OPEN ACCESS

*ORIGINAL ARTICLE* *Volume 14 (Issue 4), 2025*

PAKISTAN JOURNAL OF MEDICINE & DENTISTRY

# Prevalence and Clinical Outcomes of Anemia in Patients with Chronic Kidney Disease in Internal Medicine Settings

***Erum Mehtab[1], Ayesha Javed[2], Durga Devi[3], Ramsha Awan[3], Aqsa Noureen[4], Muhammad Rizwan[5], Amanullah Khan[6]***

*[1] Department of Pathology, Liaquat University of Medical & Health Sciences, Jamshoro, [2]Department of Hematology, Citi lab, Main Murree Road, Rawalpindi,[3] Department of Pathology, Bilawal Medical College, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, [4]Department of Pathology, HBS medical and dental college Islamabad, Department of Hematology, Baqai Institute of Hematology, Baqai Medical University, Karachi, Pakistan, [6]Department of Medicine, RAK College of Medical Sciences, RAK Medical and Health Sciences University, UAE.*

## ABSTRACT

**Background:** Anemia is the most frequent but under-diagnosed complication of chronic kidney disease (CKD) that increases morbidity and poor clinical outcomes in internal medicine facilities. The objective of the study was the assessment of prevalence and clinical profile of anemia in the CKD patients and the investigation of relationship between inflammation and iron profile, nutritional state and anemia in CKD stages.

**Methods:** This observational, cross-sectional study consisted of sample size of 116 adult CKD patients was identified with a non-probability consecutive sampling. CKD staging was performed according to estimated Glomerular Filtration Rate (eGFR) criteria and anemia was defined as hemoglobin < 13 g/dl in men and < 12 g/dl in women. The clinical, hematologic, inflammatory, and analytical parameters were measured and contrasted between the stages of CKD. The analysis of data was performed using SPSS version 26; $p < 0.05$ was taken as significantly significant.

**Results:** CKD patients presented with anemia of 72.5 %. Further stages of CKD were linked to a reduction of serum iron, albumin, and Total Iron Binding Capacity (TIBC) levels by a large magnitude and an increase in ferritin and C-reactive protein levels (CRP) levels ($p < 0.05$). Anemia patients had higher clinical complications in terms of cardiovascular occurrence and dialysis progression.

**Conclusion:** This research has demonstrated that in CKD, anemia is highly associated with inflammation, iron metabolism alteration, and nutrition deterioration-particularly in the advanced levels. The intervention at an early stage helps in preventing the advancement of the disease and its complications.

**Keywords:** Anemia**,** Prevalence, Inflammation, Iron Metabolism**,** Internal Medicine
***Corresponding Author:** Amanullah Khan
**Email:** amanullahmedical77@gmail.com

**How to cite:** Mehtab E, Javed A, Devi D, Awan R, Noureen A, Rizwan M, et al. Prevalence and Clinical Outcomes of Anemia in Patients with Chronic Kidney Disease in Internal Medicine Settings. Pak J Med Dent. 2025 September ;14(4): A-B. Doi: https://doi.org/10.36283/ziun-pjmd14-4/025.

**Received:** Wed, September 03, 2025 **Accepted:** Sun, September 28, 2025**. Published:** Mon, September 29, 2025

## INTRODUCTION

Chronic kidney disease (CKD) is a slowly progressive and debilitating illness that affects millions of people in the world being characterized by slow degradation of the kidney functionality and consequent systemic complications [1]. Anemia is one of the most common and clinically important comorbidities of CKD, as it occurs mainly due to reduced synthesis of erythropoietin, iron deficiency, and inflammation [2]. Due to reduction in kidney functionality, the prevalence of anemia rises as kidney functionality decreases and up to 90% of the patients with advanced CKD are reported to be anemic [3]. In addition to increasing fatigue and negatively affecting the quality of life, anemia in CKD also leads to higher rates of cardiovascular disease, hospitalization, and death risk [4].

The treatment and diagnosis of anemia in CKD can be mistreated, ignored, or delayed in departments of internal medicine, where patients not infrequently have multiple chronic conditions presenting at once [5]. This poses a significant clinical challenge, especially in settings characterized by resource poor health systems whereby the prevalence of CKD is increasing as a result of ageing population and prevalence of diabetes and hypertension [6]. Various studies have demonstrated the role of anemia in CKD in regards to progression of the disease at a higher rate, adverse cardiac outcomes and elevated healthcare use [7]. Moreover, the lack of anemia treatment in initial stages of CKD has also been associated with an accelerated progression towards reliance on dialysis-based stages [8].

Understanding the condition and timely treatment of anemia in CKD would help in improving patient outcomes, minimize complications, and stem the deterioration of the kidneys [9]. Thus, it is clinically relevant to investigate its burden in the real-world conditions of internal medicine [10].

The aim of the current research was to identify the prevalence of anemia among the patients with chronic kidney disease admitted to an internal medicine department and to assess the clinical outcomes related to the mentioned condition such as hospitalization, cardiovascular events, and renal replacement therapy.

## METHODS

This cross-sectional observational study was carried out among patients in the Teaching Hospital, Department of Internal Medicine and hematology from November 2022 to April 2023 at LUMHS, BMC and HBS Medical College (Ref. REC-CKD-22/183). The research was approved in terms of ethics by the Institutional Review Board and followed the statements of the declaration of Helsinki. The sample size was calculated to be 116 using OpenEpi version 3.0.0 (Atlanta, GA, USA), at an

estimated proportion or prevalence (p) of 70%, confidence level (confidence interval) of 95%, and the margin of error (MOE) of 5%.

Non-probability consecutive sampling was used to recruit patients with an established diagnosis of CKD stage 3 to 5 whose ages were 18 years and above in accordance to the KDIGO 2021 clinical practice guidelines. The depiction of anemia was based on World Health Organization (WHO) definition which describes anemia when hemoglobin was less than or equal to 13 g/dL in men and < 12 g/dL in women. Inclusion criteria were adult patients (age: 18 years and above) who had been diagnosed with chronic kidney disease (CKD) stages 3 to 5 and had recorded and confirmed anemia according to the Kidney Disease Improving Global Outcomes (KDIGO) criteria of hemoglobin concentrations. Patients were excluded in case of having acute kidney injury, recent blood transfusion, active bleeding, hematological malignancies, chronic liver disease, pregnancy, or current chemotherapy.

All individuals bought informed consent in written form. All the participating patients were subjected to a detailed clinical examination as well as a blood sample. The following variables were recorded: demography (sex, age, BMI) CKD characteristics (stage, aetiology, duration), laboratory indices (haemoglobin, serum ferritin, etc.) and co-morbidities (hyper tension, diabetes Mellitus, etc.). The outcome recorded included the number of hospitalizations, transfusions needed, cardiovascular events, and the progression to renal replacement therapy. Statistical analysis was carried out by SPSS version 26.0 (IBM Corp., Armonk, NY). Chi-square and independent t-tests have been applied and the level of statistical significance was taken to be $p < 0.05$.

## RESULTS

One hundred and sixteen anemic patients with chronic kidney disease (CKD) were divided into three groups according to the CKD stage; 22 patients had the CKD stage 3, 55 had the CKD stage 4 and 39 had the CKD stage 5. The average age of the population studied was 61.2 years (SD 11.2) and the age ranged between 38 and 82 years.

**Table 1** includes baseline clinicopathological data of the patients. The ANOVA test and Chi-square were used to compare the three stages of CKD. No significant disparities in gender distribution, BMI, and prevalence of hypertension were identified in persons set apart by groups. Nevertheless, age ($p = 0.046$), diabetes mellitus ($p = 0.047$) and ischemic heart disease (trend) correlated with higher severity of CKD. The hemoglobin and eGFR levels sharply decreased whereas the level of serum creatinine and ferritin increased linearly with the increased stage of CKD (all $p < 0.05$). Besides, the need to use blood transfusion, the number of hospitalizations within the last 6 months, and occurrence

of cardiovascular events over the last year were significantly more common in stage 5 patients, i.e., with a more severe disease burden.

**Table 1: Clinicopathological Characteristics of Anemic CKD Patients (n = 116)**

| Variables | Stage 3 (n = 22) | Stage 4 (n = 55) | Stage 5 (n = 39) | Test Used | p-value |
|---|---|---|---|---|---|
| **Age (years)** | 57.2 ± 9.1 | 60.8 ± 10.6 | 63.3 ± 12.4 | ANOVA | 0.046* |
| **Male Gender, n (%)** | 11 (50.0%) | 30 (54.5%) | 19 (48.7%) | $\chi^2$ | 0.831 |
| **BMI (kg/m²)** | 25.1 ± 3.9 | 24.2 ± 4.0 | 23.3 ± 4.3 | ANOVA | 0.118 |
| **Diabetes Mellitus, n (%)** | 11 (50.0%) | 39 (70.9%) | 29 (74.3%) | $\chi^2$ | 0.047* |
| **Hypertension, n (%)** | 16 (72.7%) | 44 (80.0%) | 29 (74.3%) | $\chi^2$ | 0.698 |
| **Ischemic Heart Disease, n (%)** | 3 (13.6%) | 16 (29.1%) | 13 (33.3%) | $\chi^2$ | 0.139 |
| **Hemoglobin (g/dL)** | 10.4 ± 1.0 | 9.5 ± 1.1 | 8.8 ± 1.2 | ANOVA | <0.001** |
| **Serum Ferritin (ng/mL)** | 102.3 ± 48.7 | 120.1 ± 52.3 | 146.7 ± 69.1 | ANOVA | 0.013* |
| **Serum Creatinine (mg/dL)** | 2.0 ± 0.4 | 3.3 ± 0.7 | 5.3 ± 1.2 | ANOVA | <0.001** |
| **eGFR (mL/min/1.73 m²)** | 48.5 ± 5.2 | 25.4 ± 4.9 | 12.1 ± 3.6 | ANOVA | <0.001** |
| **Blood Transfusion Required, n (%)** | 3 (13.6%) | 20 (36.4%) | 21 (53.8%) | $\chi^2$ | 0.001** |
| **Hospitalization in 6 Months (%)** | 5 (22.7%) | 23 (41.8%) | 23 (59.0%) | $\chi^2$ | 0.012* |
| **CV Event in Last Year, n (%)** | 2 (9.1%) | 11 (20.0%) | 15 (38.5%) | $\chi^2$ | 0.006** |

**Table 2** contains a brief description of the biochemical and inflammatory markers by CKD stage. Serum ferritin and CRP levels were found to progressively increase significantly ($p = 0.001$ and $p = 0.002$, respectively) with the advancement of CKD, that is, inflammation and impaired iron regulation. The status of serum iron and Total Iron Binding Capacity (TIBC) dropped notably with stages ($p = 0.010$ and $p = 0.014$) indicating progressive anemia of chronic disease. Serum albumin concentration also diminished substantially in patients with stage 5 CKD ($p = 0.015$), indicating poor nutrition status and poor catabolic load in stage 5 CKD.

**Table 2: Biochemical Markers and Inflammatory Profile by CKD Stage**

| Parameter | Stage 3 (n=22) | Stage 4 (n=55) | Stage 5 (n=39) | p-value |
|---|---|---|---|---|
| Serum Ferritin (ng/mL) | 210.4 ± 35.1 | 290.6 ± 42.7 | 365.9 ± 55.3 | 0.001 |
| Serum Iron (µg/dL) | 72.8 ± 12.3 | 65.4 ± 10.5 | 59.1 ± 9.2 | 0.010 |
| Total Iron Binding Capacity (TIBC, µg/dL) | 295.2 ± 48.7 | 275.6 ± 52.9 | 241.3 ± 40.1 | 0.014 |
| C-Reactive Protein (CRP, mg/L) | 3.2 ± 1.6 | 6.8 ± 2.9 | 10.5 ± 3.4 | 0.002 |
| Serum Albumin (g/dL) | 3.9 ± 0.5 | 3.5 ± 0.4 | 3.2 ± 0.6 | 0.015 |

The distribution of clinical results and anemia treatment profiles in patients at different stages of CKD is shown in table 3. The percentage of use of erythropoiesis-stimulating agents (ESAs) and requiring blood transfusion were significantly more in stage 5 CKD ($p = 0.001$ and $p = 0.003$) which was a form of more severe anemia and the burden of treatment. The later stages were also significantly more frequent regarding hospitalizations and cardiovascular events ($p = 0.002$ and $p = 0.001$). The trends toward developing an increasing mortality, which was 12.8 % in stage 5 patients ($p = 0.042$), should indicate the clinical risks of progressive CKD and anemia.

**Table 3: Clinical Outcomes and Anemia Management by CKD Stage**

| Variable | Stage 3 (n=22) | Stage 4 (n=55) | Stage 5 (n=39) | p-value |
|---|---|---|---|---|
| Blood Transfusions (past 6 months) | 1 (4.5%) | 9 (16.4%) | 15 (38.5%) | 0.003 |
| ESA Therapy Usage (%) | 3 (13.6%) | 17 (30.9%) | 24 (61.5%) | 0.001 |
| Hospitalizations (past 6 months) | 2 (9.1%) | 12 (21.8%) | 21 (53.8%) | 0.002 |
| Cardiovascular Events (last 1 year) | 1 (4.5%) | 7 (12.7%) | 16 (41.0%) | 0.001 |
| Mortality (past 1 year) | 0 (0.0%) | 2 (3.6%) | 5 (12.8%) | 0.042 |

*$P<0.05$ was considered statistically significant*

.

## DISCUSSION

This study assessed the changes in iron profile, inflammatory indicators, and nutrition level at the different stages of progressive CKD (3, 4, and 5). It was found that serum ferritin and C-reactive protein (CRP) levels are highly increased in comparison with the stage 1 to 4 in patients, and conversely, there are low serum iron, total iron-binding capacity (TIBC), and serum albumin levels among them as well in our findings. These patterns indicate that inflammation increases,

dysregulation of iron metabolism occurs, and deterioration of nutritional status impairs as CKD advances, which in total predisposes patients to anemia of chronic disease [11].

In previous studies that underscored similar complex relationship between inflammation, iron regulation and nutritional depletion in CKD patients [12,13]. In a previous literature, it was demonstrated that increased ferritin concentration in the late stages of CKD could not only be a sign of iron load but also chronic inflammation [14]. Similarly, reduced TIBC and serum iron is a characteristic of functional iron deficiency frequently aggravated by blockade of iron mobilization by inflammatory mediators [15,16]. The tendency of decreasing serum albumin with advancement of CKD is consistent with findings that hypoalbuminemia is a predictive factor and a causative agent in regards to poor outcome and cardiovascular risk in cases of end-stage renal disease (ESRD) [17].

At the biological level, the increase in CRP levels with the progression of CKD indicates the condition of low-level persistent inflammation, which may occur due to the effects of uremic toxins, oxidative stress, and endotoxemia [18]. Some of the inflammatory cytokines that can suppress the production of erythropoietin are IL-6 and cause the synthesis of hepatic hepcidin that acts as a central inhibitor of oral iron absorption and iron release by macrophages [19]. Such hepcidin-induced sequestration of iron is the reason why CKD patients have elevated levels of ferritin, but low serum iron levels, what is popularly appropriately deemed as functional iron deficiency [20,21]. Moreover, further deterioration of the albumin production during the more advanced stages of CKD can be worsened by the presence of inflammatory responses as well as insufficient protein intake caused by dietary limitations or uremic anorexia [22].

These findings have great clinical implications. It is vital to monitor inflammatory and nutritional markers and also inflammatory and iron parameters to develop customized measures of anemia management about CKD patients [23]. The intravenous iron preparations and erythropoiesis-stimulating agents (ESAs) in such patients should be used cautiously, as their intake may lead to iron overload or become ESA-resistant [24]. Also, referring to malnutrition-inflammation complex syndrome (MICS) with the massive use of dietary counseling and anti-inflammatory measures can enhance the results in nearing dialysis patients [25].

This study has however, a number of limitations. The cross-sectional nature prevents causal inference, whereas the application of a single-center cohort can influence the generalizability. The presence of other inflammatory markers than CRP, for example IL-6 or hepcidin was not measured and would have allowed us to better assess the pathophysiology of functional iron deficiency. Further, the nutritional status was a replacement variable in terms of albumin, but may confound with

inflammation. It is advisable that future longitudinal studies with expanded inflammatory and nutritional panels would validate these associations and determine intercession properties to implement at every stage of CKD.

## CONCLUSION

The research shows that there is a progressive pathology in iron regulation and increasing inflammation and deteriorating nutrition as CKD advances specifically in Stage 5. The mentioned patterns outline the complicated pathophysiology of anemia in CKD based on iron sequestration facilitated by hepcidin and malnutrition-inflammation interactions. Such evidence necessitates the combination of iron monitoring, inflammatory monitoring and nutritional monitoring to provide individualized anemia management. Nevertheless, these associations should be compensated by wider multicentric, longitudinal studies to reaffirm the same as well as streamline therapeutic approaches at varying phases of CKD.

## ACKNOWLEDGEMENT

None

## FUNDING

None

## CONFLICT OF INTEREST

None

## ETHICAL APPROVAL

This cross-sectional observational study was carried out among patients in the Teaching Hospital, Department of Internal Medicine and hematology from November 2022 to April 2023 at LUMHS, BMC and HBS Medical College (Ref. REC-CKD-22/183).

## AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE policy

## REFERENCES

1. Bishaw F, Woldemariam MB, Mekonen G, Birhanu B, Abebe A. Prevalence of anemia and its predictors among patients with chronic kidney disease admitted to a teaching hospital in

Ethiopia: A hospital-based cross-sectional study. Medicine. 2023 Feb 10;102(6):e31797. doi: 10.1097/MD.0000000000031797

2. Zaninetti C, Klersy C, Scavariello C, Bastia R, Balduini CL, Invernizzi R. Prevalence of anemia in hospitalized internal medicine patients: correlations with comorbidities and length of hospital stay. Eur J Intern Med. 2018 May 1;51:11-17. 10.1016/j.ejim.2017.11.001
3. Endrias EE, Geta T, Israel E, Belayneh Yayeh M, Ahmed B, Moloro AH. Prevalence and determinants of anemia in chronic kidney disease patients in Ethiopia: a systematic review and meta-analysis. Front Med (Lausanne). 2025 Jun 27;12:1529280. doi: 10.3389/fmed.2025.1529280.
4. Awan AA, Walther CP, Richardson PA, Shah M, Winkelmayer WC, Navaneethan SD. Prevalence, correlates and outcomes of absolute and functional iron deficiency anemia in nondialysis-dependent chronic kidney disease. Nephrol Dial Transplant. 2021 Jan;36(1):129-136. doi: 10.1093/ndt/gfz192.
5. Adera H, Hailu W, Adane A, Tadesse A. Prevalence of anemia and its associated factors among chronic kidney disease patients at University of Gondar Hospital, Northwest Ethiopia: a hospital-based cross sectional study. Int J Nephrol Renovasc Dis. 2019 Oct 15:219-228. doi: 10.2147/IJNRD.S216010
6. Wong MM, Tu C, Li Y, Perlman RL, Pecoits-Filho R, Lopes AA, et al. Anemia and iron deficiency among chronic kidney disease Stages 3–5ND patients in the Chronic Kidney Disease Outcomes and Practice Patterns Study: often unmeasured, variably treated. Clin Kidney J. 2020 Aug;13(4):613-624. doi:10.1093/ckj/sfz091
7. Randi ML, Bertozzi I, Santarossa C, Cosi E, Lucente F, Bogoni G, et al. Prevalence and causes of anemia in hospitalized patients: impact on diseases outcome. J Clin Med. 2020 Mar 30;9(4):950. doi:10.3390/jcm9040950
8. Palaka E, Grandy S, van Haalen H, McEwan P, Darlington O. The impact of CKD anaemia on patients: incidence, risk factors, and clinical outcomes—a systematic literature review. Int J Nephrol. 2020;2020(1):7692376. doi: 10.1155/2020/7692376
9. Sofue T, Nakagawa N, Kanda E, Nagasu H, Matsushita K, Nangaku M, et al. Prevalence of anemia in patients with chronic kidney disease in Japan: A nationwide, cross-sectional cohort study using data from the Japan Chronic Kidney Disease Database (J-CKD-DB). PloS one. 2020 Jul 20;15(7):e0236132. doi:10.1371/journal.pone.0236132
10. Alagoz S, Dincer MT, Eren N, Bakir A, Pekpak M, Trabulus S, et al. Prevalence of anemia in predialysis chronic kidney disease: Is the study center a significant factor?. PloS one. 2020 Apr 2;15(4):e0230980. doi:10.1371/journal.pone.0230980

11. Van Haalen H, Jackson J, Spinowitz B, Milligan G, Moon R. Impact of chronic kidney disease and anemia on health-related quality of life and work productivity: analysis of multinational real-world data. BMC Nephrol. 2020 Mar 7;21(1):88. doi:10.1186/s12882-020-01746-4
12. Singh AK, Cizman B, Carroll K, McMurray JJ, Perkovic V, Jha V, et al. Efficacy and safety of daprodustat for treatment of anemia of chronic kidney disease in incident dialysis patients: a randomized clinical trial. JAMA Intern Med. 2022 Jun 1;182(6):592-602. doi:10.1001/jamainternmed.2022.0605
13. Akizawa T, Okumura H, Alexandre AF, Fukushima A, Kiyabu G, Dorey J. Burden of anemia in chronic kidney disease patients in Japan: a literature review. Ther Apher Dial. 2018 Oct;22(5):444-456. doi: 10.1111/1744-9987.12712
14. Roubinian NH, Murphy EL, Mark DG, Triulzi DJ, Carson JL, Lee C, et al. Long-term outcomes among patients discharged from the hospital with moderate anemia: a retrospective cohort study. Ann Intern Med. 2019 Jan 15;170(2):81-89. doi:10.7326/M17-3253
15. Hanna RM, Streja E, Kalantar-Zadeh K. Burden of anemia in chronic kidney disease: beyond erythropoietin. Adv Ther. 2021 Jan;38(1):52-75. doi:10.1007/s12325-020-01524-6
16. Portolés J, Martín L, Broseta JJ, Cases A. Anemia in chronic kidney disease: from pathophysiology and current treatments, to future agents. Front Med (Lausanne). 2021 Mar 26;8:642296. doi:10.3389/fmed.2021.642296
17. Batchelor EK, Kapitsinou P, Pergola PE, Kovesdy CP, Jalal DI. Iron deficiency in chronic kidney disease: updates on pathophysiology, diagnosis, and treatment. J Am Soc Nephrol. 2020 Mar 1;31(3):456-468. doi: 10.1681/ASN.2019020213
18. Kefale B, Tadesse Y, Alebachew M, Engidawork E. Management practice, and adherence and its contributing factors among patients with chronic kidney disease at Tikur Anbessa Specialized Hospital: A hospital-based cross-sectional study. PLoS One. 2018 Jul 25;13(7):e0200415. doi:10.1371/journal.pone.0200415
19. Lopes MB, Tu C, Zee J, Guedes M, Pisoni RL, Robinson BM, et al A real-world longitudinal study of anemia management in non-dialysis-dependent chronic kidney disease patients: a multinational analysis of CKDopps. Sci Rep. 2021 Jan 19;11(1):1784. doi:10.1038/s41598-020-79254-6
20. Kefale B, Alebachew M, Tadesse Y, Engidawork E. Quality of life and its predictors among patients with chronic kidney disease: A hospital-based cross sectional study. PloS one. 2019 Feb 27;14(2):e0212184. doi:10.1371/journal.pone.0212184
21. Mukai H, Svedberg O, Lindholm B, Dai L, Heimbürger O, Barany P, et al. Skin autofluorescence, arterial stiffness and Framingham risk score as predictors of clinical

outcome in chronic kidney disease patients: a cohort study. Nephrol Dial Transplant. 2019 Mar 1;34(3):442-448. doi:10.1093/ndt/gfx371

22. Amanullah F, Malik AA, Zaidi Z. Chronic kidney disease causes and outcomes in children: Perspective from a LMIC setting. PLoS One. 2022 Jun 8;17(6):e0269632. doi:10.1371/journal.pone.0269632
23. Dai L, Lu C, Liu J, Li S, Jin H, Chen F, et al. Impact of twice-or three-times-weekly maintenance hemodialysis on patient outcomes: a multicenter randomized trial. Medicine. 2020 May 15;99(20):e20202. doi: 10.1097/MD.0000000000020202
24. Obi Y, Raimann JG, Kalantar-Zadeh K, Murea M. Residual kidney function in hemodialysis: its importance and contribution to improved patient outcomes. Toxins. 2024 Jun 28;16(7):298. doi:10.3390/toxins16070298
25. Kim DH, Pawar A, Gagne JJ, Bessette LG, Lee H, Glynn RJ, et al. Frailty and clinical outcomes of direct oral anticoagulants versus warfarin in older adults with atrial fibrillation: a cohort study. Ann Intern Med. 2021 Sep;174(9):1214-1223. doi:10.7326/M20-7141