Orthostatic Hypotension and Mortality in Elderly Frail Patients

A Retrospective Cross-Sectional Study

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Abstract: Orthostatic hypotension (OH) is a common problem in the elderly age group, and some studies have reported an association between OH and increased mortality. We evaluated possible associations between OH and mortality in a retrospective study of frail elderly patients who came for a comprehensive geriatric assessment.

The study included all patients ≥65 years who were assessed in the outpatient Comprehensive Geriatric Assessment Unit. Data were collected from the computerized medical record, including blood pressure, sociodemographic data, lifestyle, falls, pulse rate, body mass index, functional and cognitive status, and comorbidity. Data on mortality were also collected.

The study population consisted of 571 patients who underwent assessment over a 9-year study period. The mean age was 83.7 ± 6.1, 35.9% were males, and 183 (32.1%) were diagnosed with OH. Systolic OH (OHS) was more common than diastolic OH (25.2% vs 15.6%). In univariate analyses, OHS was associated with increased overall mortality. Over the follow-up period, 30.2% of the OHS patients died compared with 22.3% ($P = 0.037$), but in the Cox models there was no statistically significant associations between OHS and overall mortality. In contrast, age, burden of comorbidity, a low high-density lipoprotein level, and low creatinine clearance were independent predictors of increased overall mortality.

In a population of frail elderly patients with a high burden of comorbidity, OH was not an independent risk factor for overall mortality.

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Abbreviations: AF = atrial fibrillations, BI = Barthel Index, BMI = body mass index, CCI = Charlson Comorbidity Index, CGAU = Comprehensive Geriatric Assessment Unit, CHF = congestive heart failure, CVA = cerebrovascular accident, DM = diabetes mellitus, HDL-C = high-density lipoprotein-cholesterol, HR = hazard ratio, HTN = hypertension, IHD = ischemic heart disease, MMSE = Minimental State Examination, OARS-IADL = Older Americans Resources and Service Instrumental Activity of Daily Living, OH = orthostatic hypotension, OHD = diastolic orthostatic hypotension, OHN = orthostatic hypotension negative, OHP = orthostatic hypotension positive, OHS = systolic orthostatic hypotension.

INTRODUCTION

The prevalence of orthostatic hypotension (OH) in elderly populations ranges from 6.9%[1] to 55%,[2] with variations related mostly to the method of measurement and the study population.

Associations have been found between OH and medical conditions, including syncope,[3] falls,[3,4] cardiac events,[5,6] atrial fibrillation (AF),[7,8] heart failure,[9,10] and stroke.[11] Several studies conducted in different populations have investigated possible associations between OH and mortality. In 2 systematic reviews with meta-analyses,[12,13] the investigators found an increase in overall mortality in patients with OH. However, even in these reviews, there is a variance in studies conducted in different populations.

The aim of the present study was to assess a possible association between the presence of OH and overall mortality among elderly patients who underwent a comprehensive geriatric evaluation in the Comprehensive Geriatric Assessment Unit (CGAU).

METHODS

Study Population

The CGAU of the Clalit Health Services in Beer-Sheva was established in 2004. The unit has been described in an earlier publication.[14] In short, the unit conducts comprehensive geriatric assessments for frail elderly community-dwelling individuals. The unit's staff include geriatricians, a nurse, a social worker, and a secretary. It also has the part-time services of an occupational therapist, a physical therapist, and a dietician. The unit functions up to 15 h/week and serves patients ≥65 years who are insured by the Clalit Health Services (approximately 25,000 individuals). Patients who come to the CGAU for a comprehensive geriatric assessment undergo a 5 to 6-hour evaluation that includes physical, functional, cognitive, affective, social, and environmental examinations. In the course of the assessment, the patients undergo supine and upright blood pressure measurements to identify OH.

The study population was composed of patients who underwent this comprehensive assessment at the CGAU over the course of 9 years between January 2005 and December 2013 and who had 3 recorded blood pressure measurements that enabled the investigators to calculate orthostatic blood pressure changes.

Blood Pressure Measurements

Blood pressure measurements were taken routinely for all patients who came to the CGAU for a comprehensive geriatric assessment and who were able to lie down for 10 minutes and stand up for 3 minutes. All measurements were done during the unit's working hours between 8 AM and 4 PM. Throughout 9 years of the study, the measurements were taken by the same nurse using the same protocol with an electronic instrument (Automatic Scholar III EL Monitor, Criticare Systems, Inc).

The blood pressure cuff device was adjusted to the patient's arm with the patient lying down flat with their hands along the body axis. After the patient lay down for 10 minutes, blood pressure was measured and the patient was asked to stand up. The first standing blood pressure measurement was then taken within 1 minute of standing and was repeated at the third minute of standing.

Definitions of OH

In our usual practice, we use the definitions of the Consensus Statement on the Definition of Orthostatic Hypotension,[15] published in 1996. According to these definitions, OH is diagnosed as a drop in systolic blood pressure of at least 20 mm Hg or in diastolic blood pressure of at least 10 mm Hg within 3 minutes of standing. For the purposes of the present study, we used the following diagnostic criteria:

(1) Systolic OH at the first minute of standing (OHS1)—a drop in systolic blood pressure of ≥20 mm Hg at the first minute upright compared to the measurement at the 10th minute supine.
(2) Systolic OH at the third minute of standing (OHS3) —a drop in systolic blood pressure of ≥20 mm Hg at the third minute upright compared to the measurement at the 10th minute supine.
(3) "Any OHS"—a drop in systolic blood pressure of ≥20 mm Hg at the first and/or the third minute upright compared to the measurement at the 10th minute supine.
(4) Diastolic OH at the first minute upright (OHD1) —a drop in diastolic blood pressure of ≥10 mm Hg at the first minute upright compared to the measurement at the 10th minute supine.
(5) Diastolic OH at the third minute upright (OHD3) —a drop in diastolic blood pressure of ≥10 mm Hg at the third minute upright compared to the measurement at the 10th minute supine.
(6) "Any OHD"—a drop in diastolic blood pressure of ≥10 mm Hg at the first and/or the third minute upright compared to the measurement at the 10th minute supine.
(7) Orthostatic hypotension positive (OHP)—"Any OHS" and/or "Any OHD."
(8) Orthostatic hypotension negative (OHN)—there was no evidence for either systolic or diastolic OH at the first or third minute upright.

Data Collection

All measurements were recorded and stored in a computer program that was designed specifically for the CGAU. The computerized record contains sociodemographic data, life habits, falls, blood pressure, pulse rate, weight, height, Minimental State Examination (MMSE),[16] the Older Americans Resources and Service Instrumental Activity of Daily Living (OARS-IADL),[17] the Barthel Index (BI),[18] chronic diseases list,

and comorbidity indices including the Charlson Comorbidity Index (CCI).[19] For the present study, we chose to use the CCI because its authors designed it primarily as a predictor of mortality. This index is a summation score of points given for comorbidity (TS—total score) and points given for age (age score). For the present study, we used only the total score (CCI-TS) to separate the effect of comorbidity from the effect of age. Details on recent laboratory tests taken just before the assessment at the CGAU were obtained from the patients' computerized medical records. Information on medications during the assessment at the CGAU was obtained from the pharmacological data system including all drugs that were supplied through prescriptions over the 3 months before the assessment. Information on dates of death was obtained from the data systems of the Clalit Health Services and included data up to February 15, 2014. The data related to the overall mortality only, without cause of death.

Statistical Analysis

The results are reported as mean ± standard deviation. The unadjusted mortality rate, expressed per 100 person-years, was calculated according to OH status as follows: -

(Total number of deaths × 100/number of participants)/mean follow-up period to death/year of study completion

The survival of OH and non-OH patients was compared using the Cox proportional hazard regression model, adjusting for additional factors such as age, sex, body mass index (BMI), MMSE, BI, OARS-IADL, number of drugs with OH potential, ischemic heart disease (IHD), AFs, congestive heart failure (CHF), total cholesterol, and high-density lipoprotein cholesterol (HDL-C). The results are presented as hazard ratios (HRs) and 95% confidence intervals (CIs). Continuous variables were compared using the Student t test and analysis of variance, and categorical variables using the χ^2 test. The study was approved by the ethics committee of the Meir Hospital in Kfar Saba, Israel.

RESULTS

Over the course of the study, 628 patients underwent geriatric assessment at the CGAU. Of these, 571 (90.9%) had blood measurements that enabled OH calculations and were included in the analysis. There were no significant differences between patients included in the analysis and those who were not in terms of age, sex, or overall mortality.

The mean age of the study population was 83.7 ± 6.1 and 35.9% were males. OHP was found in 183 patients (32.1%). Any OHS was more common than Any OHD (25.3% vs 15.6%); And OHS1 was more common than OHS3 (23.8% vs 8.6%).

Mortality Rates

In all, 212 of the 571 patients (37.1%) died over a follow-up period of 4.2 ± 2.6 years (range 0.02–9.0). There were no statistically significant differences in mortality rates between patients with any type of OH and those without OH. The unadjusted mortality rate among patients with OHP was 9.6/100 person-years compared with 8.5 among patients with OHN (Risk Ratio = 1.13; 95% CI: 0.85–1.50). There was no difference between these 2 groups in the mean follow-up period to death, which was 3.5 years. The unadjusted mortality rate per 100 person-years was 11.0 among patients with OHS1 compared

TABLE 1. Comparison of Nonsurvivors and Survivors

	Nonsurvivors N = 212	Survivors (N = 359)	*P*
Any OHS, N (%)			
Yes	64 (30.2)	80 (22.3)	0.037
No	148 (69.8)	279 (77.7)	
Any OHD, N (%)			
Yes	34 (16.0)	55 (15.3)	0.812
No	178 (84.0)	304 (84.7)	
OH, N (%)			
OHP	75 (35.4)	108 (30.1)	0.195
OHN	137 (64.6)	251 (69.9)	
Sex, N (%)			
Male	98 (46.2)	107 (29.8)	<0.0001
Female	114 (53.8)	252 (70.2)	
Age			
Mean ± SD	86.1 ± 6.3	82.3 ± 5.5	<0.0001
Range	67−103	67−97	
Falls in the past, %	81.8	83.4	0.639
Number of falls in past			
Mean ± SD	3.8 ± 6.3	3.8 ± 8.0	0.999
Range	0−50	0−52	
BMI			
Mean ± SD	27.6 ± 5.2	28.9 ± 5.2	0.006
Range	14.9−46.4	16.0−44.2	
BI			
Mean ± SD	79.0 ± 17.6	87.2 ± 14.4	<0.001
Range	25−100	35−100	
IADL			
Mean ± SD	6.33 ± 3.3	8.4 ± 3.4	<0.001
Range	0−14	0−14	
MMSE			
Mean ± SD	20.8 ± 2.7	22.6 ± 5.4	<0.001
Range	2−30	6−30	
Total Charlson score			
Mean ± SD	2.9 ± 2.05	1.85 ± 1.6	<0.001
Range	0−11	0−8	
Comorbidity, N (%)			
HTN	167 (78.8)	274 (76.3)	0.386
IHD	88 (41.5)	114 (31.8)	0.017
AF	32 (15.1)	35 (9.7)	0.058
DM	92 (43.4)	138 (38.4)	0.212
CVA	40 (18.9)	58 (16.2)	0.420
CHF	39 (18.4)	31 (8.6)	0.001
COPD	17 (8.0)	29 (8.1)	1.000
Cancer	18 (8.5)	18 (5.0)	0.108
Parkinson	20 (9.4)	20 (5.6)	0.089
Number of medications/month			
Mean ± SD	8.4 ± 4.7	8.0 ± 4.1	0.305
Range	0.7−29.7	1.0−23.7	
Total cholesterol			
Mean ± SD	179.0 ± 40.1	186.9 ± 44.4	0.039
Range	78−285	90−377	
LDL-C			
Mean ± SD	99.5 ± 31.6	105.3 ± 37.6	0.067
Range	30−193	38−264	
HDL-C			
Mean ± SD	52.7 ± 15.2	55.5 ± 14.7	0.038
Range	19−99	28−113	
Hemoglobin			
Mean ± SD	12.9 ± 1.5	13.1 ± 1.3	0.189
Range	9−17	9−17	

	Nonsurvivors N = 212	Survivors (N = 359)	P
Creatinine clearance			
Mean ± SD	46.7 ± 19.0	60.1 ± 22.0	<0.0001
Range	12.0–110.0	17.25 ± 166.7	
Follow-up, y			
Mean ± SD	3.4 ± 2.1	4.65 ± 2.7	<0.0001
Range	0.03–8.5	0.02–9.0	

AF = atrial fibrillations, BI = Barthel Index, BMI = body mass index, CHF = congestive heart failure, COPD = chronic obstructive pulmonary disease, CVA = cerebrovascular accident, DM = diabetes miletus, HDL-C = high-density lipoprotein cholesterol, HTN = hypertension, IHD = ischemic heart disease, LDL-C = low-density lipoprotein cholesterol, MMSE = Minimental State Examination, OARS-IADL = Older Americans Resources and Service Instrumental Activity of Daily Living, OH = orthostatic hypotension, OHD = diastolic orthostatic hypotension, OHN = ortho-orthostatic hypotension negative, OHP = orthostatic hypotension positive, OHS = systolic orthostatic hypotension, SD = standard deviation.

with 10.7 for patients with Any OHS, 9.0 for OHD1, and 9.1 for Any OHD.

Table 1 shows the characteristics of patients who survived compared to those who died. The survivors were significantly younger, more were females, their BMI was higher, their basic and instrumental activity of daily living was lower, and their MMSE score was lower. The burden of illness, measured by CCI, including IHD and CHF was higher among the deceased. Survivors had higher levels of creatinine clearance, total cholesterol, and HDL. There were no significant differences between survivors and deceased in the rate of falls in the past, the number of drugs, the low-density lipoprotein level, and hemoglobin concentration. There were also no significant differences between survivors and deceased in essential hypertension (HTN), diabetes mellitus (DM), cerebral vascular accidents (CVA), chronic obstructive pulmonary disease, Parkinson disease, and malignancy. There was a trend to higher rates of AF among the deceased.

Effect of OH and Other Risk Factors on Overall Mortality

The mortality rate was higher in the deceased group only for Any OHS (30.2% vs 22.3%, P = 0.037). There were no statistically significant differences between other types of OH (Any OHD, OHP) and overall mortality (Table 1).

Two Cox models were constructed to identify factors that affect overall mortality. All variables that had a statistically significant association with overall mortality on univariate

analysis (Table 1) were entered into the model. The first model (Table 2) included Any OHS, age, sex, MMSE score, BI score, OARS-IADL, several drugs with the potential to cause OH, and CCI-TS. The second model (Table 3) included the same variables, but chronic diseases and laboratory results were entered into the model instead of CCI-TS to identify associations between single disease morbidity and overall mortality. It is noteworthy that in a preliminary analysis no significant association was found between Any OH and CCI-TS (Mann–Whitney U test, P = 0.075). In both models, age was a risk factor for increased overall mortality. In the first model, the morbidity index CCI-TS was independently associated with increased overall mortality and high BMI was protective. In the second model, only low creatinine clearance and low HDL were independent risk factors for increased overall mortality. However, in both models, there was no statistically significant association between Any OHS and overall mortality.

DISCUSSION

In this retrospective study conducted in a frail elderly population seen at the outpatient CGAU, OH was not associated with an increase in overall mortality. This result contradicts the results of earlier published studies on this issue,[1,6,20–22] in which the investigators found that patients with OH had increased overall mortality ranging from 16%[22] to 71%.[21] However, some previous studies also did not find an association between OH and overall mortality.[23–25] Xin et al[13] reported that associations between overall mortality and OH were less

TABLE 2. Multivariate Cox Proportional Hazards Analysis[1]

Variable	Hazard Ratio	95% CI	P
Age, y	1.057	1.030–1.085	<0.0001
Sex (male)	1.405	1.022–1.931	0.036
BMI	0.946	0.916–0.977	0.001
MMSE	1.002	0.975–1.029	0.901
BI	1.000	0.987–1.013	0.964
OARS-IADL	0.942	0.882–1.007	0.08
Number of drugs with OH potential	1.007	0.915–1.108	0.89
Any OHS (yes/no)	1.052	0.751–1.473	0.768
CCI-TS	1.212	1.108–1.326	<0.0001

BI = Barthel Index, BMI = body mass index, CCI-TS = Charlson Comorbidity Index total score, MMSE = Minimental State Examination, OARS-IADL = Older Americans Resources and Service Instrumental Activity of Daily Living, OH = orthostatic hypotension, OHS = systolic orthostatic hypotension.

TABLE 3. Multivariate Cox Proportional Hazards Analysis[2]

Variable	Hazard Ratio	95% CI	*P*
Age, y	1.032	1.000−1.065	0.049
Sex (male)	1.291	0.931−1.790	0.125
BMI	0.972	0.936−1.009	0.133
MMSE	0.991	0.964−1.018	0.498
BI	0.988	0.976−1.000	0.055
OARS-IADL	0.971	0.909−1.036	0.373
Number of drugs with OH potential	0.951	0.857−1.056	0.344
IHD	1.159	0.821−1.638	0.402
AF	1.342	0.883−2.039	0.168
CHF	1.465	0.957−2.242	0.079
Any OHS (yes/no)	1.178	0.846−1.641	0.333
Total Cholesterol	0.997	0.993−1.002	0.234
HDL-C	0.988	0.977−1.000	0.048
Creatinine clearance	0.985	0.985−0.997	0.015

AF = atrial fibrillations, BI = Barthel Index, BMI = body mass index, CHF = congestive heart failure, OHS = systolic orthostatic hypotension, HDL-C = high-density lipoprotein cholesterol, IHD = ischemic heart disease, MMSE = Minimental State Examination, OARS-IADL = Older Americans Resources and Service Instrumental Activity of Daily Living, OH = orthostatic hypotension.

striking in retrospective studies, studies that were not community based, and studies in which the prevalence of OH was >20%. Furthermore, the association between overall mortality and OH was less significant in studies in which adjustments were made for ''classic'' risk factors for cardiovascular disease.

In another retrospective study conducted by Largo et al,[25] following adjustment for other risk factors, the statistically significant association between overall morality and OH was no longer found. The present study is based on data for CGAU patients, who are similar to hospitalized patients or patients in a tertiary clinic rather than a community-based clinic. Other studies that did not find an association between overall mortality and OH were also conducted in atypical populations. Weiss et al[24] evaluated patients who were discharged following acute hospitalizations in the Department of Geriatrics; Largo et al[25] evaluated patients at the falls clinic; and Fisher et al[23] studied patients from long-term health care facilities. The prevalence of OH in the present study was 32.1%. This is high in relation to studies that found a significant association between overall mortality and OH.[13] Federowski et al[6] reported a prevalence of 4.1% for OHS and 2.4% for OHD; Masaki et al[1] reported a prevalence of 6.9% for OH, the prevalence of OH in the ARIC study was 5.1%; and Verwoert et al[22] found a prevalence rate of 17.8% for OH. In contrast, in studies that did not find a significant association between overall mortality and OH the prevalence of OH ranged from 23% in the study by Fisher et al[23] to 54% in the study by Largo et al.[25] It should be noted that in the study by Luukinen et al,[20] in which the prevalence of OH was 30%, there was no increase in nonvascular death among patients with OH, but the rate of vascular death in this group was higher, especially among patients with DM.[26] In light of the limitations of the present study (absence of reliable data in the medical record on causes of mortality), we were not able to assess specific causes of death.

The mortality rate for patients in the present study was 10.6 per 100 person-years. In those studies, in which OH was found to be a predictor of overall mortality, the reported mortality rate was much lower with Fedorowski et al reporting 0.9 per 100 person-years,[6] Rose et al 1.0,[21] and Masaki et al 3.4.[1] Verwoert et al[22] reported the highest mortality rate of 4.7 per 100 person-

years. In contrast, in studies in which no association was found between overall mortality and OH, the mortality rate was higher: 9.3,[25] 11.6,[23] and 15.3.[24]

The differences in mortality among the studies are probably related to age and burden of disease. In the present study, the mean age was 83.7. In studies that found a significant association between mortality and OH, the mean age of the patients was younger: 45.7 in the study by Fedorowski et al,[6] 54.0 in the study by Rose et al,[21] and 68.1 in the study by Verwoert et al.[22] The only study with a significant association and a more elderly population was the study by Masaki et al[1] where the age range was 71 to 93 years.

In studies where no significant association was found between mortality and OH the mean age of the patients was higher: 78.8 in the study by Largo et al,[25] 81.5 in the study by Weiss et al,[24] and 83.2 in the study by Fisher et al.[23] In the study by Luukinen et al,[20] in which the authors found an increase in vascular mortality but not in nonvascular mortality, the mean age was 74.0. Fedorowski et al[6] found a weaker effect of OH on mortality with increase in age. In patients <42 and 48 years of age, the adjusted HR was 1.46; in those between 42 and 28 years of age, it was 1.21; and in those ≥48 years, it was 1.17. Similarly, in the study by Rose et al,[21] the HR for OH as a predictor of overall mortality in younger patients was 3.7 compared to 1.6 in older patients (60–65 years).

Morbidity is another factor that can explain the differences in mortality among the various studies. In comparison with studies that found a significant association between overall mortality and OH, patients in studies that did not find this association had higher rates of chronic morbidity. Thus, in studies with patients in relatively similar age ranges, but with contradictory results, such as Weiss et al[24] and Masaki et al,[1] there was a significant difference in burden of disease. In the study by Weiss et al, in which there was no significant association between mortality and OH, the prevalence of DM, HTN, coronary heart disease, and CVA was higher than in the study by Masaki et al where there was a significant association. This difference can be explained, at least in part, by the study setting, that is, community-based versus geriatrics ward, but the authors themselves suggested that the low morbidity rates among the

patients stemmed from genetic and ethnic factors.[1] Weiss et al[24] contended that the lack of association between overall mortality and OH in their study can be explained, in part, by the fact that their patient population, which consisted of individuals with acute hospitalizations in a geriatric ward, was less mobile and thus were less likely to suffer from known negative effects of OH, such as falls.

The results of the present study contradict, in part, the findings of Weiss et al.[24] We did not find any differences in the number of falls or risk factors for falls between the OHP and OHN groups over the year before the assessment. The results of 6 of the 9 studies that were included in the meta-analysis by Angelousi et al[12] also did not find any association between OH and risk of falls.

Thus, in the effort to explain the differences in the results of studies on the effect of OH on mortality in different age groups and with varying burdens of morbidity, we side with the assumptions of Masaki et al,[1] Verwoert et al,[22] and Rose et al[21] that the finding of OH in younger patients is, probably, a manifestation of latent cardiovascular disease or autonomic dysfunction that has not been expressed clinically yet, and in older patients it is a manifestation of frailty. In frail elderly patients with a heavy burden of disease OH may affect mortality through classic risk factors, but it cannot be isolated as a significant independent risk factor.

In the present study, older age was an independent risk factor for overall mortality. Similar results were found in most previous studies.[23,24,27] When specific diseases that were associated with increased overall mortality in univariate analyses were entered into the Cox model, no specific disease still had a statistically significant association with increased mortality. The lack of significant association for the other diseases would appear to stem from the small sample of patients who suffered from specific diseases. Nevertheless, when a more comprehensive index of morbidity, CCI-TS, was entered into the model it was found to be a significant, independent predictor of overall mortality (HR = 1.21; 95% CI: 1.11–1.33).

Strengths and Limitations of the Study

The study has several advantages. To our knowledge, this is the first study that assessed possible associations between overall mortality and OH in a population of frail elderly patients who came for a comprehensive geriatric assessment. The study population was well defined and there was a complete database on overall mortality. In multivariate analysis, we used the CCI, thus reducing the risk that some comorbidities were missed. And, finally, in present study, the same nurse conducted blood pressure measurements using 1 protocol throughout the study.

This study also has several limitations. First, as a retrospective study, its results are very dependent on the inclusiveness of the medical records. Thus, for example, there was insufficient data for 95 of the 571 patients (16.6%) to calculate the CCI-TS, which could lead to biased results. Second, the study was conducted in 1 center only and with a relatively small number of participants. The patient population that came to the unit for geriatric assessment may be different from the general population of frail elderly, especially because these specific patients were referred for comprehensive geriatric assessment. Thus, the results of this study may not be generalizable to the overall population of frail elderly. In addition, we only analyzed overall mortality because we did not have access to cause-specific mortality. Another possible limitation of this study is that blood pressure measurements were conducted at 1 time only. The medical

literature indicates that the reproducibility of OH is low and that OH varies over the course of the day.[28–32] Nevertheless, Hossain et al[32] found that mortality was the same in patients with OHS when OH was assessed at 1 time only compared with those with more than 1 OH measurement. Thus, we believe that this limitation does not have a critical effect on the results of the study. And, finally, it is possible that the geriatric assessment process in the unit may, per se, change mortality and could be a significant confounder. However, the results of 2 systematic reviews did not show that outpatient comprehensive geriatric assessment affects mortality.[33,34]

In conclusion, we found that OH is not an independent risk factor for overall mortality. In frail elderly population, OH is most likely a marker of frailty that is easy to measure.

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