for opportunities to increase access to behavioral health services following a school shooting near GE's headquarters in Connecticut. Foundation leaders met with Arora and visited several Project ECHO sites. The prospect of new funding inspired Arora to ask Erika Harding, who had been developing the diabetes teleECHO clinic and its CHW training curricula, to direct replication efforts. At the time, there were approximately 10 replication partners.

Arora, Harding, and others began writing the second RWJF grant for USD 5 million over three years. One of their goals was to make Project ECHO at UNM more autonomous. RWJF encouraged Arora to consider whether UNM was the right place to continue growing Project ECHO. It took several months to hire new staff, and Arora had to comply with UNM salary caps. They decided the faculty opportunities for Project ECHO program directors and specialists at UNM outweighed the drawbacks of bureaucratic delays.

Other objectives of the RWJF proposal included replicating in two new states, creating a "MetaECHO Conference" that would convene partners and other stakeholders once every 18 months, and developing a software program for tracking Project ECHO programs and partners. "We didn't have a good internal

tracking tool," Harding said, "so it was hard to know who was doing what where. Basically, it was all in Dr. Arora's head." At Harding's suggestion, they included the creation of a legal structure for replication.

GE Foundation and RWJF worked with Burness to announce their respective grants at a joint press briefing in June 2013. Part of GE Foundation's three-year USD 5 million grant would fund the development of a new Project ECHO program, ECHO Access, to recruit and train CHWs to support the patients the IAP program discussed. Arora advocated that they pilot it in New Mexico first. "I wanted to make sure it worked well before taking it to other settings," he said. A program participant noted, "ECHO has created the opportunity to learn from people who are like walking, talking psychiatric and behavioral health encyclopedias or textbooks."

Project ECHO on the Ground: The IAP TeleECHO Clinic

When primary care providers first began treating patients with substance use and behavioral health disorders, they typically needed a lot of support from the IAP specialist team. Common questions included how to diagnose, initiate treatment, and address treatment resistance or comorbidities. The specialist team facilitated role-play to help providers practice talking to patients about sensitive issues. Providers' questions and participation often changed over time; they might attend the clinic less frequently, and when they did call in, they presented patients with atypical or otherwise more complex presentations of disease. An average of 147 providers participated in IAP annually, and those who attended more than one session averaged 12–13 sessions over a period of 16–17 months.[96] A nurse practitioner explained, "After participating in IAP for about two years, I would say I have the equivalent of a two-year fellowship in behavioral health and psychiatry … The CME hours have been helpful as well."

Komaromy noted:

> Evidence-based guidelines are incredibly important, but there's often *not* evidence. The ability to rely on guidelines or information you could look up online breaks down with more complicated patients. For example, there's not usually guidance on how to treat someone who is homeless and has low health literacy. That's where the collective wisdom of a group of people all putting their heads together and sharing ideas and suggestions to help guide a clinical approach is so powerful.

Primary care providers referred complex or very ill patients to psychiatrists or other specialists. "We don't claim that every patient with a behavioral health disorder or a substance use disorder can be treated in primary care," Komaromy said. "Our goal is to help primary care providers identify those patients who really do need specialty or emergency care right now and to help them get that care."

The ECHO Institute

GE Foundation and RWJF grant funding supported a new ECHO Institute at UNM dedicated to replicating the ECHO model globally. Building on early replication support efforts, the ECHO team developed a replication process. The Institute led trainings and offered technical assistance to partners. Interested sites were encouraged to join a monthly Project ECHO overview Arora led via videoconference.

Arora and his technology team switched from Polycom to a cloud-based platform called Zoom, which users could download from the internet and did not require specific hardware. It also adapted to low-bandwidth settings, which reduced the likelihood of dropped calls.

Project ECHO Hubs

Most organizations interested in Project ECHO were academic medical centers or large nonprofit organizations. Arora and Harding rigorously vetted other potential partners to ensure they were in good legal standing and their intentions aligned with the Project ECHO mission. They rarely turned anyone down, and when they did, it was because their organization's mission was not aligned with ECHO's.

The ECHO Institute formalized an ECHO Model™ and identified four core components the hubs were expected to incorporate: (1) use technology to leverage scarce resources and lower the transaction costs of collaboration; (2) share best practices to reduce disparities; (3) employ case-based learning to master complexity; and (4) monitor outcomes to ensure value. All sites wanting to become Project ECHO hubs had to sign an intellectual property terms of use agreement and a statement of collaboration to show their commitment. Harding said:

> One of our goals was to identify the ECHO Model as intellectual property and protect it from being stolen and commercialized. But it was even more about creating a communication mechanism with our partners and about the relationship between us. Mutual sharing is so fundamental to what we do, but until we developed partnership agreements, we didn't have a way to talk about and enforce it. So it was about creating the expectation that you're going to share, and then ensuring the legal right for partners to use what we shared, and vice versa.

Some existing replication partners were reluctant to sign the documents. "At that point, there wasn't much value to offer them beyond the ECHO model, which we'd already given to them," Harding said.

Specialists and administrators from committed partners attended a one-day orientation held monthly in Albuquerque that offered a basic overview of the model and implementation, followed by a two-day immersion training with more in-depth instruction on how to start and sustain a Project ECHO program. Attendees observed live teleECHO clinics, discussed the recommended "anatomy" of a teleECHO clinic (see **Exhibit 6** for suggested clinic format), and participated in a "Mock ECHO" where they practiced the roles of clinic director, clinic coordinator, specialist, and spoke participant. Institute team members provided feedback on the role-play and how to engage primary care providers. The importance of case-based learning was emphasized throughout. One team member explained, "Without that, what you have is a weekly webinar or lecture—it's not the same thing. We don't want people to confuse ECHO with Zoom. Technology helps expand reach and access and is part of the model, but it's not the core."

Arora aimed to keep his schedule as clear as possible during "training week" and to meet with every person or group who attended. "He feels a personal connection to them," a replication team member explained. "Participants see his presence as something really valuable." In addition to the hub organizers, the Institute urged people to bring a leader from their university or organization, their funding institution, and any other collaborating partners (e.g., external evaluators) to the orientation and immersion events to secure their support.

Arora and Harding encouraged partners to recruit site teleECHO clinic directors who were passionate about Project ECHO. "It's always champion-driven," Harding said. The directors also needed to have strong facilitation and interpersonal skills. One noted, "You need someone who's a recognized expert but also a good listener who really enjoys teaching. There are some people who are really smart and talented clinicians who aren't good teachers." Hubs also needed someone to provide technical support to participants and ensure the videoconference sessions ran smoothly.

In 2014, Arora hired internist Bruce Struminger—who had participated in the HCV TeleECHO Clinic as a physician with the IHS in Arizona—as a third associate director to manage partnerships with the IHS and the Centers for Disease Control and Prevention, as well as the Institute's global HIV and TB programs and

several of its New Mexico programs. Miriam Komaromy, an associate director as of 2012, oversaw the IAP program, Complex Care program, and CHW programs (see **Exhibit 7** for an Institute organizational chart).

The number of Project ECHO hubs outside the US began to grow, including programs in Canada, Uruguay, Vietnam, and Northern Ireland, and there were plans to launch an HIV hub in Namibia with the Namibian Ministry of Health.

Transitions

As the Institute got off the ground, RWJF helped Arora arrange a meeting with a trustee of the Helmsley Charitable Trust, who invited Arora to collaborate to develop an Endocrinology TeleECHO Clinic (Endo ECHO) to address its interest in diabetes. They launched Endo ECHO in May 2014. The hub team—an adult endocrinologist, a pediatric endocrinologist, a diabetes educator, a CHW, a social worker, a nurse manager, a kidney specialist, and a psychiatrist—worked toward "patient-centered" care. The nurse manager explained, "Beyond clinical care, we talk about things that impact everyday life, whether you have diabetes or not, because those types of things—losing your job, not having health insurance, getting a divorce—affect the way we feel about ourselves, and that affects the way we manage our health."[97]

The Helmsley Charitable Trust made it a grant requirement for the ECHO Institute to hire a chief operating officer (COO) and to make a plan for promoting fidelity to the ECHO model. "They were really pushing us to standardize our business processes and to do a lot more work with our hub-and-spoke model," an Institute staff member said. "I think we would have gotten there eventually, but having a funder say, 'You need to do this,' was a big driver."

Arora was hesitant at first to create the COO role and pass day-to-day operations on to someone else. Ultimately, he hired a successful business strategist, Charrissa Lin, who had spent years working for private corporations and consulting companies and was looking for a higher calling. "My role was becoming more and more externally facing," Arora said. "I spent a lot of time traveling and talking to potential partners and payers, so I needed a more internally focused person who could keep the machine running."

GE Foundation and the Helmsley Charitable Trust continued to fund Burness's work covering their respective grant activities. "I think they saw value in the connections we were helping ECHO build and in making sure that communications and policy were an important part of ECHO's continuing expansion," Milder said. "We had helped the Institute tell its story in ways that reflected the priorities of different funders." A June 2014 *New York Times* piece[98] on Project ECHO created another surge of interest.

"Building a Movement"

Arora and his leadership team contemplated ways to expand Project ECHO further. They looked at what other organizations had done. Arora summarized their thinking:

> We ruled out the for-profit model because it wasn't conducive to reaching the poorest of the poor. We looked at the world's leading health care nonprofit organizations, including academic medical centers, and saw that they have two goals: one is to help the world, and the second is to help their own organization. They're reluctant to share their best practices. We knew that this model wouldn't work either, so we asked, 'What model would?' We decided: a movement.

A management consultant suggested the Institute set an "audacious" goal to help communicate its vision. In 2014, Arora announced ECHO's goal to "touch 1 billion lives by 2025." That fall, the Institute organized and hosted its first MetaECHO Conference in Albuquerque. Burness helped design the program and prepared Institute staff and partners to deliver brief TED Talk–style "ECHO Talks" to inspire people

before Arora introduced the concept of "the ECHO movement." "You are part of it," he told attendees. As he later explained, "We often describe ECHO as a coalition of the willing—of specialists who want to extend their knowledge and expertise for the social good and of primary care providers who want to do more for patients who would otherwise have great difficulty getting the care they need."[99]

The Institute developed an online, cloud-based software program called iECHO to help teleECHO clinic program coordinators manage logistics and data. They also started using an online file-sharing service, Box, to share resources with hubs, including Project ECHO talking points and promotional materials, notes from monthly MetaECHO calls, sample case presentation forms and didactic presentations by disease, evaluation tools, curriculum development tools, job descriptions, budgeting, and fundraising tools. The Institute asked hubs to include a technical assistance line item in grant proposals that, if funded, would go to the Institute for training and support costs (see **Exhibit 8** for a sample teleECHO clinic startup budget). Partners could upload resources they developed as well; they did so rarely, despite reminders to share.

In the summer of 2015, GE Foundation awarded the Institute a new grant of USD 14 million to bring the Project ECHO model to 1,000 FQHCs and to pilot a teleECHO clinic on quality improvement in FQHCs. GE Foundation's goal was "to transform primary care," with FQHCs as the strategic focus. Emergency physician David Barash had become chief medical officer and executive director of the global health portfolio. He was excited about Project ECHO's potential:

> This is a platform where you can transfer knowledge about any subject matter. It's like the Apple operating system—I believe that ECHO could become a new operating system for workforce development. At the Foundation, we think strategically about how to invest our philanthropic dollars, using the same principles any investor would use when choosing where to deploy their resources. We look for impact and return on investment. Project ECHO's model exemplifies how adults learn new skills and can change forever how we transfer our expertise to others.

The grant funded 8 new replication staff for a total of 11 members. At the end of the year, Arora hired a chief technology officer to improve and expand iECHO based on user feedback to better support the administration and evaluation of teleECHO clinics.

Funders and other advisers continued to encourage Arora to charge a fee for technical assistance or turn ECHO into a franchise model that could be sold to hubs (see **Exhibit 9** for Project ECHO funding over time). However, Arora remained opposed. "Charging people, even a small amount of money, would slow down the movement because a lot of the people we want to reach don't have that money," he explained. Instead, as Lin put it, "We need to get embedded in the ongoing payment streams of health care. It could be that, or health education. How do we get state departments of health or Medicaid to pay?"

According to Arora, "One choice we've made is to say that it's okay if we don't sustain ourselves as an organization. If the Institute goes away in a few years, so what? The movement will have been built and will continue." While this attitude was motivating to some, it led some junior staff to feel undervalued. Most staff across the Institute worked there because they believed in the mission, and many had taken significant pay cuts to do so. "Every day, it seems like there's a new hub or a new country or a new disease state, which keeps it exciting but can also be a little overwhelming at times," one employee noted.

Superhubs

With the hub-and-spoke onboarding model defined, leadership started to wonder about the potential to speed expansion by replicating more of the Institute's work. They mentioned the idea to a few hubs, and there was interest. These new "superhubs" would be responsible for raising awareness about ECHO, training and supporting new hubs, maintaining fidelity across hubs, collaborating and sharing updates with the Institute, and developing a strategy for sustaining themselves.

By mid-2016, there were seven superhubs: Northern Ireland Hospice, Universidad de la República in Uruguay, the ECHO India Trust, and, in the US, the American Academy of Pediatrics, the University of Wyoming, the University of Chicago, and the Missouri Telehealth Network. The American Academy of Pediatrics trained a pediatric sickle cell anemia care provider in Cincinnati, Ohio, to be a Project ECHO hub—the first not trained by the ECHO Institute. The Institute sent the hub a letter welcoming it to the MetaECHO Community and explaining the Institute's role. Superhubs created their own partnership documents, subject to the ECHO Institute's approval.

Outlook

The second MetaECHO Conference, funded by GE Foundation, took place in April 2016 and drew more than 400 attendees from 15 countries (see **Exhibit 10** for a list of Project ECHO partners). "We need around 1,000 hubs across the globe to touch 1 billion lives by 2025," Arora told to attendees. The leadership team had started to talk about what it meant to touch lives at a primary, secondary, tertiary, and even quaternary level—from doctors trained and patients discussed in clinics, to the other patients benefiting from better-trained physicians, physicians trained by ECHO participants, and the friends and family of beneficiaries. The numbers added up quickly.

The Institute and a few partners were using the ECHO model for nonmedical issues as well, such as assistive technologies for students with disabilities and crisis intervention for law enforcement (see **Exhibit 11** for program overviews). "So many people are presenting about ECHO, and many hubs are publishing now," Harding said. "ECHO seeds are being planted all the time" (see **Exhibit 12** for a selection of Project ECHO publications). Most peer-reviewed publications described Project ECHO's impact in terms of provider participation, satisfaction, and/or knowledge and clinical competence. Studies suggested Project ECHO changed provider behavior (one study) and patient outcomes (six studies) and could generate savings for the health system (two studies).[100] In June 2016, the US Surgeon General visited the ECHO Institute to learn more about its potential to curb the US' opioid epidemic. The Department of Health and Human Services was requiring grantees to use Project ECHO in a new program aimed at improving opioid addiction treatment in primary care practices.

By December 2016, the ECHO Institute—with over 100 faculty and staff—was supporting 100 Project ECHO hubs in more than 30 US states and 21 countries to address more than 55 conditions, and more than 200 new ECHO projects were in development. And, as of that date, there had been no medical malpractice cases associated with Project ECHO.

As 2016 came to a close, US senators Orrin Hatch (R-Utah) and Brian Schatz (D-Hawaii) introduced a bill, the Expanding Capacity for Health Outcomes (ECHO) Act, to Congress to better integrate Project ECHO's "technology-enabled collaborative learning and capacity-building model" into health systems nationwide. The bill emerged from a conversation between a Hatch staffer who had attended a Burness briefing on GE Foundation's support of ECHO and a Schatz staffer familiar with the Hawaii ECHO hub.

The bill would require the Department of Health and Human Services to study how Project ECHO and similar models could create cost savings and improve health care, and how to advance the use of such models and integrate them into current funding streams and innovative grant proposals. It did not include any financial appropriations.

The ECHO Act passed in both the House and the Senate, and the president signed it into law in December 2016. Arora considered whether this political attention and the new research it would inspire were what he needed to expand the ECHO model. What else would he need to create the "coalition of the willing" that would be crucial to reaching 1 billion lives?

Appendix *Common Acronyms and Abbreviations*

ACA	Affordable Care Act
ACO	Accountable care organization
CHCS	Center for Health Care Strategies
CHW	Community health worker
CME	Continuing medical education
CMS	Centers for Medicare and Medicaid Services
COO	Chief operating officer
ECHO	Extension for Community Healthcare Outcomes
FQHC	Federally qualified health center
GE	General Electric
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
IAP	Integrated Addiction and Psychiatry
IHS	Indian Health Service
MCO	Managed care organization
PCP	Primary care physician
RWJF	Robert Wood Johnson Foundation
UNM	University of New Mexico
US	United States
USD	United States Dollars
VHA	Veterans Health Administration

Glossary of Project ECHO Terms

Term	Definition
Demonopolize	Share freely with others particularly in the case of knowledge to enable others to become equally expert.
Dry Run	A rehearsal that is scheduled prior to the teleECHO clinic launch where hub sites check VTC capability of the hub and spoke sites and to provide housekeeping information.
ECHO®	Extension for Community Healthcare Outcomes
ECHO Access	A program aimed at expanding access to treatment for Mental Health Disorders (MHDs) and Substance Abuse Disorders (SUDs), supported by the Integrated Addictions and Psychiatry (IAP) teleECHO program.
ECHO Care™	An innovative program supported by the Complex Care TeleECHO Clinic, designed to improve access to primary and specialty care for patients with complex needs while also reducing the cost of care and improving the quality of care by utilizing a multidisciplinary team-based approach.
ECHO Health®	Project ECHO's coordination application used primarily as a patient and care team management application.
ECHO Institute™	Refers to Project ECHO's legal entity, faculty and staff as well as headquarters and physical location at UNMHSC in Albuquerque, NM.
ECHO Model™	Developed as a platform for both healthcare service delivery and research in 2003. The ECHO model is based on four core pillars: 1. use technology to leverage scarce resources, 2. sharing "best practices" to reduce disparities, 3. case-based learning to master complexity, and 4. a web-based database to monitor outcomes. The ECHO model develops knowledge and capacity among community clinicians through on-going telementoring and education.
Force Multiplication	Refers to an exponential increase in workforce capacity created through the ECHO model. Utilizing telementoring and guided practice ECHO builds system capacity by empowering primary care providers to gain new knowledge and expertise to treat patients in their own communities.
Hub	Regional center where multidisciplinary team of subject matter experts for a teleECHO clinic is located.
iECHO	Project ECHO's web-based partner relations management tool that is used to manage teleECHO clinics, collect data on teleECHO clinic participation, and provide online resources to partners.
Introduction	This is a 90-minute video conference session that consists of a 45-minute presentation by Dr. Sanjeev Arora or his designee followed by a 45-minute question and answer session: describing how ECHO started, how it is implemented, and the next steps for starting a teleECHO clinic.

Immersion	Three-day in-depth training for those that are ready to implement the ECHO model and have signed Project ECHO's partnership documents. Allows partners to delve deeper into skills and resources needed while developing ongoing relationships with ECHO staff to allow for successful replication.
IT Support Techs	Project ECHO It employee dedicated to managing and coordinating participant technological connections to the teleECHO clinics.
Knowledge Networks	Consists of regularly scheduled teleECHO clinics that bring together expert inter-disciplinary specialists and community-based partners.
Learning Loops	The sharing of knowledge between experts and community partners through active participation in teleECHO clinics.
MetaECHO™ Community	Refers to the ever-expanding community of individuals and organizations using the ECHO model to help demonopolize expert knowledge.
Mock TeleECHO™ Clinic (Mock ECHO)	Simulated teleECHO clinics that are designed to prepare hub team members for launching live teleECHO clinics.
Orientation	Full day of presentations on the ECHO model in Albuquerque, NM including the mission/model, IT and ECHO applications, implementation next steps, evaluation, and snapshots of ECHO programs.
Project ECHO®	Refers to the overall movement to implement the ECHO model, including the ECHO Institute.
Replication	Implementation and adaption of the ECHO model based on community needs and resources with training and technical assistance from the ECHO Institute and other superhubs.
Replication Partner Coordinator (RPC)	This expert on the ECHO model provides direction to partners with next steps and individualized attention that is crucial to considering details involved in launching a new and successful ECHO program.
Session	Refers to an individual teleECHO clinic occurrence.
Spoke	Community partner site at which individual or team of learners is located and connects to hub via teleECHO clinics.
Superhub	Project ECHO partner that has the ability to sign partnership documents, train, and provide ongoing support to replication partners in the same way that the ECHO Institute's Replication Team does. These teams will receive a special superhub training of immersion plus an additional week focused on a train-the-trainer method for the teams to learn to recruit, teach, and support replication partners through the implementation process.
TeleECHO™ Clinic	Term used to describe regularly scheduled videoconferencing sessions which include subject matter experts and learners who use the ECHO model, didactic presentations and case-based learning to create learning loops. TeleECHO clinics are a core feature of the ECHO model.
TeleECHO™ Clinic Manager	Project ECHO manager, often with healthcare experience, who assists in curriculum development for the educational and training component of the teleECHO clinic, assists in coordinating teleECHO clinic functions and provides managerial support to the teleECHO clinic coordinators.

TeleECHO™ Clinic Coordinator	Someone who is responsible for the administrative and organizational component of a teleECHO clinic; as well as provide guidance information to teleECHO clinic participants and teleECHO clinic guest speakers.
Telementoring	Term used to describe the guided mentoring relationship that develops during a teleECHO clinic using videoconferencing technology.
UNMHSC	University of New Mexico Health Sciences Center, where the ECHO Institute is based in Albuquerque, NM.
VTC	Video teleconferencing; participation in teleECHO clinics via video connection.
Zoom	Teleconferencing software used for teleECHO clinics.

Source: ECHO Institute, 2016.

Exhibit 1 *Map of the United States*

Source: http://www.drodd.com/html7/50-states-map.html

Exhibit 2 *Average Physician Salaries and Physician-to-Population Ratios in the US by Medical Specialty*

Specialty	Average Salary (2016; USD)	Number of Americans per Physician (2013)
Orthopedics	443,000	16,317
Cardiology	410,000	14,365
Dermatology	381,000	27,821
Gastroenterology	380,000	23,200
Radiology	375,000	11,466
Urology	367,000	32,345
Anesthesiology	360,000	7,756
Plastic surgery	355,000	45,539
Oncology	329,000	22,951
General surgery	322,000	12,551
Emergency medicine	322,000	8,489
Ophthalmology	309,000	17,259
Critical care	306,000	35,794
Pulmonary medicine	281,000	55,209
Ob/Gyn	277,000	7,743
Nephrology	273,000	33,652
Pathology	266,000	23,058
Neurology	241,000	24,029
Rheumatology	234,000	59,012
Psychiatry	226,000	8,476
Internal medicine	222,000	2,847
Allergy	222,000	70,188
HIV/ID	215,000	39,755
Family medicine	207,000	2,902
Endocrinology	206,000	48,493
Pediatrics	204,000	1,622

Note: Salaries reflect annual compensation for patient care, including salary, bonus, and profit-sharing contributions (earnings after taxes and deductible business expenses, but before income tax).

Source: Medscape Physician Compensation Report 2016; Association of American Medical Colleges, 2014 Physician Specialty Data Book.

Exhibit 3 *Primary Care Health Professional Shortage Areas (HPSAs) in the US by State, September 2016*

Location	Total Primary Care HSPA Designations	Percent of Need Met	Practitioners Needed to Remove HSPA Designation
United States	6,397	~57%	8,404
Alabama	84	74.34%	152
Alaska	82	34.94%	22
Arizona	160	52.09%	417
Arkansas	82	62.76%	55
California	573	61.17%	802
Colorado	119	50.88%	153
Connecticut	39	12.50%	121
Delaware	9	93.84%	4
District of Columbia	15	50.40%	43
Florida	256	40.55%	1,014
Georgia	207	54.36%	334
Hawaii	24	61.58%	7
Idaho	98	61.95%	57
Illinois	229	59.86%	439
Indiana	117	74.30%	144
Iowa	122	63.47%	77
Kansas	159	65.24%	68
Kentucky	144	68.69%	96
Louisiana	124	77.82%	143
Maine	68	46.29%	16
Maryland	50	54.89%	169
Massachusetts	69	65.34%	58
Michigan	326	65.49%	222
Minnesota	119	52.68%	63
Mississippi	109	59.21%	228
Missouri	216	30.16%	357
Montana	111	53.18%	38
Nebraska	109	41.79%	5
Nevada	75	51.57%	81
New Hampshire	30	54.90%	13
New Jersey	101	40.90%	164
New Mexico	179	43.46%	608
New York	28	48.47%	12
North Carolina	141	53.29%	212
North Dakota	77	36.66%	30
Ohio	138	68.16%	144
Oklahoma	179	60.03%	160
Oregon	113	55.92%	136

Pennsylvania	159	63.70%	88
Rhode Island	15	32.75%	37
South Carolina	92	68.96%	156
South Dakota	87	44.29%	31
Tennessee	119	71.95%	116
Texas	425	66.43%	572
Utah	57	66.83%	59
Vermont	31	43.86%	1
Virginia	105	66.83%	131
Washington	155	45.42%	231
West Virginia	107	69.65%	30
Wisconsin	125	70.11%	77
Wyoming	39	69.76%	11

Note: The US government uses Health Professional Shortage Area (HPSA) designations to identify areas and population groups within the US that are experiencing a shortage of health professionals. According to federal regulations, an area must have a population-to-provider ratio of a certain threshold in order to be considered as having a shortage of providers. For primary medical care, the population to provider ratio must be at least 3,500 to 1 (3,000 to 1 if there are unusually high needs in the community).

Source: Kaiser Family Foundation, 2016, available at: http://kff.org/other/state-indicator/primary-care-health-professional-shortage-areas-hpsas/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D.

Exhibit 4 *Examples of Incentive Programs to Reduce Health Care Provider Shortages in Rural Areas*

Federal Programs:
Area Health Education Centers (AHECs) Program: Supports partnerships between community organizations and schools of medicine and nursing to recruit and train students for health careers and place them in community-based primary care clinics; facilitates continuing education for health professionals in rural and underserved areas. **Scope/Impact:** Provided more than 50 grants in 2016
National Health Service Corps (NHSC): Offers scholarship (tuition, fees, living expenses) and loan-repayment programs for physicians and primary care providers who commit to practicing in underserved rural and urban areas. Following graduation, scholarship recipients spend between two and four years at a community-based clinic in a health professional shortage area (HPSA). The loan-repayment program places fully trained PCPs in HPSAs for two years in exchange for up to USD 60,000 in loan repayment, or for up to USD 170,000 if they stay for five years. **Scope/Impact:** 180 recipients in 2016; a 2012 study found that 82% of NHSC clinicians continued to practice in underserved communities for up to one year after service completion, and 55% of NHSC clinicians continued practicing in underserved areas 10 years after service completion
Improving Rural Health Care Initiative: Funds residency programs that place residents in a rural setting for at least one year; administers a rural health workforce grant program that supports medical students and residents working in rural areas. **Scope/Impact:** 39 students were placed at 49 rural centers in 2013
Title VII of the Public Health Service Act: Provides funding for leaders in primary care, faculty development programs, innovative curricula development, and several residency programs that train physicians for rural or inner-city service. **Scope/Impact:** Data not available
Indian Health Service (IHS) Scholarship Program: Provides health professional training scholarships to students of American Indian or Alaskan Native background in exchange for a minimum two-year service commitment within an IHS program in the students' chosen health field. **Scope/Impact:** 1,200 applicants annually (average), from which the program selects ~150 awardees; as of 2016, approximately 7,000 students had received scholarships, with many pursuing careers within HIS or their tribal communities
Medicare HPSA Bonus Payment: Provides a 10% bonus payment (paid quarterly, based on the amount paid for services) to PCPs and psychiatrists when they furnish Medicare-covered services to beneficiaries in a HPSA. **Scope/Impact:** Data not available
Exchange Visitor Program: Waives the two-year foreign residency requirement for foreign physicians with J-1 visas in exchange for three years of work in areas with primary care and/or mental health professional shortages. **Scope/Impact:** Data not available

Conrad State 30 Program: Allows each state 30 visa waivers for foreign physicians who commit to serving in a HPSA. **Scope/Impact:** 300+ physicians are recommended for visa waivers in rural communities each year
State Programs:
State Loan Repayment Program (SLRP): Requires physicians to serve in a public or nonprofit health care delivery setting for at least two years in order to qualify for loan repayment aid. **Scope/Impact:** Varies by state
NHSC Student/Resident Experiences and Rotations in Community Health (SEARCH): Offered by roughly half of US states, allows health professional trainees to complete a clinical rotation in an underserved community. **Scope/Impact:** Data not available
Centers for Medicare and Medicaid Services (CMS): Provides funding for medical residency programs, including family medicine residencies that require residents to spend part of their training in rural underserved areas. **Scope/Impact:** Data not available
Individual State Rural Physician Scholarship Programs: Certain states operate special programs to provide financial support and faculty/physician mentorship to students interested in practicing in rural areas. **Scope/Impact:** Varies by state

Source: Compiled by case writers using the following sources: AMA Journal of Ethics, "Federal and State Initiatives to Recruit Physicians to Rural Areas;" AMA Journal of Ethics, "Closing the Gap: Finding and Encouraging Physicians Who Will Care for the Underserved?"; National Conference of State Legislators, "Closing the Gaps in the Rural Primary Care Workforce"; Commonwealth Fund, "States in Action Archive"; Health Resources and Services Administration, "Health Professional Shortage Areas & Medically Underserved Areas/Populations"; US Department of Health and Human Services, "Testimony on Improving Federal Health Care in Rural America: Developing the Workforce and Building Partnerships."

Exhibit 5 *Results of Project ECHO Provider Surveys, 2006 and 2007*

Annual Survey of Clinicians Participating in ECHO HCV Clinic, 2006	
N=17 Rating Scale from 1 to 5 1=Not at all to 5=To a Large Degree	Mean score (1–5)
ECHO has diminished my professional isolation.	4.3
My participation in ECHO has enhanced my professional satisfaction.	4.8
Collaboration among agencies in ECHO is a benefit to my clinic.	4.9
ECHO has expanded access to HCV treatment for patients in our community.	4.9
In general, access to specialist expertise and consultation is a major area of need for me and my clinic.	4.9
Access to HCV specialist expertise and consultation is a major area of need for me and my clinic.	4.9

Community Clinician Assessment of Self-Efficacy* in HCV Patient Care (ECHO Annual Survey, 2006 and 2007)		
N=25	Before Participation, Mean	After 1 Year of Participation, Mean
Ability to identify patients who should be screened for HCV	4.2	6.4
Ability to identify suitable candidates for treatment for HCV	2.8	5.6
Ability to assess severity of liver disease in patients with HCV	3.2	5.5
Ability to treat patients with HCV and manage side effects	2.0	5.2
Ability to educate clinic staff about patients with HCV	2.8	5.8
Ability to educate and motivate patients with HCV	3.0	5.7
Ability to assess and manage psychiatric comorbidities in patients with HCV	2.6	5.1
Ability to assess and manage substance abuse comorbidities in patients with HCV	2.6	4.7
Ability to serve as a consultant within my clinic and in locality for HCV questions/issues	2.4	5.6
Overall competence (average of nine items above)	2.8±	5.5±

*Provider self-efficacy: Twenty-five clinicians participating in the ECHO HCV clinics related their knowledge, skills, or competence in HCV prior to and after approximately 1 year of participation. Providers rated themselves, both retrospectively and currently, on a seven-point scale (1 = None or no skill at all; 2 = Vague knowledge, skills or competence; 3 = Slight knowledge, skills or competence; 4 = Average among my peers; 5 = Competent; 6 = Very competent; 7 = Expert, teach others).

Note: See original source (citation below) for standard deviation values, p values, and effect sizes.

Source: Arora et al. Expanding access to hepatitis C virus treatment—Extension for Community Healthcare Outcomes (ECHO) Project: Disruptive innovation in specialty care. *Hepatology*. 2010:52(3): 1124-1133. doi:10.1002/hep.23802.

Exhibit 6 *Suggested Anatomy of a TeleECHO Clinic, May 2016*

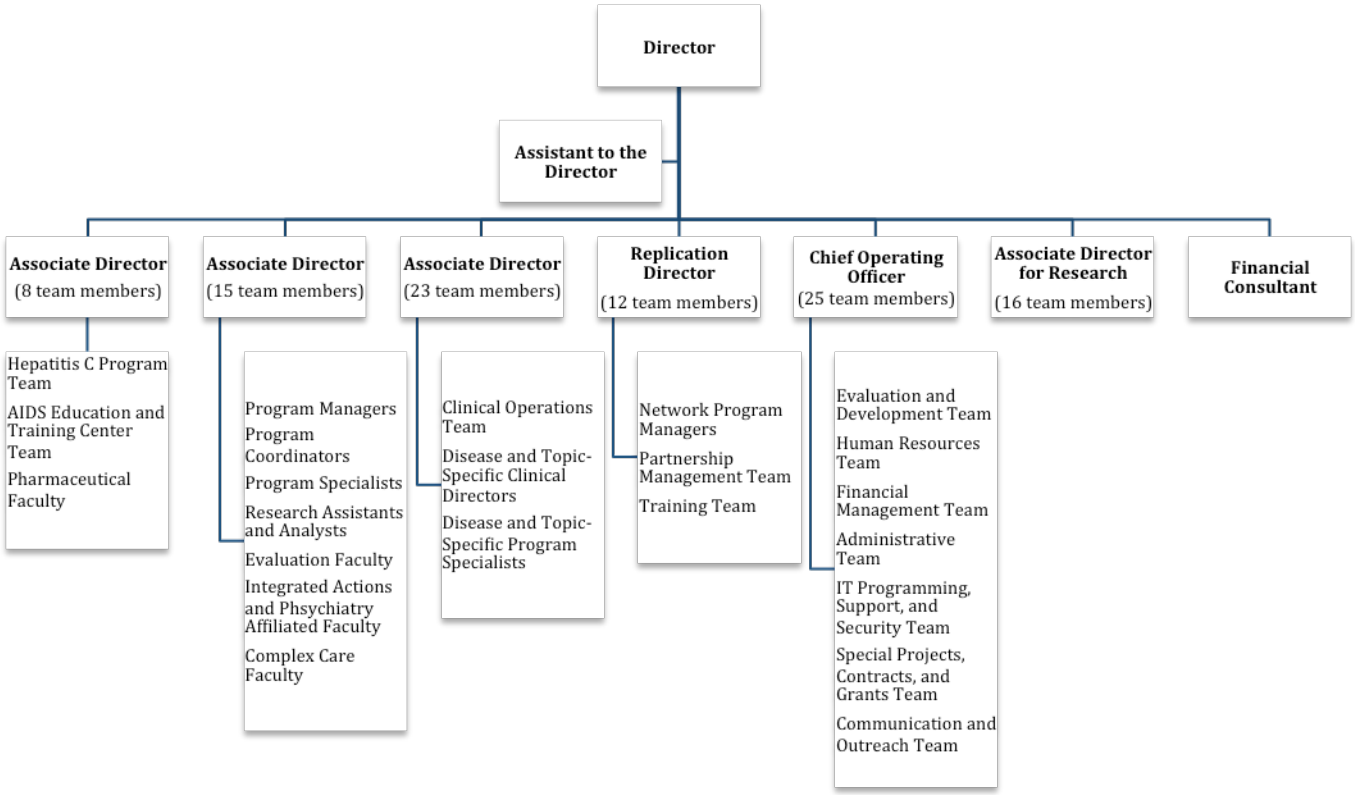
1. Brief Planning Huddle
2. Introductions
    a. Video participants
    b. Telephone participants
    c. Hub and in-person participants
3. Announcements
    a. Updates
    b. Audience questions and concerns
4. Brief Didactic (30 minutes or less)
5. Patient Case Presentation
    a. Hub facilitator introduces the presenter (Example: "Dr. Jones, you have a case today. Please present your case."
    b. Spoke presenter presents the case
    c. Facilitator invites other team members at spoke to comment/elaborate on the case
    d. Hub facilitator summarizes presentation
    e. Hub facilitator ensures with presenter the summary is accurate (Example: "Dr. Jones, did I summarize this case correctly?")
6. Hub/ECHO asks audience for questions
    a. No recommendations for diagnosis or treatment at this point
    b. Video participants
    c. Telephone participants
    d. Hub/ECHO Core Group
    e. Facilitator draws out comment from participants who are not medical providers
7. Hub/ECHO asks audience for recommendations and impressions
    a. Diagnosis or further workup
    b. Non-pharmacological recommendations
    c. Pharmacological recommendations
    d. Interventional recommendations
    e. Facilitator draws out comment from participants who are not medical providers
8. Hub/ECHO summarizes recommendations and consensus on diagnosis and treatment plan
    a. Asks presenter if his or her questions have been adequately addressed
    b. Invites presenter to represent in the future and sets a tentative date for a follow-up presentation
9. Close and Debrief
    a. All facilitators on the "hub" team should review and comment on the flow and facilitation of the session, with an eye to self-reflection and issues that may not have been obvious in the moment

Helpful Recommendations

1. The speaker should always introduce him or herself.
2. Help direct the case discussion if presenter is unable to focus or long-winded.
3. Look for "teachable moments" to impart important knowledge to participants.
4. Always treat participants with respect and address critical comments appropriately.

Source: ECHO Institute.

Exhibit 7 *ECHO Institute Organizational Chart, July 2016*



Note: Team member totals include 11 vacant positions as of July 2016.

Exhibit 8 *Budget Template for New TeleECHO Clinics in the US, Spring 2016*

PART 1: Budget Template for Building a TeleECHO Clinic in the United States (in USD)				
US Costs	**Year 1**	**Year 2**	**Year 3**	**Notes**
Personnel for Running TeleECHO Clinic				This core team can support between 1–4 teleECHO clinics.
IT User Support (0.5–1.0)	32,500	32,500	32,500	
Coordinator/ Administrator (1.0)	17,800	17,800	17,800	
Medical Director (Nurse or MD) (0.5)	32,000	32,000	32,000	
Hub Expert Clinical Team				See cost assumptions below for % effort recommended.
Disease Expert	50,000	50,000	50,000	
Pharmacist	20,000	20,000	20,000	
Behavioral Health Specialist	20,000	20,000	20,000	
Evaluation Expert/ Researcher	14,800	14,800	14,800	See cost assumptions below for % effort recommended.
Subtotal	***187,100***	***187,100***	***187,100***	
Replication Training at ECHO Institute, UNM (Albuquerque)				
Travel for 5 team members (avg. air fare USD 350 round-trip)	3,250	0	0	
Hotel for 5 team members × 4 nights (USD 100/night)	2,500	0	0	
Training costs for ECHO institute (see TA line item below)	Free	Free	Free	
Food during ECHO training (breakfast, lunch, most dinners)	Free	Free	Free	
Subtotal	***5,750***	***0***	***0***	
Equipment-Teleconferencing				Additional needs depend on size of teleECHO clinic and room.
Teleconferencing hardware for hub (select from PART 3 medium or small conf. setup)	3,800	0	0	
High-speed internet (Hub)	400	0	0	
Teleconferencing software (Zoom)	Free	Free		Zoom is free through June 2016 for partners. Partners who use other software need to include the cost.
ECHO Clinic Management Software (iECHO)	Free	Free	Free	This service is free to ECHO partners.
ECHO Patient Presentation & Outcomes Tracking Software	Free	Free	Free	This service is called iHealth and is free to ECHO partners.
Subtotal	***4,200***	***0***	***0***	

Recruitment by Hub of Spoke Participants				
Recruitment trips: Food, gas, hotel for 10 trips to 10 clinics in selected geographic area	5,000	0	0	
Continuing Medical Education (CME) Credit**	2,000	2,000	2,000	This may be called something else outside of the US.
Subtotal	***7,000***	***2,000***	***2,000***	
Evaluation				
Using iECHO/ iHealth Tools	Free	Free	Free	Fee to ECHO partners.
Survey Monkey or other online survey tools	350	350	350	
Other (see menu below)	Variable	Variable	Variable	
Subtotal	***350***	***350***	***350***	
TOTAL	**188,400**	**173,450**	**173,450**	
Other possible costs to consider				
1/2 day training mini conference for spoke leaders at hub	Variable			
Curriculum development per disease/focus area	Variable	Variable	Variable	
3G internet service for Spokes (400*#Spokes)	Variable	Variable	Variable	
Technical Assistance for TA from ECHO Institute @UNM				
Small ECHO projects (training 0–5 people, 1 hub, limited TA)	Free	Free	Free	
Medium-sized projects (training up to 30 people over two years)	200,000 over two years: 75% year 1, 25% year 2			Small ECHO projects and partners in developing countries receive free TA. However, we request that larger projects and partners writing grants help support ECHO's training costs by writing the ECHO Institute into the grant for project planning and start-up costs. The amount typically depends on the anticipated size of the project and ability to pay.
Large-system or statewide projects (see **Technical Assistant Menu Document**)	Variable	Variable	Variable	Contact Replication Team for details
PART 2: Cost Assumptions				
Staff	**Annual Salary**	**FTE**		
Nurse Manager salary	65,000	0.5		
IT user support	35,600	0.5		

Administrative Coordinator	32,000	1		
Medical Director/Specialist (endocrine, GI, etc.)	250,000	0.2		
Pharmacist	100,000	0.2		
Behavioral Psychologist/Psychiatrist	100,000	0.2		
Evaluation Expert	74,000	0.2		
Project ECHO Training @UNM ECHO Institute, Albuquerque				
Number of people sent to train at ECHO Institute UNM	5 people			This assumes that a team of 5 people will be coming for 4 nights. This also assumes travel within the US. International travel will obviously incur more costs.
Average cost for round-trip flight	650			
Average cost hotel per night	125			
Average number of nights stay for training	4 nights			
PART 3: Determining Teleconferencing Equipment Needs				
Teleconferencing equipment	**Unit Cost**	**Quantity**	**Total**	
For medium sized conference room (20–40 people)				
Logitech cc3000e plus (camera, mic, speaker)	1,000	1	1,000	
TV stands (recommended 2 TVs, @$200 each)	200	2	400	
Computer (to run camera and zoom)	1,000	1	1,000	
2 55" televisions	700	2	1,400	
TOTAL			**3,800**	
3G broadband facilities charge for hub	400	1	400	

** CME cost number updated to $2,000/year based on ECHO Institute staff input.
Source: ECHO Institute, September 2016.

Exhibit 9 *Project ECHO Funding (USD) by Source and Fiscal Year (FY), 2004–2015*

	FY 04–FY 12	FY 13	FY 14	FY 15
Federal	6,490,027	3,376,046	3,703,101	4,099,558
State and MCO*	14,350,154	1,208,121	1,602,892	3,757,552
Foundation	5,479,736	9,836,986	6,581,292	13,551,190
Total	26,319,917	14,421,153	11,887,285	21,408,300

*Managed Care Organization
Source: ECHO Institute, 2016.

Exhibit 10 *Project ECHO Implementing Partners, Spring 2016*

Group	Location	Topic
US-Based Projects		
Albertina Kerr	Portland, OR	Developmental Disabilities
Baylor St. Luke's Medical Center	Houston, TX	Advanced Liver Disease, Cardiology, HBV, HCV, Infectious Disease
Behavior Change Institute	Oakland, CA	Autism
Billings Clinic	Billings, MT	Behavioral Health for Corrections, Addictions/Psychiatry ECHO for Corrections
Cherokee Nation at Hastings Hospital	Tahlequah, OK	HCV
Cincinnati Children's Hospital Medical Center	Cincinnati, OH	STORM (Sickle Cell Treatment & Outcomes Research in the Midwest)
Community Health Center, Inc.	Middletown, CT	Chronic Pain, Coaches International—supporting Quality Improvement and Specialists, HIV, HCV, Opioid Addiction – Buprenorphine
Georgia AAP Chapter	Atlanta, GA	Pediatric Growth and Endocrinology
Harvard/Beth Israel Deaconess Medical Center	Boston, MA	Gerontology – ECHO Age
Johns Hopkins University School of Medicine	Baltimore, MD	Sickle Cell Disease
Kansas University Medical Center / Children's Mercy Hospital	Kansas City, MO and Kansas City, KS	Children and Youth with Epilepsy
LA Net	Los Angeles, CA	Geriatrics
Maimonides	New York, NY	Pediatric Epilepsy
Migrant Clinicians Network	Texas	Managing Ambulatory Health Care
Missouri Telehealth Network/University of Missouri	Columbia, MO	Autism, Asthma, Chronic Pain, Endocrinology
New Mexico Office of the Medical Investigator	Albuquerque, NM	Medicolegal Death Investigation
Ochsner Health System	New Orleans, MA	Liver Disease Management
Oregon Health and Science University/Health Share of Oregon	Portland, OR	Psychiatric Medication Management
Parents Reaching Out	Albuquerque, NM	Parent Advocacy for Children with Disabilities

ResolutionCare	Eureka, CA	Palliative Care
St. Joseph's Hospital & Medical Center	Phoenix, AZ	HCV
Trinitas Regional Medical Center	Elizabeth, NJ	IDD population (intellectual and developmental disabilities)
University of California Davis	Davis, CA	Pain Management
University of California at San Francisco	San Francisco, CA	HCV
University of Chicago	Chicago, IL	Children and Youth with Epilepsy, HCV, Hypertension, Risk Based Approach to Women's Health, Pediatric ADHD, Pediatric Obesity and Comorbidities , Geriatric/Palliative, Pilot on Free & Charitable Projects
University of Cincinnati College of Medicine	Cincinnati, OH	Chronic Pain
University of Colorado School of Public Health	Denver, CO	Children and Youth with Epilepsy
University of Hawaii	HI	Endocrinology, Behavioral Health
University of New Mexico	Albuquerque, NM	Chronic Pain and Headache Management, Community Health Worker Training Initiatives, Complex Care, Endocrinology, Epilepsy Across a Lifespan, HCV, HCV Corrections, HIV, IHS HCV, IHS HIV, Integrated Addictions and Psychiatry, NM Department of Health TB, NM Peer Education Project, Nurse Practitioner/Certified Nurse-Midwife, Rheumatology, Women's Health and Genomics, Improving Clinical Flow Pilot
University of New Mexico: Center for Development and Disability	Albuquerque, NM	India Autism ECHO Program
University of New Mexico: Envision NM	Albuquerque, NM	Childhood Overweight Medical Management, Pediatric Nutrition, Pediatric Asthma/Pulmonary
University of Nevada	Reno, NV	Antibiotic Stewardship, Autism, Diabetes/General Endocrinology, Gastroenterology, Pain Management, Primary Care and Behavioral Health, Mental Health, Rheumatology, Special Series, Sports Medicine
University of Rochester Medical Center	Rochester, NY	Geriatric Health in Long Term Care, Palliative Care in Primary Care, Palliative Care in Long Term Care, Geriatric Mental Health in Primary Care, General Psychology, Eating Disorder

University of Utah	Salt Lake City, UT	Behavioral Health, Chronic Pain & Headache Management, HCV, High Risk Obstetrics, Liver Care, Immune Disorders of the Gut, Internal Medicine/ Pediatrics Residency, Interprofessional Education (Medicine, Nursing, Pharmacy, Social Work, Wellness/Nutrition), UU Community Clinics Headache, UU Community Clinics HCV, Pregnancy Care, Post-partum Hemorrhage, Identifying & Managing Patients at Risk for Cancer, Nursing Education, Burn and Soft Tissue Injury
University of Washington	Seattle, WA	Chronic Pain, HCV, HIV, HIV Public Health, Multiple Sclerosis, NW Heart Failure Collaborative
University of Wyoming / Wyoming Institute for Disabilities	Laramie, WY	Assistive Technologies in Education
UT MD Anderson Cancer Center	Houston, TX	Cervical Cancer Prevention, Management of Cervical and Breast Cancer (in Mozambique and in Zambia), Tobacco Cessation in Mental Health Facilities
Visiting Nurses Association Health Group	Red Bank, NJ	Care Transition
Western NY Collaborative/AKA Excellus Blue Cross BS	Rochester, NY	Behavioral Health
West Virginia University/Cabin Creek Health Systems	West Virginia	HCV
Veteran's Health Administration	12 hubs around the U.S.	Behavioral/Mental Health, Cardiology, Chronic Pain, Dermatology, Endocrinology/Diabetes, Epilepsy, Hepatitis C, HIV/AIDS, Infectious Disease, Liver Care, Neurology, Nephrology, Nursing, Otolaryngology, Pulmonary/Asthma, Sleep Medicine, Spinal Cord Injury/Plastics, Surgery, Transgender, Transplant, Urology, Vascular Medicine, Women's Health
Department of Defense		
Army		
Eastern Region Medical Command	Landstuhl RMC – Germany	Chronic Pain
Northern Region Medical Command at Womack AMC	Fort Bragg, NC	Chronic Pain

Pacific Region Medical Command at Tripler AMC	Honolulu, HI	Chronic Pain
Southern Region Medical Command at Dwight D Eisenhower AMC	Fort Gordon, GA	Chronic Pain
Air Force		
USAF Diabetes Center of Excellence	San Antonio, TX	Diabetes
Navy		
NAVMED East	Navy Medical Center Portsmouth	Chronic Pain
NAVMED West	Navy Medical Center Dan Diego	Chronic Pain
Internationally Based Projects		
Adizes Institute	Mexico	Business Consulting
Ambience Public School	Delhi, India	Teacher Mentorship
Amor-Pro TB, Puentes de Esperanza, Centers for Disease Control and Prevention, and Cure TB/San Diego County TB Control Branch	Mexico, California, Texas, New Mexico	US-MX Border TB Initiative
CAMH Centre for Addiction and Mental Health	Toronto, Canada	Behavioral Health
Health and Social Care Board Northern Ireland	Belfast, Northern Island	Dermatology for GP Trainees, Carers, Diabetes, Ophthalmology
Hospital de Clínicas de Porto Alegre	Porto Alegre, Brazil	HCV
Hospital Eva Peron	Buenos Aires, Argentina	Dermatology, Psoriasis
Hospital Italiano	Buenos Aires, Argentina	HCV
Institute for Cytology and Preventive Oncology (ICPO) and Karuna Trust	Karnataka, India	Cancer Screening and Prevention for Accredited Social Health Activists (ASHA) workers and Auxiliary Nurse Midwives (ANMs)
Institute of Liver and Biliary Sciences	New Delhi, India	Liver Diseases
Jamaican Ministry of Health	Mandeville, Jamaica	Chronic Disease Prevention and Management
Karuna Trust	Bangalore, India	Maternal and Child Health Clinic
Lair Centre	Vancouver, Canada	HCV

Namibia Ministry of Health and Social Services	Windhoek, Namibia	HIV
National AIDS Control Organization (NACO) at B.J. Medical College	Ahmedabad, India	HIV
National AIDS Control Organization (NACO) at Maulana Azad Medical College	New Delhi, India	HIV
National Institute for Mental Health and	Bangalore, India	Mental Health and Drug Addiction, Mental Health during Pregnancy and Postpartum,
Northern Ireland Hospice	Belfast, Northern Ireland	Community Hospice Nurse Specialist Clinic
Ontario Pain ECHO	Queens University & University of Toronto Ontario, Canada	Chronic Pain
Pontifícia Universidade Católica do Rio Grande do Sul	Porto Alegre, Brazil	Dementia and Depression
Reaching You	Egypt	HCV, Cardiology, Pulmonary
Royal College of Surgeons Ireland	Ireland	Rheumatology
St. James' Hospital	Dublin, Ireland	HCV
St. Michaels' Hospital	Toronto, Canada	Substance Use Disorders
Universidad Austral	Buenos Aires, Argentina	HCV
Universidad de la República	Montevideo, Uruguay	Anemia, Autism, Cervical Cancer, Heart Failure, HCV, Palliative Care
Vietnam National Lung Hospital	Hanoi, Vietnam	Tuberculosis (TB)
West/North West Hospitals Group	Galway, Ireland	Diabetes

Exhibit 11 *Examples of Nonmedical Project ECHO Programs*

University of Wyoming Project ECHO, Wyoming Institute for Disabilities

The Wyoming Institute for Disabilities (WIND) saw how academic medical centers were using Project ECHO to improve medical outcomes and wanted to try using it to improve education outcomes. Wyoming had slightly higher developmental disability rates among school-age children than the national average but few special education and child behavior specialists. WIND became a Project ECHO hub in 2013 and a superhub in 2015. As of August 2016, WIND operated seven Project ECHO programs:

- **Assistive technology:** Provides training and best practices to support educators and service providers at 103 spoke sites nationwide in considering, implementing, and evaluating the use of assistive technologies (any device that helps a person with a disability complete an everyday task) to improve outcomes for students.
- **Educational leadership:** Provides a mentoring platform for school district superintendents and leaders to improve community, district, and student outcomes. Didactic topics include teacher and staff evaluations, school board elections, grading policy development, curriculum mapping, and program evaluation.
- **Autism:** Provides professional development, program planning resources, and ongoing support for educators and other professionals working with students with autism. Didactic topics include diagnostic guidelines and tools, current research review, behavior management and intervention, data collection tips, and visual supports and structure in the classroom.
- **Geriatrics:** Provides support for providers who care for geriatric patients, including physicians, nurse practitioners, physician assistants, medical assistants, pharmacists, social workers, case managers, mental health staff, and occupational and physical therapists.
- **Behavior supports:** Provides professional development, behavior support planning resources, and ongoing support for educators and other professionals working with students exhibiting behavioral challenges in schools.
- **Secondary transition:** Provides ongoing support for educators and state and local agencies working with students transitioning from K–12 education systems into postsecondary education, employment, and community living settings.
- **Waiver services:** Provides support for service providers and other professionals working with Medicaid populations who have advanced or unique needs, including children with mental health issues, people with developmental disabilities, and people in long-term care.

Source: University of Wyoming, http://www.uwyo.edu/wind/echo/.

Crisis Intervention Team TeleECHO Clinic, University of New Mexico

In collaboration with the Albuquerque Police Department and with a three-year grant from the US Department of Justice and the Bureau of Justice Assistance, UNM began piloting a Crisis Intervention Team (CIT) teleECHO clinic in January 2016. Its goal was to improve law enforcement interactions with people living with mental illness in New Mexico—especially in rural areas—by reducing the use of police force, fostering connections between law enforcement and the mental health system, and building trust and collaboration between law enforcement and local communities. Led by the addictions psychiatrist who

codirected the ECHO Institute's chronic pain and headache management clinics, the CIT ECHO clinic convened law enforcement professionals weekly to discuss strategies for intervening in situations involving people with mental illness. In May 2016, there were 11 participating law enforcement agencies. Participants called in from their offices in Albuquerque and across the state and included police officers, detectives, probation officers, emergency responders, and Albuquerque Police Department officers who specialized in supporting people in crisis (e.g., chronically homeless, mentally ill). They shared advice and resources based on their experience, and the psychiatrist provided recommendations based on his clinical expertise and experience. Case discussions focused on using the approach and tactics of the national Crisis Intervention Team policing movement (in which several participants were certified), including identifying mental illness, using de-escalation skills, diverting individuals from jail to hospitals, connecting individuals with mental health services, and improving connections with the community at large. The CIT teleECHO clinic was not bound by HIPAA regulations because law enforcement officials, as opposed to health care providers, presented the cases. Participants used individuals' names with the goal of improving inter-agency collaboration across law enforcement jurisdictions.

Source: ECHO Institute, MetaECHO Conference 2016 Poster Session.

Improving Clinical Flow Pilot Program, University of New Mexico

Launched in August 2015 by the ECHO Institute and the Institute for Healthcare Improvement (IHI), with funding from the GE Foundation, the Improving Clinical Flow TeleECHO Clinic aimed to help administrators and clinic staff in identify inefficiencies and waster and to design and implement quality improvement projects to address them. Fifteen FQHCs participated in two-hour weekly sessions facilitated by ECHO Institute and IHI staff. Together, the clinics served approximately 130,000 patients across the US. Seven faculty experts from across the US joined each week to provide input and recommendations and to deliver the didactic presentation (e.g., task-shifting). Their combined expertise included clinic administration, management, business strategy, data collection and analysis, change management, and organizational psychology. Participating clinics tracked data for 12 process and outcomes indicators and uploaded it monthly to a shared database.

Case presentations began with background on the clinic and an overview of how it was structured. The clinic team then stated the question or problem they needed help with and described what they had tried thus far to resolve it themselves (e.g., "We recently lost four physicians, and here is how we have coped so far …"). They also outlined what data they had related to the issue and any Plan-Do-Study-Act (PDSA) cycles they were implementing to test possible solutions. The teleECHO clinic format was as follows:

- Participant introductions
- Case 1: Case presentation, clarifying questions from FQHC participants and expert faculty, recommendations from participants and faculty, discussion summary
- 30-minute didactic presentation
- Case 2: Case presentation, clarifying questions from FQHC participants and expert faculty, recommendations from participants and faculty, discussion summary
- Office hours (remaining 10–15 minutes)

Source: ECHO Institute.

Exhibit 12 *Selection of Peer-Reviewed Publications on the Impact of Project ECHO*

2007–2011

- Academic health center management of chronic diseases through knowledge networks: Project ECHO. *Academic Medicine*. Arora et al.
- Project ECHO: Linking university specialists with rural and prison-based clinicians to improve care for people with chronic hepatitis C in New Mexico. *Public Health Reports*. Arora et al.
- Expanding access to hepatitis C virus treatment – Extension for Community Healthcare Outcomes (ECHO) project: disruptive innovation in specialty care. *Hepatology*. Arora et al.
- Outcomes of treatment for hepatitis C virus infection by primary care providers. *The New England Journal of Medicine*. Arora et al.
- Partnering urban academic medical centers and rural primary care clinicians to provide complex chronic disease care. *Health Affairs*. Arora et al.

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