Breakout Session:
Technology for Telehealth

January 21, 2021 at 3PM ET/12PM PT

Learning Objectives/Overview

By the end of this session, participants will be able to:

- Describe necessary software and infrastructure for effective telehealth service delivery of HIV clinical care services
- Identify potential HIPAA-compliant technology that can be utilized for telehealth delivery
- Describe upcoming technological advancements and opportunities for telehealth

*Submit questions through the Q&A chat box. Questions will be facilitated at the end of the session.*
Introductions - Speakers

Madhuri J. Lad, DO, FACOI, AAHIVS
Asst. Medical Director
Okl. State University
Internal Medicine Specialty Services

Michael Snyder, PhD
Chairman & Professor, Department of Genetics
Director, Center for Genomics and Personalized Medicine

OSU Telemedicine

Madhuri J. Lad, DO, FACOI, AAHIVS
Assistant Medical Director
Oklahoma State University Internal Medicine Specialty Services
Learning Objectives

- ● Describe necessary software and infrastructure for effective telehealth service delivery.
- ● Identify potential HIPAA-compliant technology that can be utilized for telehealth delivery.
- ● Describe upcoming technological advancements and opportunities for telehealth.

OSU Internal Medicine Specialty Services Clinic

*Established in September 1996 in Tulsa with telemedicine since 2014 for rural areas

*Cared for over 3000 HIV-positive persons since 1996

*Coverage of the eastern half of the state of Oklahoma with Ryan White funding
Patient Case

- 55M, HIV-positive in Poteau, OK
- Barrier - transportation
- Treated with Reyataz/Norvir/Descovy
- CD4=300, VL<20 (scanned)
- Cough - Azithromycin and Flonase prescribed yesterday
- Rash - “itchy spot” on right leg
- Telemed appt
- Labs & appt in Poteau
- Rx refills e-scribed
- Meds/labs reviewed with pt
- Interaction between Flonase and Norvir discussed
- Stethoscope - lungs clear
- Dermascope used to diagnose and treat tinea corporis

Barriers to HIV Care

- Mental Health
- Substance abuse
- Nutrition
- Transportation
- Housing
Mobile Telemedicine Clinic

© 2010 Oklahoma State University
Comparison: Polycom vs. Zoom

**POLYCOM**
- Expensive $4000-$5000 for unit and annual fee
- High quality camera
- More difficult set-up and use
- Requires updates
- Limited use

**ZOOM**
- Cost effective
- Easy to use
- Use on desktop, laptop, tablet, or cell phone
- Less equipment
- Multi-purpose platform
Custom Quote

Date of Quote: 6/10/2015
Quote #: 10277-42117-68325
Revision #: 1
Customer: OSU Center for Health Sciences
Room Name: Quote A
Contact: Steve Casady
Address: 1111 W 17th S
Tulsa, Ok 74107
Expiration Date: 7/10/2015
Account Executive: Greg Marlas
Phone: (918)521-5131
Opportunity #: E&I CNR01317

Total: $6,333.70

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<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
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<td>Avizia HORUS Scope + 3 Cam (Gen/Oto/Derm) Bundle</td>
<td>6,500.00</td>
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<td>AVZ-HS-BUNDLE-ACS</td>
<td>Avizia Core Service - Avizia HORUS Scope + 3 Cam (Gen/Oto/Derm) Bundle</td>
<td>650.00</td>
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Section Subtotal: $6,333.70

Welcome to Littmann® TeleSteth™

STETHOSCOPE
January 2021

HealthHIV’s TeleHealthHIV Summit
Elevating the standard of stethoscope monitoring.

Eko Digital
The Electronic Stethoscope, Perfected.

Duo ECG & Digital Stethoscope
-Captures both ECG tracings & heart sounds
-User friendly interface design
-Ambient noise reduction
-FDA cleared & HIPAA compliant
-Easy for patients self monitor, when prescribed

Stethoscope only

Stethoscope and ECG
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### Equipment costs

- Cart with monitor $5000
- Steth program $1200
- Steth + ECG $400
- Scopes $7000
- Zoom

- Total = $13,600

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### Staff

- **Telemedicine bus driver** requires a commercial driver’s license and competent with technology of equipment, software, and connectivity
- **Nurse** required for rooming (vitals, med rec, PHQ-9) and needs to be competent with equipment. Documentation in EMR.
- **Physician** needs to be competent with the equipment and coding
Challenges

- Weather or mechanical issues for bus, maintenance and fuel costs
- Wifi and stethoscope connectivity
- Software updates
- Inexperienced staff on telemedicine equipment
- Cancelled appointments or “no shows”
- Secure site location of bus & Storage of bus when not in use
- Referrals in rural areas
- Time spent driving to and from location
- Inefficient use of time of bus driver/IT and nurse

Overcome Challenges

- Reschedule due to weather or mechanical issues for telemed bus
- Wifi hotspot or direct cable connection to local network
- Use of cell phones if Wifi connectivity issues
- Anticipation of software updates
- Use of earbuds instead of stethoscope improved sound/connection
- Education of staff on telemedicine equipment
- Secure and discrete location of bus and test signal strength
- Contract with hospital for use of building space for telemedicine
Eastern Oklahoma Medical Center in Poteau

Caring Hands FQHC in McAlester
Connectivity Issues

• Test area for signal strength. Weather, trees, and buildings all affect signal strength.
• Direct cable connection to a local network is best. Usually difficult to obtain due to security issues.
  • Wifi on the telemed bus
  • Hotspot
  • Multiple cell signals (AT&T, Verizon)

PROS AND CONS OF TELEMED

**PROS**
• Convenience
• Affordable
• Saves time and transport

**CONS**
• Connectivity issues
• Loss of personal touch
• Difficult for complicated cases
• Limited physical exam
Future Goals

• Secure signed contract with outlying hospitals for use of space
• Combine HIV telemedicine days with other OSU departments to share expenses
• Recruit additional patients to reduce barriers to care
• Offer other services, such as counseling or test and treat programs
• Coordinate with FQHC’s to refer new HIV positive patients in rural areas for care through telemedicine
• Start a third telemedicine location in eastern Oklahoma
• Share our experiences with other programs

Thank you to my telemedicine staff!

Madhuri J. Lad, DO, FACOI, AAHIVS
Assistant Medical Director
Oklahoma State University Internal Medicine Specialty Services
Detection of COVID-19 and RVI Using Wearables

Michael Snyder
Stanford University

January 21, 2021

Conflicts: Personalis, Genapsys, SensOmics, Qbio, January, Protos, Fitricine, Mirvie, Oralome

United States COVID-19 Cases

From Rob Jackler

January 18

1st Surge Peak
April 10
7-Day Ave 31,709

2nd Surge Peak
July 23
7-Day Ave 66,794

Quarter of a Million Cases per Day

Jan 18 7-Day Ave 300,594

Peak Day
Jan 8

Current Test: PCR

- Slow (2-3 days)
- Expensive ($120/test)

Wearable Sensors: Over 900 Devices

- Worn by millions of people (20% of US)
- Make 100Ks of measurements each day

Li, Dunn et al., PloS Biol 2017
Sensors Make Many Types of Measurements

HR, HRV, Respiration Rate, SpO2, Skin Temp, Blood Pressure

Li, Dunn et al. PloS Biol 2017

Longitudinal Personal Omics Profiling

Omics Measurements

Genome
Epigenome
Transcriptome
Proteome
Cytokines
Metabolome
Lipidomics
Autoantibody-ome
Microbiome (Gut, Urine, Nasal, Tongue, Skin)

Billions of Measurements!

Clinical Tests
Questionnaires
Stress Echos
Glucose Control

Biosensors

109 Individuals

Year 1
Viral infection
Year 2 ...
8 yrs
49 Major Health Discoveries

**Metabolic**
- 1 MODY mutation (gene)
- 1 ABCC8 Mutation (gene)
- 14 New Diabetes

**Cardiovascular**
- 6 Carotid Plaques (imaging)
- 1 Atrial Fibr. (wearable)
- 1 RMB20 mutation (gene)
- 1 Reduced LVEF/GLS (imaging)
- 3 Dilated L. Atrium (imaging)
- 1 Pharmagenomic (gene)

**Other**
- 1 Sleep Apnea (wearable)
- 1 SLC7A9 mutation (cystinuria risk)
- 2 Macroalbuminuria

**Infectious**
- 1 Lyme Disease (wearable)

**Heme/Onc**
- 7 Oncologic Risk Genes
  - (Thyroid Cancer in 1)
- 1 Lymphoma (Imaging)
- 1 MGUS (IgM)
- 1 Smoldering Myeloma (IgM)
- 1 α Thalassemia (Clinical)
- 1 β Thalassemia (Gene/Clinical)
- 1 Pros1 Mutation (gene)

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**Early detection of Lyme disease**

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Digital Health: Tracking Physiomes and Activity Using Wearable Biosensors Reveals Useful Health-Related Information


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HealthHIV's TeleHealthHIV Summit
Detects All Days of Illness

Li, Dunn et al. PloS Biol 2017

COVID-19 Infectious Disease Study

Launched IRB Approved Study

Partnering with Leading Companies E.g. Fitbit, Garmin

>5000 Enrolled >30 COVID-19 Positives (Golden dataset)
Identifying COVID-19 at early stage

https://innovations.stanford.edu

Algorithm Predictions of COVID-19 Illness
Summary of Early Detection

Elevated Heart Rate: 7 Beats/Min

Phase 2: Online Real-Time Detection - CuSum

ASFODQR (COVID-19 positive)

AJWW3IY (COVID-19 positive)

Holiday bump

AR4FPCC (Other illness)

AFEFA29 (Healthy)
My Health Dashboard UI

- Visualize and monitor your health data at different resolutions

https://innovations.stanford.edu

Personal Health Dashboard: Managing big data in real time

**Big Data Challenges**

- **Scalability**
  Fast and efficient processing, managing storing of bioinformatics workloads, and recruiting millions of participants (UI/UX)

- **Interoperability**
  Ability to run analytical pipelines and process/move data across multiple platform (e.g., wearables, cloud provides)

- **Security**
  Protect both data and analytical processes from any malicious activities

**Big Data Needs**

- Acquisition
- Storage
- Distribution
- Analysis

**Precision Medicine**
COVID-19 Infectious Disease Studies

Pre-symptomatic detection of COVID-19 from smartwatch data


Nature Biomedical Engineering 4, 1208-1220 (2020) | Cite this article

Wearable sensor data and self-reported symptoms for COVID-19 detection

Giorgio Que, Jennifer M. Radin, Matteo Gadaleta, Katie Baca-Motes, Lauren Airriello, Edward Ramos, Vik Kheterpal, Erik J. Topol & Steven R. Steinhardt

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Feasibility of continuous fever monitoring using wearable devices

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34k Accesses | 3 Citations | 657 Altmetric | Metrics
COVID-19 Infectious Disease Studies

Pre-symptomatic detection of COVID-19 from smartwatch data


Nature Biomedical Engineering 4, 120921 (2020) | Open Access | Published: 16 November 2020

64K Accesses | 4 Citations | 963 Downloads

Wearable sensor for symptoms of COVID

Benjamin L. Smart, Giorgio Quer, Jennifer M. Radin, A. Gilchrist, Karen Puk, Ramos, Vik Khetrapal, Eric J. Topol

Scientific Reports 11

Nature Medicine 27, 73-77(2021) | Citable this article

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Feasibility of continuous fever monitoring using wearable devices

Title: Longitudinal Physiological Data from a Wearable Device Identifies SARS-CoV-2 Infection and Predicts COVID-19 Diagnosis

Authors: Robert P. Hirt, MD2,3, Matteo Danieleklo PhD3, Lewis Tomalin PhD4, Kate Hyewon Choi MS5, Minxi Zheng MPh6, Eddy Galden MPh6, Sapnasreeka Kaur BBA7, Dree Holmes MPH7, Anthony Bello BA1, Renata Flyzik MS8, Ismail Nabeel MD9, Alexander Charney MD10,11, Benjamin Goldenberg PhD11, Matthew Leon MD, David Reich MD12, Dennis Charney MD12,13, Erin P, Böttinger MD14, Laurie Keuter PhD15, Maye Suissa-Farias PhD16, Siméon N. Naidi MD11,12, Zahi A. Fayad PhD11,12

Affiliations:
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Summary

1. COVID-19 is associated with alterations in heart rate, steps, and sleep
   85% detection

1. Built an online detection system for detection of COVID-19 in real time
   63% detected before or at symptom onset in “real-time” algorithm

3. Set up a system to scale to millions of people

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