Effective Health Care

Imaging Techniques for Monitoring Solitary Lung Nodules
Nomination Summary Document

Results of Topic Selection Process & Next Steps

- *Imaging Techniques for Monitoring Solitary Lung Nodules* was found to be addressed by a 2013 guideline from the American College of Chest Physicians (ACCP), a 2012 guideline from the American College of Radiology (ACR), and two more recently published systematic reviews. Given that the existing guidelines and systematic reviews cover this nomination, no further activity will be undertaken on this topic.
  - Gould MK(1), Donington J, Lynch WR, et al. Evaluation of individuals with pulmonary nodules: when is it lung cancer? Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest. 2013 May;143(5Suppl):e93S-120S. doi: 10.1378/chest.12-2351. PMID: 23649456
  - Kanne JP, Jensen LE, Mohammed TH, et al. Expert Panel on Thoracic Imaging. ACR Appropriateness Criteria® radiographically detected solitary pulmonary nodule. [online publication]. Reston (VA): American College of Radiology (ACR); 2012.

    Zhang CY(1), Yu HL, Li X, et al. Diagnostic value of computed tomography scanning in differentiating malignant from benign solitary pulmonary nodules: a meta-analysis. Tumour Biol. 2014 Sep;35(9):8551-8. doi: 10.1007/s13277-014-2113-8. Epub 2014 May 26. PMID: 24859887
  - Li B, Li Q, Chen C, et al. A systematic review and meta-analysis of the accuracy of diffusion-weighted MRI in the detection of malignant pulmonary nodules and masses. Acad Radiol. 2014 Jan;21(1):21-9. doi: 10.1016/j.acra.2013.09.019. PMID: 24331261

Topic Description

Nominator(s): Organization

Nomination Summary: The nominator (on behalf of a group of stakeholders) is interested in the comparative effectiveness of investigational and existing imaging techniques (e.g. tomosynthesis versus chest X-rays) for monitoring of solitary lung nodules.

Staff-Generated PICO
Population(s): Patients with a solitary pulmonary nodule that has been identified either during screening or incidentally during another radiological examination like chest x-ray or computed tomography (CT)
Intervention(s): Investigational imaging techniques including low dose CT, static and dynamic spiral CT, multidetector CT (MDCT), dual energy subtraction (DES) chest x-ray, dual energy subtraction digital tomosynthesis (DES-DT), single photon emission CT (SPECT) with technicium-99 (Tc-99) depreotide and thallium-201-chloride (Tl-201),

fluorodeoxyglucose positron emission tomography (FDG-PET) with different tracers including fluorine-18, fluorine-18 fluorothymidine, 11C choline and 11C methionine, 1.5 Tesla and 3 Tesla Magnetic resonance Imaging (MRI) and diffusion-weighted imaging MRI (DWI-MRI)

Comparator(s): Existing imaging techniques including CT scan and/or chest X-ray

Outcome(s):

1. Overall mortality or survival
2. Quality of life, measured using standardized scales like Short-Form Health Survey and EQ5D
3. Adverse effects or harms associated with testing and associated treatments, for example, exposure to radiation, harm caused by false positives (such as unnecessary biopsies, increased medical cost, increased stress due to medical diagnoses and treatments), under-diagnosis resulting in failure to achieve early diagnosis and intervention, risk of a missed metastases diagnosis, and errors in pre-therapy staging that may cause unnecessary medical treatments and stress

Key Questions from Nominator:

1. What is the evidence on the comparative effectiveness of diagnostic accuracy with investigational techniques (low dose CT, static and dynamic spiral CT, multidetector CT(MDCT), dual energy subtraction (DES) chest x-ray, dual energy subtraction digital tomosynthesis (DES-DT), single photon emission CT (SPECT) with technicium-99 (Tc-99) depreotide and thallium-201-chloride (Tl-201), fluorodeoxyglucose positron emission tomography (FDG-PET) with different tracers including fluorine-18, fluorine-18 fluorothymidine, 11C choline and 11C methionine, 1.5 Tesla and 3 Tesla magnetic resonance Imaging (MRI) and diffusion-weighted imaging MRI (DWI-MRI)) in patients who have a solitary pulmonary nodule identified either during screening or incidentally during another radiological examination like chest x-ray or computed tomography (CT), as compared to existing techniques like CT scan and/or chest X-ray?
    a. Is diagnostic accuracy modified by nodule or patient-level characteristics, including size and morphology of the tumor, presence of calcification, location of the tumor in the lung, use of contrast enhancement, growth rate of nodule, edge characteristics of nodule, characteristics of internal nodule appearance, attenuation or density, and presence of symptoms and risk factors of lung malignancy, including patient age, smoking, diet and family history of cancer?
    b. What are the adverse effects or harms of testing or test-associated treatment, including exposure to radiation, harm caused by false positives (such as unnecessary biopsies, increased medical cost, increased stress due to medical diagnoses and treatments), under-diagnosis resulting in failure to achieve an early diagnosis and intervention, risk of a missed metastases diagnosis, and errors in pre-therapy staging that may cause unnecessary medical treatments and stress
2. What is the clinical utility of monitoring with investigational techniques in patients who have a solitary pulmonary nodule identified either during screening or incidentally during another radiological examination like chest x-ray or computed tomography (CT), as compared to existing techniques like CT scan and/or chest X-ray?

a. How does the use of investigational imaging techniques impact mortality and morbidity rates?
b. How does the use of investigational imaging techniques impact therapeutic decision making?
c. How does the use of investigational imaging techniques impact the use of other diagnostic techniques (bronchoscopy, fine needle biopsy, etc)?

Considerations

- Lung cancer is the second most common cancer in men and women. Detection of malignant potential of a solitary pulmonary nodule (SPN) is important because individuals with a SPN could have a cancer that is potentially curable, possibly due to its slow rate of growth or by virtue of its detection at an early stage. The comparative effectiveness of existing technologies to detect and monitor SPNs is not yet established.
- The topic was found to be addressed by multiple guidelines and systematic reviews, including the following:
  - A 2013 guideline from the American College of Chest Physicians ACCP, titled *Evaluation of individuals with pulmonary nodules: when is it lung cancer? Diagnosis and management of lung cancer, 3rd ed*. The guideline provides recommendations for solid and nonsolid nodules less than 8 mm, and nodules greater than 8 mm but less than 30 mm.
  - A 2012 guideline from the American College of Radiology (ACR), titled *Appropriateness Criteria® radiographically detected solitary pulmonary nodule*. The guideline considers the following techniques- CT, transthoracic needle biopsy, fluorodeoxyglucose-positron emission tomography (FDG-PET)/CT whole body, watchful waiting with CT follow-up, and magnetic resonance imaging (MRI).
  - A 2014 systematic review titled *Diagnostic value of computed tomography scanning in differentiating malignant from benign solitary pulmonary nodules: a meta-analysis.* The meta-analysis examines the diagnostic value of CT scanning in differentiating malignant from benign solitary pulmonary nodules.
  - A 2014 systematic review titled *A systematic review and meta-analysis of the accuracy of diffusion-weighted MRI in the detection of malignant pulmonary nodules and masses.* The review examines accuracy of diffusion-weighted MRI in the detection of malignant pulmonary nodules and masses.