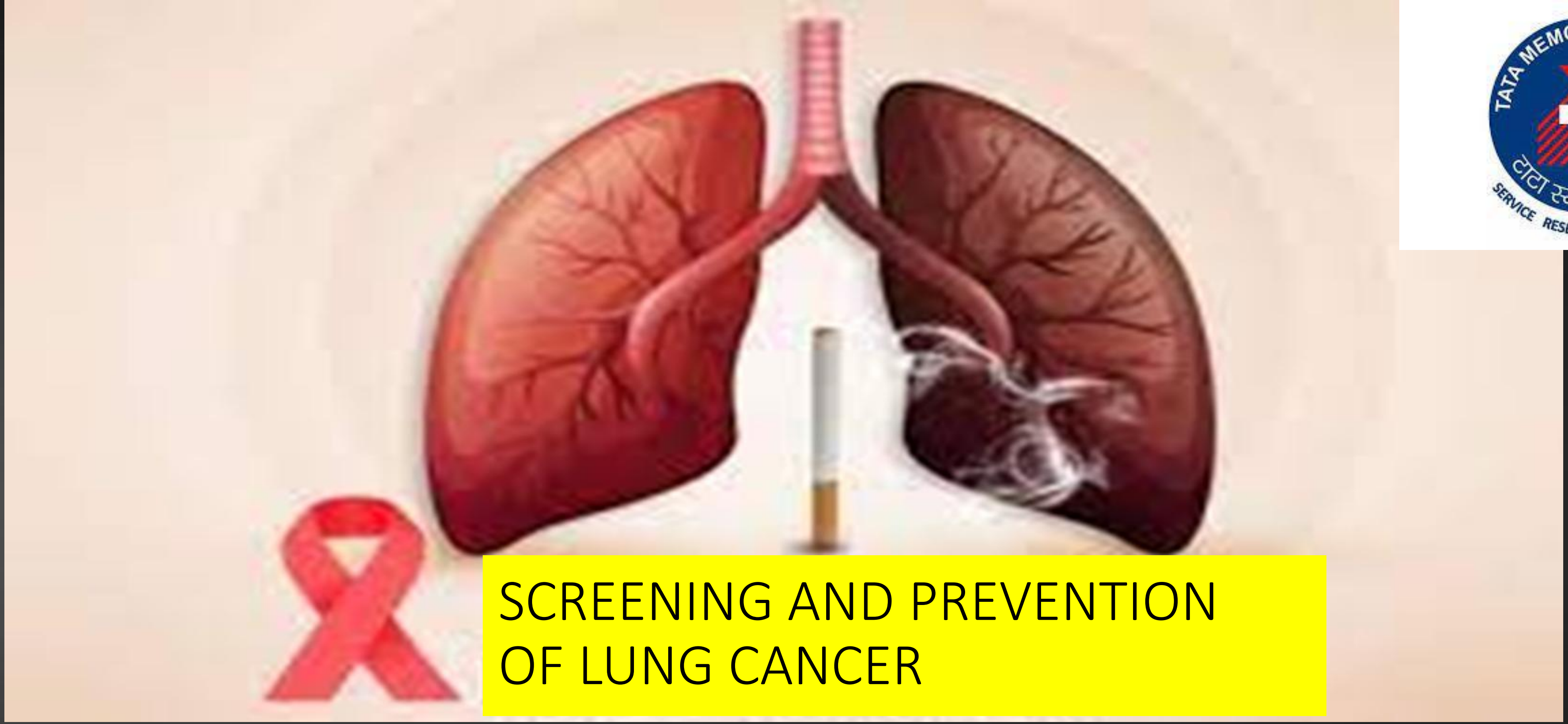

SCREENING AND PREVENTION OF LUNG CANCER

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Mumbai.

Flow

- Introduction
- Whom To Screen
- When To Screen
- How To Screen
- Why To Screen
- Post-screening
- How To Confirm Lung CA,
- Adverse Events Of Screening

LUNG CANCER PREVENTION

- Quitting cigarette smoking and maintaining a smoke-free lifestyle can reduce the risk of lung cancer **01**
- Avoid secondhand smoke wherever possible and encourage those around you to quit smoking **02**
- Take precautions to reduce exposure to harmful chemicals at workplace **03**

Prevention: Primary

- Avoid the use of tobacco smoke
- Personal and family history are important risk factors
- Know environmental carcinogens that increase risk
- Chemoprevention:
  - Consuming carotenoids, Vit A, retinoids Vit E, selenium, Vit C, fat

Prevention: Secondary

- Aim is to early diagnose high risk populations via screening
- CXR, MRI, CT scans, sputum cytology



Prevention: Tertiary

- Targeted at people who survived a cancer disease
- Assists them to retain an optimal level of functioning regardless of their potential debilitating disease

Cancer Screening

Cancer screening refers to the process by which large number of people within population undergo one or more tests that are designed to find the occult tumour.

The aim is to detect preclinical or earlier phase of the disease and to initiate treatment at the earliest to prevent progression. Screening is worth if the earlier intervention improves the outcome.

Whom and when to screen-**USPSTF**

(Grade B recommendation)

- annual screening for lung cancer with
- low-dose computed tomography (LDCT)
- in adults aged 50 to 80 years
- who have a 20 pack-year smoking history
- and currently smoke or have quit within the past 15 years.

Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.

Other recommendations

American Cancer Society :

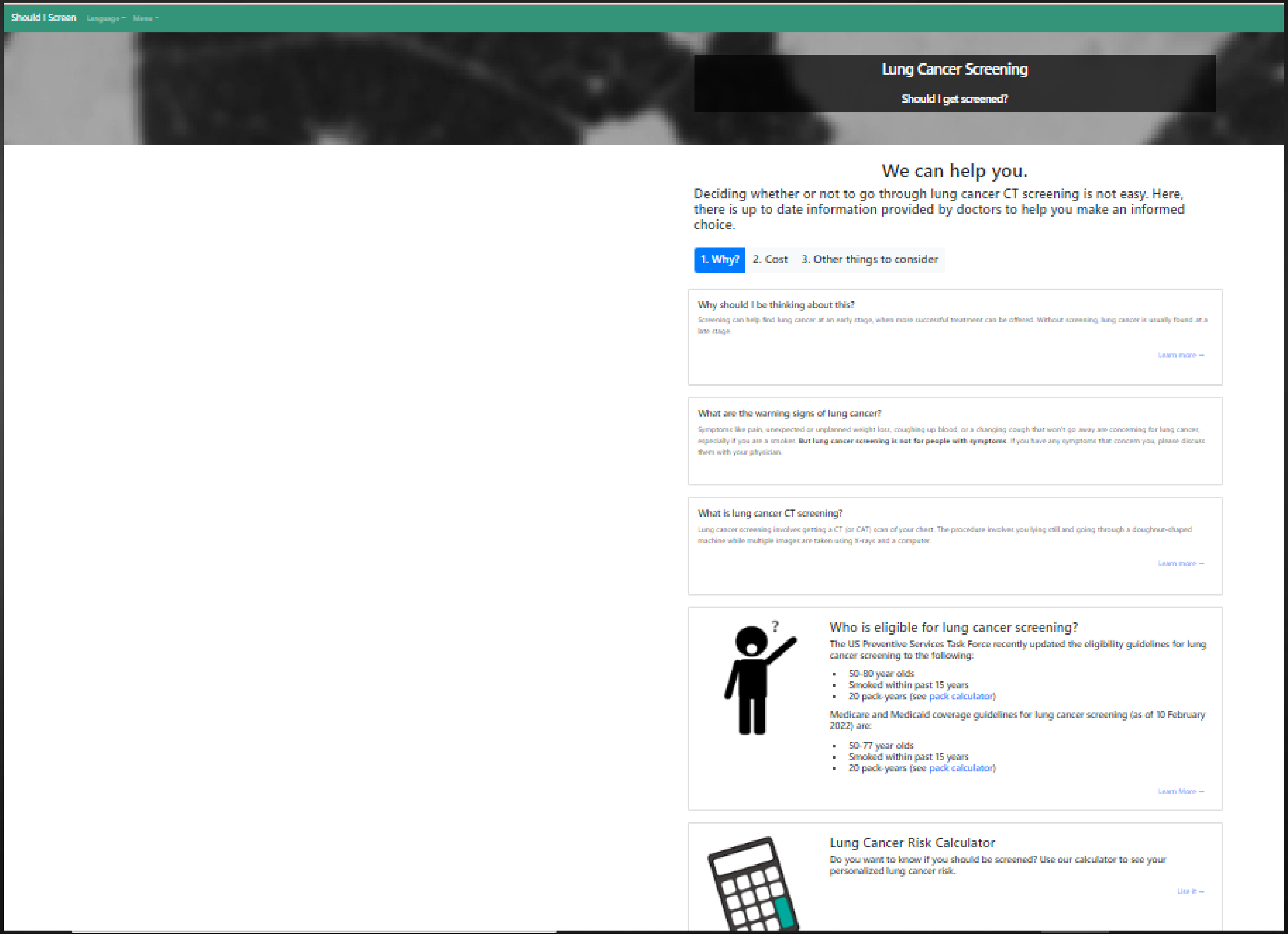
•annual lung cancer screening
•with LDCT
•for persons aged 55 to 74 years
•who are in fairly good health, have at least a 30 pack-year smoking history,
•and currently smoke or have quit within the past 15 years.

National Comprehensive Cancer Network v1 2022

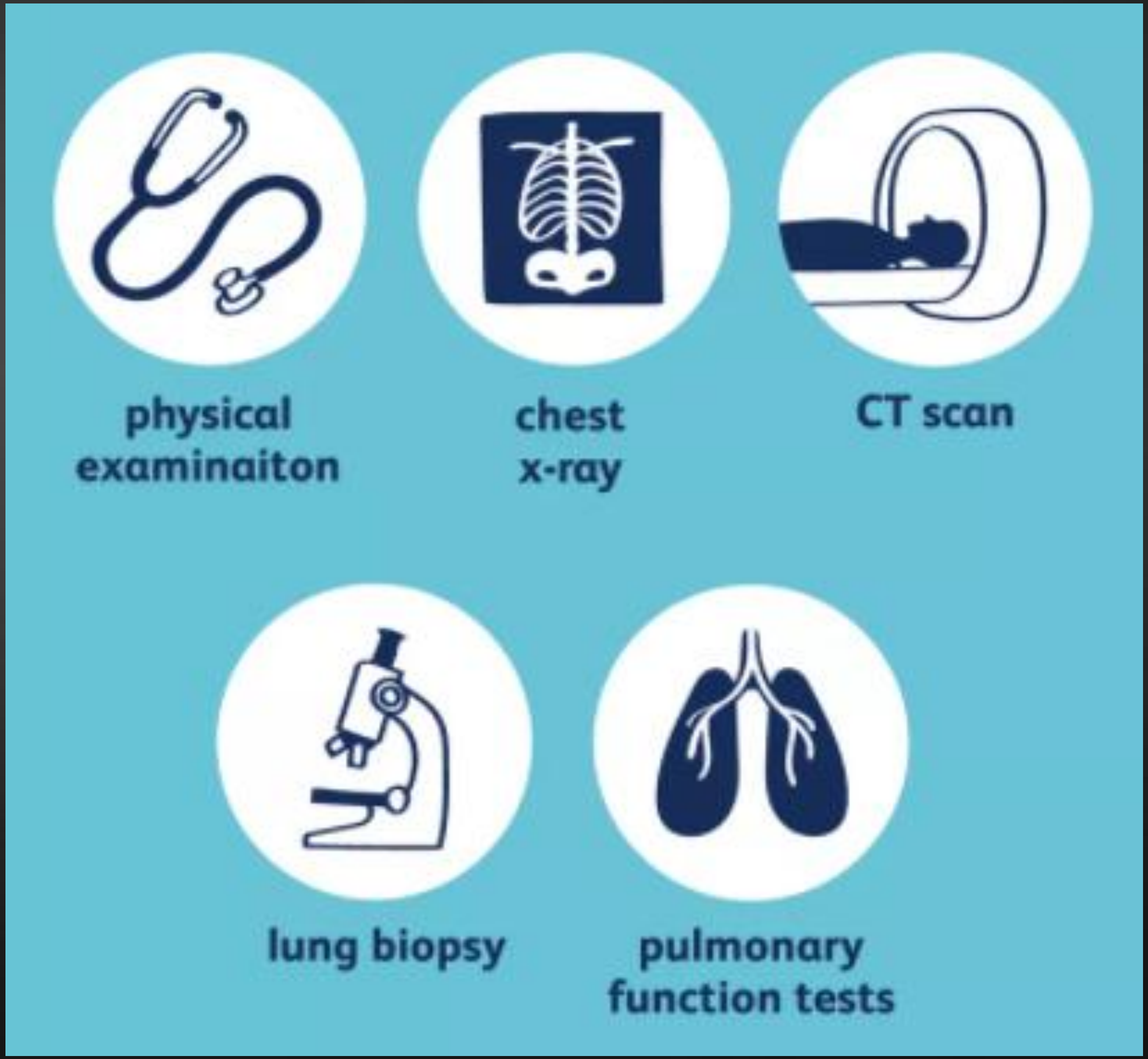
•annual screening
•with LDCT
•in persons aged ≥ 50 years
•who have at least a 20 pack-year smoking history

No upper age cut off
Lower pack –year

shouidiscreen.com



How to screen



How to screen

Annual Screening
Low dose CT

CXR and sputum cytology- not beneficial

In candidates for screening, shared patient/provider decision-making is recommended

NCCN

LOW-DOSE COMPUTED TOMOGRAPHY ACQUISITION, STORAGE, INTERPRETATION, AND NODULE REPORTING (Lung-RADS)[1-4]

Acquisition	Small Patient (BMI ≤30)	Large Patient (BMI >30)
Total radiation exposure	≤3 mSv	≤5 mSv
kVp	100–120	120
mAs	≤40	≤60
	All Patients	
Gantry rotation speed	≤0.5	
Detector collimation	≤1.5 mm	
Slice width	≤2.5 mm; ≤1.0 mm preferred for characterization of nodule consistency, particularly for small nodules[5]	
Slice interval	≤slice width; 50% overlap preferred for 3D and computer-aided detection (CAD) applications	
Scan acquisition time	≤10 seconds (single breath hold)	
Breathing	Maximum inspiration	
Contrast	No oral or intravenous contrast	
CT scanner detectors	≥16	
Storage	All acquired images, including thin sections; maximum intensity projections (MIPs) and CAD renderings if used	
Interpretation Tools		
Platform	Computer workstation review	
Image type	Standard and MIP images	
Comparison studies	Comparison with prior chest CT images (not reports) is essential to evaluate change in size, morphology, and density of nodules; review of serial chest CT exams is important to detect slow growth	
Nodule Parameters		
Size	Largest mean diameter on a single image (mean of the longest diameter of the nodule and its perpendicular diameter, when compared to the baseline scan)	
Density	Solid, ground-glass, or mixed (mixed; otherwise referred to as part solid)	
Calcification	Present/absent; if present: solid, central vs. eccentric, concentric rings, popcorn, stippled, or amorphous	
Fat	Report if present	
Shape/Margin	Round/ovoid, triangular/smooth, lobulated, or spiculated	
Lung location	By lobe of the lung, preferably by segment, and if subpleural	
Location in dataset	Specify series and image number for future comparison	
Temporal comparison	If unchanged, include the longest duration of no change as directly viewed by the interpreter on the images (not by report); if changed, report current and prior size	

Why to screen

BENEFITS

- Decreased lung cancer mortality
- Quality of life

a) Reduction in disease-related morbidity
b) Reduction in treatment-related morbidity
c) Improvement in healthy lifestyles
d) Reduction in anxiety/psychosocial burden

- Discovery of other significant occult health risks (eg, thyroid nodule,severe but silent coronary artery disease, early renal cancer in upperpole of kidney, aortic aneurysm, breast cancer)

Improved survival

Decreased cancer specific mortality

Less radical treatment

Improve quality of life

Reduced cost of treatment

Reassurance with true negative tests

Why not to screen

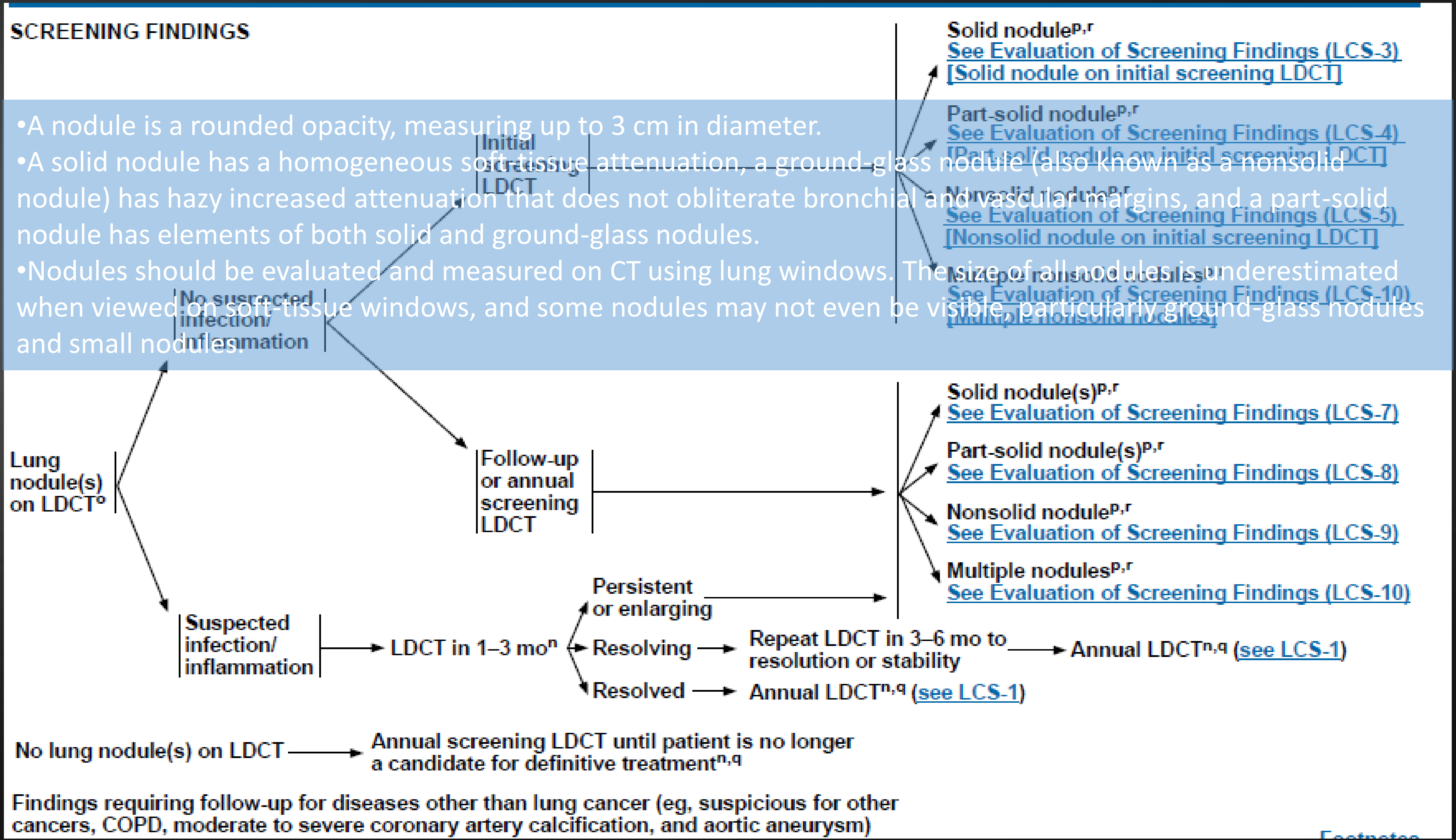
RISKS

- Futile detection of small aggressive tumors or indolent disease
- Quality of life

Anxiety about test findings

- Physical complications from diagnostic workup
- False-positive results
- False-negative results
- Unnecessary testing and procedures
- Radiation exposure
- Cost
- Incidental lesions

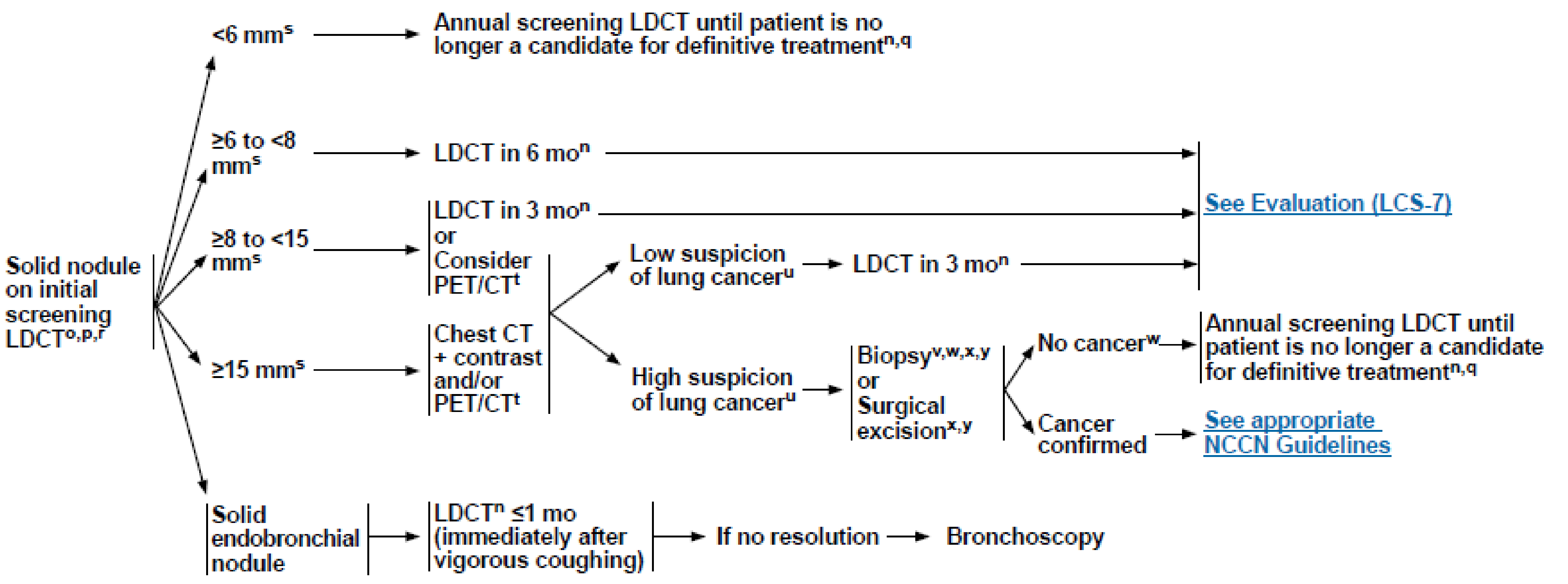
Post-screening- NCCN V 1 2022



- A nodule is a rounded opacity, measuring up to 3 cm in diameter.
- A solid nodule has a homogeneous soft-tissue attenuation, a ground-glass nodule (also known as a nonsolid nodule) has hazy increased attenuation that does not obliterate bronchial and vascular margins, and a part-solid nodule has elements of both solid and ground-glass nodules.
- Nodules should be evaluated and measured on CT using lung windows. The size of all nodules is underestimated when viewed on soft-tissue windows, and some nodules may not even be visible, particularly ground-glass nodules and small nodules.

EVALUATION OF SCREENING FINDINGS

FOLLOW-UP OF SCREENING FINDINGS



Part-solid nodule on initial screening LDCT[o,p,q,r,z]

- <6 mm[s] → Annual screening LDCT until patient is no longer a candidate for definitive treatment[n,q]
- ≥6 mm with solid component <6 mm[s] → LDCT in 6 mo[n] → See Evaluation (LCS-9)
- ≥6 mm with solid component ≥6 to <8 mm[s] → LDCT in 3 mo[n] or Consider PET/CT[t]
  - LDCT in 3 mo[n] → See Evaluation (LCS-9)
  - Low suspicion of lung cancer[u] → LDCT in 3 mo[n] → See Evaluation (LCS-9)
  - High suspicion of lung cancer[u] → Biopsy[v,w,x] or Surgical excision[x]
    - No cancer[w] → Annual screening LDCT until patient is no longer a candidate for definitive treatment[n,q]
    - Cancer confirmed → See appropriate NCCN Guidelines
- Solid component ≥8 mm[s] → Chest CT + contrast and/or PET/CT[t]
  - Low suspicion of lung cancer[u] → LDCT in 3 mo[n] → See Evaluation (LCS-9)
  - High suspicion of lung cancer[u] → Biopsy[v,w,x] or Surgical excision[x]
    - No cancer[w] → Annual screening LDCT until patient is no longer a candidate for definitive treatment[n,q]
    - Cancer confirmed → See appropriate NCCN Guidelines

Nonsolid nodule on initial screening LDCT[o,p,r,z,aa]

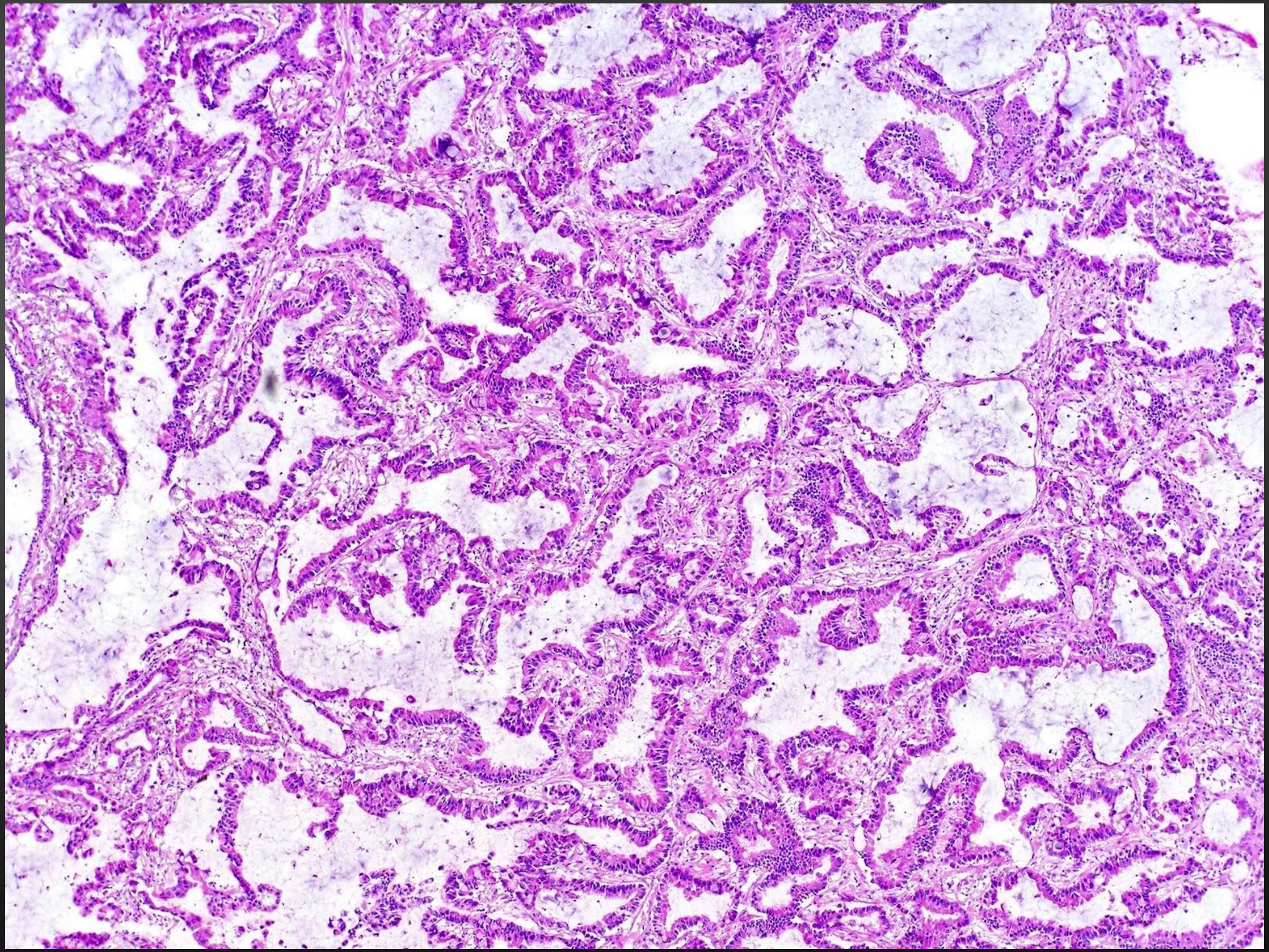
- <20 mm[s] → Annual screening LDCT until patient is no longer a candidate for definitive treatment[n,q]
- ≥20 mm[s] → LDCT in 6 mo[n] → See Evaluation (LCS-10)

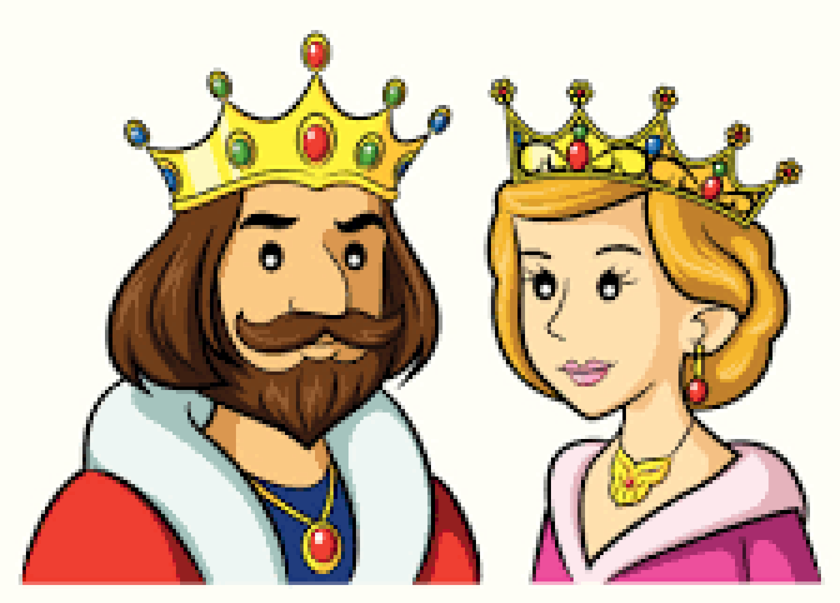
Multiple nonsolid nodules[r,z,bb,cc]

→ Pure nonsolid nodules[s] → Measure the largest nodule and manage based on LCS-5 or LCS-9

→ Dominant nodule(s) with part-solid component[s,dd] → Measure the largest nodule and manage based on LCS-4 or LCS-8

Confirmation of Ca Lung





Adverse Events Of Screening

Harms:
false-positive results leading to unnecessary tests and invasive procedures,
overdiagnosis,
radiation-induced cancer,
incidental findings, and increases in distress or anxiety

- False positive (FP):The NLST -26.3% (baseline), 27.2% (1 year) and 15.9% (2nd year). NELSON - 19.8% at baseline, 7.1% at year 1, 9.0% for males at year 3, and 3.9% for males at year 5.5 of screening
- Ovediagnosis :In the CISNET modeling studies, which account for lifetime follow-up, the 2013 USPSTF screening program (A-55-80-30-15) -6.3% of screen-detected cases of lung cancer being over diagnosed lung cancers vs 6.0% lung cancers with (A-50-80-20-15).
- RT induced cancer: Relative to the 2013 USPSTF recommendation (A-55-80-30-15), the 2021 USPSTF recommendation (A-50-80-20-15) would be associated with an estimated 38.6 vs 20.6 radiation-related lung cancer deaths per 100 000 persons in the total population aged 45 to 90 years, or 1 death caused for every 13.0 vs 18.5 lung cancer deaths avoided by screening

Incidental findings

- Required further evaluation (4.4% to 40.7%)
- Common incidental findings included coronary artery calcification, aortic aneurysms, emphysema, and infectious and inflammatory processes. Other common findings were masses, nodules, or cysts of the kidney, breast, adrenal gland, liver, thyroid, pancreas, spine, and lymph nodes.
- Cancers involving the kidney, thyroid, or liver were ultimately diagnosed in 0.39% of NLST participants in the LDCT group during screening

IASLC

ORIGINAL ARTICLE

Lung Cancer Incidence and Mortality with Extended Follow-up in the National Lung Screening Trial

Check for updates

The National Lung Screening Trial Research Team*

Received 21 July 2018; revised 29 May 2019; accepted 31 May 2019
Available online - 28 June 2019

The median follow-up times were 11.3 years for incidence and 12.3 years for mortality

Table 2. Histologic Type and Stage of Lung Cancers by Arm

Variable	LDCT Arm n (%)	CXR Arm n (%)	*p* Value[a]
All	1701	1681	
Histologic type			
All NSCLC	1397 (82.1)	1343 (79.9)	0.28
BAC	121 (7.1)	46 (2.7)	<0.0001
Adenocarcinoma	608 (35.7)	598 (35.6)	0.76
Squamous	416 (24.5)	395 (23.5)	0.45
Large cell	56 (3.3)	53 (3.2)	0.77
Other NSCLC	196 (11.5)	251 (14.9)	0.009
SCLC	245 (14.4)	291 (17.3)	0.05
Carcinoid	12 (0.7)	7 (0.4)	
Unknown	47 (2.8)	40 (2.4)	
Stage[b]			
I[c]	673 (39.6)	462 (27.5)	<0.0001
IA	523	326	
1B	148	134	
II[c]	145 (8.5)	153 (9.1)	0.65
IIA	91	80	
IIB	43	66	
III[c]	298 (17.5)	321 (19.1)	0.36
IIIA	204	216	
IIIB	84	94	
IV	468 (27.5)	597 (35.5)	<0.0001
Occult	5	4	
Unknown	112 (6.6)	143 (8.5)	

Table 3. Lung Cancer Mortality, Stage IV Incidence and Overall Mortality by Arm

Outcome	LDCT, n (per 1000 subjects)	CXR, n (per 1000 subjects)	Difference across Arms per 1000 Subjects (95% CI) (CXR Minus LDCT)	RR (95% CI)	*p* Value Interaction[a]
All lung cancer deaths					
All subjects	1147 (42.9)	1236 (46.2)	3.3 (-0.2 to 6.8)	0.92 (0.85-1.00)	
Men	733 (46.5)	755 (47.9)	1.4 (-3.3 to 6.1)	0.97 (0.87-1.07)	0.17
Women	414 (37.8)	481 (43.9)	6.1 (0.8-11.3)	0.86 (0.75-0.98)	
Current smoker	724 (56.3)	818 (63.4)	7.1 (1.3-12.9)	0.88 (0.80-0.97)	0.12
Former smoker	423 (30.5)	418 (30.2)	-0.3 (-4.3 to 3.8)	1.01 (0.88-1.15)	
Age 55-64 y at randomization	641 (32.7)	739 (37.7)	5.0 (1.3-8.6)	0.86 (0.78-0.96)	0.051
Age 65-74 y at randomization	506 (71.2)	497 (69.9)	-1.3 (-9.7 to 7.2)	1.01 (0.90-1.15)	
Lung cancer deaths: dilution-adjusted analysis[b]					
All subjects	578 (21.6)	646 (24.2)	2.5 (0.001-5.1)	0.89 (0.80-0.997)	
Men	373 (23.7)	390 (24.7)	1.1 (-2.3 to 4.5)	0.95 (0.83-1.10)	0.14
Women	205 (18.7)	256 (23.3)	4.6 (0.8-8.4)	0.80 (0.66-0.96)	
Current smoker	356 (27.7)	423 (32.8)	5.1 (0.9-9.3)	0.84 (0.73-0.97)	0.16
Former smoker	222 (16.0)	223 (16.1)	0.1 (-2.9 to 3.1)	0.99 (0.82-1.19)	
Age 55-64 y at randomization	310 (15.8)	362 (18.4)	2.6 (0.1-5.2)	0.85 (0.73-0.99)	0.39
Age 65-74 y at randomization	268 (37.7)	284 (40.0)	2.3 (-4.1 to 8.6)	0.94 (0.80-1.11)	
Stage IV cases					
All subjects	468 (17.5)	597 (22.3)	4.8 (2.5-7.2)	0.79 (0.70-0.89)	
Men	303 (19.2)	365 (23.2)	3.9 (0.8-7.1)	0.83 (0.71-0.97)	0.24
Women	165 (15.1)	232 (21.2)	6.1 (2.6-9.6)	0.71 (0.58-0.87)	
Current smoker	297 (23.1)	386 (29.9)	6.8 (2.9-10.7)	0.77 (0.66-0.90)	0.69
Former smoker	171 (12.3)	211 (15.3)	2.9 (0.2-5.7)	0.81 (0.66-0.99)	
Age 55-64 y at randomization	278 (14.2)	367 (18.7)	4.5 (2.0-7.0)	0.76 (0.65-0.89)	0.48
Age 65-74 y at randomization	190 (26.7)	230 (32.4)	5.6 (0.1-11.2)	0.83 (0.69-1.01)	
Stage IV cases through year 6					
All Subjects	245 (9.2)	344 (12.9)	3.7 (1.9-5.5)	0.71 (0.60-0.84)	
Men	165 (10.5)	214 (13.6)	3.1 (0.7-5.5)	0.77 (0.63-0.95)	0.21
Women	80 (7.3)	130 (11.9)	4.5 (2.0-7.1)	0.62 (0.47-0.82)	
Current smoker	153 (11.9)	221 (17.1)	5.2 (2.3-8.2)	0.70 (0.57-0.86)	0.66
Former smoker	92 (6.6)	123 (8.9)	2.3 (0.2-4.3)	0.75 (0.57-0.98)	
Age 55-64 y at randomization	140 (7.1)	207 (10.5)	3.4 (1.6-5.3)	0.68 (0.55-0.84)	0.46
Age 65-74 y at randomization	105 (14.8)	137 (19.3)	4.5 (0.3-8.8)	0.77 (0.60-0.99)	
Overall mortality (all subjects)	5253 (196.6)	5366 (200.7)	4.2 (-2.6 to 10.9)	0.97 (0.94-1.01)	
Overall mortality excluding lung cancer deaths (all subjects)	4106 (153.7)	4130 (154.5)	0.9 (-5.3 to 7.0)	0.99 (0.95-1.03)	

[a]All deaths with a corresponding lung cancer diagnosis within 6 years of randomization were included.
[b]*p* Value for interaction of trial arm by age, sex, or smoking status for the RR.
LDCT, low-dose computed tomography; CXR, chest radiography; CI, confidence interval; RR, rate ratio.

In this extended follow-up analysis of the NLST, the difference in the proportion dying of lung cancer across arms (CXR minus LDCT) was 3.3 per 1000, which translates into an NNS to prevent one lung cancer death of 303.

NLST trial

the overall mortality benefit is no longer significant (RR 0.97 (95% CI: 0.94–1.01); the difference in the number dying (per 1000) is 4.2 (95% CI: –2.6 to 10.9, p =0.18).

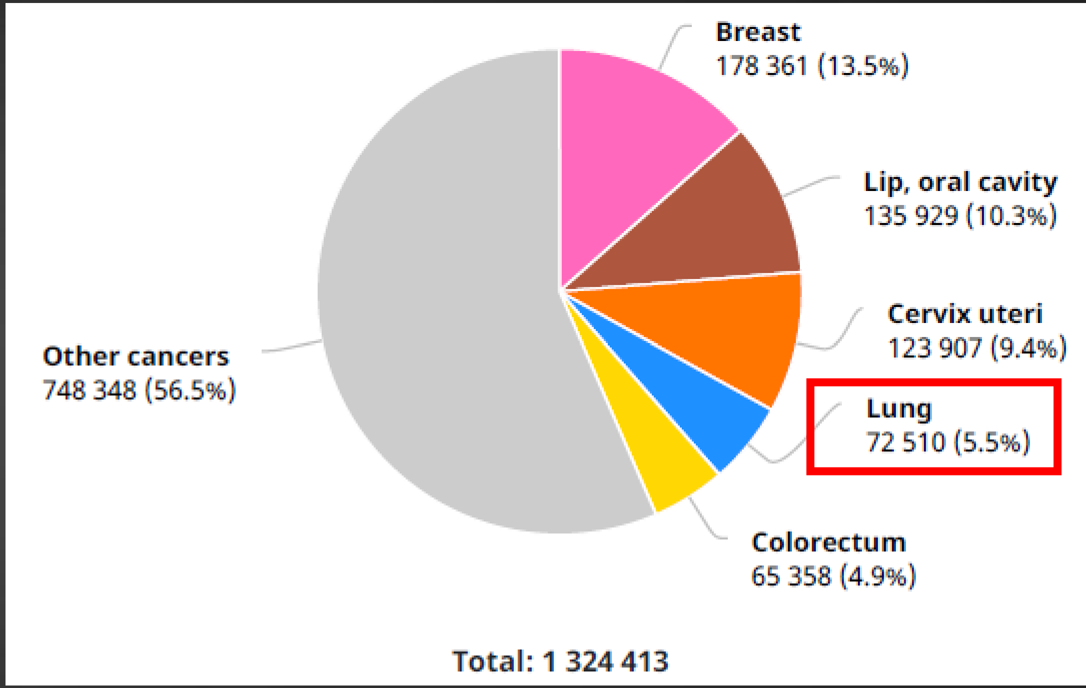
Non-std control arm

lack of information on any posttrial screening that may have occurred in either the LDCT or chest radiography group

NELSON

- LDCT at baseline, than after 2 and 5.5 years.
- LDCT to no screening
- among smokers 50–74 years old, with >15 cigarettes a day for >25 years or >10 cigarettes a day for >30 years and have quit less than 10 years ago.
- median follow-up of 10 years- NELSON found that lung cancer mortality was significantly lower among at-risk individuals who underwent LDCT compared with no screening among high-risk patients (2.43% vs 3.17%).

How common is Lung Cancer in India ?



	New cases				Deaths				5-year prevalence (all ages)	
Cancer	Number	Rank	(%)	Cum.risk	Number	Rank	(%)	Cum.risk	Number	Prop.
Breast	178 361	1	13.5	2.81	90 408	1	10.6	1.49	459 271	0
Lip, oral cavity	135 929	2	10.3	1.09	75 290	3	8.8	0.62	300 413	0
Cervix uteri	123 907	3	9.4	2.01	77 348	2	9.1	1.30	283 842	0
Lung	72 510	4	5.5	0.67	66 279	4	7.8	0.61	80 817	0
Oesophagus	63 180	5	4.8	0.57	58 342	5	6.9	0.53	68 607	0

GLOBOCAN 2020 (WHO) https://gco.iarc.fr/today

WHAT TO TELL PATIENTS-
-shared decision-making

- All cause mortality

13.93% risk of death at 10 years with screening

Vs.

13.76% risk of death without screening (statistically NOT SIGNIFICANT)

- As for the risk of lung cancer death,

3.2 vs. 2.4% with vs without screening (Δ= 0.74%)

India

- No lung cancer screening guideline in india.
- issues with availability of low dose CT scan and associated cost, also implicated is the high prevalence of pulmonary tuberculosis leading to over-diagnosis

TAKE HOME MESSAGE

Screening may be considered in

- Heavy Smokers
- >50yrs

BUT AFTER SHARED DECISION MAKING


THANK YOU