Adolescent Tuberculosis

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Disclosures

- I have no disclosures or conflicts of interest relevant to this topic to report
- I am on the DSMB for a South African study evaluating the efficacy of regiments for MDR-TB infection treatment in children
- I am an associate editor for *Pediatrics*

Objectives

- Describe the differences between adolescents and younger children and between adolescents and adults
- Summarize evidence for best practices in diagnosing and treating LTBI and disease in adolescents
- Identify potential strategies to apply these practices in your setting

The Adolescent Conundrum

Trait	Pediatric	Adult
Symptoms		x
Radiographic findings	x	
Difficulty in obtaining adequate specimens	x	
Difficulty in securing microbiologic diagnosis	x	
Concern for medication tolerance		x
Consideration for alternative methods of birth control		x
Infection control considerations / public health ramifications		x

Epidemiology

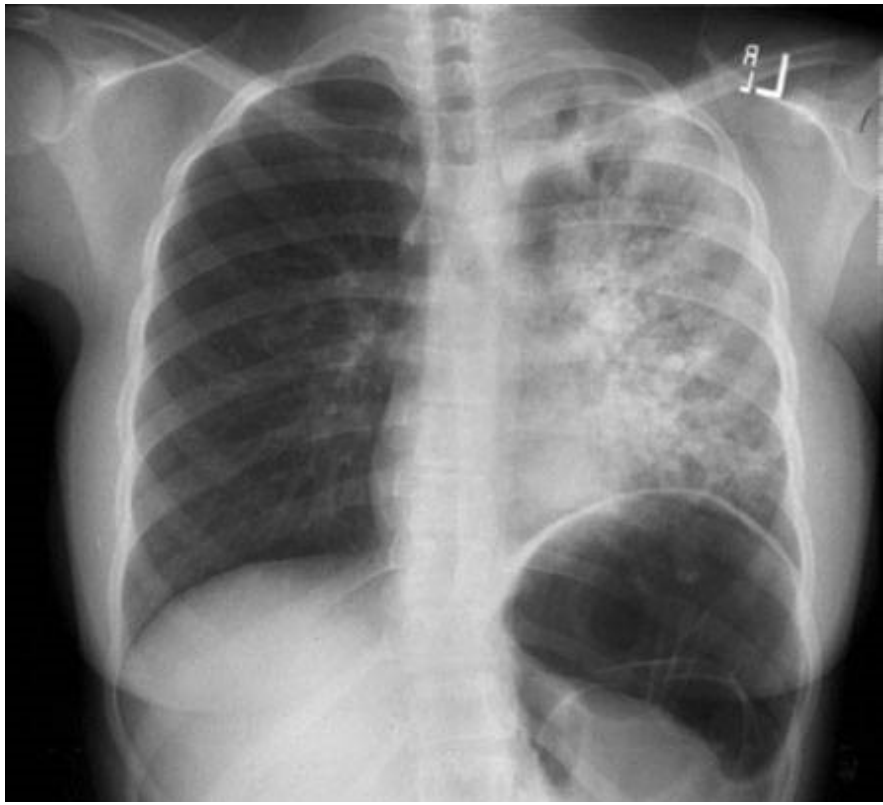
- **2008-2010, U.S.:** 2660 cases in persons < 18 yrs old
  - 29% were 13-17yrs old (2% of all US TB cases)
- **2020, Texas:** ~900 cases
  - 0-4y: 3%
  - 5-14: 3%
  - 15-24y: 11%

Variable	Total U.S. population	10-14y	15-19y
% of population	N/A	6.9%	7.1%
Foreign born	13%	5%	7%
Below poverty line	15%	19%	20%
Uninsured	16%	10%	15%

Pediatrics 2012;130:e1425; www.census.gov

Risk of Progression from TB Infection to Disease by Age

Age at infection (y)	No disease (%)	Pulmonary TB (%)	CNS TB (%)
<1	50	30-40	10-20
1-2	75-80	10-20	2.5
2-5	95	5	0.5
5-10	98	2	<0.5
>10	80-90	**10-20**	<0.5



Peds in Review 2010;31:13

CXR Findings in Adolescent TB

More common	Less common
Cavities	Mediastinal lymphadenopathy
Pleural disease	Miliary
More extensive parenchymal disease (less likely to be detected via active case finding compared to younger children)	

Braz J Infect Dis 2011;15:40

Microbiologic/PCR Yield, Pulmonary TB

Assay	Younger children	Teens	Adults
Smear-positivity*	2-3%	10-29%	43-72%
Culture-positivity*	4-7%	21-52%	66-75%
Xpert sensitivity	50-90%	?	76-95%
Xpert specificity	99%	?	95-99%

Pediatrics 2004;114:333; Pediatrics 2012;130:e1425; IJTLD 2012;16:1234; BMC Infect Dis 2013;13:31; Lancet Infect Dis 2013;13:36; Lancet 2011;377:1495

Tuberculosis in Adolescents

A French Retrospective Study of 52 Cases

Test	Result	% +
CXR	Any anomaly consistent with TB	83%
	Adenopathy	70%
	Infiltrates*	54%
TST	> 15 mm	83%
AFB	Smear	28%
	Culture	52%

Culture positivity: 23% at 12 years, **71%** at 18 years

Pediatr Infect Dis J 2006;25:930

Predictors of Smear-Positivity

- 78 adolescents, Taiwan
- Univariate analysis indicated risk factors for smear-positivity:
  - Cough > 4 weeks (aOR 13.8, 2.3-83)
  - Hemoptysis
  - Multilobar or lower lobe involvement (aOR: 12.6, 1.2-135)
  - Cavitations (aOR 7.7, 1-58)
  - Pleural effusions

IJTLD 2010;14:155

Treatment: Disease

- For larger adolescents, use ATS/CDC dosing schedule as opposed to Red Book schedule
- Routine use of B6 in adolescents
- Pregnancy test in all post-menarchal females prior to starting therapy

Challenges

- Medical:
  - Infection control
  - Medication tolerance
  - Lack of medical home
- Social:
  - Substance use and abuse
  - Stigma
  - Missing school, work

Infection Control

- Contact investigations: hospital, school, home, …
  - Same principles apply in all settings
- Lack of negative-pressure rooms in many pediatric facilities
- Complacency on part of pediatric providers, or inadvertent exposure because TB not suspected

Medication Tolerance

- Metabolize INH, EMB more slowly than younger children, but faster than adults
- Few adolescent-specific data; in our series of 145, 6 (4%) had side effects, 2/6 with transaminitis
- Discuss birth control options with all post-menarchal girls
- Baseline transaminases

Tuberculosis 2012;92:9; Arch Dis Child 2005;90:614

Unexplained Deterioration During Antituberculous Therapy in Children and Adolescents

Clinical Presentation and Risk Factors

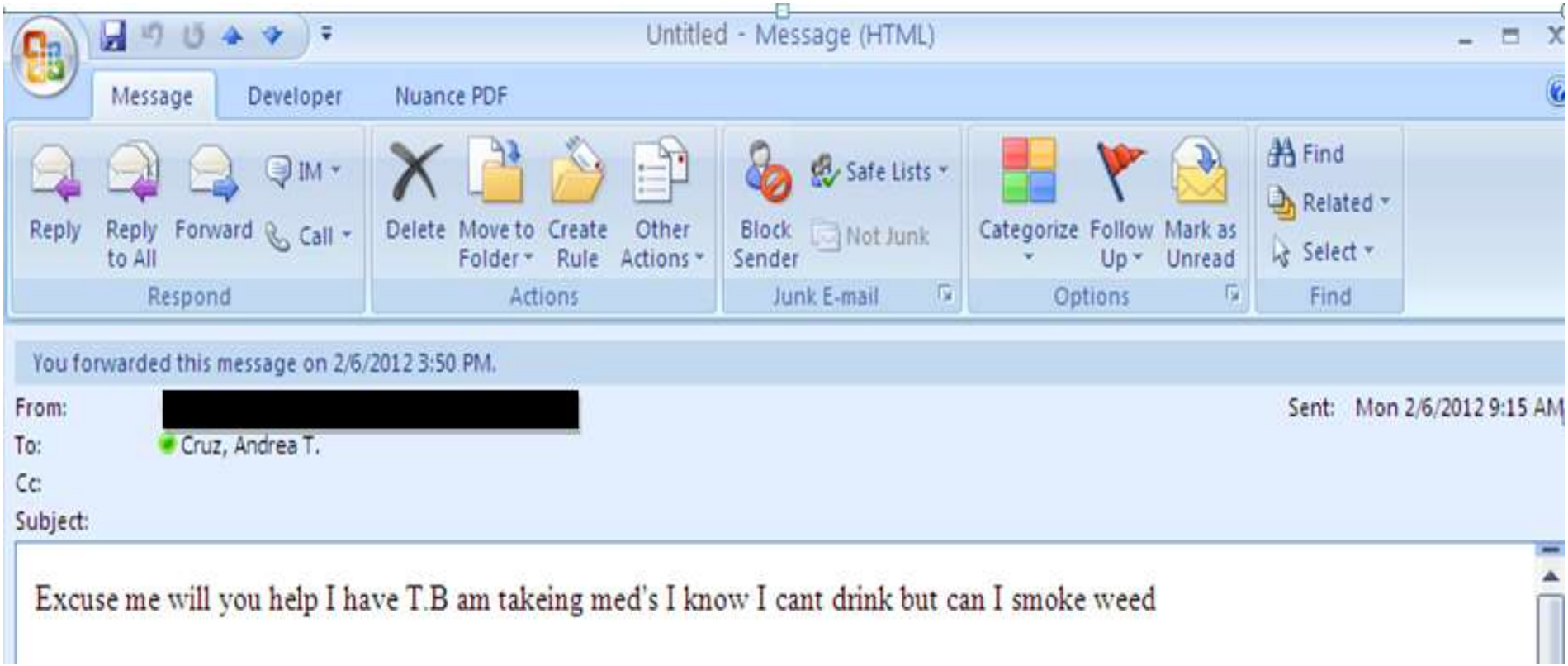
Nisha Thampi, MD, Derek Stephens, MSc,† Elizabeth Rea, MD, MSc,‡§ and Ian Kitai, MD*§*

- 110 HIV-uninfected children, Toronto 2002-2009
- Deteriorations occurred in 14%, associated with:
  - Weight for age ≤ 25th percentile
  - Multiple sites at diagnosis
  - Most common site: airway compression from enlarging intrathoracic lymphadenopathy
- Median time: 80 days (range: 10-181 days)

Pediatr Infect Dis J 2012;31:129

Lack of Medical Home

- Changes preventive opportunities
- Changes venues where present to care
- TB clinician often serves as their ‘real’ pediatrician, at least for the next 6-9 months:
  - Opportunity for health maintenance
  - Catch-up vaccinations
  - Screen for other diseases
  - Contraception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Categorize
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Mark as Unread
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Find
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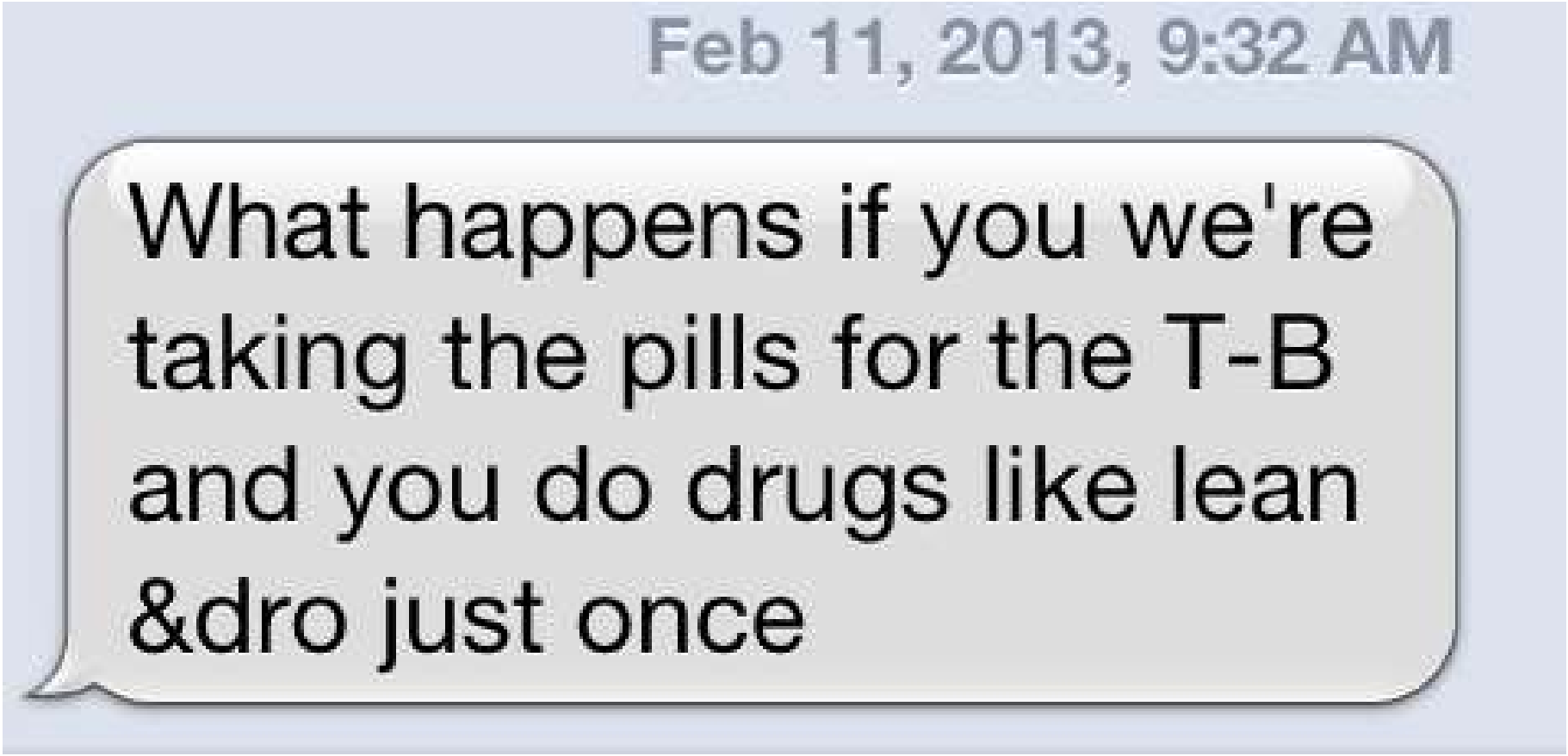
Find
You forwarded this message on 2/6/2012 3:50 PM.
From:
To:
Cruz, Andrea T.
Cc:
Subject:
Sent: Mon 2/6/2012 9:15 AM
Excuse me will you help I have T.B am takeing med's I know I cant drink but can I smoke weed



Lean: promethazine + codeine + Sprite +/- Jolly Ranchers

Dro: hydroponically-grown marijuana

Teens, Substance Use & Abuse: 2012

Drug	Prevalence of use
Ethanol	78% of high school seniors (median age 14 years) 15% met criteria for lifetime abuse
Any illicit drugs	43% had used (median age 15 years) 16% met criteria for drug abuse
Marijuana	40% use, 23% used in last month
Cocaine	6.8%
Heroin	2.9%
Inhalants	11.4%
Methamphetamines	3.8%
Prescription Stimulants	1.7-3%
Prescription Sedatives	0.4-2.7%
Prescription Opioids	4-12%

Data suggests substance use, abuse worsening during the COVID-19 pandemic

Arch Gen Psychiatry 2012;69(4):390; http://www.cdc.gov/healthyyouth/yrbs/pdf/us_drug_trend_yrbs.pdf

Prevalence of alcohol use in children, teens

Stigma

- Guilt over potentially infecting family members, friends, classmates
- Fear about ramifications of contact investigations
- Address social media, messaging
- Judicious sharing of information

Link between stigma, adherence, and concomitant use of other substances (& other risk-taking behavior)

Missing School

- Coordinate with local health departments re: repeat sputum sampling in the field
- Arrange for work to be sent home versus home schooling until they can return to school
- If possible, try to fit appointments during spring break, holidays, etc to minimize time lost

Conclusions

- Adolescents straddle the line between pediatric and adult TB in terms of presentation, diagnostics, and treatment
- There are few adolescent-specific data available to guide management, and the age group per se poses challenges to providers
- In contrast to the younger child, the adolescent needs to be an active participant in his/her care