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Global Tuberculosis Institute
NEW JERSEY MEDICAL SCHOOL

Strategies & Approaches for Video-Based Directly Observed Therapy (DOT)

May 1, 2014

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Rutgers, The State University of New Jersey

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Housekeeping

Polling Question

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

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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

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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

mHealth for Monitoring Tuberculosis Treatment Adherence

Richard S. Garfein, PhD, MPH

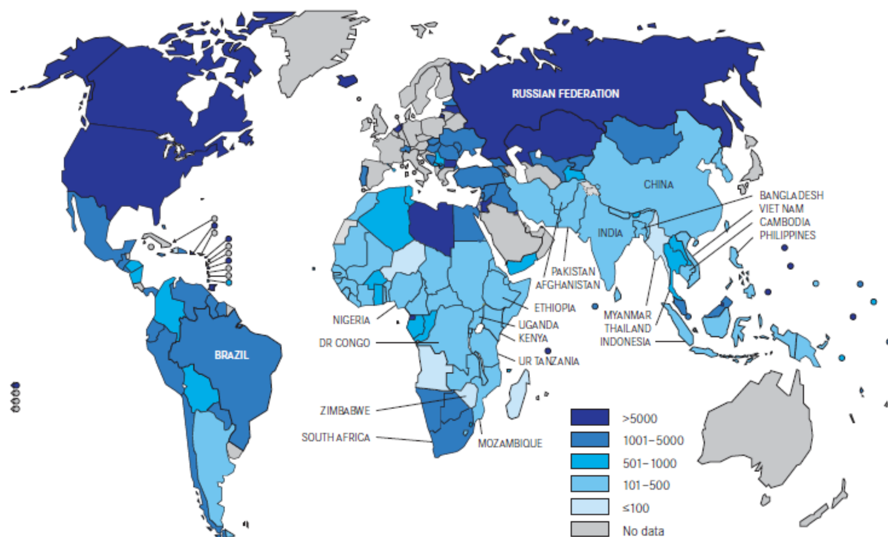
Rutgers Global Tuberculosis Institute
Webinar
May 1, 2014

UC San Diego
SCHOOL OF MEDICINE

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

Cost per TB patient treated with first-line drugs (US$), 2010



TB costs San Diego County >$8.6 million/year for ~300 cases (*Tuberculosis in the San Diego-Tijuana Border Region, International Community Foundation, 2010, http://www.icfdn.org*)

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

Isoniazid, Rifampin, Pyrazinamide, and Ethambutol pills

CDC, http://www.cdc.gov/tb/topic/treatment/tbdisease.htm

Global TB Treatment Burden

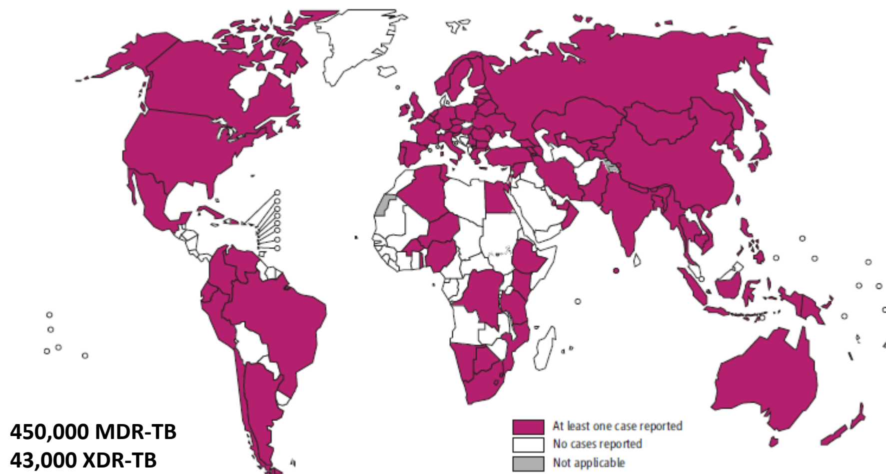
2 Billion Doses

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 → 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



450,000 MDR-TB
43,000 XDR-TB

XDR-TB *is TB that is resistant to INH, RIF, ≥1 fluoroquinolone and the injectable antibiotics.*

Directly Observed Therapy (DOT)

- Patient observed swallowing each dose of medication

Provider visits patient

Patient visits clinic

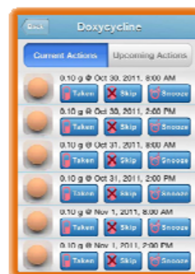
- Recommended by the CDC and WHO:
  - Improves adherence
  - Reduces risk of acquired drug resistance, treatment failure, and relapse
  - Permits intermittent dosing
  - Reduces total number of doses

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)

Video Phone DOT???

Videophone DOT Experiments

Washington (1998-2000)
- 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, *CID* 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

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

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

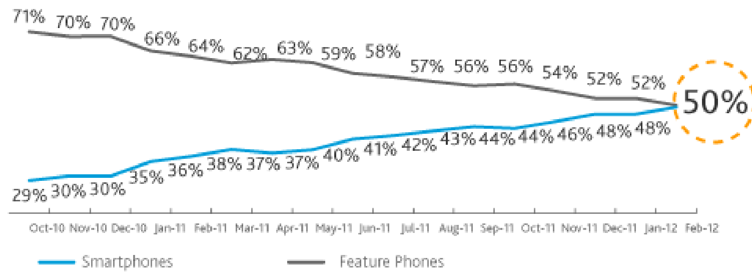
	In-Person DOT		VDOT	
Site	**Cost**	**(95% CI)**	**Cost**	**(95% CI)**
San Diego	$4,167	($3,634-$5,780)	$1,293	($700-$1,937)
Tijuana	$458	($336-$652)	$174	($111-$600)

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



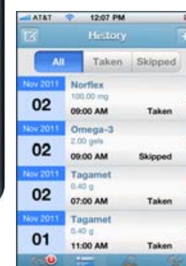
Read as: During February 2012, 50 percent of US mobile subscribers owned a smartphone

Source: Nielsen

nielsen

Possible Ways to <u>Improve</u> 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

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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 programed with Fuzebox
- Patients are assigned a unique conference number
- Observation schedule is confirmed
- Patents receive training on how to:

  - Hold medication bottles in front of the camera

  - Pour the medication in front of the camera

New York City Department of Health & Mental Hygiene

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

This project was supported by in kind donation provided by the Verizon Foundation through the UCSD.
Product names are provided for identification purposes only; their use does not imply endorsement by the NYC DOHMH.

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

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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

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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

Clark County Public Health
Vancouver, WA

- 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

Clark County Public Health
Vancouver, WA

- 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

New Jersey Department of Health Trenton, NJ

- 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

New Jersey Department of Health Trenton, NJ (2)

- 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 therefor 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 patients 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

New York City Department of Health & Mental Hygiene

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

New York City Department of Health & Mental Hygiene

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

New York City Department of Health & Mental Hygiene

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

Reason(s) for accepting VDOT	Total Patients
Accommodate school hours	1
Accommodate work schedule	4
Convenient method	8
Location convenience	1
Preserve privacy	3
Time convenience	3
Travel	2
Grand Total	**22**

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

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Thank you for your participation!