***NQF Question:*** *Provide the measure title.*

Inappropriate diagnosis of community-acquired pneumonia (CAP) in hospitalized medical patients

Abbreviated form: Inappropriate diagnosis of CAP

***NQF Question:*** *Provide a brief description of the measure.*

* *Including type of score, measure focus, target population, timeframe, (e.g., Percentage of adult patients aged 18-75 years receiving one or more HbA1c tests per year).*

The inappropriate diagnosis of CAP in hospitalized medical patients (or “Inappropriate Diagnosis of CAP”) measure is a process measure that evaluates the annual proportion of hospitalized adult medical patients treated for CAP who do not meet diagnostic criteria for pneumonia (thus are inappropriately diagnosed and treated).

***NQF Question:*** *Attach the data dictionary, code table, or value sets (and risk model codes and coefficients when applicable). Excel formats (.xlsx or .csv) are preferred.*

Excel file attached – Data\_Dictionary\_Pneumonia\_Measure

* Tab 1: International Classification of Diseases (ICD) 10 Codes for Case Sampling
* Tab 2: Detailed Inclusion Criteria
* Tab 3: Radiographic Findings
* Tab 4: Signs and Symptoms
* Tab 5: Detailed Exclusion Criteria
* Tab 6: Eligible Antibiotics for Inclusion Criteria

***NQF Question:*** *State the numerator.*

* *Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome).*

The measure quantifies adult, hospitalized medical patients inappropriately diagnosed with pneumonia. Here, inappropriate diagnosis is defined as patients treated with antibiotics CAP who do not meet diagnostic criteria for pneumonia. Patients are considered inappropriately diagnosed if they did not have 2 or more signs or symptoms of pneumonia (documented at some point in the 2 days prior to the hospital encounter through the first 2 days of the hospital encounter) AND meet radiographic criteria for pneumonia.

***NQF Question:*** *Provide details needed to calculate the numerator.*

* *All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, time period for data collection, specific data collection items/responses, code/value sets.*
* *Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at sp.11.*

Patients in the numerator include those that did not have a) ≥2 signs or symptoms of pneumonia (documented at some point in the 2 days prior to the hospital encounter through the first 2 days of the hospital encounter) or did not b) meet radiographic criteria for pneumonia.

* Minor numerator exclusions:
	+ Those whose only antibiotic treatment was azithromycin (treatment could be related to chronic obstructive pulmonary disease exacerbation)- 2.2% (50/2301)
	+ Those with a blood culture positive for a pathogenic bacteria: 1.7% (38/2301)
	+ Those with a urine antigen positive for streptococcus (0.9% [20/2301]) or legionella (0.5% [12/2301])

Signs (e.g., tachypnea, leukocytosis) and symptoms (e.g., new cough, shortness of breath) of pneumonia are found in the attached excel file. Any combination of 2 or more symptoms is required to be considered appropriately diagnosed. Any patient who has 0 or 1 eligible signs or symptoms is considered inappropriately diagnosed with CAP and placed in the numerator.

In addition to signs and symptoms, data abstractors are instructed to review the medical record for any chest X-rays, chest computerized tomography (CTs), or abdominal CTs with lung findings to capture language that may be relevant to pneumonia (see excel file for definitions). Chest x-rays, chest CTs, and abdominal CTs that are obtained in the 2 days prior to the hospital encounter through day 4 of the hospital encounter should be included. Imaging results obtained on the day of transfer to the ICU should also be included. Otherwise, imaging results obtained after transfer to the intensive care unit (ICU; e.g., day 2 of transfer) should NOT be included even if it falls within the 4-day window.

Based on descriptions of radiographic criteria identified by abstractors, the following logic is used to determine if the patient met radiographic criteria for CAP for each individual image.

* Highest/first priority radiographic descriptions:
	+ If interval improvement/resolution, no change from previous/no interval change, normal/no abnormalities or no evidence of pneumonia is documented🡪image considered NOT to meet radiographic criteria
* Second priority radiographic descriptions (overrides other findings except first priority, above):
	+ If air space density/opacity/disease, bronchopneumonia, cannot rule out pneumonia, cavitation, infection (cannot rule out infection/likely infection), infiltrate (any lobe specifications), loculations, pneumonia, necrotizing pneumonia, post-obstructive pneumonia, or consolidation is documented, then image considered to meet radiographic criteria
* If none of the above:
	+ If ground glass is listed, then image considered to meet radiographic criteria
		- Exception: if ground glass plus interstitial lung disease, pulmonary edema or pulmonary vascular congestion is documented, then image considered NOT to meet radiographic criteria
	+ If mass is listed, then image considered to meet radiographic criteria
		- Exception: If neoplasm/metastatic disease/malignancy is documented, then image considered NOT to meet radiographic criteria
	+ If nodular air space disease, then image considered to meet radiographic criteria
		- Exception: If neoplasm/metastatic disease/malignancy or interstitial lung disease is documented, then image considered NOT to meet radiographic criteria
	+ If pleural effusion, then image considered to meet radiographic criteria
		- Exception: If pulmonary edema, pulmonary vascular congestion, or ground glass is documented, then image considered NOT to meet radiographic criteria
	+ If aspiration pneumonia, then image considered to meet radiographic criteria
		- Exception: If pneumonitis is documented, then image considered NOT to meet radiographic criteria

**If there were multiple radiographic images, the following prioritization applies:**

If available, chest CTs that occur within 1 calendar day (-1,0,+1) of a chest X-ray or abdominal CT are prioritized (even if they conflict with other results)

* If patient has any Chest CT meeting radiographic criteria, then patient considered to meet radiographic criteria
* If the patient’s Chest CT does NOT meet radiographic criteria, then the patient is considered NOT to meet radiographic criteria, and then considered inappropriately diagnosed, add to numerator
* Example
	+ Chest X-ray and Chest CT on day 1. Chest X-ray says pneumonia. Chest CT says no pneumonia. Patient considered inappropriately diagnosed.
	+ Chest X-ray on day 1. Chest CT on day 5. Chest X-ray says pneumonia. Chest CT says no pneumonia. Patient not considered inappropriately diagnosed.

If no chest CT is present, the following will apply

* If Abdominal CT AND/OR Chest X-Ray meet radiographic criteria, then patient considered to meet radiographic criteria
* If NEITHER Abdominal CT or Chest X-Ray meet radiographic criteria, then patient considered NOT to meet radiographic criteria, and considered inappropriately diagnosed, add to numerator

***NQF Question:*** *State the denominator.*

* *Brief, narrative description of the target population being measured.*

The denominator includes all adult, general care, immunocompetent, medical patients hospitalized and treated for CAP who do not have a concomitant infection.

***NQF Question:*** *Provide details needed to calculate the denominator.*

* *All information required to identify and calculate the target population/denominator such as definitions, time period for data collection, specific data collection items/responses, code/value sets.*
* *Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at sp.11.*

The denominator includes all sampled patients eligible for abstraction during the measure period (typically annual measurement). Please see excel file (inclusion criteria tab) for detailed operationalized definitions.

Inclusion criteria:

* Adult patient admitted and discharged from the participating hospital with a discharge diagnosis (listed as any discharge diagnosis) of CAP (see excel file for ICD 10 codes)
* Admitted to a general care medicine service
* Received any eligible antibiotic therapy on day 1 or 2 of hospitalization (see excel file for eligible antibiotics)
* Immunocompetent (allowing for mild immune suppression)
* Do not have a concomitant infection (e.g., antibiotic treatment for unrelated infection, COVID-19, fungal pneumonia)

Exclusion Criteria:

* Left against medical advice or refused medical care
* Admitted on hospice
* Pregnant or breastfeeding
* Cystic fibrosis
* Pneumonia-related complication (e.g., empyema)

***NQF Question:*** *Provide details needed to calculate the denominator exclusions.*

* *All information required to identify and calculate exclusions from the denominator such as definitions, time period for data collection, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at sp.11.*

Inclusion and exclusion codes and criteria are provided in the attached excel file.

***NQF Question:*** *Diagram or describe the calculation of the measure score as an ordered sequence of steps. \**

* *Identify the target population; exclusions; cases meeting the target process, condition, event, or outcome; time period of data, aggregating data; risk adjustment; etc.*

The measure estimates hospital-level inappropriate diagnosis of CAP. If the hospital has elected to sample patients, they will generate a sample using eligible ICD 10 discharge codes (see excel file for ICD 10 codes). Next, they will apply electronic inclusion criteria (medicine admission, antibiotics on day 1 or 2 of hospitalization) to either their quarterly or monthly patient sample. The resulting list will be randomized, and patients screened in order of randomization. First, patients are screened for inclusion in the denominator. All adult, general care, medical patients hospitalized and treated for CAP are potentially eligible. If the patient meets eligibility criteria and does not have any exclusions, they are placed in the denominator. Patients automatically excluded from the numerator are those treated only with azithromycin, those with blood cultures positive for a pathogenic organism, and those with a positive streptococcal or legionella urinary antigen. Patients are then assessed for whether they meet diagnostic criteria for pneumonia defined as 2 or more symptoms/signs of pneumonia AND meeting radiographic criteria. If a patient does not meet diagnostic criteria they are placed in the numerator. A lower score is considered better diagnostic quality for CAP.

***NQF Question****: If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.*

Sampling: Hospitals have the option to sample from their population or submit their entire population. Hospitals also have the option to sample quarterly or monthly. Over the entire year, 76 cases are recommended for the denominator. Thus, hospitals whose Initial Patient Population size is less than or equal to the minimum number of cases per quarter (N=19) or month (N=6) for the measure should not sample. A hospital may choose to use a larger sample size than is required.

Sampling Procedures:

Potentially eligible patient lists should be reviewed monthly or quarterly (as desired). Lists will be determined by the ability of the facility; however, we suggest electronically including the following criteria:

* Initial sample based on ICD-10 discharge diagnostic codes
* Exclude patients who did not receive antibiotics on day 1 or 2 of hospitalization
* Exclude patients admitted to a non-medicine service
* Exclude patients admitted to intensive care

Regardless of the option used, hospital samples must be monitored to ensure that sampling procedures consistently produce statistically valid and useful data. Due to exclusions, hospitals selecting to sample cases MUST submit AT LEAST the minimum required sample size.

Eligible lists should then be randomized and reviewed in order until the desired number of cases is included (~7/month or 19/quarter).

Minimum Sample Size:

Using the spearman brown prophecy, we evaluated the number of cases needed to reach each reliability threshold:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reliability | 0.6 | 0.7 | 0.8 (standard) | 0.9 |
| Number of annual cases needed | 29 | 45 | **76** | 171 |

Based on these data, for a desired reliability of 0.8, each hospital would need to abstract 76 cases annually or 6-7 cases per month.

***NQF Question:*** *Identify the specific data source or data collection instrument. \**

*For example, provide the name of the database, clinical registry, collection instrument, etc., and describe how data are collected.*

Electronic medical record data. The data collection instrument is provided. Those interested in using our online REDCap tool may contact us directly to coordinate.