



## Evidence-based Series 7-20 Version 2

A Quality Initiative of the  
Program in Evidence-based Care (PEBC), Cancer Care Ontario (CCO)

### 18-Fluorodeoxyglucose Positron Emission Tomography in the Diagnosis and Staging of Lung Cancer

*Members of the Lung Cancer Disease Site Group*

An assessment conducted in November 2014 deferred the review of Evidence-based Series (EBS) 7-20 Version 2, which means that the document remains current until it is assessed again next year. The PEBC has a formal and standardize process to ensure the currency of each document ([PEBC Assessment & Review Protocol](#))

The reviewed EBS report, which is available on the [CCO web site](#) consists of the following four sections:

- Section 1: Clinical Practice Guideline (ENDORSED)
- Section 2: Systematic Review
- Section 3: Guideline Development and External Review
- Section 4: Guideline Summary Review

**Release Date: October 5, 2012**

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Phone: 905-527-4322 ext. 42822 Fax: 905-526-6775 E-mail: [ccopgi@mcmaster.ca](mailto:ccopgi@mcmaster.ca)

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## Guideline Report History

GUIDELINE VERSION	SYSTEMATIC REVIEW		PUBLICATIONS	NOTES AND KEY CHANGES
	Search Dates	Data		
Original version April 2007	1996-2006	Full Report	Web publication	NA
Current Version 2 Oct 2012	2006-2012	New data found in Section 3: <a href="#">Document Summary and Review Tool</a>	Updated Web publication	2007 recommendations is <b>ENDORSED</b>

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Evidence-based Series 7-20 Version 2: Section 1

A Quality Initiative of the  
Program in Evidence-based Care (PEBC), Cancer Care Ontario (CCO)  
Developed by the Lung Cancer Disease Site Group

**18-Fluorodeoxyglucose Positron Emission Tomography  
in the Diagnosis and Staging of Lung Cancer:  
Guideline Recommendations**

*Y.C. Ung, D.E. Maziak, J.A. Vanderveen, C.A. Smith, K. Gulenchyn, W.K. Evans,  
and the Lung Cancer Disease Site Group*

These guideline recommendations have been **ENDORSED**, which means that the recommendations are still current and relevant for decision making.  
Please see [Section 4: Document Summary and Review Tool](#) for a summary of updated evidence published between 2006 and 2012, and for details on how this Clinical Practice Guideline was **ENDORSED**.

**Report Date: October 5, 2012**

**Questions**

What is the role of 18-Fluorodeoxyglucose (<sup>18</sup>FDG) Positron Emission Tomography (PET) in:

1. The diagnosis of solitary pulmonary nodules (SPN)?
2. The staging of primary non-small cell lung cancer (NSCLC) at initial diagnosis?
3. The staging of primary small cell lung cancer (SCLC)?

Outcomes of interest include accuracy measures of imaging and the impact of PET on patient management and patient outcomes.

**Target Population**

This practice guideline applies to adult patients with lung cancer.

**Technology**

The recommendations in this practice guideline refer to PET scanning with a dedicated PET scanner.

**Recommendations**

There is limited randomized controlled trial evidence related to the impact of PET on the clinical management of the lung cancer patient. In addition, PET technology has evolved significantly over time making it difficult to make recommendations based on studies using out-of-date imaging technologies. However, based on the interpretation of available evidence and expert consensus opinion, the Lung Cancer Disease Site Group recommends the following:

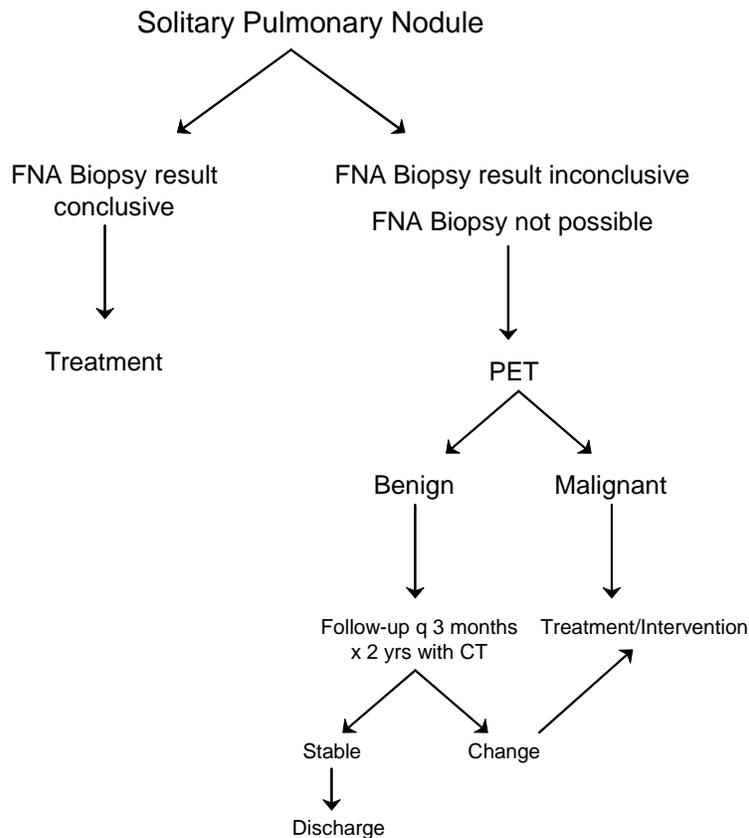
- **Diagnosis of Solitary Pulmonary Nodules (SPN)**

- Fine needle aspiration (FNA) biopsy is recommended as the first-line diagnostic approach in the workup of SPN. PET should be reserved for those situations in which a biopsy is inconclusive or contraindicated
  - PET appears to have a high sensitivity and specificity to differentiate benign from malignant lesions as small as 1 cm in size. Lesions less than 1 cm are difficult to categorize as they lack a sufficient mass of metabolically active cells. False-negative results can occur with low-grade malignant tumours due to their lower metabolic activity or with ground-glass opacities as may be seen in bronchoalveolar carcinomas.

**Key Evidence**

- Two systematic reviews with meta-analyses and seven prospective studies examined the use of PET in the diagnosis of SPN
- Meta-analyses found sensitivity to range from 96%-97% and specificity to range from 78%-86%, and the prospective studies confirmed these results
- False-negative results occurred with low-grade malignant tumours, such as bronchoalveolar cell carcinomas or with ground-glass opacities. False positive results occurred in inflammatory conditions
- There are no randomized trials examining the use of PET in the differentiation of benign from malignant SPN

**Algorithm for SPN**



- **Staging of Primary NSCLC**

- In the opinion of the Lung DSG, the evidence on whether the addition of PET to conventional staging or the up-front use of PET in mediastinal and extrathoracic staging changes clinical management in patients with NSCLC is conflicting
- Prospective studies have found that PET detects unexpected distant metastases in up to 15% of patients, which may lead to changes in patient management.
- For potential surgical candidates, mediastinoscopy is recommended to verify that PET positive mediastinal lesions are due to cancer in view of the potential for false positive results. Mediastinoscopy is necessary to ensure that a patient is not denied potentially curative surgery. A solitary extrathoracic site should also be confirmed to be metastatic, if possible, in order that a patient not be denied the chance of curative therapy.

**Key Evidence**

- Eleven systematic reviews and a total of three randomized controlled trials and twenty-two prospective studies examined the use of PET in staging NSCLC.
- Two trials randomized patients to conventional workup with or without PET. One trial reported a 51% relative reduction in futile thoracotomies ( $p=0.003$ ) when PET was added to conventional workup, and the other trial found no difference in the number of futile thoracotomies avoided ( $p=0.2$ ). Differences in the trial designs (patient populations, disease stage, definition of futile thoracotomies, and management of patients) may have contributed to the conflicting results.
- One trial randomized patients to traditional staging workup or up-front PET. A statistically significant difference was not found between the two groups for the mean number of staging tests performed. As well, the mean number of function tests, non-invasive procedures, invasive procedures, and thoracotomies did not significantly differ between the two arms. However, the percentage of patients who needed more than one invasive test to determine N staging and the number of mediastinoscopies was significantly lower for the PET group, and the median time to diagnosis was significantly shorter for the PET group (14 days versus [vs.] 23 days,  $p<0.0001$ ).

- **Staging of SCLC**

- There is limited evidence on the use of PET in the staging of SCLC but three prospective trials showed good accuracy in differentiating limited from extensive stage disease.

**Key Evidence**

- Three prospective studies demonstrated an accuracy of PET in staging extensive versus limited stage disease ranging from 83% - 99%.

**Future Research**

The Ontario Clinical Oncology Group is currently conducting two prospective randomized controlled trials to examine the impact of PET on improving the management of patients with stage III NSCLC and potentially surgically resectable NSCLC. These trials will evaluate whether PET improves patient outcomes or changes patient management. Patients should be encouraged to participate in clinical trials evaluating PET.

Recently, integrated PET-computerized tomography (CT) scanners have been developed to provide metabolic and anatomical information simultaneously. This technique has great potential for the diagnosis and staging of lung cancer. The vast majority of

published research has been with dedicated PET; therefore, further trials using PET-CT are needed to fully assess its accuracy and impact on patient outcomes and patient management.

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*Contact Information*

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Phone: 905-527-4322 ext. 42822 Fax: 905-526-6775 E-mail: [ccopgi@mcmaster.ca](mailto:ccopgi@mcmaster.ca)