HEARTLAND NATIONAL TB CENTER
THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT TYLER

Chest Radiology in Pregnant Women with TB

Megan Devine, MD
Heartland National TB Center

Associate Professor of Medicine
UT Health Science Center Tyler

Objectives

- Describe the timely diagnosis of MTB disease in pregnant women using radiology as a tool.

- Describe the radiographic manifestations of pulmonary MTB disease in pregnant women.

TB Disease in Pregnancy is Bad for Both Mother and Baby

TB in Pregnancy

- Active TB disease in pregnant women is associated with increases in:
  - Maternal morbidity
  - Pre-term birth
  - Low birth weight
  - Perinatal death
- Outcomes are worse when anti-TB treatment is started late.
  - Neonatal mortality and extreme prematurity were significantly higher in pregnant women with TB who started treatment later (> 25 weeks)

Sobhy S. BJOG. 2017; 124: 727-733
Tripathy SN. Int J Gynaecol Obstet. 2003.

Maternal Morbidity
OR 2.8,
CI 1.7-4.6

Anemia
OR 3.9,
CI 2.2-6.7

C-section
OR 2.1
CI 1.2-3.8

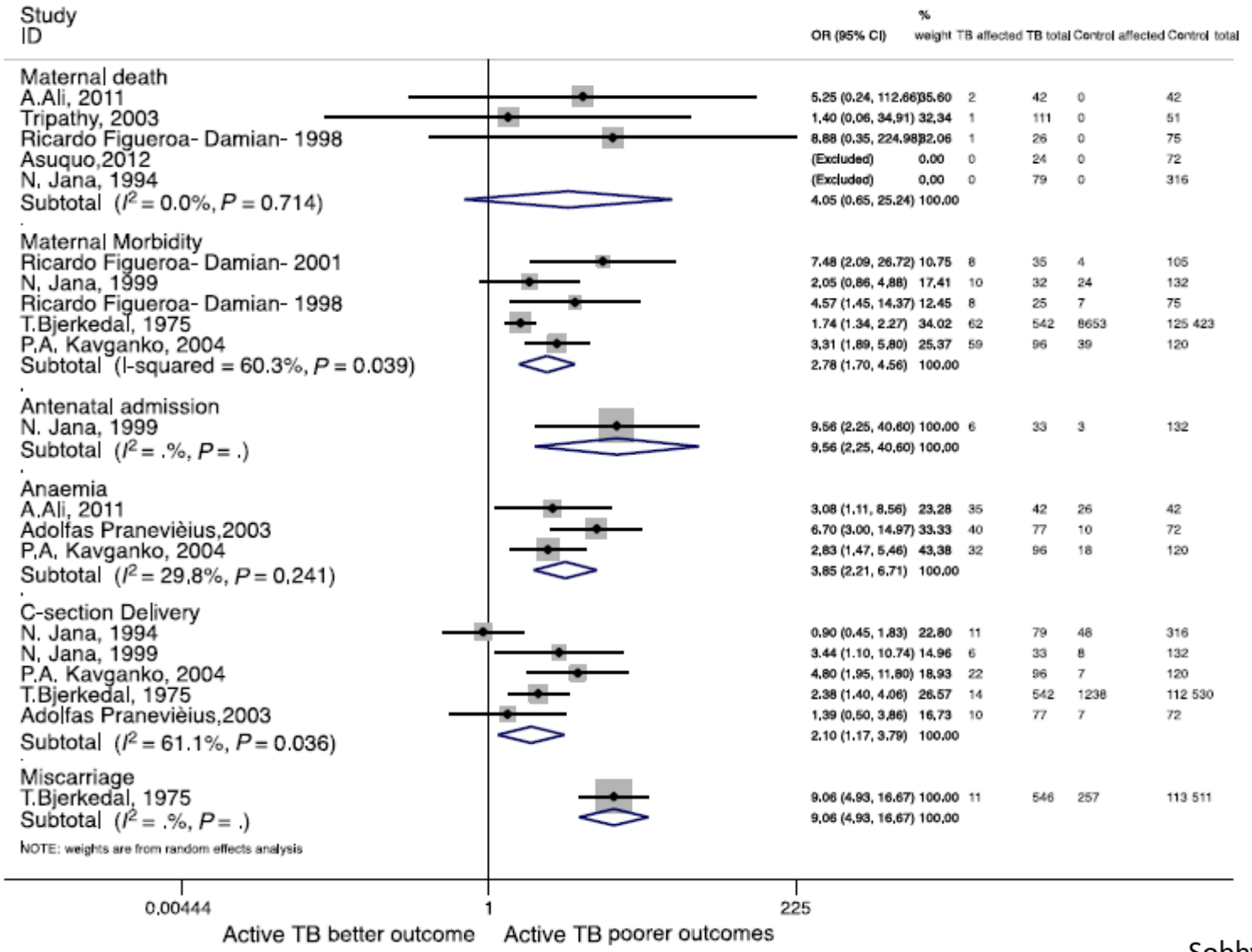


Figure 3. Maternal outcomes in women with tuberculosis (TB) compared with those without TB.

Sobhy S. BJOG. 2017; 124: 727-733

Perinatal death
OR 4.2
CI 1.5-11.8

Low birth weight
OR 1.7
CI 1.2-2.4

Pre-term birth
OR 1.7
CI 1.2-2.4

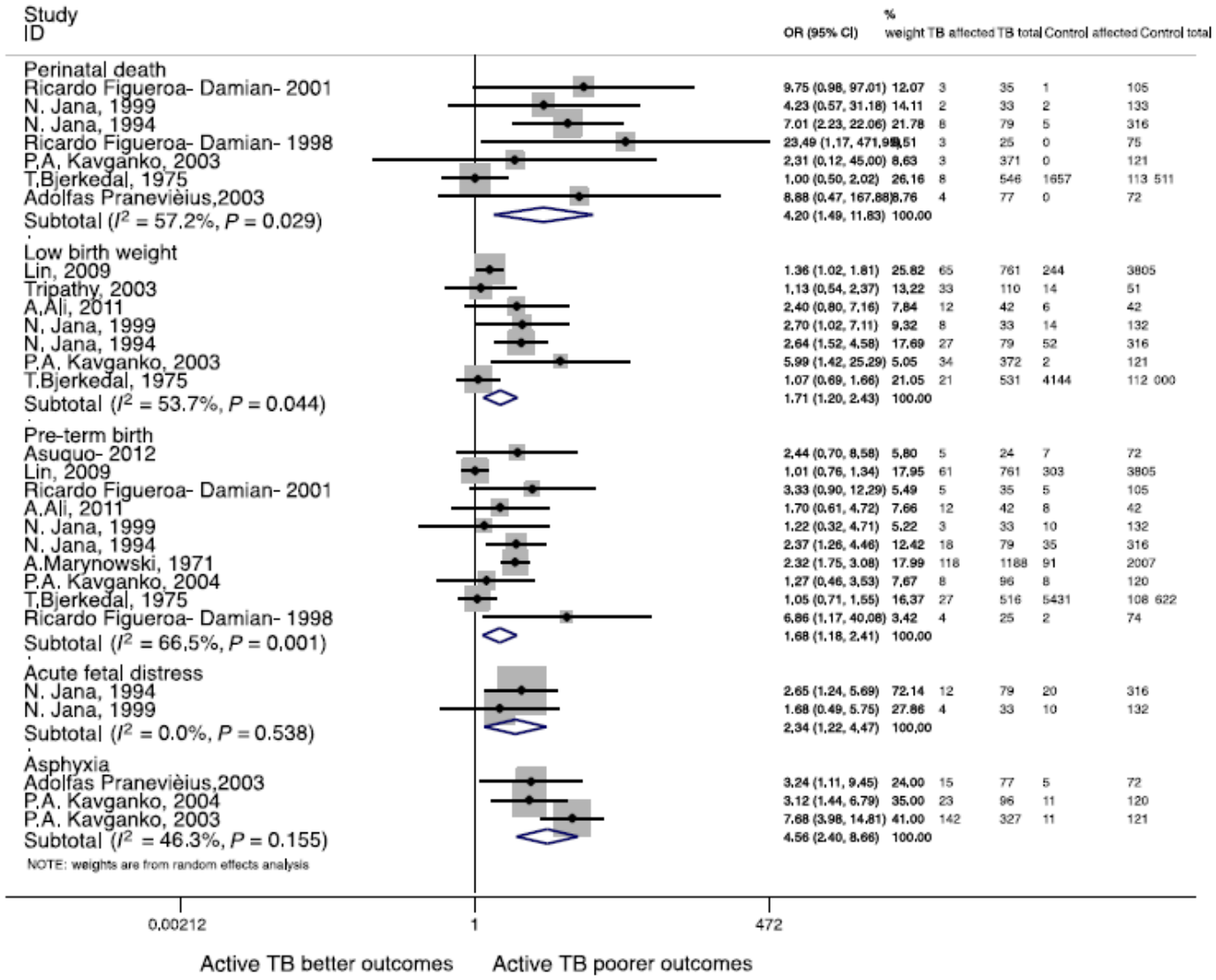


Figure 4. Perinatal outcomes in women with tuberculosis (TB) compared with those without TB.

Sobhy S. BJOG. 2017; 124: 727-733

TB Disease in Pregnancy can be Challenging to Identify

TB in Pregnancy

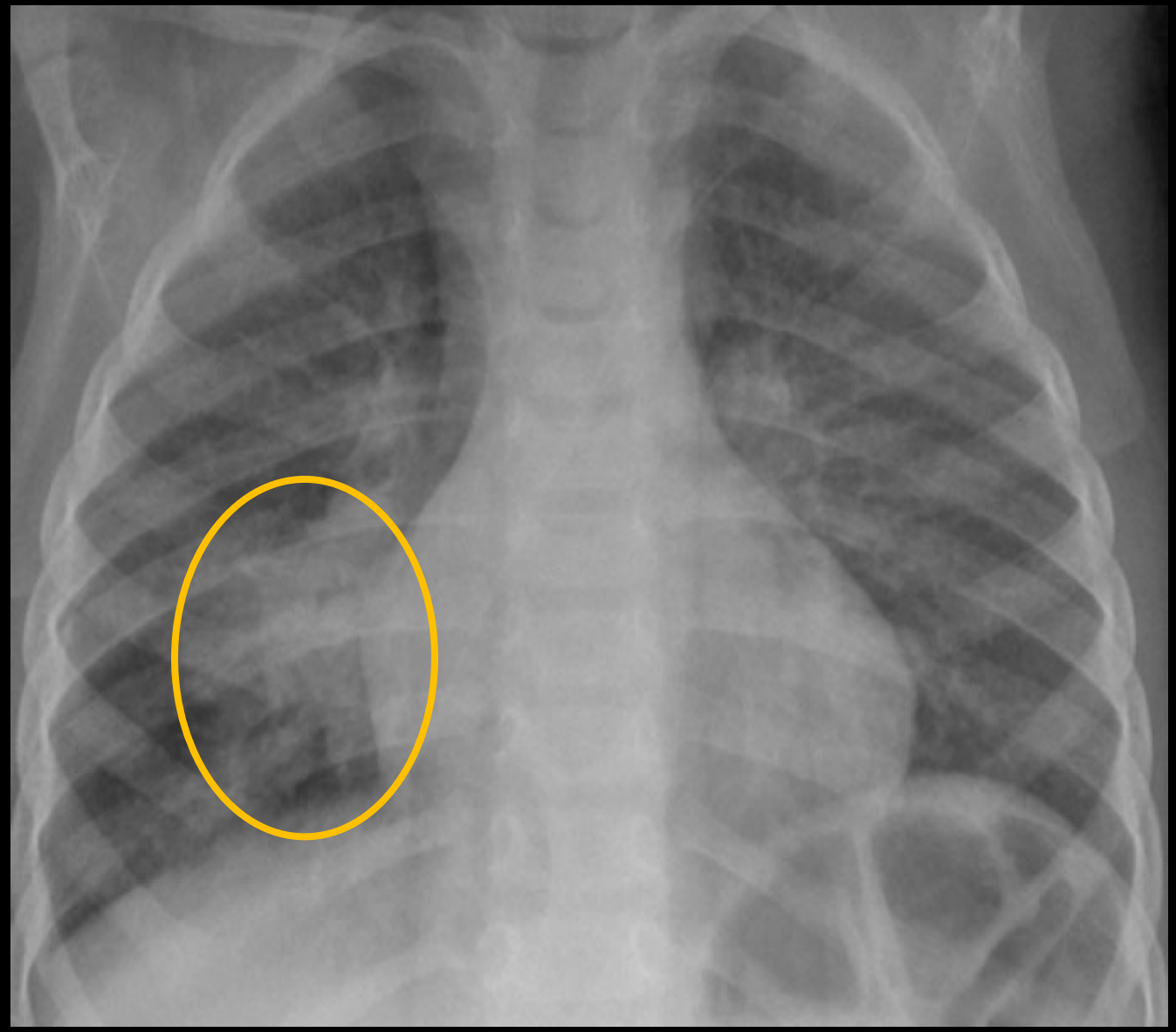
- Significant overlap between symptoms of pregnancy and symptoms of TB disease.
  - ×Fatigue and malaise
  - ×Poor appetite
  - ×Breathlessness
- A significant number of pregnant women may be asymptomatic and found only through screening.

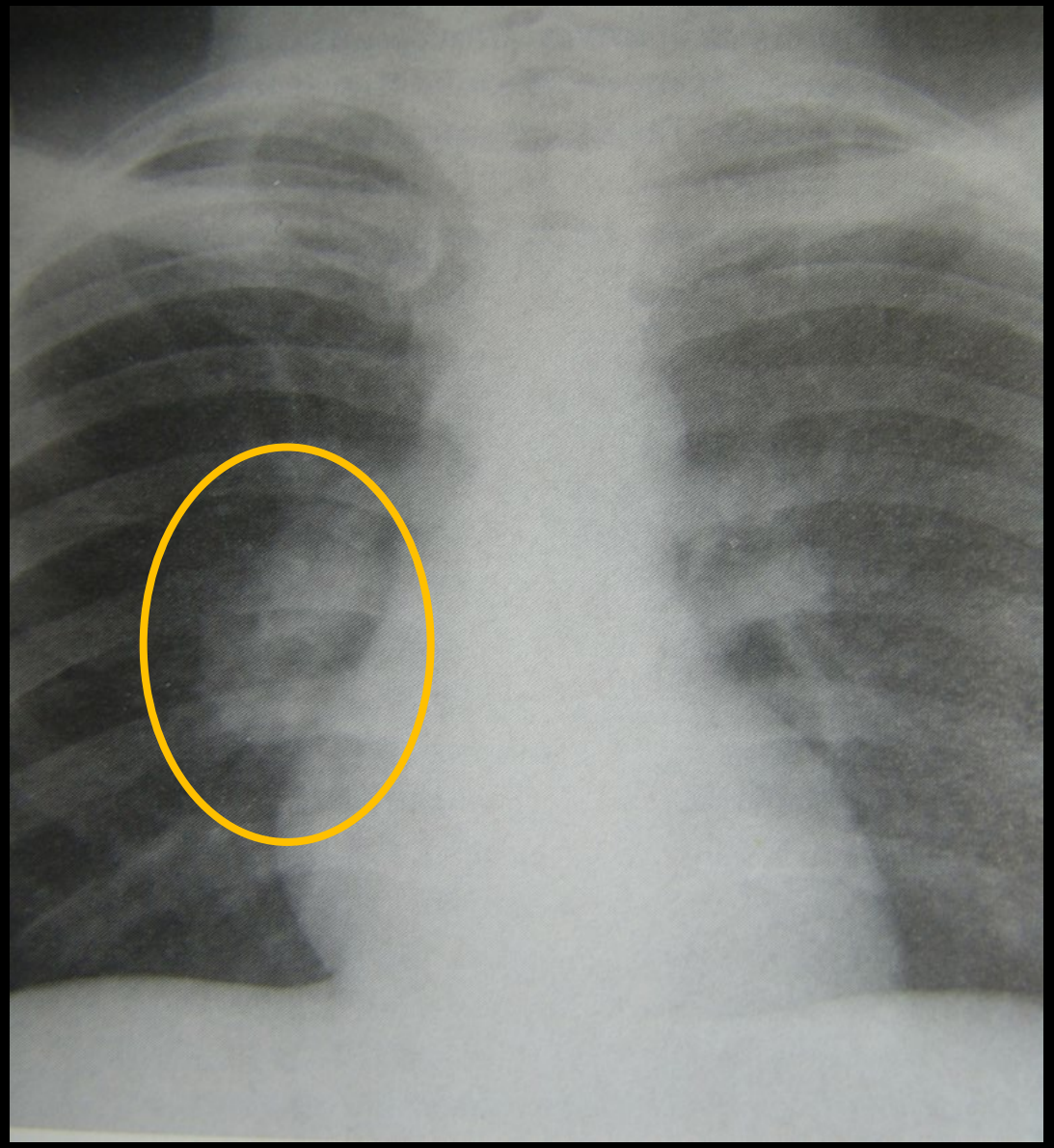
E. Jane Carter. Susan Mates. CHEST. 1994; 106: 1466-70
JM Gould. AC Aronoff. Clinical Microbiology. Vol. 4. Issue 6. 2016.

TB in Pregnancy

- In several series, all women with pulmonary TB disease had some abnormality on CXR
  - ✓ Unilateral, non-cavitary disease
  - ✓ Small and/or indistinct infiltrates
  - ✓ Small effusions
- Pregnant women may be more likely to have negative sputum smears and negative cultures

E. Jane Carter. Susan Mates. CHEST. 1994; 106: 1466-70
H Bishara et al. IMAJ. VOL 17. June 2015.

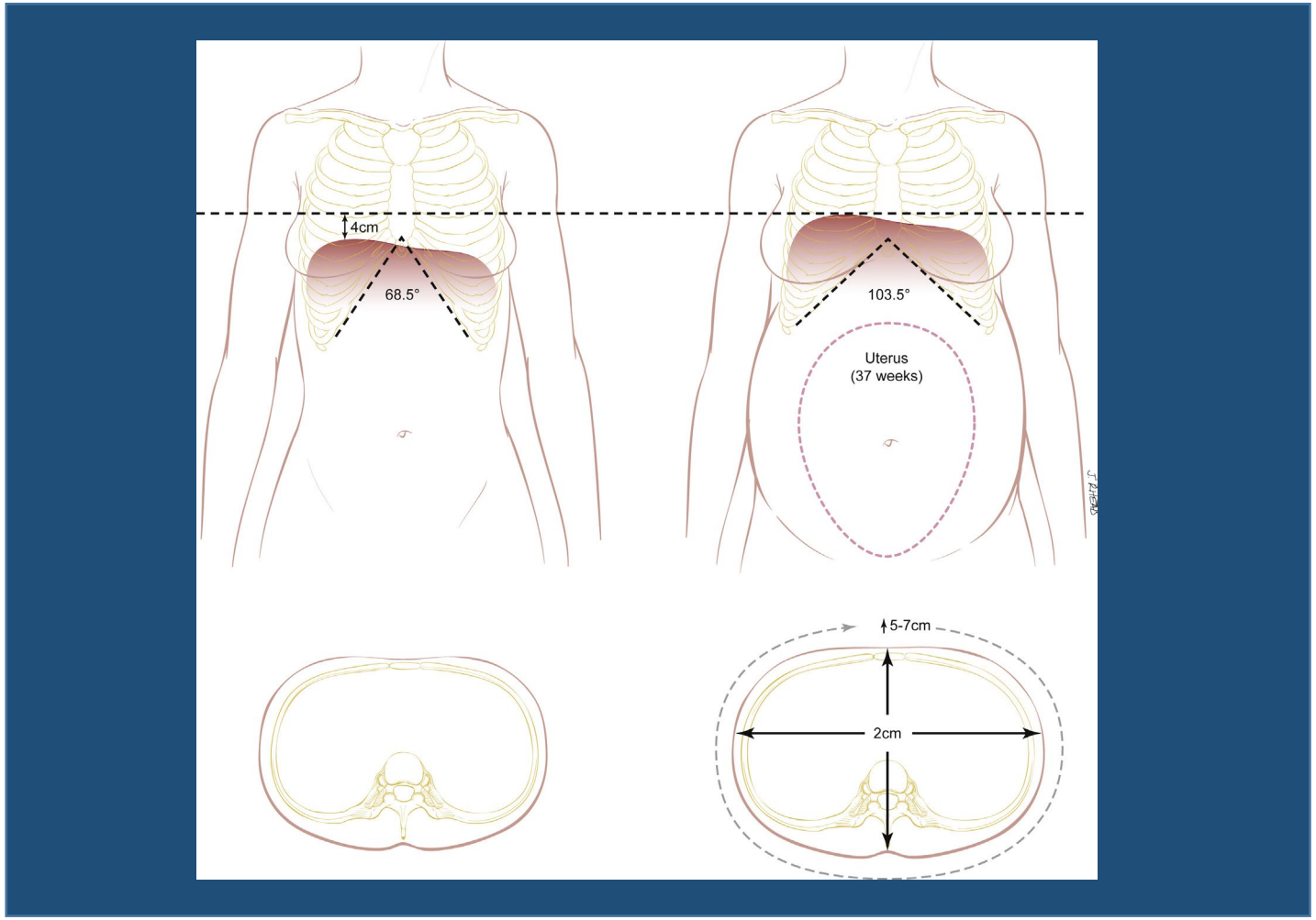




Chest Xray in Pregnant Women

Chest Anatomy Changes in Pregnancy

- 50% increase in the average costal angle
- Increase in lower chest wall circumference
- Diaphragmatic position moves up 4-5cm



- Maternal blood volume increases ~ 2 liters
- Increased LV compliance
- Decreased SVR
- CVP and wedge pressure do not change

Chest Radiology in Pregnancy

Chest Xrays in pregnancy are considered safe!

- No-adverse-effect-level (NOAEL) = the threshold level under which the incidence of congenital malformations will not be increased
- NOAEL = 0.2 Gy at the most sensitive stage of development
- HPS.org Health Physic's Society website
- Shield the abdomen/pelvis

"The use of shielded chest radiography in pregnant women poses no significant risk" - WHO

Brent, Robert. AJOG. January 2009.
WHO recommendations on antenatal care for a positive pregnancy experience. World Health Organization; 2016.

Chest Radiology in Pregnancy

Table 2. Effects of Gestational Age and Radiation Dose on Radiation-Induced Teratogenesis ⇦

Gestational Period	Effects	Estimated Threshold Dose*
Before implantation (0–2 weeks after fertilization)	Death of embryo or no consequence (all or none)	50–100 mGy
Organogenesis (2–8 weeks after fertilization)	Congenital anomalies (skeleton, eyes, genitals)	200 mGy
	Growth restriction	200–250 mGy
Fetal period	**Effects**	**Estimated Threshold Dose***
8–15 weeks	Severe intellectual disability (high risk)†	60–310 mGy
	Intellectual deficit	25 IQ-point loss per 1,000 mGy
	Microcephaly	200 mGy
16–25 weeks	Severe intellectual disability (low risk)	250–280 mGy*

*Data based on results of animal studies, epidemiologic studies of survivors of the atomic bombings in Japan, and studies of groups exposed to radiation for medical reasons (eg, radiation therapy for carcinoma of the uterus).

†Because this is a period of rapid neuronal development and migration.

Modified from Patel SJ, Reede DL, Katz DS, Subramaniam R, Amorosa JK. Imaging the pregnant patient for nonobstetric conditions: algorithms and radiation dose considerations. Radiographics 2007;27:1705–22.

Table 3. Fetal Radiation Doses Associated With Common Radiologic Examinations ⇦

Type of Examination	Fetal Dose* (mGy)
Very low-dose examinations (<0.1 mGy)	
Cervical spine radiography (anteroposterior and lateral views)	<0.001
Head or neck CT	0.001–0.01
Radiography of any extremity	<0.001
Mammography (two views)	0.001–0.01
Chest radiography (two views)	0.0005–0.01

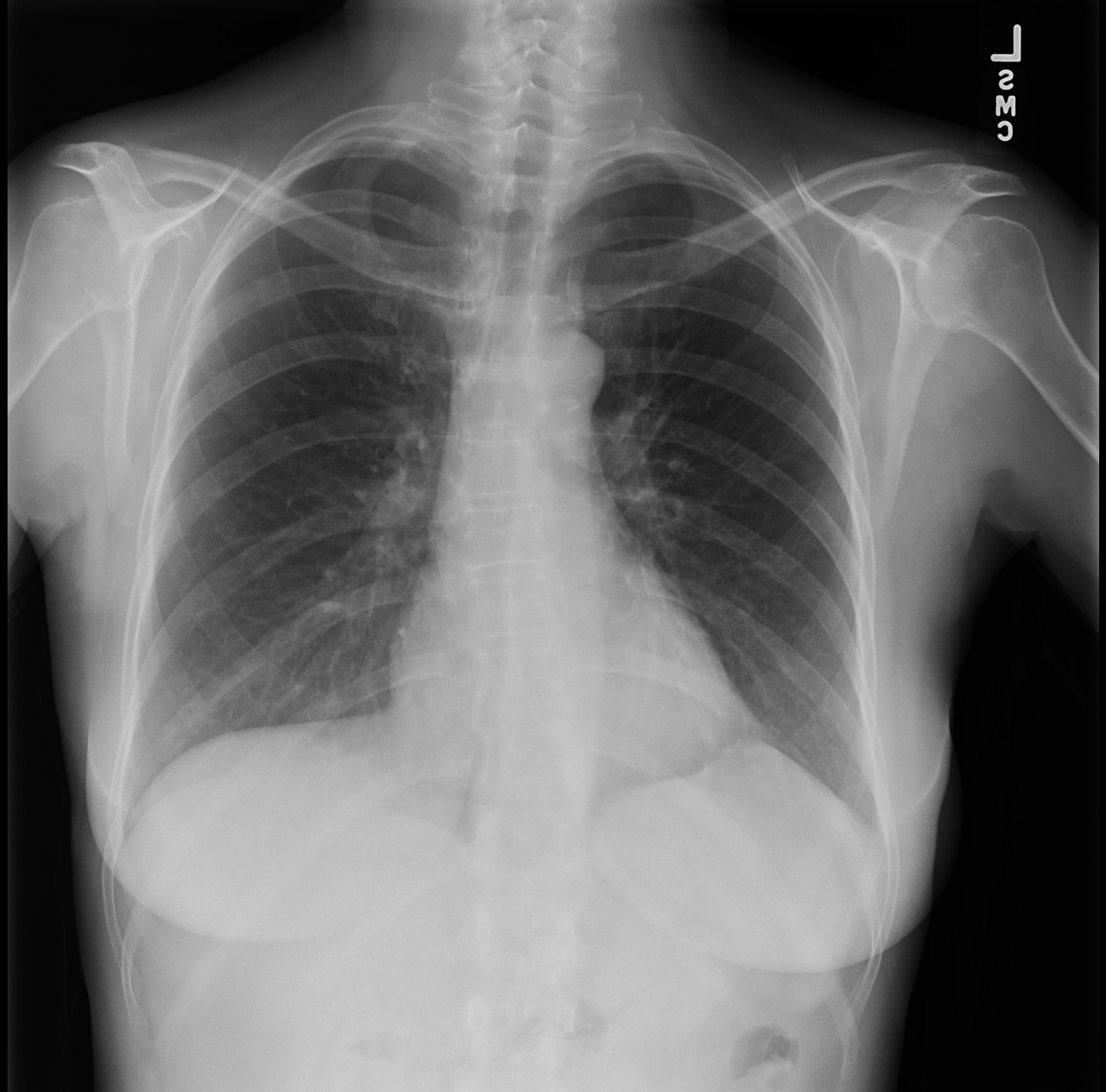
Guidelines for Diagnostic Imaging During Pregnancy and Lactation. ACOG. VOL. 130 NO. 4 October 2017.

Chest Radiology in Pregnancy

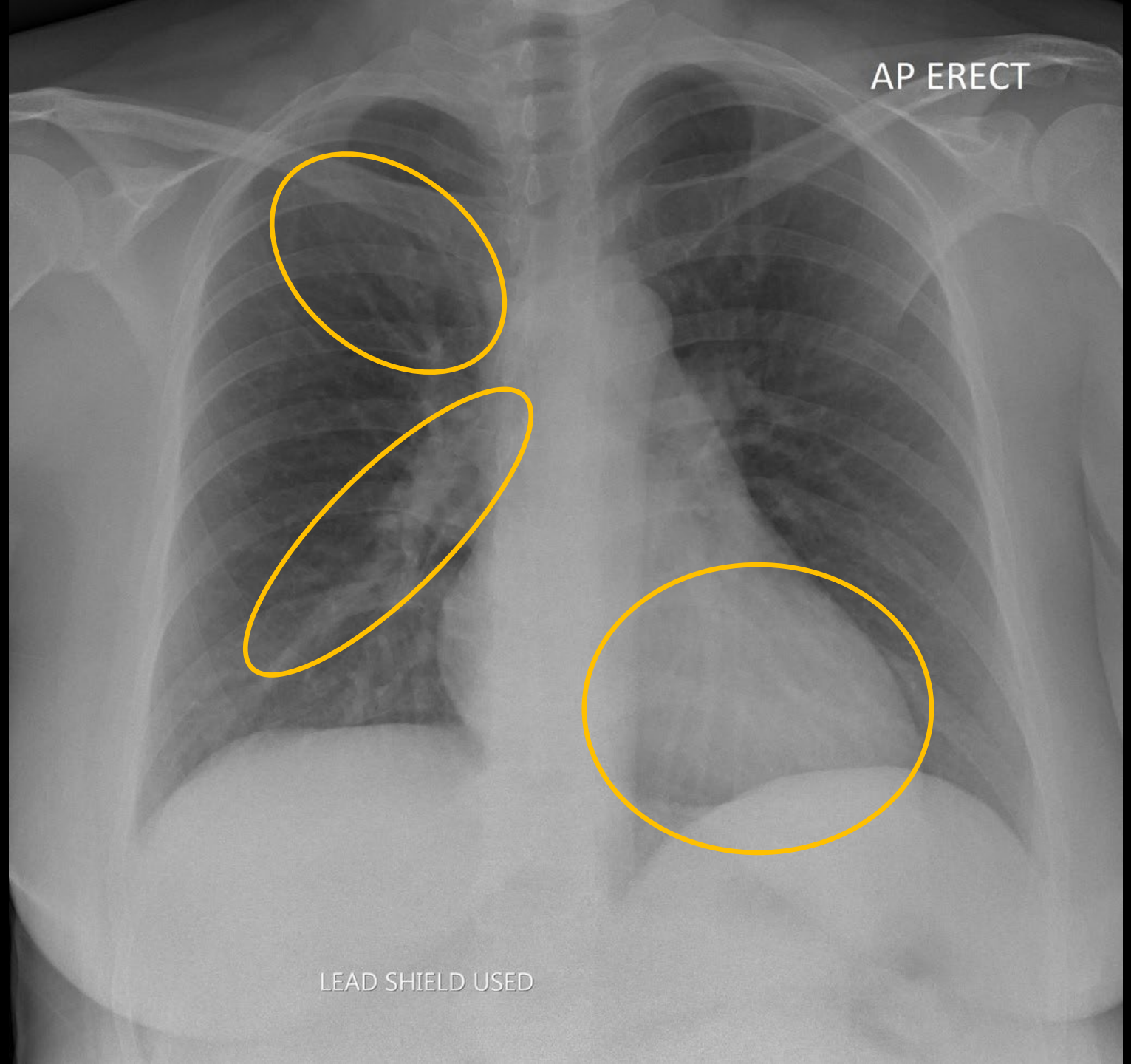
- Chest Xrays of pregnant women look like the chest xrays of non-pregnant women.
  - ✓ May have increased vascularity, enlarged PA shadows or mildly enlarged cardiac border
  - ✓ May have elevated diaphragms, smaller lung volumes
- Chest xrays of pregnant women with TB disease may have more subtle findings.
  - ✓ May have less fibrotic and less cavitary change.
  - ✓ May be more likely to have subtle infiltrates, adenopathy, small effusions.

E. Jane Carter. Susan Mates. CHEST. 1994; 106: 1466-70
H Bishara et al. IMAJ. VOL 17. June 2015.

Non-pregnant woman



Pregnant woman, 27-weeks gestation



Chest Radiology in Pregnancy

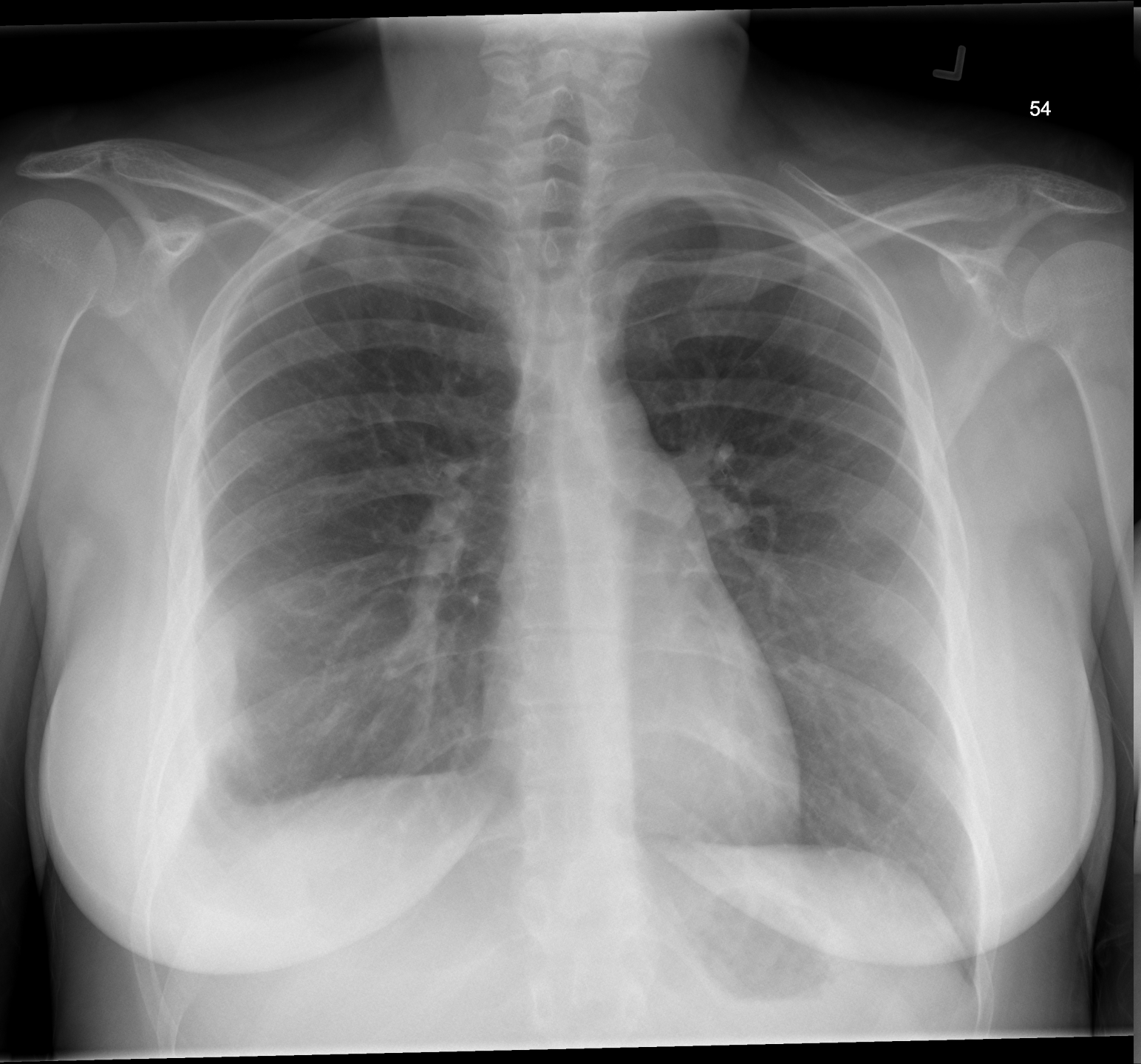
"If routine screening is not performed prenatally, with radiographic follow-up of infected individuals, most pregnant women [with TB] will not have their conditions diagnosed and, therefore they will not be treated in time to prevent risk to the fetus, the newborn and the obstetric ward."

E. Jane Carter. Susan Mates. CHEST. 1994; 106: 1466-70

Cases and Discussion

A Young Woman Identified Post-Partum

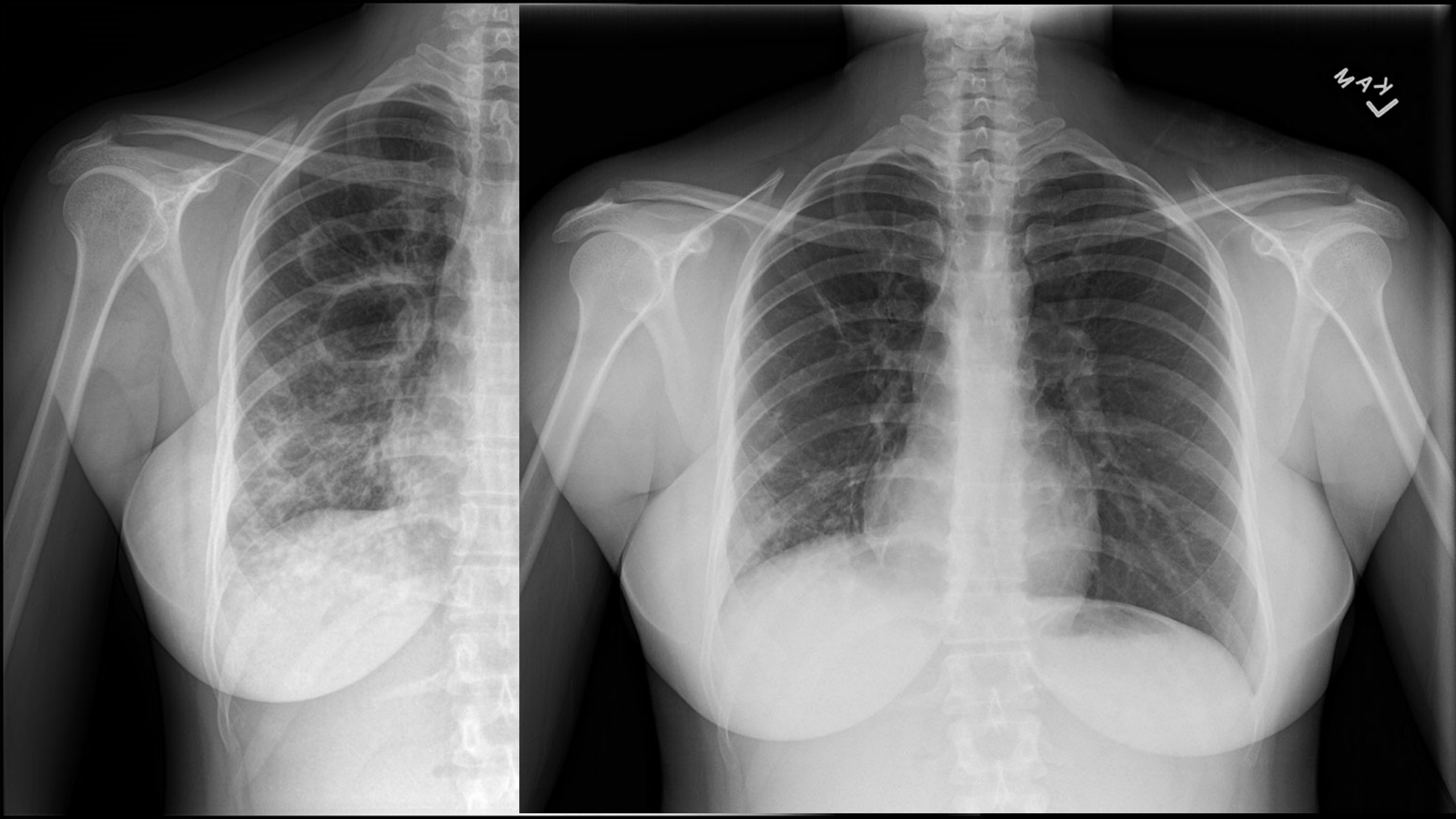
When her infant became ill.


54


54

A Woman Identified Post-Partum

When she became ill.


MAY

Missed Opportunities

Case Report

A pregnant woman in her first-trimester comes to attention due to a + TST, 35mm, obtained while incarcerated.

- Asymptomatic and negative CXR
- Planned to treat as LTBI post-partum

Additional information:

- HIV status – negative
- No known TB exposures BUT prior incarceration
- No previously reported + TST

Case Report

In her third trimester, she is out of incarceration and working in a pawn shop

Fatigue

Tachycardia

Worsening anemia despite iron supplementation

No weight gain (15 wks, 65kg, 34 wks, 64kg)

HA 2 wks prior to delivery

Could we consider this normal in a third trimester pregnancy ?

Case Report

At 36 weeks, she has premature rupture of membranes and delivers a healthy baby girl weighing 5lbs, 5 ounces

She is afebrile, Hgb 7.8, platelets 653,000

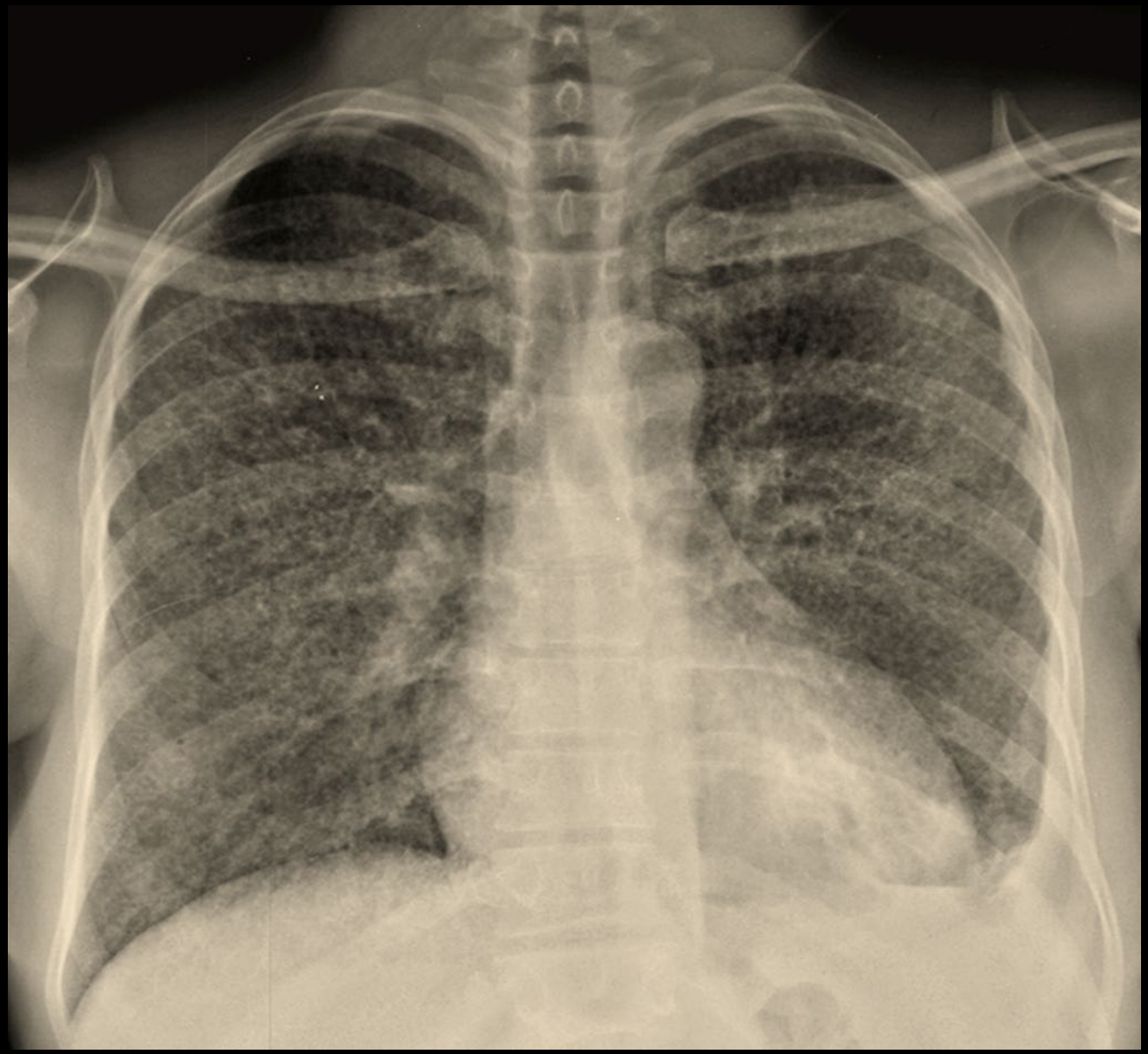
At 3 weeks postpartum, she is again incarcerated and now her TST is 0mm (previous TST 35mm).

She has multiple visits to medical services.

Fatigue, night sweats, shortness of breath.

Tachycardia, low albumin, low hemoglobin.

At 7 weeks post-partum, she goes to the ER with fever to 103F, cough and continued constitutional symptoms.



Case Report

At 13 weeks post-partum, she is admitted to the hospital with fever, hypoxia, tachycardia, and intermittent incontinence.

Multiple serologic abnormalities

+ QFT

Sputum and urine AFB +

RIPE started 4 days after admission. She expires the next day.

What can we learn from this woman's tragic course?

Additional Questions or Comments

Thank you