

# POLYPHARMACY IN THE ELDERLY IS ASSOCIATED WITH INCREASED MORTALITY AND ACUTE KIDNEY INJURY

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## Introduction and Objectives

In older people anti-hypertensive and other medications can cause adverse effects which are often related to hypotension<sup>1-4</sup>. Randomised controlled trials show that treating hypertension in old age reduces strokes and cardiovascular events<sup>5,6</sup>. However in elderly patients with multiple co-morbidities there is a trade-off between using anti-hypertensive medication to reduce the risk of future disease and increased risk due to adverse effects of medication<sup>1-4</sup>. Drug treatments for symptomatic relief of conditions common in old age such as prostatism, Parkinson's disease and depression also have hypotensive effects<sup>7,8</sup>. Adverse effects due to hypotension include syncope and falls which can cause serious injury such as hip fracture and head injury<sup>1</sup> as well as a number of symptoms which impair daily quality of life for the older population<sup>3</sup>. Side effects of medication are a significant cause of hospital admissions<sup>9</sup>.

The aim of this study was to assess the prevalence of low blood pressure and impact on outcomes (Mortality and Acute Kidney Injury), particularly in the presence of anti-hypertensive treatment, in a primary care population.

## Methods

This is a retrospective observational study. Using data extracted from primary care databases by an automated Clinical Advisory System, data from 29 General practice surgeries were analysed including a population of approximately 200,000. Data on the medication, blood pressure, blood results and co-morbidity of patients aged 70 were obtained.

Inclusion criteria were: patients with a valid serum creatinine test, a BP measurement between 01/04/11 and 01/01/12 and aged over 70 years at first screening.

The blood pressures and medication data were collected according to the schedule in Figure 1. Definition of index BP was the first one after 01/06/2012. Definition of 'previous blood pressures' were all systolic and diastolic BPs 12 months prior to and including the index BP. Follow-up BPs were all the systolic and diastolic BPs in the twelve months following the index blood pressure. Current medication was defined as medication prescribed between the index BP and in the 4 months previous. Follow-up medications were all medications prescribed between 8 and 12 months after the index BP date. Current co-morbidity included all those extracted and reported prior to the index BP date. Follow-up co-morbidity included any reported up to 12 months after the index date.

Ethical approval had previously been sought to extract anonymous patient data from primary care practices. Approval was subsequently sought to reanalyse the dataset for the purposes of this study.

Table 1. Cox-Regression analysis of variables associated with mortality in follow up

|                                     | Significance (p) | Exp(B) |
|-------------------------------------|------------------|--------|
| Gender                              | <0.05            | 1.354  |
| Age                                 | <0.001           | 1.142  |
| Systolic BP <100mmhg                | <0.001           | 4.514  |
| Acute Kidney Injury in Follow up    | 0.286            | 1.171  |
| Previous Stroke                     | 0.014            | 1.849  |
| Diagnosis of Chronic Kidney Disease | 0.153            | 1.257  |
| Diagnosis of Heart Failure          | <0.01            | 2.550  |

## Results and Conclusions

11,160 patients over 70 years old were analysed, 6369 (57%) were female. 128 people had a systolic blood pressure of less than 100mmHg (89, 70% were taking anti-hypertensive medication), 346 people had systolic BP 100-109mmHg (223, 64% were taking anti-hypertensive medication), 823 people had a systolic BP of 110-119mmHg (532, 65% were on anti-hypertensive medication). The patients were taking between 0 and 5 antihypertensive medications at index: 34.1% were taking an ACEI, 17.6% were taking diuretic, 16.4% an ARB, 13.2% a Calcium Channel Blocker, 13% a beta-blocker, 3.9% an alpha-blocker, and 0.4% a centrally-acting antihypertensive. Coded co-morbidities at index were as follows: 12.4% had a diagnosis of hypertension, 7% diabetes, 4.2% coronary artery disease (CAD), 8.6% chronic kidney disease (CKD), 1.3% heart failure.

Kaplan-Meier survival curves indicate survival was reduced in patients with index BP <100mmHg and average (over one year prior to index) systolic BP < 100mmHg; 3.4% died over the one-year of follow-up (Figure 2).

Cox regression analysis showed that age, sex, index BP less than 100mmHg and index diagnoses of stroke and heart failure were significant variables associated with mortality (Table 1).

Over one-year's follow-up, 10.6% of patients had an episode of acute kidney injury (AKI) 0.8% had 2 episodes, 0.3% had three episodes. Of the 128 patients with index systolic BP<100mmHg 30 patients (23%) had an episode of AKI in follow-up compared to 11% in those with systolic BP≥100mmHg (Chi<sup>2</sup> 20.9, p<0.05).

Variables associated with AKI included age, sex, index systolic BP less than 100mmHg, current number of antihypertensive groups, and index diagnoses of diabetes, hypertension, stroke, chronic kidney disease (stage 3-5) and heart failure. Of the 44 patients with average BP<100mmHg, 7 (16%) had AKI in follow up.

In conclusion a significant number of elderly patients with hypotension remain on anti-hypertensive medication. Hypotension in the elderly is associated with acute kidney injury and mortality. Medication review and intervention in these groups may reduce the incidence of adverse incidents associated with low blood pressure. This study indicates there is scope for the development of systems and strategies to improve the care of complex elderly patients with multiple medications and co-morbidities. The importance of regular holistic review of medications in order to balance the risk and benefits of drugs used for prevention of future disease has been highlighted<sup>9</sup>.

Figure 1. Schedule of data collection

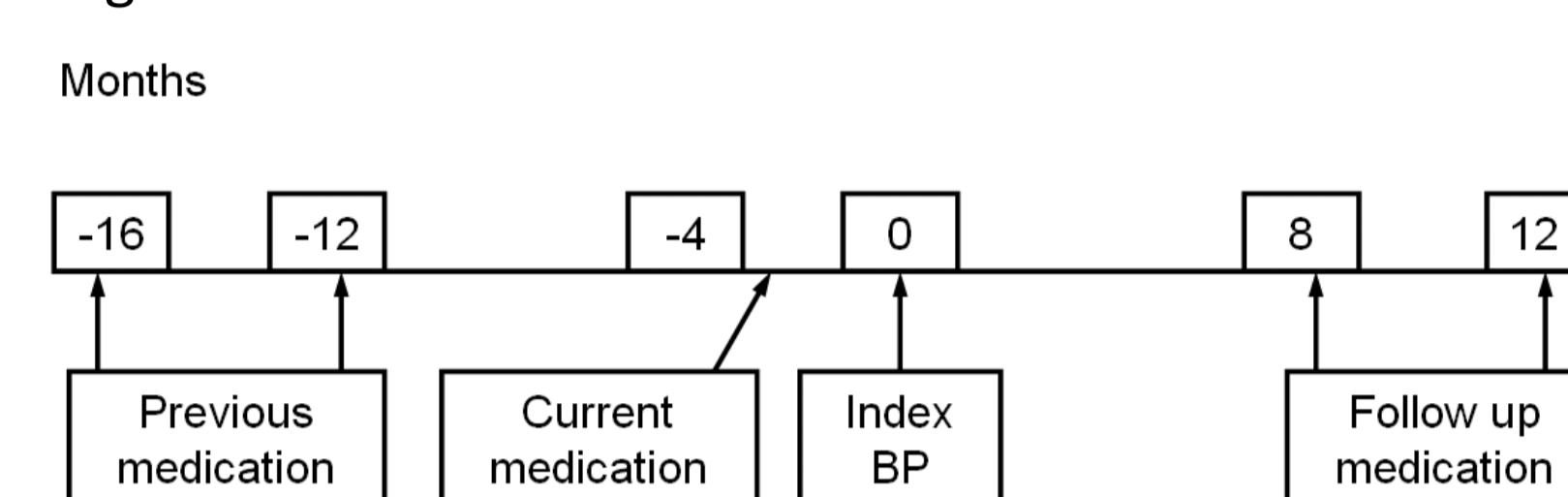
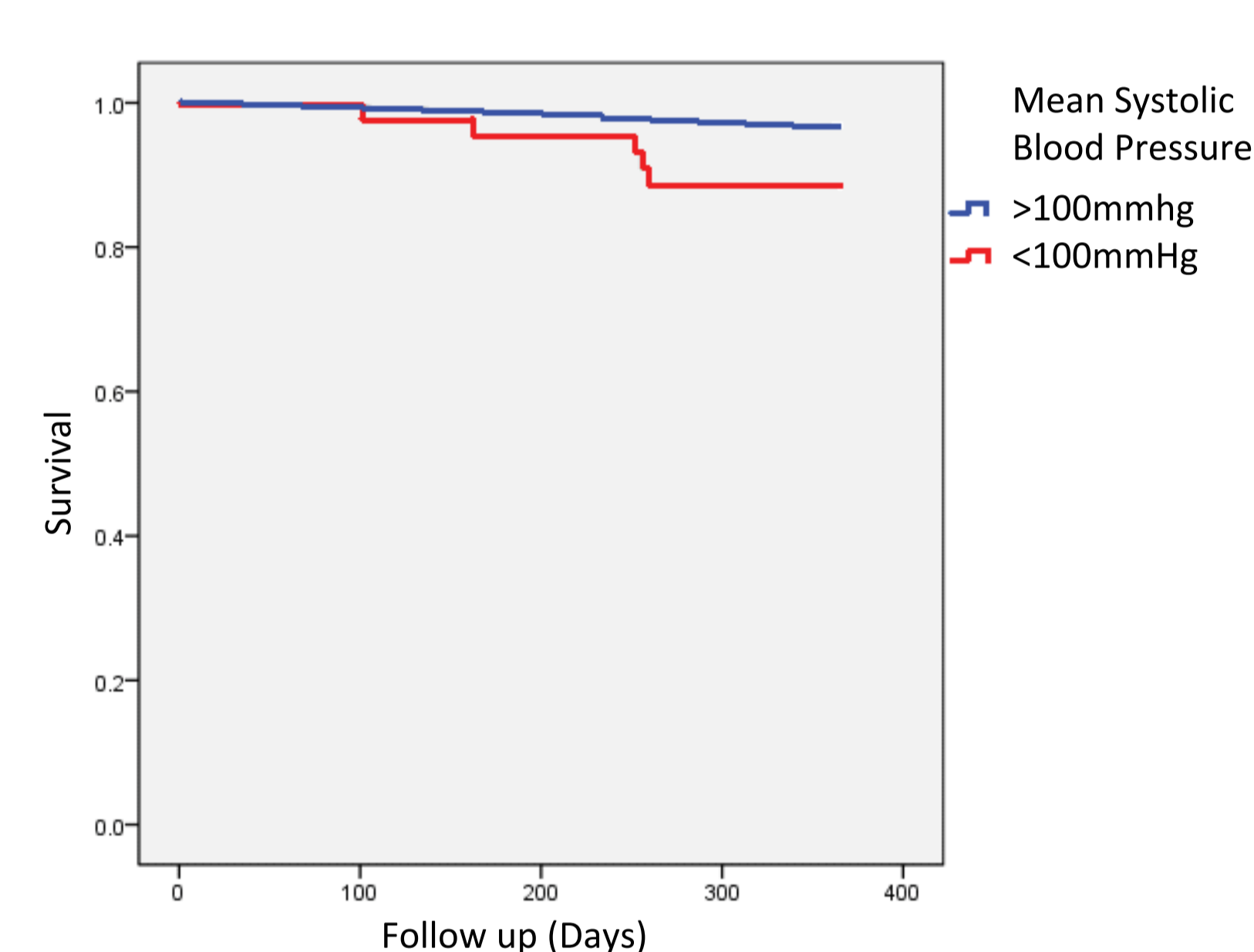


Figure 2. Kaplan-Meier Survival by mean systolic blood pressure.



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