



Florida Pharmacy Association

Regulatory and Law Conference

9/7/2019 - 9/8/2019

Charting the Tele-future of Health Care

Christopher B. Sullivan, PhD



Introduction to Speaker

Your speaker for this session is:

Christopher B. Sullivan, PhD

Statement of Disclosure:

“I have no vested interest or affiliation with any corporate organization offering financial support of grant money for this continuing education program, or any affiliation with an organization whose philosophy could potentially bias my presentation.”



Learning Objectives for This Session

- Describe the major technologies that enable the delivery of telehealth and telepharmacy services.
- Summarize telehealth projects that apply telecommunication-based technologies to solve specific health care problems.
- Explain how telehealth and telepharmacy are driven by health care needs of people in remote and rural areas.
- Compare legislative, economic and business factors that favor or hinder the development of telehealth networks.
- Conclude that telecommunication technologies will continue their integration with how doctors offer clinical services.

Baseline Question 1

Are Telehealth and Telepharmacy the same?

A. Yes

B. No

C. Sometimes

D. Maybe

E. Don't Know

Baseline Question 2

Are all Telehealth technologies new and innovative??

A. Yes

B. No

C. Sometimes

D. Maybe

E. Don't Know

Baseline Question 3

Where are most Telehealth programs initiated today?

- A. Federal Government
- B. State Governments
- C. Telehealth Associations
- D. Private Enterprise
- E. Don't Know



Definition of Telecommunication and Telehealth

- Telecommunications
- Telehealth versus Telemedicine
- Definitions of Telemedicine
- Medicare and Medicaid Criteria for Telehealth Services
- Legislative Definition of Telehealth
- Telepharmacy

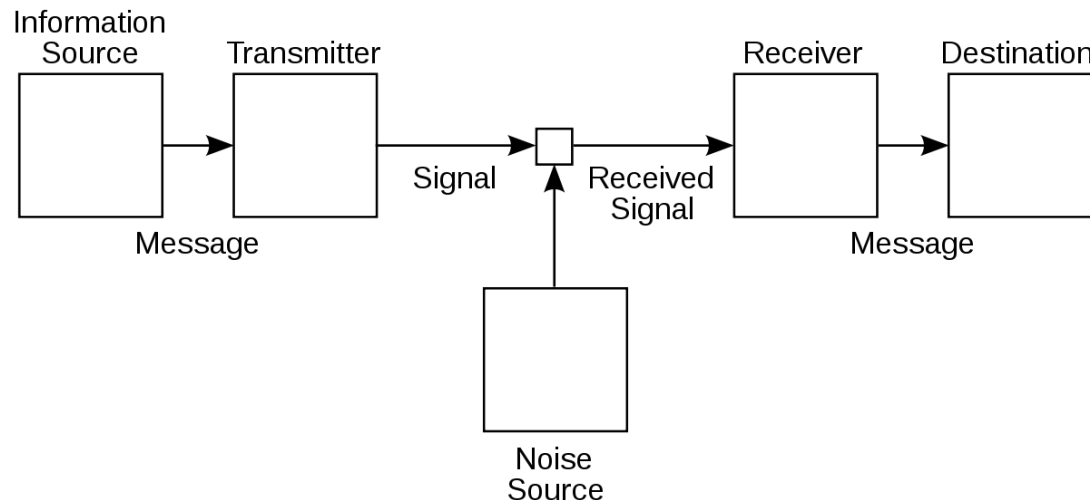
Definition of Telecommunication

Tele-

- Distant - at a distance or over a distance.

Communication

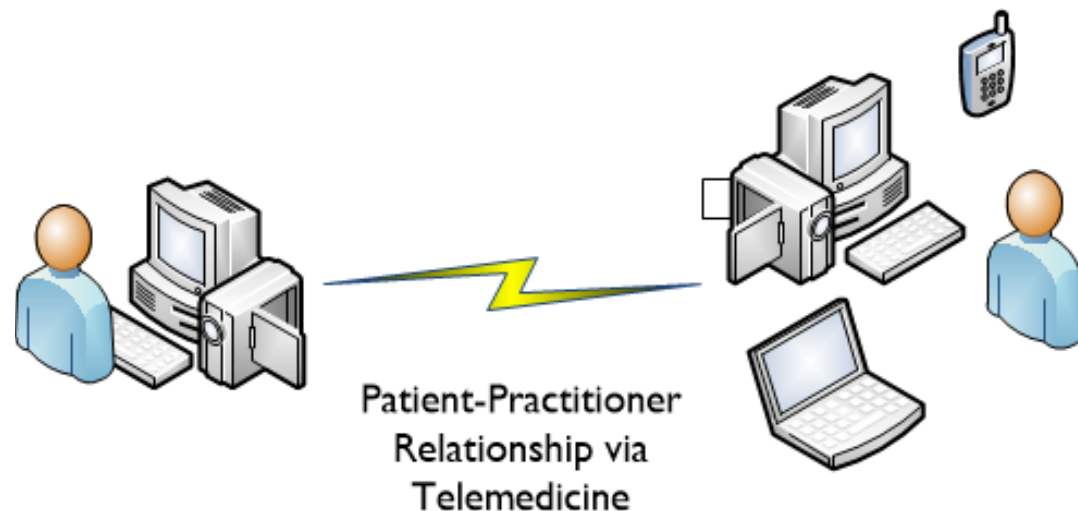
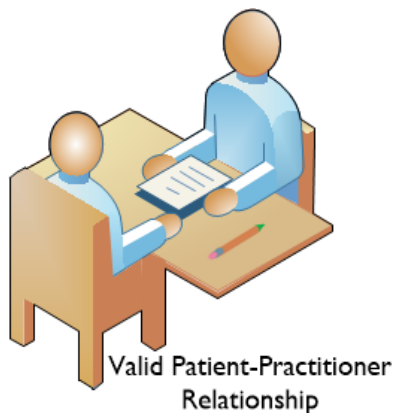
- The process by which a person, group or organization (the sender) transmits some type of information (the message) to another person, group or organization (the receiver).



Shannon-Weaver
Communication Model

Transition from Face-to-Face to Telehealth

The social expectations of doctor-to-patient communication shift with telehealth to include an electronic interface in a treatment setting

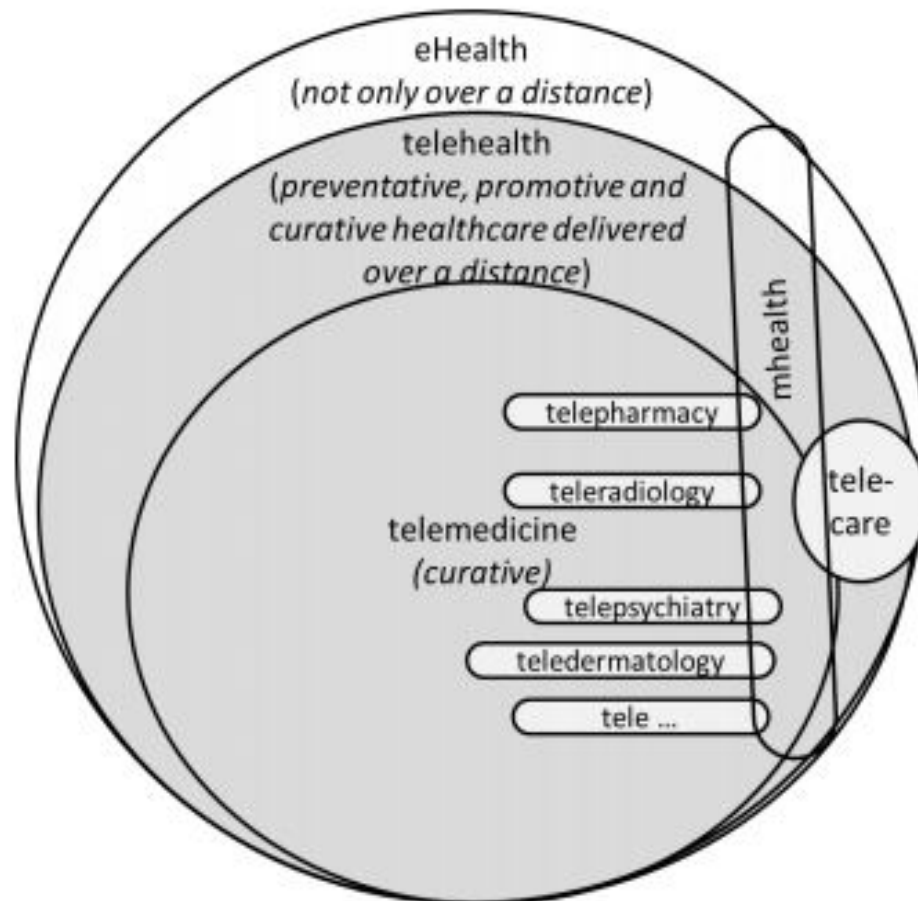


“Telemedicine involves... secure videoconferencing or store and forward technology to provide or support healthcare delivery by replicating a traditional, face-to-face encounter.”
(FSMB, 2014)

Telehealth Coverage

The World Health Organization:

- Telemedicine and telehealth are synonymous.

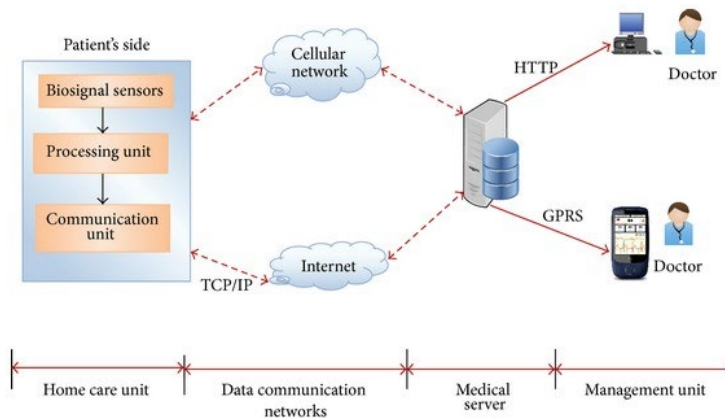


A Review of Telehealth Service Implementation Frameworks
Liezl van Dyk, 2014

Definitions of Telemedicine

The American Telemedicine Association

- Telemedicine supports patient care through “medical information exchanged from one site to another via electronic communications.”
- Telehealth covers a “broader definition of remote healthcare that does not always involve clinical services.”



The Health Resources and Services Administration

- ...the use of electronic information and telecommunications technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration.

Criteria for Telehealth Services



- “Telehealth services” include health care services physicians normally conduct in-person “when they are instead furnished using interactive, real-time telecommunication technology.”
- Health care delivery by a physician located at a different site from the recipient for the purposes of evaluation, diagnosis, or treatment
- Using interactive audio and video telecommunications equipment providing two-way, real time, interactive communication



Definitions of Telemedicine



Florida Board of Medicine, 2016

~~“Telemedicine” is the practice of medicine “where patient care, treatment, or services are provided through the use of medical information exchanged from one site to another via electronic communications.”~~

Florida Board of Medicine, 1 July 2019

- Florida passed Telehealth, Chapter 2019-137, Laws of Florida.... The Department is currently working on the implementation of the Telehealth law...



Legislative Definition of Telehealth

Florida Legislature, 2019 Telehealth Bill

- "Telehealth" means the use of synchronous or asynchronous telecommunications technology by a telehealth provider to provide health care services, including:
 - Assessment, diagnosis, consultation, treatment, and monitoring of a patient;
 - Transfer of medical data;
 - Patient and professional health-related education;
 - Public health services;
 - Health administration.
- The term does not include audio-only telephone calls, e-mail messages, or facsimile transmissions.

Definition of Telepharmacy



Florida Board of Pharmacy

Florida's Board of Pharmacy does not address Telepharmacy

National Association of Boards of Pharmacy

“Practice of Telepharmacy” means the provision of Pharmacist Care Services by registered Pharmacies and Pharmacists located within US jurisdictions through the use of telecommunications or other technologies to patients or their agents at distances that are located within US jurisdictions.

- The Practice of Telepharmacy does not restrict the pharmacist to interactive, two-way telecommunications.



Telehealth Services

Basic telehealth services include:

Synchronous or live videoconferencing refers to an interactive consultation between a physician and patient or consulting physician.

Asynchronous or store and forward refers to the transmission of diagnostic images for review by a physician at a later time.

Remote Patient Monitoring refers to the use of clinical devices to collect and send data to a home health agency or physician

Mobile Health refers to the use of wireless devices over the Internet to obtain health information and support.

Telepharmacy refers to a pharmacist using telecommunications technology to oversee aspects of pharmacy operations.

Staff of Global Partnership for Telehealth



An important fact to remember is that all telehealth operations rely on people – for technical, administrative and management support.

Examples of Telehealth Projects

- **Synchronous** – School-based Telehealth



Synchronous Example - School Telehealth

Health and Education:
Crossing the Chasm
with Telehealth

The Impact of Collaborative School-Based
Telehealth Models

Loren Nix, Director of School-Based Telehealth, Global Partnership for Telehealth
10th Annual Global Partnership for Telehealth Conference, March 2019

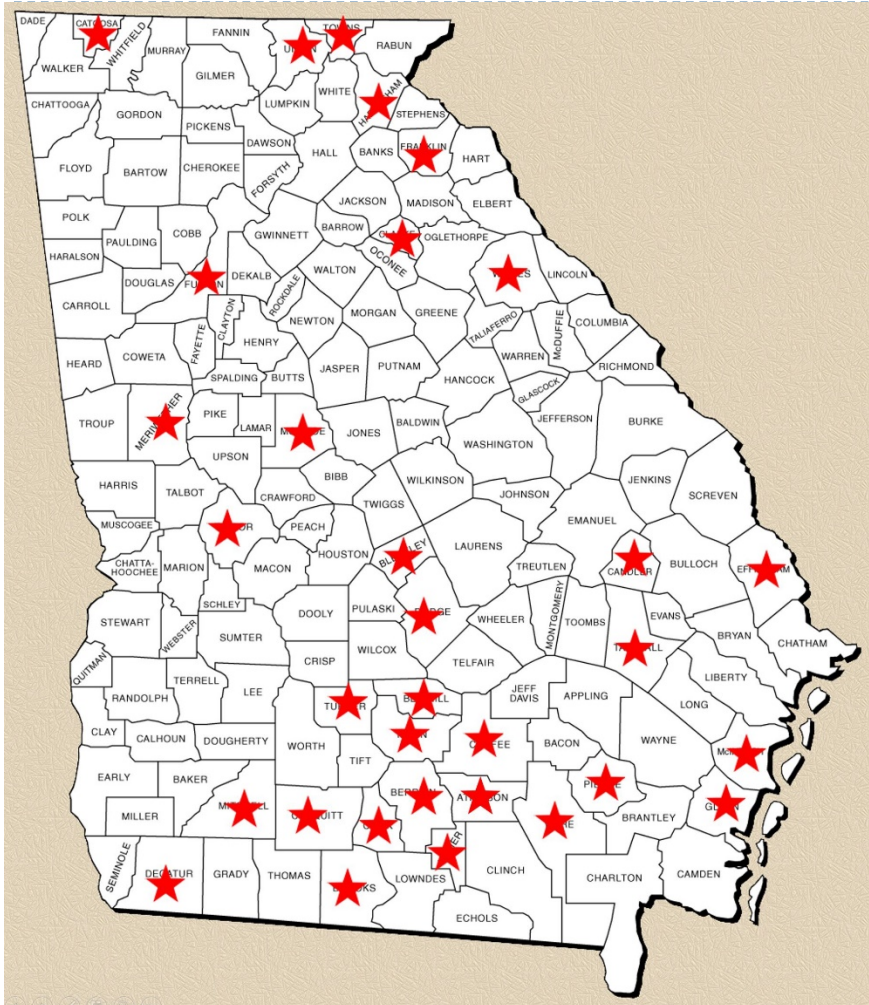
School-based Telehealth Equipment



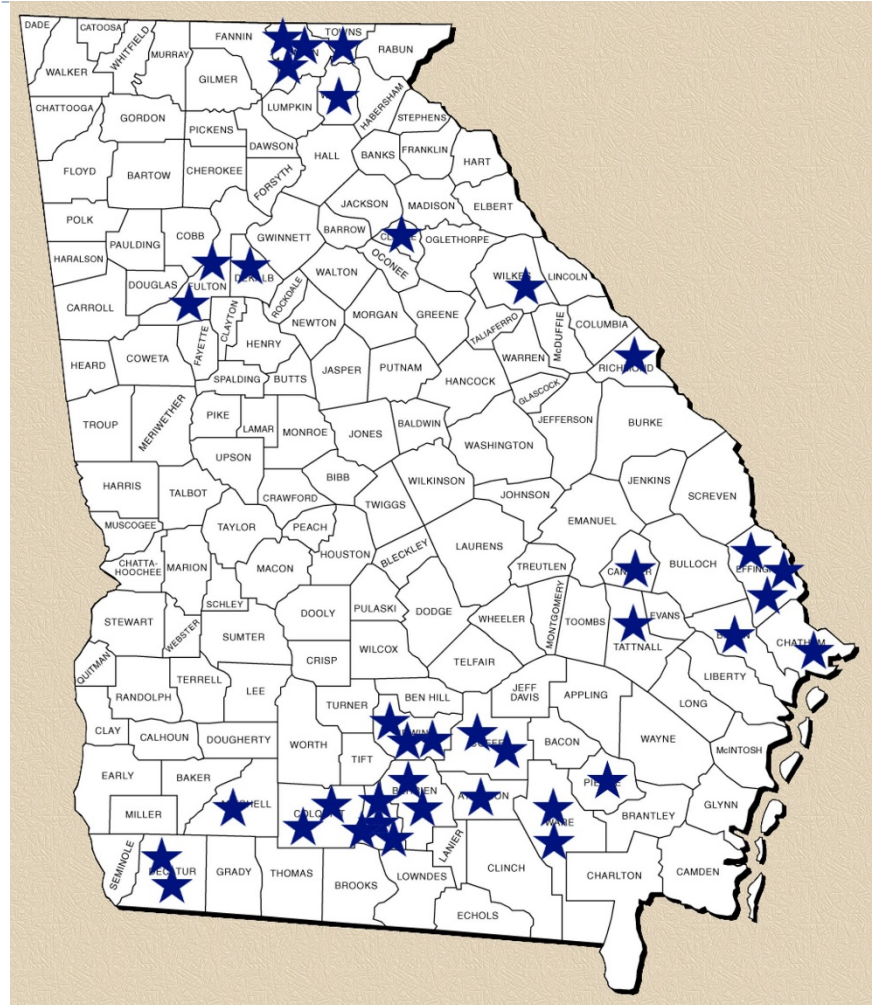
Clinical Application of Telehealth Technology



Georgia Telehealth Schools and Clinics



Georgia Telehealth Schools



Telehealth Health Care Providers

Findings from School-based Telehealth

Recent findings of 2 school districts implementing school-based telehealth:

Of the 121 appointments done:

- 81.8% appointments were established within 15 minutes
- 12 minutes was the average appointment time
- Without telemedicine availability, 58.6% would have taken their child to a doctor's office or walk-in clinic, 4.1% would have gone to the ER, and 14% would have gotten no care at all
- 61.1% of parents indicated that without telemedicine, they would have had to drive more than 10 miles to take their child to the doctor; 12.4% would have had to travel more than 30 miles
- 70.2% of parents reported that telemedicine saved time from work, with 14% indicating they would have missed an entire day of work without the telemedicine visit

Examples of Telehealth Projects

- **Asynchronous** – Teleradiology for Maternal Fetal Monitoring



Asynchronous Example – Maternal Fetal Monitoring



**IMPLEMENTING MATERNAL FETAL
TELEMEDICINE INTO AN URBAN,
OBSTETRIC PRIVATE PRACTICE**

Tanya Mack & Dr. Ann Patterson, PhD

8th Annual Global Partnership for Telehealth Conference, March 2017



Relevance of MFM via Telehealth

WHY IS THIS TOPIC RELEVANT TODAY ?

- **Subspecialty Service Shortages are not going to improve soon (gaps exist in large city hospitals also)**
- **Demonstrate shift from rural to urban use of telemedicine**
- **Telemedicine is moving directly into physician practices**
- **Telemedicine programs are turning the profitability corner and affecting large numbers of patients**

LOWER COSTS

EASY PATIENT ACCESS

NEW REVENUE



Image Quality of Obstetric Teleradiology



We are able to obtain exceptional image quality, including 3D Imaging, from thousands of miles away.

Guess: How big is this baby?
You will be amazed by today's telemedicine technology tools.



Results of MFM Telehealth Program

PROGRAM RESULTS BY THE NUMBERS 1/1/15 THRU 12/31/16 (STILL ACTIVE)

- \$4,852** Per month average, incremental practice revenue
- 2,624** Telemedicine patient encounters completed
- 1,140** Pregnant Women seen by MFM telemedicine
- 60** Days from contract sign to GO LIVE
- 49%** Pts with at least 1 follow up telemedicine visit
- 6%** Pre-delivery hospitalization rate

Examples of Telehealth Projects

- **Remote Patient Monitoring** – Preventing 30-day Readmission



Remote Patient Monitoring Model - TEACH

The Impact of the TEACH (Telehealth After COPD Hospitalization) Program on the 30-day Readmission Rate for Medicare Advantage Patients with COPD

OBJECTIVE

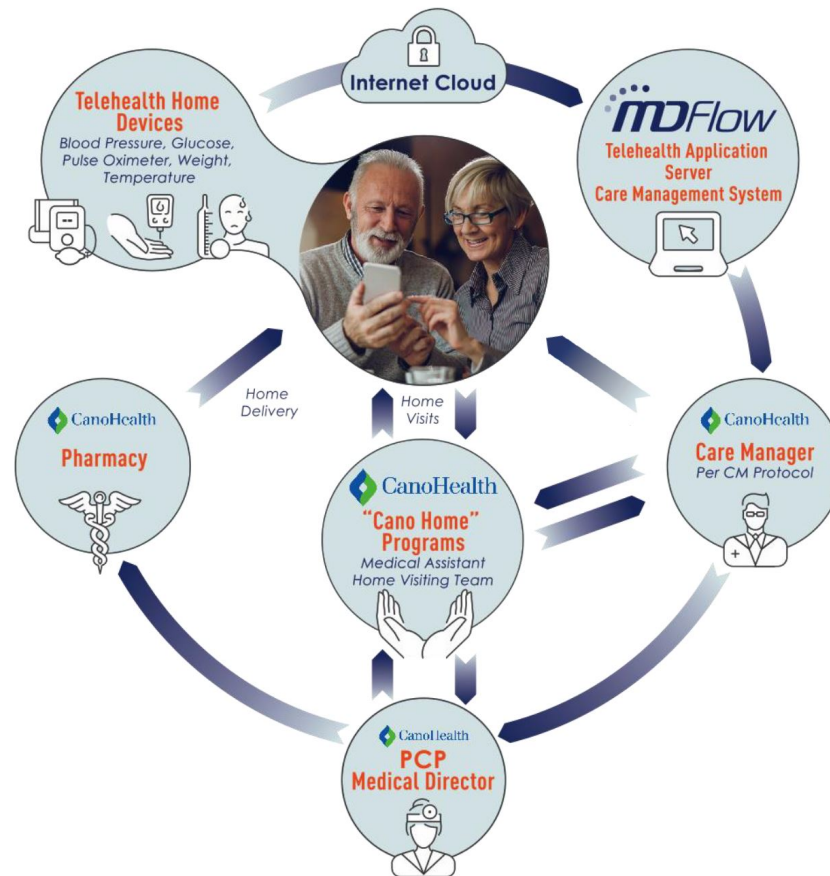
- Evaluate the impact on the 30-day readmission rate of Medicare Advantage (MA) patients with COPD by utilizing a combination of daily Telehealth monitoring by Care Management (CM) team with alternating days of home visits (HV) by medical assistant (MA).
- MA and CM team acted on HV evaluation and Telehealth alerts to assist in timely execution of relevant interventional CM protocols.

Dr. Richard Aguilar, MD & Harold Tong

10th Annual Global Partnership for Telehealth Conference, March 2019

TEACH Telehealth Model

PATIENT CENTRIC TELEHEALTH SOLUTION



Telehealth Monitoring in the TEACH Project

TELEHEALTH DATA Table 2

Patient #	# of Days Enrolled	Total Data Points Expected Per Device	DATA POINTS COLLECTED PER DEVICE				Total Data Points Collected Per Patient	Average Data Points Collected Per Day
			Blood Pressure	Glucose	Pulse Ox	Weight		
1	30	60	14	7	12	14	47	1.6
2	30	60	71	6	46	45	168	5.6
3	30	60	62	6	36	32	136	4.5
4	30	60	56	3	24	169	252	8.4
5	31	60	28	0	11	13	52	1.7
6	30	60	38	0	6	27	71	2.4
7	30	60	44	3	11	28	86	2.9
8	30	60	29	1	11	2	43	1.4
9	10	20	69	2	52	22	145	14.5
10	30	60	41	1	10	22	74	2.5
11	30	60	74	0	6	40	120	4.0
12	30	60	35	1	17	63	116	3.9
13	29	58	29	1	20	13	63	2.2
14	30	60	27	1	9	38	75	2.5
15	29	58	59	2	30	11	102	3.5
16	24	48	90	1	50	77	218	9.1
17	31	60	15	2	15	18	50	1.6
18	25	50	42	2	10	4	58	2.3
19	32	60	28	0	26	6	60	1.9
20	30	60	45	2	11	7	65	2.2
TOTAL		1,134	896	41	413	651	2,001	\bar{x} 3.9/day
% Of Total Expected Data Points			78%	4%	36%	56%	44%	



Results of TEACH Project

RESULTS

- Seventeen patients (85%) completed through day 30 post discharge
- Eight patients (40%) experienced exacerbations with the majority of them occurring in the first week of enrollment. Each was treated with 1-3 different support measures per CM protocols and all exacerbation resolved. Table 1
- None of the 8 patients that experienced exacerbations were re-admitted during the 30-day post discharge period.
- One patient (5%), was readmitted for unstable angina on day #13
- One patient expired at home from sudden death on day #24.
- On average, only 44% of the required testing of Telehealth devices were performed ranging from 4% for glucose to 78% for blood pressure. Table 2

Examples of Telehealth Projects

- **Mobile Health – Telerehabilitation**

Mobile Health Example - Telerehabilitation

Teleneurology and Rehabilitation for Mobility Disorders

Heather Barksdale PT, DPT & Paul Hoffman, MD



Dr. Paul Hoffman, MD & Heather Barksdale, PT, DPT
5th Annual FloridaTelehealth Summit, November 2018

Telerehabilitation Approach

- Subjects are participating in web based home rehabilitation training using the Jintronix software platform and Kinect tracking system.
- Televideo visits are made weekly by physical therapists to review progress and recommended exercises
- Subjects are assigned between 6-10 exercises to perform as part of web based home program with modifications as needed throughout sessions



Telerehabilitation Comparison

Improved access to specialized neuro-rehabilitation guided exercise programs

- **Traditional outpatient PT model:** 2x/week x 8 weeks= 16 guided sessions
- **Telerehab model:** Recommend at least 2x/week- available to patient throughout the week, all times of the day including weekends



Telerehabilitation Travel Savings

Reduction in travel cost and travel time for the patient

- 01: Lake City: 62.7 miles, 65 minutes
- 02: Panama City Beach: 280 miles, 4 hours & 20 minutes
- 03: New Port Richey: 195 miles, 3 hours & 26 minutes
- 04: Savannah: 138 miles, 2 hours & 10 minutes
- 05: Tallahassee: 171 miles, 2 hours & 36 minutes



One round trip visit mileage cost (53.5 cents/mile)				
\$67.09	\$299.60	\$208.65	\$147.66	\$182.97
Mileage cost for 8 visits				
\$536.72	\$1498.00	\$1669.20	\$1181.28	\$914.85



\$5800.00

Telerehabilitation Results

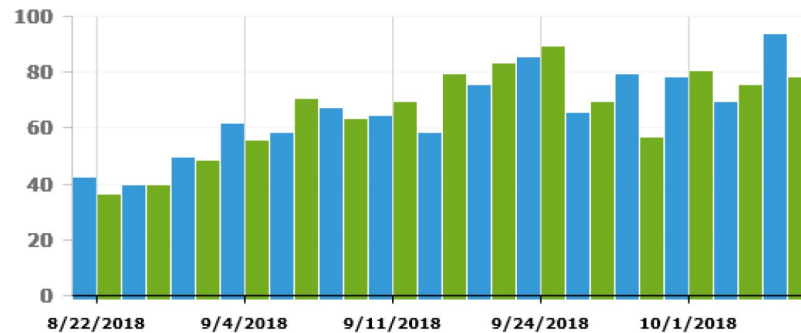
Results so far

Max Trunk Flex. Achieved (Avg): Sitting

Left Avg : Improvement of 51°

Right Avg: Improvement of 42°

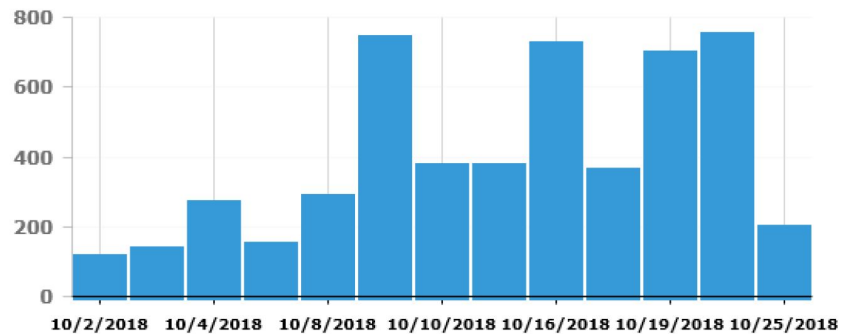
***Sample range of motion chart- subject 1



Distance (feet) ambulated:

Average improvement of 84 feet/day

***Sample distance chart- subject 4



Examples of Telehealth Projects

- **Telepharmacy – North Dakota Telepharmacy Project**

ND Telepharmacy Project – Initial Drivers

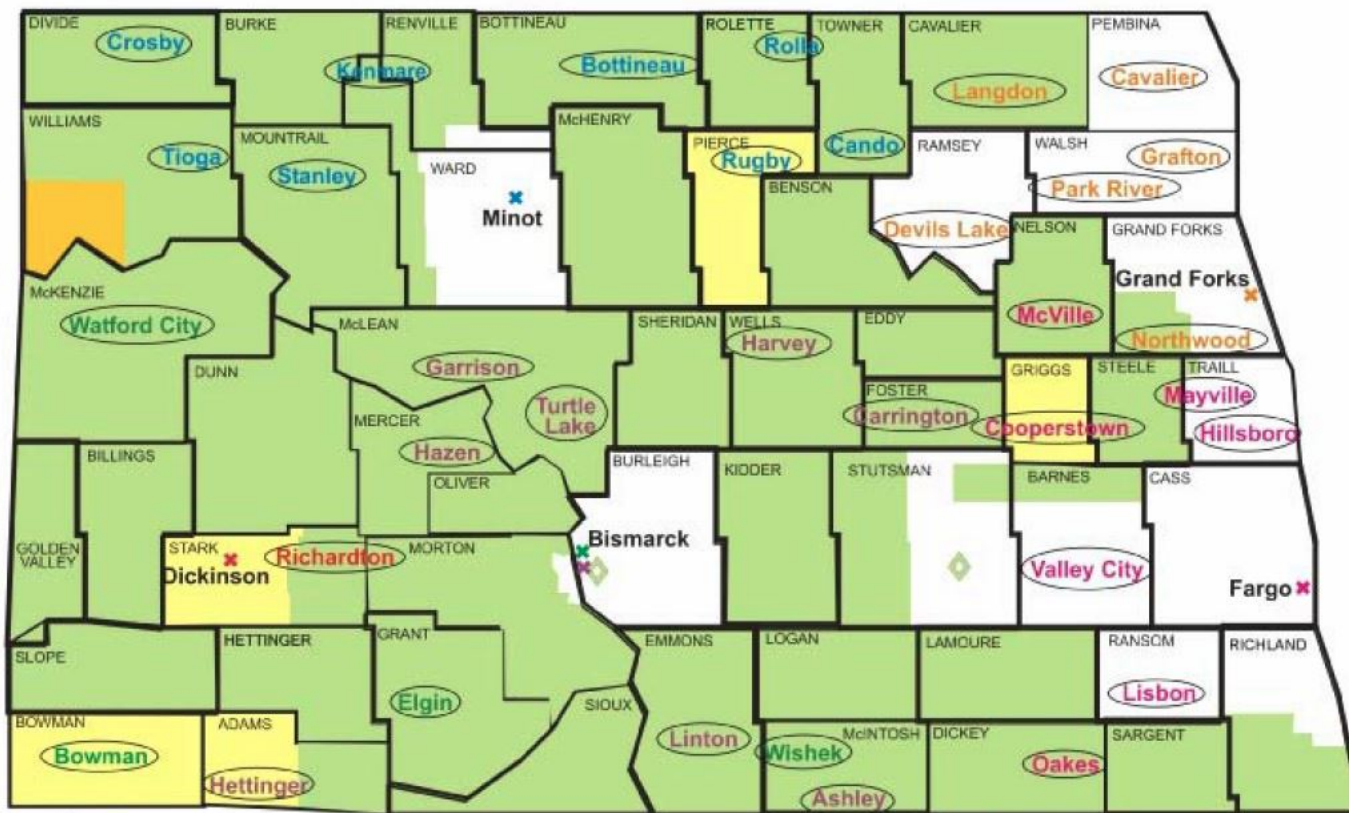
In June 2003 the North Dakota State Board of Pharmacy established rules allowing telepharmacy in North Dakota

- A licensed pharmacist at a central pharmacy supervises a pharmacy technician at a remote telepharmacy site using video conferencing technology.
- The technician prepares the prescription drugs that will be dispensed by the pharmacist.
- The pharmacist communicates face-to-face in real time with the technician or customer through the video conference connection.



ND Telepharmacy Project – Rural Need

Exhibit 2. North Dakota Health Professional Shortage Areas, Critical Access Hospitals, and Network Affiliates



Center for Rural Health
University of North Dakota
School of Medicine & Health Sciences

- Designated Geographic HPSAs
- Designated Low Income HPSA
- Proposed Low Income HPSA
- Designated Facility HPSAs
- Critical Access Hospital
- ✱ Trinity Hospital
- ✱ St. Joseph's Hospital & Health Center
- ✱ Med Center One
- ✱ St. Alexius Medical Center
- ✱ Altru Hospital
- ✱ MeritCare Hospital

5/08



ND Telepharmacy Project - Outcomes

The North Dakota Telepharmacy Project current status:

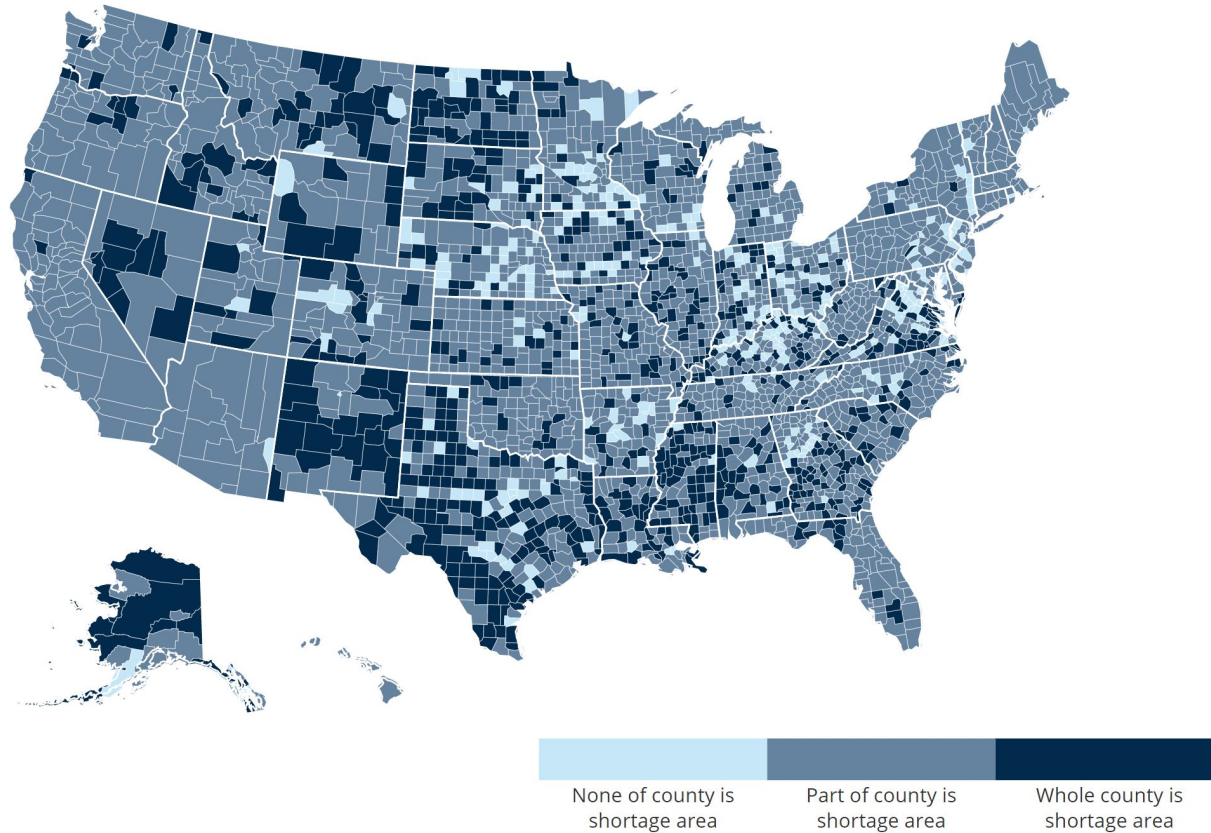
- 81 partner pharmacies involved in the project
- Pharmacies include central, remote, retail and hospital sites
- 40 counties covered in North Dakota and Minnesota
- 80,000 rural citizens affected
- \$26.5 million in economic development
- 80-100 new jobs added
- Overall medication error rate at 1% versus 1.7% nationally
- North Dakota telepharmacy permits have increased with no decline in traditional pharmacy locations

Health Care Needs in Remote and Rural Areas

- Primary care shortages in the USA
- Urban versus rural health care disparities
- Rural hospital closures
- Rural pharmacy closures
- Access to pharmacies in rural Florida
- The health care crisis in Florida

Primary Care Shortages in Rural America

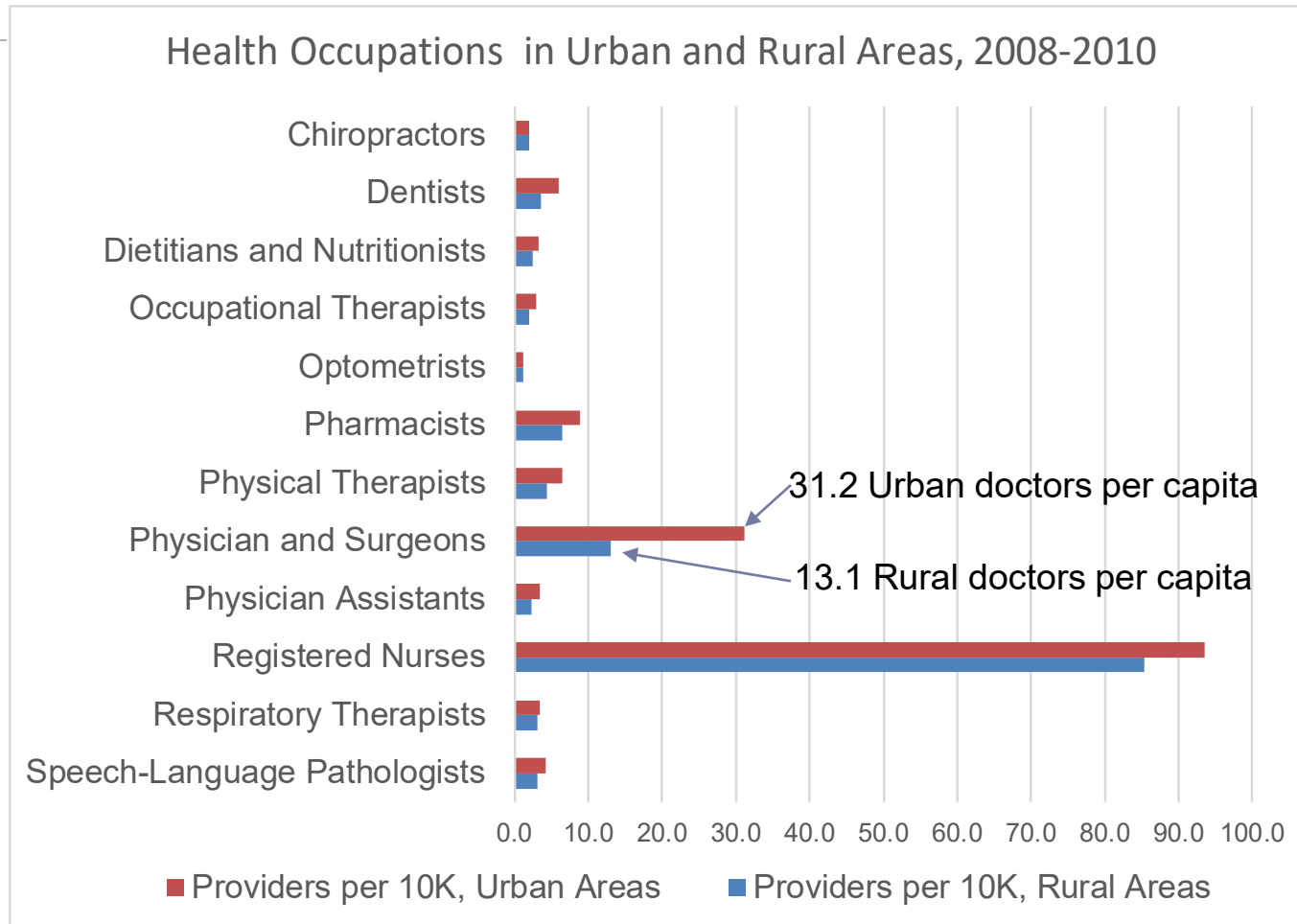
Health Professional Shortage Areas: Primary Care, by County, 2017



Source: data.HRSA.gov, 2017.

Most counties in America suffer from health care shortages, but rural counties are the most hard hit.

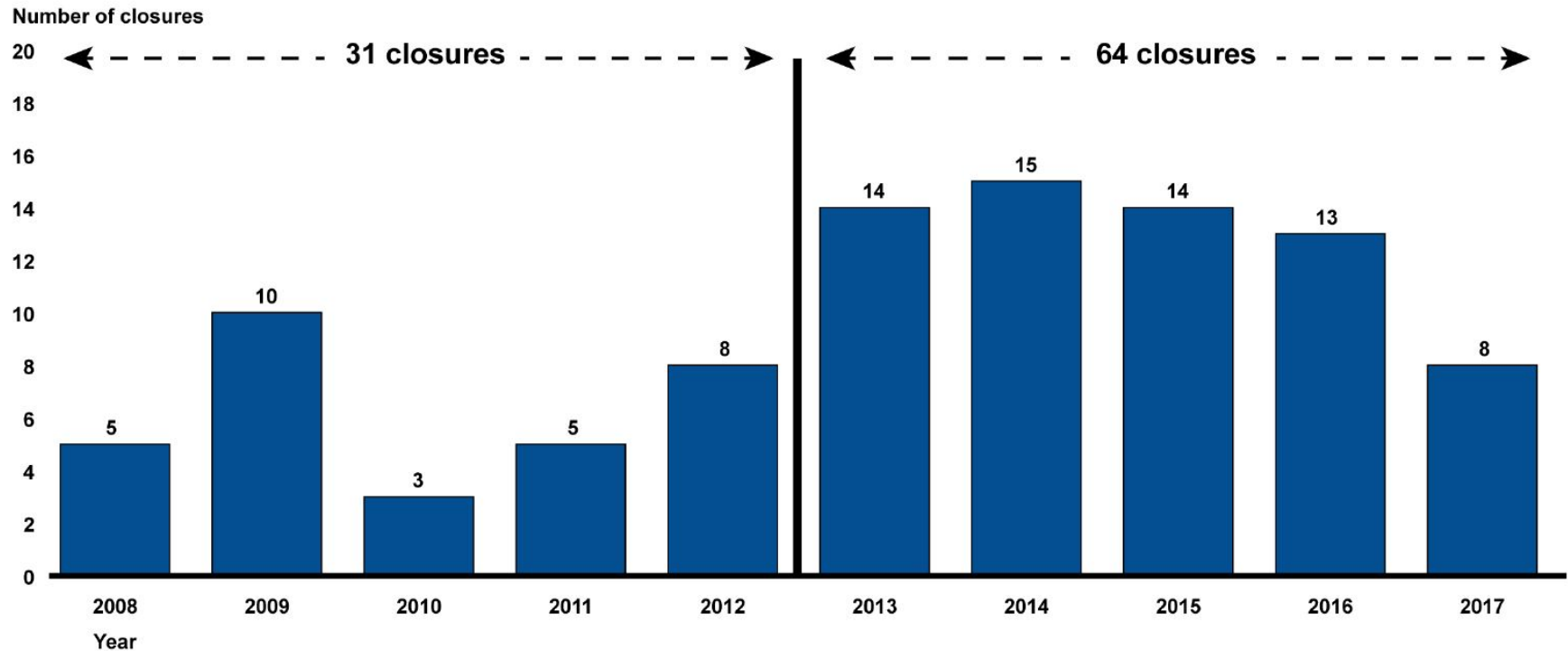
Urban versus Rural Health Care Disparities



There are more than twice as many doctors per capita in urban areas of America compared to rural America.

Rural Hospital Closures 2012-2017

Figure 1: Nationwide Rural Hospital Closures from 2008 through 2012 and from 2013 through 2017

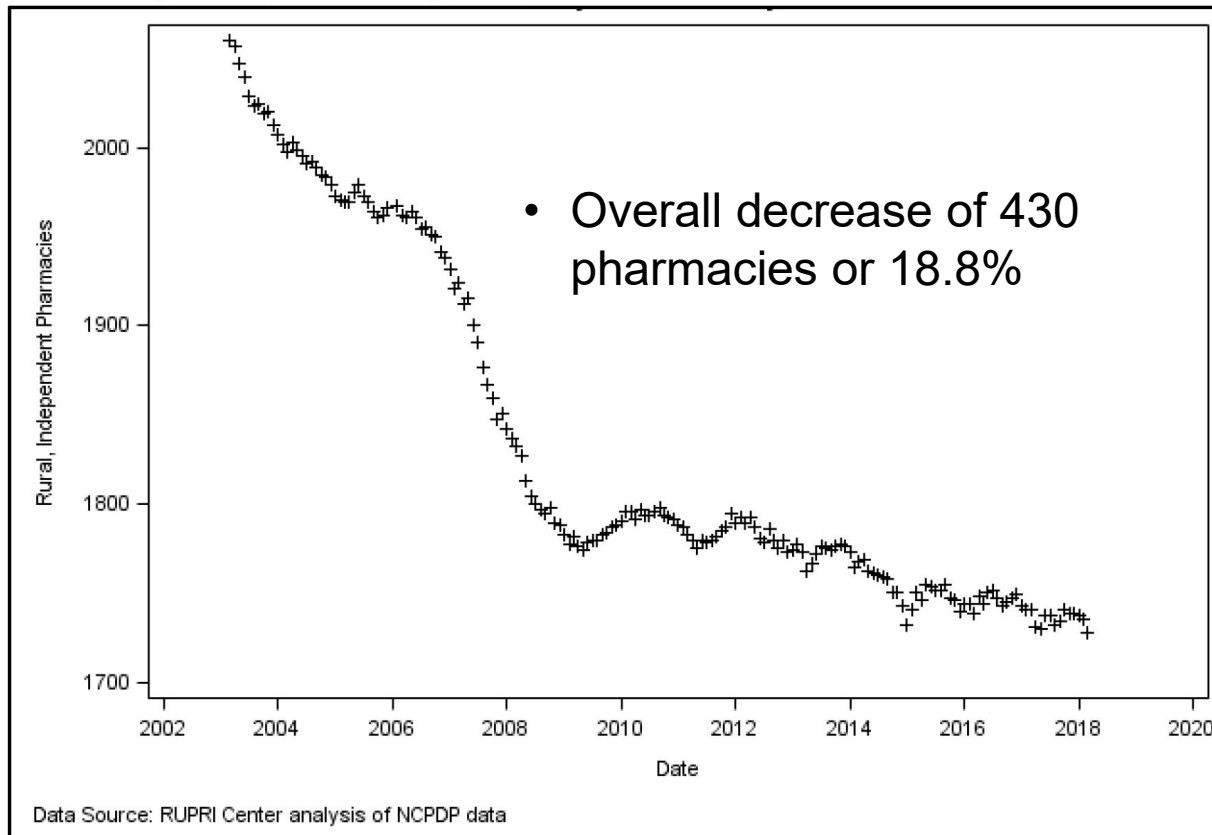


Source: GAO analysis of Department of Health and Human Services-funded data. | GAO-18-634

Between 2012 and 2017, 95 rural hospitals across America ended operations, or reduced the health care services they offer.

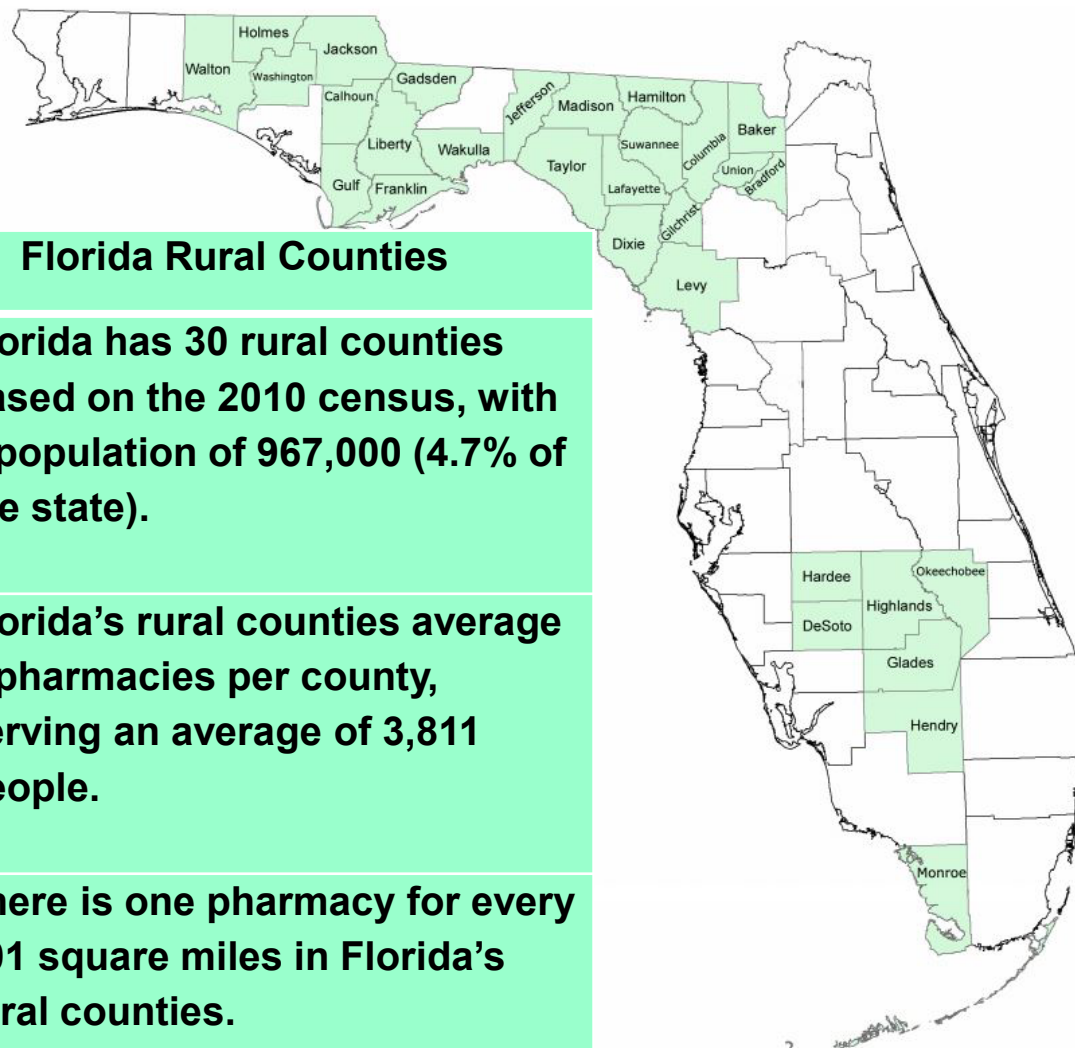
Pharmacy Closures in Rural America, 2003-2018

Figure 2. Monthly Count of Rural Independently Owned Pharmacies That Were the Only Pharmacy in a Community, 2003-2018



Since 2003, 430 independent rural pharmacies have closed - from 2,063 to 1,633. This represents a decrease of 18.8%, leaving many rural towns without a local pharmacy.

Pharmacy Access in Urban and Rural Florida



Florida Urban Counties

- Florida has 37 urban counties with a population of 19,500,000 (95.3% of the state).
- Florida's urban counties average 159 pharmacies per county, serving an average of 4,128 people.
- There is one pharmacy every 13 square miles in Florida's urban counties.

Florida Rural Counties

- Florida has 30 rural counties based on the 2010 census, with a population of 967,000 (4.7% of the state).
- Florida's rural counties average 9 pharmacies per county, serving an average of 3,811 people.
- There is one pharmacy for every 101 square miles in Florida's rural counties.



Crisis of Health Care in Florida

HIMSS

What Got Us Here Won't Get Us There

- In 2017, the United States spent about \$3.5 trillion, or 18 percent of GDP, on health expenditures – more than twice the average among developed countries
- During 2016, combined and state spending for Medicaid totaled about \$21.8 billion in Florida
- Florida ranked #48 for overall health care among 50 states + the District of Columbia. Florida ranked 49th for access, quality and use of health care
- Chronic diseases are among the **leading causes** of morbidity, mortality and disability
- Behavioral health disorders increase the risk of many major causes of death in Florida

HIMSS PUBLIC POLICY

Factors Driving the Implementation of Telehealth Services

- Federal Telehealth Programs
- State Telehealth Programs
- Florida Medicaid Telehealth Provisions
- National Associations Promoting Telehealth
- Examples of Florida Hospitals Promoting Telehealth



HRSA Telehealth Program Areas

HRSA is one of numerous federal government agencies that promote telehealth through grants and telehealth services.

Telehealth Guidance Resources

Telehealth Overview

Telehealth Policy

Technical Assistance Resources

Telehealth Reimbursement and Funding

Telehealth Technologies and Vendors

Telehealth Licensure

Telehealth Research

Federal Telehealth Programs

Telehealth Provider Directory

Telehealth Reports and Policy Briefs

Telehealth Resource Centers

Telehealth Conferences

Telehealth Distribution Lists and Webinars

Topical Resources

Broadband Funding

Disaster Relief

HIPAA

Mobile Health (mHealth)

Remote Patient Monitoring

Telebehavioral Health

Training

Telehealth Training

Bureau of Primary Health Care

HRSA Bureau Specific Resources

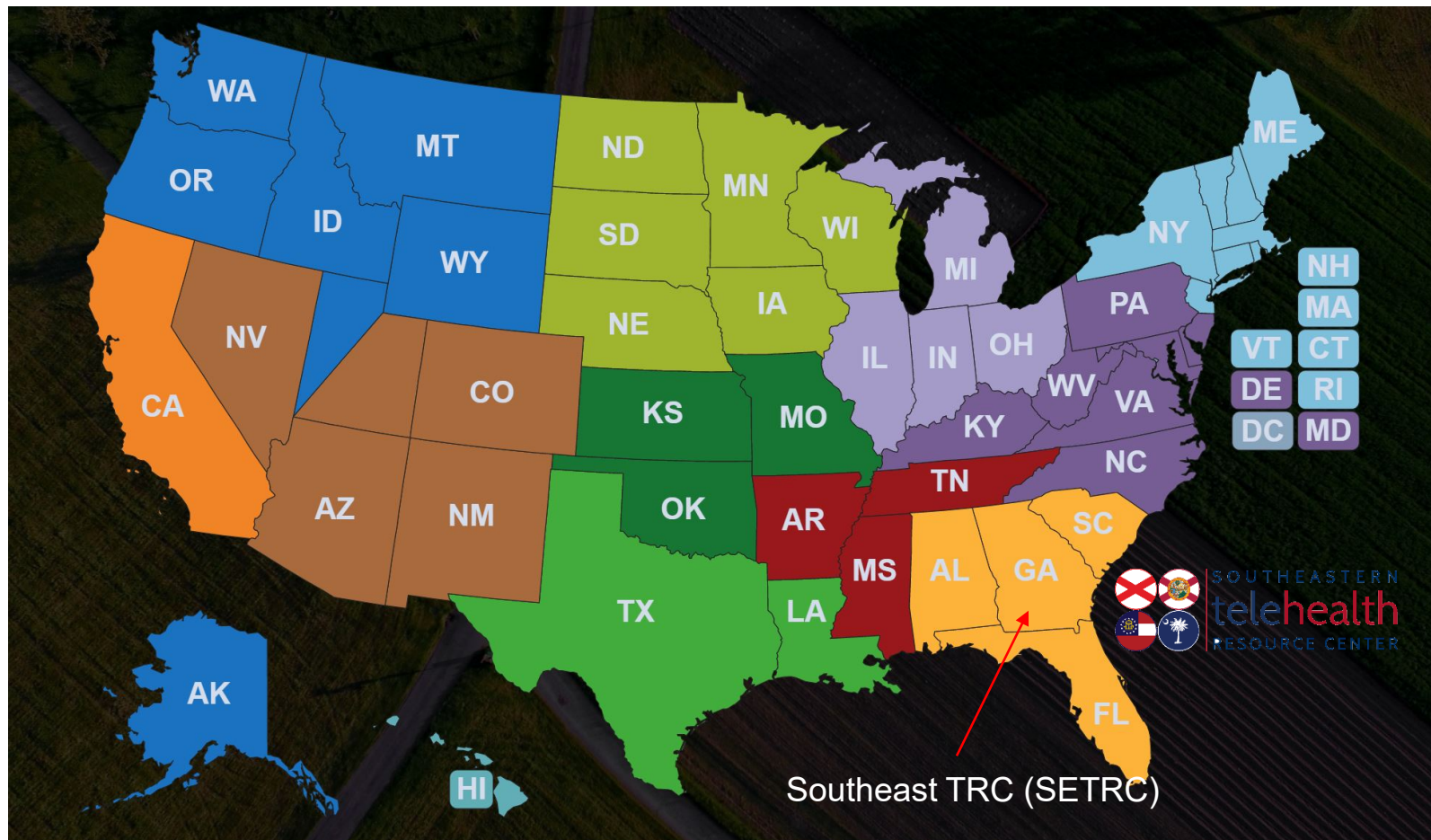
HIV/AIDS Bureau

Maternal Child Health Bureau

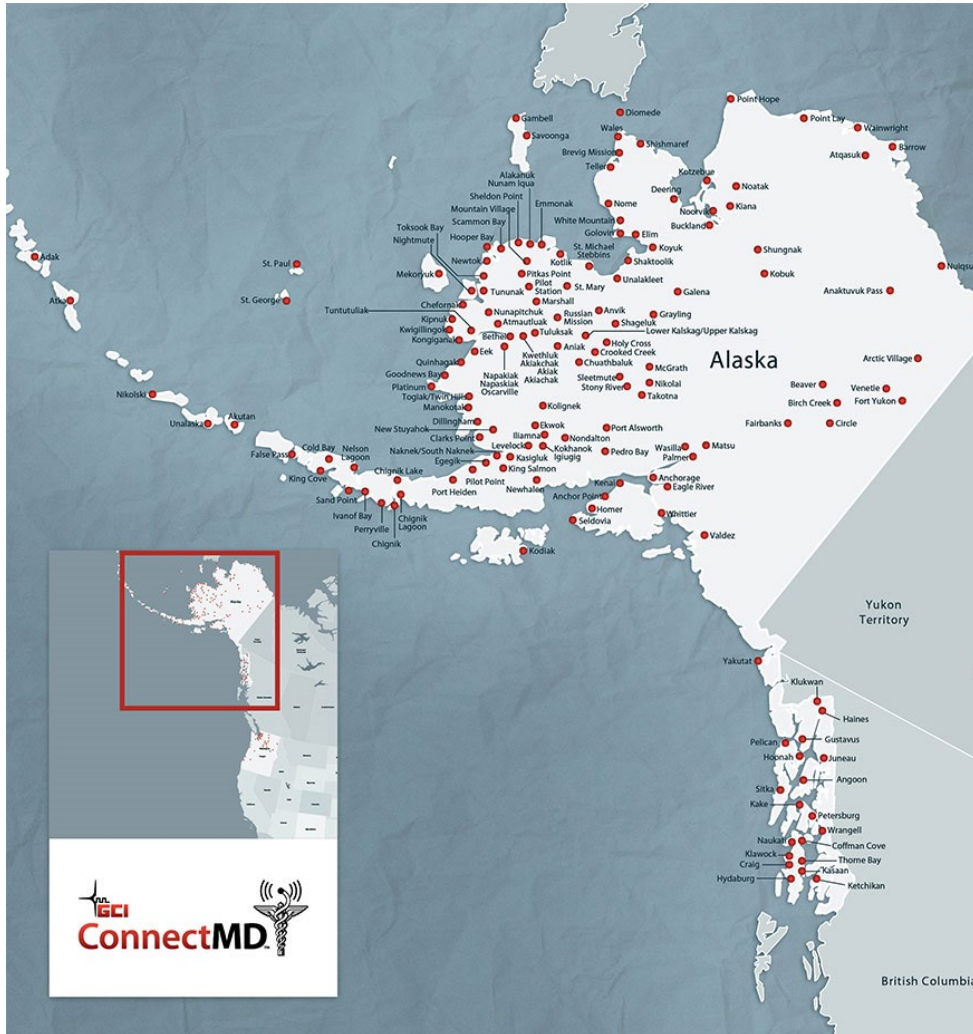
Federal Office of Rural Health Policy

Bureau of Health Workforce

HRSA Funded Telehealth Resource Centers



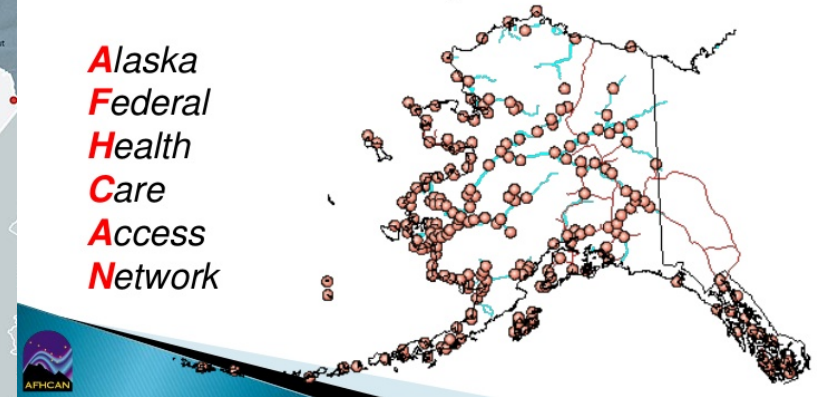
Telehealth Programs in Alaska



AFHCAN MISSION

To improve access to health care for federal beneficiaries in Alaska through sustainable telehealth systems

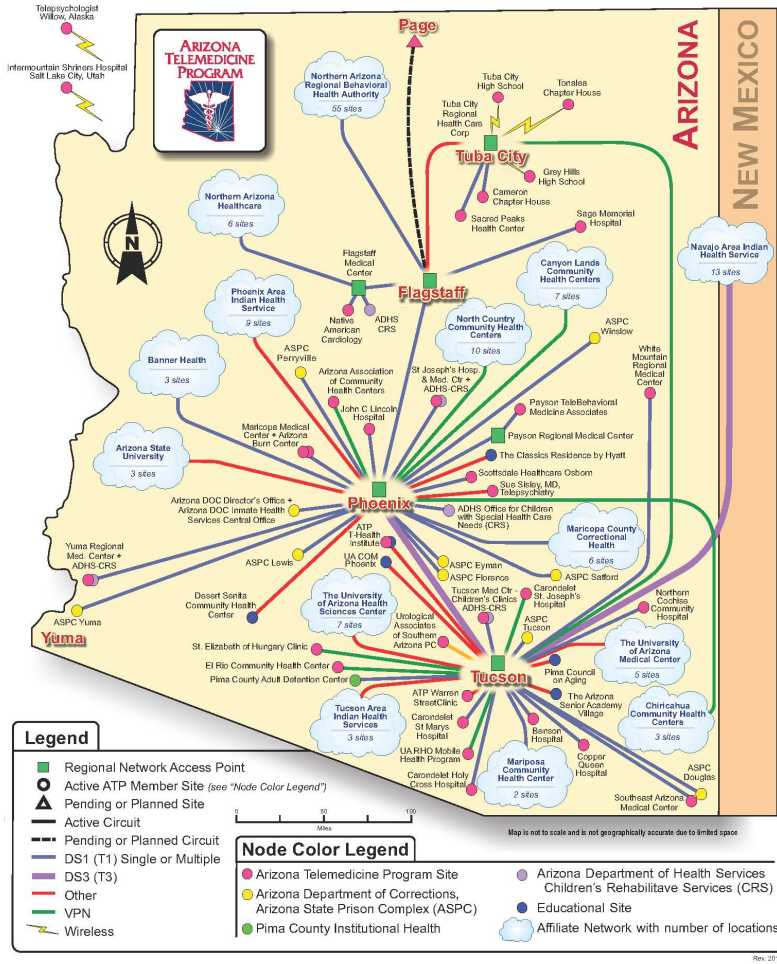
*Alaska
Federal
Health
Care
Access
Network*



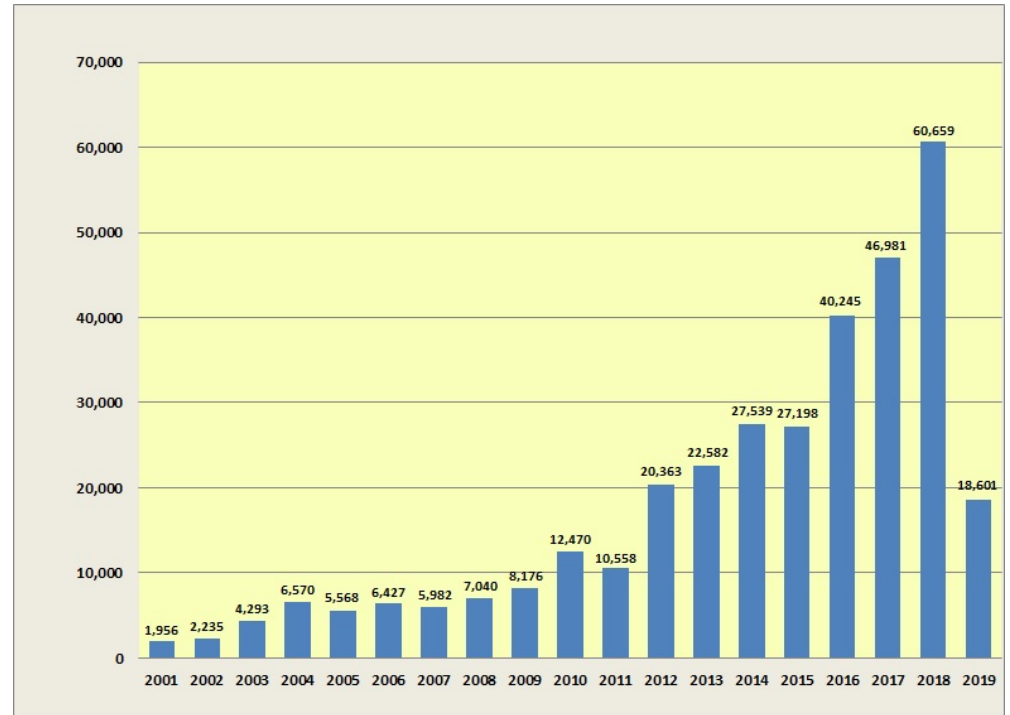
The telehealth network in Alaska reaches hospitals, clinics and Native American villages across the state.

Telehealth Programs in Arizona

ARIZONA TELEMEDICINE NETWORK



Arizona Regional Behavioral Health Authority



The telehealth networks in Arizona provide telemedicine services, including an expanding program of telebehavioral health.

Telehealth in Florida

Telehealth Advisory Council: *Florida Report on Telehealth Utilization and Accessibility*

- 44.8% of Florida hospitals offer telehealth services.
- The most frequent use cases of telehealth in Florida include:
 - Neurology (including stroke care)
 - Home health/patient monitoring
 - Primary care
 - Behavioral health
 - Radiology
- Financial barriers are the most frequently reported obstacles during implementation and operation of telehealth programs.
- Many providers reported a lack of knowledge about telehealth services.



Florida Report
on Telehealth
Utilization
and Accessibility



December 2016

Florida Medicaid Requires Telehealth



The 2019 Florida Medicaid Managed Care Contract requires health plans to offer telemedicine services.

The Managed Care Plan shall provide coverage for services provided through telemedicine, when appropriate, for services covered under this Contract, to the same extent the services would be covered if provided through a face-to-face (in-person) encounter with a practitioner.

The Managed Care Plan agrees to not be more restrictive in the coverage requirements for services provided through telemedicine than those established for services provided in-person.

The Managed Care Plan shall ensure the enrollee has a choice of whether to access services through a face-to-face or telemedicine encounter.

Associations Promoting Telehealth



American Telemedicine Association

The ATA focuses on advancing telehealth and is working to change the way the world thinks about healthcare.



American Hospital Association

The AHA represents and serves all types of hospitals, health care networks, patients and communities.



Health Information Management Systems Society

HIMSS is a global not-for-profit organization focused on better health through information and technology.

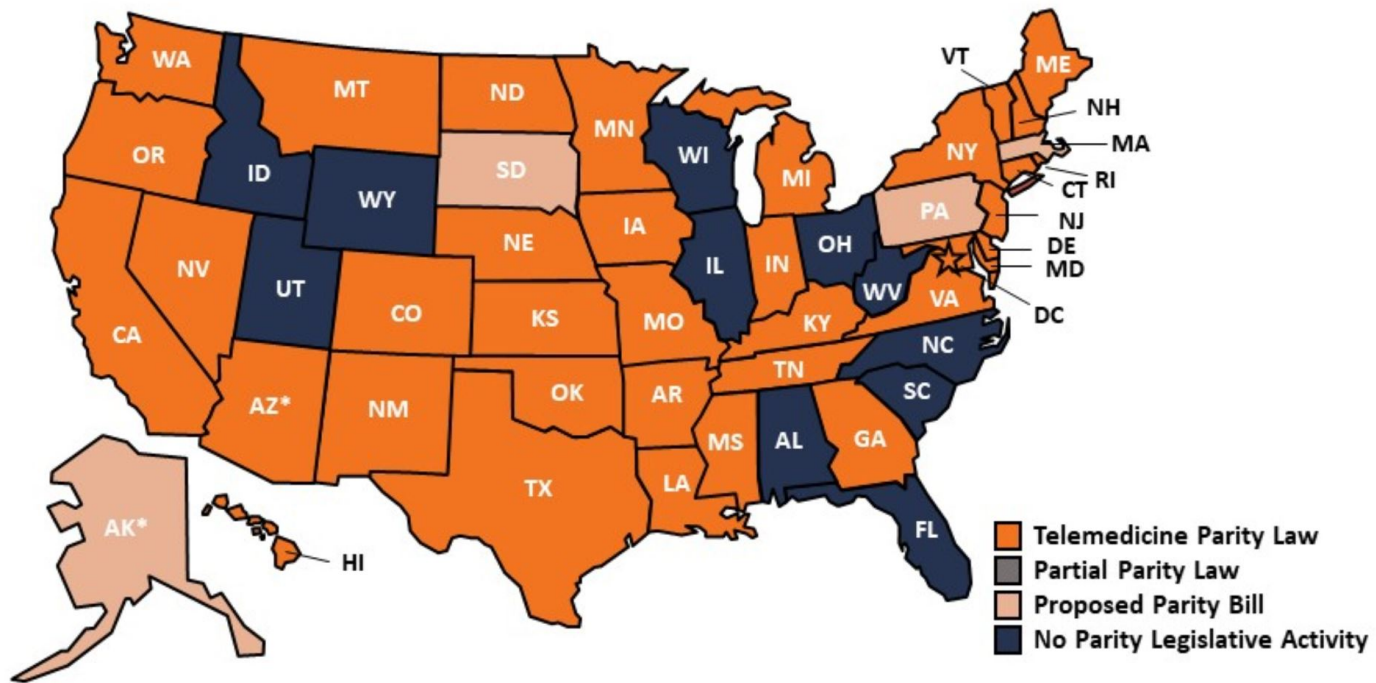


American Health Information Management Association

AHIMA is the authority for "HIM knowledge" representing health information management professionals worldwide.

ATA Legislative Tracking of Telehealth Laws

States with Parity Laws for Private Insurance Coverage of Telemedicine (2018)



States with the year of enactment: Alaska (2016)*, Arizona (2013)*, Arkansas (2015), California (1996), Colorado (2001), Connecticut (2015), Delaware (2015), Georgia (2006), Hawaii (1999), Indiana (2015), Iowa (2018), Kentucky (2000), Louisiana (1995), Maine (2009), Maryland (2012), Michigan (2012), Minnesota (2015), Mississippi (2013), Missouri (2013), Montana (2013), Nebraska (2017), Nevada (2015), New Hampshire (2009), New Jersey (2017), New Mexico (2013), New York (2014), North Dakota (2017), Oklahoma (1997), Oregon (2009), Rhode Island (2016), Tennessee (2014), Texas (1997), Vermont (2012), Virginia (2010), Washington (2015) and the District of Columbia (2013)

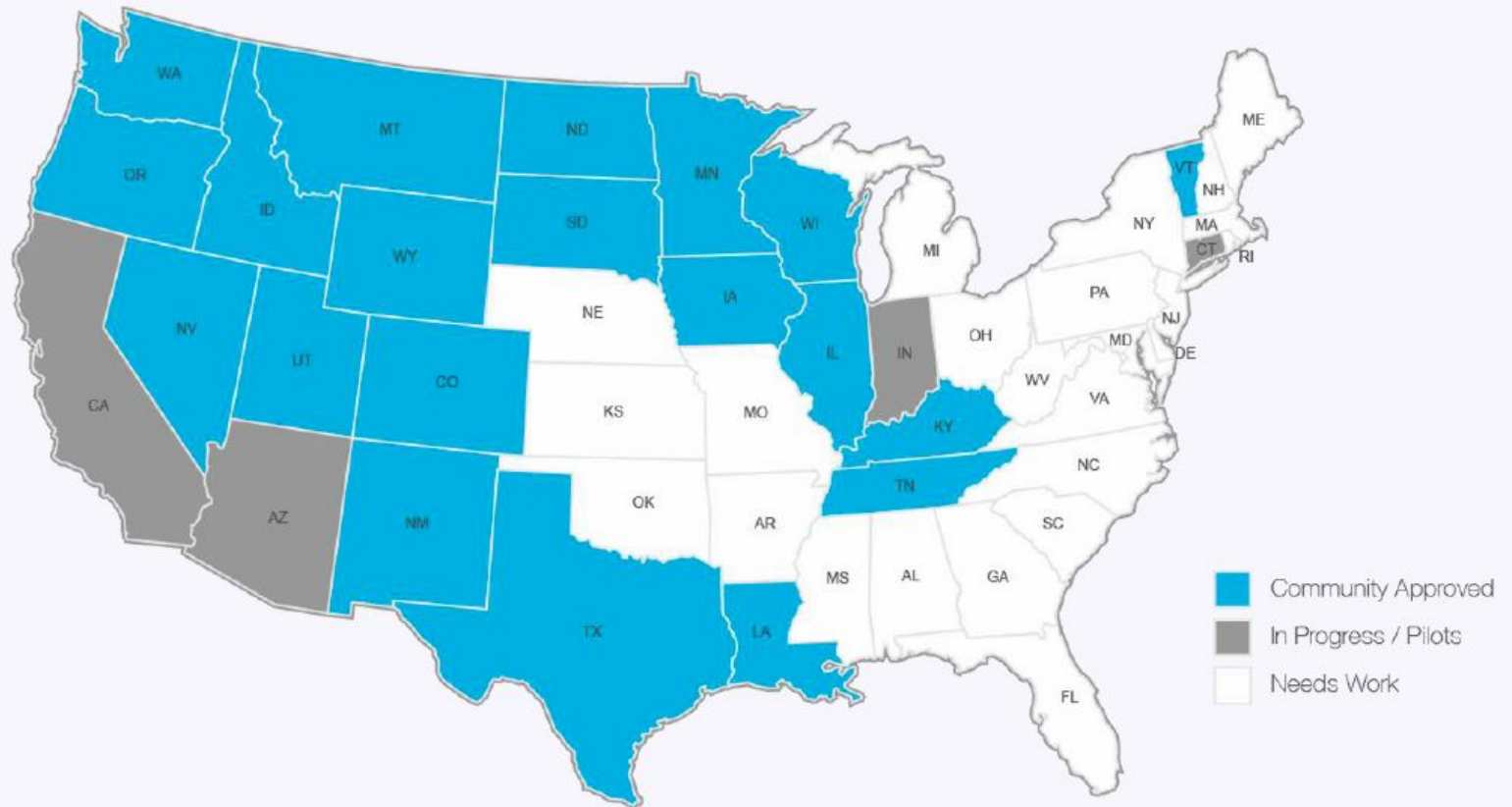
States with proposed legislation: In 2018, Alaska, Massachusetts, Pennsylvania, and South Dakota

*Coverage applies to certain health services.



States with Telepharmacy Rules and Projects

2016



<http://www.telehealthresourcecenter.org/node/764>

Source: Quarles & Brady LLP analysis & report, July 2016



Memorial Healthcare System Telehealth Services



Memorial Healthcare System has several telehealth programs for managing chronic conditions:

- Remote patient monitoring
- Ability to track results in EMR
- TelePharmacy
- Complex chronic care
- TeleAsthma
- Delivering care in the home
- TelePrimary Care
- TeleBehavioral Health
- HIV care plan compliance
- TeleOncology

MHS telehealth programs for post-discharge care of the patient:

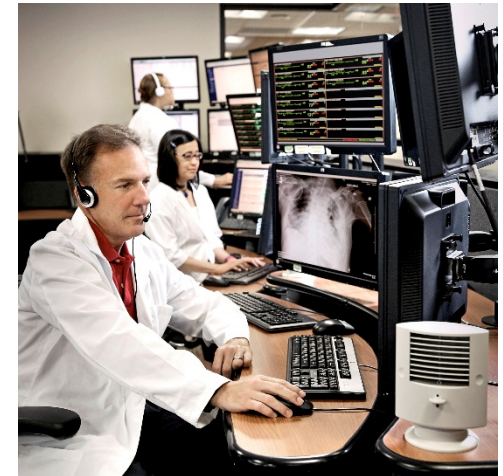
- Wound care (TeleWound Care)
- Telehelath on-call
- Virtual Lactation Consultant
- TeleNutritionist
- Post-surgical follow-up
- TeleBehavioral Health
- Post-discharge TelePharmacy
- Virtual Primary Care Coordination

Telehealth at Baptist Health South Florida



Baptist Health South Florida offers an e-ICU that oversees 147 ICU and step-down beds.

- Telehealth equipment is linked to a remote monitoring site.
- Computers monitor patients' medical needs.
- The Tele-ICU intensivist communicates over video and two-way audio

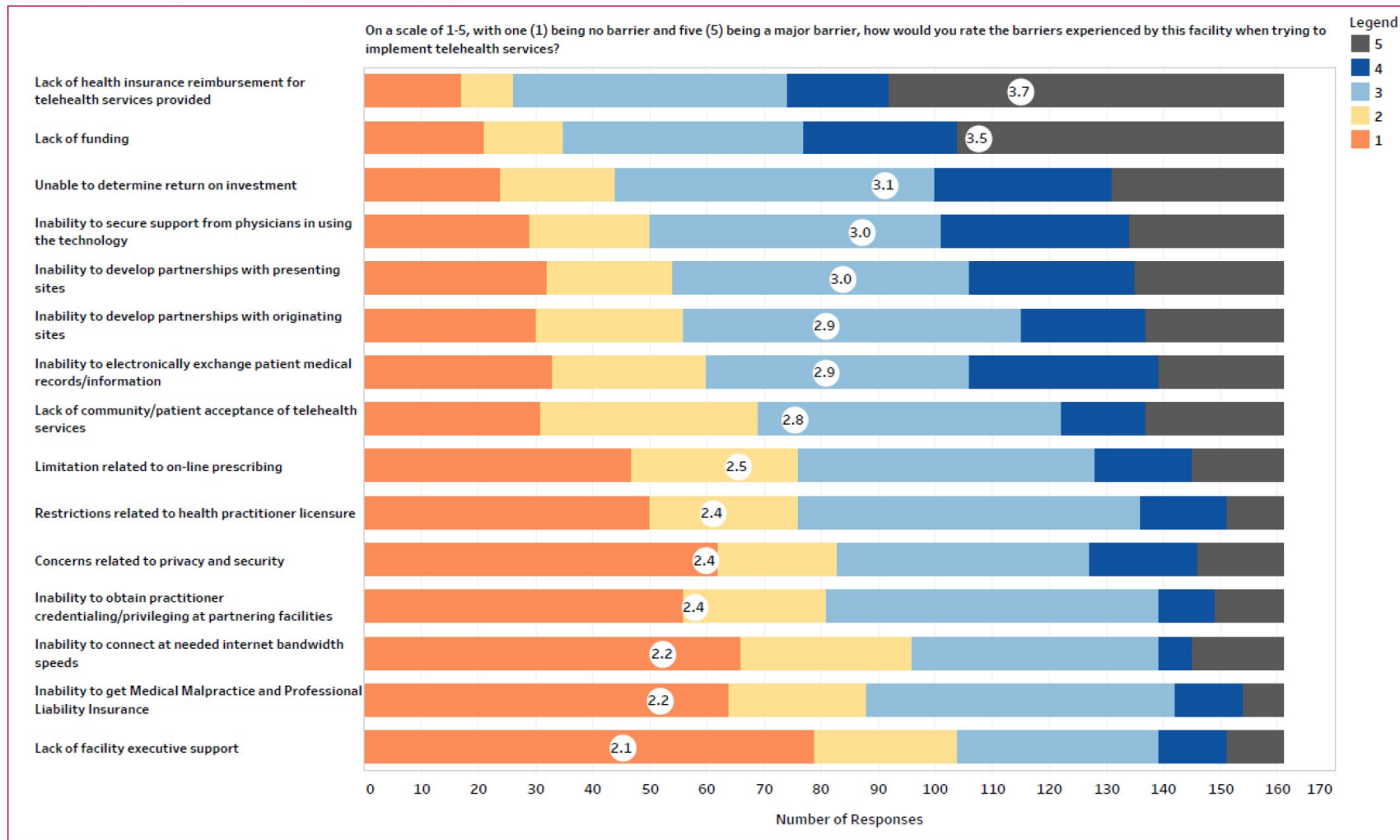


Other telehealth programs:

- Home health programs and remote monitoring
- Telepsychology on cruise lines
- ePrimary care
- Virtual Urgent Care
- eSitter program
- **ePharmacy services**

Challenges of Telehealth Startups in Florida

Figure 16. Barriers to Implementation Among Facilities Attempting to Offer Telehealth Services





Regulatory Barriers to Telehealth

Florida Telehealth Legislation does not require parity

2019 Florida legislation provides a framework for telehealth services but does not establish parity between face-to-face and telehealth care.

- A contract between a health insurer... and a telehealth provider... must establish mutually acceptable payment rates or payment methodologies for services provided through telehealth.

Medicare Telehealth reimbursement limited to rural sites

- An originating site is the location where a Medicare beneficiary gets physician or practitioner medical services through a telecommunications system:
- A county outside a Metropolitan Statistical Area (MSA)
- A rural Health Professional Shortage Area (HPSA) in a rural census tract.

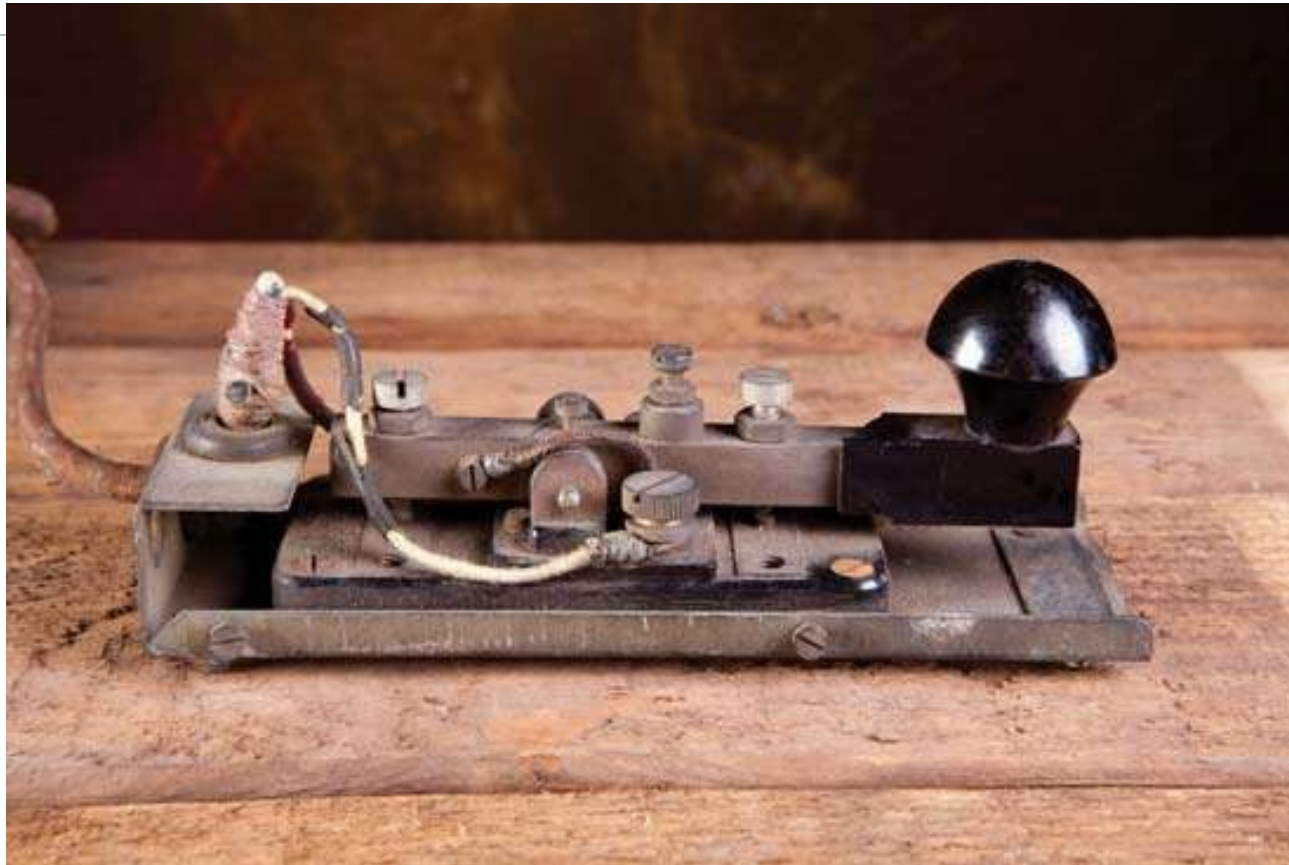
Telehealth is Result of Technological Invention

A Background History of Telehealth Technology

The increasing sophistication of communication technology and increase in transmission speed provides greater opportunities for the application of health care services.

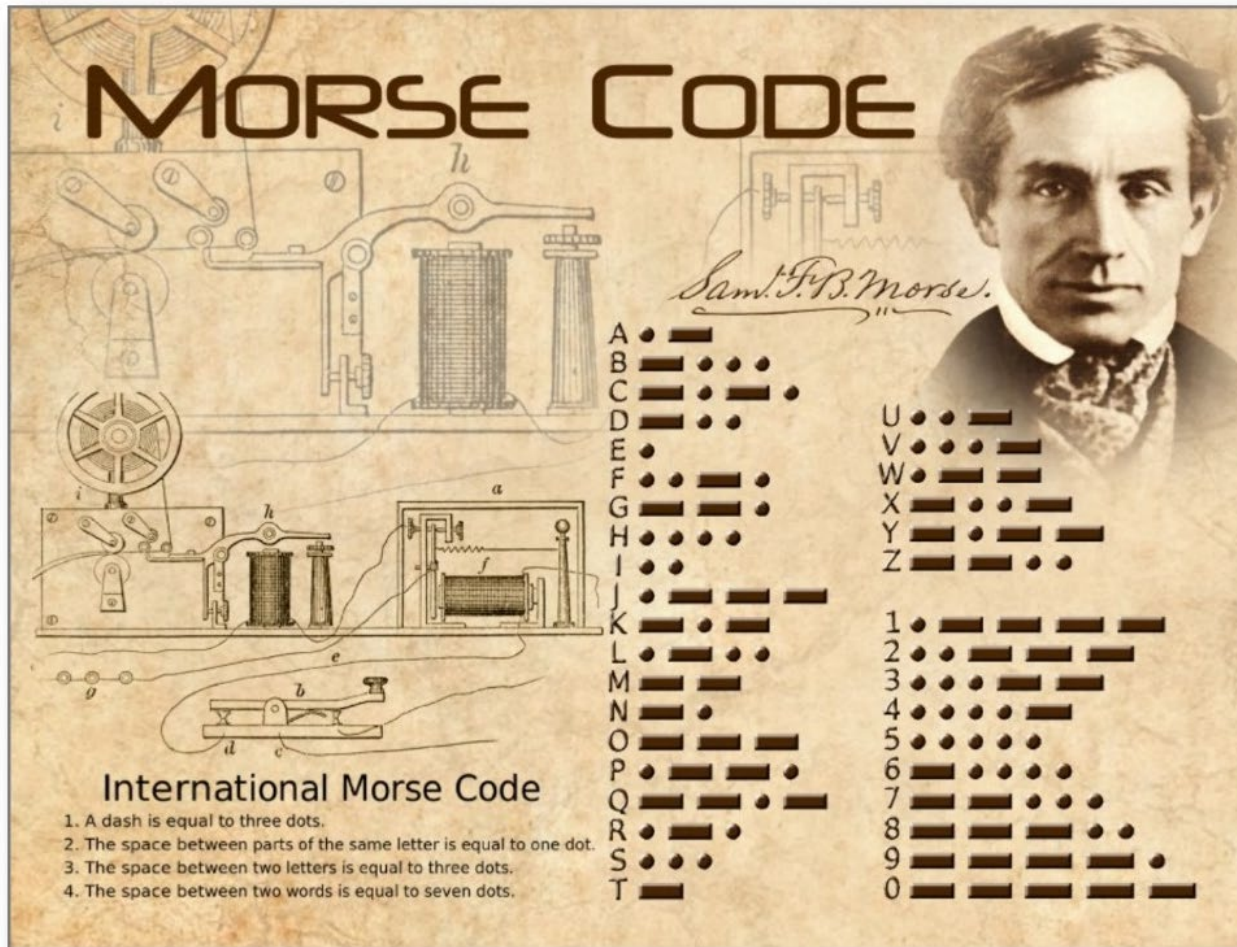
- Telegraph – Samuel Morse, 1844
- Telephone – Alexander Graham Bell, 1877
- Wireless Telegraph (radio) – Guglielmo Marconi, 1894
- Television – Philo T. Farnworth, 1927
- Cable Telecommunications – Television Industry, 1940s
- The Internet – US Dept of Defense, ARPANET, 1960s
- The Personal Computer - Apple and Microsoft, 1970s
- Wireless Cell Phone, Telecommunications Industry, 1980s
- Wireless Medical Devices – Medical Device Industry, 2020s

Samuel Morse - the Telegraph



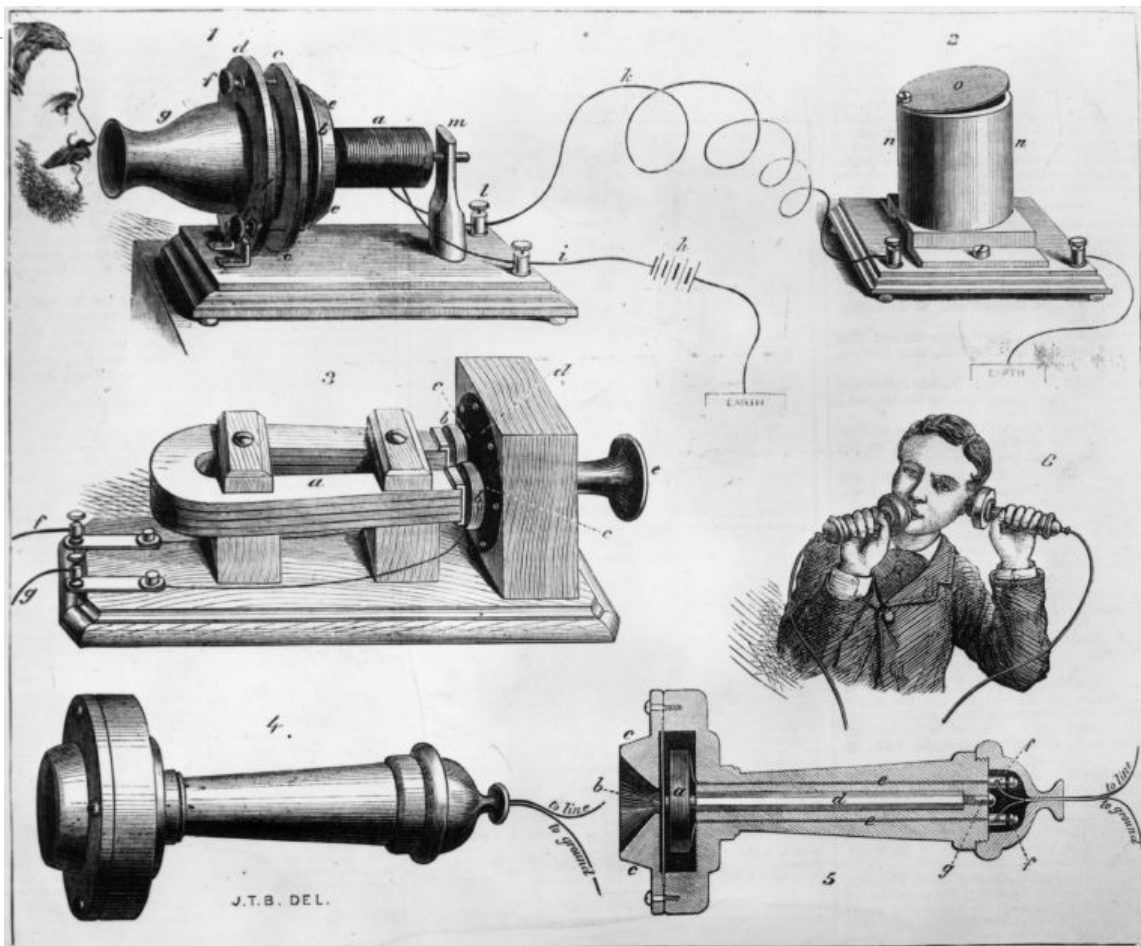
In 1844 Samuel Morse sent his first telegraph message, from Washington, D.C., to Baltimore, Maryland. By 1866, a telegraph line had been laid across the Atlantic Ocean from the U.S. to Europe.

Morse Code as a Communication Invention



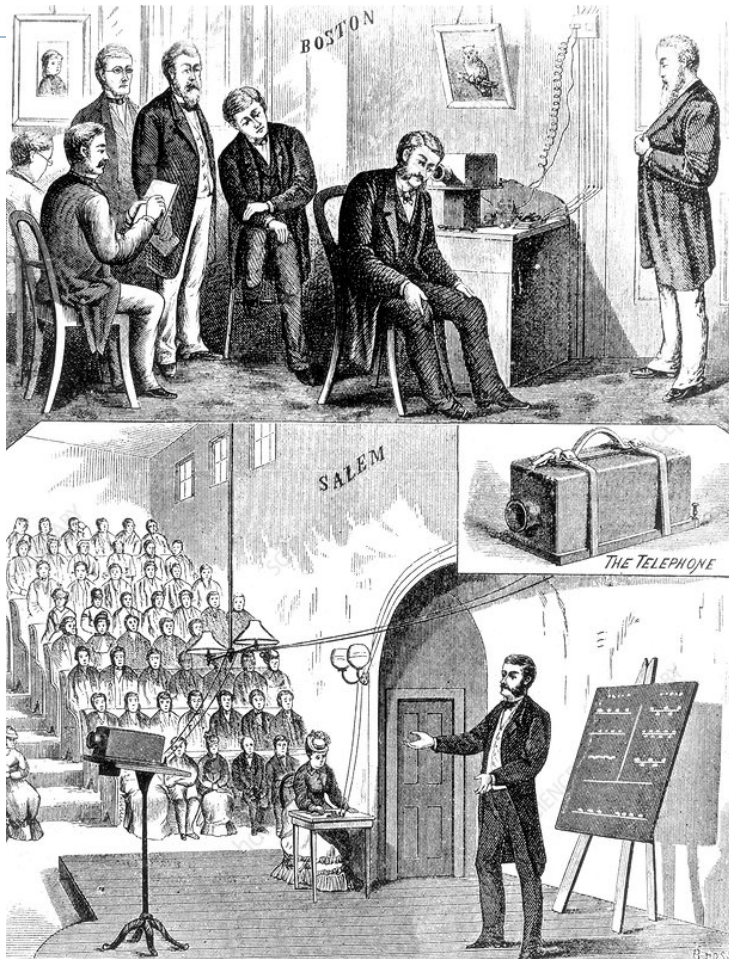
Samuel Morse invented a specialized code of “dots and dashes,” foreshadowing the use of binary code in computing today.

Alexander Graham Bell – The Telephone



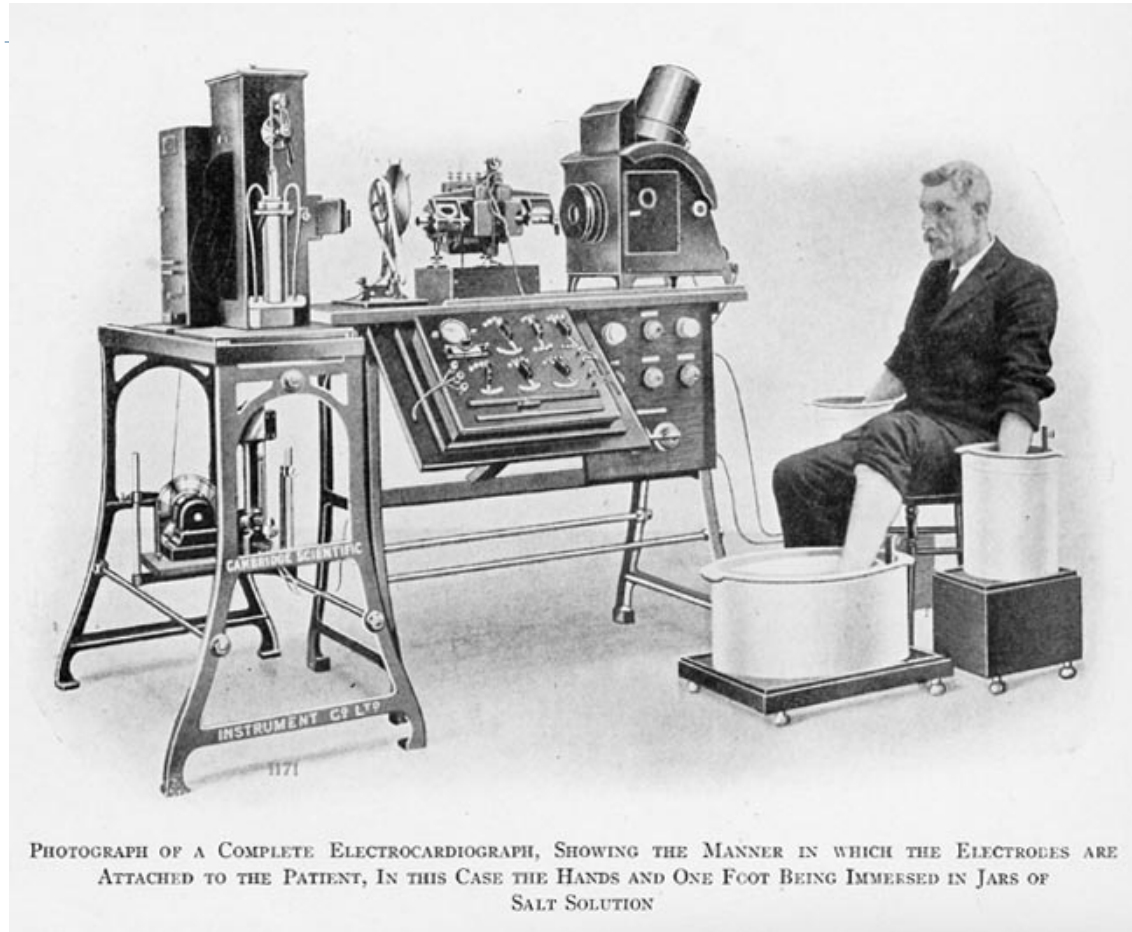
Alexander Graham Bell was working on a design for a multi-line telegraph when he developed the telephone in 1876.

The Telephone Offered Distant Communication



Bell anticipated that the telephone would be used for listening to speeches and operas by audiences who had no access to them.

Willem Einthoven's Telecardiogram



In 1905, Willem Einthoven used a telephone cable to transmit the first “telecardiogram” from a hospital to his laboratory.

Guglielmo Marconi Invents the “Wireless”



In 1894, Guglielmo Marconi developed the first successful long-distance wireless telegraph.

- The first transatlantic radio signal was broadcast in 1901.

The Wireless Changed Maritime Communications

New-York Tribune.

Vol. LXXII... No. 23,893. To-day, suspended. Tomorrow, late edition with. NEW-YORK, TUESDAY, APRIL 16, 1912.—FOURTEEN PAGES. * * * * PRICE ONE CENT In City of New York, Approved by Post Office and Carriers as Second-Class Matter, October 3, 1879. Accepted for mailing at special rate of postage provided for in Act of October 3, 1917. Authorized to mail at this rate on condition that copies be mailed at least twice each week.

1,340 PERISH AS TITANIC SINKS; ONLY 886, MOSTLY WOMEN AND CHILDREN, RESCUED

CROWD BESIEGES WHITE STAR OFFICE

Line Officials Only Able to Tell Inquirers That but 675 of 2,200 Were Saved.

VINCENT ASTOR SEEKS NEWS

On Early Bulletins Two of Strass Family Started for Halifax to Meet Mr. and Mrs. Isidor Strass.

Hundreds of telephone calls and telegraphic inquiries poured into the office of the White Star Line in lower Broadway last night, asking information as to the safety of friends and relatives who were on the Titanic.

From about 7 o'clock in the evening on the answers given by the company were far from reassuring, and a little later in the evening people began to come in person, seeking to get more definite news.

Vice-President Franklin of the White Star Line could tell them only that his latest information from Captain Harbeck of the Olympic was to the effect that the Titanic sank at 2:20 a. m. yesterday and that 675 passengers had been

DIAGRAMMATIC MAP SHOWING POSITION OF THE TITANIC WHEN SHE STRUCK THE ICEBERG AND LINERS RUSHING TO HER ASSISTANCE.

Wireless from Olympic's Captain Gives News and Weeping Women Gather at White Star Offices to Learn Fate of Relatives

—1,323 Passengers on Ship and Crew of 890.

SURVIVORS EIGHT HOURS IN BOATS

No Word from Virginian or Parisian, Which Vice-President Franklin Hopes Saved Others—Disaster Greatest in History, if Hope Is Unfounded—Captain Believed to Have Gone Down at His Post of Duty.

FIRST CLASS PASSENGERS ON TITANIC.....	318
SECOND CLASS PASSENGERS ON TITANIC.....	261
THIRD CLASS PASSENGERS ON TITANIC.....	740
CREW OF THE TITANIC.....	890
TOTAL.....	2,209
REPORTED SAVED ON THE CARPATHIA.....	866
MISSING.....	1,343

The White Star liner Titanic sank at 2:20 a. m. yesterday about 1,150 miles east of Sandy Hook.

First reports placed the number of survivors, passengers and crew,

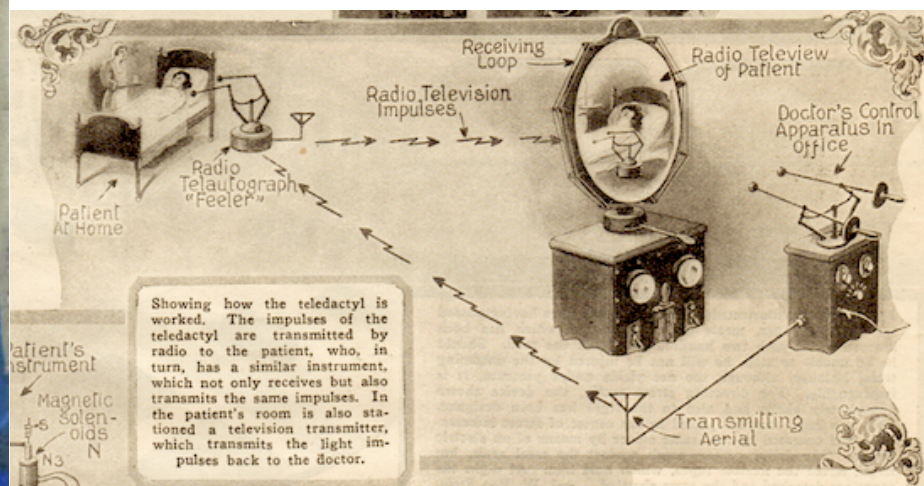
Following the Titanic disaster, the Wireless Act of 1912 required all ships to maintain wireless communications at all time.

Predictions for the Video Telephone



1918 – The Telephot was predicted as a futuristic device that could be connected to the telephone system. Dick Tracy followed suit.

Early Telemedicine Predictions



Telemedicine in 1925: Using the "Teledactyl," a busy doctor could make a virtual house call using remote control arms and video screen.

Electronic Scanning as Basis of Television

SECOND SECTION

PAGES 11 TO 22

San Francisco Chronicle

FOUNDED 1865

CCC

SAN FRANCISCO, CAL., MONDAY, SEPTEMBER 3, 1928

S. F. Man's Invention to Revolutionize Television

NEW PLAN BANS ROTATING DISC IN BLACK LIGHT

W. W. Crocker, R. N. Bishop
Head Local Capitalists
Backing Genius

Two major advances in television were announced yesterday by a young inventor who has been quietly working away in his laboratory in San Francisco and has evolved a system of television basically different from any system yet placed in operation.

The inventor is Philo T. Farnsworth, and local capitalists, headed by W. W. Crocker and Roy N. Bishop, are financing the experiments and have aided him in obtaining basic patents on his system.

In any method of transmitting moving images at a distance, some means must be evolved of breaking the image into pin points of light. These points are translated into electrical impulses, the electrical impulses are collected at the receiving end and translated back into light, and the image results.

These points are translated into electrical impulses, the electrical impulses are collected at the receiving end and translated back into light, and the image results.

NEW PRINCIPLE APPLIED

All television systems now in use employ a revolving disc, two feet in diameter, to break up or "scan" the image. A similar disc is at the receiving end, and the two discs must revolve at precisely the same instant and at precisely the same speed or blurred vision results.

Farnsworth's system employs no moving parts whatever. Instead of moving the machine, he varies the electric current that plays over the image and thus gets the necessary scanning.

The system is thus simple in the extreme, and one of the major mechanical obstacles to the perfection of television is thereby removed.

It was through this simplicity that he achieved his second great advance, the cutting in half of the wave band length necessary to prevent television broadcasts interfering with each other. The importance of this is manifest, inasmuch as it requires approximately four times the wave band length for television that ordinary sound broadcasting requires. Farnsworth has cut this television wave band in half and is hoping for still further reduction.

PERFECT MOTION RECORDS

His system sends twenty pictures per second, so motion is perfectly recorded, and there are 8000 elements, or pin points of light, in each picture to insure detail. The laboratory model he has built transmits the image on a screen one and one-quarter inches square. It is a queer looking little image in bluish light now, one that frequently smudges and blurs, but the basic principle is achieved and perfection is now a matter of engineering.

The sending tube which is the heart of Farnsworth's transmitting set is about the size of an ordinary quart jar that a housewife uses for preserving fruit, and the receiving tube containing the screen is even smaller. Farnsworth estimates the receiving apparatus could easily be attached to an ordinary radio set and can be manufactured to retail at \$100 or less.

Farnsworth is a native of Provo, Utah, and conceived the idea for his television set while a student at Brigham Young University there. He was discovered by George Everson and Leslie Gorrell, who brought the set to the attention of research engineers at the California Institute of Technology. These experts pronounced it workable and helped Farnsworth obtain financial backing. The research laboratories are at 202 Green street.

Young Genius and Part of His New Black Light Machine



Philo T. Farnsworth holding the sending and receiving tubes of his new television set.

In 1927, Philo Farnsworth successfully transmitted the first electronic television image, creating the TV standard.

The First Farnsworth Television

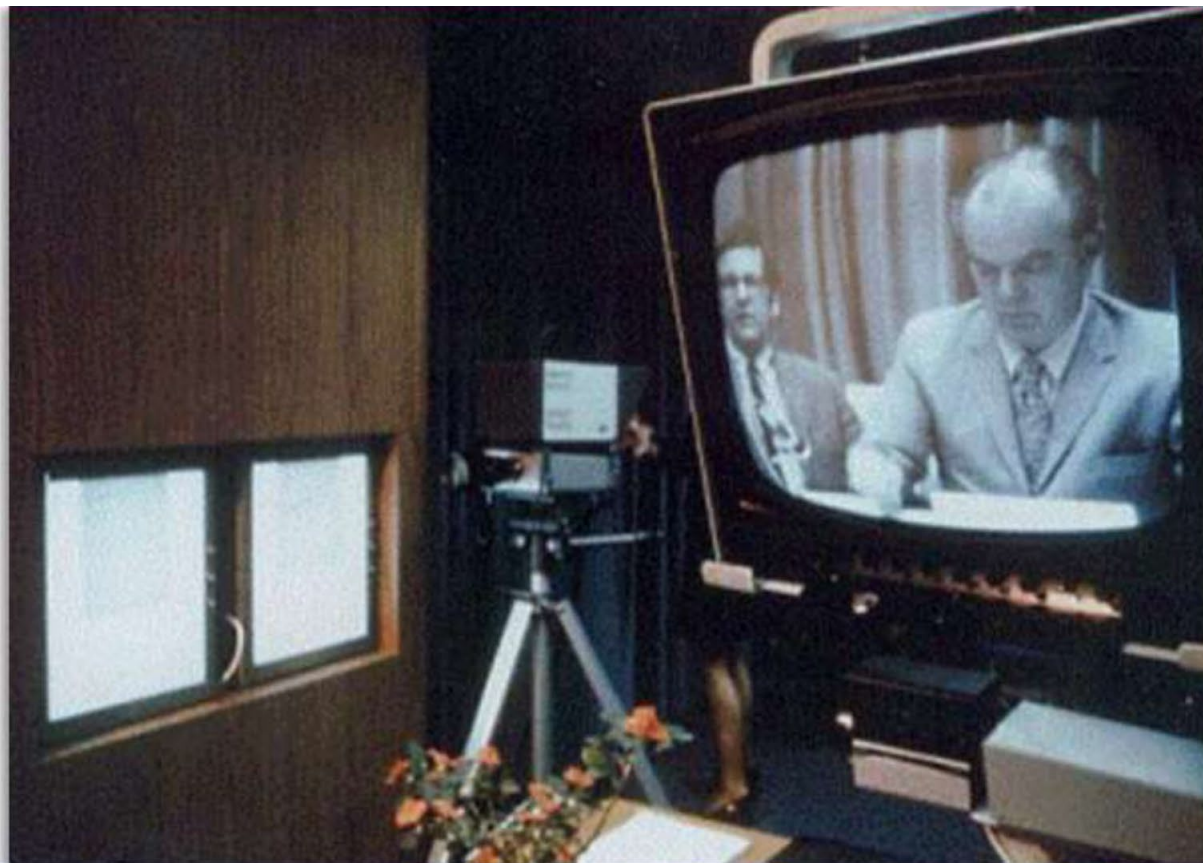


The first television integrated the electronic scanning tubes invented by Farnsworth and the wireless capability of radio.

The First Telehealth System in Boston

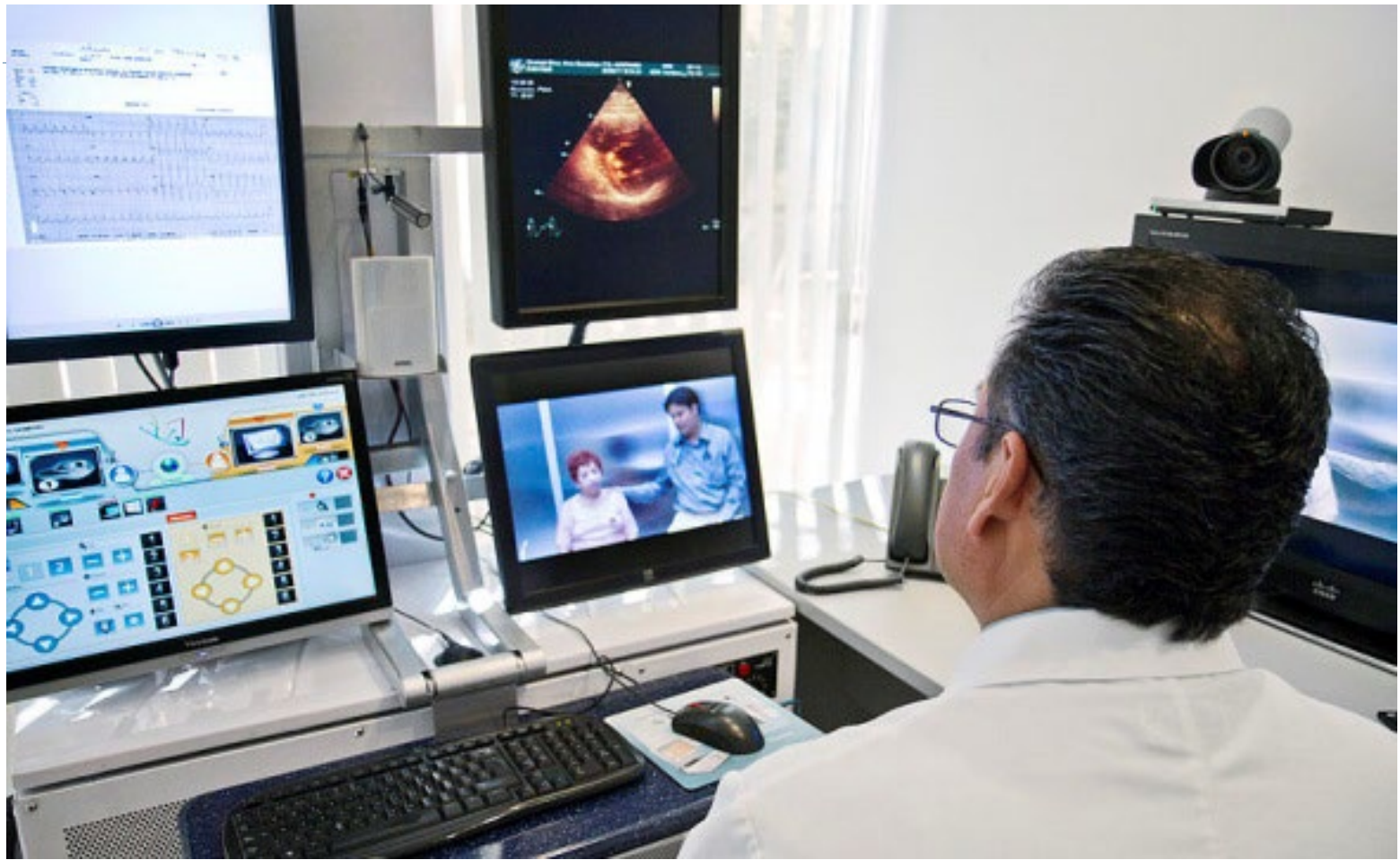
Kenneth T. Bird:

“Telemedicine can be defined as the practice of medicine by means of an interactive audio-video communications system without the usual physician-patient physical confrontation. Telemedicine depends on the physician and his special abilities. It does not replace him or alter his role. In fact telemedicine multiplies the usefulness of the specialist and enlarges his horizons while simultaneously maintaining his position at the focal point of all health care activities”



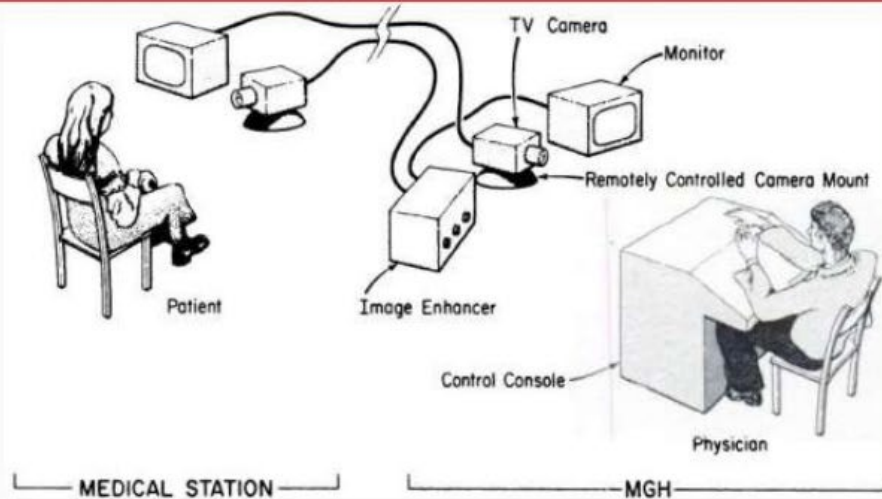
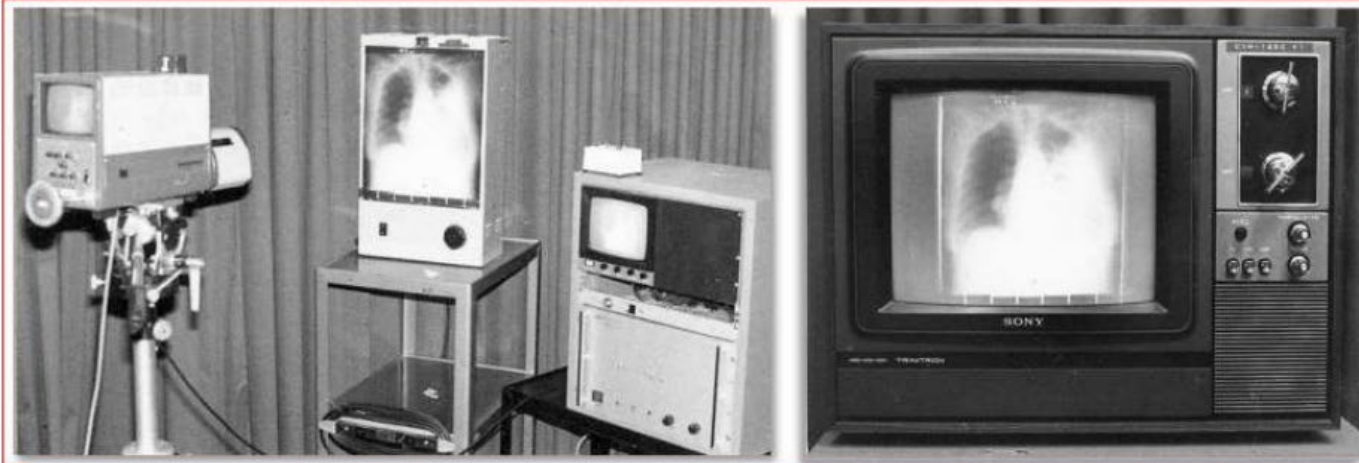
In 1967, Dr. Kenneth Bird, MD, installed a TV link between Mass General Hospital and Logan Airport in Boston to provide health care treatment to passengers in the airport and to avoid traffic.

Physician Office – Telehealth Technology



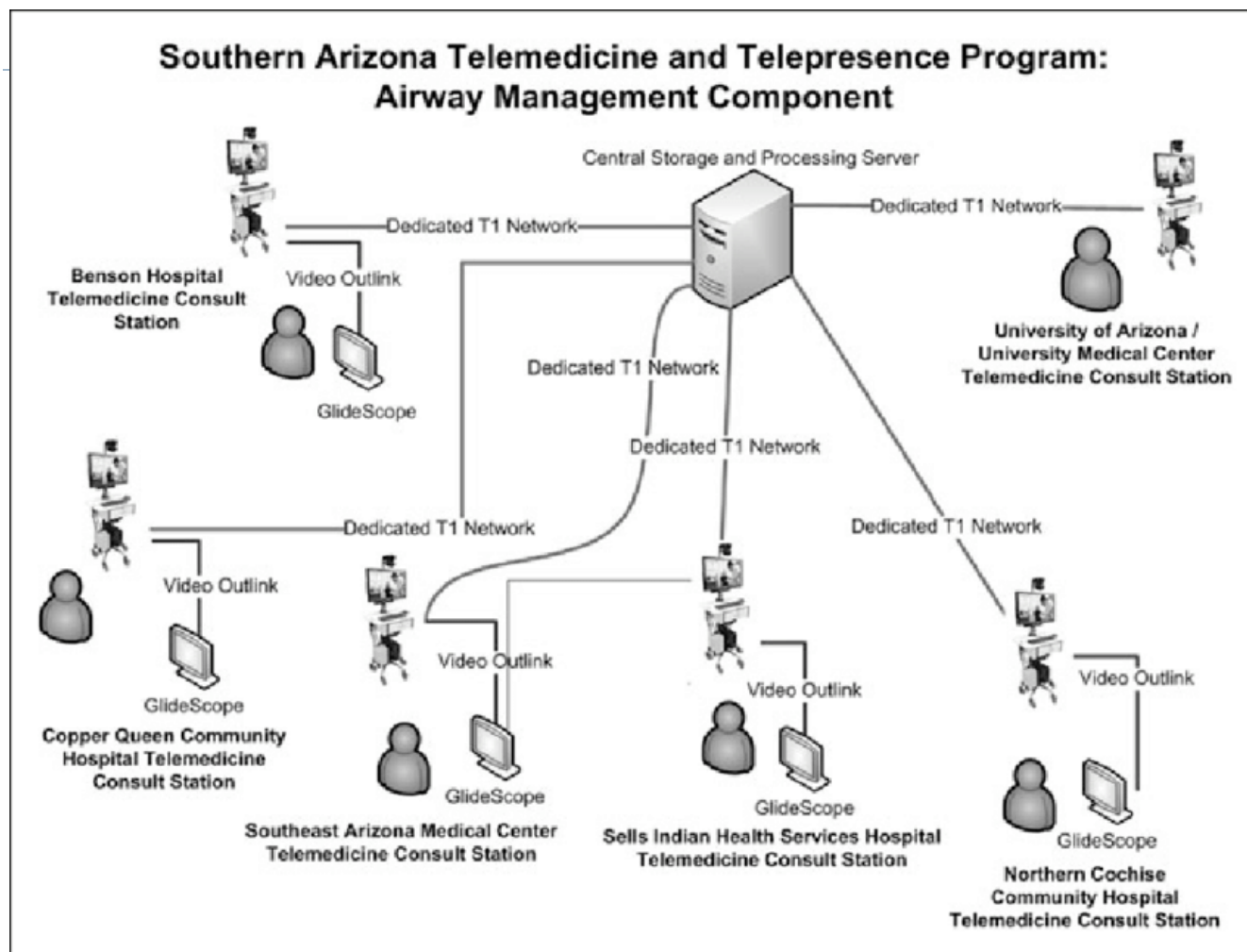
Modern telehealth systems look much like the first system between Mass General Hospital and Boston's Logan Airport.

The First Telehealth System Network



The first telehealth network in Boston aimed TV cameras at the doctor, patient and TV screens with clinical images.

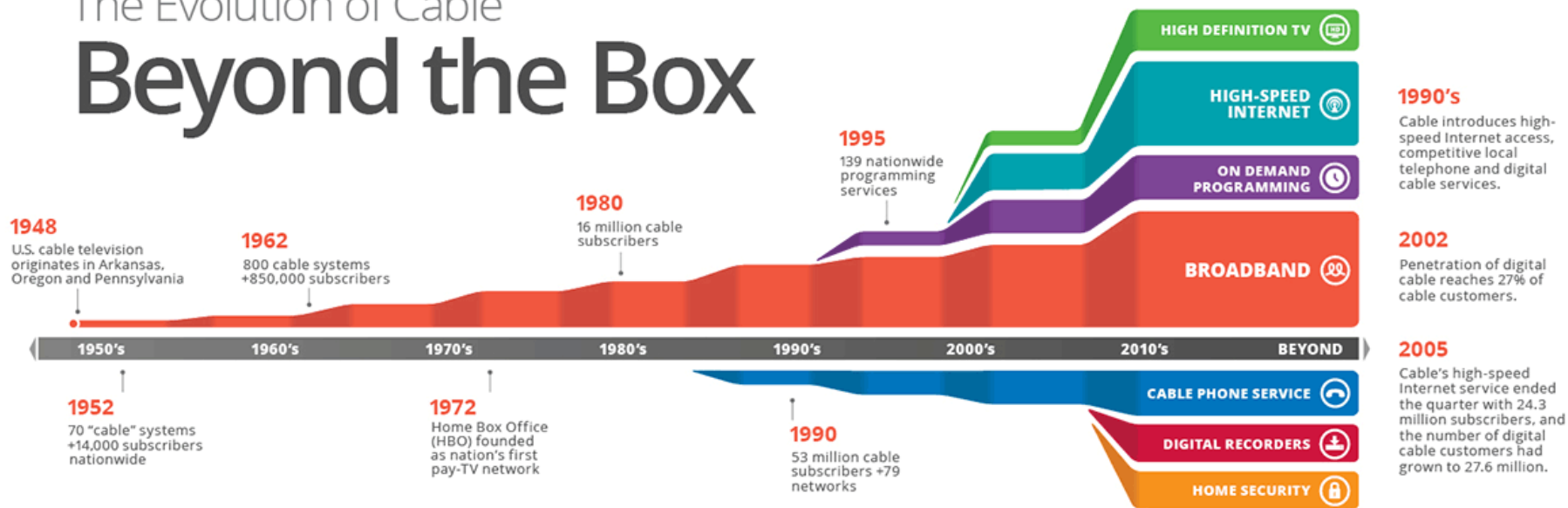
Telemedicine Network for Trauma Patients



Modern telehealth networks have replaced TV cameras with computers, but look pretty similar to the first networks.

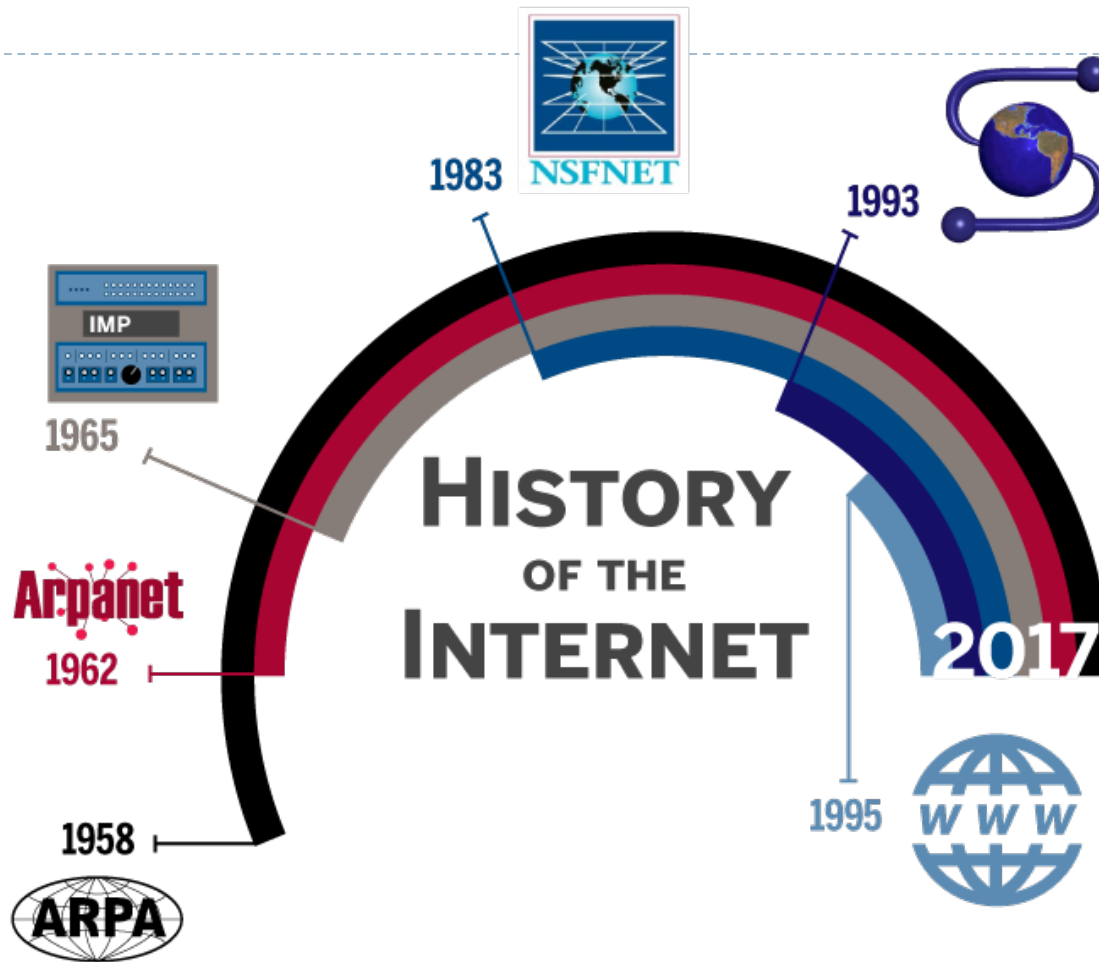
Growth of Cable Television, 1948-2019

The Evolution of Cable Beyond the Box



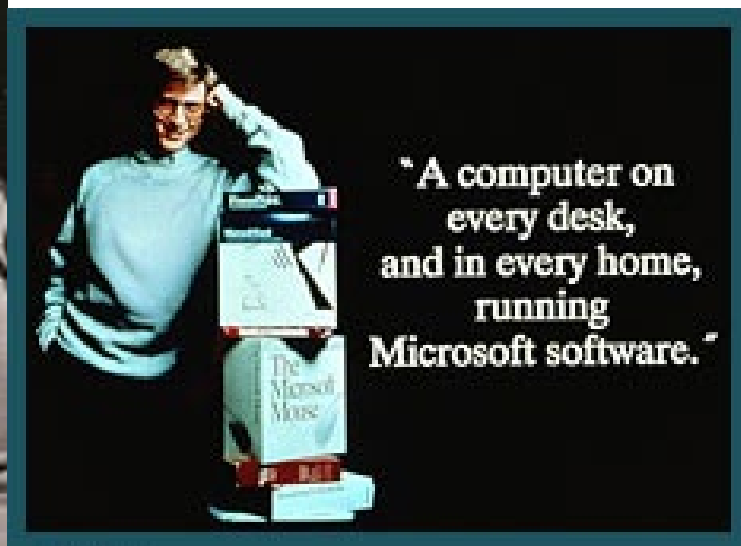
The development of cable television increased the throughput capacity of TV channels. The steady growth of broadband is a major factor in the development of new telehealth solutions.

Development of the Internet, 1958-2019



Initially begun as a defense project in the USA, the Internet has grown to become an important channel for telehealth applications.

Apple and Microsoft Usher in the PC Era



Apple Computer and Microsoft created an electronic revolution in the 1980's when they commercialized the first personal computers and the use of a standardized operating system.

CHOA VTC: Video Capacity 2017

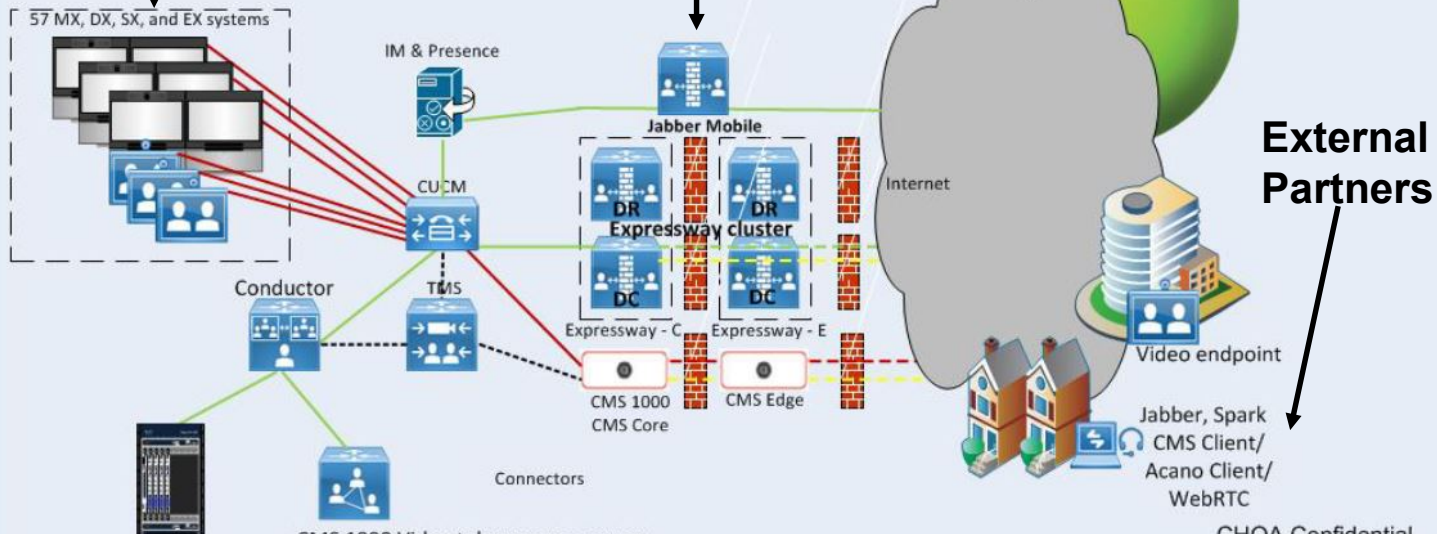
CHOA VTC Infrastructure Overview – End of Video bridge Expansion

Multifunction touchscreens turn any room into a video collaboration hub

57 MX, DX, SX, and EX systems



High speed connections



MSE 8510 MCU
60 HD ports @ DC

CMS 1000 Video telepresence server
60 HD ports @ DR

Cisco Video Servers

CHOA Confidential

DATE	1/6/17			
DRAWN BY	Bill Beguhn			
Revision 2	SIZE	FSOM NO	DWG NO	REV
Confidential	SCALE	NTS	SHEET	1 OF 1

CHOA VTC Infrastructure

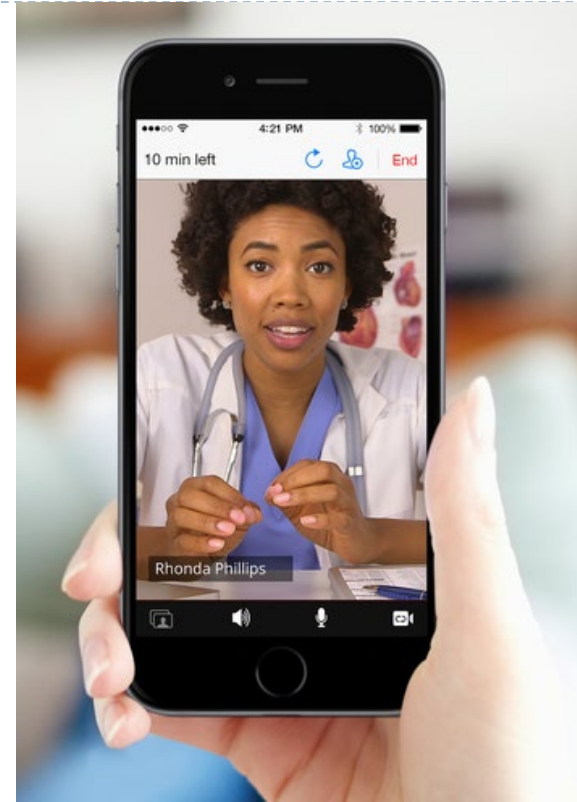


Steve Jobs Unveils the iPhone and iPad



Steve Jobs introduced the iPad as “more intimate than a laptop, and so much more capable than a smartphone.”

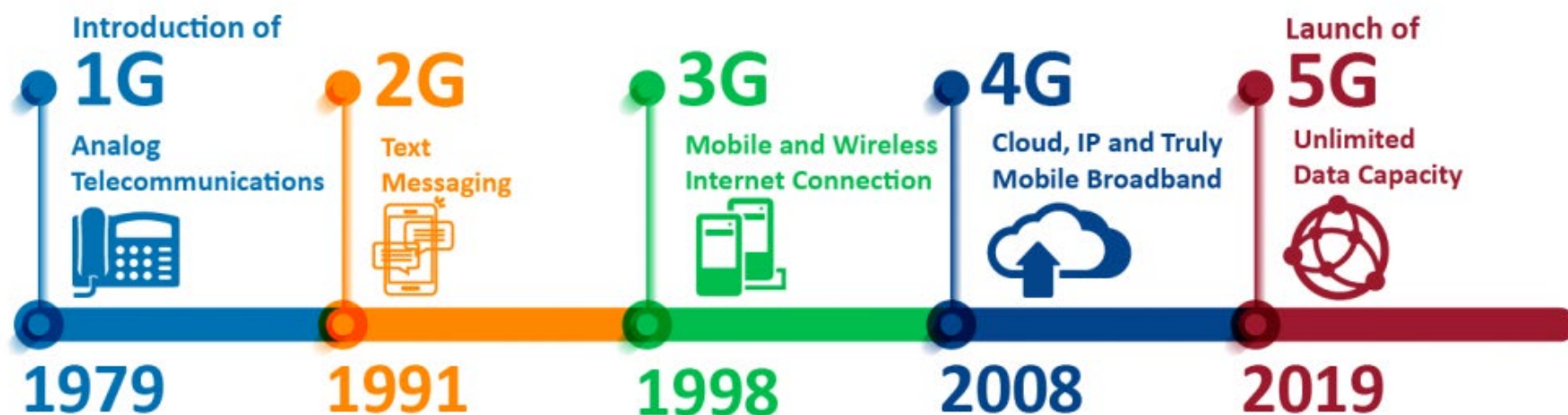
Wireless Cell Phones, 1979-2019



Cell phone technology advanced from the first clunky handsets of the 1980's to smaller, video-enabled devices that offer a newer, innovative approach to telehealth communications.

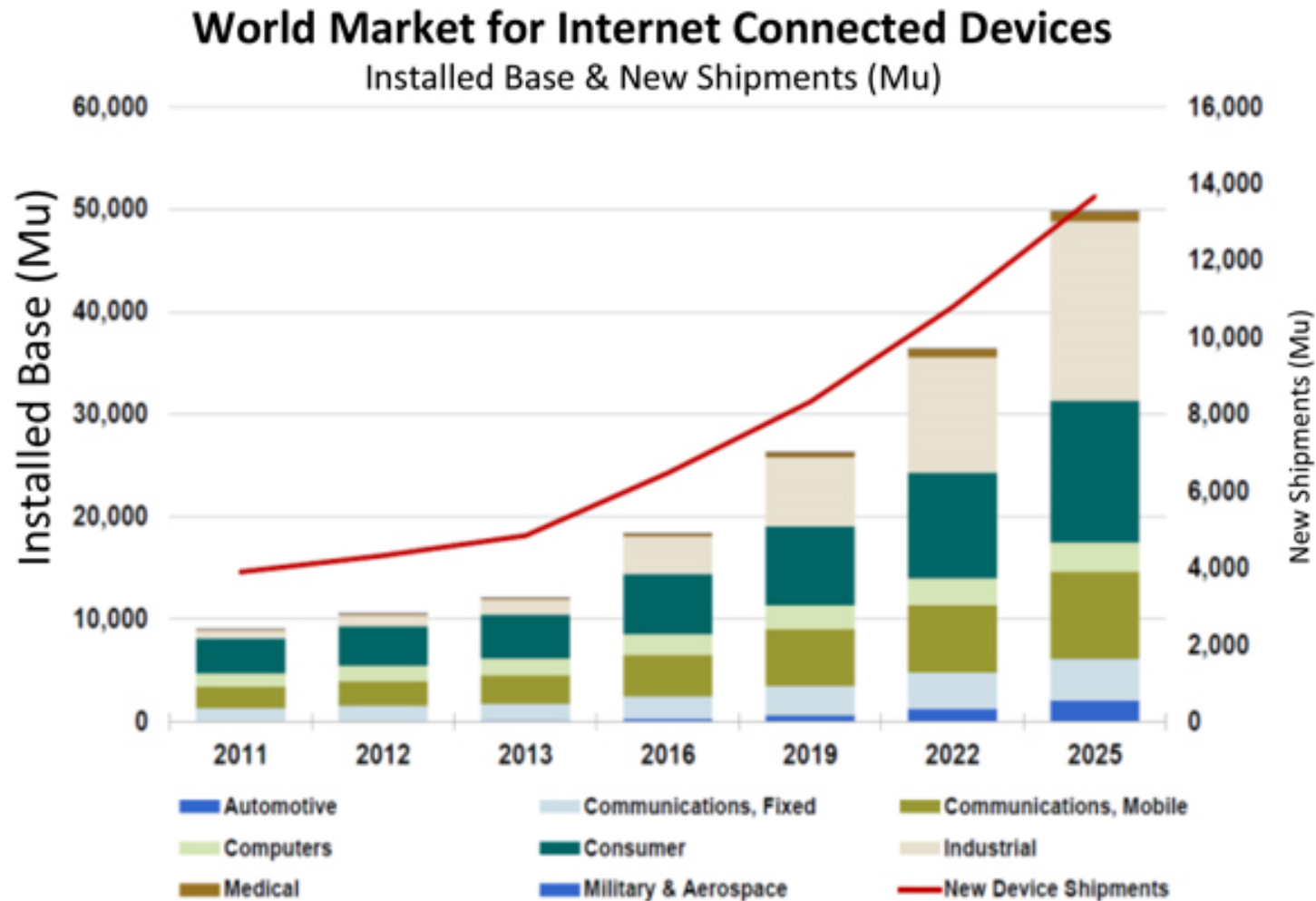
Development Cell Phone Capacity

The Evolution of 5G



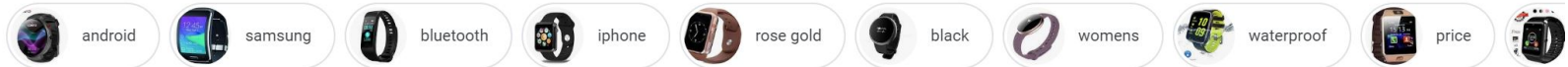
The development of broadband capacity is also evident in the increasing broadband capacity of wireless communications, leading to potential new innovations in telehealth solutions.

Projected Increase of Networked Devices to 2025












Source: IHS 2013 Connected Devices

Googling "Smart Watches"



Sponsored

 <p>\$199.00 Apple Watch Series 3 GPS - 38mm - Sport... Walmart ★★★★★ (9k+)</p>	 <p>\$275.00 Fossil Gen 4 Smartwatch ... Target ★★★★★ (1k+)</p>	 <p>\$179.00 Fossil Gen 4 Smartwatch ... Fossil ★★★★★ (1k+)</p>	 <p>\$155.00 Fossil Hybrid Smartwatch ... Fossil ★★★★★ (198)</p>	 <p>\$11.00 Smart Watch With Camera Bluetooth... Wish</p>	 <p>\$199.99 Samsung - Galaxy Watch Active... Best Buy ★★★★★ (3k+)</p>	 <p>\$31.24/mo For 24 months Apple Watch Series 4 GPS + Cellular, ... Verizon Wireless</p>	 <p>\$14.00 NEW Z60 PLUS Smart Watch Phone... Wish</p>	 <p>\$69.! Pemi Watch Moder</p>
---	---	---	--	--	--	--	--	---

 <p>Bluetooth Smart Fitness Sm... amazon.co.uk</p>	 <p>T6 Smart Watch Bluetooth ... walmart.com</p>	 <p>Smart Watches HSN hsn.com</p>	 <p>Smart Watch Touch Screen ... amazon.com</p>	 <p>Fitness Tracker Smart Watch... amazon.com</p>	 <p>Smart Watch V8 Men Bluetoo... aliexpress.com</p>	 <p>SW98 Smart Watch Bluetooth... dhgate.com</p>
---	---	--	---	--	---	---

 <p>Next NA Smart Watche... snapdeal.com</p>	 <p>The Best Smartwatches For M... esquire.com</p>	 <p>2019 New Smart Watch Men ... dhgate.com</p>	 <p>Amazon.com: Smart Watche... amazon.com</p>	 <p>Kids Smart Watches with GPS ... walmart.com</p>	 <p>Casio Pro Trek WSD-F30 Review Digital ... digitaltrends.com</p>	 <p>Buy Samsung G argos.co.uk</p>
---	---	--	--	--	--	--

FDA Approved: Apple Watch 4



Apple Watch 4 Functions:

• Activity	• Now Playing
• Alarm	• Phone
• Battery	• Podcasts
• Breathe	• Radio
• Calendar	• Reminders
• Date	• Remote
• ECG	• Stocks
• Find My Friends	• Stopwatch
• Heart Rate	• Sunrise/Sunset
• Home	• Timer
• Mail	• Walkie-Talkie
• Maps	• Weather
• Messages	• Weather Conditions
• Moon Phase	• Workout
• Music	• World Clock
• News	



Clinical Diagnosis Devices – The Otoscope



Physicians use otoscopes to screen for inner ear and other problems. The digital otoscope is used in telemedicine to inspect the inner ear, capture digital images and videos and share this visual data with other treating physicians.

Googling: "Remote ECG Monitoring"

wireless

cardiac telemetry

atrial fibrillation

wearable

holter

cardiocre

smartphone

wifi


holter monitor

electrocardiogram

blood pressure

patient monitoring system


Sponsored



\$349.00
Eko DUO ECG + Digital Stethoscope
Eko




\$1,995.00
Cardioline Microtel - Portable Wireless 1...
Medical Device Depot




\$49.95
iOximeter Smartphone Pulse...
Concord Health Sup...




\$109.99
NetBotz Wireless Temperature Sensor
APC by Schneider El...




\$39.20
B51 ECG Heart Rate Blood Pressure...
Yiwa




\$373.50
Sensaphone 400 (CottageSitter)...
DIYControls.com



\$799.00
EMOTIV EPOC+ 14 Channel Mobile EEG
Emotiv



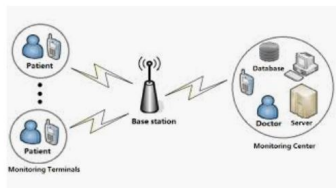
\$47.60
L7 Bluetooth IP68 Waterproof ECG...
Yiwa



\$205.99
Generac GNC-6664 Wireless Remote In...
Max Tool
★★★★★ (24)



\$59.95
Portable E Monitor FL PulseOxim



Electrocardiogram Monitoring System ...
browardcountymedicalassociation.org



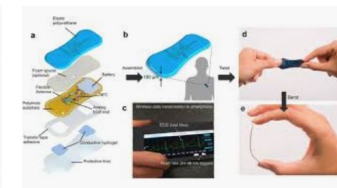
Wireless remote monitoring: the future ...
news-medical.net



ECG Wireless Remote Access | DAIC
dicardiology.com



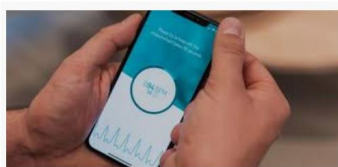
A Tele-Electrocardiographic Monitoring ...
austinpublishinggroup.com



wearable, and disposable cardiac ...
nature.com



ecg@
medg



ECG Wireless Remote Access | DAIC
dicardiology.com



Spider Wireless ECG: Wearable ...
youtube.com



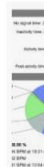
Figure 1: AliveCor® Heart Monitor iPhone® case.
eplabdigest.com



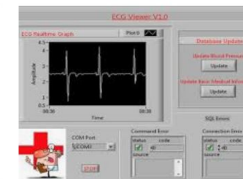
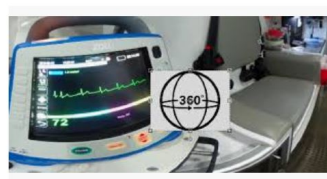
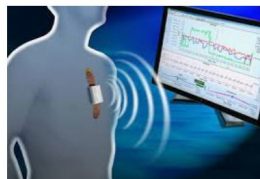
Smart Wearable ECG EKG Monitor - QardioCore
getqardio.com



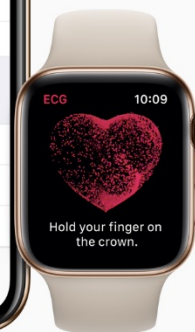
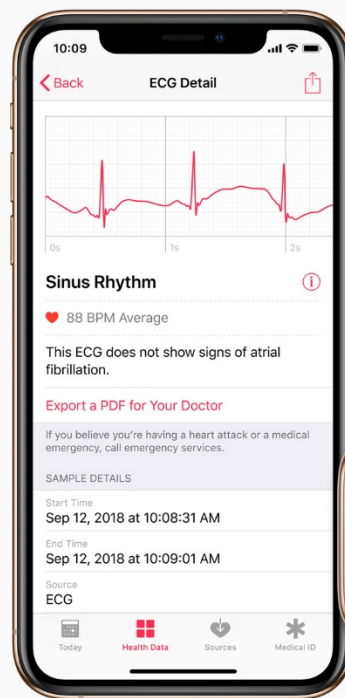
Cardiac Telemetry Wifi E...
alibaba.com



Cardia
dicardi



Apple Watch 4 – ECG Monitoring

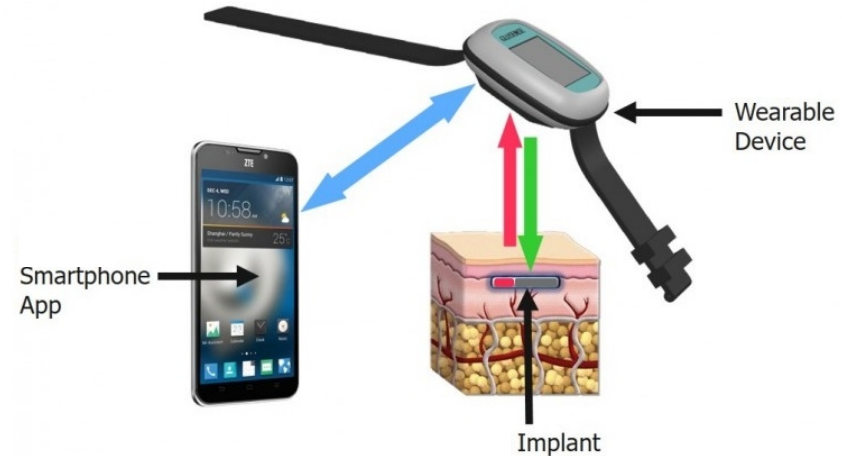


“New electrodes built into the back crystal and Digital Crown on Apple Watch Series 4 work together with the ECG app to enable customers to take an ECG similar to a single-lead reading.” Apple Marketing

Remote Glucose Tracking for Diabetes



The Dexcom G6 monitoring system, awaiting FDA approval, monitors levels of interstitial glucose under your skin.



The Glyde CGM is a glucose-monitoring implant inserted just under the skin and an external, wearable device. It continuously measures glucose levels and communicates data wirelessly to the wearable device and smartphone.



Medicare CPT Codes for Telehealth

In the past two years CMS has published four CPT codes for Remote Physiologic Monitoring (RPM)

- CPT code 99453 - Weight, blood pressure, pulse oximetry, respiratory flow rate, set-up and patient education on use of equipment
- CPT code 99454 - Weight, blood pressure, pulse oximetry, respiratory flow rate, devices supply daily recordings or programmed alerts
- CPT code 99457 - Clinically qualified healthcare professional interactively communicating with the patient/caregiver
- New CPT code 994X0 - Clinically qualified healthcare professional interactively communicating with the patient/caregiver for an additional 20 minutes



Some Conclusions on the Future of Telehealth



Some Concluding Remarks

Despite the increasing sophistication of telecommunication technologies and speed of transmission, telehealth has done little to change the way physicians practice medicine.

- The use of interactive, synchronous video has changed little since the first telehealth networks in the 1960s
- The use of asynchronous store and forward technologies to read digital files corresponds to reading x-rays

Major changes brought about by telehealth technologies:

- Geographic reach opens greater access to health care services in remote, rural and isolated urban areas
- The increasing speed of communications allows for higher resolution video and faster turnaround time for diagnostic results



Telecommunications - Transforming Health Care

- 1) The unique innovations in clinical devices attached to the interactive telehealth network will continue to extend the reach of physicians by offering better visual resolution sophisticated measurement for diagnostic decisions.
- 2) Major innovations in the provision of health care will come about through the use of mobile devices and remote monitoring for telehealth. These two will continue to merge.
- 3) Health care providers will increasingly rely on telehealth technologies to conduct clinical activities and will adapt to the increasing power of the technical systems they use.
- 4) Rural communities will experience expanding access to health care services as telehealth technologies are introduced and made readily available.



Post-Presentation Questions

Post Presentation Question 1

Are telehealth regulations consistent across America?

- A. Yes
- B. No
- C. Somewhat
- D. Maybe
- E. Don't Know

Post Presentation Question 2

Which of the following modalities is not considered a telehealth solution?

- A. Synchronous audio-visual communications
- B. Store and forward communications
- C. Telephone interactions
- D. Remote monitoring
- E. Don't Know

Post Presentation Question 3

Can telehealth services be implemented before there are state regulations defining its activities?

- A. Yes
- B. No
- C. Sometimes
- D. Maybe
- E. Don't Know

Post Presentation Question 4

What is the greatest barrier to implementing telehealth in Florida?

- A. Reimbursement for services
- B. Lack of fast Internet connection
- C. Concerns about privacy and security
- D. Restrictions on health care licensing
- E. Don't Know

Thank you for your attention.

Questions?



Christopher B. Sullivan, PhD
Image Research, LLC
cbsullivan@imageresearch.com
850-591-2821

This presentation, with notes, is available at:

www.imageresearch.com/telepharmacy