Cancer Care Ontario
Action Cancer Ontario

Lung Cancer Imaging Guidelines: Integration with the Lung Cancer Diagnosis and Staging Clinical Pathway

Cancer Imaging Guidance L-1 Version 1
January 2014

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Contents

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Preamble

Imaging professionals and cancer care providers need up to date evidence based guidelines to make informed decisions about the most appropriate health care for specific circumstances. Guidelines should be based on the best evidence, be freely accessible, responsive to new developments and applicable to Ontario's Cancer Centres.

Although numerous guidelines have been produced that provide recommendations for cancer imaging, a 2010 stakeholder survey conducted by the Cancer Imaging Program (CIP) at Cancer Care Ontario (CCO) found that awareness of existing guidelines was limited (Appendix 1). Recommendations for cancer imaging are often embedded in larger guidance documents or specialist society guidelines, or are developed to address a single, specific clinical question. This can make identification of which documents to use and/or where to find specific guidance challenging, and can impede utility for the referring physician and radiologist as part of routine clinical practice. Additionally, a 2010 review of English language guidelines published between 2003 and 2008 on the topic of lung cancer from the Canadian Partnership Against Cancer (CPAC) determined that there was duplication of coverage for guidance particularly for treatment, diagnosis and staging (Ref 1). Guideline development is resource and time extensive and, thus, better leverage of existing guidance helps focus resources in other areas of need.

CCO's Disease Pathway Maps (also referred to as pathways) provide information about what type of care should be offered to Ontario cancer patients and, where applicable, they link to Ontario clinical guidelines. The pathways are intended to set care expectations for cancer patients in Ontario, based on best scientific evidence and consensus clinical opinion. By describing what care should be provided to Ontario patients, the pathways may help identify areas for improvement along the cancer journey. The first pathway completed by CCO is the Lung Cancer Diagnosis Pathway and made publicly available on the CCO website in March 2012.

In order to provide relevant and current evidence based guidance for cancer imaging in Ontario and enhance the clinical Pathways, the CIP has undertaken a process to endorse relevant and current high quality guideline recommendations for cancer imaging in Ontario. Through this endorsement process, we aim to provide a complete and useful source of guidance for cancer imaging derived from these more comprehensive guidelines and from specialist society guidelines.

Framework

Vision

- Ensuring patients receive the appropriate imaging test at the right time

Goals

- Reduce unwanted variation in patient care regarding imaging
- Facilitate timely, streamlined access to appropriate imaging
- Endorse existing relevant, high quality, evidence-based guidelines for cancer imaging from other jurisdictions and avoid costly duplication of effort to develop new guidelines

Objectives

- Identify imaging-specific decision points in the cancer clinical pathway and provide guidance for clinical decision making.
- Provide summary recommendations for indicated imaging with supporting evidence
    - Where applicable provide minimum protocol standard
- Improve communication between referring healthcare providers and radiologists regarding appropriate testing
- Reduce barriers to identifying and providing access to appropriate tests by creating a decision support/resource linked to CCO Disease Pathway Maps
- Improve the awareness of guidelines among members of the target audience and support the uptake and implementation of guidelines as a quality improvement initiative for cancer imaging in Ontario

Target Audience

The intended users of these recommendations are:

- respirologists
- surgeons
- radiation oncologists
- medical oncologists
- general practitioners
- oncology nurses
- pathologists
- radiologists
- nuclear medicine physicians

Recommendations for Imaging for Lung Cancer

The following recommendations have been endorsed by the Cancer Imaging Program (CIP) and reviewed externally. The process used for the endorsement process is described on page 9.

	Clinical Pathway Scenario	CIP Recommendations	Source	Description of Guidance
	Initial presentation			
1.	Clinical Suspicion	Chest x-ray	CCO 2011 Ref 3	A person should have a chest X-ray within two working days if they present with any of the following: •Hemoptysis •new finger clubbing •suspicious lymphadenopathy •Dysphagia •Features suggestive of lung cancer that has metastasized elsewhere or other cancers that have metastasized to the lung •Features suggestive of paraneoplastic syndromes OR Any of the following unexplained signs or symptoms lasting more than three weeks (patients with known risk factors may be considered sooner): •Cough •Weight loss/loss of appetite •Shortness of breath •chest and/or shoulder pain •abnormal chest signs •Hoarseness Patients with underlying chronic respiratory problems should have a chest X-ray within three weeks if they have unexplained changes in existing symptoms.

2.	Chest x-ray negative but high level of suspicion	CT scan of thorax and upper abdomen	NICE 2011 1.1.4 Ref 4	If the chest X-ray is normal but there is a high suspicion of lung cancer, patients should be offered urgent referral to a member of the lung cancer MDT, usually the chest physician.
3.	Chest x-ray SPN	Review previous images If no previous - CT scan of thorax and upper abdomen	NICE 2011 1.3.2 Ref 4	Patients with known or suspected lung cancer should be offered a contrast-enhanced chest CT scan to further the diagnosis and stage the disease. The scan should also include the liver and adrenals.
4.	Chest x-ray Mass	CT scan of thorax and upper abdomen	NICE 2011 1.3.2 Ref 4	Patients with known or suspected lung cancer should be offered a contrast-enhanced chest CT scan to further the diagnosis and stage the disease. The scan should also include the liver and adrenals.

	Diagnosis – Positive CT scan			
5.	Peripheral Mass or suspicious lung nodule	Needle biopsy – fine or core	NICE 2011 1.3.14 Ref 4	Offer CT- or ultrasound-guided transthoracic needle biopsy to patients with peripheral lung lesions when treatments can be planned on the basis of this test.
6.	Peripheral Mass or suspicious lung nodule	PET/CT if needle biopsy not possible or inconclusive	CCO 2007 Ref 5	PET should be reserved for those situations in which a biopsy is inconclusive or contraindicated
7.	Central Mass	Needle biopsy – fine or core if failed endoscopic biopsy If both not possible - PET/CT	NICE 2011 1.3.16 Ref 4	Offer fibreoptic bronchoscopy to patients with central lesions on CT where nodal staging does not influence treatment. Enlarged lymph nodes (≥ 10 mm maximum short axis on CT) may be simultaneously sampled with TBNA (non-ultrasound-guided) if required for diagnosis.
8.	Central Mass	PET/CT if both	CCO 2007	PET should be reserved for

		fine/core and endoscopic biopsy not possible	Ref 5	those situations in which a biopsy is inconclusive or contraindicated
9.	Suspected stage 4	Tissue biopsy from easiest site	NICE 2011 1.3.25 Ref 4	Confirm the presence of isolated distant metastases/synchronous tumours by biopsy or further imaging (for example, MRI or PET-CT) in patients being considered for treatment with curative intent.
10.	Pleural effusion	Thoracocenthesis-ultrasound guided if necessary	ACCP Ref 6	In patients suspected of having lung cancer who have an accessible pleural effusion, thoracentesis is recommended to diagnose the cause of the pleural effusion.
11.	Chest wall involvement	Consider US	NICE 2011 1.3.3 Ref 4	In the assessment of mediastinal and chest wall invasion: • CT alone may not be reliable • Other techniques such as ultrasound should be considered where there is doubt • Surgical assessment may be necessary if there are no contraindications to resection

	Staging Non-Small Cell Lung Cancer			
12.	MRI Brain	To rule out metastasis	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
13.	CT Brain	If MRI not possible	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
14.	CT Thorax and upper abdomen	If previous inadequate or outdated	ACR Ref 7	Indicated CT chest with or without contrast through adrenal glands.

15.	MRI Thorax	Not Indicated routinely	NICE 2011 1.3.6 Ref 4	Magnetic resonance imaging (MRI) should not routinely be performed to assess the stage of the primary tumour (T-stage) in NSCLC.
16.	MRI Thorax	For patients with superior sulcus tumors or chest wall invasion	NICE 2011 1.3.7 Ref 4	MRI should be performed, where necessary to assess the extent of disease, for patients with superior sulcus tumours.
17.	PET/CT	Where curative resection is being considered	CCO 2007 Ref 5	Prospective studies have found that PET detects unexpected distant metastases in up to 15% of patients, which may lead to changes in patient management
18.	Bone scan	If suspected metastasis	NICE 2011 1.3.28 Ref 4	An X-ray should be performed in the first instance for patients with localized signs or symptoms of bone metastasis. If the results are negative or inconclusive, either a bone scan or an MRI scan should be offered.
19.	X-ray bone	Stage M1b disease	NICE 2011 1.3.28 Ref 4	An X-ray should be performed in the first instance for patients with localized signs or symptoms of bone metastasis. If the results are negative or inconclusive, either a bone scan or an MRI scan should be offered.

	Staging Small Cell Lung Cancer			
20.	MRI Brain	For Staging	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
21.	CT Brain	If MRI not possible	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial

				pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
22.	CT Thorax and upper abdomen	If previous inadequate or outdated	ACR Ref 7	CT chest with or without contrast (through adrenal glands). CT of the abdomen with contrast
23.	MRI Thorax	Not Indicated routinely	NICE 2011 1.3.6 Ref 4	Magnetic resonance imaging (MRI) should not routinely be performed to assess the stage of the primary tumour (T-stage) in NSCLC.
24.	PET/CT	For limited disease SCLC	CCO 2009 Ref 8	PET is recommended for staging in patients with SCLC who are potential candidates for the addition of thoracic radiotherapy to chemotherapy
25.	Bone scan	Not indicated if PET/CT negative	ACR Ref 7	Not necessary if PET has been done.

Lung Cancer Imaging Guideline Endorsement Process

Methodology

1. A review of the Lung Cancer Diagnosis Pathway (Version 2012.2V) was undertaken to identify all decision points related to diagnostic imaging for which clinical guidance from existing guidelines would be sought. Any gaps related to imaging within the pathway were also identified. See Appendix 2 for the radiology view of the Lung Cancer Diagnosis Pathway.
2. Guidelines were identified by: internet search for lung cancer imaging guidelines using the PEBC preferred list of guideline developers and guideline directories of Canadian and international health organizations (page 8) and the National Guidelines Clearinghouse. The intent of this search was to create a comprehensive list of all existing guidelines, based on evidence that is relevant to the project. These websites/databases were searched from 2005 through March 2012 using the following keywords: —lung cancer , —small cell lung cancer , —non small cell lung cancer , —diagnosis , —staging , —. In addition, MEDLINE and EMBASE databases, along with the Cochrane Database of Systematic Reviews (CDSR), were also searched from 2005 through March 2012 using the same keywords.
3. Guidelines were screened for relevance by one author (JD). All relevant guidelines were reviewed by other members of the working group.
4. The selected relevant guidelines were assessed for quality using the AGREE II[1] scores (Ref 2) available through the SAGE database[2]. (Appendix 3)
5. Recommendations that were relevant to the decision points identified in step 1 were compiled and reviewed by the working group as candidates for endorsement. (Appendix 4)
6. The endorsed recommendations were reviewed by a group of health professionals including radiologists and other imaging professionals, medical oncologists, radiation oncologists, surgeons (Appendix 5). The guidelines considered for endorsement did not cover the areas of follow-up, surveillance, and secondary prevention.

[1] Appraisal of Guidelines, Research and Evaluation: An instrument to assess the process of guideline development and reporting of this process in the guideline.

[2] Standards And Guideline Evidence

Inclusion Criteria

1. Standards focused on care delivered by cancer organizations; and/or processes of care; and/or professional practice standards specific to cancer.
2. Guidelines focused on clinical practice involving cancer patient populations.
3. Guidelines that were more generic in focus but relevant to lung cancer imaging
4. Less than 5 years old

Exclusion Criteria

Non-English guidelines were excluded.

Guideline Developer Websites Reviewed:

International

Scottish Intercollegiate Guidelines Network (SIGN)

National Institute for Clinical Excellence (NICE)

American Cancer Society (ACS)

American Society of Clinical Oncology (ASCO)

European Society for Medical Oncology (ESMO)

Cancer Society of New Zealand

American Society for Therapeutic Radiology and Oncology (ASTRO)

National Guidelines Clearinghouse

National Comprehensive Cancer Network (NCCN)

New Zealand Cancer Control Trust

The Cancer Council Australia

National Cancer Control Initiative (AUS)

The Collaboration for Cancer Outcomes Research and Evaluation (AUS)

State Government of Victoria, Australia

Peter MacCallum Cancer Centre (Australia)

Medical Oncology Group of Australia

Cancer UK

Cancer Services Collaborative, Avon Somerset and Wiltshire (UK), NHS (UK)

Canadian

Cancer Care Ontario (CCO) clinical practice guidelines

Alberta Cancer Board – Treatment Guidelines

Saskatchewan Cancer Agency – Follow-up Guidelines

Cancer Care Manitoba – CCM Home

British Columbia Cancer Agency

Nova Scotia Cancer Agency

Quality Appraisal of Clinical Practice Guidelines

The Standards and Guidelines Evidence (SAGE) Inventory of Cancer Guidelines was accessed. The Inventory of Cancer Guidelines is a searchable database of over 1100 English language cancer control guidelines and standards released since 2003, developed and maintained by the Capacity Enhancement Program, Canadian Partnership Against Cancer. The Appraisal of Guidelines for Research and Evaluation (AGREE II) Instrument (Ref 2) evaluations are conducted and reported for all guidelines in the inventory. Each of the relevant guidelines found through the search process was identified within the SAGE database and the AGREE II scores reviewed.

Results

Seven guidelines were identified that were deemed to have sufficient quality, based on current information to be considered for endorsement. The AGREE II rigour scores for the seven endorsed guidelines are listed in Table 1. Full AGREE II scores are listed in Appendix 3.

The NICE guideline was current, of high quality and addressed 16 of 25 decision points identified in the CCO Clinical Pathway. The CCO referral guidelines addressed 5 decision points. The remaining 4 decision points were addressed by ACCP and ACR guidelines. Guidance was found to address all decision points identified in the clinical pathway (Appendix 2).

The NCCN guidelines were current but did not meet the minimum inclusion thresholds set by SAGE for an AGREE II assessment to be completed.

Table 1: SAGE AGREE II Scores for Guidelines Endorsed

Year	Guideline Developer	Topic	AGREE Rigour Score
2011	National Institute for Health and Clinical Excellence (NICE) Ref 4	*Diagnosis and Treatment of Lung Cancer*	76
2011	Cancer Care Ontario (CCO) Ref 3	*Referral of Suspected Lung Cancer by Family Physicians and Other Primary Care Providers*	77.1
2010	American College of Radiology (ACR) Ref 7	*Non-invasive clinical staging of bronchogenic carcinoma*	32.3
2009	Cancer Care Ontario (CCO) Ref 8	*PET Imaging in Small Cell Lung Cancer*	63.5
2007	American College of Chest Physicians (ACCP) Ref 6	*Initial Diagnosis of Lung Cancer*	70.1
2007	Cancer Care Ontario (CCO) Ref 5	*18-Fluorodeoxyglucose Positron Emission Tomography in the Diagnosis and Staging of Lung Cancer*	86.5

Conclusion

The CIP has identified guidelines and recommendations to guide practice for imaging of lung cancer patients in Ontario. Through the process described in this document, recommendations for practice in Ontario have been endorsed and recommended for use by physicians involved in lung cancer care.

References

1. Cancer Practice Guidelines Status Report: March 2011 Lung 2010

2. Brouwers M, Kho ME, Browman GP, Cluzeau F, Feder G, Fervers B, Hanna S, Makarski J on behalf of the AGREE Next Steps Consortium. AGREE II: Advancing guideline development, reporting and evaluation in healthcare. Can Med Assoc J. Dec 2010, 182: E839-842; doi:10.1503/cmaj.090449

3. Del Giudice L, Young S, Vella E, Ash M, Bansal P, Robinson A, et al. Referral of suspected lung cancer by family physicians and other primary care providers. Toronto (ON): Cancer Care Ontario; 2011 Aug 29. Program in Evidence-based Care Evidence-Based Series No.: 24-2.

4. National Institute for Health and Clinical Excellence, Lung Cancer: The Diagnosis and Treatment of Lung Cancer. NICE Clinical guideline 121. April 2011

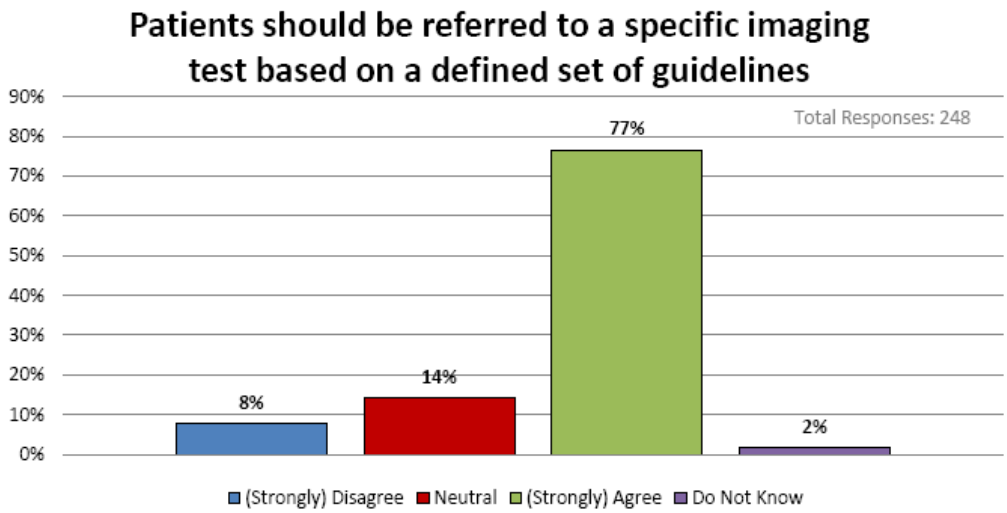
5. Ung YC, Maziak DE, Vanderveen JA, Smith CA, Gulenchyn K, Evans WK,et al. 18-Fluorodeoxyglucose positron emission tomography in the diagnosis and staging of lung cancer. Toronto (ON): Cancer Care Ontario; 2007 Apr 27 [In review 2011 Sep]. Program in Evidence-based Care Evidence-based Series No.: 7-20

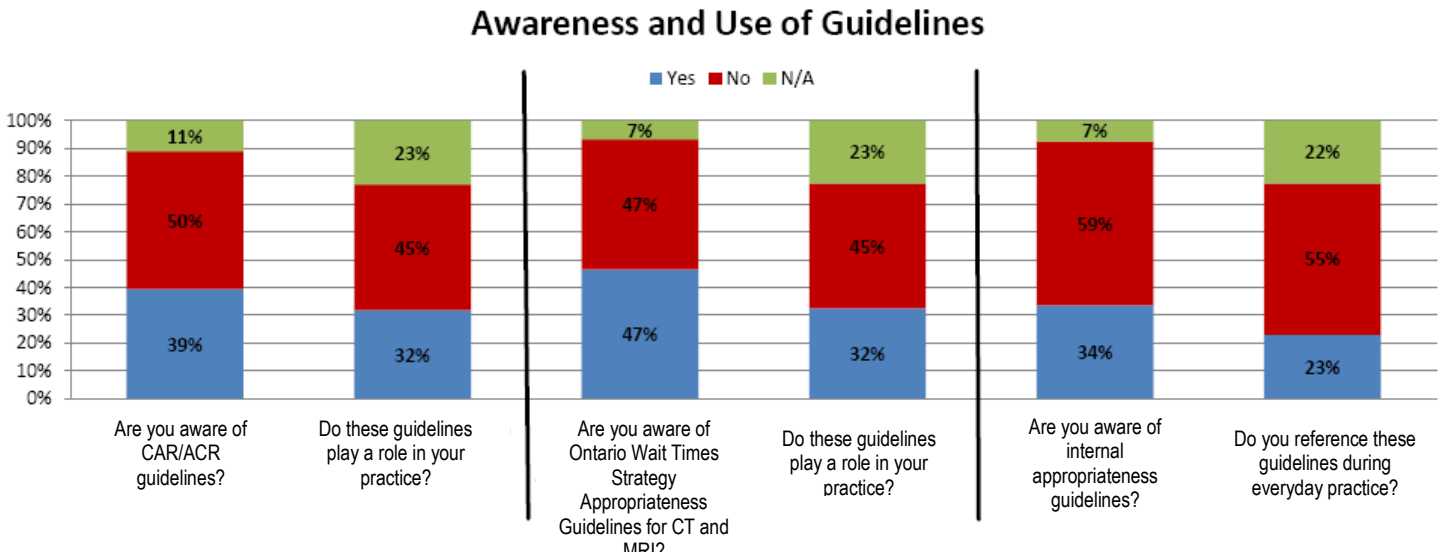
6. M. P Rivera and A C. Mehta. Initial Diagnosis of Lung Cancer: ACCP Evidence-Based Clinical Practice Guidelines (2nd Edition). *Chest* 2007;132; 131S-148S

7. American College of Radiology, ACR Appropriateness Criteria. Clinical Condition: Non-invasive Clinical Staging of Bronchogenic Carcinoma. 2005, review 2010.

8. Y Ung and C Walker-Dilks PET Imaging in Small Cell Lung Cancer: Recommendations A Quality Initiative of the Program in Evidence-Based Care (PEBC), Cancer Care Ontario (CCO) Report Date: January 19, 2009

Appendix 1: Summary of Stakeholder Survey Results, Guidelines and Appropriateness





- There was a high level of consistency among LHINs surrounding the idea that patients should be referred to a specific test based on a defined set of guidelines, with a provincial mean of 77%, and a range of 61% to 79%.

- Generally, the level of awareness of various guidelines was notably higher than the use of these guidelines in practice.

- The majority of comments regarding guidelines suggested that patient management is too complex for guidelines to address.

Appendix 2: Lung Cancer Diagnosis Pathway: Radiology Version

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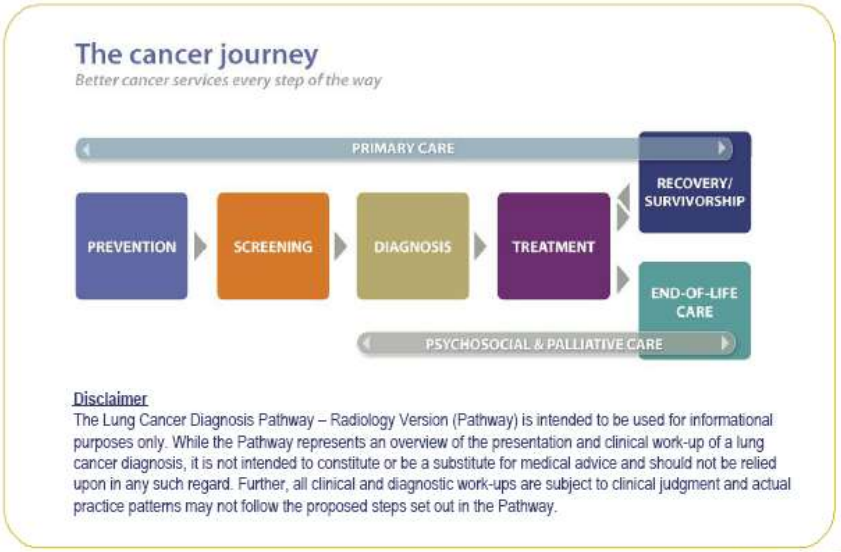
Lung Cancer Diagnosis Pathway – Radiology Version

Disease Pathway Management Secretariat
Version 2013.7



Disclaimer

The Lung Cancer Diagnosis Pathway – Radiology Version (Pathway) is intended to be used for informational purposes only. While the Pathway represents an overview of the presentation and clinical work-up of a lung cancer diagnosis, it is not intended to constitute or be a substitute for medical advice and should not be relied upon in any such regard. Further, all clinical and diagnostic work-ups are subject to clinical judgment and actual practice patterns may not follow the proposed steps set out in the Pathway.

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Lung Cancer Diagnosis Pathway – Radiology Version

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Pathway Disclaimer

The Lung Cancer Diagnosis Pathway (Pathway) is a resource that provides an overview of the presentation and clinical work-up of a typical lung cancer diagnosis.

The information contained in this Pathway is intended for healthcare providers and other stakeholders in the cancer system, including administrators and organizers. **The Pathway is intended to be used for informational purposes only. While the Pathway represents an overview of the presentation and clinical work-up of a lung cancer diagnosis, it is not intended to constitute or be a substitute for medical advice and should not be relied upon in any such regard. Further, all clinical and diagnostic work-ups are subject to clinical judgment and actual practice patterns may not follow the proposed steps set out in the Pathway.**

The Pathway is **not** intended for patients. In the situation where the reader is a patient, the reader should always consult a healthcare provider if he/she has any questions regarding the information set out in the Pathway. The information in the Pathway does not create a physician-patient relationship between Cancer Care Ontario (CCO) and the reader.

While care has been taken in the preparation of the information contained in the Pathway, such information is provided on an "as-is" basis, without any representation, warranty, or condition, whether expressed, or implied, statutory or otherwise, as to the information's quality, accuracy, currency, completeness, or reliability. CCO and the Pathway's content providers (including the physicians who contributed to the information in the Pathway) shall have no liability, whether direct, indirect, consequential, contingent, special, or incidental, related to or arising from the information in the Pathway or its use thereof, whether based on breach of contract or tort (including negligence), and even if advised of the possibility thereof. Anyone using the information in the Pathway does so at his or her own risk, and by using such information, agrees to indemnify CCO and its content providers from any and all liability, loss, damages, costs and expenses (including legal fees and expenses) arising from such person's use of the information in the Pathway.

Pathway Legend

- Primary Care (Family Physician, Nurse Practitioner, Walk-In Clinic, Emergency Department)
- Respirologist
- Pathology
- Diagnostic Assessment Program (DAP)
- Thoracic Surgeon
- Radiation Oncologist
- Medical Oncologist
- Radiologist
- Multi-disciplinary Case Conferences (MCC)
- No Specific Specialty
- Possible Action or Result
- Referral to

Pathway Consideration

The family physician should be informed of all tests and consultations.
Usual ongoing care with the family physician is assumed to be part of the Pathway.

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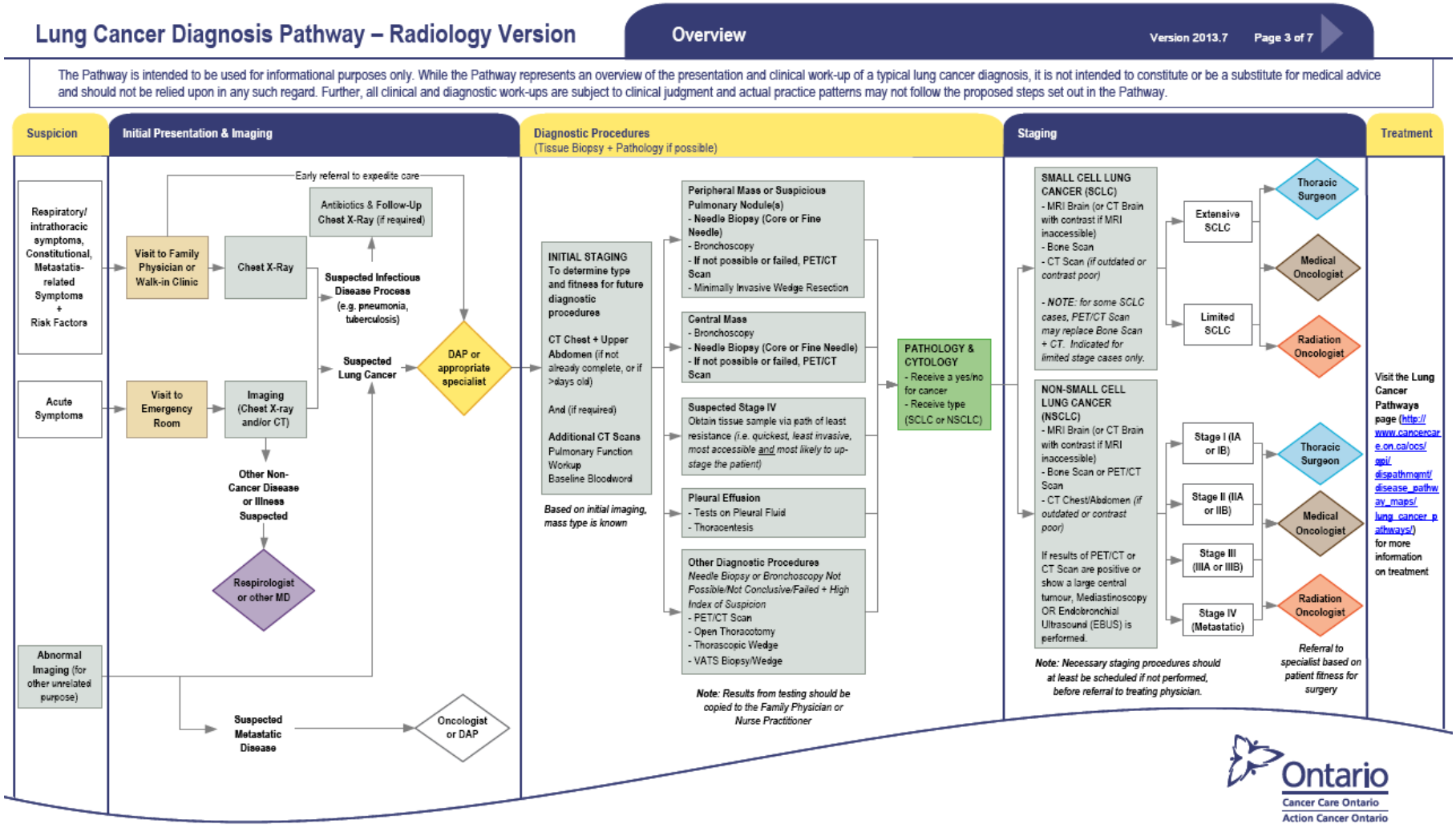
Lung Cancer Diagnosis Pathway – Radiology Version
Overview
Version 2013.7
Page 3 of 7
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Suspicion
Initial Presentation & Imaging
Diagnostic Procedures
(Tissue Biopsy + Pathology if possible)
Staging
Treatment
Respiratory/ intrathoracic symptoms, Constitutional, Metastatis-related Symptoms + Risk Factors
Acute Symptoms
Abnormal Imaging (for other unrelated purpose)
Early referral to expedite care
Visit to Family Physician or Walk-in Clinic
Chest X-Ray
Antibiotics & Follow-Up Chest X-Ray (if required)
Suspected Infectious Disease Process (e.g. pneumonia, tuberculosis)
Visit to Emergency Room
Imaging (Chest X-ray and/or CT)
Other Non-Cancer Disease or Illness Suspected
Respirologist or other MD
Suspected Lung Cancer
DAP or appropriate specialist
Suspected Metastatic Disease
Oncologist or DAP
INITIAL STAGING
To determine type and fitness for future diagnostic procedures
CT Chest + Upper Abdomen (if not already complete, or if >days old)
And (if required)
Additional CT Scans
Pulmonary Function Workup
Baseline Bloodword
Based on initial imaging, mass type is known
Peripheral Mass or Suspicious Pulmonary Nodule(s)
- Needle Biopsy (Core or Fine Needle)
- Bronchoscopy
- If not possible or failed, PET/CT Scan
- Minimally Invasive Wedge Resection
Central Mass
- Bronchoscopy
- Needle Biopsy (Core or Fine Needle)
- If not possible or failed, PET/CT Scan
Suspected Stage IV
Obtain tissue sample via path of least resistance (i.e. quickest, least invasive, most accessible and most likely to up-stage the patient)
Pleural Effusion
- Tests on Pleural Fluid
- Thoracentesis
Other Diagnostic Procedures
Needle Biopsy or Bronchoscopy Not Possible/Not Conclusive/Failed + High Index of Suspicion
- PET/CT Scan
- Open Thoracotomy
- Thoracoscopic Wedge
- VATS Biopsy/Wedge
Note: Results from testing should be copied to the Family Physician or Nurse Practitioner
PATHOLOGY & CYTOLOGY
- Receive a yes/no for cancer
- Receive type (SCLC or NSCLC)
SMALL CELL LUNG CANCER (SCLC)
- MRI Brain (or CT Brain with contrast if MRI inaccessible)
- Bone Scan
- CT Scan (if outdated or contrast poor)
- NOTE: for some SCLC cases, PET/CT Scan may replace Bone Scan + CT. Indicated for limited stage cases only.
Extensive SCLC
Limited SCLC
Thoracic Surgeon
Medical Oncologist
Radiation Oncologist
NON-SMALL CELL LUNG CANCER (NSCLC)
- MRI Brain (or CT Brain with contrast if MRI inaccessible)
- Bone Scan or PET/CT Scan
- CT Chest/Abdomen (if outdated or contrast poor)
If results of PET/CT or CT Scan are positive or show a large central tumour, Mediastinoscopy OR Endobronchial Ultrasound (EBUS) is performed.
Stage I (IA or IB)
Stage II (IIA or IIB)
Stage III (IIIA or IIIB)
Stage IV (Metastatic)
Thoracic Surgeon
Medical Oncologist
Radiation Oncologist
Note: Necessary staging procedures should at least be scheduled if not performed, before referral to treating physician.
Referral to specialist based on patient fitness for surgery
Visit the Lung Cancer Pathways page (http://www.cancercare.on.ca/ocs/gpi/diseathmgmt/disease_pathway_maps/lung_cancer_pathways/) for more information on treatment
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Lung Cancer Diagnosis Pathway – Radiology Version

Suspicion

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- Medical Oncologist
- Radiologist
- Multi-disciplinary Case Conferences (MCC)
- No Specific Specialty
- Possible Action or Result
- Referral to

Symptoms

Respiratory or Other Intrathoracic Symptoms:
Change in Cough
Hemoptysis (may not be chronic)
New or Changing Chest Pain
New Shortness of Breath
Non-Resolving Pneumonia (>6 Weeks)
Difficulty Swallowing
Change in Voice (hoarseness)

Constitutional Symptoms:
Weakness
Tiredness
Weight Loss
Change in Appetite

Metastasis-related Symptoms:
Neurological
Abdominal pain/discomfort
Bone pain

Paraneoplastic Syndromes

Other (Atypical) Symptoms

No Symptoms:
Abnormal Imaging (e.g. X-ray)

Plus

History

Smoking History

Occupational Risk

Family History

Note: Results from testing should be copied to the Family Physician or Nurse Practitioner

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Lung Cancer Diagnosis Pathway – Radiology Version

Initial Presentation & Imaging Version 2013.7 Page 5 of 7

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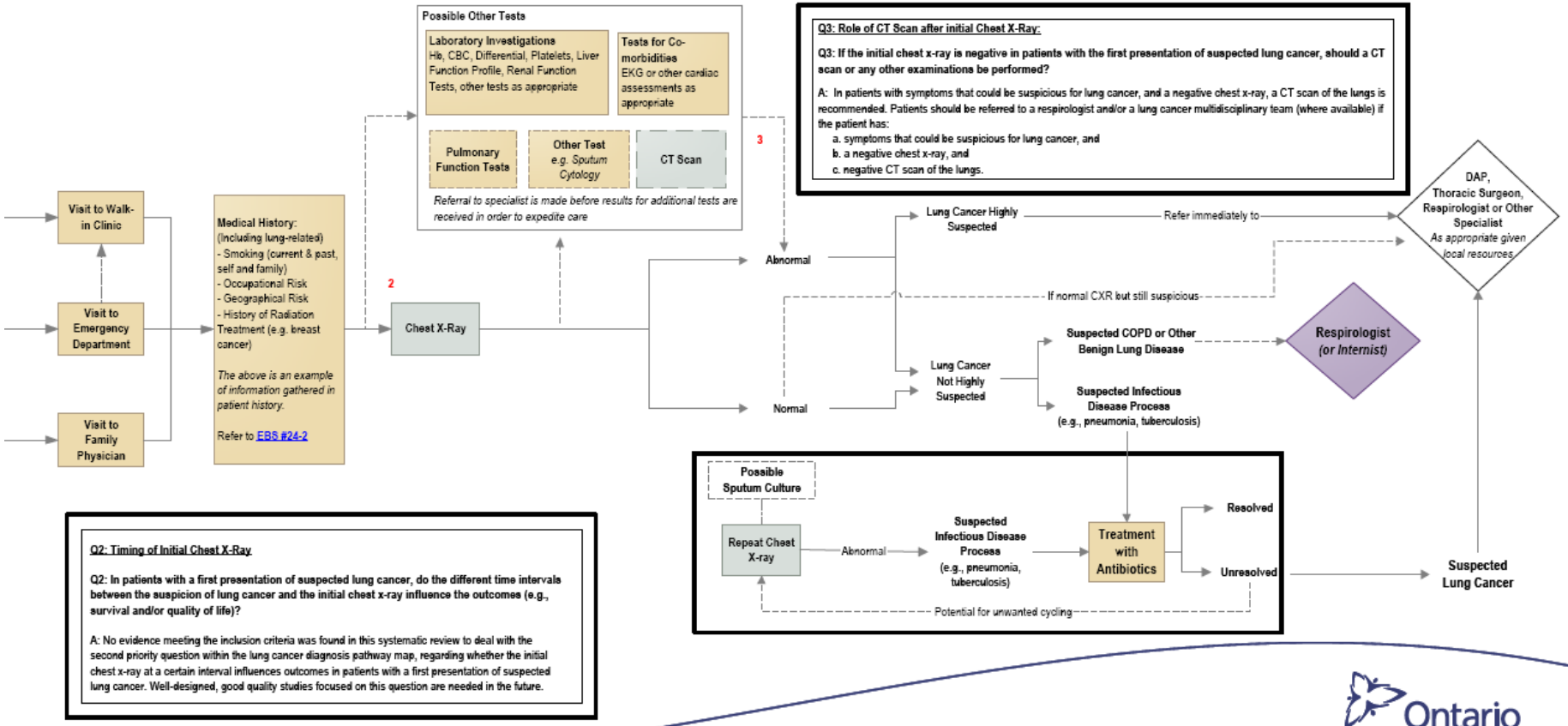

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Lung Cancer Diagnosis Pathway – Radiology Version

Diagnostic Procedures Version 2013.7 Page 6 of 7

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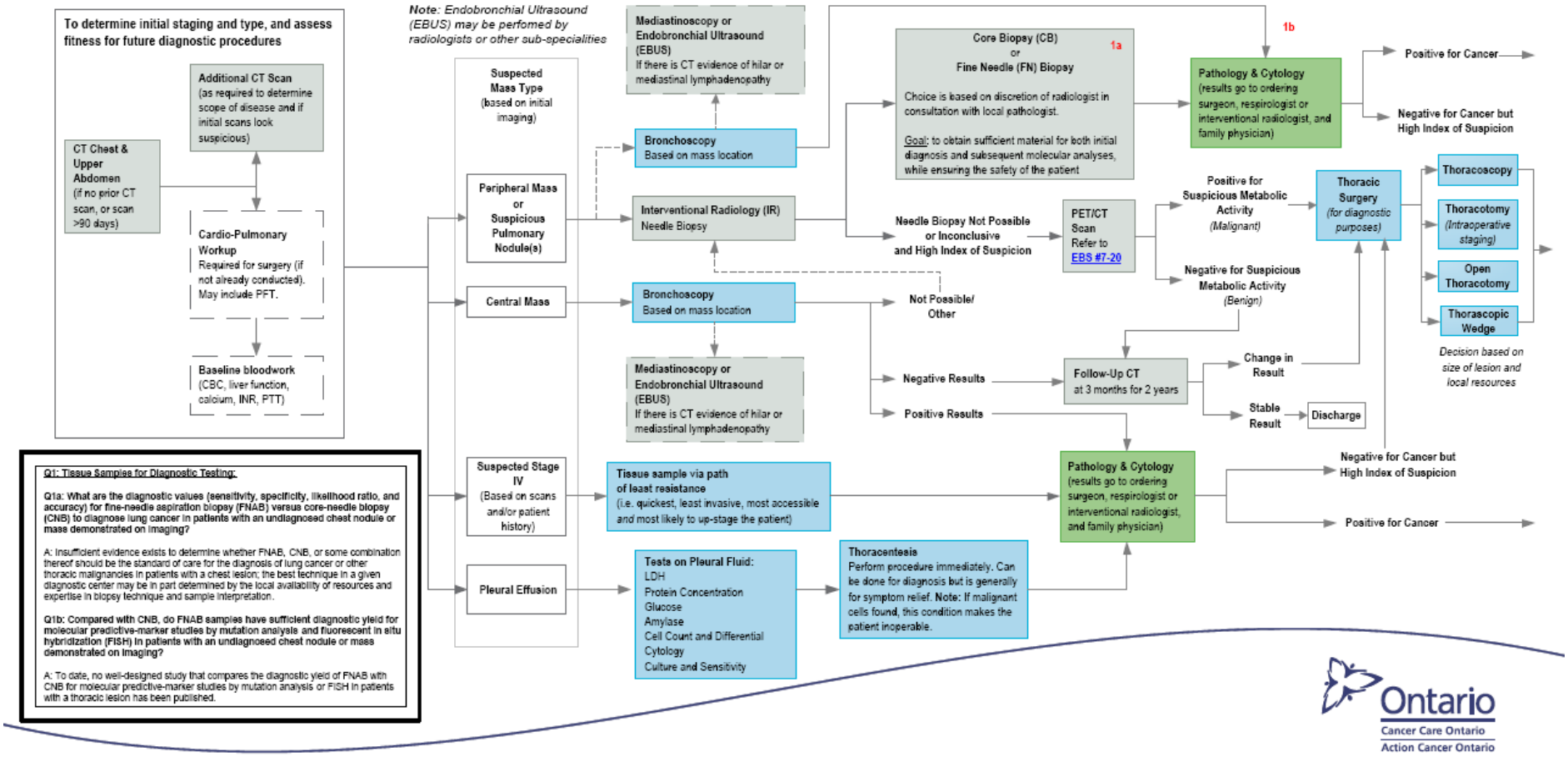

Lung Cancer Diagnosis Pathway – Radiology Version

Staging Version 2013.7 Page 7 of 7

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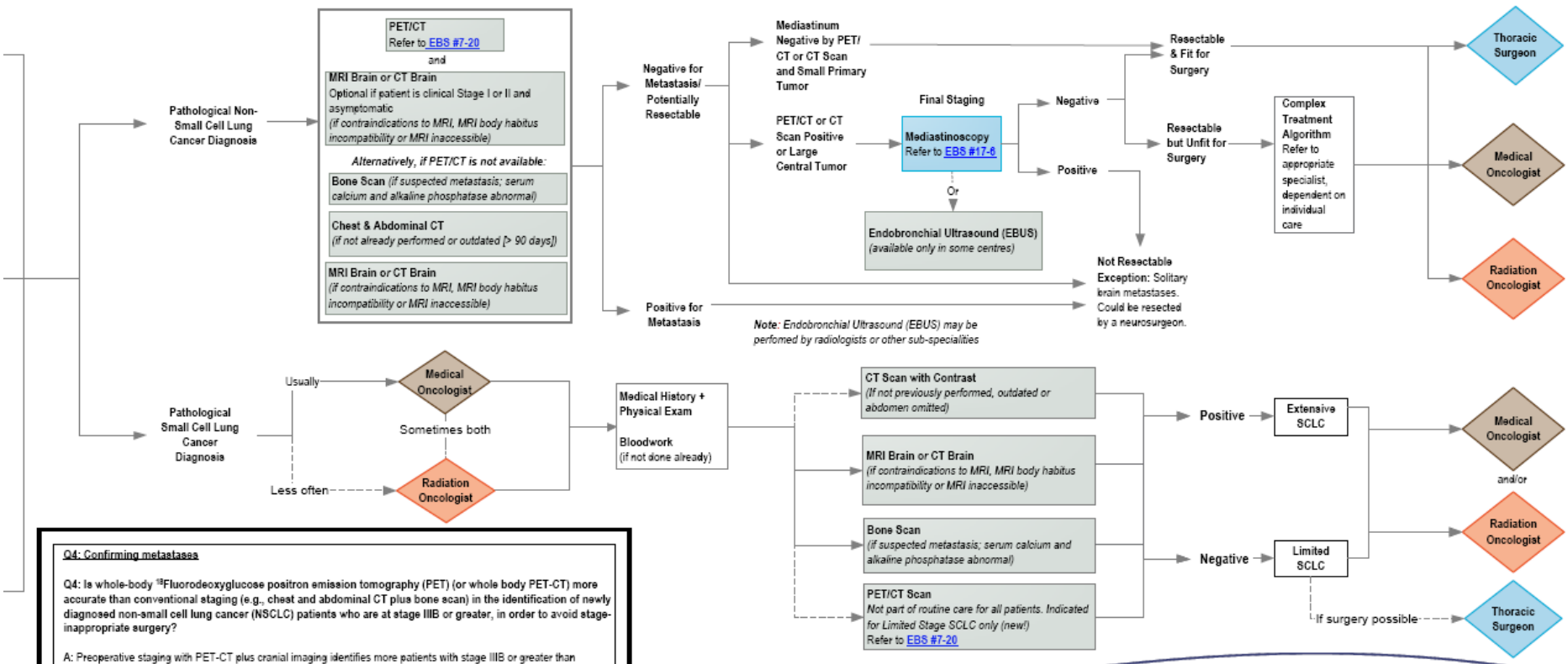

Q4: Confirming metastases

Q4: Is whole-body ^{18}Fluorodeoxyglucose positron emission tomography (PET) (or whole body PET-CT) more accurate than conventional staging (e.g., chest and abdominal CT plus bone scan) in the identification of newly diagnosed non-small cell lung cancer (NSCLC) patients who are at stage IIIB or greater, in order to avoid stage-inappropriate surgery?

A: Preoperative staging with PET-CT plus cranial imaging identifies more patients with stage IIIB or greater than conventional staging to avoid stage-inappropriate surgery (sensitivity 48% versus 19%, *p*-value = 0.0014) in newly diagnosed NSCLC patients, but PET-CT also incorrectly upstaged disease in more patients (specificity 93% versus 99%, *p*-value = 0.0265). There is no statistical difference between PET-CT plus cranial imaging group and conventional staging group for mortality at 3 years (31% versus 35%, *p*-value = 0.4404).

Ontario
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Appendix 3: Quality assessment of guidelines

SAGE AGREE II Full Scores for Identified Guidelines

	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6
Guideline	Scope and Purpose:	Stakeholder Involvement:	Rigor:	Clarity Presentation:	Applicability:	Editorial Independence:
CCO Ref 3	88.9	69.4	74.0	88.9	25	8.3
NICE Ref 4	83.3	69.4	60.4	88.9	70.8	79.2
CCO 18 fu Ref 5	83.3	58.3	86.5	91.7	47.9	58.3
ACCP initial diagnosis Ref 6	72.2	57.4	61.1	92.6	36.1	50.0
ACR Ref 7	52.8	44.4	32.3	69.4	32.3	6.3
CCO pet Ref 8	80.6	33.3	63.5	77.8	12.5	41.7

Appendix 4: Guideline Cumulative

Source of Guideline Selected for Clinical Pathway

Clinical Pathway Scenario	Decision	CCO 2011 Ref 3	NICE 2011 Ref 4	CCO 2007 Ref 5	ACCP 2007 Ref 6	ACR 2010 Ref 7	CCO 2009 Ref 8
1. Clinical Suspicion	Chest x-ray	Y					
2. Chest x-ray negative but high level of suspicion	CT scan of thorax and upper abdomen		Y				
3. Chest x-ray SPN	Review previous images if no previous indicated CT scan of thorax and upper abdomen		Y				
4. Chest x-ray Mass	CT scan of thorax and upper abdomen		Y				
5.Peripheral Mass or suspicious lung nodule	Needle biopsy – fine or core		Y				
6.Peripheral Mass or suspicious lung nodule				Y			
7. Central Mass	Needle biopsy – fine or core if failed endoscopic biopsy If both not possible PET/CT		Y				
8. Central Mass				Y			
9.Suspected stage 4	Tissue biopsy from easiest site		Y				
10. Pleural effusion	Thoracocenthesis- ultrasound guided if necessary				Y		
11. Chest wall involvement	Consider US		Y				
12. MRI Brain	Looking for metastasis		Y				
13. CT Brain	Looking for metastasis If MRI not possible		Y				
14. CT Thorax and upper abdomen	If previous imaging inadequate or outdated					Y	
15. MRI Thorax	For routine staging		Y				
16. MRI Thorax	For patients with superior sulcus tumors or chest wall invasion		Y				

Clinical Pathway Scenario	Decision	CCO 2011 Ref 3	NICE 2011 Ref 4	CCO 2007 Ref 5	ACCP 2007 Ref 6	ACR 2010 Ref 7	CCO 2009 Ref 8
17. PET/CT	For patients who are being considered for curative surgical resection base on negative standard tests or for stage 3 patients considered for potentially curative combined modality therapy			Y			
18. Bone scan	Looking for metastasis		Y				
19. X-ray bone	Looking for metastasis Stage M1b		Y				
20. MRI Brain	Looking for metastasis		Y				
21. CT Brain	Looking for metastasis if MRI not possible		Y				
22. CT Thorax and upper abdomen	If previous inadequate or outdated					Y	
23. MRI Thorax	For routine staging		Y				
24. PET/CT	For limited disease SCLC- for evaluation and staging where combined modality therapy with chemotherapy and radiotherapy is being considered						Y
25. Bone scan	AVOID IF PET NEGATIVE					Y	

Appendix 5: Multidisciplinary External Review

After internal consultation (i.e., CCO regional Cancer Imaging Program leadership and provincial heads of CCO Clinical Programs), external consultation was performed through survey. This was distributed by email, primarily through CCO programs to their stakeholders, and included:

- Surgical Oncology
- Systemic Therapy
- Radiation Therapy
- Primary Care
- Disease Pathway Management

CIP also reached out to the Program in Evidence-Based Care lung Disease Site Group chairs and selected members of the Canadian Association of Radiologists.

Responses were received from a wide variety of disciplines, and included broad geographic representation.

Respondent Information

- 22 Reviewers
    - 6 Medical Oncologists
    - 6 Thoracic surgeons
    - 4 Family Physicians
    - 4 Radiologists
    - 2 Radiation Oncologists

Note:

- 18 out of 22 Reviewers completed the questionnaire. 4 reviewers elected to submit a tracked changed document in lieu of the questionnaire. The tracked changed documents are not included in the Questionnaire summary

Summary of Rated Questions

18 Responses to the questionnaire were received from the open call for external review. Key results from the questionnaire are summarized in Table 1

Table 1 Responses to eight items on the multidisciplinary external review questionnaire

	Reviewer Rating (N=18)				
Question	**Incomplete (1)**	**(2)**	**Moderate (3)**	**(4)**	**Complete (5)**
1. Rate the completeness of the Lung Cancer Imaging Recommendations	0	0	3	8	7
	Low (1)	**(2)**	**Moderate (3)**	**(4)**	**High (5)**
2. Rate the endorsement methods used to develop the Lung Cancer Imaging Recommendations	0	0	4	6	8
3. Rate the overall quality of the Lung Cancer Imaging Recommendations	0	1	2	9	6
	Poor (1)	**(2)**	**Moderate (3)**	**(4)**	**Excellent (5)**
4. Rate the presentation of the Lung Cancer Imaging Recommendations document	1	1	5	8	3
	Strongly Disagree (1)	**(2)**	**Neutral (3)**	**(4)**	**Strongly Agree (5)**
5. Would you make use of the Lung Cancer Imaging Recommendations in your professional decisions?	1	1	6	5	5
6. Would you encourage the Lung Cancer Imaging Recommendations for use in practice?	0	0	5	7	6
7. Will the Lung Cancer Imaging Recommendations document improve the appropriate ordering of imaging tests?	2	0	5	7	4
8. Would you recommend publishing the Lung Cancer Imaging Recommendations document on the Cancer Care Ontario Website?	1	1	2	6	8

Summary of Written Comments

In addition to rating the document, respondents were encouraged to given written comments for rated each question as well as three additional questions.

Overall, the quality, completeness and utility of the Lung Cancer Imaging Recommendations document was felt to be high, with many of the respondents indicating that they would be useful in their clinical practice and would improve the appropriate ordering of imaging tests. Many of the suggested enhancements to document formatting have been included in this final version.

With regards to utility and alignment to current practice, there were some interesting divergences in responses, with some respondents indicating that this did not represent new information and others suggesting this differed from their current practice. This variation for this targeted stakeholder/consulting group highlights, in part, the need for consolidated, evidence-based guidance along the patient's clinical path.

With regards to impact to appropriate ordering, many respondents commented that although the Lung Cancer Imaging Recommendations should be available through conventional means (e.g., the Cancer Care Ontario website), greater impact will be possible through active and enhanced stakeholder engagement, including distribution through other means (e.g., lung Diagnostic Assessment Programs, regional cancer program newsletters, direct engagement with stakeholders through teleconferences, engagement with other organizations, etc), and consideration of social media. A few respondents emphasized that monitoring of guideline concordance followed by targeted outreach where needed would also help drive uptake.

Finally, many questions or comments submitted pertained to the clinical Pathway, either directly or by encouraging better incorporation of this document with the Pathway. Thus, modifications to the Recommendations document have been made to strengthen the link between the pathway and the cancer imaging recommendations, and other comments were submitted to DPM for consideration in future versions of the primary lung diagnosis pathway.

The CIP thanks all reviewers for their thoughtful feedback and contributions to the final document.