

heart disease (CHD) risk more than 20% over 10 years (high-risk), was 5%, 7%, and 11% for men and 0.8%, 1.2% and 5% for women in rural, resettlement and urban population respectively (chi-square for trend for both,  $p < 0.001$ ). Overall prevalence of metabolic syndrome was 12%, 20% and 36% in rural, resettlement and urban populations respectively (chi-square for trend,  $p < 0.001$ , for both men and women). Overall prevalence of high-risk status by Framingham criteria was 17% in those with metabolic syndrome, irrespective of sex and locality. Probable CHD (by ECG and/or Rose's angina questionnaire) was present in 22% of those with metabolic syndrome in urban areas (unadjusted OR 4.6,  $p < 0.001$ ). Prevalence of metabolic syndrome and CHD risk increased progressively with rising body mass-index (BMI). Non-rural residence significantly elevated the risk of likelihood of CHD (OR for high-risk category 1.5 for resettlement and 2.6 for urban,  $p < 0.001$ ) and metabolic syndrome (OR 1.6 for resettlement and 2.0 for urban areas,  $p < 0.01$ ) even after adjusting for age, BMI, and sex.

**Conclusion:** The risk for CVD and metabolic syndrome increases progressively with degree of urbanization in India. Increasing obesity in urban areas is a major, but not only, determinant of this risk gradient.

### 1030-190 Burden, Rate of Screening and Awareness of Cardiovascular Risk Factors in a Geographically Limited Latin American Population

Francisco Lopez-Jimenez, Ector Jaime Ramirez-Barba, David Vega, Elia Lara, Virend K. Somers, Randal J. Thomas, Thomas E. Kottke, Mayo Clinic, Rochester, MN, Health Department, State of Guanajuato, Mexico, Guanajuato, Mexico

**Background:** Cardiovascular disease represents the number one cause of death in Mexico and many other countries in Latin America, but population-based data about the prevalence, level of awareness and knowledge of cardiovascular risk factors are lacking.

**Methods:** This was a cross-sectional, population-based survey of cardiovascular disease risk factors in the state of Guanajuato, Mexico, where sociodemographic characteristics are similar to the national average. Samples were selected by a two-stage cluster design. Neighborhoods identified as basic geographical statistical units were randomly selected from urban and rural populations, weighted for the socioeconomic characteristics of the entire state. The face-to-face interviews were performed at participants' home. Random blood glucose and total cholesterol measurements were performed using a semiquantitative analyzer using fingertip blood sampling. Nutritional and physical activity data were assessed using standardized questionnaires.

**Results:** Of persons contacted, 99.5% agreed to participate. From the 3083 adults included, 52% resided in rural communities. Cardiovascular risk factors were highly prevalent; 67.2% had a BMI equal or greater than 25 kg/m<sup>2</sup>, while 50.3% of women had central obesity; 18.3% of participants had hypertension, 18.3% had hyperlipidemia, 9.1% had diabetes mellitus, and 60% did not do any regular exercise; 27.3% of men reported current smoking. Regarding self-reported screening in the preceding 5 years, 17.6% of people had not had a blood pressure check, 83.6% had not had tested their serum cholesterol and 43.1% had not had a blood glucose check. The immense majority of subjects identified at least four out of the five major modifiable cardiovascular risk factors: diabetes mellitus, hypertension, hyperlipidemia, obesity and smoking, out of a list of multiple factors.

**Conclusions:** There is a high prevalence of cardiovascular risk factors in Mexico with suboptimal screening for diabetes, and dyslipidemia. These findings confirm the need for effective public health programs to decrease the current and increasing burden of cardiovascular disease in Latin America.

### 1030-191 Beyond LDL Control: Additional Benefits of Better Control of Hypertension and Glycemia in Patients on Statin Therapy: An Analysis From PROVE IT-TIMI-22

Kausik K. Ray, Christopher P. Cannon, Richard Cairns, Stephen D. Wiviott, Ajay J. Kirtane, Marc S. Sabatine, Carolyn Hoss McCabe, Eugene Braunwald, C. Michael Gibson, Brigham and Women's Hospital, Boston, MA, Harvard Medical School, Boston, MA

**Background:** The NCEP III guidelines now recommend an on treatment LDL of <70mg/dl in high risk patients. We sought to evaluate whether ACS patients who fail to reach these NCEP targets might benefit from other risk factor modification (systolic blood pressure and glycemic control).

**Methods:** In PROVE IT-TIMI 22 patients free from clinical events at 4 months (n=3463) were evaluated for death, myocardial infarction (MI) or unstable angina (UA) to the end of follow up (mean 2 years). Systolic blood pressure, HBA1c and on treatment LDL were measured as part of the study protocol at 4 months. Target systolic blood pressure (JNC-7) was set at <140mm Hg and HBA1c ranges of <6, 6-7, >7 for glycemic control (as set by the ADA).

**Results:** At 4 months a systolic blood pressure of <140mmHg was associated with a 2.3% lower rate of CV events in patients with LDLs  $\geq 70$ mg/dl (HR 0.71 CI 0.52, 0.97  $p=0.03$ ) and a 2.5% lower rate in patients with LDLs <70mg/dl (HR 0.64 CI 0.41, 1  $p=0.05$ ) (Figure 1). HBA1c was only available in 2835 event free patients. Within LDL strata better glycemic control (<6%) tended to be associated with a reduction in CV events, which was most significant at higher LDL levels (Figure 2)

**Conclusions:** Achieving a target BP of <140mmHg and better glycemic control at 4 months is associated with improved CV outcomes in ACS patients. BP lowering appeared to be equally important in both low and high LDL subgroups. The lowest event rates were in seen in those patients who achieved an LDL <70 mg/dl and a HBA1c <6.

Fig 1. Percentage of patients with Death/MI or UA from 4 months to end of follow up Stratified by month 4 LDL and Systolic Blood pressure

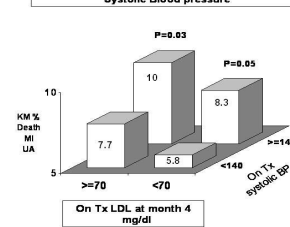
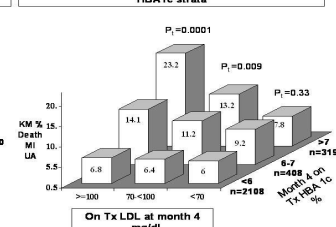


Fig 2. Percentage of patients with Death/MI or UA from 4 months to end of follow up Stratified by month 4 LDL and HBA1c strata



### 1030-192 Coronary Heart Disease Events and Associated Costs in United States Adults With Uncontrolled Comorbid Hypertension and Dyslipidemia

Joshua S. Benner, Allison A. Petrilla, Timothy W. Smith, David Klingman, David S. Battleman, ValueMedics Research, LLC, Arlington, VA, Leonard Davis Institute of Health Economics, Philadelphia, PA

**Background:** Hypertension (HTN) and dyslipidemia (DYS) are prevalent risk factors for coronary heart disease (CHD) that often coexist. However, the clinical and economic burden of uncontrolled comorbid HTN/DYS has not been well studied. This study determined the prevalence of uncontrolled HTN/DYS, frequency of CHD events attributable to HTN/DYS, and associated medical costs.

**Methods:** Prevalence of HTN/DYS was calculated using patient-level data from the Third National Health and Nutrition Examination Survey (NHANES III). Patients with uncontrolled HTN/DYS were identified by comparing observed blood pressure (BP) and cholesterol levels with JNC VII and NCEP ATP III criteria, respectively. Framingham risk equations were used to calculate the 4-year risk of CHD; HTN and DYS were then statistically controlled and risks recalculated. The difference in the expected number of events among US adults was thus attributable to HTN/DYS. First-year direct medical costs of preventable events were calculated based on event-specific cost figures from the literature.

**Results:** 6,424 NHANES III subjects (representing 148 million non-institutionalized civilian US adults) were included in the study. The weighted prevalence of uncontrolled HTN/DYS was 17.9 million (12.1%) and nearly 2 in 3 US adults with HTN also have DYS. Mean age of patients with uncontrolled HTN/DYS was 61.8 (SE = 0.8) years; 61% were male. Mean 4-year risk of CHD was 9.8% among patients with uncontrolled HTN/DYS, versus 4.8% and 4.7% in patients with uncontrolled HTN alone or uncontrolled DYS alone, respectively, and 1.0% in patients with neither condition. Among those with uncontrolled HTN/DYS, 825,241 events (47% of expected events) could be prevented over 4 years if both conditions were controlled. The first-year direct medical costs of these preventable events totaled \$10.5 billion.

**Conclusions:** The clinical and economic burden of CHD is substantial in patients with uncontrolled comorbid HTN/DYS; 1 in 10 will experience a CHD event within 4 years. Nearly half of these events could be prevented by controlling BP and cholesterol. Intensive efforts are needed to screen and treat patients for multiple, modifiable cardiovascular risk factors.

## POSTER SESSION

### 1031 Innovations in Wiotting and Cardiovascular Diagnosis

Sunday, March 06, 2005, 9:00 a.m.-12:30 p.m.

Orange County Convention Center, Hall E1

Presentation Hour: 10:00 a.m.-11:00 a.m.

### 1031-181 Multichannel Magnetocardiographic Visualization of Myocardial Ischemia: Novel Noncontact Mapping Method

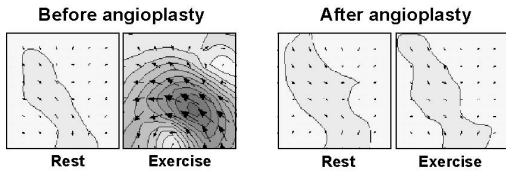
Hideaki Kanzaki, Satoshi Nakatani, Akihiko Kandori, Keiji Tsukada, Masafumi Kitakaze, Kunio Miyatake, National Cardiovascular Center, Osaka, Japan, Hitachi Central Research Laboratory, Tokyo, Japan

**Background:** Magnetocardiography (MCG) is a noncontact mapping technique to record the magnetic field around the heart produced by cardiac electric activity. Our hypothesis is that multichannel MCG is useful for screening of myocardial ischemia.

**Methods:** The 64-channel MCG (Hitachi MC-6400) following the Master's exercise test was performed in 29 patients: 17 with significant angiographic stenosis and 12 without stenosis. Isomagnetic field maps were constructed with the MCG signals at ST-segment to estimate depth of ischemic area using Biot-Savart Law.

**Results:** Exercise-induced abnormal current flow was obtained around the left ventricle (Figure, Left) in 12 of 17 with stenosis (sensitivity 71%) and was not obtained in 12 of 12 without stenosis (specificity 100%). The estimated depth was feasible in 10 (59%): 4.9  $\pm$  1.4 cm from the anterior chest wall in left anterior descending artery lesion and 7.4  $\pm$  1.4 cm in right coronary artery or left circumflex artery lesion. The abnormal current flow was not provoked by exercise after coronary angioplasty (Figure, Right).

**Conclusion:** Multichannel MCG is a novel noncontact mapping method for visualization of myocardial ischemia.



**1031-182 Classifying Heart Valve Pathology Using Voice-Recognition Technology**

Marie A. Guion, Ahmed Tewfik, KP Madhu, Arthur Erdman, University of Minnesota, Minneapolis, MN

**Background:** Use of the stethoscope--one of the oldest tools in cardiology--is fast, inexpensive, and minimally invasive, but interpreting the information it yields can be highly complex. Advanced digital signal processing software has the potential to revolutionize the stethoscope through the use of mathematical algorithms to interpret acoustic information. In this study, a novel classification algorithm based on voice-recognition systems is used for identifying differences between normal and diseased heart sounds.

**Methods:** 160 random patients undergoing a trans-thoracic echocardiogram were recruited from the Fairview University Hospital in Minneapolis, Minnesota. Patient data was collected using an electronic stethoscope (20-1000 Hz) and echo reports were used to classify valves as normal or diseased. 60 patients defined training spaces for the apex, aortic and tricuspid sites. Classification of sound signals was performed by linearly combining the mel-cepstrum and Principal Components Analysis feature vectors. During the training phase, patient data associated with normal and diseased valves was used to obtain a representative vector of each class. During the recognition phase, the feature vector from the test patient was compared with representative vectors.

**Results:** The classification accuracy of diseased patients was approximately 75% on the validation set comprised of 100 patients (71 diseased, 29 normal). There were 8 false negatives and 15 false positives. The algorithm sensitivity is 88.7% and specificity is 48.3%.

**Conclusion:** Voice recognition technology can be used to analyze the sounds produced by heart valves to assist a physician in determining whether a patient should be referred for an echocardiogram. Because voice recognition technology was developed as a generic signal processing method to recognize a large vocabulary of words (i.e., specific acoustic patterns) from a variety of speakers, this method has significant potential to help cardiologists to classify and recognize specific "acoustic signatures" associated with a wide range of cardiac events and conditions.

**1031-193 Assessment Of Coronary Flow Reserve By New Indices Extracted From Semi-Automated Doppler Tracing**

Enrico G. Caiani, Luigi Delfino, Valentina Magagnin, Christine Champlon, Massimo Lambro, Sergio Cerutti, Maurizio Turiel, Politecnico di Milano, Milano, Italy, Istituto Ortopedico Galeazzi, Università degli Studi di Milano, Milano, Italy

**Background.** Transthoracic Doppler echocardiography provides a noninvasive evaluation of coronary flow velocity reserve (CFR) in the distal LAD, as the ratio of maximal (pharmacologically stimulated) to baseline diastolic velocity peak, manually obtained from Doppler tracings. While CFR>2.5 is associated with normality and CFR<1.9 with reduced flow, the interpretation of 1.9<CFR<2.5 is still unclear.

Our goals were: 1) to develop a technique for semi-automated Doppler tracing and computation of other indices than CFR; 2) to test if any of these indices could reflect reduced coronary flow.

**Methods.** 15 normal (N) subjects and 15 patients (P) with reduced LAD flow, confirmed by invasive techniques, were studied for CFR evaluation. Stress echo (Philips Sonos 5500, S8 probe) was performed with dipyridamole (0.56 mg/kg over 4 min + 0.28 mg/kg over 2 min). Custom software was used to detect the Doppler profile and compute CFR, systolic (S) and diastolic (D) peak and mean velocity, S and D phase durations, D positive and negative maximum first derivative, D to S peak velocity ratio (DSVR).

**Results.** The proposed method correctly extracted the Doppler profile, as confirmed by visual inspection. The CFR (mean±SD) was greater in N (3.1±0.6) than in P (1.4±0.4). In addition, many of the new indices (Table) evidenced significant differences (#) between the two groups.

**Conclusions.** In addition to CFR, computerized analysis of Doppler coronary flow velocity could provide new indices useful for clinical evaluation.

	N		P	
	Ctrl	Stress	Ctrl	Stress
S peak (cm/s)	13±5	28±14*	20±6#	34±14*
D peak (cm/s)	19±5	64±25*	34±6#	48±2*#
S mean vel. (cm/s)	10±4	22±11*	16±5#	28±9*
D mean vel. (cm/s)	15±4	44±14*	24±5#	33±11*#
S time (ms)	349±168	266±49*	350±70	296±48*
D time (ms)	580±190	451±120*	541±158	373±89*#
D max der. (cm/s <sup>2</sup> )	2.6±0.7	4.4±1.8*	3.1±1.2	2.7±1.7#
D min der. (cm/s <sup>2</sup> )	-1.4±0.6	-3.6±1.5*	-1.9±1.5	-2.4±1.6#
DSVR	1.6±0.6	2.7±1.1	1.9±0.9	1.6±0.8#

\*:p<0.05 paired t-test; #: p<0.05 unpaired t-test

**1031-194 Decrease in R-R Interval Entropy Prior to the Onset of Atrial Fibrillation**

Volkan Tuzcu, Selman Nas, Tulay Borklu, Ahmet Ugur, Cincinnati Children's Hospital, University of Cincinnati, Cincinnati, OH, Arkansas Children's Hospital, University of Arkansas, Little Rock, AR

**Background.** It has been proposed that autonomic nervous system might have a role in the initiation of atrial fibrillation (AF). We studied the R-R interval entropy changes prior to the onset of AF using sample entropy.

**Methods.** We included 25 patients with lone AF for our study. Each record set contains two 30-minute records from 25 subjects. Each patient has of 30-minute records containing the ECG immediately preceding an episode of AF (pre-AF) along with the ECG containing 30 minutes of the ECG during a period that is distant from any episode of AF (AFd). Sample entropy was used for entropy analysis.

**Results.** The sample entropy of R-R intervals was found to be significantly reduced in the pre-AF period compared to the AFd period (0.45 ± 0.25 vs. 0.78 ± 0.46, p = 0.003). We divided the pre-AF periods into three successive 10-minute segments and analyzed with sample entropy in order to show the presence of a possible trend. There was a significant decreasing trend in entropy towards the onset of AF with linear mixed models (p = 0.002).

**Conclusions.** There is reduced heart rate complexity with a significant decreasing trend in R-R interval entropy prior to the onset of AF. There is a need for well defined studies with larger patient groups in order to assess the entropy changes further and to look for possible changes which might be predictor of impending AF episodes.

POSTER SESSION

**1057 Atrial Fibrillation: Patterns of Occurrence, Care, and Outcomes**

Sunday, March 06, 2005, 1:30 p.m.-5:00 p.m.  
Orange County Convention Center, Hall E1  
Presentation Hour: 2:30 p.m.-3:30 p.m.

**1057-181 Trends in Incidence of Atrial Fibrillation in Olmsted County, MN (1980-2000)**

Yoko Miyasaka, Marion E. Barnes, Stephen S. Cha, Bernard J. Gersh, James B. Seward, Walter P. Abhayaratna, Kent R. Bailey, Teresa S.M Tsang, Mayo Clinic, Rochester, MN

**Background:** There is evidence that the prevalence of atrial fibrillation (AF) increased during 1968-1989. However, more contemporary trends in incidence of AF are not available.

**Methods:** The complete medical records for residents of Olmsted County, MN, who had an ECG-confirmed diagnosis of first AF between 1980 and 2000 were comprehensively reviewed for each incident AF case. The trends in overall incidence were evaluated. Incidence was calculated as the number of new AF cases in each year divided by the sum of the Olmsted County population in that year. Statistical comparison across time and between genders was via Poisson regression using PROC GENMOD in SAS, using a log link function, and log (population) offset.

**Results:** 4,618 residents (mean age 73 ± 14 years, range 18 to 107 years; 51%men) were confirmed to have developed incident AF between 1980-2000. The incidence rate was 3.1/1000 person-years in men and 2.7/1000 person-years in women. Adjusted for age, the incidence ratio for men and women was 1.86 (P<0.0001). The overall rate of increase in incidence of AF for the period of 1980-2000 was 0.62% per year (P=0.012). The yearly increase was 0.7% in men (p=0.04) and 0.54% in women (p=0.13), and was not significantly different between men and women.

**Conclusions:** The overall age-adjusted incidence of AF increased significantly for the period 1980-2000. The rate of increase did not differ significantly between men and women.

**1057-182 Accuracy of Electrocardiogram Overreading by a Cardiologist in the Setting of Incorrect Computer Interpretation**

Daejoon Ahn, Subramaniam Krishnan, Frank Bogun, Henry Ford Hospital, Detroit, MI, University of Michigan, Ann Arbor, MI

**Background:** Misdiagnoses of atrial fibrillation(AF) based on misinterpretation of ECGs are common. The purpose of this study is to determine whether the specialty of the reading physician is associated with different accuracy in diagnosing ECGs initially misinterpreted as AF.

**Methods:** We retrieved 2,298 ECGs with the computerized interpretation of AF from 1,085 patients. Two electrophysiologists identified 442 ECGs from 382 patients that were incorrectly interpreted as AF. Medical records of these patients were reviewed to determine 1) the specialty of the physician who ordered and initially interpreted the ECG (primary reader), 2) the accuracy of the interpretation by the primary reader, 3) the accuracy of the interpretation by the over-reading cardiologist.

**Results:**

Specialty	Interpretation corrected	Interpretation uncorrected	Accuracy
Internist	93	38	71%
Emergency physician	105	35	75%
Other specialist †	20	14	59%
Cardiologist as primary reader	72	5	94% *
Cardiologist as over-reader	208	84	71% **

† Included surgeons, family practitioners, neurologists and anesthesiologists.

\* P<0.05 vs. internist, emergency physician or other specialist.

\*\* P<0.05 vs. cardiologist as primary reader.