Appropriate Utilization of a Low Dose Chest CT Nodule Protocol
Group PQI

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Purpose and Rationale

With advances in CT technology, the frequency of detecting incidental small lung nodules has increased. The majority of smokers who undergo thoracic CT have small lung nodules, and less than a few percent of very small nodules in patients without a history of cancer will prove to be malignant. The Fleischner Society guidelines recommend serial CT follow up examinations for small nodules 4-8 mm in size in all patients (non smokers and smokers), and all nodules under 8 mm in high risk patients (smokers).

Follow up CT examinations for pulmonary nodules can be performed used lower radiation exposure that diagnostic thoracic CT examinations that are used to evaluate the entire thorax (lungs, mediastinum, chest wall etc), without reducing diagnostic accuracy for evaluating the lung nodules specifically.

The goal of this project is to monitor and improve adherence to the use of a low dose chest CT protocol for the follow up of pulmonary nodules detected on CT, and possibly to other indications, including the evaluation of possible pulmonary nodules detected with chest radiographic images.

Project Resources

1. Christe A, Torrente JC, Lin M, et al. CT Screening and Follow-Up of Lung Nodules: Effects of Tube Current–Time Setting and Nodule Size and Density on Detectability and of Tube Current–Time Setting on Apparent Size. AJR 2011; 197:632-630

2. Rusinek H, Naidich DP, McGuiness G, et al. Pulmonary nodule detection: low dose versus conventional CT. Radiology 1998;209:243-249

3. MacMahon H, Austin JH, Gamsu G, Herold CJ, Jett JR, Naidich DP, Patz EF Jr, Swensen SJ; Fleischner Society. Guidelines for management of small pulmonary nodules detected on CT scans: a statement from the Fleischner Society. Radiology 2005 Nov;237(2):395-400.

4. National Comprehensive Cancer Network, Lung Cancer Screening Guideline http://www.nccn.org/professionals/physician_gls/pdf/lung_screening.pdf

Project Measures

Metric 1
Numerator # of cases appropriately using low dose nodule protocol
Denominator # of chest CT cases that should have used a low dose nodule protocol

Metric 2
Numerator # of cases documenting use of a low dose protocol in the report
Denominator # of cases that used a low dose nodule protocol

Baseline Data Collection

Make a plan for selecting cases. Using CPT codes (chest CT with contrast, without contrast and with & without contrast), PACS or RIS data, identify a list of consecutive CT exams. Obtain the final reports for the exams and review for the following:

Inclusion criteria:

- pulmonary nodule follow up - as recommended from a prior CT
- suspicion of pulmonary nodule on chest radiographic images
- lung cancer screening

Exclude criteria:

- known malignancy, other than non-melanoma skin cancer, provided in the clinical indication for the examination*

*Low dose nodule CTs may be appropriate in the setting of some malignancies, such as patients with sarcoma, hepatocellular carcinoma, head & neck cancer, and may not be excluded from the PQI project based on local practice.

The number of cases required will vary based on the patient demographics typical of your practice. A reasonable target would be to end up with 100 CT exams after applying the inclusion/exclusion criteria.

Sort your cases into those who should and should not undergo a low dose chest CT. The number of cases that should have undergone a low dose chest CT is your metrics denominator. Then code each of these cases as to whether or not a low dose chest CT was performed, which forms your metric numerator. A tally sheet may be useful, to include clinical indication for the chest CT provided (on the requisition and/or in the radiologist report), whether or not the clinical indication was appropriate for a low dose chest CT, and whether or not a low dose chest CT was actually performed.

Data Analysis

The goal is to achieve high compliance with the policy. There may always be cases for which some deviation from the policy is medically appropriate, so 100% compliance may not be reasonable or desirable. It is reasonable, however, to set a goal of 0 cases not using a low dose chest CT protocol.

Factors Potentially Influencing Performance

After analyzing the data, identify metrics where there is room for improvement. Reflect on your setting and practice and identify factors that may have influenced your results. Then, design an intervention intended to improve performance.

Possible contributors may include:

1. Lack of accessible medical record information to determine if a low dose nodule CT protocol is appropriate. Possible interventions include:
    - Requiring more complete information in the process of making exam appointments for chest CT exams
    - Asking the patient the reasons why they are here for the exam when they arrive for the exam
    - Gaining access to the relevant electronic medical records
    - Contacting the ordering provider/provider's practice

2. Lack of radiologist knowledge/awareness that chest CT examinations performed for the purpose of nodule follow up can be performed using a low dose protocol without negatively impacting diagnostic accuracy. The radiologist(s) may be aware this can be done but ignore it because they are uncomfortable with the resulting changes in image quality (increased noise).
    - An appropriate intervention might be an educational program reviewing the accuracy of a low dose nodule CT protocol, including seeking buy-in and altering the policy of using such a protocol through group deliberation.

3. The radiologist(s) may be aware this can be done but ignore it because of potential impact on 3D nodule volumetry and computer aided diagnosis algorithms.
    - An appropriate intervention might be an educational program reviewing the trade offs of radiation dose reduction versus application of these tools on patient outcome

4. Lack of radiologist participation in individual protocol selection.
    - Increase/require participation in protocol selection

5. Lack of referring physician familiarity of when a low dose chest CT nodule protocol should and should not be performed (may impact pre-authorization they are obtaining), and may impact their understanding of image quality (acceptable increased noise on soft tissue windows)
    - An appropriate intervention might be an educational program reviewing the clinical indications for using a low dose chest CT and the lack of significant on diagnostic accuracy due to the increased image noise perceived on soft tissue windows

Post Intervention Data Collection

Plan to collect data again six months after baseline and then every six months for the duration of the project (one to three years is typical). In the interim, implement your intervention.

Make sure that cases are collected, tallies are performed and metrics are analyzed the same way as at baseline. The only exceptions to this would be to adjust the number of cases identified if more cases are needed for analysis or to correct a problem identified with the baseline data collection procedure. If so, once the procedure has been corrected use it consistently going forward.

You may want to make a chart or graph of your performance on the metrics to identify trends and patterns. Review the data with your project team after every six month collection period.

If you are meeting your goals, no further changes may be necessary. However, you should plan to take steps to institutionalize whatever changes contributed to successful performance. If additional improvement is possible, look at your processes again and design additional interventions. It is generally best to only make one intervention per study cycle so that conclusions can be drawn about what caused the observed effect.

Once performance has stabilized or you feel the project is well underway, consider selecting and launching another PQI project.