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The Accuracy of InterQual Criteria in Determining the Observation Versus Inpatient Status in Older Adults with Syncope

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Abstract

Background: McKesson's InterQual criteria are widely used in hospitals to determine if patients should be classified as observation or inpatient status, but the accuracy of criteria is unknown.

Objectives: We sought to determine whether InterQual criteria accurately predicted length of stay in older patients with syncope.

Methods: We conducted a secondary analysis of a cohort study of adults ≥ 60 years with syncope. We calculated InterQual criteria and classified the patient as observation or inpatient status. Outcomes were whether LOS were less than or greater than two midnights.

Results: We analyzed 2361 patients and 1,227 (52.0%) patients were male and 1,945 (82.8%) were white, with a mean age of 73.2 \pm 9.0 years. The median LOS was 32.6 hours (IQR 24.2–71.8). The sensitivity of InterQual criteria for LOS was 60.8% (95% CI 57.9–63.6%); specificity 47.8% (95% CI 45.0–50.5%).

Conclusion: In older adults with syncope, those who met InterQual criteria for inpatient status had longer LOS compared to those who did not; however, the accuracy of the criteria to predict length of stay over 2 days is poor, with sensitivity of 60% and specificity of 48%. Future research should identify criteria to improve LOS prediction.

Keywords

syncope; geriatrics; interqual; case management

Introduction:

Observation care has grown as an alternative to “short-stay” inpatient admissions since the 1980s.^{1,2} Observation status is on the rise: between 2007 and 2012, observation stays for short-term acute care treatment and assessment grew by 57% among Medicare patients.^{3–6} This trend may have been influenced by multiple factors, including increasing hospital boarding and crowding,^{7,8} and faster diagnostic and treatment protocols. In 2006, the Centers for Medicare and Medicaid Services (CMS) initiated the Recovery Audit Contractor (RAC) program with the goal of identifying potential waste in the program.⁴ One targets of this program were “short stay” hospital admissions. RACs review claims for inpatient stays and determine if the admission to the hospital was medically reasonable and necessary. If a RAC determines that the inpatient admission was not necessary and the care should have been provided on an outpatient basis, then the inpatient claim would be denied. To provide clarity, in 2014 CMS specifically identified a stay that spans two midnights or longer (“two midnight rule”) as inpatient stays.^{4,9} RACs would not review inpatient claims that crossed two midnights and would be presumed to be medically necessary. For fiscal year 2013 CMS estimated that the improper payment rate was 10.1 percent, which represented \$36 billion.¹⁰ To assist in appropriately classifying patients, hospitals have employed case managers to differentiate between observation or acute inpatient status. McKesson’s InterQual criteria are one of the tools used by case management to determine if a patient qualifies for inpatient versus observation status.¹¹ Patients with higher severity of illness, increasing comorbidities and requiring more intensive treatment often meet InterQual criteria for inpatient status.^{12,13} Historically, RACs have used InterQual criteria during review and so hospitals have turned to InterQual to align hospitalization status with what could turn up in an audit. Given the widespread use, it is important to understand whether InterQual accurately predicts length of stay.

One of the leading diagnosis associated with payment denials by CMS is syncope.¹⁴ In a recent analysis of the California Statewide Database showed that the median length of stay for a syncope evaluation is 2 days without significant change over 6 years.¹⁵ Syncope is a chief common complaint for older adults in the ED, and often presents a diagnostic challenge.^{16,17} Approximately 1% of all ED visits are for syncope, and almost one third of these cases are admitted. Given the variation in the evaluation of syncope and potential costs to hospitals, it is imperative to appropriately classify patients in observation or inpatient status. We evaluated the accuracy of InterQual criteria to determine LOS of less than or greater than two midnights in older adults with syncope.

Materials and Methods:

This is a secondary analysis of a large, multicenter, prospective cohort study of older adults with unexplained syncope ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01802398) identifier [NCT01802398](https://clinicaltrials.gov/ct2/show/study/NCT01802398))¹⁸ to determine whether InterQual criteria predicted the need for observation (less than two midnights) vs. acute hospitalization (more than 2 midnights). The study was approved by the institutional review boards at all sites and written, informed consent was obtained from all participating subjects.

Briefly, this study was conducted at 11 academic emergency departments across the United States from April 28, 2013 to September 21, 2016. ED annual volumes ranged from 47,000 to 120,000. Eligible patients were ≥ 60 years of age with a complaint of syncope or near-syncope at 11 academic United States EDs. Exclusion criteria were: intoxication, medical or electrical intervention to restore consciousness, and inability or unwillingness to provide informed consent or follow-up information. Patients with a presumptive cause of loss of consciousness due to seizure, stroke or transient ischemic attack, or hypoglycemia were also excluded.

All patients underwent standardized history, physical examination, laboratory testing, and 12-lead ECG testing. Additional testing and patient disposition were directed by the treating clinical providers. We conducted 30-day patient follow-up using previously described methods,¹⁹ including a review of the electronic medical records by local research personnel to evaluate for serious outcomes within 30 days from the index ED evaluation.

Patients were excluded if they were discharged, transferred, eloped or left against medical advice after initial evaluation in the ED or if they had any identified causes of syncope in the ED meeting objective immediate inpatient admission criteria, including cardiac arrhythmias, myocardial infarction, cardiac intervention, new diagnosis of structural heart disease, stroke, pulmonary embolism, aortic dissection, subarachnoid hemorrhage, cardiopulmonary resuscitation, or internal hemorrhage/anemia requiring transfusion. LOS was calculated by using patient arrival time in the ED and discharge time from the hospital per the local electronic health record, and how many midnights the stay was.

The primary outcome was LOS over two midnights. The predictor of interest was InterQual classification of observation versus inpatient status. InterQual criteria are based on the 2018 guidebook (<https://www.changehealthcare.com/solutions/interqual>). To explore whether InterQual criteria have improved over time, we conducted a secondary analyses assessing the 2009 InterQual criteria, which required only one of two criteria (known cardiac disease or drug induced cardiac disorder) to meet inpatient criteria of having history of cardiac disease. Interqual uses a branching logic, which consists of findings on echocardiography, electrocardiogram, and symptoms. In order to meet inpatient criteria, the patient needs to meet a criteria in each of the category within history, associated symptoms, ECG finding, or have aortic stenosis with valve area <1.0 cm². Criteria used in our analysis are included in Table 1.

Patient characteristics were described as number and percentage or mean and SD. Differences between categorical variables are analyzed with a chi-square test or Fisher's exact test and differences between continuous variables with two sample t-tests. Significance was defined as $p < 0.05$. We calculated the sensitivity, specificity, negative and positive predictive values of the InterQual criteria. Data analyses were performed using the R package (R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>).

Results:

Overall, 3,686 patients were enrolled in the study, 674 patients were discharged after initial evaluation in the ED and 62 patients had other dispositions, 376 patients had a serious diagnosis found during the ED encounter, and 108 patients had missing LOS information (Figure 1). After exclusions, there were 2361 patients available for analysis. Overall, 1,227 (52.0%) patients were male, 1,945 (82.8%) were white, with a mean age of 73.2 +/- 9.0. The median LOS was 32.6 (IQR 24.2–71.8) hours and mean LOS 61.3+/- 82h. Table 2 describes the individual characteristics of the cohort. Over half (54.0%) of patients were initially categorized as observation status.

Primary Results:

Table 2 describes the individual characteristics of the cohort: 1252 (53.0%) of patients had LOS more than 2 midnights and Figure 2 shows the LOS for study patients. Using InterQual criteria, 1,328 (56.2%) of patients would meet criteria for inpatient hospitalization. These patients tended to be older, more likely to be male and had higher history of cardiovascular disease, including heart failure, coronary artery disease, and arrhythmias (all $p < 0.05$). However, patients had similar symptoms, including dyspnea, palpitations, syncope during exertion or supine, and hypotension.

Meeting InterQual criteria did predict LOS over 2 midnights (odds ratio 1.42; 95% CI 1.20–1.67). However, the accuracy of InterQual criteria to predict LOS was modest (Table 3). The sensitivity of InterQual criteria for LOS over two midnights was 60.8% (95% CI 57.9–63.6%); specificity 47.8% (95% CI 45.0–50.5%); PPV 50.8% (48.1–53.4%); NPV 57.9% (54.9–60.9%).

Additional analysis assessed the 2009 InterQual criteria to meet inpatient criteria of any cardiac disease. Similar to current criteria, InterQual criteria did predict increased LOS (odds ratio 1.66; 95% CI 1.41–1.96). The sensitivity of InterQual criteria was 57.5% (95% CI 54.3–60.6%); specificity was higher at 55.2% (95% CI 52.6–57.8%); PPV 46.5% (43.6–49.3%); NPV 65.7% (63.0–68.4%).

Discussion:

InterQual criteria are used by case management and utilization staff as a screening tool to assist physicians in determining the appropriate level of care when patients require hospitalization. In our study, we found that InterQual criteria have only modest sensitivity and specificity for assigning older syncope patients to the appropriate disposition status. In addition, our analyses showed that there is no evidence that InterQual criteria have improved performance over time.

Previous studies that focused on the accuracy of InterQual criteria for other patients requiring acute care had similar results: a small study of patients with gastrointestinal bleeding showed poor prediction of need for admission, and over 50% of those recommended for discharge would have needed further care including blood transfusion, need for over 500 mL fluid bolus, >2 gm drop in hemoglobin, new congestive heart failure

or chest pain, intensive care unit transfer, new need for telemetry, new ECG ischemia, need for surgery, intravenous vasopressors, endoscopic intervention, variceal bleeding, or death.²⁰ In another study, InterQual criteria differed significantly from a panel of psychiatrists reviewing charts for the appropriateness for psychiatric admissions and continued stays.²¹ More recently, Wang et al. evaluated the accuracy of 2012 InterQual criteria for predicting LOS in patients with congestive heart failure. Overall, InterQual criteria was a poor predictor of LOS.¹² In a large study of over 40,000 hospitalizations, the authors found that observation stays “did not meet the CMS definition of observation” Over 16.5% of observation patients stayed more than 48 hours. The authors also found that there were 1,141 distinctly billed observation codes. This wide variety of diagnoses, combined with complicated InterQual criteria, suggest that observation status is not well defined.⁵

The differentiation between observation and inpatient is important for several reasons. Time in the hospital in observation status is considered outpatient rather than inpatient, it is not counted toward the three-day inpatient stay requirement that, among other requirements, qualifies a Medicare beneficiary for subsequent skilled nursing facility care. While observation services are often appropriate, the extended use of such services could have unintended consequences for some Medicare beneficiaries. There is concern that Medicare beneficiaries have increased out-of-pocket expenses for observation admissions.²² However, a report in 2013 from the Office of the Inspector General, which shows that the patient expense for an observation stay was less than the expense for a short inpatient stay 94% of the time. For hospitals, inpatient and observation status also differ in payment: a recent analysis of a hypothetical 3-day hospitalization for syncope showed that the total hospital revenue would be almost \$4,000 if billed as an inpatient hospitalization versus only \$1,500 for an observation stay.²² Given almost 460,000 hospitalizations for syncope annually, this represents millions in potential difference in payments. This is balanced by RAC audits and denials of payment.²³

Limitations

There are several limitations to our analysis. We had data on patients with ejection fractions <40%, while InterQual categorizes those with ejection fraction <35% as the cut point. This may cause us to categorize more patients as acute vs observation. However, there were only 78 patients in this category and would not have significantly changed the test characteristics and diagnostic accuracy of the InterQual criteria. In addition, we did not have any patients who had significant findings such as short PR interval, Brugada or Wolf-Parkinson-White syndrome. This is most likely due to our cohort of older adults, as these conditions are usually diagnosed at a younger age. We also recognize there may be bias in LOS as patients who are designated as observation status tend to have shorter LOS. However, we found that in both the observation and inpatient assigned groups, LOS were similar. Overall, we were only missing LOS data on less than 5% of our cohort. We did not collect information on individual site policies and practices for classification of observation versus admission, but by including 11 hospitals, we hope to have captured variation within the data. Lastly, while this was a multicenter study, all centers were academic medical centers and practices may not be generalizable to community hospitals.

Conclusion

In older adults with syncope, those who met InterQual criteria for inpatient status had longer LOS compared to those who did not; however, the accuracy of the criteria is poor, with sensitivity of 60% and specificity of 48%. Future research should identify criteria to improve LOS prediction.

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Article summary:**Why is this topic important?**

Syncope is a common chief complaint in older adults in the emergency department, and frequently placed in observation status. To assist in appropriately classifying patients, hospitals have employed case managers often using InterQual criteria to differentiate between observation or acute inpatient status, which may be different than physician judgment.

What does this study attempt to show?

This study show that InterQual criteria have only modest sensitivity and specificity for assigning older syncope patients to the appropriate disposition status.

What are the key findings?

This study show that InterQual criteria have only modest sensitivity and specificity for assigning older syncope patients to the appropriate disposition status. While those with inpatient status have longer lengths of stay, the difference is only modest.

How is patient care impacted?

Using InterQual criteria to assign disposition status may not be beneficial for patients.

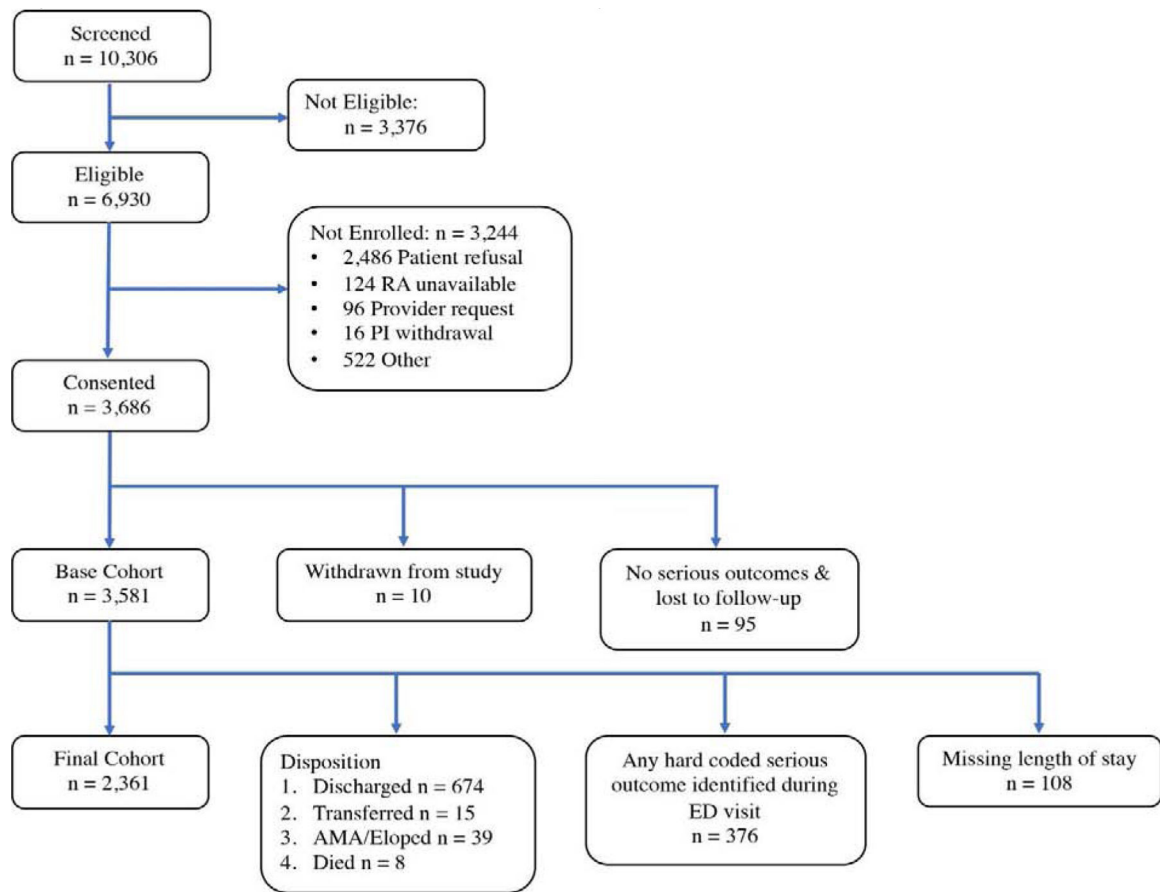


Figure 1.
Patients screened and enrolled for analysis

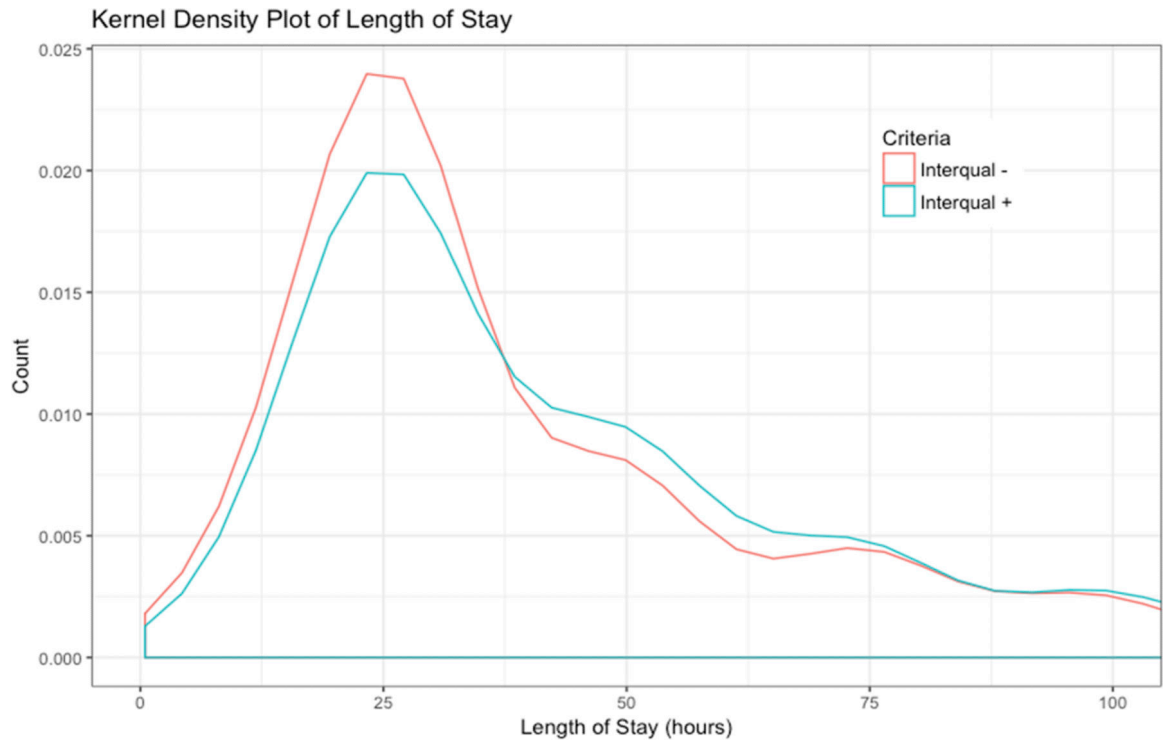


Figure 2. Length of stay of those who met and did not meet InterQual acute stay for syncope.

Table 1.

InterQual criteria used for observation versus inpatient status recommendation

<u>History of (one)</u>
Ejection Fraction <40%
Premature sudden death in family
<u>Associated symptoms (one)</u>
Dyspnea
Palpitations
Syncope During Exertion
Syncope While Supine Hypotension
Heart Rate <60/min
<u>ECG findings (one)</u>
QRS duration 120 ms
Prolonged QTc (>440 ms in men, >460 ms in women)
Short QTc (<340 ms)
Abnormal ECG
Abnormal ECG - Short PR Interval (<10 ms)
Abnormal ECG - Brugada Pattern
Abnormal ECG - Wolff-Parkinson White
Aortic Stenosis 1.0 cm ²

ECG: electrocardiogram, ms: millisecond

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Table 2.

Patient demographics

Variable	Overall Cohort (n=2361)	InterQual not met (n=1033)	InterQual met (n=1328)	p-value
Age				0.037
60 to <70	975 (41.3)	461 (44.7)	514 (38.8)	
70 to <80	764 (32.4)	313 (30.3)	451 (34.0)	
80 to <90	514 (21.8)	213 (20.6)	301 (22.7)	
90+	105 (4.5)	45 (4.4)	60 (4.5)	
Male Gender	1227 (52.0)	414 (40.1)	813 (61.2)	<0.001
<u>Race</u>				0.199
White or Caucasian	1945 (82.8)	854 (82.8)	1091 (82.8)	
Black or African American	331 (14.1)	137 (13.3)	194 (14.7)	
Asian	29 (1.2)	17 (1.7)	12 (0.9)	
Other	44 (1.9)	23 (2.2)	21 (1.6)	
Length of Stay (hours), median [IQR]	32.6 [24.2, 71.8]	30.1 [23.6, 66.6]	41.6 [24.8, 74.0]	<0.001
Length of Stay Crosses 2 Midnights	1109 (47.0)	435 (42.1)	674 (50.8)	<0.001
Initial Disposition				0.033
Inpatient	1087 (46.0)	450 (43.6)	637 (48.0)	
Observation	1274 (54.0)	583 (56.4)	691 (52.0)	
<u>History of</u>				
Congestive Heart Failure	318 (13.5)	66 (6.4)	252 (19.0)	<0.001
Coronary Artery Disease	673 (28.5)	204 (19.8)	469 (35.4)	<0.001
Arrhythmia	493 (20.9)	156 (15.1)	337 (25.5)	<0.001
Ejection Fraction < 40%	78 (3.3)	0 (0.0)	78 (5.9)	<0.001
Premature sudden death in family	23 (1.0)	0 (0.0)	23 (1.7)	<0.001
<u>Prescribed Medication</u>				
Beta Blockers	964 (40.9)	348 (33.7)	616 (46.5)	<0.001
Calcium Channel Blockers	449 (19.0)	196 (19.0)	253 (19.1)	0.957
Diuretics	732 (31.0)	270 (26.2)	462 (34.8)	<0.001
Dyspnea	477 (20.2)	198 (19.2)	279 (21.0)	0.269
Palpitations	298 (12.6)	133 (12.9)	165 (12.4)	0.744
Syncope During Exertion	424 (18.0)	179 (17.3)	245 (18.4)	0.482
Syncope While Supine	87 (3.7)	37 (3.6)	50 (3.8)	0.815
Hypotension	269 (11.4)	106 (10.3)	163 (12.3)	0.127
Heart Rate <60/min	298 (12.7)	0 (0.0)	298 (22.6)	<0.001
QRS duration 120 ms	435 (18.7)	0 (0.0)	435 (32.8)	<0.001
Prolonged QTc (>440 ms in men, >460 ms in women)	1040 (44.6)	0 (0.0)	1040 (78.5)	<0.001
Short QTc (<340 ms)	6 (0.3)	0 (0.0)	6 (0.5)	0.040
Abnormal ECG	1282 (54.9)	386 (38.3)	896 (67.6)	<0.001
Abnormal ECG - Short PR Interval (<10 ms)	0 (0.0)	0 (0.0)	0 (0.0)	1.000

Variable	Overall Cohort (n=2361)	InterQual not met (n=1033)	InterQual met (n=1328)	p-value
Abnormal ECG - Brugada Pattern	0 (0.0)	0 (0.0)	0 (0.0)	1.000
Abnormal ECG - Wolff-Parkinson White	0 (0.0)	0 (0.0)	0 (0.0)	1.000
Aortic Stenosis 1.0 cm ²	9 (0.4)	0 (0.0)	9 (0.7)	0.006
Physician Risk Assessment, mean (SD)	9.2 (11.8)	8.0 (10.7)	10.1 (12.6)	<0.001

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Table 3.

InterQual sensitivity, specificity, PPV and NPV

	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	PLR (95% CI)	NLR (95% CI)
LOS crossing two midnights	60.8% (57.9%, 63.6%)	47.8% (45.0%, 50.5%)	50.8% (48.1%, 53.4%)	57.9% (54.9%, 60.9%)	1.16 (1.08, 1.25)	0.82 (0.75, 0.9)
LOS 48 hours	60.7% (57.6%, 63.8%)	46.8% (44.2%, 49.4%)	43.6% (40.9%, 46.3%)	63.7% (60.8%, 66.6%)	1.14 (1.06, 1.22)	0.84 (0.76, 0.93)

CI: confidence interval

PPV: positive predictive value

NPV: negative predictive value

PLR: positive likelihood ratio

NLR: negative likelihood ratio