Polling Question

• Are you currently using video DOT in your practice?
  - Yes
  - No
  - Not yet, but planning on it
Objectives

- Describe at least two options for utilizing video-based DOT;
- Discuss factors that affect the implementation of video-based DOT; and
- Apply the lessons learned from several healthcare programs who use video-based DOT

Faculty

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Clark County Public Health
Vancouver, WA
Polling Question

- What systems do you use for video DOT? (check all that apply)
  - Mobile phone
  - Tablet
  - Computer with webcam
  - Other
Polling Question

- What apps do you use for video DOT? (check all that apply)
  - Skype
  - FaceTime
  - Tango
  - ooVoo
  - Fusebox
  - Other
Monitoring TB Medication Adherence

• Purpose:
  – Document whether or not doses were taken
  – Encourage treatment completion

• Goals:
  – Reduce TB morbidity and mortality
  – Prevent TB transmission
  – Prevent acquired drug resistance

**First Line TB Treatment**

**Initial phase (8 weeks):**
- 4 drugs daily (~500 pills)

**Continuation phase (18 weeks):**
- 2 drugs daily (~500 pills)

~1000 pills over 6 months


**Global TB Treatment Burden**

2 Billion Doses
11 Billion Pills
90% of cases can be cured with 1st line antibiotics, but adherence is critical.

- Contributors to poor adherence:
  - Long treatment regimens
  - Side effects
  - Contraindications with other medications and alcohol

- Poor adherence $\rightarrow$ drug resistance (MDR/XDR-TB)
  - Second line drugs more toxic and less effective
  - Drastically increases treatment time and costs
  - Transmission of resistant strains

Countries and territories reporting at least one case of XDR-TB by end of 2012, WHO

XDR-TB is TB that is resistant to INH, RIF, $\geq 1$ fluoroquinolone and the injectable antibiotics.
Directly Observed Therapy (DOT)

- Patient observed swallowing each dose of medication

- Recommended by the CDC and WHO:
  - Improves adherence
  - Reduces risk of acquired drug resistance, treatment failure, and relapse
  - Permits intermittent dosing
  - Reduces total number of doses

DOT Limitations

- Cost
- Human resources (100-200 person-hours/pt)
- Transportation
- Impractical for rural patients
- Coordination b/w patient and provider
- Restricts patient mobility
- Privacy and stigma concerns
- Patients feel patronized
Indirect Monitoring Technology

- Count the number of doses dispensed (MEMS Caps, GlowCap, etc.)

Direct Monitoring Technology

- Drug metabolite testing (blood, urine, hair, toenails)
- Patient-facilitated tracking (Adhere.IO, Pill Apps)
- Embedded sensors (Proteus)
Videophone DOT Experiments

- 6 patients for up to 6 months
  - 95% adherence
  - High patient satisfaction; ease of use
  - Saved $1810/pt in staff and miles

San Diego (2004)
- 33 patients over 9 month period
  - High patient acceptance
  - Saved 27,840 travel miles ($10,161)
  - Saved 795 staff hours ($15,000)

Disadvantages:
- Limited to business hours
- Patient must be at home
- Fewer patients have landline phones
- Problem for San Diego’s mobile binational patients

DeMaio, C/D 2001;33:2082-2084
Bethel and Moser, ATS Conference, San Diego, CA, May 2006
Live Via Internet/Phone

Recorded Videos

“Mobile Phone-Based Video Directly Observed Therapy (VDOT) for Tuberculosis”
VDOT Study Results: Acceptance

<table>
<thead>
<tr>
<th></th>
<th>San Diego (n=41)</th>
<th>Tijuana (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you find VDOT more or less confidential than in-person DOT?</td>
<td>More 33 (80)</td>
<td>7 (78)</td>
</tr>
<tr>
<td></td>
<td>No Difference 6 (15)</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Less 2 (5)</td>
<td>2 (22)</td>
</tr>
<tr>
<td>Did you ever fail to record a video because you were worried that someone else was watching?</td>
<td>No 40 (98)</td>
<td>9 (100)</td>
</tr>
<tr>
<td></td>
<td>Yes 1 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>If you had to redo your TB treatment, would you choose VDOT or in-person DOT?</td>
<td>VDOT 38 (93)</td>
<td>8 (89)</td>
</tr>
<tr>
<td></td>
<td>No Preference 2 (5)</td>
<td>1 (11)</td>
</tr>
<tr>
<td></td>
<td>In-Person 1 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Would you recommend VDOT to other TB patients?</td>
<td>Yes 41 (100)</td>
<td>9 (100)</td>
</tr>
<tr>
<td></td>
<td>No 0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>As a result of participating in the study, are you more comfortable using a smart phone?</td>
<td>More 28 (68)</td>
<td>8 (89)</td>
</tr>
<tr>
<td></td>
<td>No Difference 13 (32)</td>
<td>1 (11)</td>
</tr>
</tbody>
</table>

Cost Analysis

- **VDOT costs** based on pilot study data
  - Included staff salaries, transportation, phones and service
  - No charge for use of VDOT application included in costs
- **In-person DOT costs** based on TB program records
  - Included staff salaries and transportation

<table>
<thead>
<tr>
<th>Site</th>
<th>In-Person DOT Cost</th>
<th>(95% CI)</th>
<th>VDOT Cost</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Diego</td>
<td>$4,167</td>
<td>($3,634-$5,780)</td>
<td>$1,293</td>
<td>($700-$1,937)</td>
</tr>
<tr>
<td>Tijuana</td>
<td>$458</td>
<td>($336-$652)</td>
<td>$174</td>
<td>($111-$600)</td>
</tr>
</tbody>
</table>
Smartphone Market Share: Devices Make Up Almost Half Of All Phones
-- The Huffington Post 03/30/2012 --

U.S. Smartphone Penetration

February 2012, Nielsen Mobile Insights

Possible Ways to Improve Adherence

- Enhanced SMS reminders/ motivators
- Voice calls for direct patient contact
- Push videos for patient education and motivation
- Link to Personal Health Record
Future Considerations

• Security and HIPAA compliance
• Cost (patient’s and provider’s)
• Acceptability of various technologies
• Best mix of approaches for population served
• Best practices for use of technology
• Policy around insurance/Medicaid reimbursement
• Long term outcomes

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Polling Question

• What are some of the challenges you anticipate for using video DOT?
  - Confidentiality
  - Privacy Concerns
  - Technical issues
  - Training staff
  - Reimbursement
  - IT issues
  - Other

Video DOT:
Implementation & Challenges

May 1, 2014

Teresa Casey, RN, BSN – Barren River District Health Department
Carolyn Lyons, RN, BSN - Barren River District Health Department
Derel Glasheower, MPH – Clark County Public Health
Joshua Van Otterloo, MSPH - Clark County Public Health
Patricia Woods, RN, MSN – New Jersey Department of Health
Christine Chuck, MPA– New York City Department of Health & Mental Hygiene
Barren River District Health Department
Bowling Green, KY

• Experience:
  – Implemented in 2011
  – Client had business in Brazil and requested alternative to DOT to prevent extension of treatment
  – BRDHD innovative and forward thinking- administration gave consent to implement
  – BRDHD developed protocol to prevent client pocketing or palming medication
    – Medication and both hands in visual fields at all times during Internet DOT (IDOT)
    – Oral cavity check after last pill

Barren River District Health Department Bowling Green, KY

• Systems Used:
  – Logitech (No longer available)
• Future Systems to be utilized:
  – Skype
  – FaceTime
Barren River District Health
Department Bowling Green, KY

Challenges:
  Solutions:
  – 1. Reliability of client
      • Must complete initial phase of treatment without issues
  – 2. Language barrier
  – 3. Lack of technology or internet access
      • Web camera loaned to client after signing agreement
  – 4. Client inability to use technology
  – 5. Technical glitches
      • Self-administer
      • Emergency medicine packets kept at LHD

* When all else fails, revert back to face to face DOT

Clark County Public Health
Vancouver, WA

• Experience:
  – Used electronic DOT since 2009
  – First suggested by a patient
  – Variety of programs (Skype, ooVoo)
  – Real time and recorded
  – Started slowly, now the preferred method
Clark County Public Health
Vancouver, WA

• Who is eligible:
  – Willing and able
  – Not MDR-tuberculosis
  – Completed initial phase of treatment
  – No medication intolerance or adherence concerns
  – Ultimately a decision by TB team

• When we stop:
  – Adherence concerns
  – Medication intolerance
  – Patient decides

Clark County Public Health
Vancouver, WA

• Challenges:
  – IT department
  – Reimbursement
  – Confidentiality / HIPAA
    • Security Rule interpretations vary
    • Recorded vs. real-time
    • Encryption
Clark County Public Health
Vancouver, WA

• Overcoming Challenges:
  — Staff acting as advocates
  — Leadership buy-in goes a long way
  — Reimbursement needs a legislative fix
    • BUT we save a lot of money doing electronic DOT
  — Mitigating Confidentiality / HIPAA
    • Informed consent
    • DOT is the only thing done over the internet
    • Real-time only
    • Searching for HIPAA-compliant software

New Jersey Department of Health
Trenton, NJ

• Experience:
  — Initially started in 2006 with analog video phone DOT
  — In 2011 counties in NJ started using other remote forms of DOT
  — Seven out of 21 counties have implemented this in their clinics
  — Thirty patients to date have had been placed on VDOT
  — A 93% compliant rate has been reported with only two patients that had to be returned to face to face DOT
  — All the clinics felt it was a overall successful experience that reduce field time and increased compliance
  — Patient’s were able to receive DOT during Hurricane Sandy, during inclement weather, while on vacation or abroad
New Jersey Department of Health
Trenton, NJ (2)

• Systems Used:
  – Analog video phone
    • Has become obsolete for most patients
  – Skype
  – FaceTime
  – Tango
  – ooVoo

New Jersey Department of Health
Trenton, NJ (3)

• Challenges
  – Access to WiFi and connectivity
  – Patients being inconsistent with their DOT times or calling too late at night
  – Procuring the equipment for the clinic and/or the patient
  – Counties have a block on downloading the needed applications on their computers
    • Computers may not have a camera on their PC
New Jersey Department of Health
Trenton, NJ (4)

• Pros
  – Decreased missed doses/increase compliance
  – Accommodates patient work schedule
  – Can decrease staff time (travel, gas, vehicles)

New York City Department of Health &
Mental Hygiene

Unique Position of Offering Two Forms of VDOT

1. Live- streaming VDOT
   • Patients ingest medication remotely using a smartphone programed conferencing software (FuzeBox) while the DOT worker observes remotely

2. Recorded VDOT
   • Patients record themselves ingesting medication
   • Observer reviews video later
New York City Department of Health & Mental Hygiene

- VDOT was offered to eligible patients receiving treatment for suspected or confirmed TB disease
- Patients were ineligible for DOT if they were:
  - Hospitalized
  - Incarcerated
  - Receiving injectable anti-TB medications
  - Residing in nursing homes

New York City Department of Health & Mental Hygiene

Upon enrollment:
- Patients are loaned a smartphone programmed with Fuzebox
- Patients are assigned a unique conference number
- Observation schedule is confirmed
- Patients receive training on how to:
  - Hold medication bottles in front of the camera
  - Pour the medication in front of the camera
Challenges and Resolutions (1/2):

1. Securing mobile phones with service and data plans
   • Received in kind donation of 25 smart phones with data plans via Verizon Foundation & UCSD

2. Identify a video conferencing application acceptable to our IT Department
   • Skype and Tango were disapproved
   • FuzeBox was approved

New York City Department of Health & Mental Hygiene

Challenges and Resolutions (2/2):

• Initial FuzeBox Limitations:
  - Required six steps to start a conference
  - Allowed only one person to host a meeting

• FuzeBox-VDOT Customization:
  - Create a Public and Private meeting space
  - Create a one-touch application

• Patient’s excessive data usage with VDOT phones
Polling Question

- Assuming the level of adherence is similar to in-person DOT, what is the cost per patient, per month that a health department would be willing to pay for Video DOT?
  - <$50
  - $51-$75
  - $76-$100
  - $101-$150
  - $151-$200
  - $201-$250
  - $251-$300
  - >$300

Video DOT: Case Studies & Outcomes

May 1, 2014

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Barren River District Health Department Bowling Green, KY

• Case Study
  – 64 y/o male
  – Received treatment for 1 year, Sept. 9, 2011 – Aug. 15, 2012
  – Lived 50.25 miles from BRDHD
  – Staff time:
    • Home visit 2.3 hours
    • IDOT 10 minutes
  – Initial phase and monthly screenings done face to face
  – Completed 126 IDOTs
    • First IDOT 1/20/12

Barren River District Health Department Bowling Green, KY

Outcomes
  – Gas savings @ $0.42/mile reimbursement $5318.46
  – Staff time saved:
    • 289.8 hrs vs. 21 hrs = 268.8 hours
    • 37.5 hr work week = 7.168 weeks
  – Window period for DOT visit decreased from potential
    2 hour wait to 30 minutes
• Case Study
  – Original electronic DOT patient
  – Foreign-born, male, in his 40’s
  – International preacher with spinal TB
  – Regularly used online video software for business and family
  – Given his long treatment and significant life disruption of DOT, he suggested electronic DOT
  – Electronic DOT for 9 months
    • Recordings from multiple states and countries

• Evaluation of cases since 2009
  – 52 tuberculosis cases
    • 12 did electronic DOT
    • 1,016 electronic doses
  – More likely to be younger and male
  – Cases used electronic DOT in a variety of ways
    • Entire continuation phase
    • Travel / vacation
    • Convenience
Clark County Public Health
Vancouver, WA

• Evaluation of cases since 2009
  – Effectiveness
    • Looked at treatment completion, missed doses, treatment interruptions, hospitalizations, deaths
    • All electronic DOT patients completed treatment
    • Electronic doses were no more likely to be missed
    • No difference in interruptions, hospitalizations, death

Clark County Public Health
Vancouver, WA

• Evaluation of cases since 2009
  – Effectiveness
  – Cost
    • Looked at time spent observing DOT, travel time, mileage
    • Since 2009, saved over $28,000
      – $28.11 a dose
      – $2,380 a patient
    • Expanded latent TB infection treatment in the county
    • Began a tablet computer loaner program
Clark County Public Health
Vancouver, WA

• Evaluation of cases since 2009
  – Effectiveness
  – Cost
  – Program Benefits
    • Decrease burden on patients
    • Managing travel and inclement weather
    • Greater staff flexibility

Clark County Public Health
Vancouver, WA

• Case Study
  – Foreign-born adoptee, female, age 2
  – Suspect pulmonary TB, treated empirically
  – Lives 45 minutes – 1 hour away, in the mountains
  – First tablet computer loaner patient
  – Challenges of DOT in young kids
    • It’s a process
    • Follow the medication
    • Challenges overcome by a motivated parent
  – Time savings: 2.5 hours vs. 10 minutes
Case Study

- 58 year old US born confirmed pulmonary TB case
- Was treated for pulmonary TB 20 years ago
- HIV positive for twenty years on medication
- Has cirrhosis of the liver
- History of drug and alcohol use twenty years ago

Case Study

- Patient is an amputee that is bedridden
- Lives with his wife and two dogs that have to be removed from the room when strangers visit
  - This made traditional DOT impossible because no one would be home daily to let health care worker (HCW) in
- The patient needs medical transportation to get to the clinic therefore the doctor sees the patient monthly in his home
New Jersey Department of Health
Trenton, NJ (3)

• Case Study
  – Tango was the application decided upon for VDOT because the patient already had the application on his phone
  – Tango has the capability to send a video which the patient does if HWC is unavailable or if there is a connection problem
  – Instrumental in conferencing with the MD during a rash on the patient's leg since the patient could not get to the clinic easily
  – Patient has been 100% compliant with daily call which not have been possible without VDOT

New York City Department of Health & Mental Hygiene

Case Study A

• 23 year old college student with TB disease
• DOT started in March 2013, 93% compliance
• In September the patient requested an earlier DOT, which was not available
• Patient was enrolled on VDOT (9/2013)
• During one VDOT observation patient reported “side effect” to TB medication – rash on arms
Case Study A (cont.)

Virtual Medical Consultation by a DOHMH physician:

• A BTBC physician provided on the spot medical consultation including a virtual examination of the patient’s rash
  – Patient was reassured that rash was not related to TB drugs and advised to continue medication

Case Study A (cont.)

• Face to Face DOT would require this patient to report to the clinic for a medical examination
  – time saved for patient and clinic resources
• Patient would have been placed on self-administered therapy if VDOT was not available
  – Requested time slot was not available
• Patient completed TB treatment on DOT
Case Study B

- 33 year old male with pulmonary MDR TB
- Enrolled on VDOT, traveled to California during his TB treatment
- Avoided involving California DOH to continue DOT
- Patient had uninterrupted DOT while in California

New York City Department of Health & Mental Hygiene

<table>
<thead>
<tr>
<th>Reason(s) for accepting VDOT</th>
<th>Total Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodate school hours</td>
<td>1</td>
</tr>
<tr>
<td>Accommodate work schedule</td>
<td>4</td>
</tr>
<tr>
<td>Convenient method</td>
<td>8</td>
</tr>
<tr>
<td>Location convenience</td>
<td>1</td>
</tr>
<tr>
<td>Preserve privacy</td>
<td>3</td>
</tr>
<tr>
<td>Time convenience</td>
<td>3</td>
</tr>
<tr>
<td>Travel</td>
<td>2</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>
Polling Question

- What proportion of your health department’s TB patients would likely be placed on Video DOT if it were available?
  - None
  - Up to 24%
  - 24% to 49%
  - 50% to 74%
  - 75% to 89%
  - 90% to 99%
  - All

Speaker

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Thank you for your participation!