Reviewer’s report

Title: Blood pressure change does not associate with Center of Pressure movement after postural transition in geriatric outpatients

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Reviewer: Rachael Torres

Reviewer’s report:

General

This paper speaks to associations between orthostatic blood pressure (BP) change and quality of standing balance. It is interesting and includes a comprehensive set of BP measurements taken at different stages of postural change. However, it is unclear what the study adds to the literature and there are significant limitations that must be addressed. Specific comments follow.

1. There are spelling and grammatical errors throughout the manuscript and it is difficult to understand in some places (specific examples are provided in the following sections). The manuscript should be revised to fix these errors and improve clarity.

Abstract

1. Page 3, line 3: Orthostatic hypotension (OH) should be defined the first time it is used in the abstract. The definition is currently in the methods section and OH is mentioned five times before it is defined.

2. Page 3, line 17: What do the authors mean when they say that intermittent BP measurements could be "combined with measurements of CoP." Perhaps that BP and CoP could be assessed at the same time?

3. Page 3, lines 44-49: "Results do not underpin the value of CoP movement measurements in neither the understanding the relation between OH and impaired standing balance nor to the diagnostic process of OH." This is a very unclear statement. Please clarify.

Introduction

1. Page 4, line 17: OH and initial OH need to be defined the first time they are mentioned in the body of the manuscript.

2. Page 4, line 27: the authors indicate that OH is prevalent in 57% of geriatric outpatients when BP is measured continuously and cite as study that appears to have been conducted with the same group of participants as the present study. Do other studies agree with this estimate?
3. Page 4, lines 34-59: It is unclear why the examination of center of pressure is important when there have been previous studies looking at measures of standing balance (i.e., center of mass, maintenance of balance during semi-tandem stance and self-reported balance) in relation to orthostatic BP change. A comprehensive discussion of what CoP adds to the understanding of balance and BP change is essential.

Methods

1. Page 6, lines 5-10: It seems misleading to begin the methods section by stating that the study included 207 patients, when only a subgroup of 75 was examined. This should be reworded to improve clarity. Perhaps something along the lines of "This cross-sectional study included 75 participants who were randomly selected from a pool of 207 geriatric patients referred to the outpatient clinic of a mid-sized teaching hospital."

2. Page 6, lines 5-10: What was the basis of referral to the outpatient clinic? Do the 207 patients have a common condition, or was referral for a number of conditions? This should be clarified.

3. Page 6, lines 15-30: "In a random subgroup of 75 patients, CoP movement measurements were additionally performed, based on availability of equipment. Continuous BP measurements were … available in 62 patients. Data of four patients were excluded … leaving 58 patients for analysis. In 38 patients of this subgroup, intermittent BP, CoP measurements and continuous BP measurements were available." This section very unclear. If I am reading it correctly: 1. CoP was assessed in a random subgroup of 75 out of the 207 geriatric outpatients; 2. All 207 patients that were originally referred between March 2011 and January 2012 that came to the clinic after June 2012 had continuous BP measurements taken and; 3. Of the subgroup of 75 patients that had CoP assessed, 38 came to the clinic after June 2012 and had continuous BP measurements. This must be reworded to improve clarity. The addition of a flow chart may be helpful.

4. Page 7, line 29: "Postural changes were imposed after lying supine and fully supported for at least five minutes by an automatic lift chair bringing the patient to a full and active standing position." Moving the patient to a standing position with an automatic lift chair does not seem representative of normal supine to standing postural change. Standing involves activation of skeletal muscles that pump blood back to the trunk to prevent pooling in the lower extremities and reduced arterial pressure. Reduced muscle activation resulting from the patients doing less work to stand could be responsible for the high prevalence of OH seen when BP is measured continuously. Do the authors view this as a potential problem and do they think that CoP could also vary as a function of assisted vs unassisted standing?

5. Page 8, line 56 to page 9, line 1: "CoP movement was expressed in five different CoP parameters … and were calculated per time period." It is unclear in this sentence what the authors mean by "calculated per time period." This is clarified in the statistical analysis section that follows, but it should be made clear in this section as well.

6. The authors have data for many important covariates that should have been controlled for in statistical analyses, especially demographics and hypertension. Why did they decide to use
nonparametric tests that do not allow for covariate adjustment, when CoP parameters were standardized?

Results

1. A table providing descriptive information for those with and without OH (continuous) would be informative. As no covariate adjustment was performed in statistical analyses, it is important to know whether there were any significant differences between the groups.

Discussion

1. Page 13, lines 12-15: "Furthermore, no significant differences were found in CoP movement between patients with or without OH." The authors should specify that they are referring to OH defined using continuous BP measurement. There were not enough people to look at initial OH or intermittent OH.

2. Page 13, lines 51-57: The participants were patients that were referred to the outpatient clinic of a teaching hospital. It is unclear how "the present diverse study population may have caused attenuation of specific risk factors, such as hypertension, for developing larger BP changes." Many participants in the study had hypertension (39.7% in all 75 and 42.1% in the subgroup of 38). Please clarify this section.

3. Page 14, lines 7-10: Use of a different measure of standing balance could potentially explain conflicting results between studies. Do the authors think that there is not significant overlap between CoP and other measures, especially center of mass?

4. Page 14, line 44 to page 15, line 3: How could "inconclusive pathophysiological mechanisms" play a role in explaining the absence of associations found in this study? Are the authors trying to say that cerebral hypoperfusion causes impaired standing balance and the BP abnormalities present in these participants are not severe enough to cause cerebral hypoperfusion? Please clarify this.

5. Limitations of this study that are not mentioned in the discussion include the very small sample size, particularly with regard to analysis of different OH measures, and the lack of statistical adjustment for important covariates. These limitations are significant and greatly diminish the impact of the study. They must at least be mentioned in the text.

6. Page 16, lines 1-3: "Disentanglement of systems evolved in standing balance may require system identification techniques." As this is neither a strength nor limitation of the study, it is unclear why it is in the strengths and limitations section.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.
No

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

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