Case 1: Early Stage NSCLC

Dr. Dhar

Dr. Coughlin

Dr. Kay

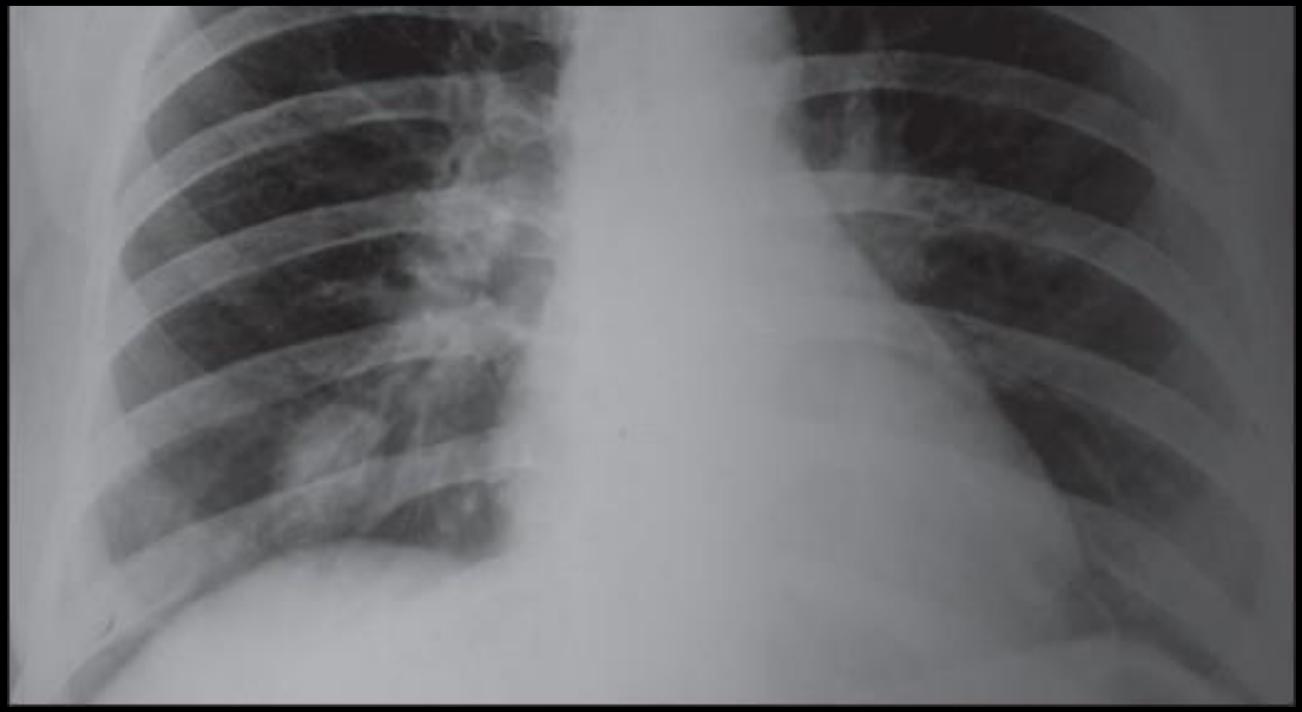
Dr. Hirmiz

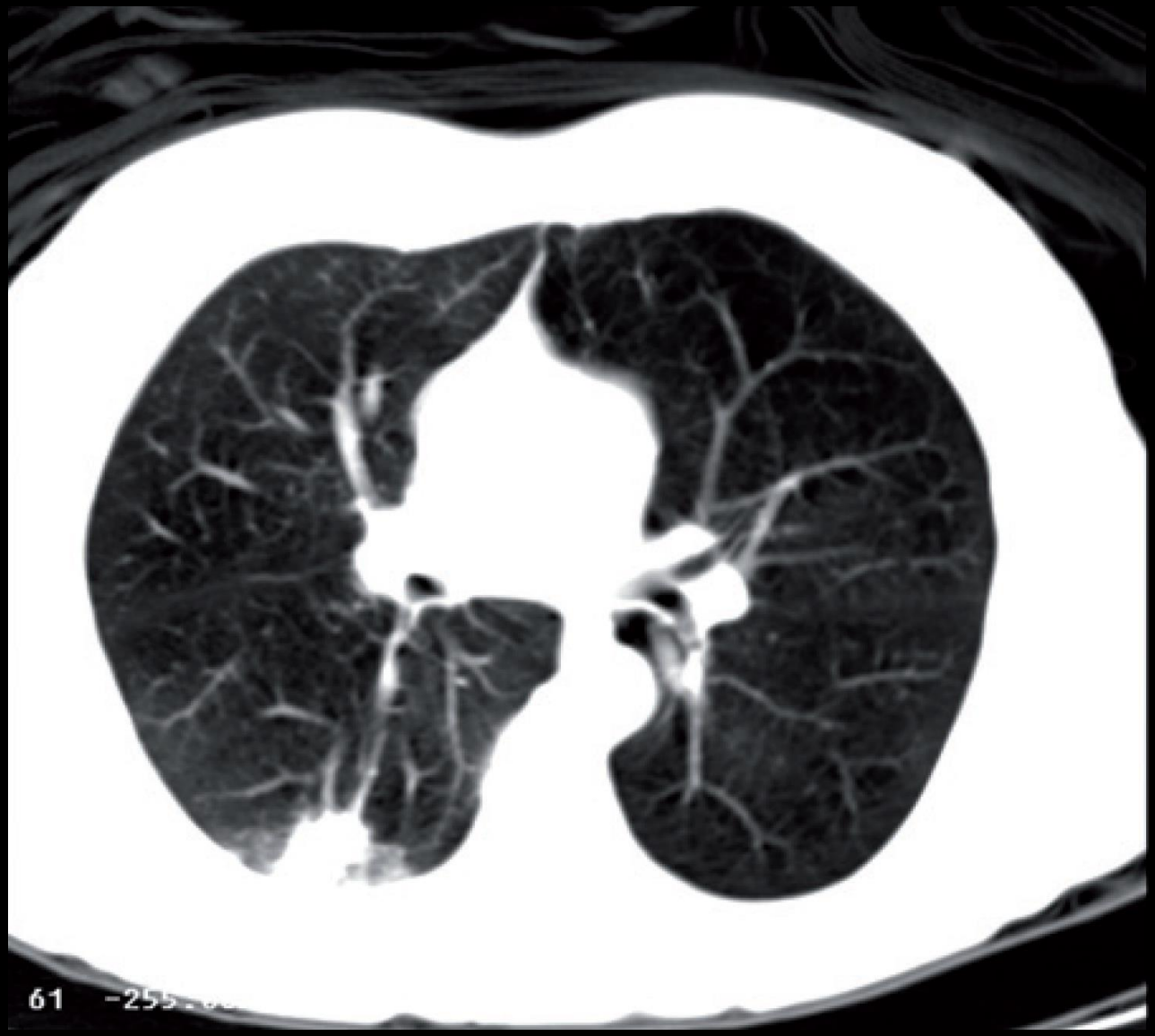
62M with 2 months of worsening cough, productive of white sputum. No significant dyspnea.

ROS otherwise negative.

PMHx: Hypertension, mild COPD

SHx: 1PPD smoker (40 pack-year history)




61

Question

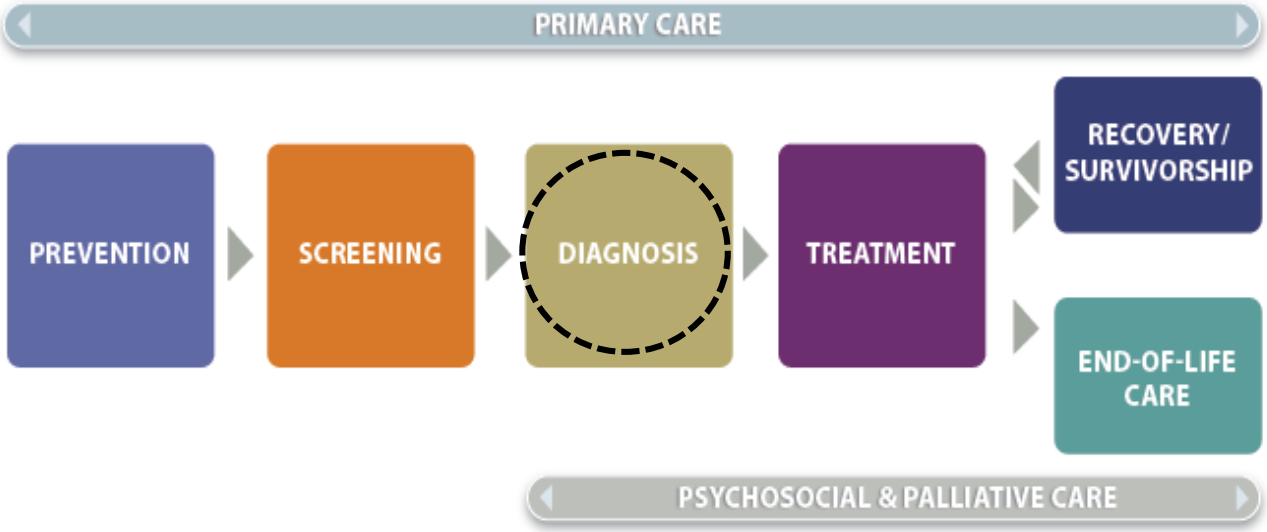
What is next best step?

- Send to ER
- Send to Lung Diagnostic Assessment Program
- Call Medical Oncologist on call
- Call David Musyj

- Dr. Dhar
  - LDAP
  - Bx
  - Staging
  - PET

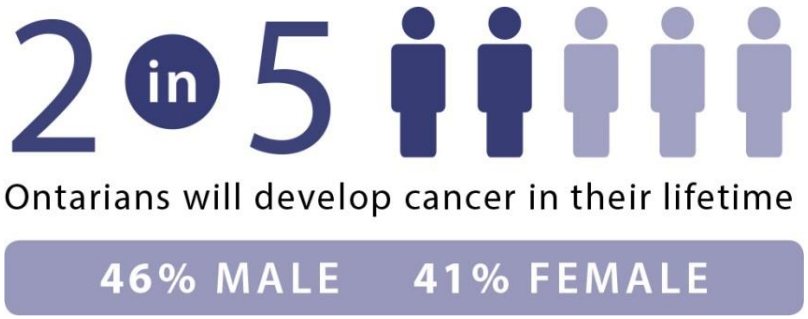
Cancer Care Ontario

Diagnostic Assessment Program (DAP)



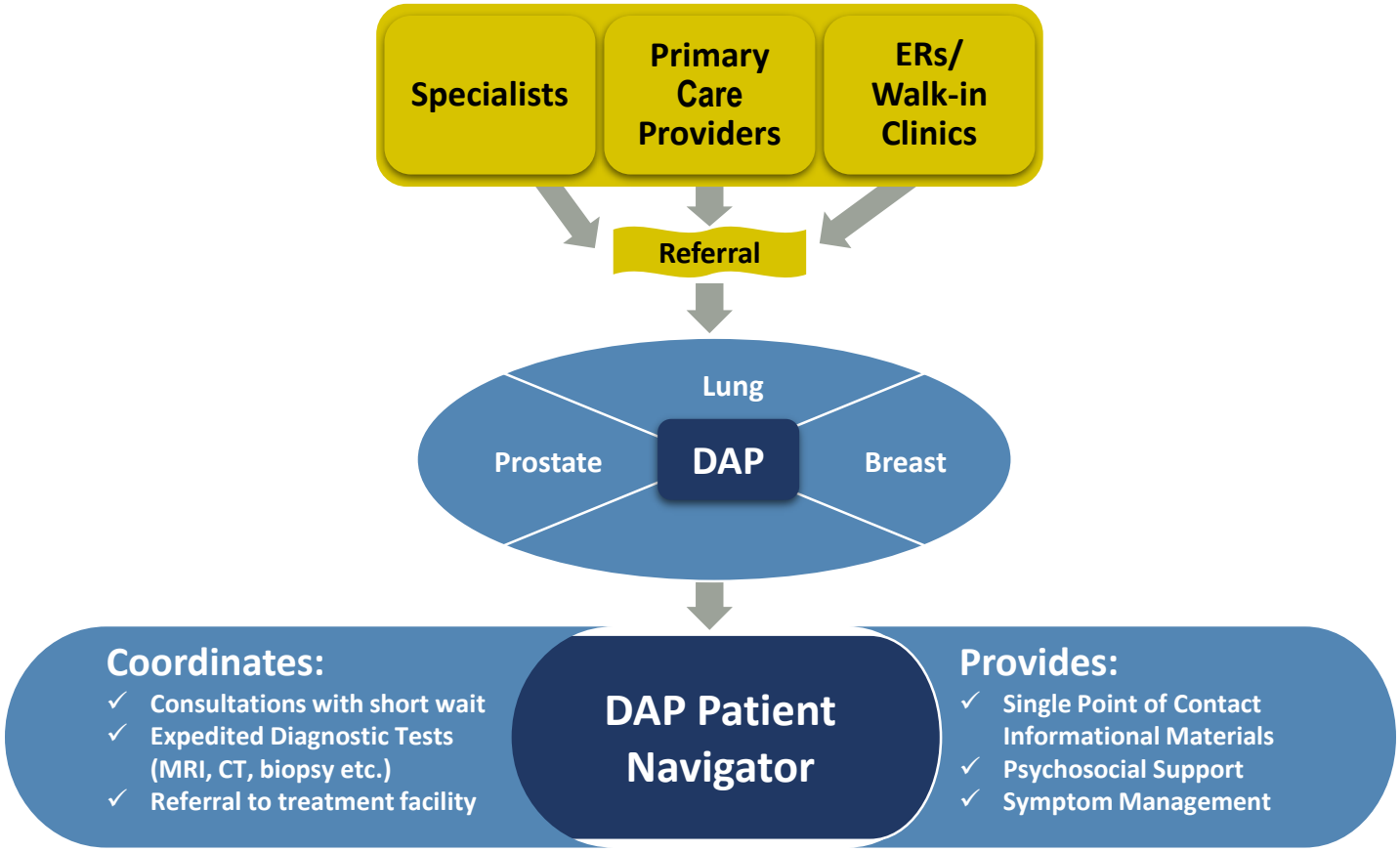
Ontario
Cancer Care Ontario

Cancer Landscape in Ontario

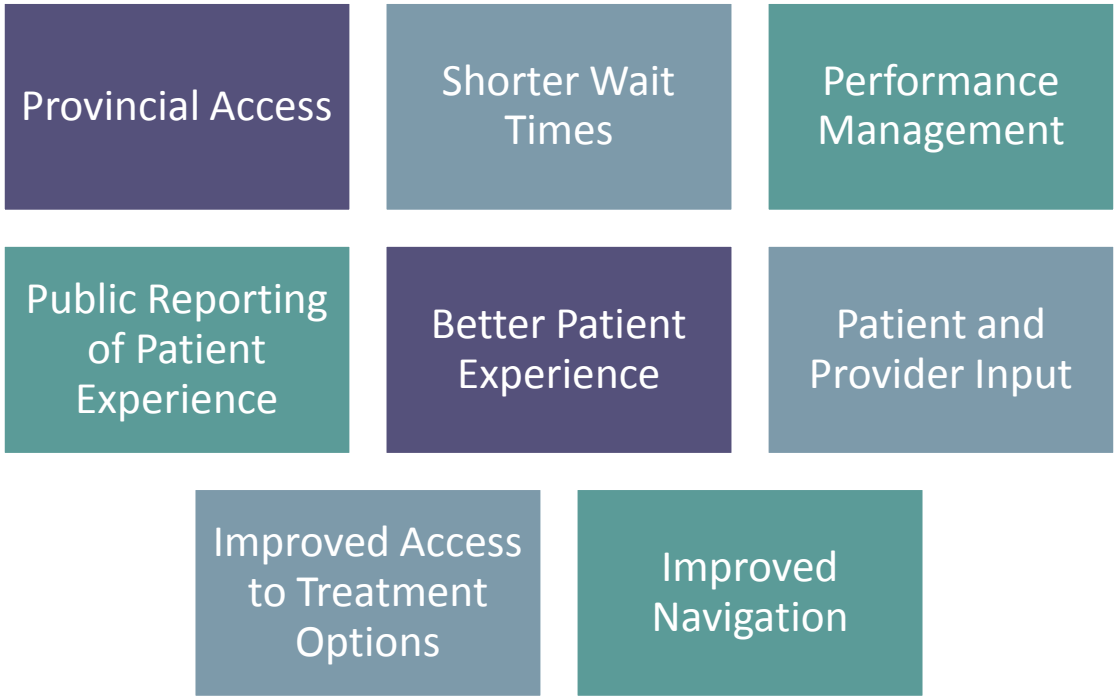


Due to our aging population, our health care system will continue to face increased demand for cancer screening, diagnostic testing, and treatment services

How do DAPs Work?



DAP Accomplishments



Referral Criteria

Referral Criteria:

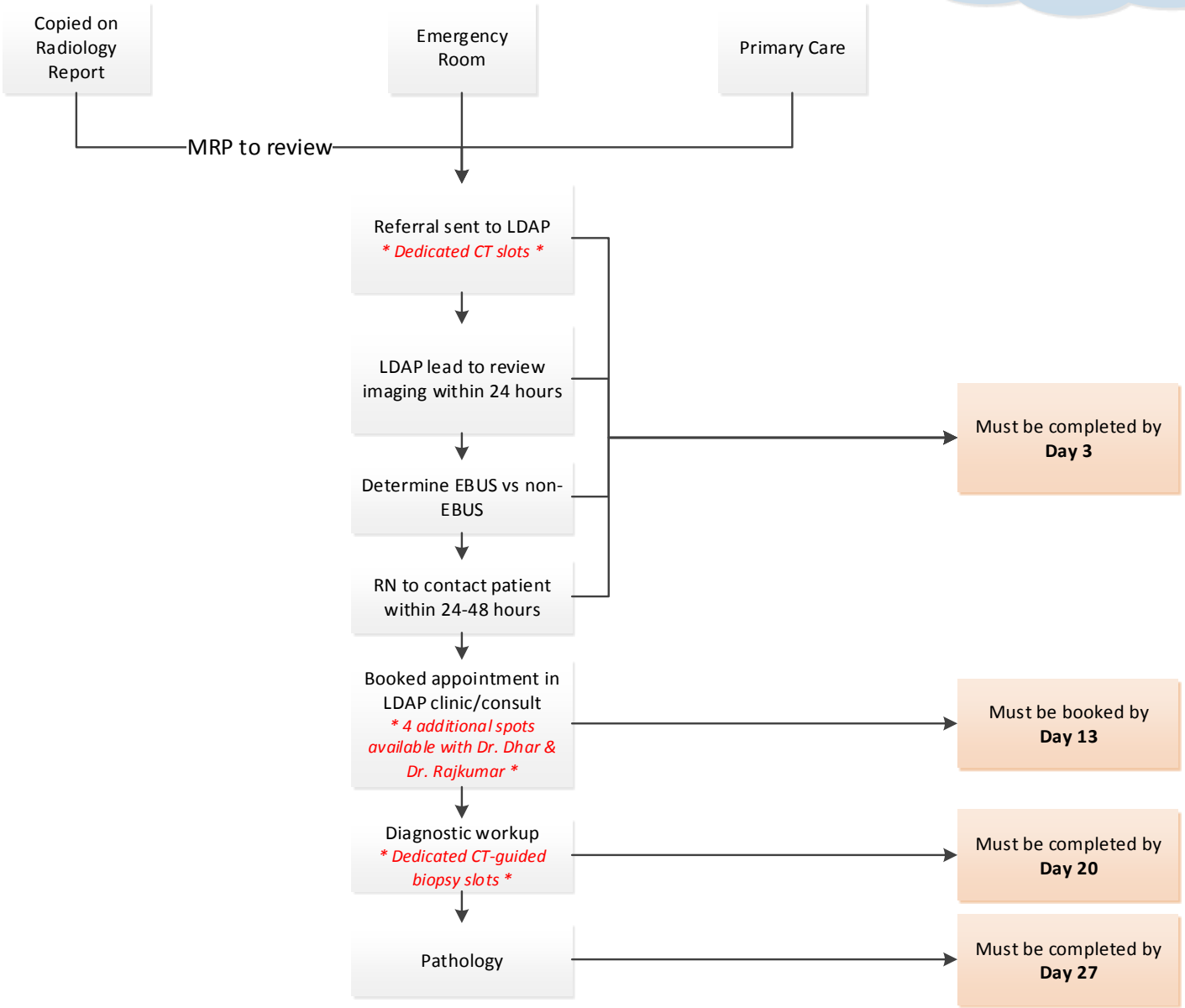
- Solitary pulmonary nodules (0.5 - 3.0cm)
- Abnormal CXR including mass, atelectasis or adenopathy
- Pneumonia non responsive to antibiotics in 4 weeks
- Recurrent non massive hemoptysis
- Non resolving pleural effusions with lung lesions
- Hoarseness with lung mass or adenopathy
- Pancoast tumor (pain shoulder area/arms, drooping eyelid, tumor in superior sulcus of lung)
- Lung mass with obvious metastatic disease (bone pain, jaundice, weight loss >10% of body weight)
- Lung lesions or pleural effusions in the presence of previous malignancies

Exclusions:

- Active WRCC Patients
- Inpatients with no plans for discharge within 24 hours
- Patients with positive pathology
- Patients who have had a failed biopsy

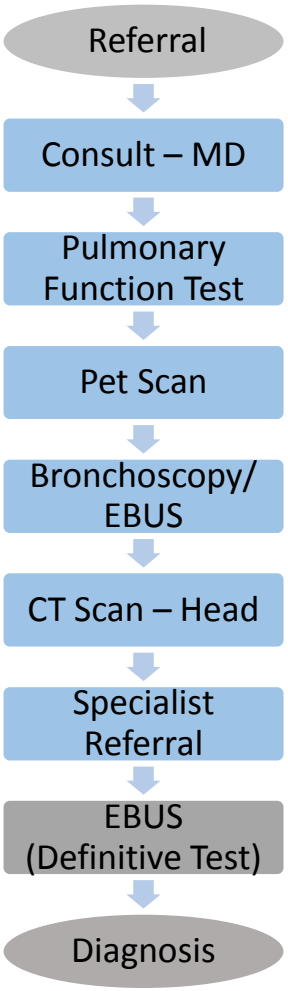
LDAP Process

TARGET: Definitive diagnosis within 28 days from referral



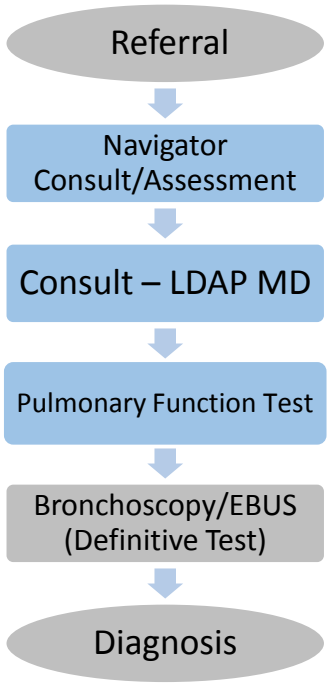
Wait time
Non DAP vs DAP

Patient A (Not LDAP Pt)



Ref-Diag = ***49 days***

Patient B (LDAP Clinic)



Ref-Diag = ***16 days***

Wait Time Reporting

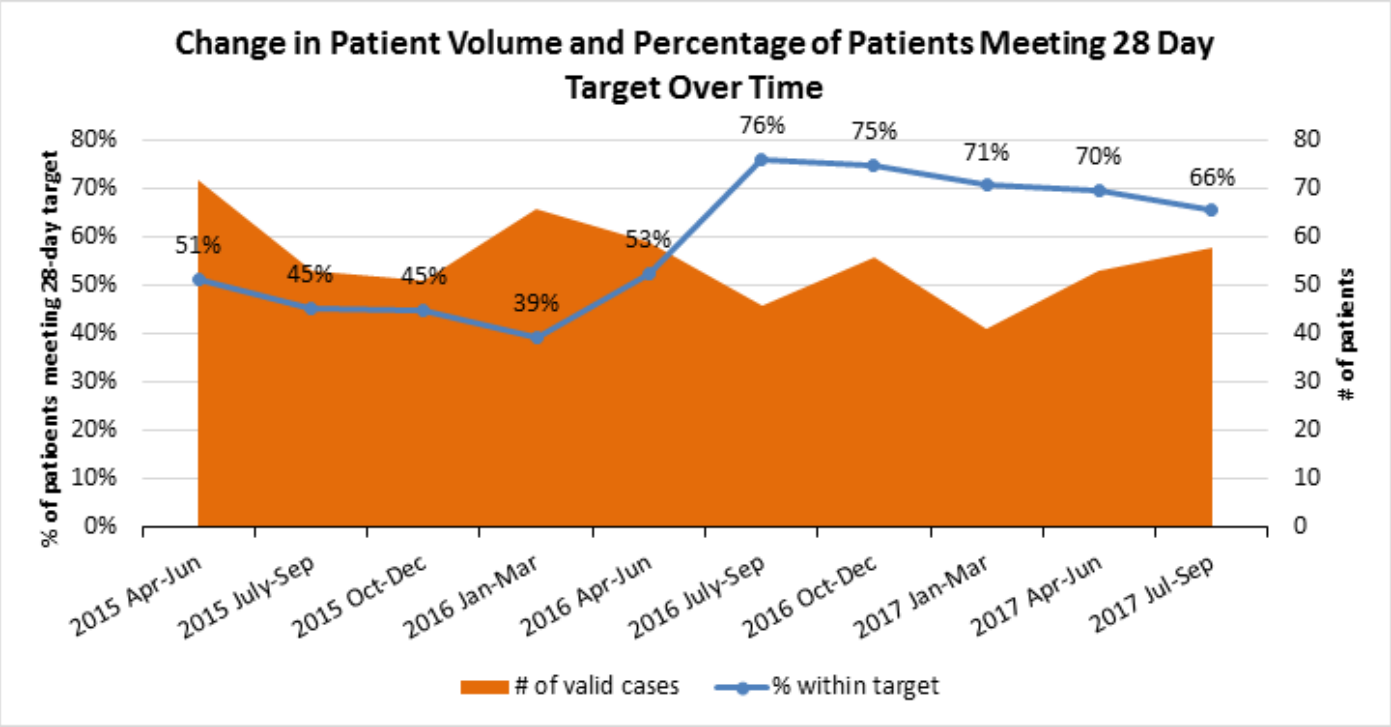
THERE ARE WAIT TIMES ASSOCIATED WITH THE LDAP PROGRAM.

65% of patients must be diagnosed within 28 days

- This data is currently reported to Cancer Care Ontario every quarter
- CCO compares this data across regions and generates a province wide report to compared DAP performance

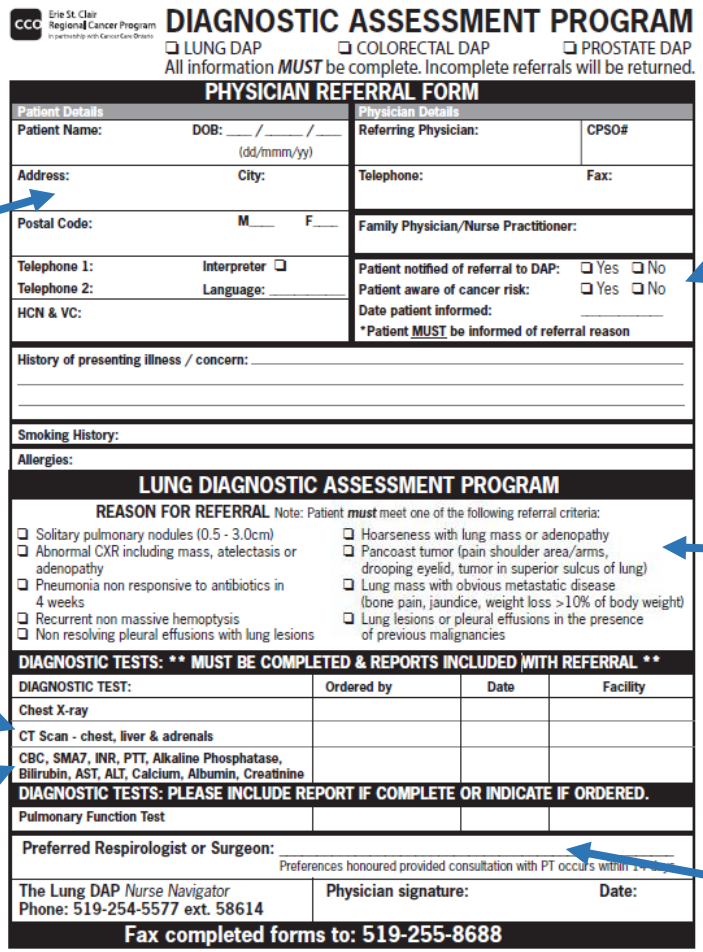
Ontario
Cancer Care Ontario

Lung DAP Wait Times are Steadily Improving



As of Q2 FY2017/2018 Windsor Regional Hospitals LDAP program is 2nd in the region for wait times

LDAP Referral Form



Erie St. Clair Regional Cancer Program

DIAGNOSTIC ASSESSMENT PROGRAM

❑ LUNG DAP ❑ COLORECTAL DAP ❑ PROSTATE DAP

All information ***MUST*** be complete. Incomplete referrals will be returned.

PHYSICIAN REFERRAL FORM

Patient Details

Patient Name: DOB: ___ / ___ / ___ (dd/mmm/yy)

Address: City:

Postal Code: M___ F___

Telephone 1: Interpreter ❑

Telephone 2: Language: _____

HCN & VC:

Physician Details

Referring Physician: CPSO#

Telephone: Fax:

Family Physician/Nurse Practitioner:

Patient notified of referral to DAP: ❑ Yes ❑ No

Patient aware of cancer risk: ❑ Yes ❑ No

Date patient informed: _____

*Patient MUST be informed of referral reason

History of presenting illness / concern: _____

Smoking History:

Allergies:

LUNG DIAGNOSTIC ASSESSMENT PROGRAM

REASON FOR REFERRAL Note: Patient ***must*** meet one of the following referral criteria:

- ❑ Solitary pulmonary nodules (0.5 - 3.0cm)
- ❑ Abnormal CXR including mass, atelectasis or adenopathy
- ❑ Pneumonia non responsive to antibiotics in 4 weeks
- ❑ Recurrent non massive hemoptysis
- ❑ Non resolving pleural effusions with lung lesions
- ❑ Hoarseness with lung mass or adenopathy
- ❑ Pancoast tumor (pain shoulder area/arms, drooping eyelid, tumor in superior sulcus of lung)
- ❑ Lung mass with obvious metastatic disease (bone pain, jaundice, weight loss >10% of body weight)
- ❑ Lung lesions or pleural effusions in the presence of previous malignancies

DIAGNOSTIC TESTS: ** MUST BE COMPLETED & REPORTS INCLUDED WITH REFERRAL **

DIAGNOSTIC TEST:	Ordered by	Date	Facility
Chest X-ray			
CT Scan - chest, liver & adrenals			
CBC, SMA7, INR, PTT, Alkaline Phosphatase, Bilirubin, AST, ALT, Calcium, Albumin, Creatinine			

DIAGNOSTIC TESTS: PLEASE INCLUDE REPORT IF COMPLETE OR INDICATE IF ORDERED.

Pulmonary Function Test			

Preferred Respirologist or Surgeon: _____

Preferences honoured provided consultation with PT occurs within [illegible]

The Lung DAP *Nurse Navigator*
Phone: 519-254-5577 ext. 58614

Physician signature: Date:

Fax completed forms to: 519-255-8688

Up to date patient demographics

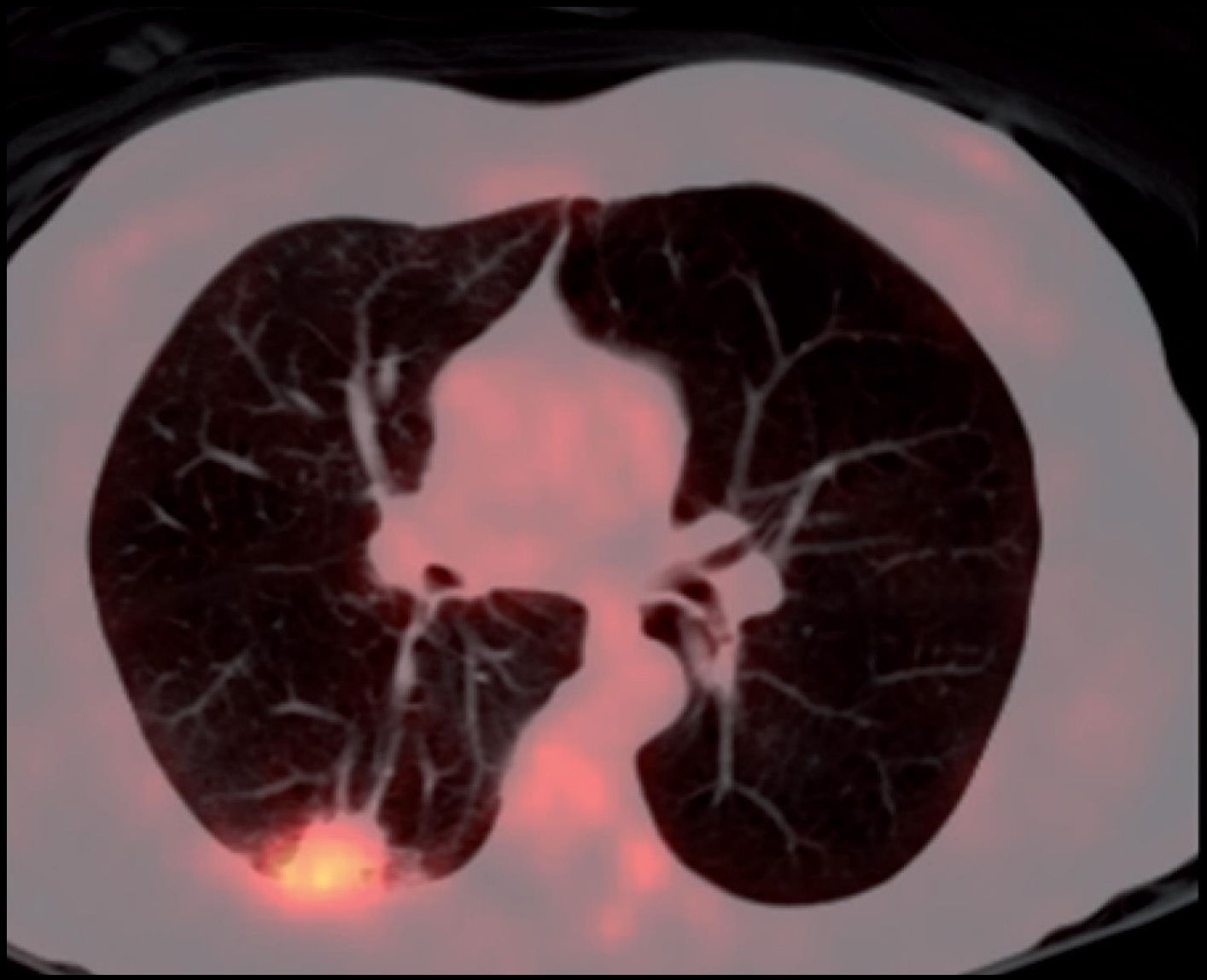
Patient must be aware of CT result, DAP referral and possibility of a Cancer diagnosis

CT report (if completed)
OR
Requisition for CT
(filled out by referring)

Must meet at least one of the referral criteria

Copy of ALL listed lab work.
Or "ordered" if a req was given to patient recently

A specific physician may be requested – but will only be honored if timelines permit.



Biopsy

- Squamous cell Lung cancer

- Referred to Thoracic Surgery (Dr Coughlin)
- Comment about case

STAGE 1 AND 2 LUNG CANCER AND MEDIASTINOSCOPY

MICHAEL COUGHLIN MD FRCSC
(THORACIC SURGERY)
WINDSOR REGIONAL HOSPITAL
APRIL 13, 2018

CANADA.CA DATA 2016

Lung cancer in Canada

Lung cancer develops in the cells of the lungs. Changes in these cells may lead to benign tumours (non-cancerous), but when cells no longer behave normally, they may cause malignant tumours (cancer). Cancer starting in the lung cells is known as primary lung cancer. Cancers that start in other parts of the body can spread to the lungs (lung metastasis), but they are not treated in the same way as primary lung cancers.

The data

- Lung cancer is the most common cancer in Canada
- 1 in 11 men will be diagnosed with lung cancer in their lifetime
- 1 in 14 women will be diagnosed with lung cancer in their lifetime
- About 28,600 Canadians will be diagnosed with lung cancer in 2017
- 98% of lung cancers occur in adults aged 50+

Risk factors and prevention

- Smoking
- Exposure to second-hand smoke
- Exposure to radon gas
- Exposure to asbestos and other carcinogens
- Air pollution
- Family history
- Age
- Being smoke-free and testing for radon at home can help lower the risk of getting lung cancer

Screening and detection

- 50% of all lung cancer cases are diagnosed late AT STAGE IV *
- 17% of Canadians diagnosed with lung cancer survive 5 or more years

Screening for lung cancer is only recommended for high risk Canadians aged 55 to 74.

T1 TUMOUR 3 CM OR LESS SURROUNDED BY LUNG OR VISCERAL PLEURA, WITHOUT INVASION MORE PROXIMAL TO THE LOBAR BRONCHUS

- T1mi MINIMALLYINVASIVE ADENOCARCINOMA
- T1a TUMOUR 1 CM OR LESS
- T1b TUMOUR MORE THAN 1 CM BUT LESS THAN 2 CM
- T1C TUMOUR MORE THAN 2 CM BUT LESS THAN 3 CM

T2 TUMOUR MORE THAN 3 CM BUT NOT MORE THAN 5 CM OR INVOLVING THE MAIN BRONCHUS (NOT CARINA), OR VISCERAL PLEURA OR WITH ATELECTASIS OR OBSTRUCTION EXTENDING TO THE HILA

- T2a TUMOUR MORE THAN 3 CM BUT LES THAN 4 CM
- T2b TUMOUR MORE THAN 4 CM BUT LESS THAN 5 CM

T3 TUMOUR MORE THAN 5 CM BUT LESS THAN 7CM OR INVADING ANY OF: PARITAL PLEURA, CHEST WALL (EVEN SUPERIOR SULCUS), PHRENIC NERVE, PARIETAL PERICARDIUM OR SEPARATE TUMOURS IN SAME LOBE AS PRIMARY

N0 NO REGIONAL LYMPH NODE METASASES

N1 METASTASES TO IPSILATERAL INTRAPULMONARY, PERIBRONCIAL, HILAR NODE METASTASES INCLUDING BYU DIRECT EXTENSION

N2 METASTASES TO IPSILATERAL MEDIASTINAL NODES INCLUDING THE CARINA (EVEN IN ABSENCE OF N1 DISEASE)

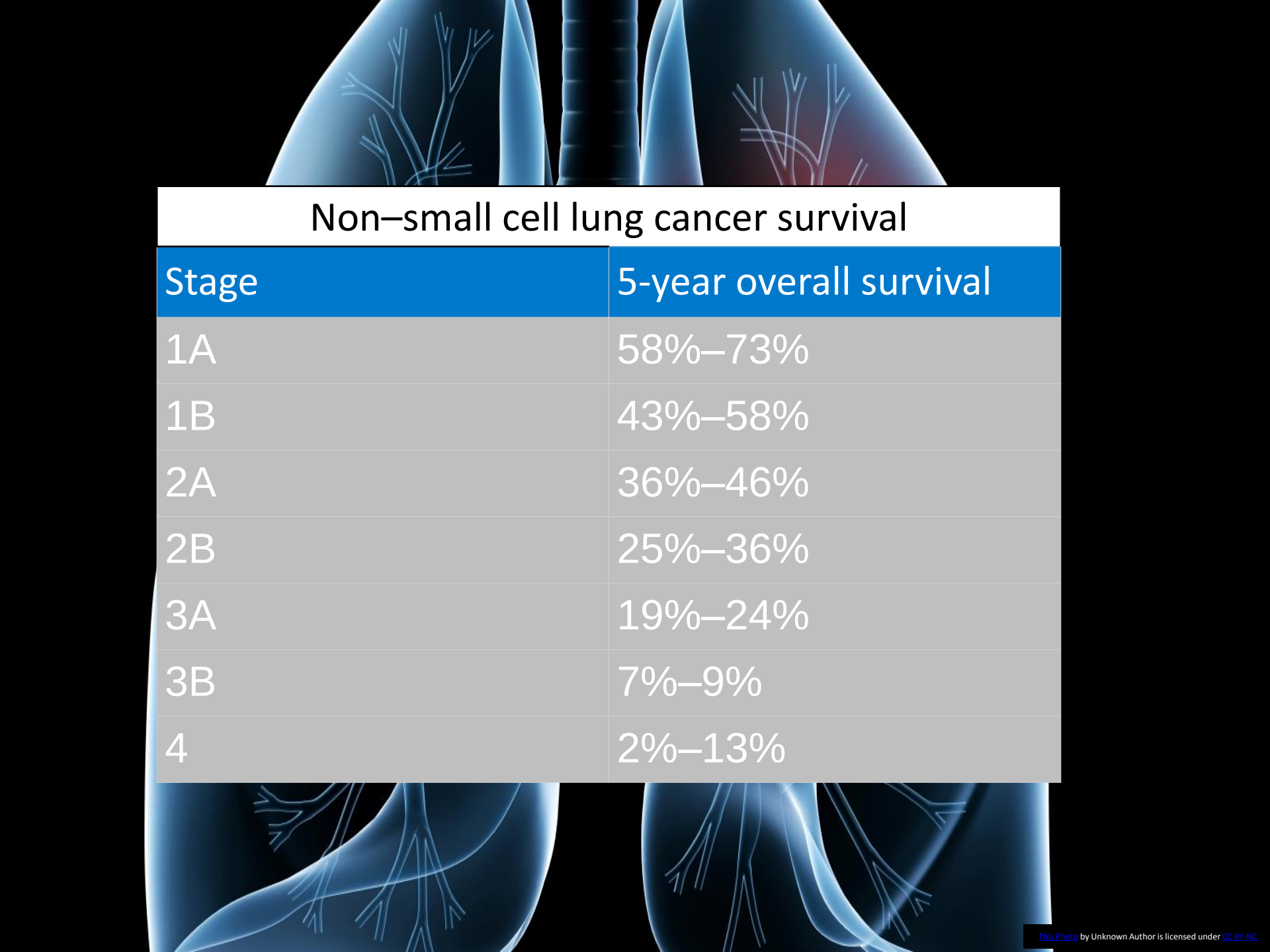
STAGE 1

- STAGE 1A T1 N0 M0
- 1A1 T1a N0 M0
- 1A2 T1b N0 M0
- 1A3 T1c N0 M0

STAGE 1B T2a N0 M0

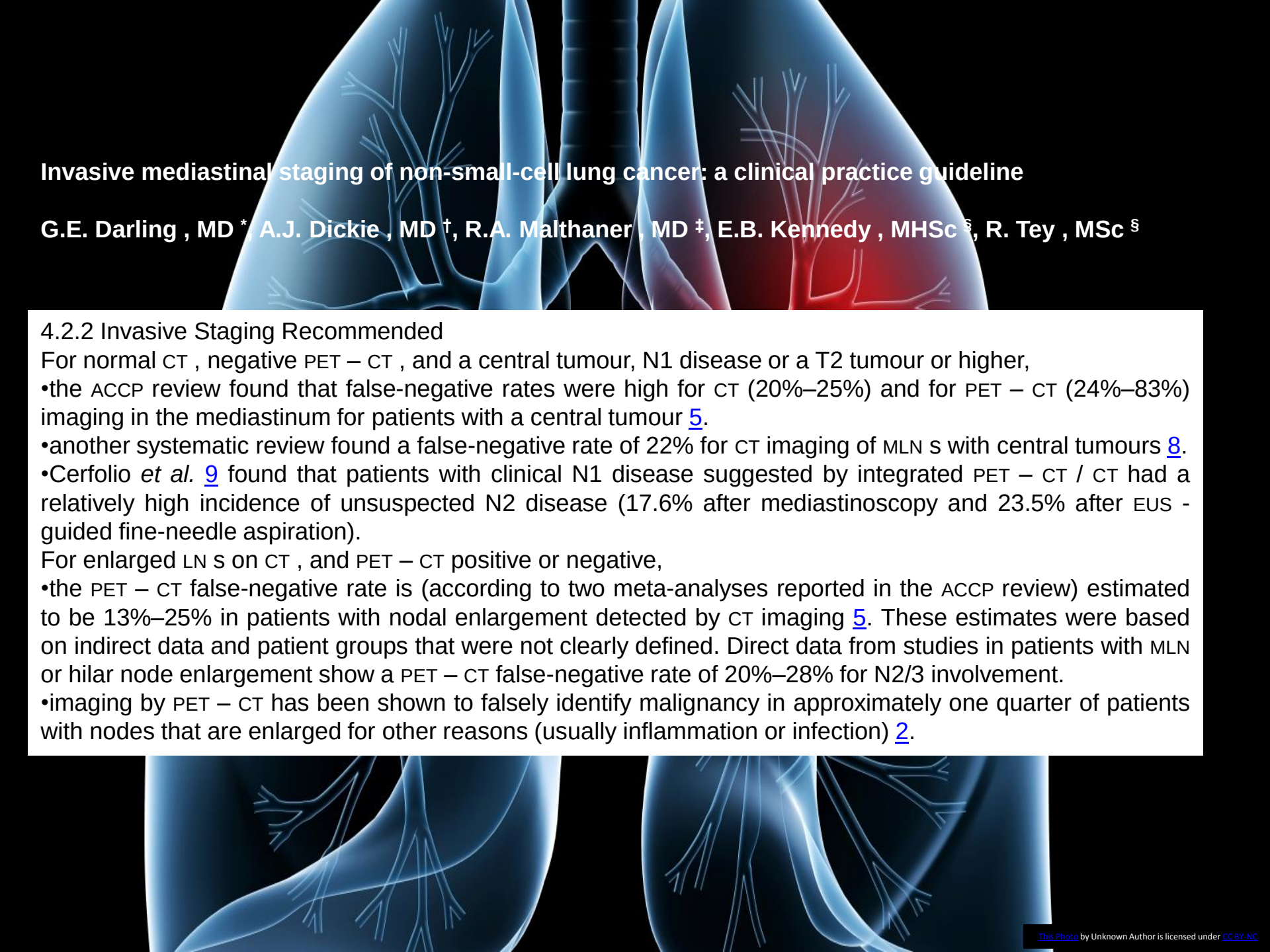
STAGE 2

- STAGE 2A T2b N0 M0
- STAGE 2B T1A-C, T2a,b N1 M0
- T3 N0 M0



Non–small cell lung cancer survival

Stage	5-year overall survival
1A	58%–73%
1B	43%–58%
2A	36%–46%
2B	25%–36%
3A	19%–24%
3B	7%–9%
4	2%–13%



Invasive mediastinal staging of non-small-cell lung cancer: a clinical practice guideline

G.E. Darling , MD [*], A.J. Dickie , MD [†], R.A. Malthaner , MD [‡], E.B. Kennedy , MHSc [§], R. Tey , MSc [§]

4.2.2 Invasive Staging Recommended

For normal CT , negative PET – CT , and a central tumour, N1 disease or a T2 tumour or higher,

•the ACCP review found that false-negative rates were high for CT (20%–25%) and for PET – CT (24%–83%) imaging in the mediastinum for patients with a central tumour 5.

•another systematic review found a false-negative rate of 22% for CT imaging of MLN s with central tumours 8.

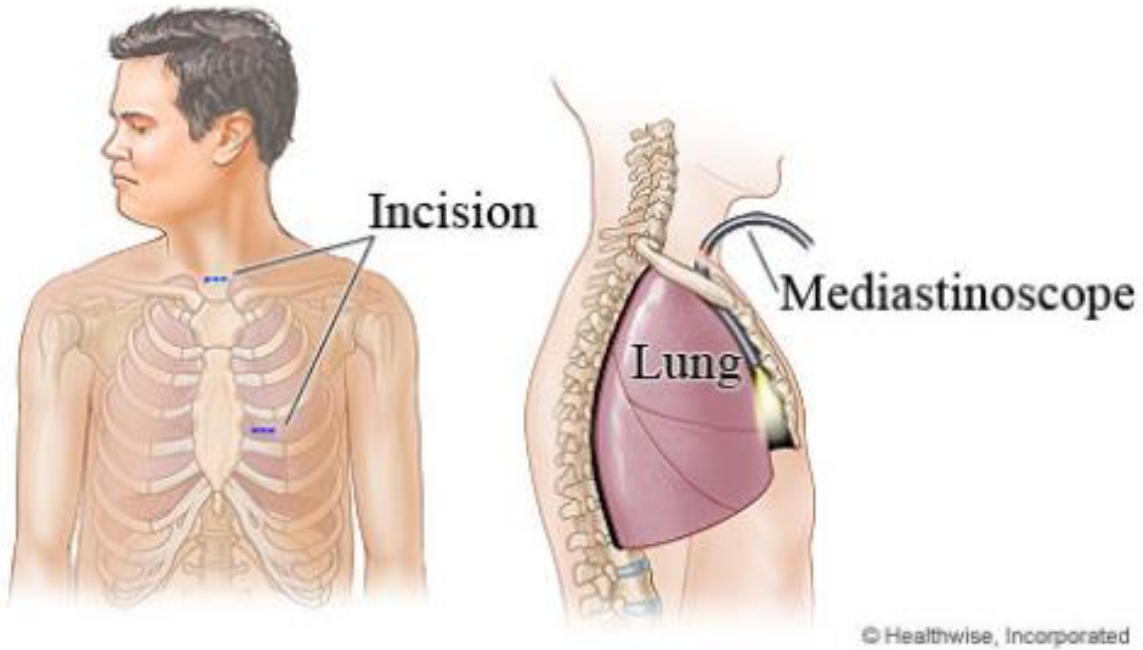
•Cerfolio *et al.* 9 found that patients with clinical N1 disease suggested by integrated PET – CT / CT had a relatively high incidence of unsuspected N2 disease (17.6% after mediastinoscopy and 23.5% after EUS - guided fine-needle aspiration).

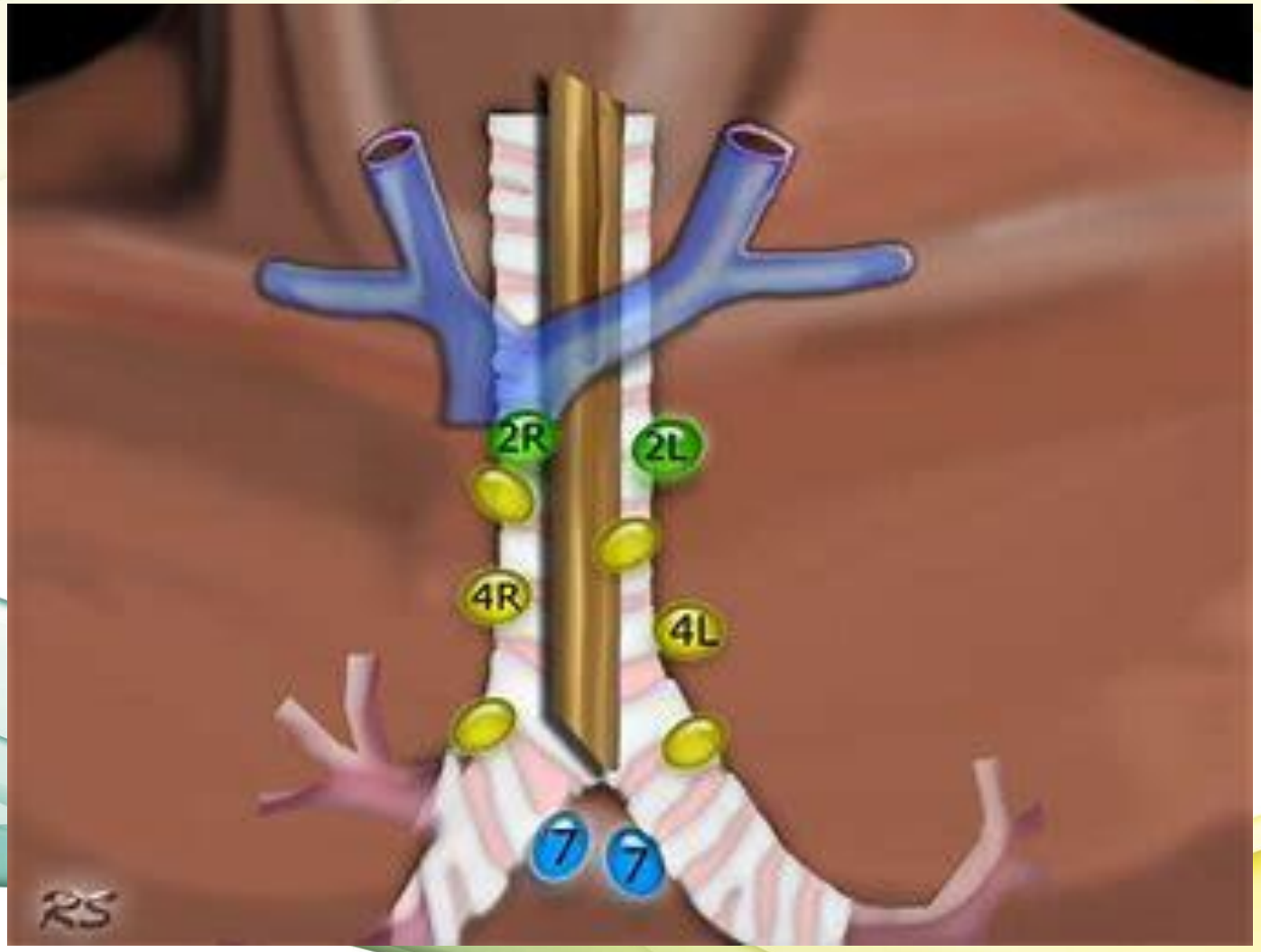
For enlarged LN s on CT , and PET – CT positive or negative,

•the PET – CT false-negative rate is (according to two meta-analyses reported in the ACCP review) estimated to be 13%–25% in patients with nodal enlargement detected by CT imaging 5. These estimates were based on indirect data and patient groups that were not clearly defined. Direct data from studies in patients with MLN or hilar node enlargement show a PET – CT false-negative rate of 20%–28% for N2/3 involvement.

•imaging by PET – CT has been shown to falsely identify malignancy in approximately one quarter of patients with nodes that are enlarged for other reasons (usually inflammation or infection) 2.

Mediastinoscopy




2R
2L
4R
4L
7
7

EARLY STAGE- BETTER PROGNOSIS, APPROPRIATE FOR LOBECTOMY OR PNEUMONECTOMY
STAGE PROPERLY BEFORE SURGERY
MEDIASTINAL STAGING IN ALL BUT STAGE 1A

- RLL lobectomy and lymph node dissection

Pathology

- Squamous Cell Carcinoma
- 3.8 cm
- Parietal pleura involvement
- All 11 nodes negative
- Stage: T3 N0 = 2B

- Referred to Medical Oncology (Dr. Kay)
- Comment about the case if any

Adjuvant Systemic Therapy for NSCLC

Amin Kay

Recurrence Rate of Resectable NSCLC

Stage	5-year Survival	Absolute Benefit of Chemo
1A	73%	--
1B	58%	3%
2A	49%	10%
2B	31%	

Adjuvant Systemic Therapy

- Platinum Doublet
  - Toxicity
- Immunotherapy trial

Follow-up

- H&P and Chest CT q6m for 2–3 y, then low-dose Chest CT annually
- Smoking cessation
- If recurrence: not curable

Case Variation:

78M with 2 months of worsening cough, productive of white sputum. Significant dyspnea (MRC 4).

ROS otherwise negative.

PMHx: Hypertension, Severe COPD (FEV1 30%)

SHx: 1PPD smoker (40 pack-year history)

Case discussed at Thoracic MCC:

- Thoracic Surgery determines patient is medically inoperable. SBRT suggested.

- Referred to Radiation Oncology (Dr. Hirmiz)
- Comment on case variation, and SBRT

Stage I Non Small Cell Lung Cancer: SBRT, alternative to surgery

Dr. Khalid Hirmiz MD,FRCPC
Radiation Oncologist
Cancer Education Day
Friday April 13,2018

WINDSOR REGIONAL HOSPITAL
OUTSTANDING CARE – NO EXCEPTIONS!

- No Disclosures

Objectives

- Discuss the role of SBRT in early stage NSCLC.
- Discuss the importance of SBRT as an alternative treatment option to surgery.
- Review evidence and toxicity of SBRT.
- SBRT in Windsor.

Introduction

- Lung Cancer is the leading cause of cancer related death worldwide.
- Incidence is expected to rise due to aging population.
- Majority of patients present with advanced or metastatic disease.
- Incidence of early stage NSCLC is expected to rise due to wider use of CT thorax in general practice and implementation of CT screening which has shown to lead to earlier detection.

Treatment of Stage I NSCLC
Surgery

- Surgery remains standard of care.
  -Lobectomy
  -Wedge Resection
  -Segmental Resection
- Local control 60%-90%
- 5 year overall survival 60-80%
- Mortality up to 5%
- Morbidity up to 25%
- Not all patients are good candidates for surgery due to age (mostly elderly) and multiple comorbidities.

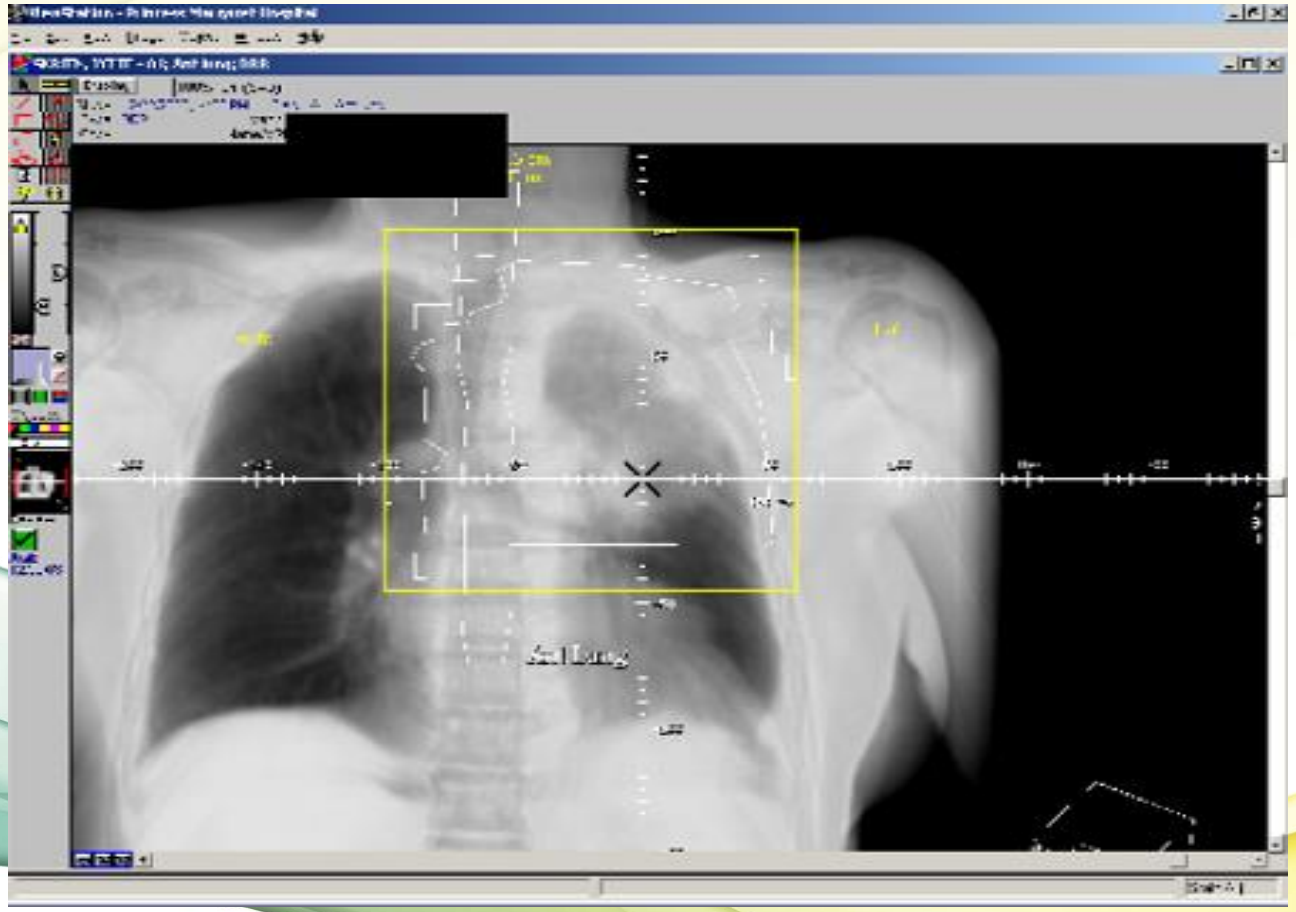
Challenges of Radiotherapy in Lung Cancer-Tumor, Patient

- Natural History (systemic disease).
- Difficulty identifying disease extent.
- Limited tolerance of lung tissue.
- Respiratory movement of the tumor.
- Poor rates of local control with RT.
- Patient population-lung cancer patients are not well enough for aggressive treatments.

Challenges of Radiotherapy in Lung Cancer-Treatment

- Uncertainty with extent of disease.
- Tumor moves and is difficult to visualize during treatment.
- Surrounding structure are radio-sensitive
  - RT dose 60Gy-66Gy/30-33 fractions/daily x6-7 weeks.
  - insufficient for local control (30-50%in 3yrs) and OS (20-35% in 3 yrs).

2D Plan



External Beam Radiation Therapy
3 D Planning (3DCRT)

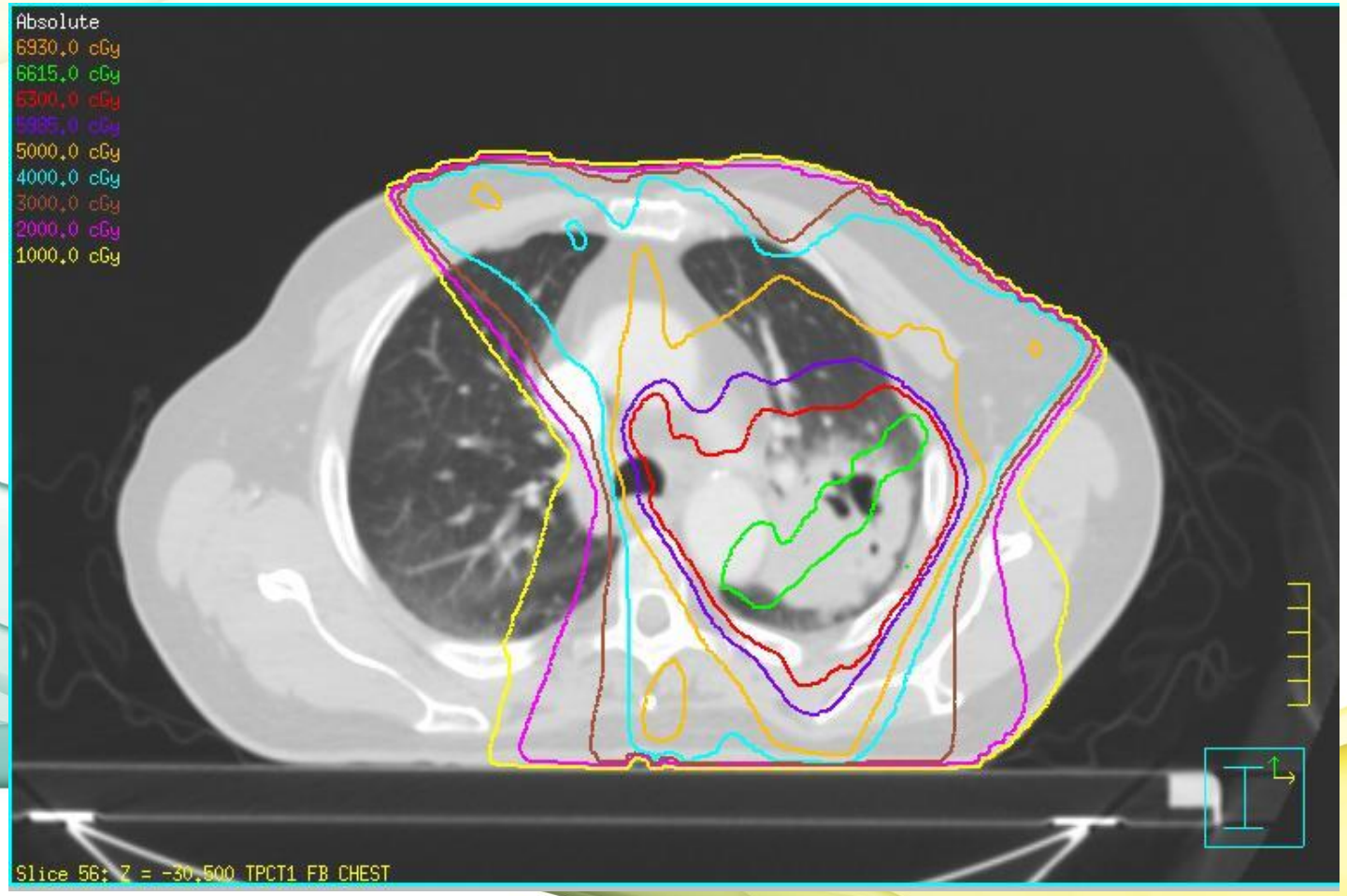
-Improved accuracy of EBRT.

-Defines target more precisely.

-Defines normal structures for avoidance

-Multiple beams aimed at different angles to avoid the critical structures(static beams IMRT or Rapid arc VMAT).

3D CRT


Absolute
6930.0 cGy
6615.0 cGy
6300.0 cGy
5985.0 cGy
5000.0 cGy
4000.0 cGy
3000.0 cGy
2000.0 cGy
1000.0 cGy
Slice 56; Z = -30.500 TPCT1 FB CHEST

SBRT for Lung Cancer (Stereotactic Body Radiation Therapy)

- SBRT=Stereotactic Body Radiation Therapy.
- SABR=Stereotactic Ablative Radiation Therapy.
- Delivering high dose RT to the tumor in a limited # of fractions using highly conformal technique IMRT or VMAT.
- Sparing normal adjacent tissue due to rapid dose fall off beyond PTV.
- Involve sophisticated technique, several beams are directed at the tumor from different angles.
- Strict breathing motion control.
- 4D CT for planning, fusion with diagnostic PET scan.
- Image guided Radiation Therapy (IGRT).

SBRT Indications

- Stage IA-IB and IIA (AJCC 8th Edition):

  -cT1a(<=1cm)N0M0=IA

  -cT1b(>1cm-2cm)N0M0=IA

  -cT1c(>2cm-3cm)N0M0=IA

  -cT2a(>3cm-4cm)N0M0=IB

  -cT2b(>4-5cm)N0M0=IIA

SBRT Outcome

- Early Phase 2 data:

  -Timmerman JAMA 2010

  -Taremi IJROBP 2012

  -Lagerwaard IJROBP 2008

-Local control at 2-4 years: 89%-97%

-Overall survival at 2-3 years: 55%-64%

-Distant mets at 2-3years: 20-23%

SBRT Toxicity

- Fatigue
- Skin irritation
- Radiation Pneumonitis
- Rib pain, #
- Rare: esophageal, bronchial, pericardial, brachial plexus injury, death.

External Beam Radiation Therapy Process

- Define target on imaging (CT, PET, Xray, MRI, Bone scan, biopsy, etc.)
- Simulation is constructed

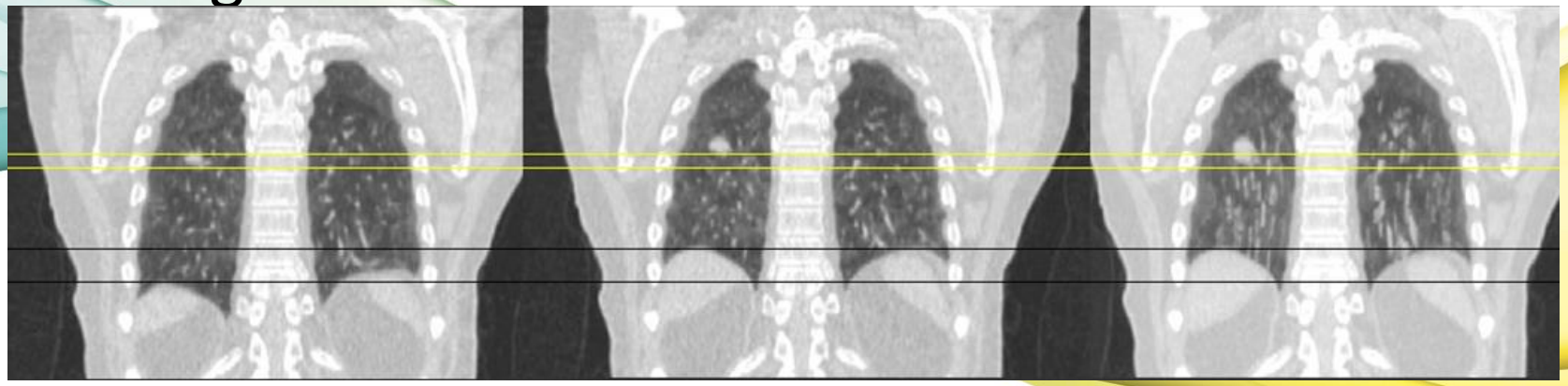
  -CT Simulation (3D).

  -4 D CT Simulation.

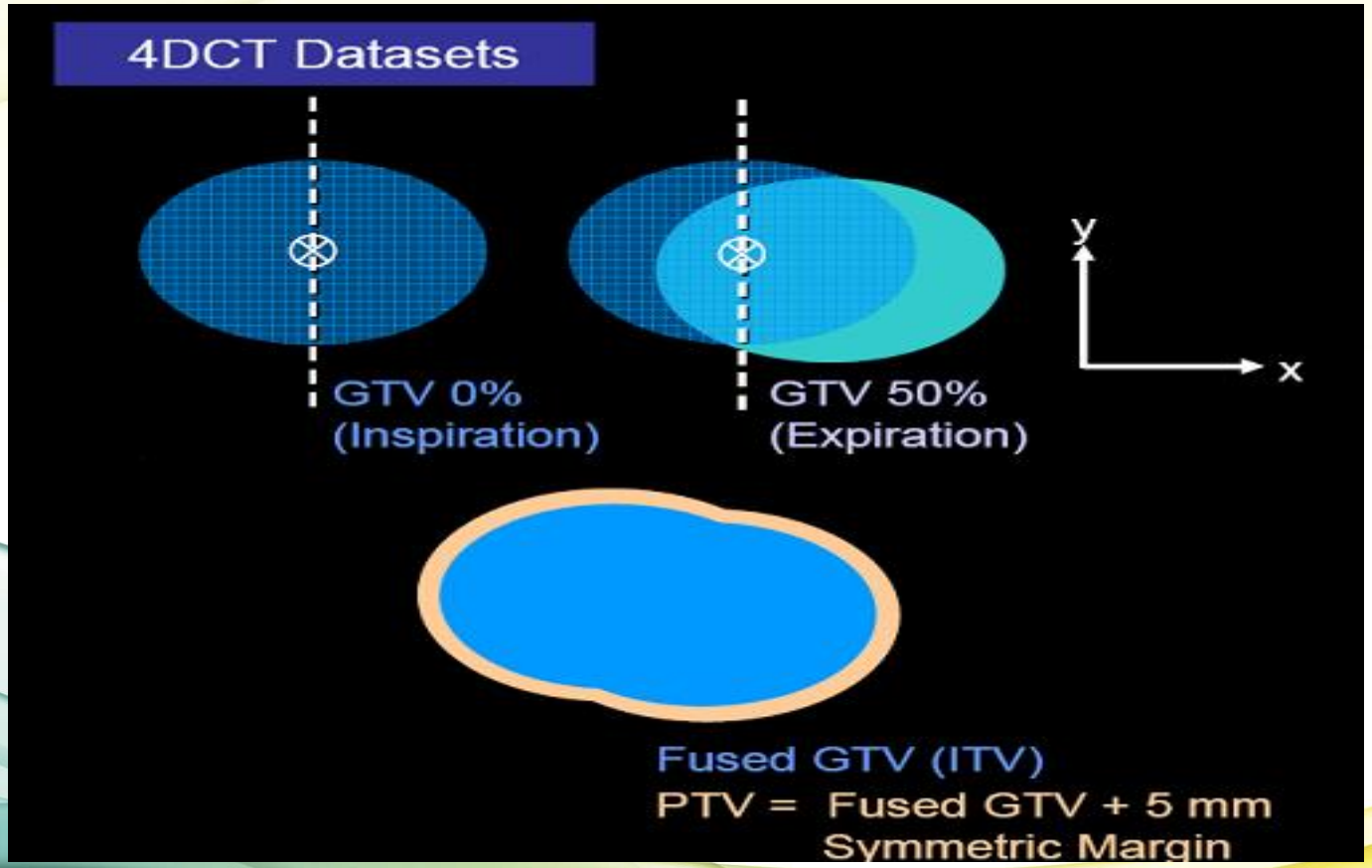
  -Patient immobilization.
- Treatment Planning (Rad Onc, Rad Physics, Dosimetry).
- Radiation Treatment.

External Beam Radiation Therapy Process-4 D Planning

-4D CT is used during simulation. It captures tumor motion by acquiring a sequence of CT images over consecutive phases of breathing cycle. Images are incorporated into planning to account for movements of target and organs during treatment.

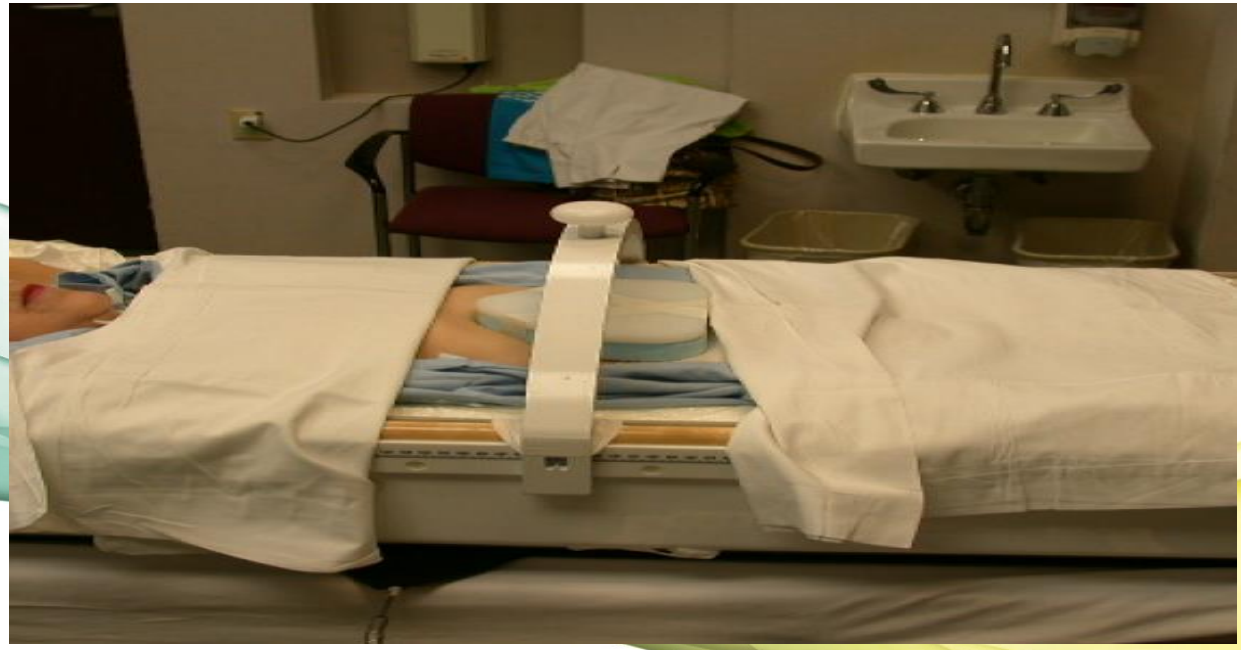


Target Delineation Using 4DCT Data

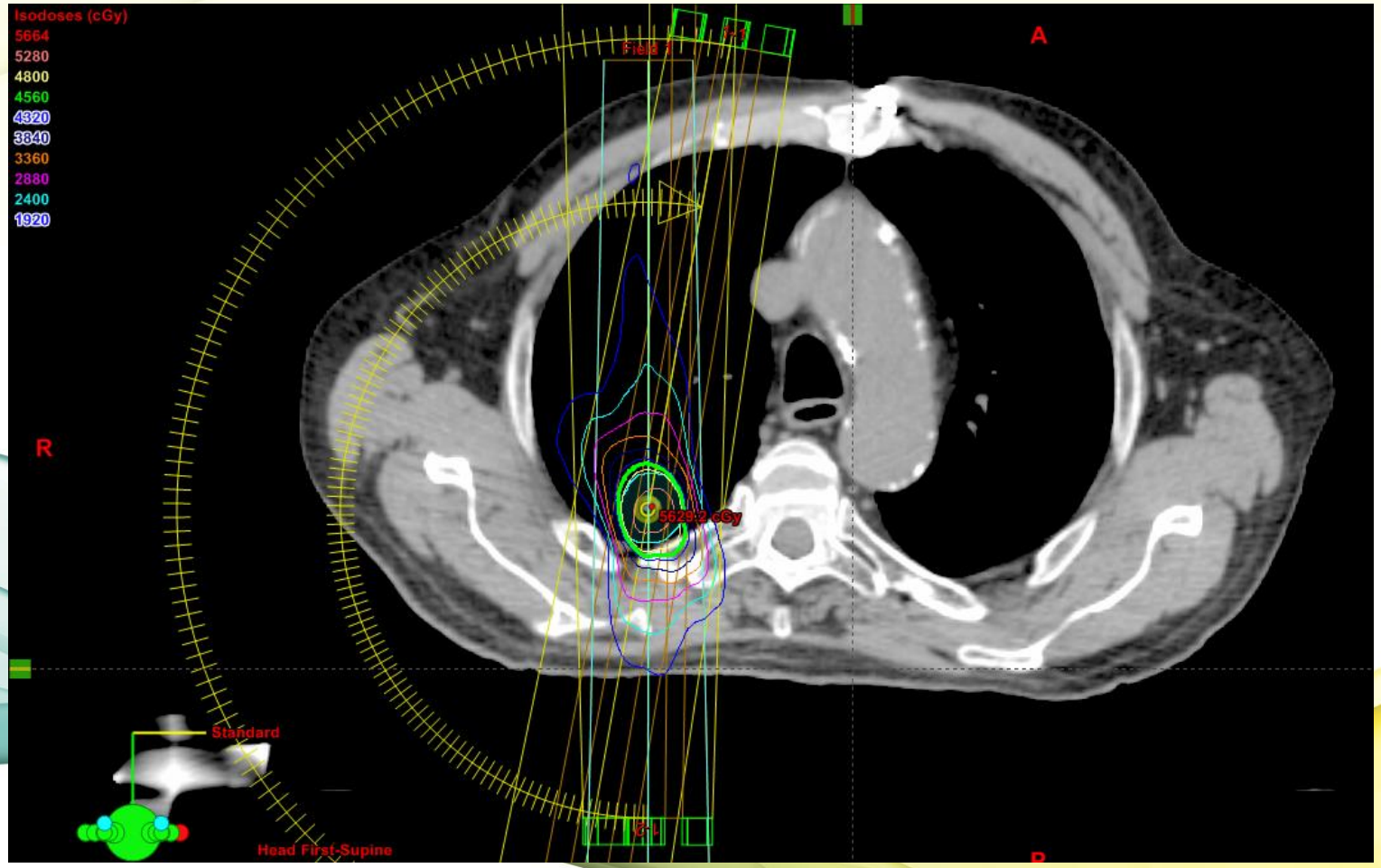


SBRT
Breathing Motion Control

- Inhibition (abdominal compression and breath hold).
- Tracking or chasing-Cyberknife.
- Respiratory gating.



Treatment Delivery



SBRT at WRCC

- **A Randomized Trial of Medically-Inoperable Stage I Non-Small Cell Lung Cancer Patients Comparing Stereotactic Body Radiotherapy Versus Conventional Radiotherapy(LUSTRE)**
- SBRT Dose:

  -Central Tumors: 6000cGy/8 fractions (750cGy/fraction/day) over 14 days

  -Peripheral Tumors: 4800cGy/4 fractions (1200cGy/fraction/day) over 1 week
- 3D CRT Dose:

  6000cGy/15 fractions (400cGy/fraction/day) over 3 weeks

LUSTRE OCOG 2013 Study Eligibility Criteria

- T1/T2a N0 M0 NSCLC, either by:
  (a) preferably histological confirmation and PET/CT evidence ***or***
  (b) a suspicious growing nodule on serial CT imaging, with malignant PET FDG avidity, for which a biopsy would be extremely risky.
- Deemed medically inoperable (as reviewed by a thoracic surgeon and defined as surgically resectable but, because of underlying physiological medical problems [e.g. COPD, heart disease], surgery is contraindicated)**.**
- Radiotherapy is preferred by the patient due to high operable risk.

SBRT at WRCC

- First SBRT treated on LUSTRE protocol in Oct 2015
- A total of 6 patients treated with SBRT on study.
- A total of 4 patients treated with 3DCRT on study.
- A total of 8 patients treated with SBRT off study.
- A total of 4 patients were treated with 3DCRT off study (ineligible for SBRT).
- So total of 14 patients treated with SBRT in about 18 months.
- We have 3 LUSTRE patients in the planning stages.

SBRT
Outcome at WRCC

- October 2015-April 2018:
- No local recurrence within the radiation field so far
- 2 patients who received SBRT died

  -1 patient died from a second and different malignancy

  -1 patient died from lung cancer progression in contralateral lung and mediastinum
- 1 patient who received 3DCRT had new suspicious nodule in a different lobe (?new primary lung cancer)

Conclusions

- SBRT is a good alternative treatment to surgery for early stage NSCLC.
- A good option for medically inoperable high risk patients.
- Comparable local control rates to surgery.
- Well tolerated with minimum toxicity.
- SBRT for early stage NSCLC is well established in Windsor with excellent outcome over 2.5 years.
- Our next goal in Windsor is to use SBRT in other malignancies.

Thank You

Question

What is next best step?

- Send to ER
- Send to Lung Diagnostic Assessment Program
- Call Medical Oncologist on call
- Call David Musyj