

Clinical Studies with DynaPulse

List of additional papers published

Update to the 2007 "Pulse Dynamics" e-Book

(January 7, 2013)

Paper #23: Preventing Chronic Disease, Public Health Research, Practice and Policy (CDC publication) -
http://www.cdc.gov/pcd/issues/2012/11_0134.htm

Predictors of Risk and Resilience for Posttraumatic Stress Disorder Among Ground Combat Marines: Methods of the Marine Resiliency Study

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Abstract: The Marine Resiliency Study (MRS) is a prospective study of factors predictive of posttraumatic stress disorder (PTSD) among approximately 2,600 Marines in 4 battalions deployed to Iraq or Afghanistan. We describe the MRS design and predeployment participant characteristics. Starting in 2008, our research team conducted structured clinical interviews on Marine bases and collected data 4 times: at predeployment and at 1 week, 3 months, and 6 months postdeployment. Integrated with these data are medical and career histories from the Career History Archival Medical and Personnel System (CHAMPS) database. The CHAMPS database showed that 7.4% of the Marines enrolled in MRS had at least 1 mental health diagnosis. Of enrolled Marines, approximately half (51.3%) had prior deployments. We found a moderate positive relationship between deployment history and PTSD prevalence in these baseline data.

Introduction: Chronic psychiatric illness such as posttraumatic stress disorder (PTSD) is a major public health problem among current and former military service members, especially those who have served in combat. The prevalence of PTSD among service members and veterans varies widely, but deployment to a war zone is consistently associated with an increased risk for PTSD by a factor of 1.5 to 3.5 across war eras (1). The Iraq and Afghanistan conflicts are no exception (2,3). Additionally, blast-related brain injuries, which are frequently associated with PTSD, are common (3,4). Although suicide rates among active duty personnel have risen since these conflicts started in 2003, reasons for the increase are not fully understood and are being investigated (5). PTSD and mild traumatic brain injury (TBI) appear to be risk factors for suicidal behavior (6). The number of veterans of the current conflicts seeking care at Veterans Health Administration (VHA) facilities has increased (7). Many of these veterans have met screening or diagnostic criteria for PTSD (20%–39%), often co-occurring with depression, anxiety, substance use disorders, and chronic pain (7,8). Associated long-term personal and societal costs are high.

Evidence-based therapies for PTSD have shown only modest efficacy in targeting war trauma (9). Increasingly, military resources are being invested in preventing PTSD. However, scientific advances in understanding the etiology and natural history of PTSD needed to develop effective prevention and treatments have been hampered by reliance on retrospective, cross-sectional research (10). Several prospective investigations of military cohorts have now been initiated (2,3,11). The Marine Resiliency Study (MRS) is singular among these investigations in its combined study of operational units and its biological, psychological, and social scope.

The objective of this article is to describe the research methods used in the MRS, a unique collaboration between the Marine Corps, Navy, Veterans Affairs (VA) Health Services Research and Development (HSR&D), and academia. The description of participant characteristics before deployment combined with

future longitudinal data analysis may allow researchers to identify modifiable multisystem risk and resilience factors for combat-related PTSD. The potential factors under investigation are measures of arousal, cardiovascular and physical fitness, mental health, stress reactivity, genetics, neurocognitive function, deployment stressors, and social and military support.

Paper #22: Journal of the American College of Cardiology Vol. 59, No. 24, 2012 (P. 2206-16)

Autonomic and Hemodynamic, Origins of Pre-Hypertension - Central Role of Heredity

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Objectives The purpose of this study is to better understand the origins and progression of pre-hypertension.

Background Pre-hypertension is a risk factor for progression to hypertension, cardiovascular disease, and increased mortality. We used a cross-sectional twin study design to examine the role of heredity in likely pathophysiological events (autonomic or hemodynamic) in pre-hypertension.

Methods Eight hundred twelve individuals (337 normotensive, 340 pre-hypertensive, 135 hypertensive) were evaluated in a sample of twin pairs, their siblings, and other family members. They underwent noninvasive hemodynamic, autonomic, and biochemical testing, as well as estimates of trait heritability (the percentage of trait variance accounted for by heredity) and pleiotropy (the genetic covariance or shared genetic determination of traits) by variance components.

Results In the hemodynamic realm, an elevation of cardiac contractility prompted increased stroke volume, in turn increasing cardiac output, which elevated blood pressure into the pre-hypertension range.

Autonomic monitoring detected an elevation of norepinephrine secretion plus a decline in cardiac parasympathetic tone. Twin pair variance components documented substantial heritability as well as joint genetic determination for blood pressure and the contributory autonomic and hemodynamic traits. Genetic variation at a pathway locus also indicated pleiotropic effects on contractility and blood pressure.

Conclusions Elevated blood pressure in pre-hypertension results from increased cardiac output, driven by contractility as well as heart rate, which may reflect both diminished parasympathetic and increased sympathetic tone. In the face of increased cardiac output, systemic vascular resistance fails to decline homeostatically. Such traits display substantial heritability and shared genetic determination, although by loci not yet elucidated. These findings clarify the role of heredity in the origin of pre-hypertension and its autonomic and hemodynamic pathogenesis. The results also establish pathways that suggest new therapeutic targets for pre-hypertension, or approaches to its prevention.

Paper #21: Journal of the American Society of Hypertension 5(1) (2011) 12–20

Korotkoff sound versus oscillometric cuff sphygmomanometers: comparison between auscultatory and DynaPulse blood pressure measurements

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Abstract

Listening to Korotkoff sounds (K-sounds) to determine systolic and diastolic blood pressure (BP) has been the standard for noninvasive BP measurement in medical practices for nearly 100 years. It is the essential tool used for evaluation and assessment of patients with hypertension and risks of cardiovascular diseases (CVD) by physicians and nurses despite limited understanding of the nature of K-sounds. Analyzing cuff oscillometric signals to obtain BP has been the foundation of most digital BP monitors available today. DynaPulse is an oscillometric digital BP monitor that records and analyzes subtle changes of pulse waveforms during the course of a BP measurement while cuff pressure slowly decreases from above systolic to below diastolic. This study compares systolic and diastolic readings obtained by K-sound method following the Bogalusa Heart Study protocol and BP measured by DynaPulse (DP2000A) monitor, in order to better understand the nature and difference between K-sound and oscillometric methods. Analysis of means and differences is applied to BP data collected from 803 subjects examined in the

Bogalusa Heart Study. The results indicated: 1) DynaPulse systolic was 9 mm Hg higher ($P < .0001$) than Phase 1 (K1) systolic, 2) DynaPulse diastolic was 5 mm Hg lower ($P < .0001$) than Phase 4 (K4), and 3) is less than 1 mm Hg higher than Phase 5 (K5) diastolic ($P < .0001$), when compared with K-sound auscultatory measurement. Understanding the methods and differences of DynaPulse oscillometric and K-sound BP measurements is important for clinic BP screening and self-BP monitoring, as well as future research to improve hypertension and CVD managements. *J Am Soc Hypertens* 2011;5(1):12–20.

Keywords: Korotkoff sounds; auscultatory; oscillometric; sphygmomanometer; DynaPulse; blood pressure measurement; Bogalusa Heart Study.

Paper #20: *J Pediatr* 2011;158:715-21

Relationship between Elevated Arterial Stiffness and Increased Left Ventricular Mass in Adolescents and Young Adults

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Objective To determine whether arterial stiffness relates to left ventricular mass (LVM) in adolescents and young adults.

Study design Demographic, anthropometric, laboratory, echo, carotid ultrasound and arterial stiffness data were obtained in 670 subjects 10 to 24 years of age (35% male, 62% non-Caucasian). Global stiffness index (GSI) was calculated from five measures of carotid artery stiffness, augmentation index, brachial distensibility, and pulse wave velocity (1 point if ≥ 95 th% for subjects with body mass index < 85 th%). Stiff arteries ($S = 73$) were defined as GSI ≥ 95 th%. Differences between flexible ($F = 597$) and S groups were evaluated by t tests. Models were constructed to determine whether GSI was an independent determinant of LVM index or relative wall thickness (RWT).

Results The S group had more adverse cardiovascular risk factors, higher LVM index and RWT ($P = .05$) with a trend for abnormal cardiac geometry. Independent determinants of LVM index were higher GSI, age, body mass index, systolic blood pressure, heart rate, glycated hemoglobin A1c, male sex, and sex-by-heart rate interaction ($r^2 = 0.52$; $P = .05$). GSI was also an independent determinant of RWT.

Conclusions Increased arterial stiffness in adolescents and young adults is associated with LVM index independently of traditional cardiovascular risk factors. Screening for arterial stiffness may be useful to identify high risk adolescents and young adults.

Paper #19: *The Journal of Clinical Hypertension* Vol 13 | No 5 | May 2011

Cardiac and Vascular Consequences of Pre-Hypertension in Youth

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Hypertension is associated with increased left ventricular mass (LVM) and carotid intima-media thickness (cIMT), which predict cardiovascular (CV) events in adults. Whether target organ damage is found in pre-hypertensive youth is not known. The authors measured body mass index, blood pressure, fasting glucose, insulin, lipids and C-reactive protein, LVM/height^{2.7} (LVM index), diastolic function, cIMT, carotid stiffness, augmentation index, brachial artery distensibility, and pulse wave velocity (PWV) in 723 patients aged 10 to 23 years (29% with type 2 diabetes mellitus). Patients were stratified by blood pressure level (normotensive: 531, pre-hypertensive: 65, hypertensive: 127). Adiposity and CV risk factors worsened across blood pressure group. There was a graded increase in cIMT, arterial stiffness, and LVM index and decrease in diastolic function from normotension to pre-hypertension to hypertension. In multivariable models adjusted for CV risk factors, status as pre-hypertension or hypertension remained an independent determinant of target organ damage for LVM, diastolic function, internal cIMT, and carotid arterial stiffness. Pre-hypertension is associated with cardiovascular target organ damage in adolescents and young adults. *J Clin Hypertens (Greenwich)*. 2011;13: 332–342.

Paper #18: Progress in Cardiovascular Diseases 53 (2011) 369–378

Progress of Ambient Air Pollution and Cardiovascular Disease Research in Asia

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Abstract

Asian countries are with deteriorating air quality accompanying the rapid economic and social development of the past decades, and the potential health impacts of air pollution have been noticed by researchers in the region. We reviewed the scientific literature on air pollution and cardiovascular diseases (CVD) published by Asian researchers in English since the 1980s to determine whether the findings in Europe and North America can be extrapolated to Asia. Epidemiological studies show that short-term particulate matter pollution is a strong predictor for CVD morbidity and mortality and suggestive on cerebrovascular morbidity and mortality in newly developed countries in Asia. Multicountry epidemiological studies are needed to fully appreciate the extent of air pollution on CVD in Asia, especially less developed Asian countries. New cohort studies should be initiated to improve our understanding of particulate matter's toxicological pathways, long-term exposure effects, and gene-environment interaction on CVD among the Asian population. (Prog Cardiovasc Dis 2011;53:369-378)

Keywords: Cardiovascular disease; Air pollution; Epidemiology; Panel study; Asia

Paper #17: Journal of Hypertension 2010, 28:1692–1698

Increased arterial stiffness is found in adolescents with obesity or obesity-related type 2 diabetes mellitus

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Objective Adults with obesity or obesity-related type 2 diabetes (T2DM) are at higher risk for cardiovascular disease possibly due to increased arterial stiffness. We sought to determine if arterial stiffness is increased in youth with obesity or T2DM as compared with lean controls.

Methods Youth age 10–24 years (NU670, 62% non-Caucasian, 35% male) were examined. They were stratified by the 85th% of BMI as lean (LU241), obese (OU234) or obese with T2DM (T2DMU195). Questionnaire, anthropometric, BP, laboratory (fasting glucose, insulin, HbA1c, lipids, CRP), physical activity, and DXA were collected. Brachial artery distensibility (BrachD), pulse wave velocity (PWV) and augmentation index (AIx) were measured. Group differences were evaluated by ANOVA. General linear multivariate models were constructed to elucidate independent determinates of arterial stiffness.

Results CV risk profile deteriorated from L to O to T2DM group. There was a progressive increase in AIx and PWV-trunk with progressive decline in BrachD from L to O to T2DM individuals (all P<0.05). Group (status as L, O or T2DM) was an independent predictor of arterial stiffness even after adjusting for CV risk factors.

Conclusion Arterial stiffness is increased in young individuals with obesity and obesity-related T2DM even after correction for risk factors.

Paper #16: Clin.cardiol. 30, 615-620 (2007) Clinical Investigations

Development and Validation of a Noninvasive Method to Estimate Cardiac Output Using Cuff Sphygmomanometry

SS Chio, JJ Tsai, YM Hsu, JC LaPointe, TH covey, OL Kwan, AN DeMaria*

Summary

Background: Obtaining cardiac output (CO) non-invasively during routine blood pressure measurement can provide additional clinical value and improve hypertension management. A new method has been developed that estimates cardiac output using pulse-waveform-analysis (PWA) from a brachial cuff sphygmomanometer. This study evaluates the ability of PWA to track changes in CO as derived by Doppler ultrasound during dobutamine stimulation.

Hypothesis: This study aimed to validate the PWA CO estimation over a wider CO range as would be obtained during dobutamine stimulation with Doppler ultrasound evaluation.

Method: 48 patients undergoing standard dobutamine stress echocardiography testing for accepted clinical indications were enrolled. Among them, 44 patients (age 36-83, 18 females, 26 males) with good waveform data for analyses provided estimates of CO in this study. Noninvasive measurements of CO were performed using both Doppler ultrasound recordings and PWA techniques simultaneously at each stage of dobutamine infusion.

Results: A total of 207 simultaneous pulse-waveform-analyses and Doppler measurements were taken during dobutamine stress on 44 cardiac patients. Linear regression analysis revealed good intra-patient correlation between pulse-waveform-analysis and Doppler at different dobutamine induced CO with coefficients from $r=0.69$ to 0.98 ($p<0.05$). Analysis of all patients yielded an overall correlation of $r=0.82$ ($p<0.001$, bias = 0.4 L/min, standard deviation = 1.8 L/min).

Conclusion: Non-invasive CO measured from a sphygmomanometer using this PWA method correlate well with those of Doppler through a range of dobutamine-stimulated levels. It should be useful for monitoring hemodynamic changes in hypertensive and cardiac patients during routine blood pressure measurement.

KEY WORDS: CARDIAC OUTPUT, PULSE WAVEFORM ANALYSIS, THERMO-DILUTION, DOPPLER ULTRASOUND, DOBUTAMINE STIMULATION, HYPERTENSION

Paper #15: <http://www.iop.org/EJ/abstract/0967-3334/31/1/R01>, Alberto P Avolio *et al* 2010 *Physiol. Meas.* 31 R1-R47 doi: [10.1088/0967-3334/31/1/R01](https://doi.org/10.1088/0967-3334/31/1/R01)

Arterial blood pressure measurement and pulse wave analysis—their role in enhancing cardiovascular assessment

Abstract. The most common method of clinical measurement of arterial blood pressure is by means of the cuff sphygmomanometer. This instrument has provided fundamental quantitative information on arterial pressure in individual subjects and in populations and facilitated estimation of cardiovascular risk related to levels of blood pressure obtained from the brachial cuff. Although the measurement is taken in a peripheral limb, the values are generally assumed to reflect the pressure throughout the arterial tree in large conduit arteries. Since the arterial pressure pulse becomes modified as it travels away from the heart towards the periphery, this is generally true for mean and diastolic pressure, but not for systolic pressure, and so pulse pressure. The relationship between central and peripheral pulse pressure depends on propagation characteristics of arteries. Hence, while the sphygmomanometer gives values of two single points on the pressure wave (systolic and diastolic pressure), there is additional information that can be obtained from the time-varying pulse waveform that enables an improved quantification of the systolic load on the heart and other central organs. This topical review will assess techniques of pressure measurement that relate to the use of the cuff sphygmomanometer and to the non-invasive registration and analysis of the peripheral and central arterial pressure waveform. Improved assessment of cardiovascular function in relation to treatment and management of high blood pressure will result from future developments in the indirect measurement of arterial blood pressure that involve the conventional cuff sphygmomanometer with the addition of information derived from the peripheral arterial pulse.

Keywords: arterial pressure, sphygmomanometer, hypertension, ageing, cardiovascular risk, pulse pressure, heart rate, pulse waveform, pulse wave analysis, transfer function, radial pulse, carotid pulse, central aortic pressure, arterial impedance, pulse wave velocity, arterial stiffness, pulse amplification, vascular haemodynamics

Paper #14: <http://www.nature.com/ijo/journal/v33/n10/abs/ijo2009164a.html>, *International Journal of Obesity* (2009) 33, 1118–1125; doi:10.1038/ijo.2009.164; published online 25 August 2009

Gender differences in the relationships among obesity, adiponectin and brachial artery distensibility in adolescents and young adults

E M Urbina, P Khoury, L J Martin, D D'Alessio and L M Dolan

Abstract

Background: Obesity-related cardiovascular diseases (CVDs) are a major cause of cardiovascular (CV) mortality. Obesity-related reduction in vascular protective adipose-derived proteins, such as adiponectin (APN), has an important role.

Methods: We compared brachial artery distensibility (BrachD) with APN, the level of adiposity and other CV risk factors (CVRFs) in 431 post-pubertal subjects (mean 17.9 years). Gender differences in average values were examined by *t*-tests. Correlations among BrachD, obesity and other CVRFs were examined. Regression analysis was performed to determine whether APN provided an independent contribution to BrachD, while controlling for obesity and other CVRFs.

Results: Male subjects had lower BrachD (5.72 ± 1.37 vs $6.45 \pm 1.60\%$ change per mm Hg, $P < 0.0001$) and lower APN (10.50 ± 4.65 vs 13.20 ± 6.53 ; all $P < 0.04$) than female subjects. BrachD correlated with APN ($r = 0.25$, $P < 0.0001$). Both BrachD and APN correlated with measures of body size, including height, weight and body mass index (BMI). Both correlated with higher systolic blood pressure, glucose, insulin and lower high-density lipoprotein cholesterol (all $P < 0.01$). In multivariate analysis, APN, gender, APN*gender and BMI *z*-score predicted BrachD ($r^2 = 0.305$). On the basis of gender difference, only BMI *z*-score was significant for male subjects ($r^2 = 0.080$), whereas APN and BMI *z*-score contributed for female subjects ($r^2 = 0.242$, all $P < 0.0001$).

Conclusions: BrachD is independently influenced by obesity in both male and female subjects. In female subjects, APN exerts an additional independent effect even after adjusting for blood pressure (BP), lipid levels and insulin. Differences in the effect of the APN–adiposity relationship on obesity-related vascular disease may be one reason for gender differences in the development and progression of atherosclerosis.

Keywords: elasticity, pediatrics, sex, risk factors, brachial artery

Paper #13:

<http://hyper.ahajournals.org/cgi/content/abstract/54/5/919?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=EM+Urbina%2C+2009&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT>

Hypertension. 2009; 54:919-950

Noninvasive Assessment of Subclinical Atherosclerosis in Children and Adolescents - Recommendations for Standard Assessment for Clinical Research: A Scientific Statement From the American Heart Association

Elaine M. Urbina, MD, FAHA, Chair; Richard V. Williams, MD; Bruce S. Alpert, MD, FAHA; Ronnie T. Collins, MD; Stephen R. Daniels, MD, PhD, FAHA; Laura Hayman, PhD, RN, FAHA; Marc Jacobson, MD, FAHA; Larry Mahoney, MD, FAHA; Michele Mietus-Snyder, MD; Albert Rocchini, MD, FAHA; Julia Steinberger, MD, MS; Brian McCrindle, MD, MPH, FAHA on behalf of the American Heart Association Atherosclerosis, Hypertension, and Obesity in Youth Committee of the Council on Cardiovascular Disease in the Young

Deterioration in endothelial function and arterial stiffness are early events in the development of cardiovascular diseases. In adults, noninvasive measures of atherosclerosis have become established as

valid and reliable tools for refining cardiovascular risk to target individuals who need early intervention. With limited pediatric data, the use of these techniques in children and adolescents largely has been reserved for research purposes. Therefore, this scientific statement was written to (1) review the current literature on the noninvasive assessment of atherosclerosis in children and adolescents, (2) make recommendations for the standardization of these tools for research, and (3) stimulate further research with a goal of developing valid and reliable techniques with normative data for noninvasive clinical evaluation of atherosclerosis in pediatric patients. Precise and reliable noninvasive tests for atherosclerosis in youth will improve our ability to estimate future risk for heart attack and stroke. Currently, large longitudinal studies of cardiovascular risk factors in youth, such as the Bogalusa and Muscatine studies, lack sufficient adult subjects experiencing hard outcomes, such as heart attack and stroke, to produce meaningful risk scores like those developed from Framingham data.

Key Words: AHA Scientific Statements • pediatrics • elasticity imaging technique • brachial artery • risk factors • vasculature • carotid arteries

Paper #12:

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WDS-4WM052N-2&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1140895210&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=2f20017c29921dcb2a99c3a127e27210

Environmental Research Volume 109, Issue 7, October 2009, Pages 900-905

Effects of environmental noise exposure on ambulatory blood pressure in young adults[□]

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Abstract

Epidemiological studies have demonstrated that environmental noise exposure is associated with hypertension in middle-aged and older populations, but the relationship in the young subpopulation and between the genders is still unclear. This panel study investigated effects of environmental noise exposure on 24-h ambulatory blood pressure in 60 adults aged 18–32 years. Individual noise exposure and personal blood pressure were measured simultaneously for 30 males and 30 females. Linear mixed-effects regression models were applied to estimate effects. Total subjects (56.6±16.5 A-weighted decibels (dBA)) had transient elevations of 1.15 (95% CI=0.86–1.43) mmHg SBP and 1.16 (0.93–1.38) mmHg DBP at daytime, as well as 0.74 (0.21–1.26) mmHg SBP and 0.77 (0.34–1.20) mmHg DBP at nighttime, significantly associated with a 5-dBA increase in noise exposure. Such effects on SBP and DBP still persisted at the 30- and 60-min time-lagged noise exposure. Per 5-dBA increase in 24-h average noise exposure was significantly associated with sustained increments of 1.15 (0.76–1.54) mmHg SBP and 1.27 (0.96–1.58) mmHg DBP in males (57.4±16.0 dBA), as well as the higher levels of 1.65 (1.36–1.94) mmHg SBP and 1.51 (1.27–1.75) mmHg DBP in females (55.9±17.0 dBA). We found that environmental noise exposure may have elevated effects on adults' blood pressure. Young females are more susceptible to noise exposure than males.

Keywords: Blood pressure; Hypertension; Noise exposure; Panel study; Young adults

Abbreviations: 95% CI, 95% confidence interval; dBA, A-weighted decibel; DBP, diastolic blood pressure; OR, odds ratio; SBP, systolic blood pressure

Paper #11:

http://journals.lww.com/bpmonitoring/Abstract/2008/10000/Reproducibility_of_systemic_hemodynamics_in_stable.8.aspx

Blood Pressure Monitoring: October 2008 - Volume 13 - Issue 5 - pp 291-294
doi: 10.1097/MBP.0b013e3283057ae4 Analytical Methods and Statistical Analyses

Reproducibility of systemic hemodynamics in stable chronic hemodialysis: a pilot study

Abstract

Objective: Hemodynamic measurements are important in the understanding of hemodialysis (HD) hypertension and intradialytic hypotension. The reproducibility of hemodynamic measurements in HD patients is not known and is the objective of this report.

Methods: We enrolled 13 male patients (mean age 63±13 years) on stable chronic HD. Blood pressure (BP) and hemodynamic variables were obtained with a pulse dynamic technology device. Measurements were taken before and after HD, in the supine and standing positions over a 2-week period.

Results: Ranges for the average intraindividual standard deviation for each hemodynamic variable before and after HD in both supine and standing positions were: 8.3-14.5 mmHg for oscillometric systolic BP; 4.1-10.7 mmHg for oscillometric diastolic BP; 10.7-14.5 mmHg for manual systolic BP; 5.4-8.8 mmHg for manual diastolic BP; 131.4-188.9 mmHg/s for left ventricular dP/dtmax; 0.17-0.27 L/min/m² for cardiac index; 142.4-222.6 dynes/s/cm⁵ for systemic vascular resistance; 0.59-1.13%/mmHg for brachial artery distensibility; and 0.09-0.15 ml/mmHg for systemic vascular compliance. Repeated measures analysis of variance results showed no significant variability in measures. Intraclass correlation coefficient ranges were 0.58-0.72 for oscillometric systolic BP, 0.46-0.83 for oscillometric diastolic BP, 0.41-0.62 for manual systolic BP, 0.57-0.84 for manual diastolic BP, 0.10-0.78 for left ventricular dP/dtmax, 0.63-0.84 for cardiac index, 0.47-0.80 for systemic vascular resistance, 0.40-0.84 for brachial artery distensibility, and 0.62-0.88 for systemic vascular compliance. No correlation was observed between interdialytic weight gain and hemodynamic variability.

Conclusion: In this pilot study, hemodynamic variables have acceptable reproducibility in chronic stable HD patients. Our results are relevant to the use of hemodynamic monitoring in HD practice and research.

Paper #10: <http://www.ncbi.nlm.nih.gov/pubmed/18828435>, *Nepal Med Coll J.* 2008 Jun;10(2):118-22.

Ambulatory blood pressure monitoring: a useful tool to diagnose hypertension and supervise it's treatment. [Shrestha B](#), [Dhungel S](#), [Pahari SK](#).

Automatic ambulatory blood pressure monitoring (ABPM) for the diagnosis and treatment of hypertension (HTN) is not common in Nepal. The purpose of this study is to evaluate various characteristics of hypertensive patients undergoing ABPM before starting antihypertensive treatment and evaluate the adequacy of the blood pressure (BP) control during antihypertensive treatment. ABPM was performed in 108 consecutive patients attending the hypertension clinic of Nepal Medical College Teaching Hospital from 1st March 2005 to 30th April 2007 with DynaPulse 5000A (version 3.20q) for approximately 24 hours. Male female ratio was 59:49 and age (mean +/- SD) was 47.8 +/- 16.4 years. The maximum use of ABPM (25.9%) was noted in the age group of 40-49 years. Body mass index was 25.7 +/- 3.8. Diabetes was noted in 13% patients. Maximum use of ABPM was observed in Newar ethnic group (56.5%). ABPM was used for the diagnosis of HTN in 62.0% patients and for follow up in 38.0% patients. Severe HTN was seen in approximately half (47.2%) of the hypertensive patients. Majority of the patients (88.0%) had dipper type of HTN. Beta-blocker (35.6%), ACE inhibitor/Losartan (31.1%) and calcium channel antagonist (26.7%) were the usual antihypertensive agents used. Single antihypertensive agent was used

in the majority of patients (64.1%). In a small number of patients (42, 38.9%) undergoing ABPM during antihypertensive therapy, the adequacy of control of HTN was very poor.

Paper #9: <http://cjasn.asnjournals.org/cgi/content/full/3/1/184>

Clin J Am Soc Nephrol 3: 184-192, 2008; © 2008 [American Society of Nephrology](#); doi: 10.2215/CJN.03340807;

Mini-Reviews

Vascular Stiffness: Its Measurement and Significance for Epidemiologic and Outcome Studies

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Arterial stiffness is recognized increasingly as an important component in the determination of cardiovascular risk, particularly in chronic kidney disease and ESRD populations. Although the technique has been around for nearly 100 yr, in the past 20 to 25 yr, pragmatic noninvasive approaches have allowed the incorporation of arterial stiffness measurements, usually in the form of aortic pulse wave velocity (PWV), into clinical assessment of patients. In populations with high cardiovascular risk, especially those with ESRD, aortic PWV measurements provide predictive utility independent of the standard brachial arterial BP measurements. This review briefly discusses the history of vascular dynamics, the determinants of PWV, and some of the available technologies in current use and concludes with a section on the relevance of arterial stiffness measurements in populations of particular interest to nephrologists.

Paper #8: http://journals.lww.com/ccmjournal/Abstract/2007/02000/Nurse_physician_perspectives_on_the_care_of_dying.13.aspx

Critical Care Medicine: February 2007 - Volume 35 - Issue 2 - pp 422-429; doi: 10.1097/01.CCM.0000254722.50608.2D
Clinical Investigations

Nurse-physician perspectives on the care of dying patients in intensive care units: Collaboration, moral distress, and ethical climate *

Hamric, Ann B. PhD, RN, FAAN; Blackhall, Leslie J. MD, MTS

Abstract

Objective: To explore registered nurses' and attending physicians' perspectives on caring for dying patients in intensive care units (ICUs), with particular attention to the relationships among moral distress, ethical climate, physician/nurse collaboration, and satisfaction with quality of care.

Design: Descriptive pilot study using a survey design.

Setting: Fourteen ICUs in two institutions in different regions of Virginia.

Subjects: Twenty-nine attending physicians who admitted patients to the ICUs and 196 registered nurses engaged in direct patient care.

Interventions: Survey questionnaire.

Measurements and Main Results: At the first site, registered nurses reported lower collaboration ($p < .001$), higher moral distress ($p < .001$), a more negative ethical environment ($p < .001$), and less satisfaction with quality of care ($p = .005$) than did attending physicians. The highest moral distress situations for both registered nurses and physicians involved those situations in which caregivers felt pressured to continue unwarranted aggressive treatment. Nurses perceived distressing situations occurring more frequently than did physicians. At the second site, 45% of the registered nurses surveyed reported having left or considered leaving a position because of moral distress. For physicians, collaboration related to satisfaction with quality of care ($p < .001$) and ethical environment ($p = .004$); for nurses, collaboration was related to

satisfaction ($p < .001$) and ethical climate ($p < .001$) at both sites and negatively related to moral distress at site 2 ($p = .05$). Overall, registered nurses with higher moral distress scores had lower satisfaction with quality of care ($p < .001$), lower perception of ethical environment ($p < .001$), and lower perception of collaboration ($p < .001$).

Conclusions: Registered nurses experienced more moral distress and lower collaboration than physicians, they perceived their ethical environment as more negative, and they were less satisfied with the quality of care provided on their units than were physicians. Provider assessments of quality of care were strongly related to perception of collaboration. Improving the ethical climate in ICUs through explicit discussions of moral distress, recognition of differences in nurse/physician values, and improving collaboration may mitigate frustration arising from differences in perspective.

Paper #7: http://journals.lww.com/jhypertension/Abstract/2007/02000/C_reactive_protein_an_intermediate_phenotype_13.aspx
Journal of Hypertension: February 2007 - Volume 25 - Issue 2 - p 329-343

C-reactive protein, an 'intermediate phenotype' for inflammation: human twin studies reveal heritability, association with blood pressure and the metabolic syndrome, and the influence of common polymorphism at catecholaminergic/[beta]-adrenergic pathway loci

Wessel, Jennifer; Moratorio, Guillermo; Rao, Fangwen; Mahata, Manjula; Zhang, Lian; Greene, William; Rana, Brinda K; Kennedy, Brian P; Khandrika, Srikrishna; Huang, Pauline; Lillie, Elizabeth O; Shih, Pei-An Betty; Smith, Douglas W; Wen, Gen; Hamilton, Bruce A; Ziegler, Michael G; Witztum, Joseph L; Schork, Nicholas J; Schmid-Schönbein, Geert W; O'Connor, Daniel T

Abstract

Background: C-reactive protein (CRP) both reflects and participates in inflammation, and its circulating concentration marks cardiovascular risk. Here we sought to understand the role of heredity in determining CRP secretion.

Methods: CRP, as well as multiple facets of the metabolic syndrome, were measured in a series of 229 twins, both monozygotic (MZ) and dizygotic (DZ), to estimate trait heritability (h^2). Single nucleotide polymorphism (SNP) genotyping was done at adrenergic pathway loci. Haplotypes were inferred from genotypes by likelihood methods. Association of CRP with hypertension and the metabolic syndrome was studied in a larger series of 732 individuals, including 79 with hypertension.

Results: MZ and DZ twin variance components indicated substantial h^2 for CRP, at $\square 56 \pm 7\%$ ($P < 0.001$). CRP was significantly associated ($P < 0.05$) with multiple features of the metabolic syndrome in twins, including body mass index (BMI), blood pressure (BP), leptin and lipids. In established hypertension, elevated CRP was associated with increased BP, BMI, insulin, HOMA (index of insulin resistance), leptin, triglycerides and norepinephrine. Twin correlations indicated pleiotropy (shared genetic determination) for CRP with BMI ($P = 0.0002$), leptin ($P < 0.001$), triglycerides ($P = 0.002$) and systolic blood pressure (SBP) ($P = 0.042$). Approximately 9800 genotypes (43 genetic variants at 17 loci) were scored within catecholaminergic pathways: biosynthetic, receptor and signal transduction. Plasma CRP concentration in twins was predicted by polymorphisms at three loci in physiological series within the catecholamine biosynthetic/ β -adrenergic pathway: *TH* (tyrosine hydroxylase), *ADRB1* (β_1 -adrenergic receptor) and *ADRB2* (β_2 -adrenergic receptor). In the *TH* promoter, common allelic variation accounted for up to $\square 6.6\%$ of CRP inter-individual variance. At *ADRB1*, variation at Gly389Arg predicted $\square 2.8\%$ of CRP, while *ADRB2* promoter variants T-47C and T-20C also contributed. Particular haplotypes and diplotypes at *TH* and *ADRB1* also predicted CRP, though typically no better than single SNPs alone. Epistasis (gene-by-gene interaction) was demonstrated for particular combinations of *TH* and *ADRB2* alleles, consistent with their actions in a pathway in series. In an illustration of pleiotropy, not only CRP but also plasma triglycerides were predicted by polymorphisms at *TH* ($P = 0.0053$) and *ADRB2* ($P = 0.027$).

Conclusions: CRP secretion is substantially heritable in humans, demonstrating pleiotropy (shared genetic determination) with other features of the metabolic syndrome, such as BMI, triglycerides or BP. Multiple, common genetic variants in the catecholaminergic/ β -adrenergic pathway contribute to CRP, and these variants (especially at *TH* and *ADRB2*) seem to interact (epistasis) to influence the trait. The results uncover novel pathophysiological links between the adrenergic system and inflammation, and suggest new strategies to probe the role and actions of inflammation within this setting.

Paper #6: <http://www.anesthesia-analgesia.org/cgi/content/full/102/5/1463>

Anesth Analg 2006;102:1463-1467; © 2006 [International Anesthesia Research Society](#)
doi: 10.1213/01.ane.0000204303.21165.a4; TECHNOLOGY, COMPUTING, AND SIMULATION

Remote Anesthetic Monitoring Using Satellite Telecommunications and the Internet

Stephen W. Cone, MD*, Lynne Gehr, MD, Russell Hummel, MS*, and Ronald C. Merrell, MD, FACS*

Abstract

Remote collaboration for anesthesia requires considerable sharing of physiologic data, audio, and images on a consistent data platform. A low-bandwidth connection between Ecuador and the United States supported effective joint management of operative plan, airway, intraoperative decisions, and recovery. Transmission with a 64-Kbps InMarSat satellite telephone (Thrane & Thrane, Denmark) connection from hospitals in Macas and Sucúa, Ecuador, to Richmond, Virginia, included preoperative patient evaluations, video of endotracheal intubations, electrocardiogram waveforms, pulse oximetry measurements, arterial blood pressure readings, capnography readings, and auscultation of breath sounds.

Paper #5: <http://heart.bmj.com/content/91/6/769.abstract>

Heart 2005;91:769-773 doi:10.1136/hrt.2003.032110; Cardiovascular medicine

Ventriculo-vascular interactions in patients with β thalassaemia major,

[Y F Cheung](#)¹, [S Y Ha](#)², [G C F Chan](#)²

Abstract

Objectives: To determine potential interactions between the heart and arterial system in patients with β thalassaemia major.

Design and patients: Vascular compliance, systemic vascular resistance, and left ventricular (LV) contractility was determined in 34 asymptomatic thalassaemia patients at 2–4 hours after blood transfusion and also in 34 age and sex matched controls using a non-invasive device. The results were compared between groups and inter-relationships between LV contractility and indices of vascular load were explored.

Setting: Tertiary paediatric cardiac centre.

Results: When compared with controls, patients had greater systemic vascular resistance (1633 (259) v 1377 (276) dynes/s/cm⁵, $p < 0.001$) and effective arterial elastance (E_a) (1.86 (0.25) v 1.65 (0.29) mm Hg/ml, $p = 0.001$), an index of combined pulsatile and static vascular load. On the other hand, their systolic blood pressure (104 (9) v 112 (13) mm Hg, $p = 0.006$), pulse pressure (45 (9) v 57 (10) mm Hg, $p < 0.001$), adjusted systemic vascular compliance (1.21 (0.09) v 1.37 (0.14), $p < 0.001$), adjusted brachial artery distensibility (21 (0.29) v 7.95 (0.29)%/mm Hg, $p < 0.001$) and LV+dP/dt (1059 (183) v 1239 (237) mm Hg/s, $p = 0.001$) were significantly lower. Significant determinants of LV contractility, as reflected by LV+dP/dt, were age (standardised $\beta = -0.24$, $p = 0.003$), body mass index (standardised $\beta = -0.34$, $p = 0.004$), systolic blood pressure (standardised $\beta = 0.90$, $p < 0.001$), and effective E_a (standardised $\beta = -0.50$, $p < 0.001$) (model $R^2 = 0.69$). No significant correlation existed between serum ferritin concentration and any of the cardiac or vascular indices.

Conclusion: An unfavourable ventriculo-vascular interaction, as characterised by impaired cardiac contractility and increased static and pulsatile vascular load, occurs in patients with β thalassaemia major.

Paper #4: <http://heart.bmj.com/content/91/6/773.1.extract>

Heart 2005;91:773 doi:10.1136/hrt.2004.04470; Miscellanea

Left ventricular pseudoaneurysm in a child

[S S Kothari, A Roy, G Sharma;](#)

[Images in cardiology](#)

A 14 year old girl presented with a history of fatigue, atypical chest pain, and breathlessness for one month. Her haemoglobin was 8.3 g/dl and erythrocyte sedimentation rate (ESR) was 48 mm in the first hour. She had ...

Paper #3: <http://ntr.oxfordjournals.org/cgi/content/abstract/7/4/581>
Nicotine & Tobacco Research 2005 7(4):581-590; doi:10.1080/14622200500185199

The Influence of Gender, Race, and Menthol Content on Tobacco Exposure Measures

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Abstract

Research has suggested that race, gender, and menthol cigarette use influence tobacco-smoke exposure measures and smoking-related disease risk. For example, a high proportion of Black smokers prefer menthol cigarettes and, despite smoking fewer cigarettes per day (CPD) than do Whites, tend to have higher cotinine levels. Additionally, Black males are more at risk for smoking-related lung cancer. High cotinine levels and smoking menthol cigarettes may lead to higher toxin intake, which contributes to increased disease risk. We explored the relationship between tobacco exposure variables (i.e., cotinine, CPD, carbon monoxide [CO], nicotine content, and nicotine dependence) with respect to race, gender, and menthol content in a sample of 307 smokers recruited from the greater Boston area to participate in a smoking cessation treatment trial. The pattern of correlations between tobacco exposure measures and cotinine showed a consistently positive correlation between cotinine and CO in all smokers and a correlation between cotinine and CPD in those who smoked nonmenthol cigarettes. Cotinine and CPD correlations varied by gender and race among menthol cigarette smokers. Consistently, we found a significant genderxracexmenthol interaction on salivary cotinine level as well as cotinine/CPD ratio. These findings suggest that the relationship between number of cigarettes consumed and salivary cotinine is more complex than previously believed. It is not sufficient to look at race alone; researchers and clinicians need to look at race and gender concurrently, as well as type of cigarette consumed.

Paper #2: <http://bingoon.org/Documents/SphygmogramAnalyzer.pdf>
Expert Systems with Applications 28 (2005) 693–700

A novel intelligent sphygmogram analyzer for health monitoring of cardiovascular system

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Abstract

A novel sphygmogram analyzer (SGA) with embedded medical advisory system is proposed to conquer the drawbacks of the existing commercial systems such as clumsy volume, awkward user-interface, and weak intelligence, etc. Firstly, benefited from the advanced embedded systems and micro-processing chips, the elementary components of SGA can be condensed into a tiny micro-system, which will greatly contribute to the wearable health monitoring devices. Secondly, the proposed SGA is distinguished due to the embedded medical advisory system, which can provide the comparative medical services while adaptive to the source restricted embedded platforms. In this paper, the hemodynamic analysis of sphygmogram is

firstly introduced and then, the implementation of SGA, including data acquiring and analyzing unit (DA2U), embedded medical advisory system (e-MAS) boosted for the application of soft computing, and the distributed information exchanging framework, is addressed in detail.

Keywords: Sphygmogram analyzer; Embedded systems; Medical advisory system; Health monitoring

Paper #1: <http://www.nature.com/ajh/journal/v15/n3s/abs/ajh2002368a.html>

P-78: Cardiovascular reactivity and diurnal arterial compliance during nebivolol treatment of young obese essential hypertensives, Sergey A. Golubev^{1,2}, Jeffrey J. Tsai^{1,2}, Maxim N. Mily^{1,2} and Vyacheslav V. Afanassiev^{1,2}

Abstract

To evaluate changes in systemic and peripheral hemodynamics in resting, under stress tests and daily life conditions during short-term treatment with nebivolol in a special high-risk population twelve randomly selected verified never treated essential hypertensives (aged 38.6 ± 8.4 years, body mass index 31.2 ± 5.2 kg/m²) underwent ambulatory blood pressure monitoring (DynaPulse 5000A; Pulse Metric, Inc., USA), standard mental arithmetic (MT) and cold pressor (CT) tests before and 4 weeks after treatment with nebivolol (5 mg once daily). Systemic and local (brachial artery) vascular hemodynamics parameters were derived blindly from each measurement by previously validated web-based pulse dynamics analysis technology. Ambulatory BP and HR were significantly reduced by nebivolol without excessive nighttime falls and variability affecting. 24-hour, but not resting systemic vascular compliance was significantly improved (1.19 ± 0.11 vs. 1.36 ± 0.16 mL/mm Hg; $p < 0.05$) without changes in brachial artery compliance. Nebivolol reduced diastolic BP response to MT (17.0 ± 8.5 vs. 14.0 ± 11.2 mm Hg; $p < 0.05$), and enhanced the rise in systemic vascular resistance during CT (1.5 ± 1.6 vs. 4.7 ± 3.3 mm Hg; $p < 0.05$).

Thus, in the studied overweight young essential hypertensives, under significant short-term antihypertensive effects of nebivolol during daily life and MT, favorable changes in systemic but not in brachial artery compliance are registered, probably due to main peripheral points of nitric oxide modulating. The last might result in some discrepancies registered in hemodynamics and compliance changes between different stress tests, resting and 24-hour conditions. Daily arterial compliance evaluation is useful for comprehensive judgement about vascular effects of antihypertensive agents.

Keywords: Nebivolol, Arterial Compliance, Cardiovascular Reactivity

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