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Routinely Collected Clinical Features Are Associated with COPD Exacerbations in Individuals Without an Exacerbation History: A COPDGene Analysis

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Rationale

- Respiratory exacerbations are detrimental events associated with morbidity, mortality, FEV₁ decline, and elevated health care costs
- In patients without a recent history of exacerbations, risk factors associated with future exacerbations are not fully understood

Methods

- Patient selection
 - Completed five-year visit for COPDGene
 - COPD (GOLD 1-4)
 - Current or former smoker
 - No exacerbation in year prior to five-year visit
 - At least one longitudinal follow-up visit (telephony or web-based) in 36 months after five-year visit

Methods

- Exacerbations were defined as acute respiratory events requiring antibiotics and/or PO/IV steroids with or without hospital admission.
- Exacerbation rates were modeled using univariable and multivariable zero-inflated negative binomial regression models controlling for age, sex, and smoking status
- Zero-inflated components of these models included FEV₁ % predicted
- Three risk scores, incorporating increasingly complex clinical variables, were constructed from factors significantly associated with increased exacerbation rates in our multivariable models
- Assigned points in risk scores were proportional to the beta coefficients in the models

Baseline Characteristics

	All participants (N=1528)
Participants with ≥ 1 exacerbation (%)	508 (33.2%)
Age (years)	69 \pm 8.0
Female (N, %)	640 (41.9%)
Race: White (N, %)	1233 (80.7%)
BMI (mean, SD)	27.9 \pm 5.9
Current smokers (N, %)	515 (33.7%)
Pack years (mean, SD)	50.6 \pm 25.3
GERD (N, %)	493 (32.3%)
Coronary artery disease (N, %)	172 (11.3%)
Congestive heart failure (N, %)	58 (3.8%)

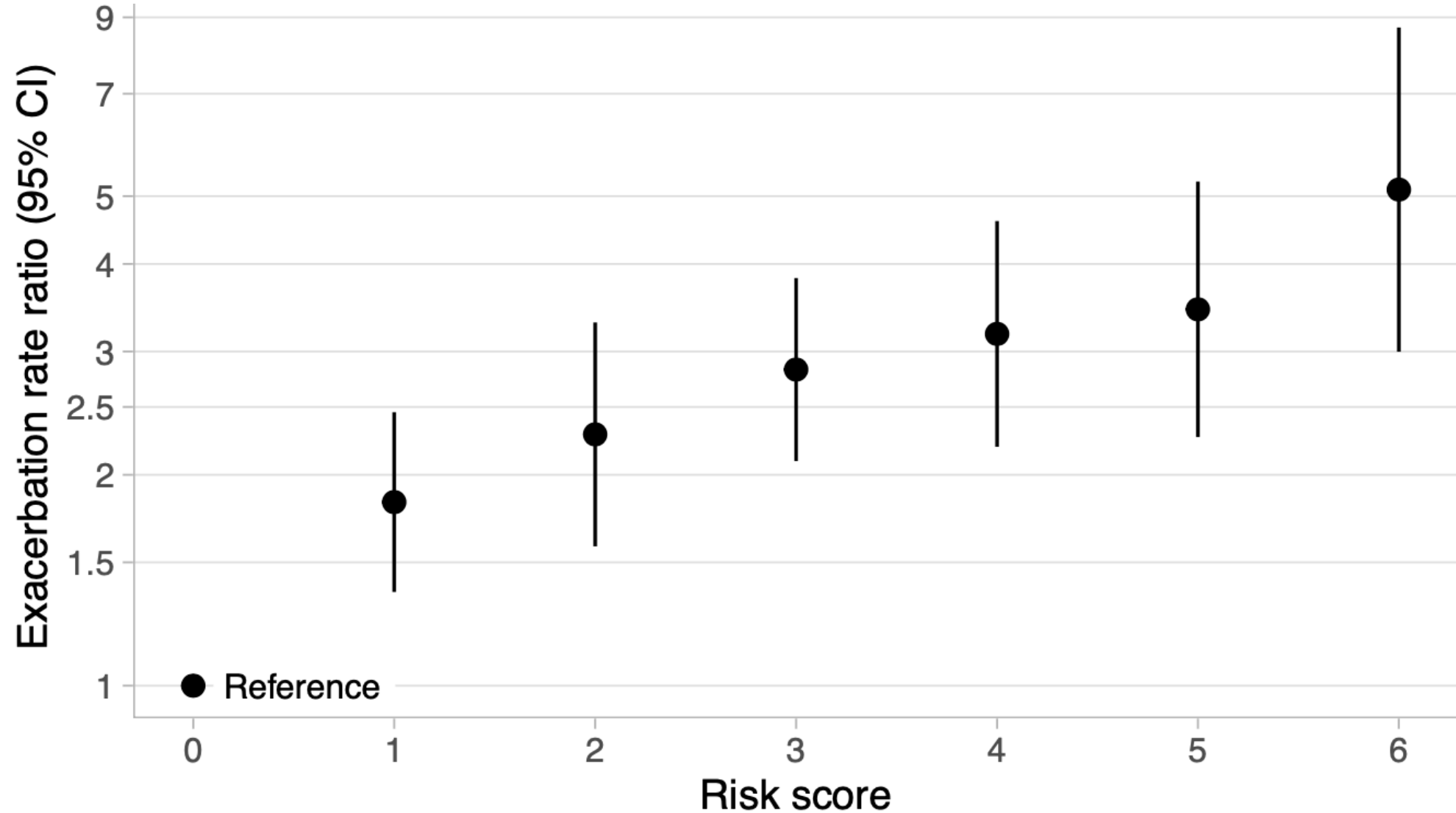
Baseline Characteristics

FEV ₁ % predicted (mean %, SD)	65.5 ± 22.0
GOLD Grade (N, %)	
• 1	418 (27.4%)
• 2	714 (46.7%)
• 3	312 (20.4%)
• 4	84 (5.5%)
CAT score (N, %)	
• <10	654 (42.8%)
• ≥10	874 (57.2%)
mMRC score(N, %)	
• 0-1	897 (58.7%)
• 2	217 (14.2%)
• 3-4	414 (27.1%)
Chronic bronchitis (N, %)	289 (18.9%)

Graduated Exacerbation Risk Score 1

Predictor	Risk Score 1
mMRC 2	+1
mMRC 3-4	+3
Chronic Bronchitis	+2
GERD	+1
Total possible points	6
Rate ratio for any exacerbation per 1 point increase (95% CI)	1.29 (1.21, 1.37)

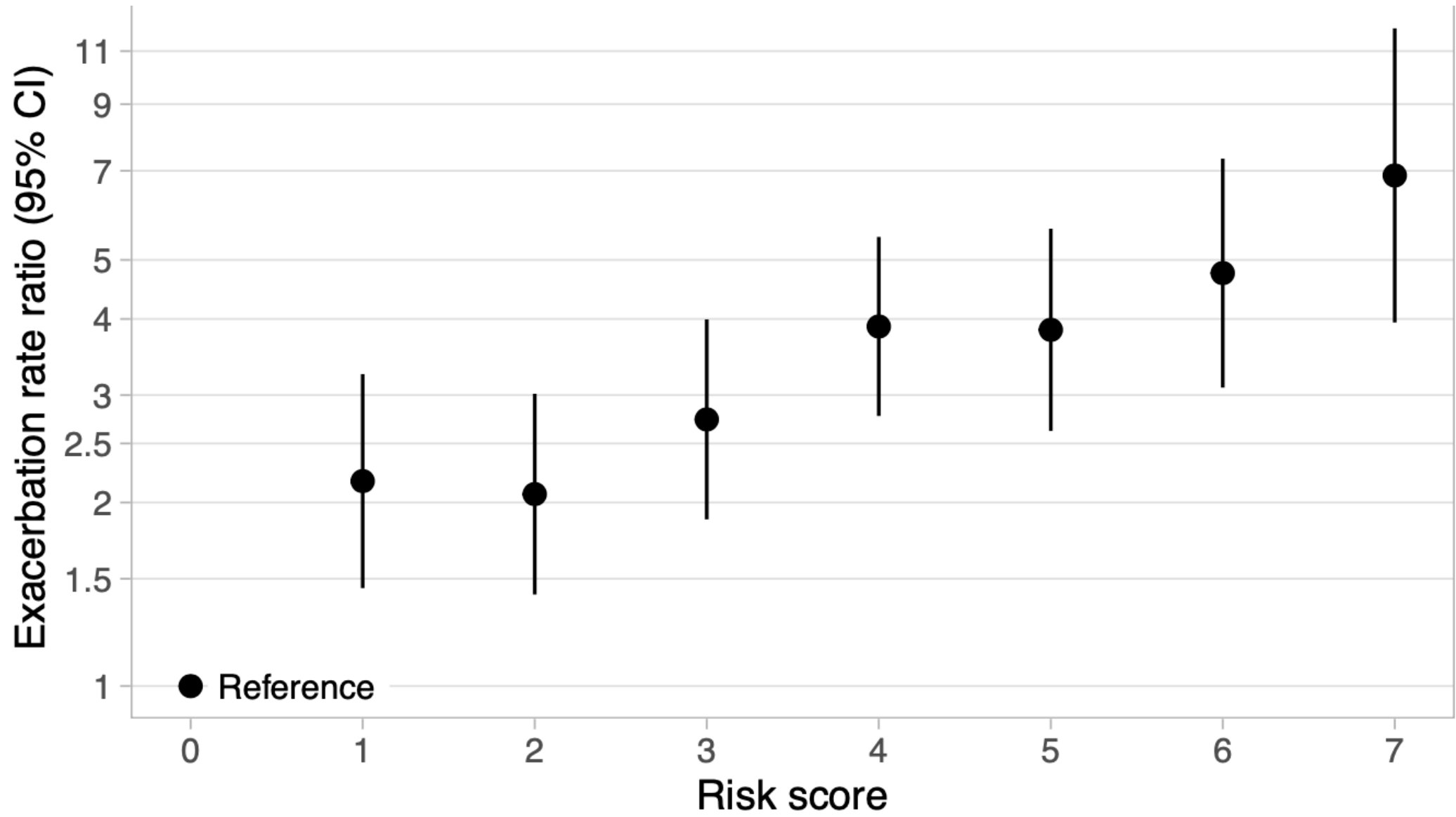
Exacerbation Rate Ratio for Risk Score 1



Graduated Exacerbation Risk Score 2

Predictor	Risk Score 2
mMRC 2	+1
mMRC 3-4	+2
Chronic Bronchitis	+2
GERD	+1
CAT score \geq 10	+2
Total possible points	7
Rate ratio for any exacerbation per 1 point increase (95% CI)	1.28 (1.21, 1.35)

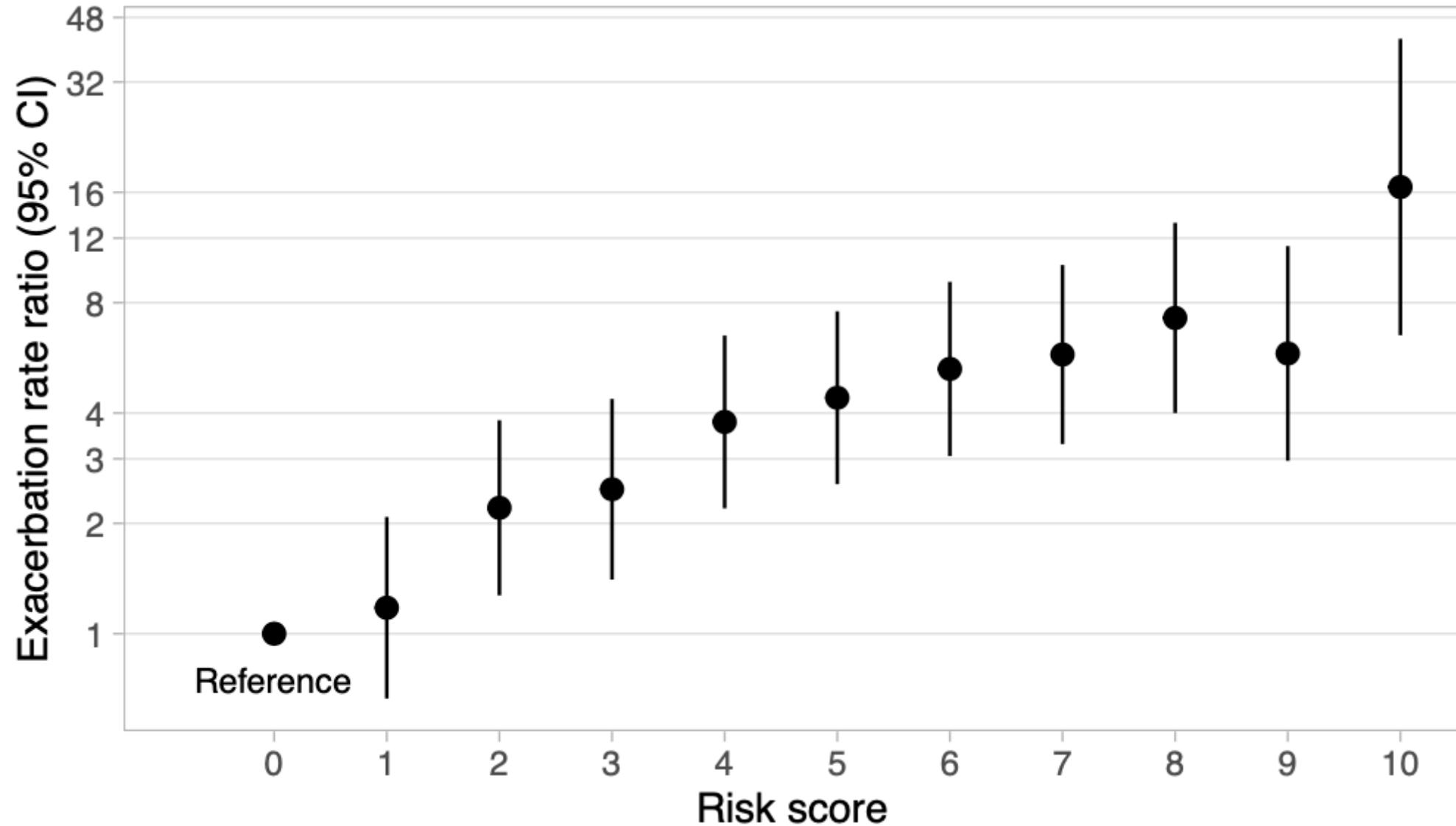
Exacerbation Rate Ratio for Risk Score 2



Graduated Exacerbation Risk Score 3

Predictor	Risk Score 3
mMRC 2	+1
mMRC 3-4	+2
Chronic Bronchitis	+2
GERD	+1
CAT score ≥ 10	+2
FEV ₁ % predicted 60-79%	+1
FEV ₁ % predicted 40-59%	+2
FEV ₁ % predicted <40%	+3
Total possible points	10
Rate ratio for any exacerbation per 1 point increase (95% CI)	1.26 (1.20, 1.32)

Exacerbation Rate Ratio for Risk Score 3





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Conclusions

- Risk factors routinely collected in clinical practice can be used to identify patients at increased risk of a COPD exacerbation in the absence of a recent history of exacerbation.
- Risk score models can incorporate increasingly complex clinical information with a dose-response relationship observed between risk score and exacerbation rate.
- This novel, adaptable risk score can be used in a variety of clinical settings and may help identify patients at higher risk of future exacerbation in the absence of a history of exacerbations.

Acknowledgements

The project described was supported by Award Number U01 HL089897 and Award Number U01 HL089856 from the National Heart, Lung, and Blood Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Health.

COPDGene is also supported by the COPD Foundation through contributions made to an Industry Advisory Board that has included AstraZeneca, Bayer Pharmaceuticals, Boehringer- Ingelheim, Genentech, GlaxoSmithKline, Novartis, Pfizer, and Sunovion.

This analysis was funded by GlaxoSmithKline (study 214185).

On behalf of all authors, an audio recording of this poster was prepared by Michael Ferrera, who did not receive any payment for this recording.

The presenting author, Michael Ferrera, declares no conflicts of interest during the last 24 months in relation to this presentation.

Coauthor Disclosures

Camden L. Lopez, MS: None

Susan Murray, ScD: None

Renu G. Jain, PhD is an employee of GSK and hold stocks and shares in GSK

Wassim W. Labaki, MD, MS has received non-financial support from Pulmonx and personal fees from Konica Minolta, outside the submitted work.

Barry J. Make, MD reports grants and personal fees from AstraZeneca, Spiration, Sunovion, Novartis, CSL Behring, Verona, Boehringer Ingelheim, Theravance, and Circassia; and support for Continuing Medical Education activities from Consensus Medical Education, Integrity Medical Education, Mt. Sinai Medical Center, WebMD, UpToDate, National Jewish Health, SPIRE Learning, the American College of Chest Physicians, Projects in Knowledge, Hybrid Communications, Peer Review Institute, Cleveland Clinic, Medscape, and Ult Medical Academy.

MeiLan K. Han, MD, MS has received personal fees from AstraZeneca, Boehringer Ingelheim, GSK, Mylan, Merck, Verona, and Teva; research support from Novartis and Sunovion.