HRV 2006

Techniques, Applications and Future Directions

At
The Fairmont Copley Plaza Hotel
138 St. James Avenue, Boston, MA 02116

Under the direction of
Ary L. Goldberger, MD
George B. Moody
Chung-Kang Peng, PhD

Presented by

HARVARD MEDICAL SCHOOL
Department of Continuing Education

BETH ISRAEL DEACONESS MEDICAL CENTER
Department of Medicine

April 20 - 22, 2006

Heart Rate Variability

New CME Course
Heart Rate Variability – 2006
Techniques, Applications and Future Directions
April 20-22, 2006
The Fairmont Copley Plaza Hotel, Boston, MA

http://cme.med.harvard.edu/courses/heartrate

Under the direction of
Ary L. Goldberger, MD, George B. Moody and Chung-Kang Peng, PhD

To be offered by the
Department of Medicine
Beth Israel Deaconess Medical Center
and
Harvard Medical School Office of Continuing Medical Education

Course Description: This 2.5-day course will provide a state-of-the-art overview of the technical considerations, pertinent computational tools, and clinical and research applications for heart rate variability (HRV) analysis. Particular emphasis will be placed on the utility and pitfalls of these techniques for patient management and research. The course faculty includes international leaders in the field. They have authored many of the seminal papers on HRV and are experienced teachers.

Objectives:
- Review signal processing in terms understandable to the clinician or bioengineer
- Critically review, compare and contrast a variety of linear, nonlinear, and complexity-based methodologies for analyzing heart rate, arterial blood pressure, and respiratory variability, including time and frequency domain methods, and nonlinear dynamical analyses
- Describe the uses and development of open-access databases and open-source software
- Identify the current clinical utility of computer analysis of heart rate and other dynamic electrocardiographic variables (e.g. T-wave alternans) in a variety of settings, including post-myocardial infarction, arrhythmias/sudden cardiac death risk and sleep apnea syndromes
- Explore future techniques and their role for expanding the utility of cardiorespiratory signal processing in patient management

Who Should Attend: Cardiologists, electrophysiologists, internists, anesthesiologists, neonatologists, critical care specialists and neurobiologists interested in a deeper understanding of the technical aspects of heart rate variability analysis; physiologists, engineers and others interested in clinical applications

Key Topics:

Basic Principles	Signal Analysis	Clinical Applications
Development of HRV	Time Domain	Arrhythmias
Data Acquisition and Processing	Frequency Domain	Autonomic Function
Physiological Interpretations	Nonlinear and Complexity-Based	Congestive Failure
Practical Considerations and	T-wave Alternans Detection	Diabetes Mellitus
Pitfalls	Heart Rate Recovery after Exercise	Myocardial Infarction
		Exercise Testing
		Neonatal Sepsis
		Sleep Apnea Syndromes
		Sudden Cardiac Death

PROGRAM

HEART RATE VARIABILITY — 2006
TECHNIQUES, APPLICATIONS AND FUTURE DIRECTIONS
THURSDAY, APRIL 20, 2006

7:15 – 8:00 *Registration and Continental Breakfast*
8:00 – 8:15 Welcome & Overview of Field: Why is Physiologic Variability Important? ....*Ary L. Goldberger, M.D.*

SIGNALS AND STANDARD MEASURES

8:15 – 9:00 Physiological Mechanisms of Heart Rate Variability (HRV) ....*Harold M. Stauss, M.D., Ph.D.*
9:00 – 9:30 Time Domain Measures: From Variance to PNNx...*Joseph E. Mietus, B.S.*
9:30 – 10:00 Frequency Domain Measures: Fourier Transform, Lomb Periodogram and Other Methods ....*George B. Moody*
10:00 – 10:30 *Coffee break*
10:30 – 11:00 Time and Frequency Domain Measures: Ectopic Beat and Activity Effects; Heart Rate Turbulence ....*Gari Clifford, Ph.D.*

COMPLEXITY/NONLINEAR MEASURES

11:00 – 11:30 Complexity Measures 1: What is Nonlinear Dynamics?...*Daniel Kaplan, Ph.D.*
11:30 – 12:00 Complexity Measures 2: Fractal Methods ....*Chung-Kang Peng, Ph.D.*
12:00 – 1:15 *Lunch*
1:15 – 1:45 Complexity Measures 3: Entropy Methods ....*Madalena Costa, Ph.D.*
1:45 – 2:30 Complexity Measures 4: Linguistic and Symbolic Dynamical Approaches
   and Time Irreversibility Measurement...*Chung-Kang Peng, Ph.D.*
2:30 – 3:00 *Coffee break*
3:00 – 4:00 Panel and Audience Discussion: Pitfalls, Applications and Limitations of Conventional and
   Newer Methods ....*George B. Moody and Faculty*
4:00 – 4:45 HRV Quiz: Unknowns and Answers
4:45 – 6:15 Reception

FRIDAY, APRIL 21, 2006
CLINICAL APPLICATIONS 1: AUTONOMIC ASSESSMENT

8:30 – 9:15 HRV in Autonomic Assessment: Diabetes Mellitus and other Conditions ....*Roy Freeman, M.D.*
9:15 – 10:00 HRV and Baroreflex Assessment ....*J. Andrew Taylor, Ph.D.*
10:00 – 10:20 A Guide to Open-Access Databases and Open-Source Software on PhysioNet...*George B. Moody*
10:20 – 10:50 *Coffee break*
10:50 – 11:10 Exercise and Heart Rate Recovery ....*Daniel E. Forman, M.D.*
11:10 – 12:00 Hands-On Practicum: Analysis of Real World Data ....*George B. Moody and Faculty*

CLINICAL APPLICATIONS 2: CARDIAC RISK ASSESSMENT,
ARRHYTHMIAS AND SUDDEN CARDIAC DEATH

12:00 – 12:30 HRV and Risk Stratification 1: Post MI and Congestive Heart Failure ....*Phyllis K. Stein, Ph.D.*
12:30 – 1:45 *Lunch*
1:45 – 2:15 HRV and Risk Stratification 2: Sudden Cardiac Death ....*Phyllis K. Stein, Ph.D.*
2:15 – 2:45 T-wave Alternans and Risk Stratification for Sudden Cardiac Death ....*Richard L. Verrier, Ph.D.*

CLINICAL APPLICATIONS 3: CHRONOBIOLOGY AND SLEEP

2:45 – 3:15 Chronobiologic Aspects of HRV ....*Frank A. J. L. Scheer, Ph.D.*
3:15 – 3:45 New Concepts in Sleep Staging and Sleep Physiology..*Robert J. Thomas, M.D.*
3:45 – 4:15 *Coffee break*
4:15 – 4:45 HRV in Sleep Stability and Sleep Apnea Detection...*Joseph E. Mietus, B.S.*
4:45 – 5:30 **Special Lecture:** Heart Rate Dynamics and Complex Arrhythmogenesis..*Leon Glass, Ph.D.*

SATURDAY, APRIL 22, 2006
OTHER CLINICAL APPLICATIONS AND FUTURE DIRECTIONS

8:30 – 9:10 Heart Rate Characteristics Monitoring in Neonatal Sepsis ....*J. Randall Moorman, M.D.*
9:10 – 9:30 Drugs and HRV...*Ary L. Goldberger, M.D.*
9:30 – 10:20 **Special Lecture**: Beyond the Fourier Transform: Coping with Nonlinear, Nonstationary Time Series.................*Norden E. Huang Ph.D.*
10:20 – 10:50 *Coffee break*
10:50 – 11:50 Panel and Audience Discussion: The Future of HRV

HMS/HST FACULTY

Gari Clifford, Ph.D., Madalena Costa, Ph.D., Daniel E. Forman, M.D., Roy Freeman, M.D., Ary L. Goldberger, M.D.,
Joseph E. Mietus, B.S., George B. Moody, Chung-Kang Peng, Ph.D., Frank A.J.L. Scheer, Ph.D., Andrew Taylor, Ph.D.,
Robert J. Thomas, M.D., Richard L. Verrier, Ph.D

OUTSIDE FACULTY

Leon Glass, Ph.D., Norden E. Huang, Ph.D., Daniel Kaplan, Ph.D.,
J. Randall Moorman, MD,. Harold M. Stauss, M.D., Ph.D., Phyllis K. Stein, Ph.D.