BRIEF REPORT

FACTORS ASSOCIATED WITH MORTALITY IN HOSPITALIZED ELDERS IN AN INTERNAL MEDICINE DEPARTMENT

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ABSTRACT

The aim of this prospective cohort study was to determine the factors associated with mortality in elders admitted to an Internal Medicine Department of a public hospital in Lima. During 2019, 360 patients over 60 years of age were consecutively evaluated by applying the Comprehensive Geriatric Assessment tools and reviewing their medical records. During hospitalization, 45 (12.5\%) died. There was a higher frequency of anemia ($p = 0.043$), hypoalbuminemia ($p = 0.006$), pressure ulcers ($p = 0.003$), high comorbidity ($p < 0.001$), functional dependence ($p < 0.001$) and malnutrition ($p = 0.002$) among deceased patients compared to non-deceased. In the multivariate model, the presence of delirium on admission was associated with a higher risk of hospital mortality (RR = 3.64; 95\% CI: 1.51 - 8.76, $p = 0.004$). Additional studies are required in our country to assess the prognostic value of delirium and other geriatric syndromes on mortality and other adverse outcomes.

Keywords: Elderly; Hospital Mortality; Risk Factors; Geriatric Assessment; Delirium; Aging, Hypoalbuminemia; Pressure Ulcer; Geriatrics; Internal Medicine (source: MeSH NLM).

INTRODUCTION

Previous studies have shown that the in-hospital mortality rate in older adults is approximately 12 to 14\%, which is two to three times higher than mortality in people under 60 years of age; the most important causes of death being pneumonia, stroke, myocardial infarction, diabetes and cancer \textsuperscript{(1)}. Different studies carried out in developed countries have shown that advanced age, poor functional and cognitive status, delirium, malnutrition, multiple comorbidities, frailty and severity of illness are factors independently associated with a higher risk of mortality and prolonged hospital stay \textsuperscript{(2,3)}.

The Comprehensive Geriatric Assessment (CGA) is a multidimensional and interdisciplinary diagnostic tool that identifies and quantifies the physical, functional, psychological and social problems that older adults may present \textsuperscript{(4)}. Because of its diagnostic accuracy, the CGA has proven to be considerably useful in defining the type of care required
by older adult patients with comorbidities, functional dependence and frailty. Its application in hospitalized patients has been proposed in order to reduce some adverse outcomes, such as mortality, prolonged hospital stay, functional deterioration, nosocomial infections, re-admissions and institutionalization

Due to the lack of Peruvian studies on the subject, the aim of this study was to determine the factors associated with mortality in older adults admitted to an internal medicine department of a Peruvian hospital. For this purpose, we collected data from the medical records, including the components of CGA. The study will serve to design intervention strategies aimed at addressing the associated risk factors and to improve the quality of care for the older adult population, considered a vulnerable segment and generally at social risk.

THE STUDY

Study design and participants
We carried out a prospective study of older adult patients hospitalized in the Internal Medicine service of the Hospital Nacional Hipólito Unanue (HNHU) during 2019. Patients aged 60 years or older, of both sexes, with complete medical history and informed consent form were included. Patients who died within 24 hours of admission, with previous stays in other hospital services, those who died without having had an CGA, those hospitalized for end-of-life care, and those who requested voluntary discharge were excluded.

The sample size calculation was based on the search for factors associated with mortality with a relative risk (RR) of at least 2.0 (6). Based on a confidence level of 95%, a power of 80%, and a proportion of unexposed individuals developing the event of interest of 12%, the sample size obtained was 352. However, in order to compensate for losses due to possible incomplete data, the number was increased by 10%, resulting in a final sample size of 387 patients. The calculations were carried out in the Open-Epi open-access program.

The sample was selected by convenience by recruiting patients who met the eligibility criteria until the sample size was reached. A total of 387 patients were consecutively evaluated, of whom 377 were eligible. During follow-up, 17 patients dropped out of the study: 12 due to voluntary discharge and five due to transfer to other services. Therefore, the final sample consisted of 360 patients.

Variables
The dependent variable was the occurrence of in-hospital death. Independent variables were considered to be those that could be linked to this outcome, grouped into demographic, clinical, laboratory tests and CGA results.

Information was obtained on age, sex, marital status and educational level. The clinical variables were the main diagnosis on admission, number of drugs the patient was consuming on admission (polypharmacy ≥ 5 drugs per day), and history of hospitalizations and falls in the last year. The results of the following laboratory tests were collected: hemoglobin, glycemia, creatinine, albumin and C-reactive protein (CRP).

The components of CGA considered were the diagnoses of urinary incontinence and pressure ulcers, comorbidity using the Charlson Comorbidity Index (CCI) (7) (low < 3 points, high ≥ 3 points), functional status at admission with the Katz index (basic activities of daily living) (8) (independent 0-1 point, partial dependence 2-3 points and total dependence 4-6 points, dichotomized for analysis into total + partial dependent vs. independent), nutritional status with the Mini Nutritional Assessment Short Form (MNA-SF) (9) (normal 12-14 points, risk of malnutrition 8-11 points and malnutrition 0-7 points) and social condition with the socio-family assessment scale modified by Merino for Peru (10) (good social condition 5-9 points, social risk 10-14 points and social problem ≥ 15 points).

KEY MESSAGES

Motivation for the study: In Peru there is little information on the factors associated with in-hospital mortality in older adults.

Main findings: Delirium on admission tripled the risk of mortality in older adults admitted to an internal medicine service. In most patients, the diagnosis of delirium was not registered in medical records.

Implications: In hospitalized patients, the application of the Comprehensive Geriatric Assessment allows for the timely detection of delirium and other geriatric syndromes. Further studies are needed to identify older patients at increased risk of mortality and other adverse outcomes.
All patients were evaluated with the Confusion Assessment Method (CAM) to detect delirium (11). In patients without delirium, cognitive function was immediately assessed with the Pfeiffer test (12) (normal 0-4 points, cognitive impairment ≥ 5 points) and affective state using the Yesavage Geriatric Depression Scale (GDS) (normal < 10 points, depression ≥ 10 points) (13). For patients with delirium on admission, both tests were deferred until discharge.

Procedures and techniques
Within 24 hours of admission, a member of the research team collected data from the medical record, completing the required information by interviewing the patient or the responsible family member, after the signing of the informed consent form. The CGA tools were then applied. The participants in the study were followed up daily, recording the date of discharge or death, in the latter case noting the basic cause of death.

Statistical analysis
The data were analyzed with the statistical program STATA 15. We determined measures of central tendency and dispersion for quantitative variables. For qualitative variables, frequencies and percentages were calculated. To evaluate the association between mortality and the independent variables, the Student’s t-test or Mann-Whitney U-test was used for continuous variables and the Chi-square test or Fisher’s exact test for categorical variables. Associations were established by calculating relative risks (RR) with their respective 95% confidence intervals (95% CI).

Adjusted associations were calculated according to a Poisson regression model with robust variance in the variables associated with the outcome of interest in the bivariate model. In the multivariate model, delirium was associated with a 3.64-fold increase in the risk of in-hospital mortality (RR = 3.64; 95% CI: 1.51-8.76, p = 0.004) (Table 4).

DISCUSSION
Delirium is characterized by an abrupt change in mental status, with altered attention and cognition, frequently accompanied by a disorder of consciousness, disorientation and inversion of the sleep-wake cycle (14). This geriatric syndrome increases the risk of mortality, prolongs hospital stay, produces functional deterioration and institutionalization in older adults, which increases health care costs (15).

In our research, 38.6% of the patients had delirium at the time of admission and its presence was associated with
an increased risk of death. Studies conducted in national hospitals have shown that 34.9 to 42.7% of older adults admitted to emergency services for medical conditions present delirium, which usually coexists with conditions of functional dependence, chronic cognitive impairment and dehydration (16). Despite its high frequency, delirium is often not correctly diagnosed and, consequently, its treatment is not accurate, and it can be confused with dementia, depression or with the changes produced by aging (14). According to the latter, only 27 (7.5%) of our patients had a diagnosis of delirium registered in their medical record.

Previous studies have shown an association between delirium and a high risk of death, independent of the effect of other factors, such as advanced age, cognitive impairment, comorbidity, functional status and severity of illness (14,15). In a study of 469 patients over 70 years of age belonging to Project Recovery, a controlled clinical trial for the prevention of delirium, Dharmarajan et al. (17) found that 15% of patients developed delirium during hospitalization. Those affected

### Table 1. General characteristics of the patients (n = 360).

| Variable                              | n   | %   |
|---------------------------------------|-----|-----|
| Age (years) a                         | 76  | 67-83|
| Sex                                   |     |     |
| Male                                  | 195 | 54.2|
| Female                                | 165 | 45.8|
| Marital status                        |     |     |
| No stable partner                     | 152 | 42.2|
| With stable partner                   | 208 | 57.8|
| Education level                       |     |     |
| Illiterate/primary school             | 257 | 71.4|
| Secondary school                      | 89  | 24.7|
| Technical/higher                      | 14  | 3.9 |
| Polypharmacy (≥ 5 drugs)              | 26  | 7.2 |
| Hospitalizations in the last year     | 191 | 53.1|
| Falls in the last year                | 123 | 34.2|
| Hemoglobin (g/dL) a                   | 11.3| 9.4-12.8|
| Glycemia (mg/dL) a                    | 104.21| 89-136.9|
| Creatinine (mg/dL) a                  | 0.95| 0.71-1.35|
| Albumin (g/dL) a                      | 3.10| 2.66-3.60|
| C reactive protein (mg/dL) a          | 3.77| 1.98-6.44|
| Urinary incontinence                  | 160 | 44.4|
| Pressure ulcers                       | 57  | 15.8|
| High comorbidity (CCI ≥ 3)            | 182 | 50.6|
| Functional status at admission        |     |     |
| Independent                           | 111 | 30.8|
| Partially dependent                   | 52  | 14.4|
| Totally dependent                     | 197 | 54.7|
| Nutritional status                    |     |     |
| Normal                                | 48  | 13.3|
| Risk of malnutrition                  | 93  | 25.8|
| Malnutrition                          | 219 | 60.8|
| Social status                         |     |     |
| Good social status                    | 40  | 11.1|
| Social risk                           | 149 | 41.4|
| Social problem                        | 171 | 47.5|
| Delirium                              | 139 | 38.6|
| Cognitive impairment b                | 79  | 33.2|
| Depression b                          | 29  | 12.2|

a Median and interquartile range, b Data from 238 patients
CCI: Charlson comorbidity index.

### Table 2. Main diagnoses at admission (n = 360).

| Diagnostic                | n   | %   |
|---------------------------|-----|-----|
| Pneumonia                 | 57  | 15.8|
| Stroke                    | 52  | 14.4|
| Decompensated DBM         | 51  | 14.2|
| Cancer                    | 47  | 13.1|
| Sepsis                    | 42  | 11.7|
| Heart failure             | 39  | 10.8|
| Respiratory failure       | 35  | 9.7 |
| Delirium                  | 27  | 7.5 |
| Urinary tract infection   | 26  | 7.2 |
| Cellulitis                | 25  | 6.9 |
| Arterial hypertension     | 23  | 6.4 |
| Liver cirrhosis           | 22  | 6.1 |
| DILD                      | 22  | 6.1 |
| Upper gastrointestinal bleeding | 16 | 4.4 |
| Acute cholecystitis       | 14  | 3.9 |
| Abdominal pain            | 11  | 3.1 |
| COPD                      | 10  | 2.8 |
| Pancytopenia              | 9   | 2.5 |
| Acute pancreatitis        | 8   | 2.2 |
| Decompensated CKD         | 5   | 1.4 |
| Hypothyroidism            | 5   | 1.4 |
| Rheumatoid arthritis      | 4   | 1.1 |
| Vitamin B12 deficiency    | 4   | 1.1 |
| Tuberculosis              | 3   | 0.8 |
| Deep vein thrombosis      | 3   | 0.8 |
| Lower gastrointestinal bleeding | 2 | 0.6 |

DBM: diabetes mellitus, DILD: diffuse interstitial lung disease, COPD: chronic obstructive pulmonary disease, CKD: chronic kidney disease.
had a higher frequency of falls, pressure ulcers; as well as use of mechanical restraint and complications during evolution, such as sleep disorders, malnutrition, dehydration and pneumonia. It has been proposed that the increased risk of death in delirious patients could be mediated by this cascade of adverse events.

Table 3. Factors associated with hospital mortality in older adults (n = 360).

| Variables                        | Not deceased (n=315) | Deceased (n=45) | p value *  |
|---------------------------------|----------------------|-----------------|------------|
| Age (years)                     |                      |                 |            |
| >80                             | 98 (31.1)            | 19 (42.2)       | 0.137      |
| ≤80                             | 217 (68.9)           | 26 (57.8)       |            |
| Sex                             |                      |                 |            |
| Male                            | 175 (55.6)           | 20 (44.4)       | 0.162      |
| Female                          | 140 (44.4)           | 25 (55.6)       |            |
| Marital status                  |                      |                 |            |
| No stable partner               | 128 (40.6)           | 24 (53.3)       | 0.107      |
| With stable partner             | 187 (59.4)           | 21 (46.7)       |            |
| Educational level               |                      |                 | 0.386      |
| Illiterate/primary school       | 221 (70.2)           | 36 (80.0)       |            |
| Secondary school                | 81 (25.7)            | 8 (17.8)        |            |
| Technical/higher               | 13 (4.1)             | 1 (2.2)         |            |
| Polypharmacy (≥5 drugs)         | 21 (6.7)             | 5 (11.1)        | 0.349      |
| Hospitalizations in the last year | 165 (52.4)         | 26 (57.8)       | 0.497      |
| Falls in the last year          | 103 (32.7)           | 20 (44.4)       | 0.120      |
| Hemoglobin < 10 g/dL            | 99 (31.4)            | 21 (46.7)       | 0.043      |
| Glycemia > 140 mg/dL            | 75 (23.8)            | 8 (17.8)        | 0.781      |
| Creatinine > 1,3 mg/dL          | 79 (25.1)            | 16 (35.6)       | 0.938      |
| Albumin < 3,5 g/dL              | 218 (69.2)           | 40 (88.9)       | 0.006      |
| CRP > 10 mg/dL                  | 44 (14.0)            | 4 (8.9)         | 0.348      |
| Urinary incontinence            | 137 (43.5)           | 23 (51.1)       | 0.336      |
| Pressure ulcers                 | 43 (13.7)            | 14 (31.1)       | 0.003      |
| High comorbidity (CCI ≥ 3)      | 148 (47.0)           | 34 (75.6)       | <0.001     |
| Functional status at admission  |                      |                 | <0.001     |
| Independent                     | 108 (34.3)           | 3 (6.7)         |            |
| Partially dependent             | 52 (16.5)            | 0 (0)           |            |
| Totally dependent               | 155 (49.2)           | 42 (93.3)       |            |
| Nutritional status              |                      |                 | 0.002      |
| Normal                          | 47 (14.9)            | 1 (2.2)         |            |
| Risk of malnutrition            | 87 (27.6)            | 6 (13.3)        |            |
| Malnutrition                    | 181 (57.5)           | 38 (84.4)       |            |
| Social status                   |                      |                 | 0.126      |
| Good social status              | 39 (12.4)            | 1 (2.2)         |            |
| Social risk                     | 128 (40.6)           | 21 (46.7)       |            |
| Social problem                  | 148 (47.0)           | 23 (51.1)       |            |
| Delirium                        | 103 (32.7)           | 36 (80.0)       | <0.001     |
| Cognitive impairment b          | 76 (33.2)            | 3 (33.3)        | 0.623      |
| Depression b                    | 28 (12.2)            | 1 (11.1)        | 0.699      |

* Chi-square or Fisher’s exact test were used to compare categorical variables. * Chi-square or Fisher’s exact test were used to compare categorical variables. * data from 238 patients.

CRP: high-sensitivity C-reactive protein, CCI: Charlson comorbidity index.
Our study found a higher frequency of hypoalbuminemia, anemia, pressure ulcers, high comorbidity, functional dependence on admission, and malnutrition among the deceased patients. These factors have been associated in the international literature with a higher risk of death in hospitalized older adults, but did not reach statistical significance in the multivariate model of this study.

Akirov et al. (18) evaluated a cohort of 30,732 patients (mean age 67 years) and found an in-hospital mortality rate of 67% in patients with mild hypoalbuminemia (2.5-3.5 g/dL) and 83% in those with severe hypoalbuminemia (<2.5 g/dL). The association was present in all age groups, and significantly normalizing the albumin levels reduced the risk of death. Specifically, in older adults, an association has been found between hypoalbuminemia and an increased risk of death, prolonged hospital stay, and re-admission after discharge (5,6).

In a study of 17,030 older adults from Calgary (Canada), an increased risk of hospitalization and death was found among patients with anemia. The observed association was independent of age, sex, renal function, comorbidity or history of diabetes in the patients studied (19).

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De Gelder et al. (3) designed a predictive model of 90-day mortality after hospital admission in older adults. Six variables were included in the model: assessment of comorbidity by CCI, platelet count, oxygen saturation, CRP values, urea and plasma glucose. Of the total of 517 patients, 18.2% died during the observation period, which corresponds to a mortality of 53% in patients located in the highest risk decile.

On the other hand, the association between poor functional status on admission and high mortality in older adults is well known. Incalzi et al. (2), in their study of 308 older adults admitted to a hospital ward, reported an excess of death among patients with functional dependence determined with the Katz index. Possible explanations for this association have been proposed, such as a greater vulnerability of patients with functional dependence and a high frequency of comorbidity, immobility, cognitive impairment, depression, polypharmacy, social problems and malnutrition in these patients.

A higher mortality rate has been described in malnourished older adults. Avelino-Silva et al. (6) prospectively evaluated a group of 746 older adults admitted to the geriatrics service of a university hospital in Brazil. In their study, patients with a low MNA-SF score who had hypoalbuminemia were twice as likely to die as patients without this condition.

Our study has several limitations. First, since it considers patients from the third level of healthcare, its conclusions...
cannot be generalized to other realities, as this would compromise its external validity. Second, a larger sample size could have improved the statistical power of the research. Third, we mainly focused on the evaluation of geriatric factors associated with higher in-hospital mortality rather than on the severity of the disease at admission. Fourth, we did not consider the frailty syndrome, which may have been present in a significant group of patients.

In conclusion, in older adult patients admitted to an internal medicine service, delirium on admission was independently associated with a 3.64-fold increase in the risk of in-hospital death.

**Author contributions:** JLV and AS conceived and designed the manuscript; JLV and AS analyzed and interpreted the data; JLV, LCR, and AS drafted the manuscript; LCR participated in the recollection of results. All authors participated in the critical revision of the article, approved the final version, and assume responsibility for the contents of the article.

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**REFERENCES**

1. Tello T, Varela L, Ortiz J, Chávez-Jimeno H. Estancia hospitalaria y mortalidad en adultos mayores hospitalizados en un hospital general de Lima Metropolitana, 1997-2008. Rev Med Hered. 2011; 22(1): 23-28. doi: 10.20453/rmh.v22i1.1096.
2. Incalzi RA, Gemma A, Capparella O, Terranova L, Porcedda P, Tresali E, et al. Predicting mortality and length of stay of geriatric patients in an acute care general hospital. J Gerontol. 1992;47(2):M35-9. doi: 10.1093/geronj/47.2.m35.
3. de Gelder J, Lucke JA, Heim N, de Craen AJ, Lourens SD, Steyerberg EW, et al. Predicting mortality in acutely hospitalized older patients: a retrospective cohort study. Intern Emerg Med. 2016;11(4):587-94. doi: 10.1007/s11739-015-1381-7.
4. Gálvez-Canó M, Chávez-Jimeno H, Aliaga-Díaz E. Utilidad de la valoración geriátrica integral en la evaluación de la salud del adulto mayor. Rev Peru Med Exp Salud Publica. 2016;33(2):321-7. doi: org/10.17843/rpmesp.2016.332.2204.
5. Ellis G, Whitehead MA, Robinson D, O’Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. BMJ. 2011;343:d553. doi: 10.1136/bmj.d553.
6. Avelino-Silva TJ, Farfel JM, Curiati JA, Amaral JR, Campora F, Jacob-Filho W. Comprehensive geriatric assessment predicts mortality and adverse outcomes in hospitalized older adults. BMC Geriatr. 2014;14:129. doi: 10.1186/1471-2318-14-129.
7. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40(5):373-83. doi: 10.1016/0021-9681(87)90171-8.
8. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged: the index of ADL, a standardized measure of biological and psychosocial function. JAMA;185:914-9. doi: 10.1001/jama.1963.030601200416.
9. Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). J Gerontol A Biol Sci Med Sci. 2001;56(6):M366-72. doi: 10.1093/gerona/56.6.m366.
10. Merino R, Varela L, Manrique G. Evaluación del paciente geriátrico hospitalizado orientado por problemas: Estudio prospectivo de 71 casos. Rev Med Hered. 1992;3(2):51-9. doi: 10.20453/rmh.v3i2.354.
11. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. Ann Intern Med. 1990;113(12):941-8. doi: 10.7326/0003-4819-113-12-941.
12. Pfeiffer E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. J Am Geriatr Soc. 1975;23(10):433-41. doi: 10.1111/j.1532-5415.1975.tb00927.x.
13. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res.1982-1983;17(1):37-49. doi: 10.1016/0022-3956(82)90033-4.
14. Oh ES, Fong TG, Hsieh TT, Inouye SK. Delirium in Older Persons: Advances in Diagnosis and Treatment. JAMA. 2017;318(12):1161-1174. doi: 10.1001/jama.2017.12067.
15. Eles EM, Hubbard BE, White SV, O’Mahony MS, Savva GM, Bayer AJ. Hospital use, institutionalisation and mortality associated with delirium. Age Ageing. 2010 Jul;39(4):470-5. doi: 10.1093/ageing/afq052.
16. Lama J, Valera L, Ortiz PJ. Prevalencia y factores de riesgo del estado confusional agudo en el adulto mayor en una sala de emergencias médicas. Rev Med Hered. 2002;13(1):10-18. doi: 10.20453/rmh.v13i1.715.
17. Dharmarajan K, Swami S, Gou RX, Jones RN, Inouye SK. Pathway from Delirium to Death: Potential In-Hospital Mediators of Excess Mortality. J Am Geriatr Soc. 2017;65(5):1026-1033. doi: 10.1111/jgs.14743.
18. Akirov A, Masri-Iraqi H, Atamna A, Shimom I. Low Albumin Levels Are Associated with Mortality Risk in Hospitalized Patients. Am J Med. 2017;130(12):1465.e11-1465.e19. doi: 10.1016/j.amjmed.2017.07.020. Epub 2017 Aug 9. Erratum in: Am J Med. 2020; 133 (5):646.
19. Calleton BF, Manns BJ, Zhang J, Tonelli M, Klarenbach S, Hemmelgarn BR. Impact of anemia on hospitalization and mortality in older adults. Blood. 2006 May 15;107(10):3841-6. doi: 10.1182/blood-2005-10-4308.
20. Jaul E, Calderon-Margalit R. Systemic factors and mortality in elderly patients with pressure ulcers. Int Wound J. 2015;12(3):254-9. doi: 10.1111/iwj.12086.