

Impact of Hemoglobin Levels and Their Dynamic Changes on the Risk of Atrial Fibrillation: A Nationwide Population-Based Study

Woo-Hyun Lim, MD¹, Eue-Keun Choi, MD, PhD², Kyung-Do Han, MS³, So-Ryoung Lee, MD², Myung-Jin Cha, MD², Seil Oh, MD, Ph.D., FHRS²

¹Division of Cardiology, Department of Internal medicine, Seoul National University Boramae Medical Center, Seoul, Republic of Korea; ²Division of Cardiology, Department of Internal medicine, Seoul National University Hospital, Seoul, Republic of Korea; ³Department of Biostatistics, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea;

Running Title: hemoglobin level and atrial fibrillation

Corresponding Author:

Eue-Keun Choi, MD, PhD

Department of Internal Medicine, Seoul National University Hospital

101 Daehak-ro, Jongno-gu, Seoul, 03080, Republic of Korea

Phone +82-2-2072-0688/Fax +82-2-762-9662

E-mail: choiek17@snu.ac.kr

Supplementary Information

I. Supplementary Tables

Supplementary Table 1. Definition of comorbidities and clinical outcomes

Diagnosis	ICD-10-CM code	Diagnostic definition
Atrial fibrillation	I480-484, I489	Admission or outpatient department \geq 1
Valvular atrial fibrillation	I050, I052, I059, Z952-Z954	Admission or outpatient department \geq 1
Hypertension	I10-I13, I15	Admission \geq 1 or outpatient department \geq 2 Minimum 1 prescription of anti-hypertensive medications (thiazide, loop diuretics, aldosterone antagonist, alpha-/beta-blocker, calcium-channel blocker, angiotensin-converting enzyme inhibitor, and angiotensin II receptor blocker).
Diabetes mellitus	E11-E14	Admission \geq 1 or outpatient department \geq 2 Minimum 1 prescription of anti-diabetic medications (sulfonylureas, metformin, meglitinides, thiazolidinediones, dipeptidyl peptidase-4 inhibitors, α -glucosidase inhibitors and insulin).
Dyslipidemia	E78	Admission or outpatient department \geq 1
Ischemic heart disease	I20-25	Admission or outpatient department \geq 1
Congestive heart failure	I50	Admission or outpatient department \geq 1
Stroke	I63, I64	Admission \geq 1 and brain imaging (CT or MRI) \geq 1
Chronic obstructive pulmonary disease	J41-44	Admission or outpatient department \geq 1

Obstructive sleep apnea

G473

Admission or outpatient department≥1

Thyroid disease

Hypothyroidism

E02-E03

Admission or outpatient department≥1

Minimum 1 prescription of thyroid hormones

Hyperthyroidism

E05

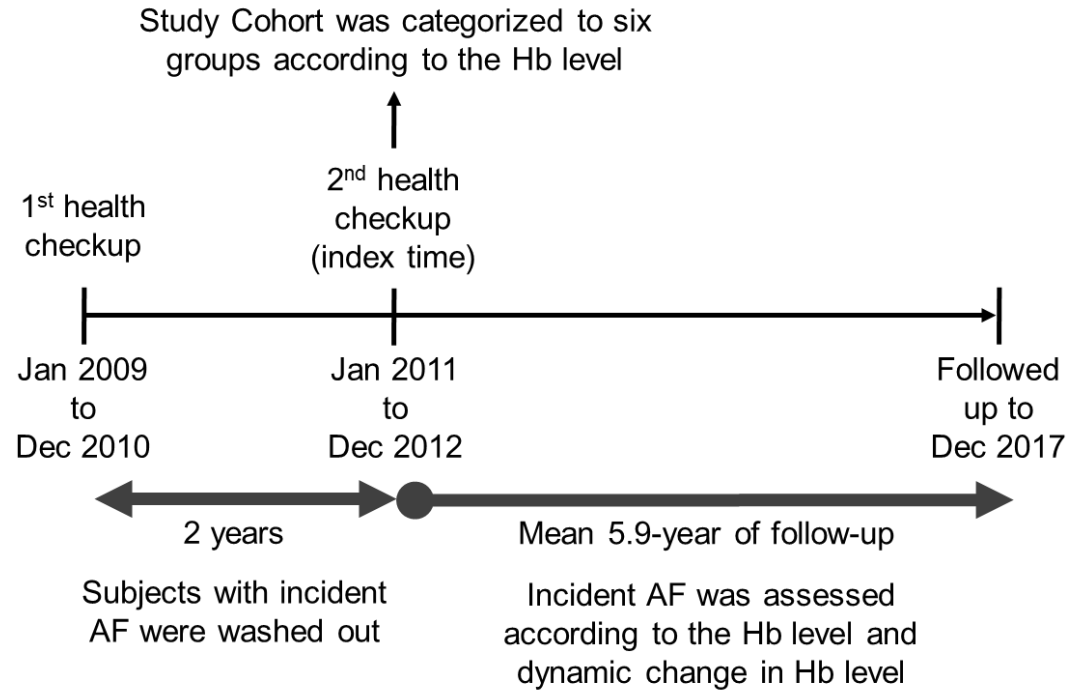
Admission or outpatient department≥1

Minimum 1 prescription of antithyroid medications
(propylthiouracil and methimazole)

Abbreviation: ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification.

II. Supplementary Figures

Supplementary Figure 1. Timeline of the study



Dynamic change of Hb levels between 2 years

1 st Hb level		2 nd Hb level
Anemic	→	Anemic, normal, upper normal
Normal	→	Anemic, normal, upper normal
Upper normal	→	Anemic, normal, upper normal

Abbreviations: AF, atrial fibrillation; Hb, hemoglobin