ment induced BP reduction, a lower in-treatment BP is associated with superior outcomes.

Key Words: Cardiovascular Outcome, In-treatment Blood Pressure, Worksite Hypertension Control Program

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DIPPING AND VARIABILITY OF BLOOD PRESSURE AND HEART RATE AT NIGHT ARE HERITABLE TRAITS
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Objective: Blunted nocturnal blood pressure dipping as well as high variability of blood pressure and low variability of heart rate are associated with increased cardiovascular morbidity and mortality. The aim of this study was to test if these traits are heritable.

Methods: We studied 260 healthy siblings without antihypertensive drugs from 118 Swedish families. Blood pressure and heart rate variability were defined as the standard deviation of blood pressure and heart rate values recorded during 24-hours, daytime (06am-10pm) and nighttime (10pm-06am). Nocturnal blood pressure dipping was defined as the ratio between nighttime and daytime blood pressure. Heritability was estimated with a maximum likelihood method implemented in “SOLAR” software package with and without adjustment for significant covariates.

Results: At night, significant heritability was found for systolic (33%, P<0.05), diastolic (36%, P<0.05) and mean (42%, P<0.01) blood pressure variation. After covariate adjustment the corresponding heritability values were 23% (P=0.08), 29% (P<0.05) and 37% (P<0.05). Daytime blood pressure variability was not heritable. The heritability of nocturnal dipping was 38% (P<0.05) for systolic, 9% (P=0.29) for diastolic and 36% (P<0.05) for mean blood pressure but after adjustment only systolic nocturnal dipping was significant (29%, P<0.05). Heart rate was highly heritable both during daytime (57%, P<0.001) and nighttime (58%, P<0.001) but the variability of heart rate, after adjustment, was only significant at night (37%, P<0.05).

Conclusions: Our data suggest that blood pressure and heart rate variability are partially under genetic control and that genetic loci of importance for these traits could be mapped by linkage analysis.

Heritability of ABP phenotypes after full adjustment

<table>
<thead>
<tr>
<th>ABP phenotype (%)</th>
<th>SBP</th>
<th>DBP</th>
<th>MBP</th>
<th>HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-hour SD</td>
<td>21</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Daytime SD</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nighttime SD</td>
<td>23</td>
<td>29**</td>
<td>37**</td>
<td>37**</td>
</tr>
<tr>
<td>24-hour VC</td>
<td>9</td>
<td>9</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Daytime VC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nighttime VC</td>
<td>21</td>
<td>25</td>
<td>33**</td>
<td>37**</td>
</tr>
<tr>
<td>Nocturnal dipping in Blood Pressure</td>
<td>29**</td>
<td>9</td>
<td>24</td>
<td>1</td>
</tr>
</tbody>
</table>

* P < 0.05, ** P < 0.01, *** P < 0.001

Key Words: American Heart Guidelines for BP Measurement, Blood Pressure Monitoring, Measure Blood Pressure

P-61
RESEARCH UTILIZATION: IMPLEMENTING THE AMERICAN HEART ASSOCIATION GUIDELINES FOR MEASURING BLOOD PRESSURE
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Research Utilization: Implementing the American Heart Association (AHA) Guidelines for Measuring Blood Pressure. The purpose of this pilot study was to determine if southeastern parish nurses would improve their knowledge of how to accurately measure blood pressure and improve their technique following a structured Blood Pressure Education and Evaluation Program (BEEP). The pilot study was a single-arm design and the outcome measures were assessed before (pre) and after (post) BEEP. The outcomes included: BEEP knowledge questionnaire, device assessment tool, technique tool, Terminal Digit Bias, and Attitude of Change. The unit of analysis was blood pressure readings (n=150 to 300 blood pressure readings). Southeastern parish nurses, who agreed to participate in BEEP, were asked to record all blood pressure measurements performed over the period of a month pre and post BEEP. The paired t-test difference between pre and post was used to assess the various outcome measures including terminal digit bias, knowledge, range of error and attitude of change. All equipment passed the device questionnaire. The knowledge improved post intervention (40% pre to 80% post). Technique improved (0% to 100%), range of error (SBP mean 2.33, SD ±9.35 pre, mean -0.83, SD ±3.46 post, DBP mean-1.73, SD ±4.2 pre, mean -1.5, SD ±3.53), terminal digit bias (mean 23, SD ±11 pre, mean 14, SD ±10) all increased. Attitude of change exhibited little change (cognitive 3.37 to 2.27, affective 2.93 to 3.13, behavioral 3.40 to 3.57). In conclusion to this pilot study it is important that further studies be conducted. It is necessary that a larger group be tested as well as adding a control group to further evaluate the effectiveness of the intervention.

Key Words: American Heart Guidelines for BP Measurement, Blood Pressure Monitoring, Measure Blood Pressure

P-62
ASSESSMENT OF THE WHITE COAT EFFECT
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Background: A major limitation of blood pressure measurements made in the physician’s office is the transient elevation commonly seen in hypertensive patients, which does not appear to be linked to target organ damage or prognosis. This has been labeled the “white coat effect” (WCE), computed as the difference between blood pressure measurements taken by the physician and resting, or “basal” measures. It is unclear, however, which resting measure is most appropriate. The awake ambulatory blood pressure is the most widely used. However, while arguably the most useful measure for prediction of clinical outcomes, it is less appropriate for use as a resting measure, because it is influenced by many factors, including physical activity level. Resting levels taken in the clinic may also be elevated, and will therefore underestimate the WCE.

Methods: We addressed this question by taking resting measures in a non-medical setting on the day before patient were seen at a Hypertension Clinic (Day 1), and comparing these with resting measures taken on the following day, in the clinic before the patient saw the physician.

Findings: As predicted, the Day 1 resting levels were lower than those taken in the clinic prior to seeing the physician (ps<.05 and .001, for systolic and diastolic pressure, respectively) in both normotensive and hypertensive subjects. Using the Day 1 resting levels, the estimated WCE, for hypertensives, was 5.3/6.9 mm Hg (systolic/diastolic), compared to estimates, using the clinic resting levels, of 0.3/0.5 mm Hg. The pattern of changes was different in normotensives and hypertensives, with the physician pressures being slightly lower than Day 1 pressures in the former, and substantially higher in the latter. Heart rate changes were similar and modest in both groups.

Interpretation: The WCE phenomenon may not just be limited to that narrow interval in which the patient actually sees the physician, but may generalize to the clinic setting, rendering a clinic “resting” level invalid. While it is strongly positive in most hypertensives, it is frequently negative in normotensives. Our results suggest that improved methods of...
measuring blood pressure in the clinic setting are unlikely to resolve the confounding influence of the WCE, and that greater reliance will need to be placed on out-of-office monitoring.

Key Words: Blood Pressure, White Coat Effect, White Coat Hypertension

P-63
VALIDATION OF THE OSCAR 2 AMBULATORY BLOOD PRESSURE MONITOR ACCORDING TO THE ASSOCIATION FOR THE ADVANCEMENT OF MEDICAL INSTRUMENTATION (AAMI) PROTOCOL

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A variety of protocols have been proposed to assess the accuracy of noninvasive blood pressure measurements using automated devices. We assessed the OSCAR 2 oscillometric 24 hour ambulatory blood pressure monitor according to the protocol defined by the British Hypertension Society (BHS) and have used the data collected in this study and applied it, according to the criteria defined in the AAMI protocol SP10:2002, in a post-hoc analysis. Blood pressure readings taken by two trained independent observers using mercury sphygmomanometers were compared with readings taken by the OSCAR 2, operated by a third independent observer. K5 was used to determine diastolic blood pressure. A total of 114 adult subjects were studied in the seated position after 10 minutes rest giving a total of 255 paired measurements for both systolic and diastolic blood pressure, 56 subjects were included in both the systolic and diastolic analyses. The subjects had the following characteristics: male sex 47.6%, mean age 54.3 ± 14.6 (range 18-88) years, mean arm circumference 29.2 ± 4.1 (range 21 - 49) cm. Blood pressure ranged from 60 - 208 mmHg and 40 - 134 mmHg for SBP and DBP. The mean difference between the paired observers and the device were 0 ± 7 mmHg for SBP and -1 ± 6 mmHg for DBP. There was a very high level of agreement between the two trained observers, all observations were within 5 mmHg. As the mean difference between the paired observers for both diastolic and systolic blood pressure was less than 5 mmHg and the standard deviation was less than 8 mmHg the OSCAR 2 satisfied the overall performance criteria defined in the ANSI/AAMI protocol (SP10: 2002). We believe that is the first device to fulfill the criteria defined by the European Society of Hypertension International Protocol, to be Graded A according to the the BHS protocol for both SBP and DBP and to meet the criteria defined by the AAMI protocol. As such we believe that the OSCAR 2 can be recommended for use in adult patients.

Comparison of observers versus device

<table>
<thead>
<tr>
<th>Differences</th>
<th>Mean of differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5 mmHg</td>
<td>≤ 10 mmHg</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>62</td>
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<tr>
<td>Diastolic BP</td>
<td>70</td>
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</tbody>
</table>

Differences between paired observer and OSCAR 2

Key Words: AAMI, Ambulatory Monitoring, OSCAR 2

P-64
THE NURSE COORDINATOR AUSCULTATORY (NCA) BP BETTER PREDICTS DAYTIME ABPM DIASTOLIC BLOOD PRESSURE IN HYPERTENSIVE SUBJECTS THAN DOES AN AUTOMATED (OMRON) DEVICE

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The mandate to eliminate mercury from the environment makes it essential to understand whether automated BP can replace mercury column auscultatory BP measurement in Htn treatment trials. This trial compares these two methods to 24 hr ABPM.

Our study population were participants in a Novartis Htn treatment trial with mild Htn were included in a post-hoc analysis to investigate the relationship between NCA mercury sphygmomanometer BP measurements and measurements taken by an Omron 705 CP. Included in our analyses were 313 subjects (181 men & 132 women, median age of 51 years) who had three NCA mercury sphygmomanometer BP readings before 24hr ABPM and 3 readings with an Omron 705 CP recorded after ABPM, all during the washout phase of the trial. ABPM values were electronically recorded for a 24-hr period and daytime (0900-2100) average SBP and DBP were calculated. Correlations of the daytime ABPM SBP and DBP with NCA and Omron readings were calculated, taking into account the correlation between the NCA and Omron measurements.

Pearson correlations showed that NCA SBP had a moderate but statistically significant better correlation to ABPM SBP than did Omron SBP (0.64 vs. 0.55, p=0.014). For DBP, NCA measures had statistically significantly higher correlation to ABPM than did Omron DBP (0.59 vs. 0.32, p<0.0001).

We conclude that for studies including DBP targets for hypertension treatment this small post-hoc sample suggests Omron DBP cannot replace that of a trained observer. SBP accuracy with Omron is similar to NCA accuracy, so either method may be used in trials with SBP targets. Further longitudinal data are needed to investigate NCA accuracy versus automated readings in hypertension trials and in the clinical setting.

Key Words: Accurate Blood Pressure Measurement, automated Blood Pressure Measurement, Clinical Trials

P-65 _MP-16_
AMBULATORY BLOOD PRESSURE MONITORING AND RISK OF CARDIOVASCULAR DISEASE

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Little is known about the prognostic significance of ambulatory blood pressure (BP) monitoring in the general population.

We conducted a prospective study of ambulatory BP and office BP in a random sample of 1700 men and women, age 41-72 years, without major cardiovascular diseases. At baseline, ambulatory BP, office BP, and other risk factors were recorded.

After a mean period of 9.5 years, 156 combined endpoints (cardiovascular death, ischemic heart disease, or stroke) were recorded. In multivariate models, the relative risk (95% confidence interval) for the combined endpoint associated with increments of 10/5 mm Hg of systolic/diastolic ambulatory BP were 1.35 (1.21-1.50) and 1.27 (1.16-1.39). The corresponding figures for office BP were 1.18 (1.09-1.29) and 1.11 (1.03-1.19). Compared with normotension (office BP <140/90; daytime BP <135/85) the relative risks associated with isolated office hyperten-