# 学 位 論 文 の 要 旨

氏名　天野志保

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| 学 位 論 文 名 | Relationship Between Anemia and Readmission Among Older Patients in Rural Community Hospitals: A Retrospective Cohort Study |
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| 著 者 名 | Shiho Amano, Ryuichi Ohta, Chiaki Sano |

## 論 文 内 容 の 要 旨

### INTRODUCTION

Anemia is a prevalent condition in older adults, and its presence correlates with increased mortality and hospitalization rates. The effective management of anemia in older adults is paramount and requires rigorous assessment. An increase in the prevalence of anemia was observed with advancing age. The specific definition of anemia in older adults remains ambiguous because the lower Hb threshold in healthy older individuals is not markedly different from that in their younger counterparts. Numerous studies have linked anemia to increased mortality rates, increased hospitalization, dementia, falls, diminished physical function, and decreased quality of life (QOL) in older adults.

In a previous study, we examined anemia recognition among older adults in a rural community hospital. The findings indicated that only 40.4% of older patients in this setting were identified as having anemia. Multivariate logistic regression analysis revealed that age was the only significant predictor of anemia recognition. This association suggests potential ageism in anemia recognition among the older adult population. Although older adults deserve comprehensive medical care, age-based limitations may persist. While there is a clear association between anemia and increased mortality and hospitalization in older adults, the potential benefits of systematic assessment and intervention remain unclear. This study aimed to ascertain whether anemia in older adults is correlated with readmission rates and the interval between discharge and subsequent readmission.

### MATERIALS AND METHODS

The study focused on a geriatric cohort, encompassing patients aged 65 years and above.

Our research included only patients admitted to the Department of General Medicine at Unnan City Hospital.

This study considered readmissions within 28 and 90 days as the dependent variables. Given that the average age of our participants was 84.9 years, anemia was defined as an Hb level less than 11.0 g/dL. Based on previous studies, risk factors for readmission were identified and assessed as independent variables. Data on these variables, including age, sex, albumin level, BMI, dependent conditions, Charlson comorbidity index (CCI), admission and discharge facilities, Functional Independence Measure (FIM) score on admission, number of medications, Hb level, admission duration, readmission occurrence, time to readmission, and readmission within 28 and 90 days, were derived from the electronic medical records.

For continuous variables, data normality was confirmed before statistical testing. The t-test and Mann–Whitney U test were applied to parametric and nonparametric data, respectively. Fisher's exact test was used for nominal variables. Certain continuous variables were dichotomized for binary analysis: CCI (either > 5 or <5) and dependent condition (either dependence ≥ 1 or 0). To explore the correlation between readmission occurrence and other influential factors, multivariate logistic regression analysis was performed. Only variables that were correlated with anemia in the univariate regression analysis were considered in the multivariate logistic model.

This study was approved by the Clinical Ethics Committee of Unnan City Hospital (approval number: 20210005; date:18 May 2021)

## RESULTS AND DISCUSSION

From April 2020 to December 2021, 1756 patients were admitted to the Department of General Medicine of Unnan City Hospital. A total of 299, 144, and 22 patients were excluded because of hospitalization for medical checkups, age < 65 years, or incomplete data (no Hb data, 3; no albumin data, 9; no BMI data, 7; and no FIM data, 3), respectively. Eleven patients were excluded because they were still hospitalized at the time of the study. In total, 1280 patients were included in this study. The mean patient age was 84.9 years (standard deviation [SD] = 8.4). The prevalence of anemia was 36.4%. The prevalence of readmission was 24.9%. The prevalences of readmission within 28 and 90 days were 10.4% and 19.1%, respectively.

The univariate regression analysis of patient characteristics for anemia shows age, sex, BMI, Alb level, dependent condition, CCI, duration of admission, presence of readmission, and number of medications differed significantly between the anemia and no-anemia groups. Multivariate logistic regression was performed on the factors associated with readmission within 28 and 90 days. Age, sex, BMI, anemia, dependent conditions, CCI, and FIM were included as factors. Readmission within 28 days was significantly associated with anemia (adjusted odds ratio = 2.28, 95% confidence interval [CI]: 1.56–3.33, $p < 0.001$), CCI (adjusted

odds ratio = 2.03, 95% CI: 1.23–3.36, $p = 0.006$), and FIM (adjusted odds ratio = 1.01, 95% CI: 1.00–1.01, $p = 0.032$). Readmission within 90 days was significantly associated with anemia (adjusted odds ratio = 1.65, 95% CI: 1.21–2.24, $p = 0.002$), dependent status (adjusted odds ratio = 1.55, 95% CI: 1.03–2.33, $p = 0.037$), CCI (adjusted odds ratio = 2.19, 95% CI: 1.48–3.24, $p < 0.001$), and FIM (adjusted odds ratio = 1.01, 95% CI: 1.01–1.01, $p < 0.001$).

Our findings revealed a potential association between anemia and readmission within 28 and 90 days. Given that our hospital is the sole public facility in the city and predominantly caters to the older population, we observed a higher trend in readmission rates.

Notably, while early readmission (within 28 days) appeared to be influenced by factors such as anemia, CCI index, and FIM score, 90-day readmission was associated with anemia, dependent status, FIM score, and CCI index. In contrast, age, sex, and BMI were not significantly associated with readmission. We believe that all these factors are very important. CCI can be improved with appropriate intervention. Improving activities of daily living (ADL) in older adults is relatively difficult. However, previous studies have shown that anemia in older adults is more than half of the time unrecognized, and such adults may not be receiving the necessary intervention and treatment due to ageism. Therefore, we selected anemia to demonstrate the potential for improvement in rehospitalization rates if anemia is appropriately identified and assessed. However, whether addressing anemia can result in reduced readmission remains an open question and requires further research.

There are several limitations in our study. External validity may have been compromised in this single-center study. However, our demographics are reflective of the impending global demographic shift towards an aging population, which not only Japan but also many other countries worldwide will soon grapple with. These data cover the period from April 2020 to December 2021, the time frame within which the coronavirus disease 2019 pandemic occurred. Therefore, the external validity of the study may have been reduced because the consultation behavior may have been different than usual. Moreover, this study did not evaluate the correlation between specific diseases and readmission rates. Anemia can be caused by a variety of factors, and the results may differ depending on the underlying disease and degree of anemia. However, this study did not examine these factors, and further research is needed.

## CONCLUSION

Our research highlights the potential association between anemia and readmission rates, both within the short- (28 days) and medium-term (90 days) time frames. Factors such as anemia, CCI score, and FIM score have emerged as determinants of short-term readmission. Addressing anemia may provide a pathway to reduce short-term readmissions regardless of disease severity, ADL status, or age.