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O – 1 Trends for prevalence and incidence of resistant hypertension: a population based cohort study in the UK 1995-2015

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Introduction: There is a dearth of data on how the prevalence and incidence of resistant hypertension (RHTN), a potent risk factor for cardiovascular disease, are changing over time. Our aim was to establish epidemiological trends for RHTN in the UK from 1995 to 2015.
Methods: We used a cohort study design using electronic health records from the UK Clinical Practice Research Datalink [1]. RHTN was defined as (1) concurrent use of ⩾3 anti-hypertensive drugs, uncontrolled hypertension (⩾140-/90 mmHg) and adherence to drug regimen or (2) concurrent use of ⩾4 anti-hypertensive drugs and adherence to drug regimen. We calculated crude and age-standardised rates of incidence and prevalence. We assessed changes in trends over time using Joinpoint models and the effect of age and gender on trends over time using Poisson models.
Results: 1,317,290 million patients with hypertension were included. The age-standardised incidence of RH increased from 0.98 cases/100 person years (py) (95% CI 0.92–1.04) in 1996 to a peak level of 2.19 cases/100 py (95% CI 2.15–2.24) in 2004. Incidence then fell to 0.49 cases/100 py (95% CI 0.46–0.51) in 2015. Age-standardised prevalence increased from 1.79% (95% CI 1.71–1.88) in 1995 to a peak of 8.26% (95% CI 8.19–8.32) in 2007. Prevalence then plateaued, and subsequently declined to 7.10% (95% CI 7.02–7.16) in 2015.
Conclusion: Prevalent RHTN has plateaued and decreased in recent years, due to a decrease in incidence from 2004 onwards. However, RHTN is not uncommon and remains a modifiable risk factor for cardiovascular disease.
Disclosure: None declared.
References:
1. UK Clinical Practice Research Datalink: https://www.cprd.com/home/.

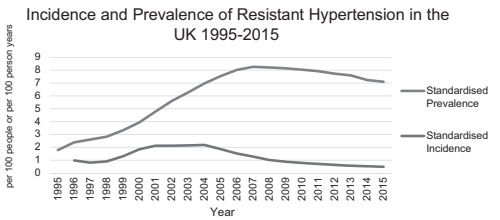

Figure 1. [O – 1]: Incidence and Prevalence of Resistant Hypertension by year, 1995-2016. Age Standardised to 2015 hypertensive population

O – 2 The use of four or more drugs for intensive control of blood pressure is associated with detrimental renal effects in Systolic Blood Pressure Intervention Trial (SPRINT)

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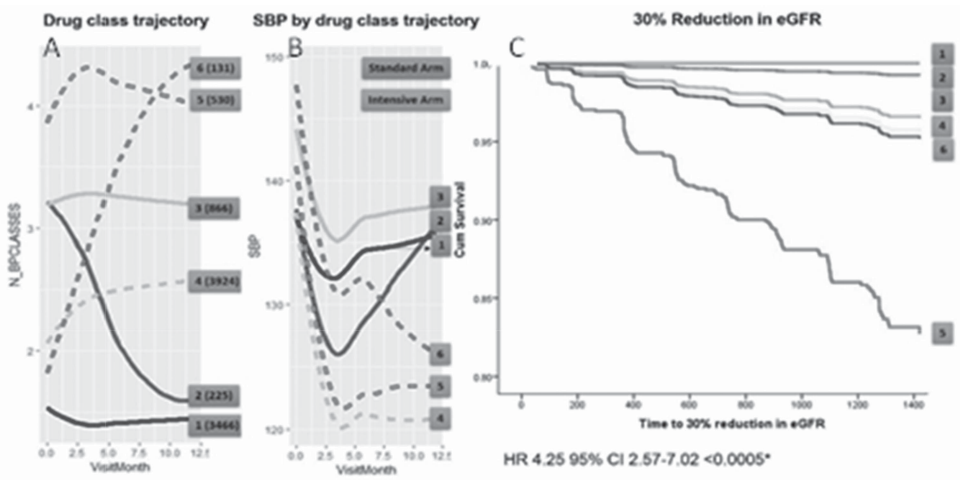
Background: In Systolic Blood Pressure Intervention Trial (SPRINT) [1], achievement of target systolic blood pressure (SBP) in the intensive arm required a higher number of drugs and intensive treatment was associated with lower cardiovascular (CV) events and death but an increased incidence of adverse events.

Methods: Number of drug classes prescribed at randomisation and at 1,2,3,6,9,12 months were used to identify distinct trajectory groups in the standard and intensive arm using Latent Class Mixed Modelling, in 8,449 participants. Cox proportional hazards (Cox-PH) models, adjusted for age, sex, SBP (area under curve [AUC] 0-12 months), prevalent cardiovascular disease (CVD), prevalent chronic

kidney disease (CKD) and number of drug classes at randomisation, were used to assess the association between drug class trajectories and renal adverse events.
Results: The 6 groups based on the trajectories of drug classes prescribed over the first year are shown in the panel A with corresponding SBP by drug class groups in panel B. Cox-PH model (reference category: Intensive group – 4 (Int – 4), SBP < 125 on 2.5 drug classes) showed that, in those without CKD at baseline, in Int-5 (125 on 4 drug classes) there was a higher risk of 30% reduction in estimated glomerular filtration rate (eGFR; hazard ratio [HR] 4.25 [2.57-7.02]; $P < 0.0005$) whilst those in Standard group (Std-1) (SBP 133 on 1.5 drugs) had a lower risk (HR 0.17 [0.10-0.29]; $P < 0.0005$) (panel C. Those in Int-5 had a higher risk of hyperkalaemia (HR 1.64 [1.03-2.61]; p 0.036) with trend towards higher risk of acute kidney injury (AKI; HR 1.42 [0.95-2.12]; p 0.09).
Conclusions: Within the intensive arm of SPRINT, treatment with $\geqslant 4$ antihypertensive drug classes was associated with adverse renal events, independent of blood pressure (BP) achieved in the first year.
Disclosure: None declared.
Reference: 1. N Engl J Med 2015; **373**:2103-2116.



A. Drug class trajectories
B. Blood pressure by trajectory group
C. Renal outcomes by trajectory group

Figure 1. [O-2]: Drug class trajectory groups and renal outcomes in SPRINT.

O – 3 Dietary salt reduction for reducing blood pressure in people with end-stage renal disease receiving dialysis: a meta-analysis

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Introduction: Dietary salt reduction in the general population results in lower blood pressure and cardiovascular risk. Despite being widely recommended, there is a paucity of evidence as to whether this is applicable to individuals with end-stage renal disease (ESRD) receiving dialysis.
Methods: This was a meta-analysis of randomised-controlled trials (RCT) investigating dietary salt reduction in individuals receiving dialysis. Studies were identified through search strategies for CENTRAL, MEDLINE (U.S. National Library of Medicine, Bethesda, MD), and EMBASE (Elsevier). Two authors independently assessed studies for eligibility with the inclusion criteria as follows: participants aged 18 years and over; a reduction in salt intake of at least 2 g/day; an intervention period of at least 1 week. The primary outcome was change in systolic and diastolic blood pressure (pre- dialysis blood pressure in the absence of 24- hour ambulatory blood pressure).
Results: 848 reports were screened, from which four RCT (89 participants) were identified for inclusion in the meta-analysis. Three were conducted in haemodialysis patients and one in peritoneal dialysis patients. Three RCT were crossover trials and one was a parallel study (Figure 1). Dietary salt reduction was associated with 8.4 mmHg reduction in systolic blood pressure (95% CI 4.8-12.0, $I^2 = 0\%$), and a 4.4 mmHg reduction in diastolic blood pressure (95% CI 2.2-6.6, $I^2 = 0\%$).
Conclusions: The results of this meta-analysis emphasise the importance of dietary salt restriction for controlling blood pressure in those with ESRD receiving dialysis.
Disclosure: None declared.

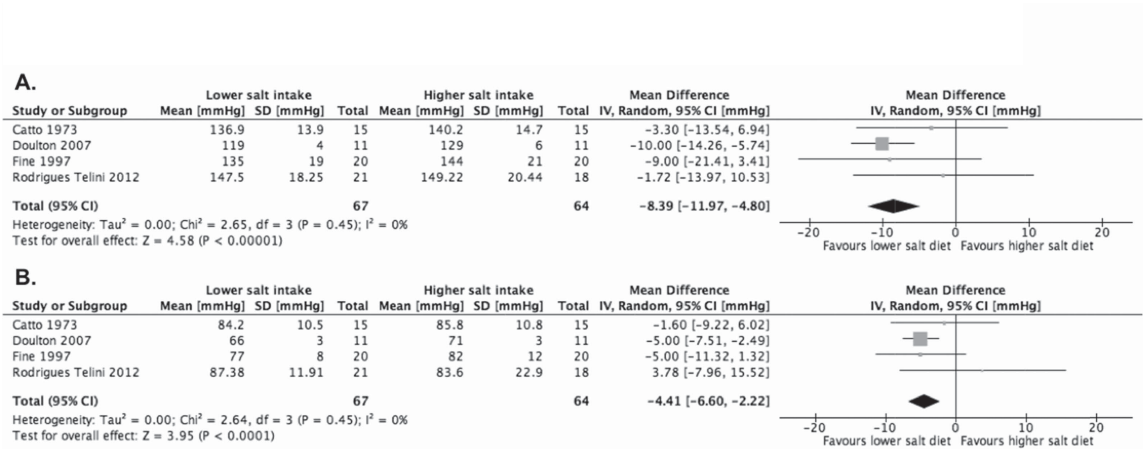

Figure 1. [O – 3]: Forest plots demonstrating net change in blood pressure with altered salt intake in dialysis patients.(A) Systolic blood pressure; (B) Diastolic blood pressure.

O – 4 Large-scale genome-wide pharmacogenetic meta-analysis of blood pressure response to antihypertensive drugs

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Introduction: The inter-individual variation in response to antihypertensive drugs may partly be due to genetic variation. Pharmacogenetics may aid in the selection of optimal treatments, although so far few variants have been validated.

Aim: Identify genetic variants modifying the association between the use of different antihypertensives and blood pressure (BP) response.

Methods: Drug-gene interaction analyses have been performed within ASCOT (Anglo-Scandinavian Cardiac Outcomes Trial), comparing Calcium Channel Blockers (CCB) vs Beta Blockers (BB).

We further performed large-scale longitudinal genome-wide interaction meta-analyses within 11 Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) consortium observational cohorts (AfterEU, AGES, ARIC, BPROOF, CHS, FHS, JHS, MESA, NEO, PROSPER, RS), giving a total sample of ~12,000 individuals.

Twelve analyses were performed: six for systolic BP; six for diastolic BP. The six analyses correspond to pairwise comparisons of the four antihypertensive classes: BB, CCB, angiotensin converting enzyme (ACE) inhibitors and diuretics. Each analysis model estimates the interaction term of interest for the genetic variant and drug exposure, adjusted for age, sex and other study-specific covariates. Analyses were restricted to hypertensive patients on monotherapy, stratified for European and African American ancestry, and tested ~2.5 million imputed variants.

Results: ASCOT analyses identified genome-wide significant variants, though these did not replicate in the observational cohorts. The combined meta-analysis of ASCOT and CHARGE (i.e. BB vs CCB) yielded several regions (e.g. *C15orf50* and *TMPRSS11F*) of suggestive association ($P < 1 \times 10^{-6}$), none of which are known BP-associated variants.

Conclusions: Despite no genome-wide significant results, some suggestive novel targets are indicated for follow-up. This project highlights methodological challenges of such pharmacogenetics analyses.

Disclosure: Helen Warren is funded by the National Institutes for Health Research (NIHR) as part of the portfolio of translational research of the NIHR Biomedical Research Centre at Barts and The London School of Medicine and Dentistry, Queen Mary University of London.

O – 5 The haemodynamic mechanism of the age-related increase in pulse pressure in women

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Objective: An age-related increase in pulse pressure accounts for the majority of incident hypertension around middle age and is thought to relate to stiffening of the aorta. We examined the contributions of large artery stiffness, ventricular dynamics, and pressure wave reflection to central pulse pressure in women from the Twins UK cohort.
Methods: A total of 2033 women aged 18 to 91 years (mean age 57 years) were studied. Non-invasive aortic flow velocity and central blood pressure were measured by Doppler sonography and carotid tonometry system respectively. Reflection index (the ratio of the peak of the backward pressure wave over that of the forward wave) was computed from the pressure and flow waves.
Results: Central pulse pressure increased with age, from 28.7 ± 6.02 mmHg for those aged below 40 years to 53.0 ± 16.12 mmHg for those > 70 years (means $\pm$ SD, $P < 0.001$). A large component of this was due to an increase in augmentation pressure (from 0.56 ± 0.33 mmHg to 13.6 ± 0.53 mmHg for those < 40 and > 70 years respectively, $P < 0.001$). This was not explained by reflection (which *decreased* from 0.28 ± 0.01 to 0.25 ± 0.01, $P < 0.001$) but by an altered pattern of ventricular ejection with delayed but sustained emptying of the ventricle (initial flow decreased from 1.02 to 0.98, $P < 0.001$) and volume at time of peak pressure increased from 51.7 ± 0.96 to 57.1 ± 1.35 ml ($P < 0.001$).
Conclusions: These results suggest that age-related increase in central pulse pressure is driven mainly by an increase in arterial stiffening and altered pattern of ventricular ejection.
Disclosure: None declared.

O – 6 Relationship between aortic stiffness and cardiac remodelling in younger adults with type 2 diabetes

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Introduction: Heart Failure is now the commonest and most deadly complication of type 2 diabetes (T2D). Diabetic cardiomyopathy is well recognized but the main aetiological causes are uncertain. Aortic stiffness (AoS) is frequently observed in patients with T2D and is associated with adverse cardiovascular events. Cardiovascular magnetic resonance (CMR) imaging can quantify AoS directly as aortic distensibility (AD), or indirectly with aortic pulse-wave velocity (aPWV). We hypothesised that AoS would be independently associated with cardiac remodeling in younger adults with T2D.
Methods: Eighty patients with uncomplicated T2D (median age 44 years [32–57]) and no prior cardiovascular disease underwent comprehensive CMR scanning. Blinded scans were analysed for ascending aortic distensibility (AAD), descending aortic distensibility (DAD), aPWV and left ventricle (LV) remodelling (LVmass/volume and LV mass index [LVMI]). Multivariate linear regression assessed whether AoS independently predicted LV remodelling.
Results: We show for the first time that, when adjusted for age, systolic blood pressure (BP), body mass index (BMI), heart rate, diabetes duration and hemoglobin (Hb) A1c, AAD and DAD, but not aPWV independently predicted LVMI and LVM/volume (Table 1).
Conclusions: AD is independently associated with cardiac remodelling in T2D. This suggests that ventricular/arterial interactions may play a significant role in cardiac risk in T2D. AoS may be a potential therapeutic target, independent of blood pressure control, to prevent heart failure in T2D.
Disclosure: None declared.

Table 1 Pearson correlations and multivariate regressions

LVM/volume	*Univariate*	*Multivariate*	*LVMI*	*Univariate*	*Multivariate*
AAD ($x10mmHg^{-3}$)	$r = -0.417$, $P < 0.001$	$\beta = -0.344$, $P = 0.003$	AAD ($x10mmHg^{-3}$)	$r = -0.424$, $P < 0.001$	$\beta = -0.264$, $P < 0.001$
DAD ($x10mmHg^{-3}$)	$r = -0.425$, $P < 0.001$	$\beta = -0.349$, $P = 0.005$	DAD ($x10mmHg^{-3}$)	$r = -0.437$, $P < 0.001$	$\beta = -0.281$, $P < 0.001$

AAD = ascending aortic distensibility; DAD = descending aortic distensibility; LVM = left ventricle remodelling; LVMI = left ventricle mass index.

O – 7 Causal effects of body mass index on cardiac structure and function in young adults using Mendelian randomisation

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Introduction: Obesity is associated with adverse cardiac effects in observational studies; however, bias and reverse causation prevent causal inference. We determined causal relationships between higher body mass index (BMI) and cardiac measures in young adults using Mendelian Randomisation.
Methods: We estimated the causal effect of higher BMI on measures of cardiac structure and function using Mendelian randomisation (MR) from 1571 young adults in the Avon Longitudinal Study of Parents and Children (age 17.8 years; 51% male).
The causal effect of BMI was estimated using a genetic risk score as an instrumental variable. Data are mean (95% confidence interval) per unit increase in BMI ($kg.m^{-2}$).
Results: Higher BMI caused higher systolic and diastolic blood pressure (0.8 (0.3, 1.8)/0.3 (0.0, 0.6) mmHg), increased left atrial size (0.08 (0.05, 0.11) cm), increased end diastolic volume (2.0 (0.6, 3.5) ml), left ventricular mass indexed to $height^{2.7}$ (1.07 (0.62, 1.52)) and cardiac output (79.0 (18.2, 139.9) ml/min). The elevated cardiac output was likely attributable to a higher stroke volume (1.0 (0.1, 1.9) ml) as results showed no evidence of a causal effect of BMI on heart rate (−0.1 (−0.5, 0.4) bpm). Other cardiac measures, including total arterial compliance, systemic vascular resistance and measures of systolic and diastolic function, were only marginally or not affected.
Conclusion: In young adults increased BMI results in higher left ventricular mass, atrial size and blood pressure. Higher blood pressure is wholly attributable to elevated stroke volume at this age. Other associations observed in observational analyses may represent confounding or reverse causation.
Disclosure: None declared.

O – 8 Selective reduction of central blood pressure by reducing cardiac pre-load

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Objective: Selective actions of antihypertensive drugs on central blood pressure (BP) components may influence target organ damage and cardiac events independent of peripheral BP. We examined whether selective actions of nitrates to reduce central rather than peripheral BP might be explained in part by reduction in pre-load in hypertensive patients.
Design and methods: 70 hypertensive patients (age 44.7 ± 14.3 years) had brachial BP measurements (OMRON-705IT, Omron Corporation, Kyoto, Japan), central BP, augmentation pressure (AP) and augmentation index (AIx) recorded by radial pulse wave analysis (SphygmoCor AtCor Medical, Sydney, Australia), and measures of pre-load by trans-thoracic echocardiography (TTE). Measurements were repeated after 5 minutes of supra-diastolic, sub-systolic pressure inflation of thigh cuffs in order to decrease venous return from the lower limbs.
Results: Leg cuff-inflation significantly decreased TTE indices of cardiac pre-load reducing inferior vena cava diameter from 1.48 ± 0.49 to 1.19 ± 0.34 cm ($P < 0.01$). Systolic BP was marginally reduced by the intervention (by 1.9 ± 0.9 mmHg, mean ± SE, $P = 0.04$) while diastolic BP and heart rate did not change significantly. By contrast effects on central haemodynamics were greater with central systolic BP, augmentation pressure and augmentation index reduced by 4.5 ± 1.3 mmHg, 3.2 ± 0.6 mmHg, and 6.2 ± 1.4%, respectively, each $P < 0.001$, $P < 0.05$ for central vs. peripheral BP).
Conclusions: Acute reduction of cardiac pre-load influences central haemodynamics; chronic reduction in pre-load might contribute to beneficial effects of diuretics to reduce heart failure events.
Disclosure: None declared.

O – 9 Isometric handgrip (IHG) training of one forearm reduces resting arterial pressure and augments reactive and exercise hyperaemia in the non-trained arm of older, normotensive men

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Introduction: Isometric handgrip (IHG) training reduces arterial blood pressure (ABP), particularly in hypertensives. We recently reported that in young normotensive men IHG training augmented exercise and reactive hyperaemia in the non-trained arm. We tested whether it has similar effects in older men.
Methods: 10 recreationally active, normotensive older men (O: 55-70 years) undertook IHG training with the dominant arm: 4 × 3min contractions at 30% maximum voluntary contraction (MVC) at 5 min intervals, 4 days/week for 4 weeks, for comparison with data from 10 young men (Y: 18-25 years). Forearm blood flow (FBF) was recorded by venous occlusion plethysmography following a 3- min period of rhythmic handgrip contractions at 60% MVC (exercise hyperaemia) and of arterial occlusion (reactive hyperaemia).
Results: IHG training increased MVC in the trained arm of O (26.8 ± 1.3, vs 30.1 ± 1.4*Kg, *: $P <$ 0.01) as in Y (29.0 ± 1.3, vs 33.5 ± 1.5*Kg), but had no effect on MVC in non-trained arm (O: 25.2 ± 1.2 vs 25.8 ± 1.2Kg, Y: 27.0 ± 0.9 vs 27.1 ± 0.9Kg). Resting mean ABP was reduced by IHG training in O only (90.81 ± 2.67 vs 86.48 ± 2.67*mmHg; Y: 88.03 ± 0.92 vs 89.37 ± 0.88 mmHg). Focussing on non-trained arm, reactive hyperaemia increased from 20.01 ± 1.34 to 25.53 ± 1.31*ml.100 ml^{-1}.min^{-1} in O (41.3 ± 1.7 to 52.9 ± 1.7* ml.100 ml^{-1}.min^{-1} in Y). Further, exercise hyperaemia increased from 30.93 ± 1.45 to 38.1 ± 1.6* ml.100 ml^{-1}.min^{-1} in O (77.8 ± 9.4 to 101.1 ± 2.9*ml.100 ml^{-1}.min^{-1} in Y).
Conclusions: IHG training for just 4 weeks reduces resting ABP in older, normotensive men and improves exercise and reactive hyperaemia in the non-trained arm without affecting muscle power. This suggests remote, beneficial effects on endothelial dilator function, which could be important in combatting cardiovascular disease.
Disclosure: None declared.

O – 10 The immediate effects of electronic cigarette use and tobacco smoking on vascular and respiratory function in healthy volunteers: a crossover study

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Introduction: Electronic cigarettes have gained unprecedented popularity as a smoking cessation tool, and are considered potentially less harmful than tobacco smoking (TS). We assessed the immediate physiological effects of electronic cigarette use (vaping) versus TS on vascular and respiratory function.
Methods: A crossover study of 20 male smokers was conducted. Vascular measurements included heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP), reactive hyperaemia index (RHI) and augmentation index (AI). Respiratory measurements included forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), FEV_1/FVC ratio, peak expiratory flow (PEF) and exhaled carbon monoxide (CO). Measurements were performed immediately before and after vaping and TS.
Results: Following vaping we observed a significant increase in RHI (2.0 ± 0.4 vs 1.7 ± 0.3; $P = 0.006$), decrease in AI (−6.9 ± 13.5 vs -10.5 ± 13.2%; $P = 0.010$), and decrease in PEF (531 ± 97 vs 567 ± 62 L/min $P = 0.03$) whereas no significant changes were observed with TS. HR increased after vaping (73 ± 9 vs 65 ± 9 bpm; $P < 0.001$) and TS (86 ± 13 vs 64 ± 8 bpm; $P < 0.001$). TS elicited a significant increase in CO (20.3 ± 9.5 vs 8.6 ± 10 ppm $P < 0.001$) which was not demonstrated after vaping. No statistically significant changes were observed in SBP, DBP, FEV_1, FVC, FEV_1/FVC after vaping or TS (all $P >$ 0.05).
Conclusions: We observed changes related to endothelial function, arterial stiffness, and PEF after vaping; which were not seen following TS. It remains to be explored whether this is an acute phenomenon with no short- or long-term complications or whether this is suggestive of potential cardiovascular and respiratory effects associated with vaping.
Disclosure: None declared.

O – 12 Coexisting hypertension and orthostatic hypotension increases the risk of falls in older adults: findings from The Irish Longitudinal Study on Ageing (TILDA)

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Introduction: Orthostatic hypotension (OH) increases the risk of all cause, unexplained falls (UF) and injurious falls (IF) in older adults with OH often coexisting with hypertension. However, it is unclear how the interaction of these common clinical entities modifies falls risk in older adults. Our goal was to determine the risk of incident falls (and its variants) in those with OH and hypertension using beat-to-beat blood pressure (BP) measurements in a population study.
Methods: Baseline (2009-2011) and follow-up (2012-2013) measurements were taken in four thousand one hundred twenty-seven participants recruited as part of the Irish Longitudinal Study on Ageing (TILDA). At baseline continuous BP measurements during standing defined presence/absence of sustained OH, with the average of 2 seated BP measurements (OMRON M10-IT, Horikawa Higashiiru, Shiokoji-Dori, Shimogyo-Ku, Kyoto, Japan)

defining hypertension presence/absence (⩾140/90 mmHg). Associations with outcomes (numbers of falls, UF, IF) collected 2 years later were assessed using modified Poisson and negative binomial regression.
Results: Participants had a mean age of 61.5(8.2) years (54.2% female). The proportion of those with OH and hypertension increased with age from 40% (50-59 year olds) to over 67%(70-79 year olds). Combined OH and hypertension was associated with an increased risk of falls (incident rate ratio (IRR): 1.75 95% CI:1.14–2.69), UF(relative risk (RR): 2.69 95% CI:1.4–5.17), and IF(RR: 1.58 95% CI:0.95–2.62) while OH alone was not.
Conclusion: OH in the presence of hypertension is associated with a stronger risk of future falls and unexplained falls in older adults than OH alone. Management of older patients with hypertension should consider coexistence of OH and consequent falls risk management.
Disclosure: None declared.

O – 13 Sodium Accumulation in the Myocardium of Hypertensive Rats

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Introduction: Salt is associated with progression of hypertensive heart disease through left ventricular hypertrophy and diastolic dysfunction. Recently, Na^+ was shown to accumulate in peripheral tissues with advancing age and resistant hypertension; glycosaminoglycans (GAG) were identified as the putative binding site. This study was set out to investigate if a similar accumulation occurs in the heart.
Methods: Heart samples from hypertensive young and old rats (spontaneously hypertensive rat and stroke prone [SHRSP]; 20 and 52 weeks old, respectively) and normotensive age-matched controls (Wistar-Kyoto [WKY] rats; $n = 6$-10 per group) were used for: (i) chemical analysis of tissue Na^+ content by flame photometry; (ii) gravimetric measurement of water content, as the difference between wet weight (WW) and dry weight (DW); (iii) histologic quantification of GAG content by alcian blue staining (A.B., pH 2.5) of mid-myocardial tissue (A.B. positive area, %).
Results: Myocardial Na^+ content was increased in SHRSP old rats compared to SHRSP young and age-matched WKY (220 ± 22 vs 169 ± 11 and 164 ± 11 mol/gDW, respectively). It was paralleled by an increase in tissue water (76.7 ± 0.9 vs 74.4 ± 1.0 and 73.5 ± 1.5%WW, respectively), but Na^+ accumulation was overall hypertonic relative to the controls (67.5 ± 5.3 vs 58.2 ± 5.7, $P < 0.01$, and 59.3 ± 5.0 mmol/l, $P = 0.01$, respectively). Myocardial GAG increased with aging, but was higher in both SHRSP young and old rats (3.02% and 0.17%) compared to WKY (0.37% and 0.05%).
Conclusion: Tissue Na^+ accumulates in the heart of aged hypertensive animals and is at least in part independent of water. GAG content increases with aging, but to a higher extent in hypertensive animals, and could represent a binding site for myocardial sodium accumulation.
Disclosure: None declared.

O – 14 Investigation of the relationship between serum potassium concentration, 24 h dietary potassium intake and expression of the thiazide-sensitive sodium-chloride cotransporter in patients with hypertension

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Introduction: We advise hypertensive patients to eat fruit and vegetables because a potassium-rich diet can help to lower blood pressure (BP). It is hypothesised that serum and dietary potassium intake regulates BP by altering the expression and activation (phosphorylation) of the thiazide-sensitive sodium-chloride cotransporter (NCC) in the distal nephron. Whilst this has been demonstrated in mice, it is unknown whether this is observed in humans over real-life ranges of serum and dietary potassium intake. Using urine from non-thiazide treated hypertensive patients, we investigated the relationship between serum and 24 hr urinary electrolytes and urinary exosomal expression of NCC.
Methods: Ethics approval, informed consent and sample size calculations were performed (80% power to detect a 2 fold change in NCC, $P < 0.05$). 30 adult primary care patients with hypertension donated spot and 24hr urine samples from which exosomes were isolated. Expression and phosphorylation status of NCC was determined by immunoblotting. Serum and urinary electrolyte analysis were performed by the Biochemistry department at Nottingham University Hospitals National Health Service Trust.
Results: Serum potassium concentration was negatively correlated with NCC phosphorylation status (T53 and T60, $P < 0.05$). Serum chloride concentration was negatively correlated with total-NCC expression ($P < 0.05$). 24h dietary potassium intake did not associate with either serum potassium concentration or NCC expression.
Conclusions: Our study supports that in patients with hypertension not taking thiazides, serum potassium and serum chloride concentrations were inversely related to

NCC phosphorylation state and expression respectively. We could not confirm murine studies suggesting that dietary potassium intake was associated with NCC expression or phosphorylation in humans.
Disclosure: None declared.

O – 15 Economic evaluation of a polypill for the treatment of patients with established or at high risk of cardiovascular disease (CVD): a UK-National Health Service study

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Introduction: 7 million people in the UK have cardiovascular disease (CVD). They are typically prescribed several daily medications and complexity of pill burden compromises adherence. A polypill combining aspirin, statin and anti-hypertensive drugs offers simplification. The use of a CVD polypill was compared to usual care in the UMPIRE (Use of a Multi-drug Pill In Reducing cardiovascular Events) trial. This demonstrated an increase in adherence and reduced lipid and blood pressure levels [1]. We explored the economic impact of introducing a polypill within an NHS setting.
Methods: 336 of 2004 UMPIRE participants were UK National Health Service (NHS) patients. We developed a patient level simulation model to assess the long-term NHS costs and health benefits associated with the introduction of a polypill. We used the Health Survey for England (HSE) 2011 [2] dataset to derive our model population. We also used the HSE dataset to derive the probability of medication adherence in real practice. We modified the probability of adherence for people in the polypill scenario by the relative risk of treatment adherence associated with taking the polypill compared to usual care from UMPIRE data. We estimated the lifetime cost and quality adjusted life years (QALYs) associated with the polypill and usual care scenarios.
Results: NHS use of a polypill offers cost savings of £1,553,386 and a gain of 27 QALYs per 10,000 patients compared to usual care.
Conclusions: A CVD polypill in a NHS setting demonstrates potential large cost savings and health gains.
Disclosures: This presentation presents independent research funded by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-1112-29080). The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.
References:
[1] Thom S, Poulter N, Field J, et al. Effects of a fixed-dose combination strategy on adherence and risk factors in patients with or at high risk of CVD: the umpire randomized clinical trial. JAMA 2013;310(9):918-929.
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O – 16 Transdermal clonidine in difficult-to-treat hypertension patients attending a specialist blood pressure (BP) clinic in the United Kingdom

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Introduction: Transdermal clonidine applied once-weekly may be useful for patients who report difficulty with taking medication daily and/or intolerances to oral medication. We sought to determine the effectiveness of transdermal clonidine in real-world patients with difficult-to-treat hypertension.
Methods: A retrospective analysis of all patients prescribed transdermal clonidine (delivering 100 mcg daily) from Jan 2014 was performed. Data were extracted from electronic pharmacy/healthcare records. Inclusion criteria were clinic systolic blood pressure (SBP) >140 or DBP >90 mmHg; prescription >1month. Exclusion criterion was initiation of another anti-hypertensive medication concurrently with transdermal clonidine.
Results: 36 patients satisfied inclusion/exclusion criteria. Mean age was 57 ± 13 years and 86% were female. Self-reported intolerance was to 3 ± 4 classes of, and 4 ± 3 individual, anti-hypertensive medications. Baseline clinic blood pressure (BP) was $186 \pm 21/101 \pm 13$ mmHg on 4 ± 2 anti-hypertensive medications. Addition of transdermal clonidine TTS-1 (Boehringer Ingelheim GmbH, Germany) was associated with reduction of BP by $23 \pm 33/10 \pm 18$ mmHg ($P < 0.001$; $P = 0.002$ respectively) over mean 18 weeks (range 5-134 weeks). 25 (69%) of patients were deemed to be responders (SBP reduction of >10 mmHg). Transdermal clonidine was stopped for the following reasons: dermatological reactions ($n = 2$); fatigue ($n = 2$); diarrhoea ($n = 1$); headache ($n = 1$); insomnia ($n = 1$); perceived ineffectiveness ($n = 2$); excessive effect ($n = 1$).
Conclusions: These data demonstrate sustained BP lowering efficacy of transdermal clonidine at lowest available dose in patients with significant history of intolerance to

oral anti-hypertensive medication in a specialist setting. There was a robust BP response in >two-thirds patients and adverse event rate of ~25%. These data confirm the potential of transdermal clonidine as an effective non-oral anti-hypertensive formulation that may have utility in specific patient populations with medication intolerance and resistant hypertension.

Disclosure: None declared.

O – 18 Is sympathetic-vascular coupling elevated in humans with hypertension?

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Introduction: Transduction of sympathetic nerve activity (SNA) into vascular tone varies with age and sex. Older normotensive men have reduced sympathetic-vascular coupling, so that a given level of muscle SNA causes less arteriole vasoconstriction. It is not known whether sympathetic-vascular coupling is altered in hypertension.

We hypothesised that sympathetic-vascular coupling is higher in hypertensive men compared to normotensive controls.

Method: 7 untreated hypertensive men (age 52 ± 16 years (mean ± SD), body mass index [BMI] 26.5 ± 4.9 kg/m^2), and 10 normotensive men (age 44 ± 12 years, BMI 24.7 ± 2.5 kg/m^2) were recruited. Muscle SNA was recorded from peroneal nerve using microneurography; beat-to-beat blood pressure (BP) (Finapres, Finometer pro model 1, SmartMedical, UK; Finapres Medical Systems) and heart rate (electrocardiogram [ECG]) were recorded simultaneously at rest for 10 minutes. Sympathetic-vascular coupling was quantified using a previously described method. The relationship between muscle sympathetic nerve activity (MSNA) burst area and subsequent diastolic BP was estimated for each participant with the slope of the regression indicating sympathetic-vascular coupling.

Results: Ambulatory blood pressure monitoring (ABPM) was higher in the untreated hypertensive men: 151/95 ± 27-/19 mmHg compared to controls 124/80 ± 8/6 mmHg. Similarly, muscle SNA was higher in the hypertensive group (69 ± 17 bursts/100 heart beats vs. 42 ± 12 bursts/100 heart bursts; $P = 0.032$).

Sympathetic-vascular coupling was lower in the hypertensive group (0.0366%/mmHg/s vs. 0.1055%/mmHg/s; $P = 0.0083$).

Conclusion: Unexpectedly, hypertensive men had lower sympathetic-vascular coupling compared to normotensive individuals suggesting more sympathetic nerve activity is needed to cause the same level of vasoconstriction. This is not explained by medication but may represent post-junctional receptor down-regulation.

Disclosure(s): Funded by the British Heart Foundation (BHF) (IBSRF FS/11/1/28400).

P – 1 New blood pressure associated loci identified in meta-analyses of 475,000 individuals using the Exome Chip

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Introduction: Genetic association studies have recently identified >400 loci that harbour DNA sequence variation that influences blood pressure (BP). Fifty-six loci were recently published from trans-ethnic Exome-chip meta-analyses with validation in independent samples. However, a further 100 single nucleotide variants (SNV) were identified with suggestive associations with BP from these meta-analyses, which remained of interest.

Methods: Here, we augment the existing sample (~335,000) with 140,886 additional individuals of European ancestry from UK Biobank, in whom 77 of the remaining 100 SNV were available for association analysis with systolic blood pressure or diastolic blood pressure (SBP, DBP) or pulse pressure (PP). We performed two meta-analyses, one comprised individuals of European, South Asian, African and Hispanic descent (pan-ancestry, ~475,000), and the other included only the subset of individuals of European descent (~423,000).

Results: Twenty-one SNV were genome-wide significant ($P < 5x10-8$), of which six are unreported in literature to date. Three SNV highlight novel BP loci: rs9678851 (missense, SLC4A1AP), rs7437940 (AFAP1), and rs1055144 (7p15.2). In addition, we identified three potentially independent BP-associated SNV (rs13303 (missense, STAB1), rs3416322 (missense, SYNPO2L), rs2729835 (missense, LACTB)) at known loci. Two of the new loci and three SNV at known loci are associated with expression levels of nearby genes, and SNV at four loci are associated with other traits.

Conclusions: These new findings yield further new candidate genes for hypertension. Follow-up studies to define the causal variants and genes underlying these associations may highlight novel proteins and pathways to target to lower BP and reduce cardiovascular risk.

P – 2 MicroNRA miR-199a-5p is a marker of blood pressure in premature cardiovascular disease patients homozygous for the methylenetetrahydrofolate reductase (MTHFR) C677T polymorphism

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Introduction: MicroRNA are small, non-coding ribonucleic acid RNA which are potentially valuable markers of cardiovascular disease (CVD) risk, including hypertension. This novel investigation aims to profile circulating serum concentrations of microRNAs in premature CVD patients to identify microRNAs that correlate best with hypertension.

Methods: Serum samples from an existing cohort of 75 premature CVD patients were analysed for expression of 68 CVD-related microRNAs. Patients had been screened for the methylene tetrahydrofolate reductase (*MTHFR*) gene polymorphism C677T, a risk factor for hypertension. Samples had been collected at baseline and following intervention with riboflavin, co-factor for the MTHFR enzyme, as part of a placebo-controlled double-blind, randomized trial. The associations between miRNA expression and blood pressure at baseline and post-intervention were investigated. Comparisons of data between homozygous normal CC and homozygous variant TT *MTHFR* genotype groups, and in response to intervention, were assessed using analysis of variance (ANOVA), Pearson's correlation and corrected t-test statistical analyses.

Results: MicroRNA expression was successfully detected and quantified in all samples. At baseline miR-199a-5p expression was inversely correlated ($r = -0.51$; $P < 0.001$) with blood pressure in patients with the *MTHFR* TT genotype only. The decrease in blood pressure in those TT genotype patients who responded to riboflavin intervention was inversely correlated with miR-199a-5p expression ($r = -0.55$; $P < 0.05$). *In vitro* and *in silico* analysis of miR-199a-5p function was also performed.

Conclusions: This is the first study to identify miR-199a-5p as a potential serum biomarker of blood pressure in a cohort of at-risk CVD patients. We propose that serum profiling of microRNA could aid early prediction of CVD and may lead to improved treatment regimes.

P – 3 Ambulatory blood pressure monitoring (ABPM) in healthy adults stratified by methylenetetrahydrofolate reductase (MTHFR) genotype

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Introduction: The C677T polymorphism in the gene encoding the folate metabolising enzyme methylenetetrahydrofolate reductase (MTHFR) is associated with hypertension. Supplementation with riboflavin (the cofactor for MTHFR) can lower blood pressure (BP) in homozygous individuals (i.e. *MTHFR* 677TT genotype) as demonstrated previously in randomised controlled trials conducted at this centre (McNulty *et al*, 2017). To date, however, studies investigating the association between this genetic risk factor and BP have relied on clinic BP measurements. The aim of this study was to evaluate 24-hr blood pressure patterns and related parameters using ambulatory blood pressure monitoring (ABPM) in adults stratified by *MTHFR* genotype.

Methods: Adults with the homozygous variant TT genotype were age-matched to those with homozygous normal, CC or heterozygous CT genotypes. All participants ($n = 167$) had clinic BP and ABPM measured, in accordance with NICE clinical guidelines (CG127).

Results: Clinic systolic BP was significantly higher in participants with the TT v CC/CT combined genotypes: 134.6 mmHg vs 126.1 mmHg, $P = 0.001$. ABPM parameters were also significantly higher in participants with the TT v non-TT genotypes: 127.5 mmHg vs 124.4 mmHg, $P = 0.052$ for mean daytime systolic BP; 111.6 mmHg vs 107.1 mmHg, $P = 0.006$ for nighttime. Daytime mean arterial pressure ($P < 0.001$) and heart rate ($P = 0.044$) were also significantly

higher in TT compared to CC/CT genotypes. In regression analysis, the TT genotype was found to be a significant determinant of systolic BP by ABPM during daytime ($P = 0.050$) and nighttime ($P = 0.006$), following adjustment for other significant factors, age and male sex.
Conclusions: Using ABPM, this study shows significantly higher BP in adults with the *MTHFR* 677TT genotype and demonstrates for the first time that this common genetic variant is associated with higher mean arterial pressure and heart rate.
Disclosure: This work was funded by Dutch State Mines (DSM) Nutritional Products, Ltd. The support of the Wellcome Trust- Wolfston Northern Ireland Clinical Research Facility is acknowledged.

P – 5 Vascular endothelial growth factor inhibitors (VEGFI) induce endothelial cell activation in cancer patients

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[1]University of Glasgow, Glasgow, United Kingdom

Introduction: Cardiovascular toxicities, especially hypertension, occur in 40% to 60% of patients treated with vascular endothelial growth factor inhibitor (VEGFI) chemotherapy. Underlying molecular mechanisms remain elusive but vascular dysfunction and endothelial injury may be important. We questioned whether patients exhibit features of endothelial cell activation and inflammation following VEGFI chemotherapy.
Methods: Serum and plasma was collected from 25 patients (80% male) before and 1-month after VEGFI chemotherapy at the Beatson West of Scotland Cancer Centre (Glasgow) in 2014-15. 22 patients (88%) had renal cell carcinoma and 3 (12%) had hepatocellular carcinoma. Patients received pazopanib ($n = 21$), sorafenib ($n = 3$) or sunitinib ($n = 1$).
Enzyme-linked immunosorbent assays were performed to measure endothelin-1 (ET-1), vascular cell adhesion molecule 1 (VCAM-1), intercellular adhesion model 1 (ICAM-1), von Willebrand factor (vWF) and plasminogen activator inhibitor type 1 (PAI-1) concentrations before/after VEGFI chemotherapy. Endothelial microparticles were characterised by flow cytometry.
Results: There was a significant increase in mean ET-1 concentration from 4.0 to 6.9 pg/mL after VEGFI chemotherapy ($P = 0.05$). VCAM-1 increased from 1480 to 1809 ng/mL ($P = 0.04$) and ICAM-1 increased from 397 to 527 ng/mL ($P = 0.37$). The number of endothelial microparticles increased from 13 to 22.6 x104/mL ($P < 0.01$). Platelet-derived microparticles reduced from 310 to 176 x104/mL in the post-treatment phase. There were no effects on vWF (1825 to 1744 pg/mL ($P = 0.08$)) or PAI-1 (3.8 to 4.1 ng/mL ($P = 0.75$)).
Conclusions: VGEFI chemotherapy is associated with increased bioavailability of ET-1, a potent vasoconstrictor. Increases in circulating VCAM-1 and endothelial microparticles suggest VEGFI promotes endothelial cell activation. Our findings indicate that VEGFI, which increase blood pressure, induce endothelial injury and inflammation, processes that may contribute to vascular dysfunction and hypertension.
Disclosure: None declared.

P – 6 Intensive blood pressure control and outcomes in hypertensive patients with dysglycemia – Study of Glasgow Blood Pressure (GBPC) Clinic and Systolic Blood Pressure Intervention Trial (SPRINT) data

Andrea Llano[1], Linsay McCallum[2], Anna Dominiczak[2], John Petrie[2], Sandosh Padmanabhan[2]

[1]NHS Greater Glasgow & Clyde, Glasgow, United Kingdom, [2]Institute of Cardiovascular & Medical Sciences, University of Glasgow, Glasgow, United Kingdom

Background: We have previously shown that hypertensive patients who developed early new onset diabetes (NOD) had a 40% higher mortality risk compared to patients with no diabetes or those with late onset NOD. This study tested whether blood pressure control could reduce the excess risk of dysglycaemia in patients without type 2 diabetes.
Methods: Data was available for 4743 patients from the GBPC (Glasgow Blood Pressure Clinic) and 8449 participants from Systolic Blood Pressure Intervention Trial (SPRINT). The outcome was first cardiovascular (CV) event or death in GBPC and primary endpoint in SPRINT (composite of MI, ACS, stroke, heart failure, or cardiovascular death).
Results: In GBPC, baseline blood glucose > 10.9 mmol/L was associated with the primary outcome in the systolic blood pressure (SBP) > 140 group only. In the SPRINT study intensive blood pressure (BP) control neutralized the risk of primary outcomes in the group with glucose > 108 mg/dL. The results are presented in Figure 1.
Clinical Trial Registry: NCT01206062, https://www.sprinttrial.org
Conclusions: Intensive blood pressure control appears to reduce the excess cardiovascular risk associated with dysglycaemia. This highlights the close association between blood pressure and glycaemia in the development of CV

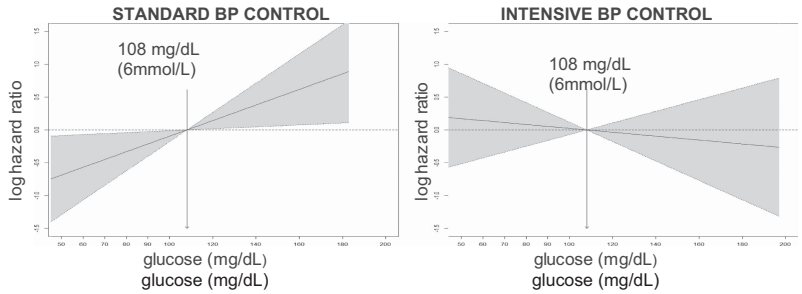

Figure 1. [P – 6]: Risk of SPRINT primary outcome with glucose level, by BP intervention group.

disease and supports consideration of lower bood pressure targets in patients at risk of diabetes.

Disclosure: None declared.

P – 7 Detrimental effect associated with the use of more than three drug classes to achieve blood pressure control in Systolic Blood Pressure Intervention Trial (SPRINT)

Linsay McCallum[1], Andrea Llano[1], Alisha Aman[1], John McClure[1], Alan Jardine[1], Anna F Dominiczak[1], Phil Chowienczyk[2], Sandosh Padmanabhan[1]

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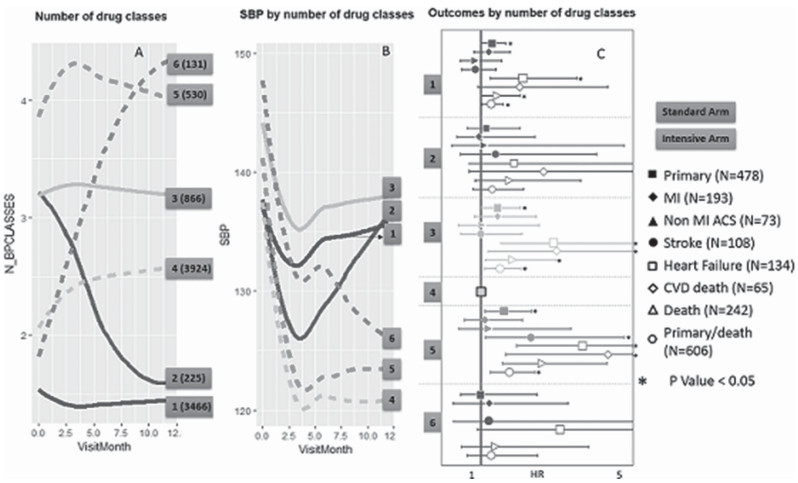
Background: In Systolic Blood Pressure Intervention Trial (SPRINT), achievement of target systolic blood pressure (SBP) in the intensive arm required a higher number of drugs and intensive treatment was associated with an increased incidence of adverse events.
Methods: Number of drug classes prescribed at randomisation and at 1,2,3,6,9,12 months were used to identify distinct trajectory groups in the standard and intensive arm using Latent Class Mixed Modelling, in 8,449 participants. cyclooxygenase -proportional hazards (Cox-PH) models, adjusted for age, sex, SBP (area under curve [AUC] 0-12 months), prevalent cardiovascular disease (CVD), prevalent chronic kidney disease (CKD) and number of drug classes at randomisation, were used to assess the association between drug class trajectories and pre-specified SPRINT outcomes.
Results: The six groups based on the trajectories of drug classes prescribed over the first year are shown in Panel A with corresponding SBP by drug class groups in Panel B. Cox-PH model (reference category: Int-4, SBP < 125 on 2.5 drug classes) showed Std-3(137.8 on 3.2 drug classes) and Int-5(125 on 4 drug classes) had significantly higher risk of

Figure 1:



Panel A: Drug class trajectory groups, Panel B: Blood pressure by trajectory group, Panel C: Cardiovascular outcomes by trajectory group

the primary outcome, heart failure, CVD death and all-cause death (Panel C).
Conclusions: Within SPRINT, treatment with >3 antihypertensive drug classes was associated with overall poor outcomes, specifically increased risk of death and heart failure, independent of blood pressure achieved in the first year.
Clinical Trial Registry: NCT01206062, https://www.sprint-trial.org.
Disclosure: None declared.

P – 8 Serum chloride and adverse cardiovascular events in the Anglo Scandinavian Cardiac Outcomes Trial (ASCOT)

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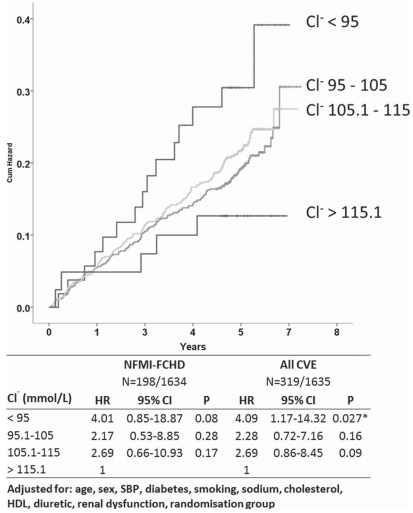
Background: Data suggests that lower serum chloride (Cl^-) is associated with higher mortality and cardiovascular risk in populations with hypertension, heart failure or chronic kidney disease (CKD). We tested the association between serum Cl^- and cardiovascular outcomes in the Anglo-Scandinavian Cardiac Outcomes Trial (ASCOT) Blood Pressure-Lowering Arm.
Methods: Serum Cl^- was measured at baseline in 319 participants from ASCOT with a cardiovascular event (CVE) and 1361 controls, matched for age and sex. Primary outcome was a composite of fatal and non-fatal MI, stroke and heart failure. Subjects were grouped into four categories based on Cl^- levels ($Cl^- <= 95$; 95.1-105; 105.1-115; >115.1 mmol/L). Kaplan-Meier (KM) and cyclooxygenase Proportional Hazard models, adjusted for age, sex, body mass index (BMI), systolic blood pressure (SBP), smoking, diabetes, cholesterol, Na^+, use of diuretics and randomisation group, were used to explore the multivariate adjusted association between baseline Cl^- and CVE.
Results: Group Cl^- <95 mmol/L had a greater proportion of females (24.1 vs 11.9%; p 0.02) than those with Cl^- >115.1, were slightly older (67.8[7.7] vs 65.3[7.5] years; p 0.01), had lower Na^+ (139[5] vs 142[3] mmol/L; $P < 0.01$), and were more likely to be taking a diuretic (66.3 vs 28.9%; $P < 0.01$). Cl^- <95 mmol/L was associated with an increased risk of a CVE (hazard ratio 4.09[95% CI 1.17-14.32; p 0.03] independent of Na^+ (1.01[0.97-1.5]; p 0.80) or diuretic use (1.13[0.89-1.42]; p 0.31) compared to those with Cl^- >115.1 mmol/L (Figure 1).



	NFMI-FCHD N=198/1634			All CVE N=319/1635		
Cl^- (mmol/L)	HR	95% CI	P	HR	95% CI	P
< 95	4.01	0.85-18.87	0.08	4.09	1.17-14.32	0.027*
95.1-105	2.17	0.53-8.85	0.28	2.28	0.72-7.16	0.16
105.1-115	2.69	0.66-10.93	0.17	2.69	0.86-8.45	0.09
> 115.1	1			1		

Adjusted for: age, sex, SBP, diabetes, smoking, sodium, cholesterol, HDL, diuretic, renal dysfunction, randomisation group

Figure 1. [P – 8]: Risk of SPRINT primary outcome with glucose level, by BP intervention group.

Conclusions: In the ASCOT study, serum chloride less than 95 mmol/L was associated with greater risk of cardiovascular events, independent of serum sodium or diuretic use.
Clinical Trial Registry: www.ascotstudy.org
Disclosure: None declared.

P – 9 Glyceryl trinitrate lowers blood pressure and blood pressure variability in acute stroke patients presenting with lacunar syndromes

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Background: Lacunar syndromes (LACS) are a common acute stroke presentation with differing aetiologies to cortical and posterior syndromes. Increased blood pressure (BP) and blood pressure variability (BPV) are associated with poor outcome after stroke. We assessed the haemodynamic effects of the nitric oxide donor glyceryl trinitrate (GTN) on acute stroke patients presenting with LACS.
Methods: The Efficacy of Nitric Oxide in Stroke (ENOS) trial randomised 4011 patients with acute stroke and raised systolic BP (140-220 mmHg) to transdermal GTN or no GTN within 48 hours of onset. LACS was defined clinically using the Oxfordshire Community Stroke Project classification. Haemodynamic parameters were measured at baseline and days 1-7. Between-visit BPV was defined as the standard deviation of systolic BP over days 1 to 7. Data are mean difference (MD) with 95% confidence intervals (CI). Analyses were adjusted for baseline prognostic factors.
Results: Baseline BP was similar in LACS ($n = 1342$) and non-LACS ($n = 2509$) participants (167/90 vs. 167/89 mmHg). Overall, BPV did not differ between LACS and non-LACS

presentations. In LACS, GTN lowered BP at day 1 by 7.9/3.8 mmHg compared with no GTN ($P < 0.001$), and in non-LACS by 6.4/3.4 mmHg ($P < 0.001$). In LACS, GTN lowered BPV compared with no GTN (MD -0.67, 95%CI -1.31 to -0.02, $P = 0.042$); a non-significant tendency towards reduced BPV with GTN was seen in non-LACS (MD -0.08, 95% CI -0.58 to 0.43, $P = 0.77$).

Conclusions: GTN lowers BP and between-visit BPV in acute stroke patients presenting with LACS. Agents that reduce BPV may be of benefit in acute stroke and warrant further investigation.

Clinical Trial Registry: ENOS trial registration: ISRCTN99414122, ENOS trial website: http://www.enos.ac.uk

P – 10 Transdermal glyceryl trinitrate does not cause precipitous changes in blood pressure in dehydrated acute stroke patients

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[1]Stroke Trials Unit, University of Nottingham, Nottingham, United Kingdom, [2]Division of Respiratory Medicine, University of Nottingham, Nottingham, United Kingdom

Background: High blood pressure (BP) is common in acute stroke and associated with poor outcome. Antihypertensive agents have accentuated vasodepressant effects in dehydrated patients. We assessed the effect of transdermal glyceryl trinitrate (GTN) on BP in the context of hydration status using data from the Efficacy of Nitric Oxide in Stroke (ENOS) trial.

Methods: ENOS randomised 4011 patients with acute stroke and raised systolic blood pressure (SBP) to transdermal GTN patch or no GTN within 48 hours of onset. The primary outcome was functional outcome (modified Rankin Scale, mRS)[1] at day 90. Blood markers of dehydration at baseline were collected at two sites ($n = 310$). Urea and urea:creatinine ratio were split into equal tertiles for comparison with outcome.

Results: In those randomised to GTN, increased baseline urea and urea:creatinine ratio were associated with an increase in diastolic BP from day 0 to 1; a relationship not seen with systolic BP or heart rate. No associations were noted between dehydration markers and hypotension, hypertension or headache by day 7, or change in BP from baseline to day 1. The highest tertile of urea (>6.9 mmol/L) was associated with less neurological improvement at day 7 ($P = 0.017$) and an unfavourable shift in mRS at day 90 (odds ratio 1.81, 95% confidence interval 1.07-3.08, $P = 0.028$) as compared with lower tertiles.

Conclusions: Transdermal GTN was safe in dehydrated acute stroke patients with no precipitous changes in BP noted. Increased baseline urea was associated independently with poor early and late outcome after acute stroke.

Clinical Trial Registry: ENOS trial registration: ISRCTN99414122, ENOS trial website: http://www.enos.ac.uk

Disclosure: None declared.

References: [1] Lees, K.R., *et al.*, Contemporary outcome measures in acute stroke research: choice of primary outcome measure. Stroke 2012. 43(4): 1163-70.

P – 11 Inappropriate sinus tachycardia-long term experience with Ivabradine

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Introduction: Inappropriate sinus tachycardia (IST) is characterised by tachycardia at rest, frequently associated with a marked increase in sinus rate with minimal activity. Symptoms include awareness of heart beat, palpitations including dizziness, fatigue, weakness or pre-syncope. Treatment to date has consisted primarily of beta blockers, with occasional use of ablation procedures, however, treatment is frequently ineffective or poorly tolerated.

Aims: The effectiveness of Ivabradine (a selective I*f* channel blocker, a pure heart rate lowering agent), in the treatment of IST was evaluated in a prospective open label fashion. All patients remained symptomatic, despite the use of maximally tolerated doses of beta blockade.

Methodology: Seventeen patients were diagnosed with IST following exclusion of alternative causes of tachycardia (electrocardiogram [ECG], echocardiogram/stress echocardiogram, Holter monitor (Welch Allyn, Skaneatales Falls, New York, USA.), thyroid stimulating hormone (TSH), plasma metanephrines and routine haematology and biochemistry) All patients remained symptomatic. Patients were aged between 27 and 73 years (average age 48 years). Resting blood pressures were between 110/70 mmHg and 160/100 mmHg, with resting pulse rates between 94 and 120 beats per minute, despite beta blockade.

Results: All patients received Ivabradine (average dose 5 mg bd, range 2.5 to 7.5 mg bd). Two patients ceased Ivabradine at three months, one because of tiredness and a second because of tiredness and bradycardia. A third patient underwent ablation therapy at 15 months. The remaining 14 patients have been followed for an average of 53 months (range 12 to 90 months). The achieved pulse rates have been between 60 and 82 beats per minute (average 72), with achieved blood pressures between 110/70 and 140/80, in all patients. Five patients also received a beta blocker, and one received Digoxin.

Conclusion: Ivabradine, a selective If channel blocker, which has a specific heart rate lowering action, is an effective, safe and well tolerated long term treatment in patients with IST.
Disclosure: None declared.

P – 12 Central pressure and cardiac effects of dietary nitrate from beetroot juice in people with or at risk of type 2 diabetes: the randomised, controlled VaSera trial

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Introduction: Dietary nitrate, via nitrite-nitric oxide, reduces blood pressure (BP) in acute studies; chronic trials so far last only 4 weeks with few patients. Arterial stiffening (AS) as aortic pulse wave velocity (PWV) is a powerful index of cardiovascular mortality, independent of BP.
Aim: We tested if nitrate in beetroot juice would reduce AS independently of change in BP in people with or at risk of type 2 diabetes (T2D).
Methodology: 126 patients were randomised, double-blind to active (nitrate containing) or placebo (nitrate free) beetroot juice (⩽11 or 0 mmol) daily over 24 weeks. AS was measured by the nominally BP-independent cardio-ankle vascular index (CAVI) and as aortic PWV; BP and augmentation were also measured. 2D echocardiography was assessed in a subgroup ($n = 87$). Intention-to-treat analysis was adjusted for BP where appropriate.
Results: There were no differences between active and placebo juices in change in peripheral BP, nor in change in AS, as CAVI or aortic PWV ($P > 0.8$), despite plasma nitrate and nitrite concentrations increasing 4- and 2-fold ($P < 0.001$ and 0.02). However, on active nitrate-containing juice, central systolic BP decreased (mean[95%CI] −2.6[−4.5,−0.8]mmHg, $P = 0.007$), consistent with our previous findings of normoxia-dependent conduit artery dilatation after inorganic nitrite. Left ventricular (LV) end diastolic and systolic volumes increased (−6.3[−11.1,−1.6]mL and −3.2[−5.9,−0.5]mL, $P < 0.05$) as did end diastolic mass/volume ratio (0.04 [0, 0.7] g/mL, $P < 0.05$) on active juice.
Conclusion: Despite not reducing arterial stiffness independently of BP change, selective reduction in central BP on dietary nitrate may have greater impact than peripheral BP for managing cardiac and vascular risk.

P – 13 Improved skeletal muscle oxygen consumption following 6 months of endurance training measured using near-infrared spectroscopy (NIRS)

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Introduction: Skeletal muscle metabolic function is known to respond positively to exercise interventions. Developing non-invasive techniques that quantify metabolic adaptations and identifying interventions that impart successful response are ongoing challenges for research.
Methods: 60 healthy non-athletic adults (18-35 years old) were enrolled in a study investigating physiological adaptions to a 6-month period of endurance running with the objective of completing their first marathon. At baseline participants underwent measurements of skeletal muscle volume oxygen consumption ($muscleVO_2$) using near-infrared spectroscopy (NIRS) during arterial occlusions. Local $muscleVO_2$ was compared to cardio-pulmonary peak volume oxygen consumption ($peakVO_2$) measured by analysis of expired gases. All measurements were repeated at follow-up and compared to marathon completion time.
Results: Skeletal muscle oxygen consumption at peak exercise is positively correlated with cardio-pulmonary $peakVO_2$ ($r_{partial} = 0.34$, $P = 0.02$). Muscle oxygen consumption significantly increased at follow-up ($P < 0.01$) despite no significant changes in cardio-pulmonary $peakVO_2$ ($P = 0.81$). Faster marathon completion time correlated with cardio-pulmonary $peakVO_2$ ($r_{partial} = -0.55$, $P < 0.01$) but not $muscleVO_2$ ($r_{partial} = 0.22$, $P = 0.30$).
Conclusions: Skeletal muscle metabolic adaptions occur following 6 months of endurance training and can be identified non-invasively using NIRS. Although the cardio-pulmonary system is limiting for running performance, skeletal muscle changes can be detected despite no significant improvement in cardio-pulmonary function.
Disclosure: This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

P – 14 Frequency-based measures of near-infrared spectroscopy (NIRS) and systolic blood pressure demonstrate position-dependent cerebral autoregulation mechanisms in older adults: results from the irish longitudinal study on ageing (TILDA)

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Introduction: The coupling between central blood pressure and cerebral blood flow (CBF) is maintained via cerebral autoregulation (CAR) mechanisms. As we age, our cardiovascular system changes. The effects this produces on the autoregulation mechanisms are complex, and not well understood. Here we aim to interrogate mechanisms of autoregulation in ageing using systolic blood pressure (SBP) and compare cerebral blood flow during supine and standing phases.
Methods: Data ($N = 2047$) from The Irish Longitudinal Study on Ageing (TILDA) were used. All respondents were aged 50+. Beat-to-beat blood pressure was measured using a Finometer during supine rest and standing, and coupled with CBF using NIRS (frontal lobe tissue saturation index, TSI). TSI was separated into low-frequency and high-frequency signals using a 2- second median filter. Standard deviation across 30 s of data was calculated during supine rest, 60 s-30 s before standing, and 60 s-90 s after stand. Outlier points were removed by calculating quantile levels. TSI variability was regressed against mean SBP levels in these intervals, with covariates of age, sex, height and weight.
Results: During rest, low frequency TSI variability (variations in average TSI levels) was not associated with SBP, but was negatively associated with SBP during standing ($P < 0.005$). High frequency TSI variability (cerebral pulse magnitude) had a strong positive association with SBP in both supine ($P < 0.01$) and standing ($P < 1e\text{-}6$) positions.
Standing considerably increased coupling effects.
Conclusion: Metrics of high and low-frequency cerebral blood flow were extracted from TSI, and separate position-dependent relationships with systolic blood pressure were determined, demonstrating multiple mechanisms at work in CAR. These relationships are important in understanding cardiovascular ageing.
Disclosure: None declared.

P – 15 Generalisability of Systolic Blood Pressure Intervention Trial (SPRINT) ≥ 75 for adverse events in community dwelling individuals

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Background: The ⩾ 75 years subgroup analysis of Systolic Blood Pressure Intervention Trial (SPRINT) did not find a difference in injurious falls with an intensive systolic blood pressure (BP) lowering strategy. Whether similar injurious falls rate might be expected outside of a clinical trial context merits consideration.
Methods: We assessed the generalizability of SPRINT for those aged ⩾ 75 using data from the Irish Longitudinal study on Ageing (TILDA), a prospective cohort study representative of the population over 50 years. We subsequently report the prevalence of outcomes of interest over follow up in community dwelling individuals aged ⩾ 75 years meeting inclusion for SPRINT at a mean follow up of 3.4 years.
Results: We found that approximately 25.9% ($N = 1401$ of the community dwelling TILDA health assessment participants aged over 50 years met final inclusion for SPRINT. 27.3% of those aged ⩾ 75 meeting final inclusion for SPRINT reported an injurious fall at follow up, (compared to 5.5% in the standard care arm of SPRINT). Orthostatic Hypotension (OH) in those meeting inclusion for SPRINT ⩾ 75 measured by standard clinic methodology was present at baseline (wave 1) in 12.33% but when assessed by the finometer at 40 seconds after standing this rose to 36.2%.
Conclusions: Injurious falls appeared to be at least 5 times more common in community dwelling individuals than that observed in the standard care arm of SPRINT over similar temporal follow up. SPRINT ≥ 75 may not be reliable for generalisation of the falls risk associated with intensive systolic blood pressure (SBP) lowering to community dwelling older people.
Disclosure: None declared.

P – 16 Serum chloride is a mortality risk predictor in type 2 diabetes mellitus–analysis of 91,159 patients in the West of Scotland

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Objective: Low serum chloride (Cl^-) is associated with increased risk of death in those with heart failure (HF), hypertension or chronic kidney disease (CKD). We sought to investigate the association of serum Cl^- with risk of cause-specific death in adults with type 2 diabetes mellitus (T2DM).
Methods: Data were available for 91,159 adults from the West of Scotland with T2DM with 10 years follow up. Two groups were created: $Cl^- < 100$ and $Cl^- \geq 100$ mmol/L. Cyclooxygenase proportional hazard models, adjusted for age, sex and sodium (Na^+), were used to assess the association between Cl^- and risk of death (all-cause mortality, vascular death, death from myocardial infarction (MI), HF, stroke and cancer).
Results: 13,459 patients had $Cl^- < 100$ mmol/L; median age 62.5 (IQR 50.9-73.1) years; median Na+ 136 (133-138) mmol/L. 77,757 patients had $Cl^- \geq 100$ mmol/L; median age 61.2 (IQR 50.2-71.4) years; median Na^+ 139 (IQR 138-141) mmol/L. $Cl^- < 100$ mmol/L was associated with a 44% increased risk of all-cause mortality ($N = 20,304$, heart rate (HR) 1.44[95% CI 1.38-1.49]; $P < 0.0001$), independent of Na^+ (Figure 1). The increased mortality risk of $Cl^- < 100$ mmol/L was observed for all-vascular death ($N = 6,323$, 1.41[1.31-1.51]; $P < 0.0001$); death from MI ($N = 1,986$, 1.42[1.25-1.60]; $P < 0.0001$); stroke ($N = 1,590$, 1.24[1.08-1.42]; p 0.003); HF ($N = 200$, 1.38[0.95-2.0]; p 0.09); cancer ($N = 5,577$, 1.12[1.04-1.21]; p 0.003).
Conclusions: $Cl^- < 100$ mmol/L was associated with increased risk of death in T2DM.
Disclosure: None declared.

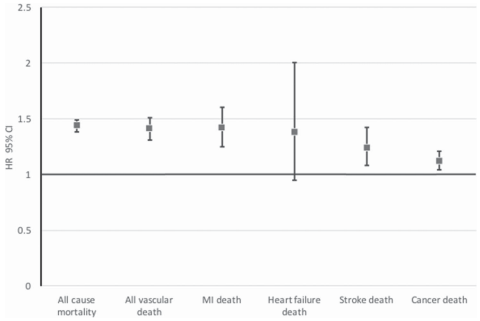

Figure 1. [P – 16]: Serum chloride < 100 mmol/L and risk of mortality.

P – 17 Serum sodium concentration and the risk of cardiovascular disease: a large community-based cohort study

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Introduction: Reducing dietary salt lowers both blood pressure and cardiovascular risk. The mechanisms underlying the adverse effects of high salt intake are incompletely understood, but parallel increases in serum sodium (SNa) may be of importance. However, very few studies have investigated the association between SNa and cardiovascular disease (CVD).
Methods: This was a retrospective cohort study using the Royal College of General Practitioners Research and Surveillance Centre database. Data collected between April 2005 - March 2015 was extracted, and the baseline period was defined as before April 2010. The primary outcome was incident CVD (myocardial infarction, acute coronary syndrome, coronary revascularisation, stroke or heart failure diagnosis) during the 5-year follow-up period. Exclusion criteria were: age less than 40, diabetes mellitus, prior CVD event, end-stage renal disease and liver cirrhosis.
Results: 146,020 individuals were included in the study. A SNa of 137 mmol/L or less at baseline was associated with increasing age, female gender, hypertension, and prescription of cardiovascular medications including diuretics. After multivariate adjustment for confounding factors, there was a significant 'J-shaped' relationship between SNa and CVD. No linear association between increased SNa and blood pressure was demonstrated.
Conclusions: To our knowledge, this is the largest study to investigate the relationship between SNa and CVD. The association was greatest with lower SNa, and was such that the risk increased at concentrations well within the normal physiological range (140 mmol/L or less). Both lower and higher SNa may be a useful indicator for the future development of CVD.
Disclosure: None declared.

P – 18 Hypertension: its prevalence and association with obesity among indigenous adolescents of Sarawak, Malaysia

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Introduction: The association between obesity and hypertension has been largely reported in adult population, but limited for adolescents, particularly in Sarawak.
Aim: The objective of this study is to determine the prevalence of hypertension and its association with obesity among indigenous adolescents aged 12-17 years in Sarawak.
Methodology: It was a cross-sectional using questionnaire, anthropometric and blood pressure measurement. Using a systematic sampling procedure, a total of 18 secondary schools representing urban and rural from 11 divisions of Sarawak were selected. Data was analyzed using Statistical Package for Social Sciences Program (SPSS) version 22.0 (IBM Corp. Armonk, NY, 2013).
Results: A total of 1780 secondary school children participated in the study with 58.9% females and 20.1% reported at least one of the parents with history of hypertension. The prevalence of pre-hypertension was 13.4%, stage 1 hypertension was 13.5% and stage 2 hypertension was 4.7%. The prevalence of overweight and obesity was 24.4%, elevated waist circumference was 13.4, and overfat and obese was 6.2%. The prevalence of hypertension among male respondents was 23.9%, female respondents was 14.1%. In multiple logistic regression, adjusting for age and family history, hypertension was associated with sex (males) (OR = 3.20, $P < 0.000$), ethnic group (ref = Iban, Malay, OR = 0.72, $P = 0.015$; Bidayuh, OR = 0.65, $P = 0.019$), overweight and obese (OR = 3.311, $P < 0.000$), elevated waist circumference (OR = 2.15, $P < 0.000$), overfat and obese (OR = 2.08, $P = 0.004$).
Conclusion: Hypertension and obesity in this population is highly prevalent. Screening blood pressure and assessment of nutritional status can be recommended as the routine health assessment in school health programme to detect and provide early intervention to those at risk of hypertension.
Disclosure: None declared.

P – 19 Height2.7 is not an appropriate index for left ventricular mass in healthy adolescents. Sex differences in left ventricular mass indexation

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Introduction: Left ventricular (LV) mass is an important predictor of cardiovascular risk. In adolescence LV mass is conventionally indexed to height$^{2.7}$; although evidence in adults suggests that this may not fully account for sex differences. We aimed to identify appropriate allometric scaling of LV mass in a large population-based sample of healthy adolescents.
Methods: 2068 adolescents (17 ± 1yrs) underwent echocardiography to assess LV mass. Lean mass was determined by dual-energy X-ray absorptiometry. Allometric relationships were determined by linear regression in samples pooled and stratified by sex following log transformation of x and y variables (log(y) = a+b*log(x)), where b is the allometric exponent.
Results: The allometric exponent relating LV mass to height was 2.68(2.51, 2.85) [mean (95% confidence interval)] which was very close to the conventional estimate of 2.7. However, when analyses were performed in males and females separately the exponent was 1.66(1.30, 2.03) in males and 1.58(1.27, 1.90) in females. LV mass showed a linear relationship with lean body mass but was 14.2(10.4, 18.0)g higher in females resulting in a biased estimate of slope when both sexes were pooled.
Discussion: Indexing to height$^{2.7}$ is not appropriate in adolescent men or women and is biased as a consequence of pooling data from both sexes. Both sexes also show differences in their association with lean body mass, which cannot be used as a 'gender-blind' index for normalization of LV mass. These observations have important implications for the appropriate indexation of LV mass and identification of young individuals with LV hypertrophy.
Disclosure: None declared.

P – 20 Resting-state cerebral haemodynamics and the quantitative effect of cardiovascular risks in the Irish population

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Introduction: Cardiovascular disease can increase the risk of cerebral hypoperfusion, increasing the risk of cognitive decline and dementia. This study sought to examine the effect of age and sex on perfusion levels in the brain via near infra-red spectroscopy (NIRS) in a large population, and to quantify the impact of cardiovascular risks on the brain.
Methods: Cross-sectional data from The Irish Longitudinal Study on Ageing (TILDA), a nationally representative sample of adults aged 50 and over, was examined ($n = 3104$). During 5 minutes of supine rest oxygenated haemoglobin (O2Hb), deoxygenated haemoglobin (HHb) and tissue saturation index (TSI) were continuously

measured from the frontal lobe with non-invasive single channel NIRS, along with beat-to-beat blood pressure (BP). Data from the final minute was analysed via multivariate linear regression models.
Results: O2Hb, HHb and TSI were significantly lower with increasing age when adjusted for sex, education and height. O2Hb and HHb were lower in males than females. Lower O2Hb was also associated with current and past smokers, diabetes and congestive heart failure. Lower TSI was associated with current smokers, diabetes, angina and heart attack. Models accounted for stroke, TIA, hypertension, high cholesterol, arrhythmias, and BP.
Conclusion: Resting-state cerebral haemoglobin levels as obtained from one minute of NIRS data identifies an age and sex gradient which should be taken into account during interpretation of perfusion levels in the brain. The relative effect of cardiovascular risks and health behaviours on the perfusion levels in the frontal lobe has been quantified in a large population.
Disclosure: None declared.

P – 21 Characterisation of aortic stiffness in end-stage renal disease with cardiovascular magnetic resonance imaging: relation to cardiac remodelling

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Introduction: Increased left ventricular mass index (LVMI) is an established biomarker for cardiovascular mortality in end-stage renal disease (ESRD). Aortic stiffness (AoS), a novel biomarker for mortality, leads to increased LVMI through disruption of arterio-ventricular coupling. Cardiovascular magnetic resonanace imaging (MRI) is the gold-standard for LVMI quantification and can quantify AoS directly, with aortic distensibility (AD), or indirectly, with aortic pulse-wave velocity (aPWV). We hypothesised that MRI-derived AoS measurements would be independently predictive of LVMI in ESRD.
Methods: 63 patients underwent 3-Tesla MRI scanning (Skyra, Siemens Medical Imaging, Erlangen, Germany). Blinded scans were analysed for left ventricular mass (LVM; indexed to body surface area), aPWV, ascending aortic distensibility (AAD) and descending aortic distensibility; (DAD). Correlations and multivariable regression analysis for each parameter were performed.
Results: Three scans were unanalysable; 60 patients (42 male) were included. Median age = 59.0 (44.8,69.0) and median haemodialysis vintage = 18.5 months (8.3,49.5). AAD ($r = -0.273$), DAD ($r = -0.413$), aPWV ($r = 0.301$) and systolic blood pressure (SBP) ($r = 0.595$) significantly correlated with LVMI ($P < 0.05$). There were no significant associations with LVM/volume ratio. Table 1 demonstrates multivariate associations of LVMI with stiffness variables.
Conclusions: AoS measures are predictive of LVMI, but not independent of SBP. These results question the additive value of measuring aortic stiffness and emphasises the importance of controlling blood pressure (BP) in ESRD.

Table 1 [P-21] Multivariable regression models to assess the ability of aPWV, AAD and DAD in predicting LVMI

Variables	*Model 1*	*Model 2*
aPWV (m/s)	0.435 (0.093,0.535)†	0.163 (-0.047,0.373)
AAD (x10mmHg^{-3})	-0.147 (-0.262,-0.033)*	0.027 (-0.111,0.164)
DAD (x10mmHg^{-3})	-0.198 (-0.316,-0.079)*	0.002 (-0.188,0.110)

β coefficients (95% confidence interval); Model 1: adjusted for age, cardiovascular disease, diabetes mellitus; Model 2: model 1+ systolic blood pressure. aPWV = aortic pulse-wave velocity; AAD = ascending aortic distensibility; DAD = descending aortic distensibility;.
*$P < 0.05$,
†$P < 0.01$.

Disclosure: None declared.

P – 22 Young Black African women show exaggerated pressor responses to environmental stressors relative to young Black African men which may predispose them to hypertension

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Introduction: In Western countries, the prevalence of hypertension is greater in those of Black African (BA), than White European (WE) ethnicity and greater in BA women than men. Exaggerated pressor responses to environmental stressors and endothelial dysfunction have been implicated in hypertension.

Methods: In 16 male and 12 female BAs (18-26 years), we recorded mean arterial pressure (MAP) by finger photoplethysmography and forearm blood flow (FBF) by venous occlusion plethysmography following (i) arterial occlusion for 2 min (reactive hyperaemia) and (ii) 5 sound stress stimuli (S1-S5; 100 dB, 2KHz, for 30 s each at 5-10 min

intervals). Forearm vascular conductance (FVC) was calculated as FBF/MAP.
Results: By sphygmomanometry, resting systolic, but not diastolic pressure was higher in male than female BAs (114.7 ± 3.5 vs 102.1 ± 2.1*mmHg, *: $P < 0.05$ and 68.0 ± 1.5 vs 66.1 ± 1.9 mmHg respectively). However, reactive hyperaemia was similar in male and female BAs: peak change (Δ) in FVC: +0.37 ± 0.03 vs +0.35 ± 0.04 conductance units (CU). Further, before S1, MAP was higher in males than females (89.7 ± 3.3 vs 77.8 ± 4.4*mmHg), but in males, S1-S5 had little effect on MAP: ΔMAP -2.36 ± 2.0 vs +1.2 ± 2.1 mmHg in S1 and S5 respectively, whereas in females, ΔMAP progressively increased from +6.0 ± 1.5* in S1 to +13.4 ± 3.4 §mmHg in S5 (§: S1 vs S5: $P < 0.05$). Further, S1-S5 evoked forearm vasodilatation in males, but vasoconstriction in females (S1: ΔFVC: +0.02+0.01CU vs -0.01 ± 0.004CU).
* indicates $P < 0.05$
Conclusion: In young adult BA women, endothelium-dependent reactive hyperaemia, is not blunted relative to BA men, but BA women show exaggerated pressor responses to repeated environmental stressors which may predispose them to greater prevalence of hypertension.
Disclosure: None declared.

P – 23 Effects of isometric handgrip training (IHG) training on endothelium-dependent vasodilatation in older (O) men: contribution of cyclooxygenase (COX) products

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Introduction: Isometric handgrip training (IHG) training reduces arterial blood pressure (ABP), especially in hypertensives. We recently reported IHG training enhances endothelium-dependent dilatation in healthy young (Y) men (18-25 years); effects in older men (O: 55-70 years) are unknown.
Methods: 10 recreationally-active O men undertook 4 weeks IHG training: 4x3min contractions at 30% Maximum voluntary contraction (MVC), 5 min intervals, 4 days/week for comparison with data from 10 Y. Cutaneous red cell flux was recorded from the non-trained arm following arterial occlusion for 3 min (reactive hyperaemia) and Acetylcholine iontophoresis (ACh, 8x20s pulses: 7x100μA, 1x200μA, 60 s intervals).
Results: IHG training increased MVC in the trained arm only (O:26.8 ± 1.3 vs 30.1 ± 1.4§, Y:29.0 ± 1.3 vs 33.5 ± 1.5§Kg; §:$P < 0.01$). IHG training decreased mean ABP in O only (O: 90.81 ± 2.67 vs 86.48 ± 2.67§mmHg; Y:88.03 ± 0.92 vs 89.37 ± 0.88 mmHg). Before IHG training, peak reactive hyperaemia was smaller in O (O:53.0 ± 2.4*, Y:70.1 ± 2.5 perfusion units (PU),*:O vs Y, $P < 0.01$). Reactive hyperaemia was augmented by COX inhibition (aspirin; 600 mg p.o.) in O, attenuated in Y (O:62.8 ± 2.1†; Y:58.8 ± 2.6†PU, †:COX effect, $P < 0.05$). Similarly, ACh evoked smaller dilatation in O; COX inhibition had no effect in either (O:117.4 ± 4.3* vs 108.8 ± 4.2; Y:172.3 ± 5.2 vs 168.5 ± 4.5 PU). IHG training enhanced reactive hyperaemia in O and Y; it was further augmented by COX inhibition in O, not Y (O:61.6 ± 2.5§ vs 69.9 ± 2.2†PU; Y:76.7 ± 2.3§ vs 77.2 ± 3.6). ACh-induced dilatation was unchanged, but augmented by COX inhibition (O: 131.8 ± 4.7 vs 158.7 ± 5.1†PU; Y: 177.2 ± 4.1 vs 211.8 ± 5.2†PU).
Conclusions: In older normotensive men, IHG training lowers resting ABP and augments endothelium-dependent dilator capacity, possibly by increasing NO availability.
Disclosure: None declared.

P – 24 Pulse wave amplitude analysis: a novel technique for measuring flow-mediated dilatation

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Introduction: Brachial Artery Ultrasound Imaging (BAUI), measuring flow-mediated dilatation (FMD), is an established in vivo research model of endothelial dysfunction, but technical challenges limit its clinical application. A novel tonometric alternative, Pulse Wave Amplitude Analysis (PWAA), derives FMD via an automated algorithm, and may be a useful biomarker of subclinical cardiovascular disease. We investigated PWAA-FMD reproducibility and its concordance with BAUI-FMD in healthy males.
Methods: Ethical approval was obtained for a three-visit validation study. Two blind-operators measured morning PWAA-FMD, with Everist's AngioDefender™ (Everist Health Inc. Ann Arbor, Michigan, USA), and BAUI-FMD, observing international consensus BAUI-FMD measurement guidelines, in visits one and two, but only afternoon PWAA-FMD in visit three. We determined PWAA-FMD inter-operator (visit1) and intra-operator (visits 1 and 2) repeatability using Intraclass Correlation Coefficient (ICC). Paired T-Tests were used to assess PWAA-FMD diurnal variation. BAUI-FMD and PWAA-FMD agreement was analysed via Bland-Altman plot.

Results: 18 healthy male volunteers (mean age = 31 years ± 9.1) completed the study. 82% of PWAA-FMD readings were within manufacturer-defined range for endothelial integrity (FMD > 10%). ICCs for PWAA-FMD inter-operator and intra-operator repeatability were 0.75 ($P = 0.001$) and 0.43 ($P = 0.032$), respectively. Mean afternoon PWAA-FMD was significantly lower than morning (visit2) PWAA-FMD (mean difference = 3.2%, $P = 0.021$). Bland-Altman analysis showed a bias of -4% ($P = 0.003$, 95% limits of agreement −13.6 to 5.7).

Conclusion: PWAA-FMD assessment is feasible in healthy male volunteers and has reasonable single-session inter-operator repeatability, but may overestimate BAUI-derived FMD. This difference may be within clinically acceptable limits but requires additional validation work in high-risk groups. PWAA-FMD diurnal rhythm was notable.

Disclosure: None declared.

P – 25 Do prostaglandins contribute to endothelium-dependent vasodilatation or muscle vasodilator responses to environmental stressors in Young Black African or White European women?

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Introduction: Reactive hyperaemia and forearm vasodilatation evoked by stressors are blunted in Black Africans (BA) relative to White Europeans (WE); the contribution of Nitric Oxide (NO) is impaired. We recently reported that in young BA men, vasodilator prostaglandins (PG) contribute to stressor-induced forearm vasodilation, but not reactive hyperaemia, whereas in young WE men, PG contribute to reactive hyperaemia only. The role/s of PG in BA and WE women are unknown.

Methods: In 8 BA and 9 WE women (18-26 years), we recorded mean arterial pressure (MAP) by finger photoplethysmography, forearm blood flow (FBF) by venous occlusion plethysmography following arterial occlusion for 2 min (reactive hyperaemia) and 5 sound stressors (S1-S5; 100 dB, 2KHz, 30 s at 5-10 min intervals), after placebo, or cyclooxygenase (COX) inhibition (aspirin 600 mg p.o.). Forearm vascular conductance (FVC) was calculated as FBF/MAP.

Results: Reactive hyperaemia was similar in BAs and WEs and unchanged by COX inhibition (FVC change (Δ): +0.38 ± 0.06 vs +0.44 ± 0.107conductance units (CU) in BAs and +0.28 ± 0.03CU vs +0.34 ± 0.03CU in WEs). S1-S5 evoked forearm vasoconstriction in BAs, vasodilatation In BAs; COX inhibition had no effect (S1: ΔFVC -0.005 ± 0.005 vs −0.0068 ± 0.004CU in BAs, +0.012 ± 0.0078 vs +0.018 ± 0.008CU in WEs). However, COX inhibition attenuated concomitant increases in MAP in BAs (S1: ΔMAP: 6.76 ± 2-52 vs 0.88 ± 2.34*mmHg,*:$P < 0.05$), but had no effect in WEs.

Conclusion: Reactive hyperaemia is no smaller in young BA than WE women; PGs make no contribution. However, in young BA women, the contribution of PGs to forearm vascular responses to stressors seen in young BA men is absent; instead PGs facilitate their pressor responses.

Disclosure: None declared.

P – 26 Assessment of the procedural efficacy of renal denervation by measurement of efferent renal nerve function

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Introduction: This study aimed to develop a method for testing the completeness of renal denervation (RDN) at the time of the procedure.

Methods: We investigated the integrity of the efferent sympathetic renal nerves by assessing reflex changes in renal blood flow (RBF; Doppler flow wire) and renal vascular resistance (RVR) in response to handgrip. Reflexes were compared between responders (≥10 mmHg fall in systolic blood pressure [SBP] at 1 month) and non-responders. Data: mean ± SEM.

Results: 9 patients (3 male), aged 56 ± 4 years, office blood pressure (BP) 187 ± 8/101 ± 7 mmHg.

There were no pre- versus post-RDN changes in resting variables for responders (5 patients, RBF: 248 ± 46 vs 264 ± 52 ml/min, $n = 8$, $P = 0.41$; RVR: 0.70 ± 0.23 vs 0.62 ± 0.19 mmHg/ml/min, $n = 8$, $P = 0.34$) and non-responders (RBF: 459 ± 139 vs 480 ± 146 ml/min, $n = 7$, $P = 0.42$; RVR 0.41 ± 0.12 vs 0.42 ± 0.10 mmHg/ml/min, $n = 7$, $P = 0.49$).

Handgrip raised SBP to similar levels pre- and post-RDN in both responders and non-responders ($\Delta > 20$ mmHg, $P < 0.05$).

Pre-RDN, there was no difference in the percentage change in response to handgrip between responders and non-responders; RBF: 21 ± 11% vs −1 ± 8% ($P = 0.38$), RVR: 8 ± 9% vs 29 ± 11% ($P = 0.20$), respectively. Post RDN these differences were borderline significant; RBF: 54 ± 26% vs −1 ± 7%, RVR:-9 ± 12% vs 17 ± 5%, respectively (both $P = 0.05$). Absolute mean data shown in Table 1.

Across the full cohort, there was a significant correlation between the percentage change in RVR with handgrip post-RDN and the change in SBP at 1 month (R = 0.6, $P = 0.03$).

Conclusion: An inability to increase RVR with handgrip post-RDN may indicate disruption of the sympathetic vascular reflex, but this technique may lack sensitivity to guide ablation in the individual patient.

Disclosure: Financial support for this study from Medtronic (External Research Project No. A 1130666), general support for the Bristol CardioNomics group from the British Heart Foundation, the James Tudor Foundation and a University Hospitals Bristol NHS Foundation Trust Clinical Research Fellowship.

Table 1 Haemodynamic responses to handgrip stress before and after renal denervation

Handgrip data for full cohort: n = *18 renal arteries*

	Pre RDN			*Post RDN*			*ΔΔ*
	Rest	*Stress*	*N, p*	*Rest*	*Stress*	*N, p*	*N, p*
SBP (mmHg)	185 ± 6	217 ± 9	16, < 0.01	181 ± 8	212 ± 8	15, < 0.01	15, 0.77
RBF (ml/min)	346 ± 72	345 ± 51	15, 0.96	380 ± 85	449 ± 90	13, 0.11	12, 0.12
RVR (mmHg/ml/min)	0.59 ± 0.13	0.60 ± 0.10	15, 0.60	0.52 ± 0.10	0.56 ± 0.15	13, 0.43	12, 0.90

RBF = renal blood flow; RD*N* = renal denervation; RVR = renal vascular resistance; SB*P* = systolic blood pressure.

P – 27 Resistant Hypertension and the incidence of myocardial infarction, stroke and death: a UK cohort study 1995-2015

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Introduction: Few analyses have assessed whether worse cardiovascular outcomes in Resistant Hypertension (RH) are due to RH status or related to hypertension control.

Methods: We compared outcomes between those with uncontrolled hypertension while adherent to 3 anti-hypertensive medicines (defined as RH) and those with uncontrolled hypertension while non-adherent to 3 anti-hypertensive medicines (not RH). Additionally, we compared outcomes for those with uncontrolled hypertension and those with controlled hypertension on 4 anti-hypertensive medicines (both defined as RH). We employed a cohort study design using the Clinical Practice Research Datalink 1995-2015 [1]. We used multivariable Cox-regression models to calculate adjusted hazard ratios (HR) and 95% CI for myocardial infarction (MI), stroke and death.

Results: 169,251 people had uncontrolled hypertension while prescribed 3 anti-hypertensive medicines, 53% ($n = 90{,}083$) were adherent and classified as RH. In fully adjusted models there was no difference in the risk of MI between those adherent and non-adherent. There was weak evidence of a protective effect on stroke (HR 0.95, 95% CI 0.89–1.01) and evidence of a protective effect on death (HR 0.91, 95% CI 0.90–0.93). Of 8,611 people prescribed 4 medicines and adherent, 58.1% ($n = 5{,}006$) had uncontrolled hypertension. The risk of death was lower in those with uncontrolled hypertension (HR 0.78, 95% CI 0.72–0.83) vs controlled on 4 medicines.

Conclusion: Those with RH (3 medicines+uncontrolled +adherent) had a lower risk of death compared to those without RH (3 medicines+uncontrolled), suggesting the benefit of adherence to antihypertensive medicines. Those with uncontrolled RH (4 medicines) had survival benefits over those with controlled RH (4 medicines). These findings need further exploration.

Disclosure: None declared.

References:

1. https://www.cprd.com/home/

P – 28 Apparent treatment resistant hypertension in general practice: a cross sectional study of prevalence with consideration of morbidity, white coat hypertension, dosing and adherence

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Introduction: For treatment resistant hypertension (TRH), target blood pressure (BP) levels need to be adapted to specific morbidity (e.g. diabetes), ambulatory blood pressure monitoring (ABPM) should be used to exclude white coat hypertension, doses should be the optimal tolerated, and non-adherence and lifestyle should be examined. Most previous studies have not accounted for these pseudo-resistance factors. We conducted a cross sectional study of the prevalence of apparent TRH in general practice, utilizing the appropriate definition, and then considered these issues.

Design and method: Forty university-research affiliated practices were invited to participate. We ran a standard ATC

drug search identifying patients on any possible hypertensive medications and then searched individual patient's records. The World Health Organisation-Defined Daily Dosing guidelines determined adequate dosing. A measure of adherence was whether patients were printed greater than nine repeat prescriptions within the last year.
Results: Sixteen practices participated ($N = 50, 878$), and 646 were deemed to have apparent treatment resistant hypertension (aTRH).19.0% had adequate medication dosing and 79.9% were deemed adherent. Using a BP cut-off of 140/90 mm Hg the prevalence of aTRH was 6.4% (95%CI 5.8-7.0). Using 130/80 mm Hg for patients with diabetes or chronic kidney disease (CKD), it was 10.0%, reducing to 9.0% when higher thresholds were applied for over eighties. Considering adequate dosing and adherence reduces prevalence rates even further.
Conclusions: Reviewing individual patient records results in a lower estimate of the prevalence of aTRH than has been generally previously reported. Consideration for individual patients of pseudo-resistance additionally lowers these estimates, and may be all that is required for the management of the vast majority of cases.
Disclosure: None declared.

P – 29 Phase II randomized sham-controlled study of renal denervation for subjects with uncontrolled hypertension–WAVE IV

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Introduction: A randomized (1:1), double-blind, sham-controlled study to assess blood pressure (BP) lowering efficacy and safety of externally delivered focussed ultrasound (US) for renal denervation (RDN).
Methods: 81 Patients (age 18-80years) across 13 centres with treatment resistant hypertension (office blood pressure [OBP] $\geqslant 160$ mmHg; $\geqslant 3$ antihypertensive medications) were treated either with bilateral RDN using therapeutic levels of US energy or sham using bilateral application of diagnostic levels of US energy. Primary and secondary objectives were change in OBP & 24- hour ambulatory blood pressure (ABP) at 24 weeks respectively.
Results: Reduction in OBP (sham18.9 ± 14 vs RDN13.2 ± 20 mmHg; $P = 0.133$) and 24- hour ABP (sham5.90 ± 15 vs RDN7.11 ± 13 mmHg; $P = 0.770$) at 24 weeks were not clinically significant. Interim analysis showing lack of antihypertensive efficacy prompted premature termination of trial. Of note, no safety signal was observed. Medication changes were less than 15% at 24 weeks. In a subset, urinary toxicological analysis disclosed full adherence in 77% at baseline and 82% at 6 months. Post-hoc analysis revealed that stricter criteria for stabilisation of BP at baseline were associated with numerically greater change in 24- hour ABP in the RDN group than in the sham group. Systolic BP changes ware greater in patients with pulse pressure < 65 compared to those with pulse pressure $\geqslant 65$ mmHg.
Conclusion: Our data did not prove that antihypertensive efficacy of the externally delivered focused US for RDN was greater than the sham effect. Post-hoc analysis suggested that the predominance of treatment resistant hypertensive patients with stiff arteries, and less stringent stabilisation of baseline BP may have hampered the trial.
Clinical Trial Registry: https://clinicaltrials.gov/show/NCT02029885.
Disclosure: Manish Saxena received payment from KONA Medical for doing extra clinical work on one weekend on KONA Wave IV study.

P – 30 Attenuation of splanchnic autotransfusion following non-invasive ultrasound renal denervation: a novel marker of procedural success

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Introduction: In Valsalva manoeuvre, autotransfusion in Phase IIi arises from sympathetically mediated capsular contraction of intra-abdominal organs including kidneys. We hypothesised that following successful renal nerve ablation this response would be attenuated and could serve as marker of procedural success.
Methods: 23patients (mean age 59.4 ± 10.5 years; body mass index [BMI] 30.2; anti-hypertensive medication 4.2;

65% males; 35% females) with resistant hypertension (HTN) (⩾3 anti-hypertensive drugs including a diuretic) were enrolled in the double-blind, sham controlled KONA Wave-IV study. They were randomised either to bilateral Renal-Denervation (RDN) using therapeutic levels of ultrasound (US) energy ($n = 12$; 75% male, mean age 57.2 ± 10.3 years) or the sham-procedure using bilateral application of diagnostic levels of US energy ($n = 11$; 55% males; mean age 61.9 ± 10.6 years). Within group changes in autonomic parameters, office blood pressure (OBP) and ambulatory blood pressure (ABP) were compared between baseline and 6months in double-blind manner.

Results: There was significant OBP reduction in both treatment (16.1 ± 27.3 mmHg, $P < 0.05$) and sham groups (27.9 ± 15.0 mmHg, $P < 0.01$). In the treatment group, heart rate was significantly reduced following RDN both at rest (4.3 ± 6.6bpm, $P < 0.05$) and in response to postural changes. During phaselli Valsalva manoeuver, RDN resulted in substantial and significant reduction in Mean Arterial Pressure (21.8 ± 25.2 mmHg, $P < 0.05$) with no significant changes in the sham group.

Conclusions: Blood pressure (BP) reduction per se is not necessarily a marker of renal nerve ablation. This reduction in splanchnic auto-transfusion following RDN has not been previously demonstrated and denotes attenuation of (renal) sympathetic efferent activity and could serve as a marker of procedural success. Sham therapy did result in clinically meaningful BP reduction that has implications for future trial design.

Clinical Trial Registry: https://clinicaltrials.gov/show/NCT02029885

Disclosure: None declared.

P – 32 Percutaneous renal denervation remains an effective treatment for resistant hypertension: a single centre experience

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Aim: Renal denervation (RDN) remains a therapeutic treatment for resistant hypertension (RHTN), despite the limited benefit in randomised control trials (1). This single centre analysis was performed to ascertain the reduction in BP with RDN when performed in an experienced centre.

Methods: 76 patients underwent percutaneous RDN between June 2012 and Dec 2016, at our centre for RHTN using the Symplicity catheter (Medtronic, USA) by an experienced team and single operator. All patients were on a minimum of 3 medications (if tolerated), with secondary causes excluded. Follow up with BP measurements were performed at 3,6,12 months out to 3 years.

Results: Enrolled patients had a mean age of 64.7 years with equal numbers of men and women. The average number of antihypertensive agents prior to RDN was 4.38 medications. Risk factors included history of: smoking $n = 40$ (52.3%); stroke $n = 18$ (23.68%); diabetes $n = 29$ (38.15%); obesity $n = 29$ (38.15%); AF $n = 16$ (21.05%); ischaemic heart disease $n = 27$ (35.52%) and hypercholesterolemia $n = 55$ (72.36%). All patients underwent femoral arterial access with a mean number of ablations of 10.18 per patient. The reduction in baseline mean SBP at 12 months post RDN was 27.79 mmHg (95% C.I. 19.74-35.84 mmHg, $P < 0.0001$). Of the 46 patients with 3-year follow up, there was persistent reduction in mean SBP of 32.42 mmHg (95% C.I. 23.73-41.12 mmHg, $P < 0.0001$).

Conclusion: RDN remains a successful treatment for RHTN with reductions in SBP out to three years when performed by experienced operators. More rigorously designed trials performed in high volumes centres may further develop RDN as a treatment for RHTN.

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Disclosure: None declared.

P – 34 Self-monitoring is not just for a study, self-monitoring is for life: an analysis of self-efficacy, blood pressure measurement preference and likelihood to continue monitoring following participation in a self-management study

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Introduction: Self-management in the TASMIN-SR trial successfully reduced and controlled blood pressure (BP) compared to clinic monitoring over 12 months. How were patient related outcomes towards future management of BP affected?

Methods: Patients with hypertension, above target clinic BP and one or more of stroke, diabetes, coronary heart disease or chronic kidney disease, were randomised to a self-management intervention (self-monitoring with self-titration) or usual clinic BP management. At 12 months patients were assessed on knowledge, attitudes and behaviours to future management of BP using the partners in health scale, illness perception questionnaire and preferential ranking of methods of BP measurement.
Results: After 12 months, self-managing patients were more likely to attribute symptoms or side effects to their antihypertensive medication than those receiving usual care, although there was no difference in the number of symptoms reported between groups. All patients rated their knowledge and self-management of BP highly, however at 12 months self-managing patients rated their ability and understanding of monitoring BP significantly higher. At baseline all patients rated self-monitoring as their preferred way to measure their BP, but only intervention patients continued to rank self-monitoring as their preferred choice at 12 months, usual care patients preferring their BP to be measured by a health professional. Intervention patients were three times more likely to want to continue self-monitoring following the trial (3.9 (95% CI 2.62–5.87; $P < 0.0001$).
Conclusions: Patients increase their understanding and efficacy of BP monitoring and are more motivated to continue following a structured protocol with health professional involvement.
Clinical Trial Registry: srctn.org Identifier: ISRCTN87171227, McManus, R. J., Mant, J., Haque, M. *et al* (2014). Effect of self-monitoring and medication self-titration on systolic blood pressure in hypertensive patients at high risk of cardiovascular disease: the TASMIN-SR randomized clinical trial, JAMA: the journal of the American Medical Association 312, 799-808.
Disclosure: None declared.

P – 35 Post-clinic blood pressure values are the closest to the gold standard ambulatory blood pressure monitoring (ABPM) readings

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Background/objectives: Ambulatory Blood Pressure Monitoring (ABPM) is gold standard for assessing hypertension. It eliminates white coat effect induced by the in-clinic blood pressure (BP). ABPM is however costly, cumbersome and not widely available. Our previous study identified post-clinic BP as the lowest reading in a clinic visit. We therefore aimed to validate post-clinic BP taken 15 minutes after physician-patient encounter with 24 hour-ABPM.
Methods: A grant-based, cross-sectional study (3461-CarERC-15) [1] was conducted in May 2015 in cardiology clinic at Aga Khan University, Pakistan, on hypertensives $\geqslant 18$ years, or those referred for diagnosis. Pregnant females were excluded. Pre-clinic readings were measured by a nurse, in-clinic by a physician and 15 minutes post-clinic by a research assistant using a validated, automated BP device (Omron-HEM7221-E, OMRON, OMRON Healthcare Co. Ltd. Kyoto, Japan (OMRON HEALTHCARE EUROPE B.V. Kruisweg 577 2132 NA Hoofddorp, the Netherlands) M6 Comfort [HEM-7221-E]). All patients were then referred for 24 hour-ABPM.
Results: Of 150 participants, 49% were males. 76% of all participants were hypertensive. The prevalence of white coat effect was 38%. Mean (SD) systolic blood pressure (SBP) taken pre-clinic, in-clinic, 15 minutes post-clinic: 153.2 ± 23 mmHg, 152.3 ± 21 mmHg, 140.0 ± 18 mmHg, respectively. Mean (SD) diastolic BP (DBP) taken pre-clinic, in-clinic, post-clinic: 83.5 ± 12 mmHg, 90.9 ± 12 mmHg, 86.4 ± 11 mmHg respectively. Mean(SD) pulse taken pre-clinic, in-clinic, post-clinic: 76.9 ± 16/minute, 74.1 ± 15/minute, 70.4 ± 13/minute, respectively. Mean daytime ambulatory SBP, DBP and pulse readings were 134.7 ± 15 mmHg, 78.7 ± 15 mmHg and 72.6 ± 12/minute, respectively. The Pearson correlation coefficients of pre-clinic, in-clinic and post-clinic SBP with daytime ambulatory-SBP were 0.423 (*P*-value:0.000), 0.538(*P*-value:0.000) and 0.552(*P*-value:0.000), respectively.
Conclusion: We demonstrate that in-clinic BP is falsely elevated and post-clinic BP is the lowest reading in a real-world patient-physician encounter. Furthermore, post-clinic BP is an important surrogate of ABPM. Therefore, we suggest that post-clinic BP be employed for diagnosis and management of hypertension.
Disclosure: Our study was funded by the Faculty of Health Sciences Seed Money Grant at Aga Khan University Hospital, Karachi.
Reference: 1. Shahab H, Khan HS, Almas A, Khan SA, Khan AH. Are BP readings taken after a patient-physician encounter in a real-world clinic scenario the lowest of all the readings in a clinic visit. Journal of the College of Physicians and Surgeons--Pakistan: JCPSP. 2015;25(3):206-9."

P – 36 Does blood pressure self-monitoring with or without supervised antihypertensive treatment modification improve blood pressure (BP) control following stroke or TIA? – the TEST-BP trial

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Introduction: Self-monitoring with or without supervised self-management of antihypertensive therapy may improve blood pressure (BP) control in a general hypertensive population, however its efficacy following stroke/transient ischemic attack (TIA) has not been widely studied.
Methods: TIA/mild stroke patients requiring BP treatment >2 weeks post-event were prospectively randomised in a blinded end-point trial to (1) treatment-as-usual (TAU) by general practitioner (GP), (2) self-monitoring (SMo), or (3) self-monitoring with telemetry and guided treatment self-management (SMa). Ambulatory BP monitoring was performed at baseline and six months. BP self-monitoring was undertaken at six weeks, three and five months. SMo results were sent to the GP whereas SMa treatment changes were supervised by the trial team. The primary outcome was change in daytime ambulatory systolic blood pressure (SBP) at 6 months.
Results: At 6 months daytime SBP fell from baseline for TAU ($n=54$) by -3.8 ± 11.9 mmHg ($P=0.024$), for SMo ($n=49$) -7.0 ± 11.1 mmHg ($P<0.001$), and for SMa ($n=50$) -5.9 ± 13.9 mmHg ($P=0.004$), no significant between group differences. Subgroup analysis of those with uncontrolled hypertension at baseline also showed no between group differences (SMo vs TAU mean difference -4.3 ± 2.7 mmHg, $P=0.11$, SMa vs TAU mean difference -5.0 ± 2.7 mmHg, $P=0.06$). SMo and SMa participants had more medication changes ($P=0.005$) with significantly more dose increases in both groups compared to TAU.
Conclusions: Self-BP monitoring was well tolerated and resulted in more treatment changes. Despite BP levels falling in all stroke/TIA groups over 6 months, self-BP monitoring did not significantly improve BP control by trial end.
Clinical Trial Registry: ISRCTN 86192648.
Disclosure: None declared.

P – 37 Non-adherence to Antihypertensive Medications is related to Total Pill Burden

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Introduction: Non-adherence to medication is present in ⩾50% of patients with apparent treatment resistant hypertension.[1] We examined the factors associated with non-adherence detected by liquid chromatography-mass spectrometry/mass spectrometry (LC-MS/MS) based urine antihypertensive drug assay.[2]
Methods: All urine antihypertensive test results, done for uncontrolled hypertension (blood pressure [BP] persistently >140/90 mmHg) between January 2015 and December 2016 at Heartlands Hospital toxicology laboratory, were analysed. Drugs detected were compared to the antihypertensive drugs prescribed. Patients were classified as adherent (all drugs detected), partially adherent (⩾1 prescribed drugs detected) or non-adherent (no drugs detected). Demographic and clinical data were compared across the 3 groups (Table 1).
Results: 335 clinical samples from 9 hypertension centres across the UK were received for analysis during the timeframe. Significant results are shown in Table 1.

[P – 37] Table 1 Comparison of demographic and clinical data with adherence classification

	Adherent	*Partially Adherent*	*Non-adherent*	P
No of Patients (%)	139 (43.2)	123 (38.2)	60 (18.6)	-
% Female	38	49	68	-
Age	64 (19)	56 (17)**	53 (16)**	<0.001
Antihypertensive Drugs Prescribed	4 (1)	4 (3)*	5 (2)**	<0.001
Total Drugs Prescribed	5 (3)	7 (5)*	7 (4)**	<0.001
BP Systolic (mmHg)	172 (30)	177 (41)	185 (31)*	0.027
BP Diastolic (mmHg)	90 (27)	98 (30)*	106 (24)**	<0.001
eGFR (mL/min/1.73 m^2)	63 (26)	71 (28)	76 (17)*	0.005

BP = blood pressure; eGFR = estimated glomerular filtration rate.

Conclusions: Non-adherence to antihypertensive medication was associated with total pill burden, number of antihypertensives prescribed, lower age, female gender, higher blood pressure and higher estimated glomerular filtration rate (eGFR).

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Disclosure: None declared.

P – 38 Clinical characteristics and outpatient management of Black patients with hypertensive urgency

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Introduction: Hypertensive Urgency (HU) is characterised by a severely elevated systolic blood pressure (SBP $\geqslant$ 180/DBP $\geqslant$ 120 mmHg), in the absence of life-threatening end-organ damage HU is common in the Black population.
Methods: We conducted a single central retrospective cohort study of consecutive Black and Afro-Caribbean patients attending a South London outpatient hypertension clinic. Clinical letters and patient electronic records were searched to obtain patient details and test results. Most patients were treated using a 'C, B, A' anti-hypertensive regimen (calcium-channel blockers, then beta-blockers, then ACE-inhibitors or alpha-blockers). Further investigations were requested on a patient-by-patient basis.
Results: 63 consecutive patients were identified (52% male, mean age 53-years). 54% of patients already had a diagnosis of hypertension. The median referral systolic blood pressure (BP) and diastolic BP was 206(26) and 115 (26), respectively. Most patients had some evidence of end-organ damage: 94% had grade-2 hypertensive retinopathy, 41% had an estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73 m^2, and 82% of patients who had an echocardiogram showed at least mild left ventricular hypertrophy. All patients were successfully treated with oral anti-hypertensives, with average systolic and diastolic BP readings of 144(29) and 88(17) two weeks after referral.
Conclusion: Black hypertensive urgency patients tend to present young and also tend to show signs of significant end organ damage. Well-designed prospective randomised controlled studies are needed to evidence an optimal treatment strategy for this clinical scenario.
Disclosure: None declared.

P – 39 Management of hypertensive urgency and emergency: an audit of local practice at a district general hospital

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Introduction: Hypertensive emergencies are becoming increasingly common. However, there are discrepancies on the management. This study set out to establish current practice and observe if these are in line with guidelines set by the British Hypertensive Society (BHS).
Methods: Two-year retrospective analysis of non-elective patient presentations to ambulatory clinic, urgent care and emergency department with hypertension as their primary presenting complaint.
Medical records were collected to evaluate the investigations and management. Discharge destinations were reviewed.
Results: 400 patients presented with hypertension, 29 met the criteria for hypertensive crisis. Hypertensive crisis was defined using the British Hypertension Society (BHS) guidelines of a systolic blood pressure (BP) >160 mmHg and/or diastolic >100 mmHg. Categorisation into urgency and emergency was based on evidence of end organ damage on admission.
The average age was 61 with 65% being female. Assessment of end organ damage was poor. 35% had fundoscopy, 60% urine dip and 20% had a protein:creatinine ratio measured.
The most common agent used initially to lower was amlodipine. Percentage reduction of initial BP varied from 0% to 52%. 51% were followed up in ambulatory setting with 55.17% admitted to hospital. There was little record to confirm whether long-term control had been achieved.
Conclusions: Amlodipine was the preferred first line treatment for the acute reduction of BP. There was variation in management, work up and follow up. Clinicians were failing to adhere to the BHS guidelines to lower the BP initially by 25% and then to 160/100-110mmg. This study confirms the need for further local guidance, to ensure standards are met.
Disclosure: None declared.

P – 40 An evaluation of a targeted approach to blood pressure control in poorly controlled hypertensive patients in an inner London borough

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Introduction: Hypertension is an important preventable cause of premature morbidity and mortality. Raised blood pressure (BP) is associated with an increased risk of stroke, myocardial infarction, heart failure, kidney disease, and premature death. The objective of this study was to evaluate the impact of targeted interventions on the BP control of a high risk cohort of hypertensive patients.
Methods: This was a longitudinal study undertaken from April 2014 to March 2015. Local general practices identified patients with a systolic blood pressure (SBP) $\geqslant$ 160 mmHg and/or diastolic blood pressure (DBP) $\geqslant$ 140 mmHg. Patients were assessed with a baseline BP reading and a repeat reading following change(s) in their hypertension management. Interventions to aid management were distribution of local hypertension management guidelines, review at a virtual clinic with specialist cardiovascular disease pharmacists, and the ability to refer to a community hypertension service or secondary care hypertension service.
Results: Patients with a baseline SBP $\geq$ 160 mmHg ($n = 1231$) demonstrated a mean reduction in SBP of 25 mmHg (95% confidence interval 23.9 to 26.2 mmHg; $P < 0.0001$). Patients with a baseline DBP $\geq$ 100 mmHg ($n = 648$) demonstrated a mean reduction in DBP of 16.7 mmHg (95% confidence interval 15.7 to 17.6 mmHg; $P < 0.0001$).
Conclusion: In this high risk patient cohort, specific targeted interventions were able to significantly enhance BP control, hence greatly reducing cardiovascular risk. Potential avenues for further research include a cost-effectiveness analysis of these interventions as well as developing methods to target patients not currently engaging well with services.
Disclosure: None declared.

P – 41 Utility of anthropometric and lipid indicators to classify people with hypertension or pre-hypertension

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Introduction: Both hypertension and prehypertension have been linked to increased cardiovascular disease (CVD) mortality; fat accumulated and/or circulating in the body may also participate in this relationship and can be estimated through anthropometric and lipid indicators. This work is aimed to compare the ability of these indicators to distinguish among normotensive, prehypertensive and hypertensive persons.
Methods: Free-living volunteers ($n = 1{,}445$) from Mexico City, aged 20-50 were included. After averaging three blood pressure measurements, participants were classified as normotensive, prehypertensive or hypertensive. Indicators were grouped by the elements needed for their calculation: (1) including only circulating fat (IOCF) (e.g. atherogenic index of plasma [AIP]), (2) including only accumulated fat (IOAF) (e.g. waist circumference [WC]) and (3) mixed (e.g. lipid accumulation product). All the indicators were compared by ROC (receiving operating characteristic) analysis.
Results: IOAF had greater areas under the ROC curve (area under the excretion rate time curve [AURC]) than the others, being the WC the highest (AURC = 0.837 for discriminating normotensive from hypertensive men); IOCF had the poorest performance (AURC ranging from 0.414 to 0.668). While all the IOAF significantly discriminated among the three blood pressure groups in men, none of them discriminated prehypertensive from hypertensive women. Cut-off points for WC to identify the presence of prehypertension were: 87.5 cm for men (sensitivity = 0.811, specificity = 0.407) and 83.5 cm for women (sensitivity = 0.836, specificity = 0.339).
Conclusions: Accumulated fat could be a better predictor of high blood pressure than that circulating, as shown by the best performance of IOAF, particularly WC. Measurement of WC should be part of routine clinical evaluations to screen for people at risk of hypertension.
Disclosure: None declared.

P – 42 Deprivation, blood pressure target achievement and exception reporting for the Quality and Outcome Framework in England

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Introduction: In Southwest England we observed an association between higher rates of exception reporting from the NHS Quality and Outcomes Framework (QOF) hypertension domain and lower achievement rates for the target blood pressure (BP) $\leqslant$150/90 mmHg. We sought to confirm this association in a national sample, and also to explore the influence of deprivation.
Methods: We combined 2015 QOF data for all general practices in England with practice level Index of Multiple Deprivation (IMD) scores. Associations were explored using scatter plots, Pearson's r and analysis of varience (ANOVA).
Results: Data existed for 7756 practices; 6233 (80%) achieved maximum QOF scores for hypertension. Percentage of patients reaching target was negatively correlated with the percentage exception reported ($r = -0.43$). Correlation was stronger for practices achieving maximum points ($r = -0.66$) than for those not ($r = -0.40$). Variance was accounted for by higher exception reporting from practices in the lowest 2 deciles of achievement (ANOVA $P < 0.0001$ overall; $P = 0.21$ without bottom two deciles). Lower prevalence and control of hypertension, and higher exception reporting rates were only weakly associated with increasing IMD scores.
Conclusions: Rates of exception reporting fall as percentage achievement of BP target rises. The correlation appears stronger above the maximum payment target achievement threshold (80%) than below. Deprivation appears less contributory to variation in exception reporting rates than underlying achievement of the BP target.
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P – 43 Fundal examination in patients with hypertension

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Introduction: Fundal examination is considered integral to the evaluation of patients with hypertension, as hypertensive retinopathy (Grades III/IV) has a predictive value for mortality and visual loss. However, such data are predicated upon retinal photographs interpreted by ophthalmologists, as opposed to direct ophthalmoscopy by physicians.
Current National Institute for Health and Care Excellence (NICE) guidelines recommend that all patients with hypertension should be offered an examination of their fundi. The aim of this audit was to assess whether this standard is being met.
Methods: Data were retrospectively analysed from 189 patients who attended a secondary/tertiary care hypertension clinic in London. Fundal examination in primary care was assessed via a review of referral letters and a telephone conversation with individual general practitioner (GP) who reviewed their records for results of such an examination. Within secondary/tertiary care, letters written by the clinician following patient visits were audited.
Results: Ten referral letters made mention of a fundal examination. Upon contacting GP, a further six patients had a record of previous fundal examination. A review of clinic letters explicitly referred to fundal examination in 31 patients, 18 of whom had evidence of hypertensive retinopathy.
Conclusion: Fundal examination is not offered to all patients with hypertension as recommended by the NICE guidelines. Only 23.3% of patients had documented evidence of retinal screening at any point during their 'patient journey'. Such data when coupled with the evidence base raise a series of questions: with whom should responsibility for fundoscopy lie, when should it be performed and how often should it be repeated.
Disclosure: None declared.

P – 44 Use of Telehealth in improving care in the Hypertension Clinic at Royal Stoke University Hospital. Gwyneth Lawson, central nervous system (CNS) in Hypertension, Dr Madhu Menon, Clinical Lead in Hypertension

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Introduction: Patients are referred to us from primary and secondary care with resistant hypertension, medication intolerance or difficult to control blood pressure (BP). Few patients bringing BP readings to clinic makes treatment difficult. We use a free mobile 'phone texting service (Florence or FLO) for patients to text BP readings, to send

reminders to patients about medication and information on lifestyle.

Methods: Each new patient has 24 hour ambulatory blood pressure monitoring (ABPM) and are offered FLO. Patients are sent lifestyle messages over three months. For subsequent appointments, patients are asked to text twice daily BP readings for a week which are downloaded to patient records. FLO is also used between clinic visits to adjust medication. This has proved particularly helpful whilst monitoring BP during pregnancy and during aldosterone and renin testing. The patient may also be sent texts with relevant advice or instructions.

Results: 130 patients are currently registered with FLO. The average age of patients using FLO is 44 years. FLO has improved patient compliance with BP monitoring, made monitoring of patients easier and led to time and cost savings. We were able to reduce the need for another ABPM in 85% of patients.

Conclusions: Using FLO has led to an improvement in the delivery of care in the hypertension clinic and has helped clinicians to make prompt decisions regarding medication. FLO has enabled us to effectively monitor patients whilst minimising clinic visits. Interaction with clinicians via FLO has also improved patient confidence in dealing with their condition.

Disclosure: None declared.

P – 45 The effect of arterio-venous fistula creation for haemodialysis access on blood pressure control in advanced chronic kidney disease

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Introduction: Central arterio-venous anastomosis (ROX Coupler) has been shown to help blood pressure (BP) control in resistant hypertension. We have assessed if arterio-venous fistula (AVF) created for haemodialysis (HD) access improves BP control in severe chronic kidney disease (CKD).

Methods: The study group consisted of patients with eGFR $\leqslant 25$ ml/min/1.73 m^2, who had successful AVFs over 2002-2015 in our centre. A 'successful fistula' was defined as one that was successfully used for haemodialysis on 6 consecutive occasions over 2 weeks. Pre and post AVF BP readings over 1 year and the number of antihypertensive medication were compared with a control group, who had unsuccessful AVF operations. The data were censored for death, dialysis and transplantation.

Results: There were 380 patients in the study group and 107 in the control group. Significant reductions in diastolic BP (−3.76 mmHg, $P < 0.001$), 1 year average diastolic BP (−3.77 mmHg, $P < 0.001$) and average MAP (−2.94 mmHg, $P < 0.001$) were oberved between pre and post AVF in the study group. In comparison, there was a smaller reduction in the average diastolic BP (−2.8 mmHg, $P = 0.03$) in the control group. There was no difference in systolic BP or medications use between pre and post AVF periods.

Conclusions: Our preliminary analysis suggests that a successful AVF creation for HD access in patients with advanced CKD is associated with lowering of BP. A further multivariate analysis of the data and a future prospective trial with a larger cohort of patients will help to confirm these findings.