Reviewer’s report

Title: Inpatient falls in older adults: a cohort study of antihypertensive prescribing pre- and post-fall

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Reviewer: Timothy Morgenthaler

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The authors have performed a retrospective cohort review to investigate "how antihypertensive medications are managed post-inpatient fall in a high-risk cohort of older adults." After presenting the methods and findings, they conclude that "Antihypertensive prescriptions are frequently unchanged after an inpatient fall." They admonish that routine medication review needs to be part of post-fall assessments, and seem to infer that it was not performed.

The paper is well written, the introduction is clear, and falls are an important topic. However, I have some with with the study as performed, the representation of the findings, and the conclusions.

1. They begin with a premise that is uncertain. They list the presence of antihypertensives as a risk factor for falls. Orthostatic/postural reductions in systolic blood pressure has been consistently identified as a risk factor (>10% drop Tinetti et al, ≥20% drop Graafmans et al, 20 mmHg drop Rubenstein et al, 20 mmHg drop Close et al, etc.) However, the presence of a specific BP during inpatient admissions has not, to my knowledge, been strongly associated with risk of falls. The most common fall risk tools do not list hypertensive medications as risk factors. The Hendrich II scale does not. The Morse fall scale does not. A recent meta-analysis (Woolcot et al, JAMA Int Med, 2009) found antihypertensives to have at most a weak odds ratio of 1.26 (95%CI 1.06-1.46) that almost missed being statistically significant. The real culprits seem to be benzodiazepines, sedative/hypnotics, and particularly antidepressants. Perhaps these classes of medications would have been better suited to study in this fashion?

2. The real risk factor related to falls, orthostatic/postural reduction, was not reported in this study. Presumably, it was not measured, though I can't say. In fact, the situation in the hospital is that most BP are measured inaccurately (estimates are that there may be anything from a mean underestimation of 24mmHg to a mean overestimation of 33mmHg for SBP) and while the patient is in bed, and during fluctuations that occur during treatment of illnesses that are severe enough that they must be in the hospital. (Kallioinen Nf et al, Journal of Hypertension. 2017;35(3):421-441)

In this study, most of the patients were
medical. It would be helpful to know what proportion were admitted with sepsis, heart failure, hepatic disorder, or renal failure with dialysis, disorders that often present in patients whose blood pressures are low—either by design (CHF) or due to underlying disorders (sepsis). Choosing a BP<140 as a risk factor doesn't make intrinsic sense to me out of context, particularly when the NICE guideline (2016) suggests that the target BP in the (ambulatory) elderly is a systolic BP<145/85. This leaves a small margin for getting it "right," in the presence of severe disease particularly. The study conclusions would be very much strengthened if it reported orthostatic BP, or at least symptoms of same. As it is, I am not convinced that an acutely hospitalized cohort of patients > 80 with a systolic BP of < 140 are at high risk for falls.

3. The authors suggest that the lack of changes in antihypertensive medication treatment reflects that the BP medications were not reviewed after the fall. I don't think this assertion may be trusted. For example, a patient admitted with CHF may have as part of their management afterload reduction. After our hypothetical patient falls, the care-givers assessment would need to take into account what they thought the underlying causes of the fall might be, and balance those thoughts with what brought the patient into the hospital or what might bring them back for another admission. It seems likely that unless there was a significant orthostatic fall, or a particularly low BP, there would be no change to an antihypertensive resulting in a systolic BP in the range of 109-127, as was found in this study.

4. The authors found that there was a significant reduction in dose of antihypertensives, with 7% of prescriptions changed to lower doses and an additional 27% with the antihypertensive discontinued. In Table 4, it appears that 95% had the same or reduced antihypertensives, while only 4% had new or increase in agents. The abstract represents the same data differently—namely by counting number of medications, and indicates that "only 13% had a reduction in the number of medications and 5% had an increase in medications" during the post-fall period. The number of medications prescribed for a patient seems a bit vague—number of types of antihypertensive medications? Number of tablets? This needs better description in the methods. Not sure this can provide the information you are after. The second way—the "on a medication level" analysis seems better. I suggest sticking with that.

Overall, I would suggest that the premise be explored a bit more in the introduction, and that the data analysis be limited to the "on a medication level" one. To really learn much about the degree of change in antihypertensive medication changes that occur after a fall in a group of patients with comorbidity, it would be much stronger to find a control group, matched by co-morbidity and age who did not fall, and then see how their hypertensive doses changed after a specific period—perhaps right after hospital day 7.2. That might strengthen conclusions about
how hypertensive doses do or do not change after a fall. Another potential way to strengthen your opinions about antihypertensive management would be to follow those who had a reduction in BP med dose and compare with morbidity matched patients who fell but did not have a change in dose and see if there was any difference in repeat fall rate.

I would suggest veering away from statements that infer that a review was not done. Your assertion may be right, but it might not be, and will that serve to promote best practice?

**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.

No

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No

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