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Incidence of postural hypotension recorded in UK general practice:

an electronic health records study

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Abstract

Background

Postural hypotension is a common condition associated with adverse outcomes and neuro-vascular dysfunction in older adults. General practice plays an important role in identification of the condition.

Aim

To examine i) the incidence of postural hypotension between 2009 and 2018 in general practice and ii) how trends vary by age, sex, year, social deprivation.

Design & setting

Retrospective cohort study using electronic health records from IQVIA Medical Research Database (IMRD) between 2000 and 2018.

Method

Patients from IMRD were included if they were aged at least 50 years. Incident postural hypotension was identified as a new (first) recording of a postural hypotension code (e.g. “Postural hypotension” (G870.11)). Recording of incident postural hypotension was estimated per 10,000 person years at risk (PYAR) according to age, sex, year and social deprivation. Relative risk ratios were estimated by multivariable Poisson regression.

Results

Of 2,911,260 patients, 24,973 had an electronic record indicating a new diagnosis of postural hypotension between 2008 and 2019. This was equivalent to 17.9 cases per 10,000 PYAR in men (95% CI 17.6-18.2) and 16.2 cases per 10,000 PYAR in women (95% CI 15.9-16.5). A significant age/sex interaction was identified. The rate of recorded postural hypotension
increased with age, social deprivation and reduced between 2008 and 2018. The rate was higher in men compared with women, particularly in older age groups (>80 years).

Conclusion

This is the first study to quantify incident recorded postural hypotension in general practice. The rate is lower than expected compared with studies in screened older populations. Potential barriers to identification include under-reporting, under-detection due to lack of time and/or poorly standardised methods of measurement, and poor coding. Future research should investigate current practice and approaches for increased detection such as education, practical methods of screening and standardised measurement of postural blood pressure.

How this fits in

Postural hypotension is a common, yet frequently overlooked condition associated with serious adverse outcomes in older people.

Timely identification in general practice may reduce the onset of adverse sequelae.

This study found that recording of postural hypotension in electronic GP records is low and poorly reflective of expected rates in the community.

These findings suggest there are barriers to identification and recording of postural hypotension in general practice, indicating potential for standardised detection measures and screening.
Introduction

Postural (orthostatic) hypotension is a common, yet frequently overlooked condition, associated with serious adverse outcomes in later life (1). It is estimated to affect around 20% of community-dwelling older adults (2, 3) and between 20 and 31% of those living in long-term care (2, 3). In the UK, the reported prevalence of postural hypotension has ranged from 28% in older women (4), up to 81% of older adults screened using continuous blood pressure (BP) monitoring (5).

Postural hypotension is usually defined as a reduction in systolic blood pressure (BP) of $\geq$20 mm Hg or diastolic BP of $\geq$10 mm Hg within 3 minutes of assuming an erect posture or head-up tilt to at least 60 on a tilt table (6). Its resulting effect on reduced cerebral blood flow is associated with falls, fractures, ischaemic events, cognitive impairment and increased mortality (3, 7). Older people with postural hypotension are 2.5 times more likely to have recurrent falls, compared with those without (8). Falls are estimated to cost the NHS more than £2.3 billion per year, including acute care for fractures and social care (9).

Early detection in symptomatic patients or those with certain risk factors may prevent some of these complications. General practice plays an important role in identification. However, current guidelines for detecting postural hypotension are varied and based on limited evidence (10). In the United Kingdom, screening is recommended for older adults presenting after a fall or in people with hypertension who are symptomatic, diabetic or aged over 80 years (11)(12). US guidelines recommend that a postural BP is checked in high-risk groups (1). A large proportion of postural hypotension cases are asymptomatic, and are therefore likely to remain undetected unless screened for in high-risk groups (2). No studies have examined the incidence of cases presenting to general practice, and it is unclear how well General Practitioners (GPs) identify symptomatic postural hypotension in normal practice.
and whether this varies in different population sub-groups. This study aims to i) examine the incidence of recorded postural hypotension over the last decade in general practice electronic health records and ii) examine how trends in incidence of recorded postural hypotension vary by age, sex and socio-demographic characteristics.

**Method**

**Design**
Retrospective cohort study using routinely collected healthcare data.

**Data Source**
This study used data from anonymised electronic primary care records contributing to the IQVIA medical research database which includes over 18 million patients (13) from over 700 practices. These are broadly representative of UK practices in terms of age, sex, practice size, geographical distribution and socio-demographic characteristics (14). GPs systematically recorded medical diagnoses and symptoms using the Read classification coding system during routine health care (15). This includes data from consultations with clinicians (GPs, nurses) and data (e.g. diagnoses, health measurements) coded into healthcare records from letters received from secondary care (e.g. hospital admissions and outpatient clinics). Social deprivation is measured using linked population census data on the Townsend score (based on postcode sector area of residence, owner-occupation, car ownership, overcrowding and unemployment). This is split into Townsend quintiles 1-5 (1 being the least deprived) (16). In the UK, healthcare is free to access, and individuals typically register with a GP in their local area. Approximately 98% of the UK population are registered with a GP (17) and over 90% of NHS contacts are in general practice (18).
Study population

The source population was all patients aged at least 50 years, registered with a GP practice contributing data to the IQVIA medical research database at acceptable quality and mortality reporting levels (19)(20) for at least 1 year between 1 January 2000 and 31 December 2018.

Measurement of outcome

Cases of postural hypotension were identified as patients who had a new (first) record of a Read code for postural hypotension between 1 January 2000 and 31 December 2018, at least 6 months after they registered with the GP. A list of all diagnosis codes were constructed using established methods (21). We used a specific code list which included four Read codes with high certainty of a validated diagnosis: a) “O/E - BP reading: postural drop” (medcode 2468.00); b) “Orthostatic hypotension” (G870.00); c) “Postural hypotension” (G870.11); d) “Parkinsonism with orthostatic hypotension” (F130300). The number of individuals with a newly recorded diagnosis was determined by age (in 10 year age-bands), sex, year and quintiles of Townsend score.

Statistical Analysis

The recording of coded postural hypotension was estimated per 10,000 person years at risk (PYAR) for individuals who were registered at some point between 2009 and 2018. Incidence rates of recorded postural hypotension were reported per 10,000 PYAR with 95% confidence intervals (CI) for men and women overall, for age bands, Townsend quintile, calendar year, and stratified by sex. Annual rates were graphed to examine the time trends. Incidence rate ratios were estimated by multivariable Poisson regression and estimates were mutually adjusted by sex, age, year and social deprivation. We ran models with and without interaction terms and performed the likelihood ratio test to analyse which model fit best. This identified a
significant age/sex interaction. Therefore, we have presented all results stratified by sex.

Analyses were carried out using STATA 16.0.

Patient and Public Involvement

We consulted a Patient and Public Involvement (PPI) advisory group throughout this study. This included three older members (aged over 65 years) who either had experience of postural hypotension themselves or cared for an older adult who has experienced postural hypotension. They contributed to the interpretation of the results and recommendations for clinical practice.

Results

In total, 24,973 individuals (amongst 2,911,260 patients) had an electronic record indicating a new diagnosis of postural hypotension between 2008 and 2019. This was equivalent to 17.9 cases per 10,000 PYAR in men (95% Confidence Interval (CI) 17.6-18.2) and 16.2 cases per 10,000 PYAR in women (95% CI 15.9-16.5). We found a significant age/sex interaction. Therefore, we have presented all results stratified by sex (Table 1).
Table 1  Incidence rates of recorded postural hypotension per 10,000 PYAR (95% CI) for men and women overall, for age bands, Townsend quintile, calendar year, stratified by sex

<table>
<thead>
<tr>
<th>Rate per 10,000 PYAR (95% CI)</th>
<th>Adjusted* IRR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>Overall</td>
<td>17.9 (17.6-18.2)</td>
</tr>
<tr>
<td><strong>Age band</strong></td>
<td></td>
</tr>
<tr>
<td>50-69</td>
<td>4.4 (4.1-4.7)</td>
</tr>
<tr>
<td>60-69</td>
<td>11.6 (11.1-12.1)</td>
</tr>
<tr>
<td>70-79</td>
<td>30.9 (30.0-31.9)</td>
</tr>
<tr>
<td>80-89</td>
<td>62.5 (60.4-64.6)</td>
</tr>
<tr>
<td>90+</td>
<td>82.9 (76.4-89.7)</td>
</tr>
<tr>
<td><strong>Townsend quintile</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16.6 (16.1-17.3)</td>
</tr>
<tr>
<td>2</td>
<td>16.9 (16.2-17.5)</td>
</tr>
<tr>
<td>3</td>
<td>17.9 (17.2-18.7)</td>
</tr>
<tr>
<td>4</td>
<td>18.9 (18.1-19.7)</td>
</tr>
<tr>
<td>5</td>
<td>21.7 (20.6-22.8)</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>19.3 (18.3-20.3)</td>
</tr>
<tr>
<td>2010</td>
<td>18.5 (17.6-19.5)</td>
</tr>
<tr>
<td>2011</td>
<td>19.1 (18.1-20.1)</td>
</tr>
<tr>
<td>2012</td>
<td>17.9 (16.9-18.8)</td>
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<tr>
<td>2013</td>
<td>18.5 (17.5-19.5)</td>
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<td>2014</td>
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<td>2015</td>
<td>17.4 (16.4-18.5)</td>
</tr>
<tr>
<td>2016</td>
<td>16.2 (15.1-17.4)</td>
</tr>
<tr>
<td>2017</td>
<td>15.7 (14.5-16.9)</td>
</tr>
<tr>
<td>2018</td>
<td>16.0 (14.8-17.3)</td>
</tr>
</tbody>
</table>

*from multi-level Poisson regression adjusted by age-band, Townsend quintile and year, stratified by sex

There were differences in trends by age, sex, Townsend deprivation quintile and year (Table 1, Figure 1). The incidence of postural hypotension increased significantly with age to an adjusted incidence rate ratio (IRR) of 19.0 (95% CI 17.2-21.0) in men in the oldest age group (90+), compared with men aged 50-69 years. In women aged 90+, the adjusted IRR was 13.8 (95% CI 12.6-13.8), compared with women aged 50-69 years.

For patients in the most socially-deprived Townsend quintile 5, the adjusted IRR in men was 1.4 (95% CI 1.3-1.5) and in women was 1.4 (95% CI 1.4-1.5), compared with the least
deprived Townsend quintile. Time trends show a small but significant reduction over the years. In 2018, the adjusted IRR in men was 0.8 (95% CI 0.7-0.9) and 0.7 (95% CI 0.7-0.8) in women, compared to 2009.

Figure 1 Incidence of recorded new GP diagnosis of postural hypotension from 2009-2018

A significant age/sex interaction was identified (Figure 2). The incidence of recorded postural hypotension increased at a greater rate by age-band amongst men, compared with women (Figure 2).
**Figure 2 GP recording of postural hypotension by age and sex**

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-60</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>60-70</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>70-80</td>
<td>240</td>
<td>260</td>
</tr>
<tr>
<td>80-90</td>
<td>300</td>
<td>320</td>
</tr>
</tbody>
</table>

**Discussion**

**Summary**

This is the first study to quantify recorded diagnoses of postural hypotension amongst patients in general practice.

The rate of recorded postural hypotension diagnoses in primary care among men aged 50 and over was 17.9 cases per 10,000 PYAR (95% CI 17.6-18.2) and 16.2 cases per 10,000 PYAR in women (95% CI 15.9-16.5). This rate is much lower than expected from studies in screened older populations which estimates the prevalence of postural hypotension in community dwelling adults to be 22% and 23.9% in long-term care (3).

The rate of recorded postural hypotension increased substantially with age as anticipated; increased with greater levels of social deprivation; reduced slightly over time between 2008 and 2018; and was higher in men compared with women, particularly in older age groups (>80 years).
Strengths and limitations

The main strength of this study is the large population sample (just under 3 million patients) enabling precise estimates of rates of case recording in primary care. The IQVIA medical research database (MRD) is also broadly demographically representative of patients in UK primary care. We were unable to examine rates of postural hypotension by ethnic group due to high levels of missing data and the IQVIA MRD generally under-represents groups from minority ethnic backgrounds.

There are, however, limitations in estimating the community incidence of postural hypotension from dynamic, longitudinal GP records. We defined cases with a high specificity diagnostic list of Read codes as we were interested in GP recorded postural hypotension cases specifically. However, there are several barriers which likely resulted in lower recording of coded postural hypotension in the electronic GP records, compared with community numbers (Figure 3).
Figure 3 Barriers to recording of postural hypotension cases in UK general practice
Barriers include patient underreporting to GPs. This is likely due to asymptomatic cases not presenting to primary care (only an estimated 30% of cases present with the classical symptoms of dizziness or light-headedness) (22) and due to a lack of routine postural BP screening in general practice. A further smaller percentage of cases may present with non-specific symptoms (22) such as intermittent blurred vision, which our Patient and Public Involvement (PPI) group agreed were less likely to trigger presentation to their GP.

Further factors include under-detection by clinicians in primary care, which might be due to: limited recognition of postural hypotension in clinical guidelines and its significance, atypical symptoms and a broad differential diagnoses, rising workloads and lack of time to screen and poorly standardised methods of postural blood pressure (BP) measurement leading to fewer diagnoses. Lastly, there is likely poor or inconsistent coding of postural hypotension in electronic records due to variable use of appropriate code terms, use of free text BP recording and symptom codes. For cases that are coded, we cannot be certain of the validity of GP recording (e.g. whether the Freeman consensus definitions are being used) (6).

Nevertheless, the rate of recorded postural hypotension identified in this study represents a clinically meaningful group who are likely to have a clinical diagnosis. These are likely to be the most severe cases, representing symptomatic patients presenting to GP or those identified following a fall where a postural BP was screened for (as advised by guidelines) (8). This is a key group of patients, providing new insight into identification of postural hypotension in general practice to further our understanding of its significance.
Comparison with existing literature

There are no studies examining the incidence of postural hypotension amongst community-dwelling older adults or in primary care to make direct comparisons. It is difficult therefore to evaluate the extent of under-diagnosis of incident postural hypotension in primary care. A recent systematic review and meta-analysis found the pooled prevalence of postural hypotension to be 19% for 23 screened primary care cohorts (2). A further systematic review on epidemiological studies in community-dwelling older adults found that the prevalence of orthostatic hypotension (OH) in screened populations (including therefore both asymptomatic and symptomatic OH) was 22%, and 24% for those in long-term care (3). It is also estimated to affect 30% of older people with diabetes (23).

The higher incidence of recorded postural hypotension diagnoses amongst men compared with women, and the significant age/sex interaction, likely reflects the known similarities in underlying pathology between postural hypotension and cardiovascular disease (CVD), which is well-established to affect men to a greater extent (23).

The steep increase in incidence of recorded postural hypotension by increasing age-band was expected and consistent with our knowledge of the aetiology of this condition (2, 3, 10). Physiological changes associated with natural ageing process causing reduced baroreceptor sensitivity and altered cardiovascular functions increases susceptibility to postural hypotension (8).

Our study found rising rates of recorded postural hypotension in groups with greater social deprivation. This may be due to a greater prevalence of polypharmacy, comorbidity and CVD amongst this population, as previously described in the literature (24).
Our finding that the rate of recorded postural hypotension followed a slight downward trend from 2008 to 2018 may reflect evidenced changes in rising GP workload during this period and reducing priority of postural hypotension detection amongst other chronic disease management and GP work (25). Between 2007 and 2014 the overall workload of GPs in England rose by 16% (25).

Implications for research and/or practice

This study provides the first insight into current practice and identification of postural hypotension in routine general practice, assimilating data and trends over a 10-year period. Standardised recording of postural BP may help increase identification and recording of postural hypotension in GP records. Gibbon et al suggest that a postural BP drop detected within 60 seconds of standing upright is preferable and more likely to be associated with adverse clinical outcomes (1). This is a pragmatic approach that could be incorporated into existing routine care for high risk groups including older adults (such as the NHS “Over 75 health check”), and can be carried out by auxiliary healthcare professionals or via ambulatory home BP monitoring, which is now more widely used (26). Early identification of postural hypotension (i.e. before the onset of clinical sequelae such as falls and ischaemic events) may allow for a window of opportunity. This can be used to adjust high-risk drugs, optimise CVD status, provide practical advice on hydration that may reduce subsequent adverse outcomes.

Lastly, postural hypotension and its association with serious adverse outcomes in older people is gaining attention in research. It is recognised as an important marker of neuro-vascular dysfunction and a contributor to cognitive decline (7). Therefore, understanding current practice and approaches for improving postural hypotension detection is increasingly important. Future research should consider age-sex interactions, with greater differences in
rates of postural hypotension amongst men and women in higher age groups (above 70 years). This study provides context for future research to investigate the potential benefits of routine screening of postural BP in general practice amongst high risk patients.

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Competing interests: N/A

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