What Physiological Parameters we need to observe during Head Up Tilt Table test?

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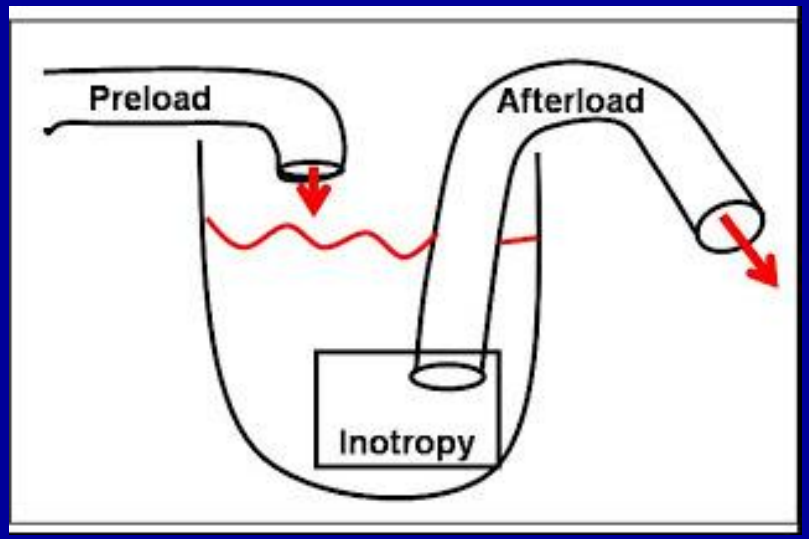
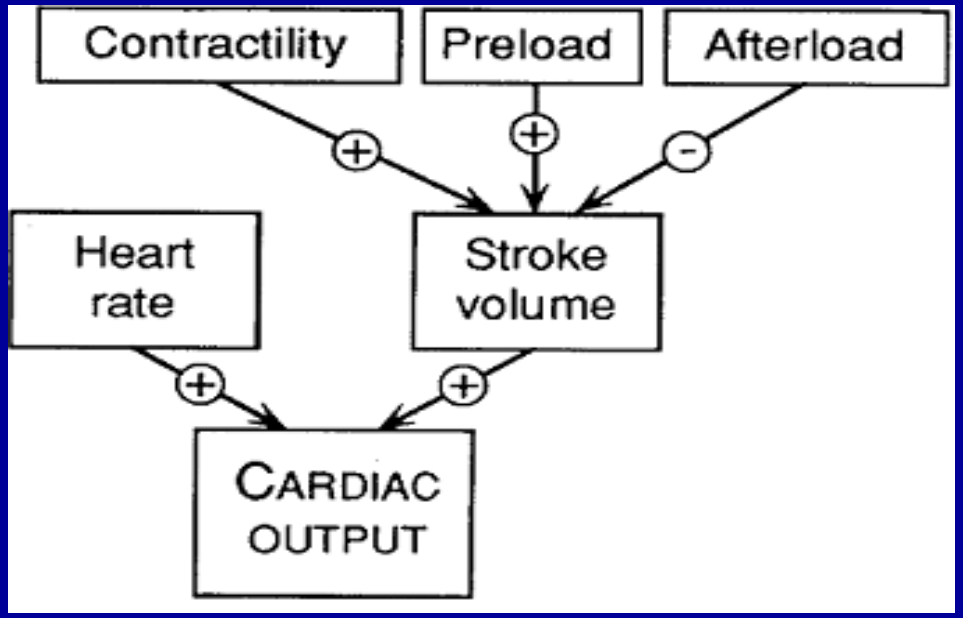
Introduction

- Vital organs' functions are related to adequate perfusion of oxygen and nutrients
- Maintenance of the blood supply to vital organs during postural change is complex and involve several systems (Neuro, Cardiac, Endocrine, Renal and vascular)
- Upright posture represents a challenge to human vascular system
- Cardiac blood output needs a balanced pre load, myocardial muscle contractility and arterial after load

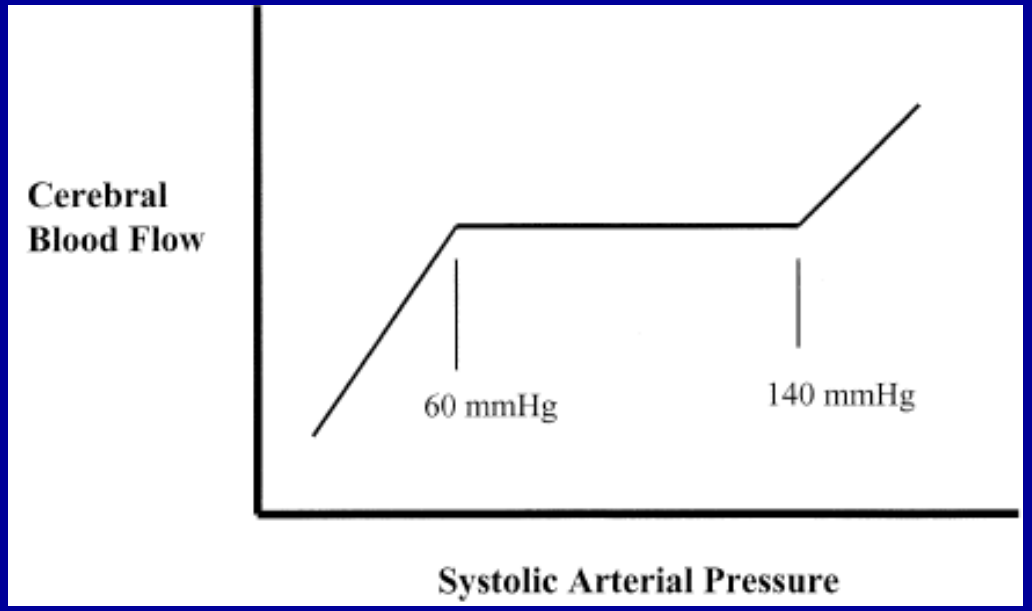
Physiology of Upright Posture

Circulation

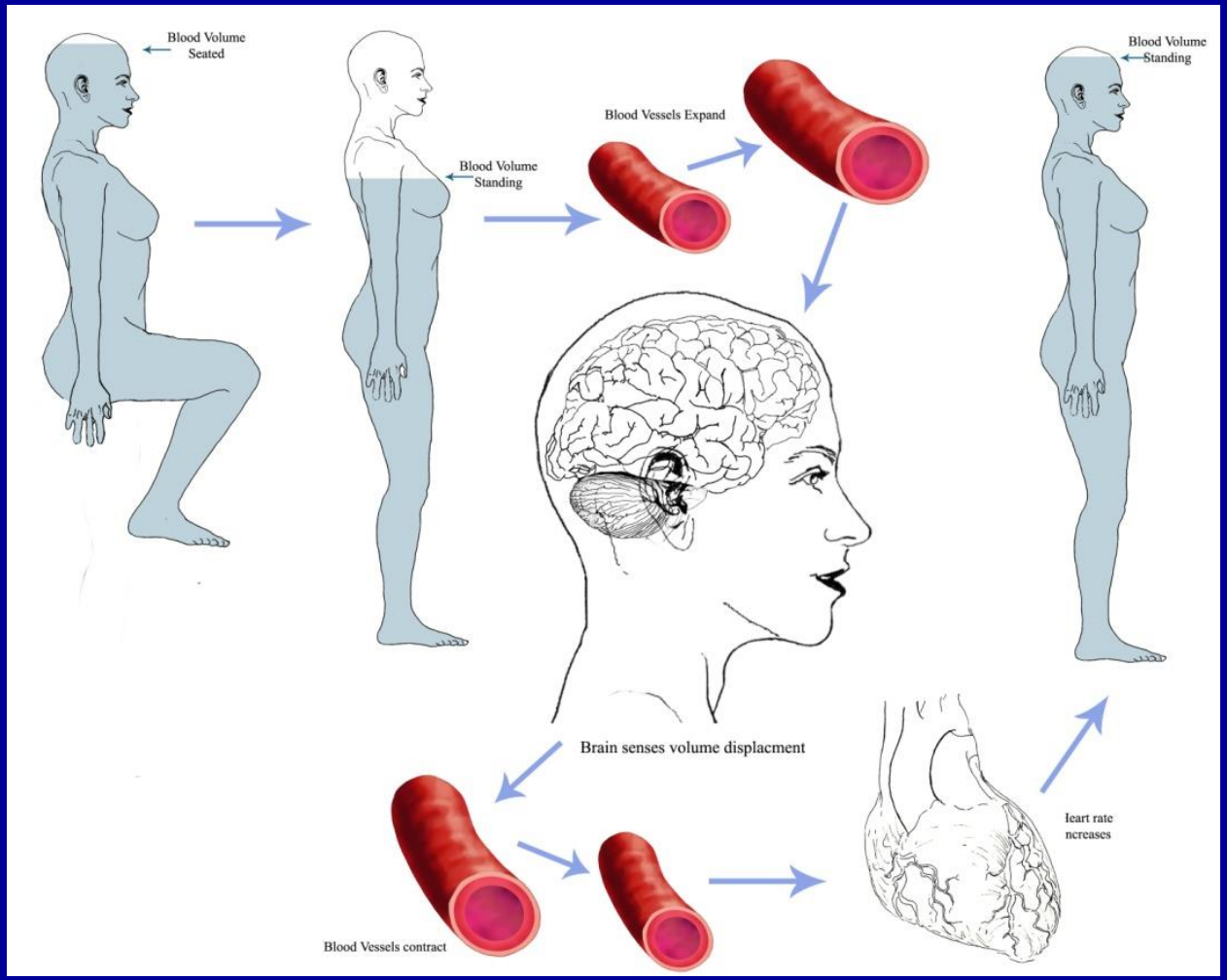




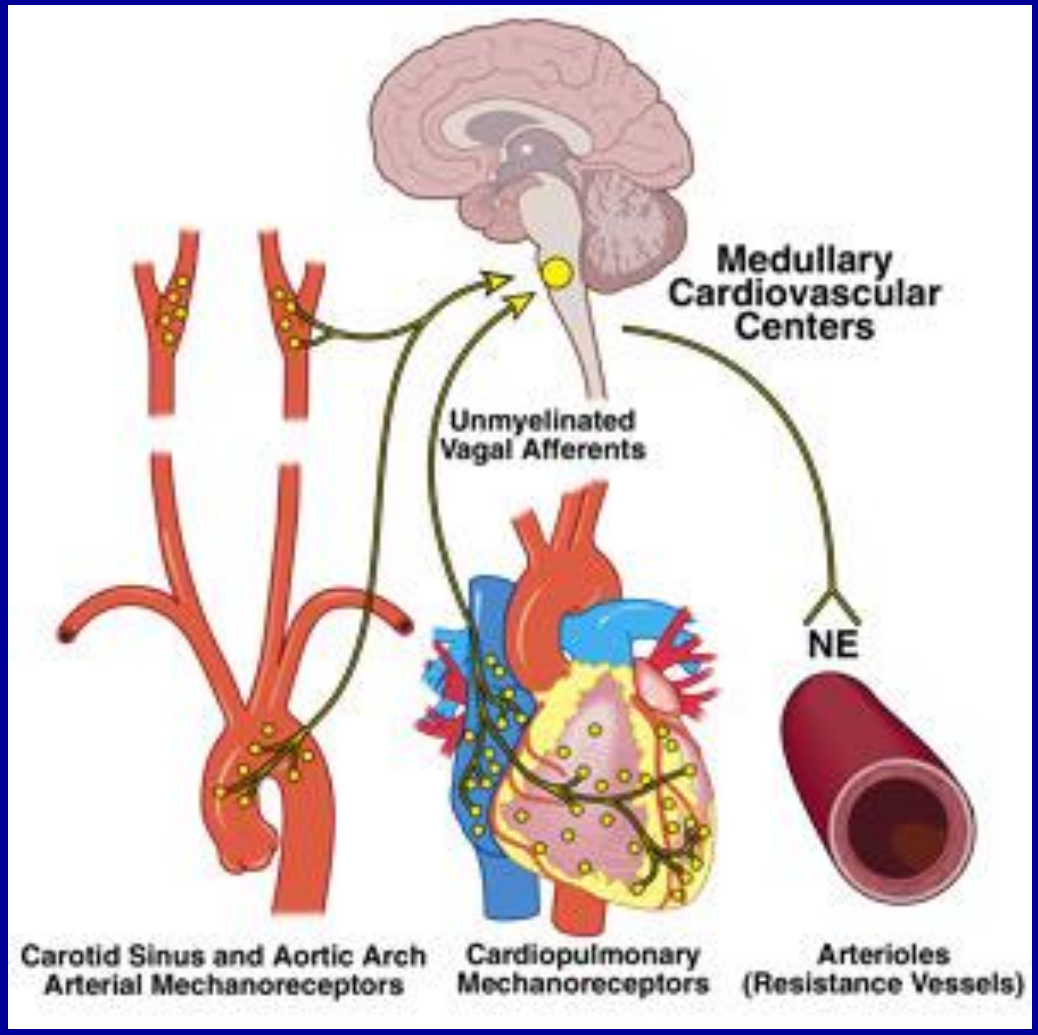
Cerebral flow in relation to Systolic Blood Pressure



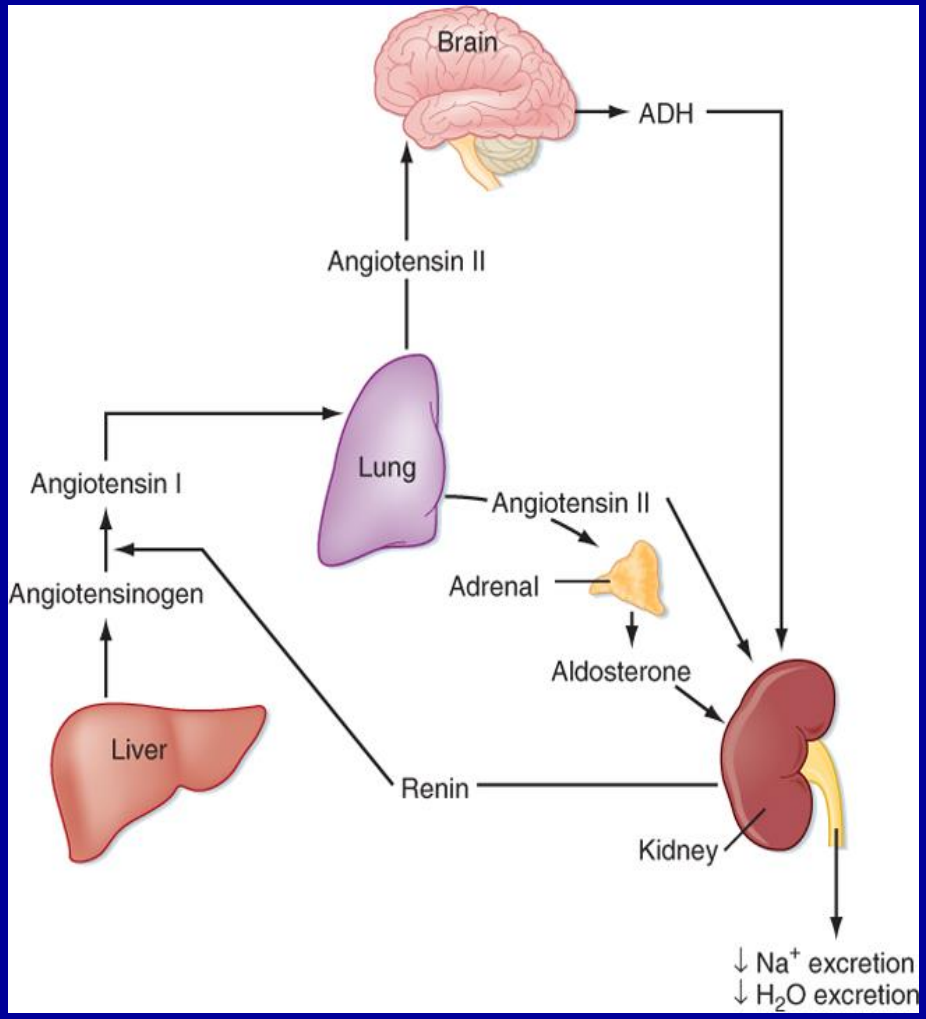
Gravity effect on Intravascular Plasma distribution

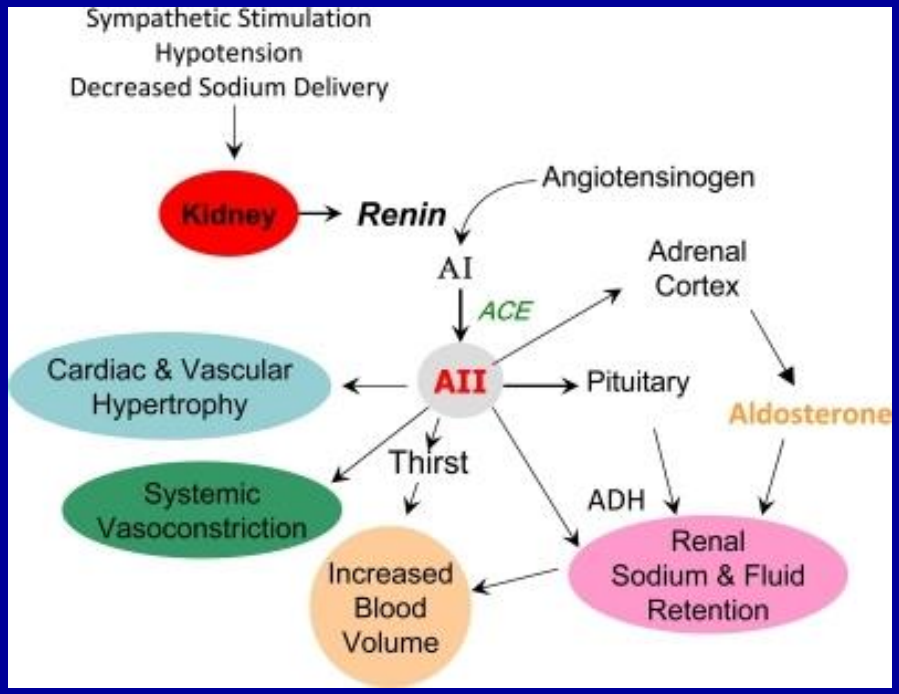


Mechanical and Baroreptors

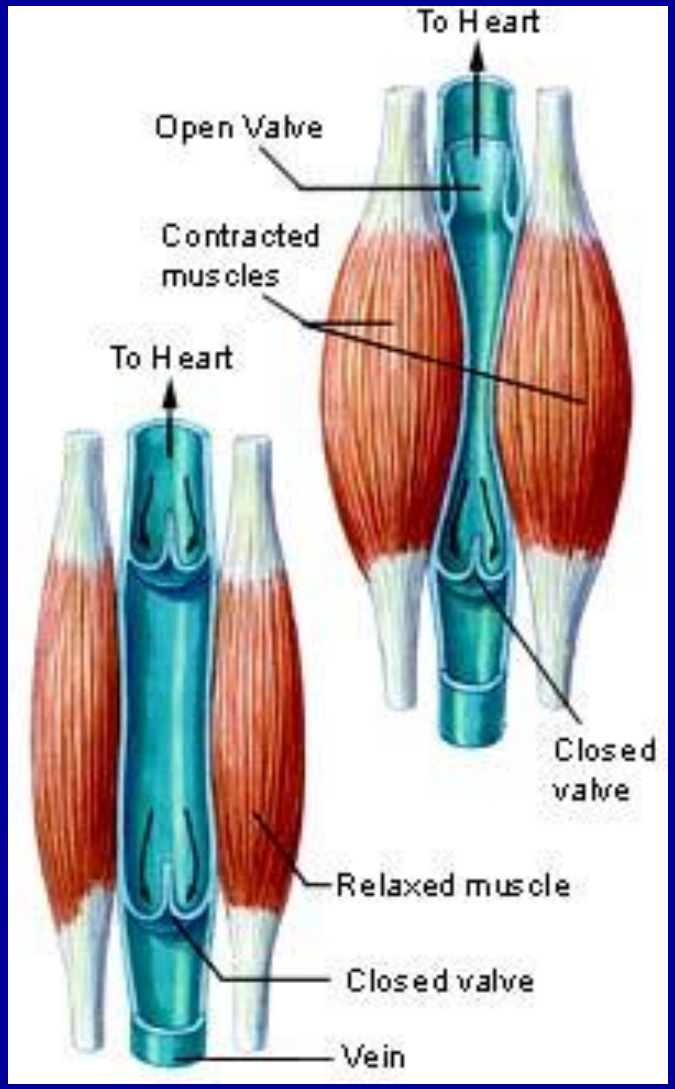


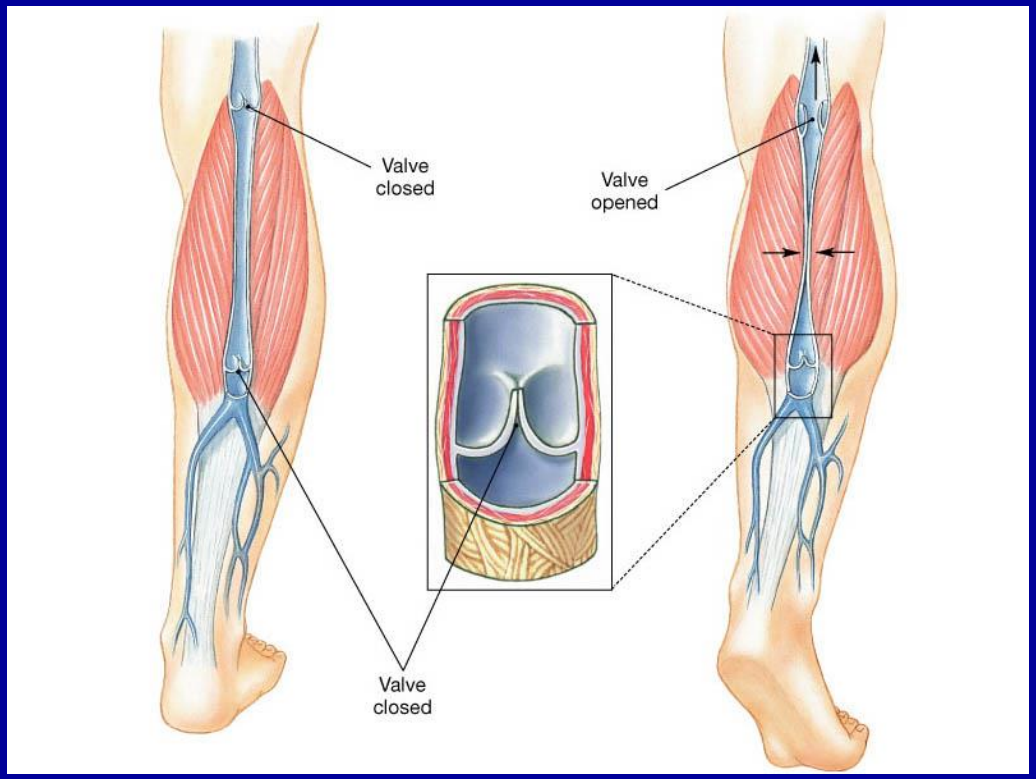
Renin- Angiotensin- Aldosterone System (RAAS)



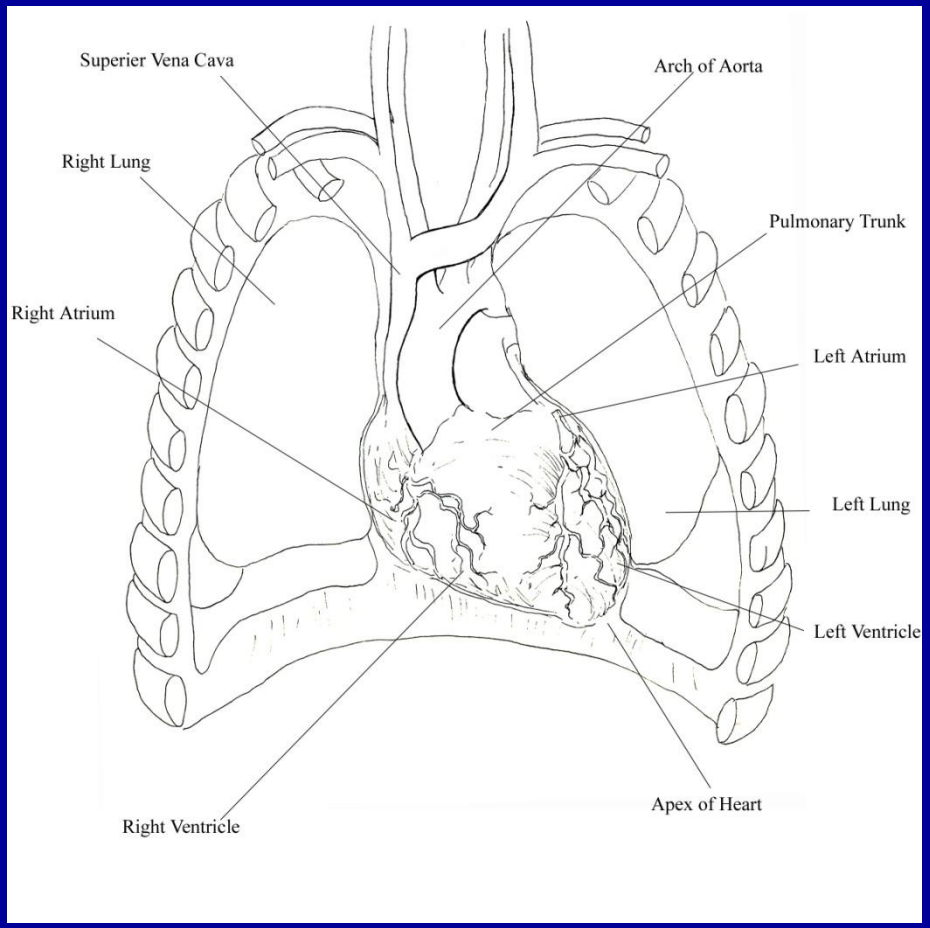


Muscular-Venous pumps





Negative Intra thoracic pressure with Inspiration



Neurocardiogenic Syncope

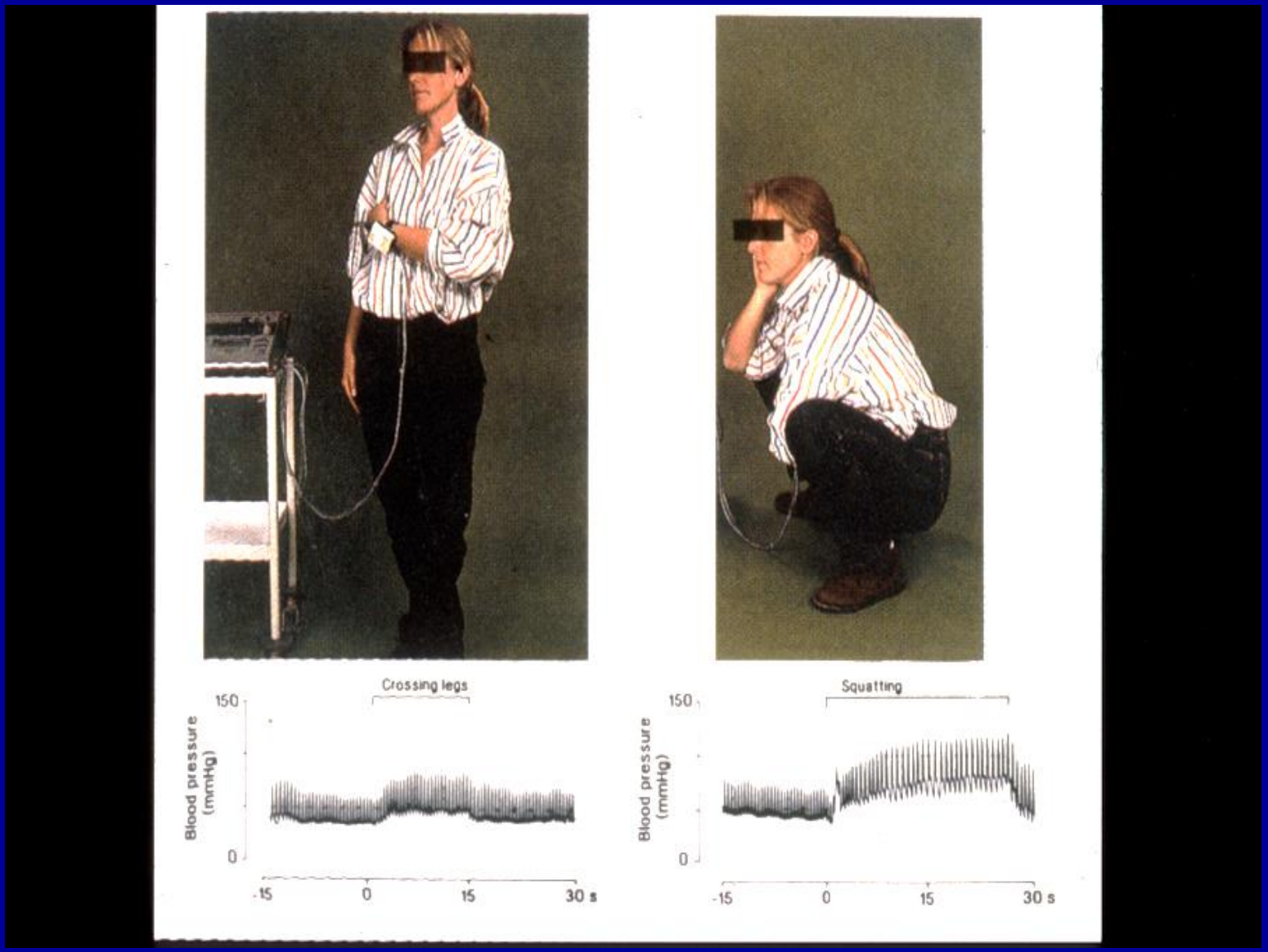
Precipitating Events

- Standing Stationary
- Dehydration
- Hot Room
- Viral Illness
- Urination
- Sight of Blood
- Pain
- Emotional Stress

Types of syncope

- reflex (neurally-mediated) syncope
- vasovagal
- carotid sinus syndrome
- orthostatic hypotension
- Partial seizures
- Psychiatric

Increased Venous Return to the Heart leads to improve Cardiac Output and Blood Pressure



The physiological Hemodynamic Head up Tilt Table Test (HUTT)

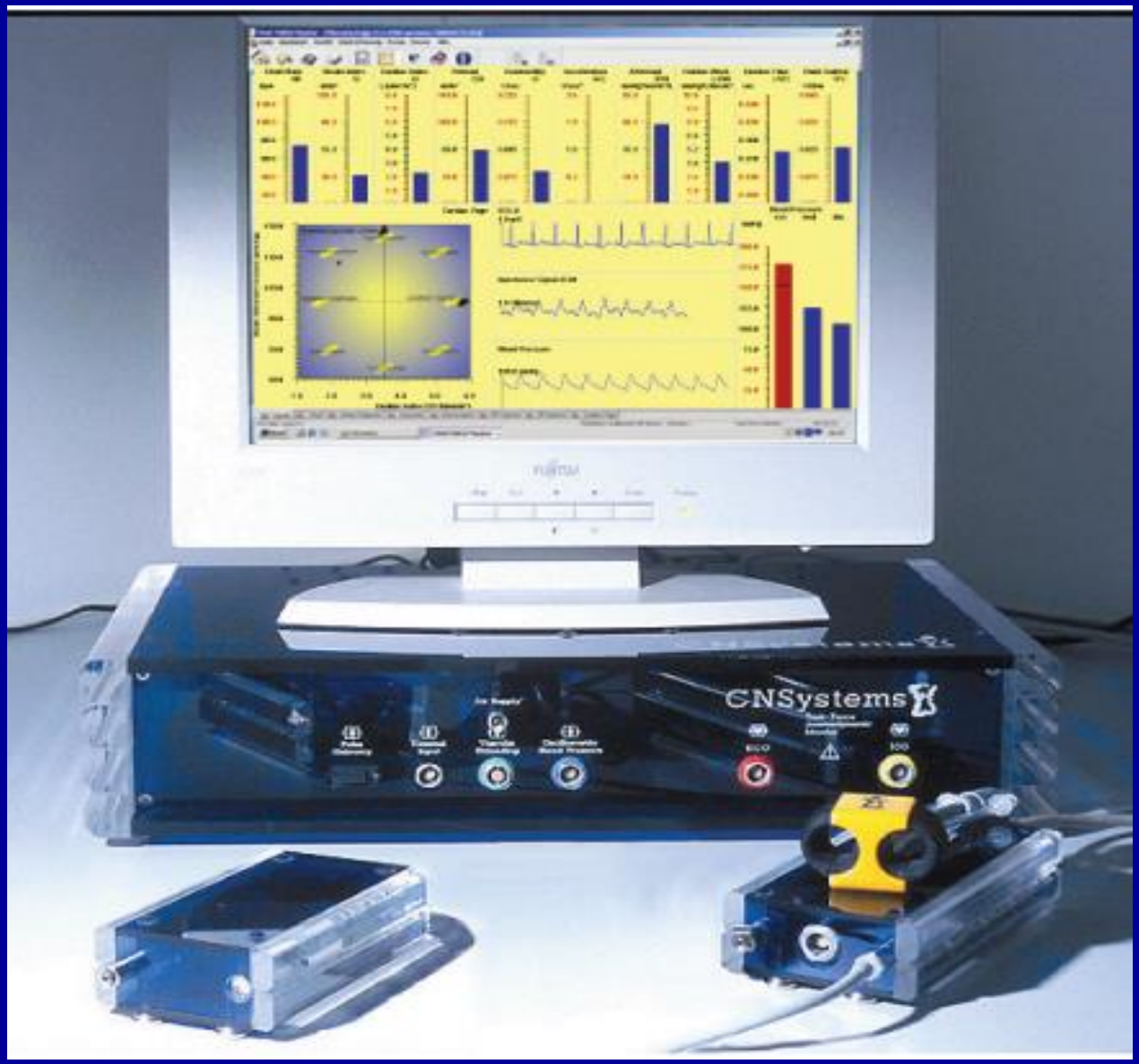
Conventional tilt table test started in mid 1980's

Continuous BP monitor

More physiologic parameters HUTT

Trans- thoracic impedance to measure Stroke volume(SV)

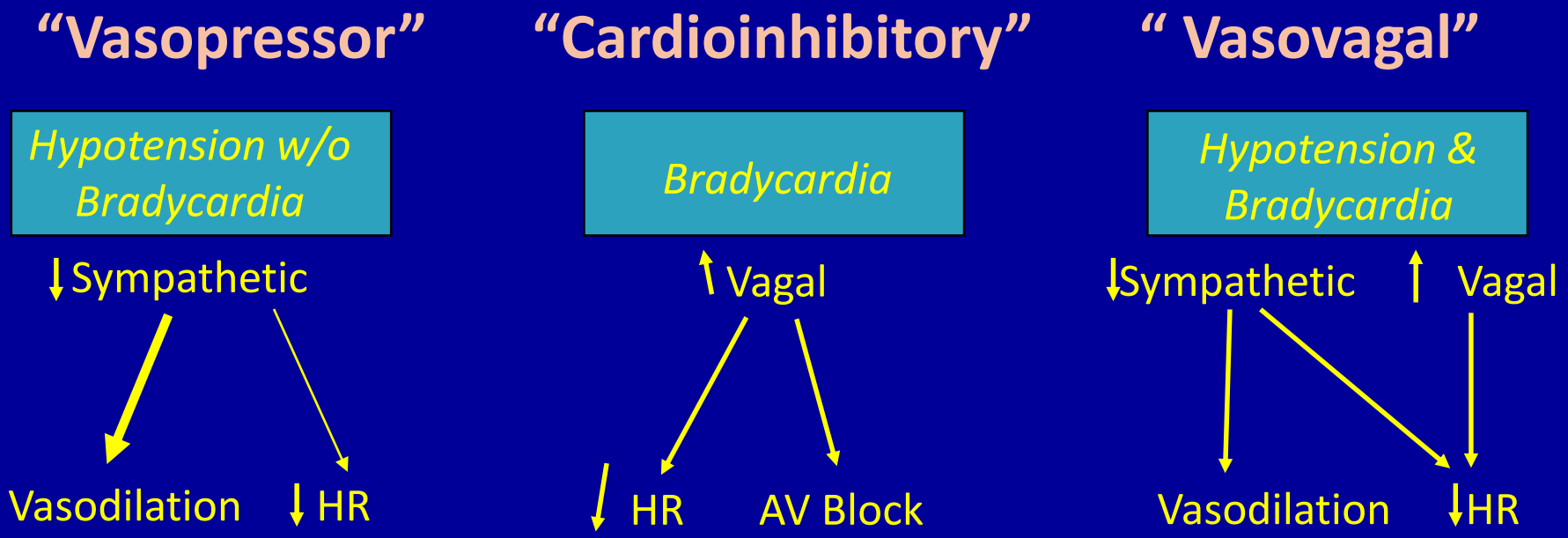
CNsystem Task Force monitor



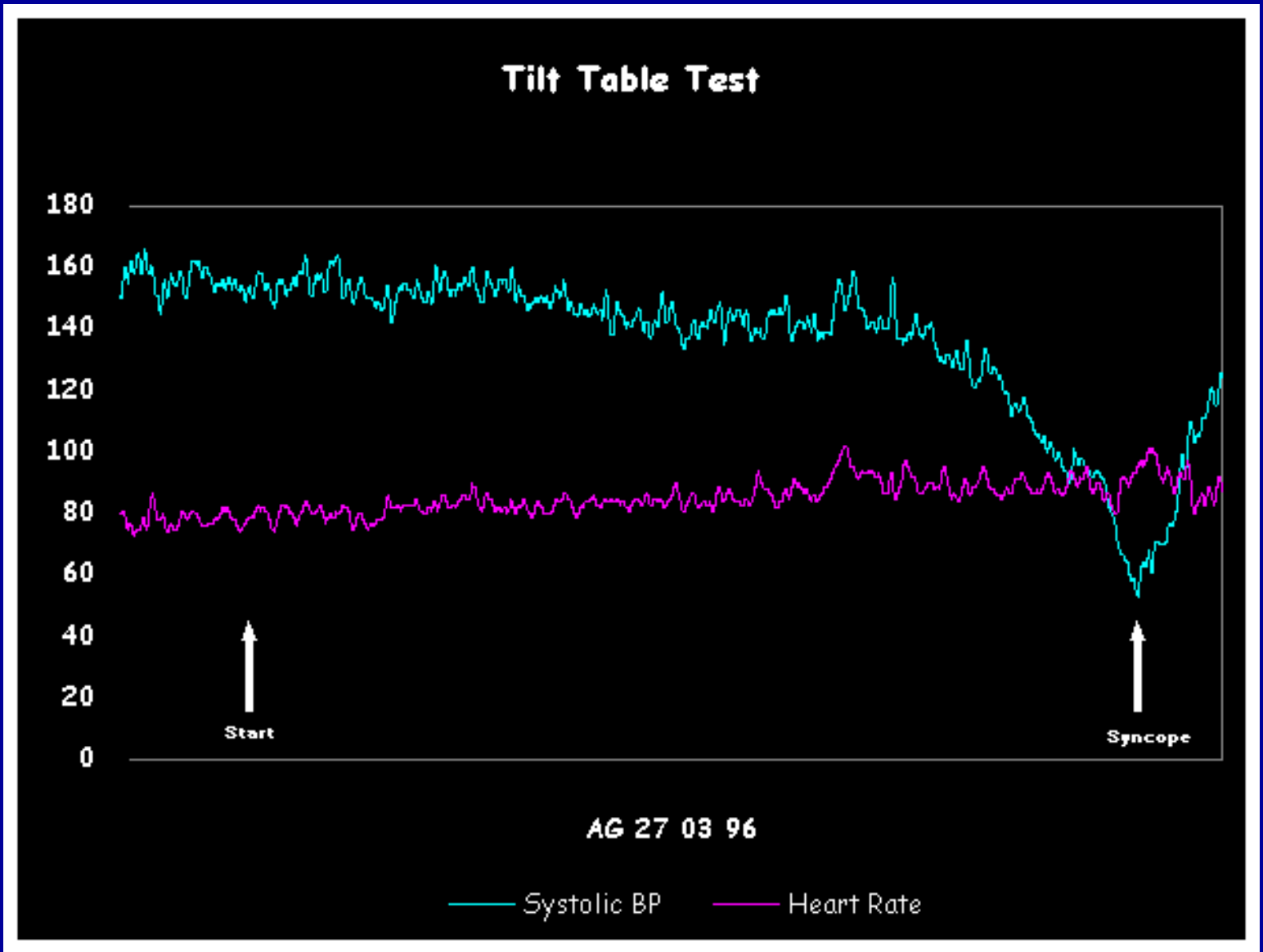
HUTT in our center

Typical screen display during monitoring

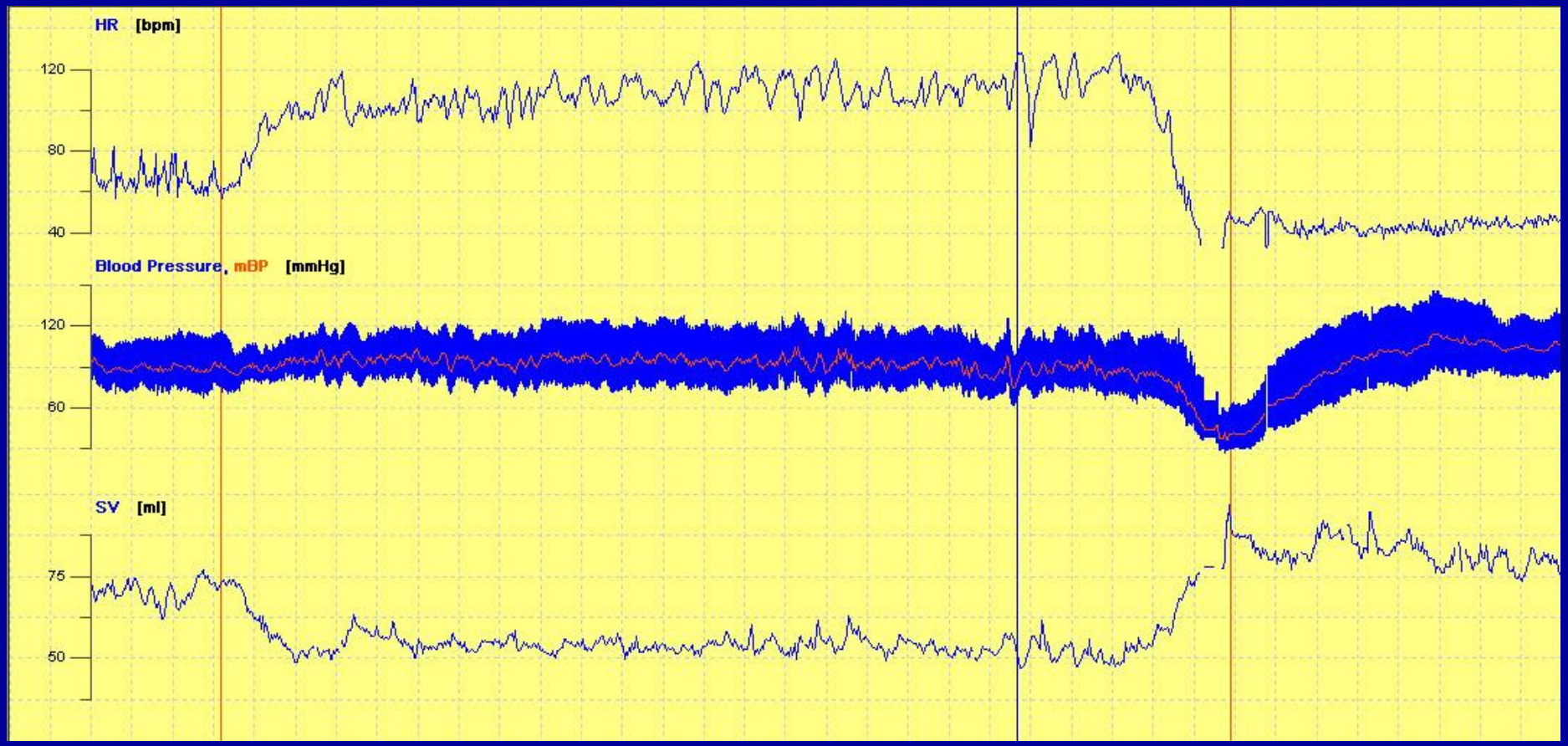
Neurally Mediated Syncope
Tilt Test Responses



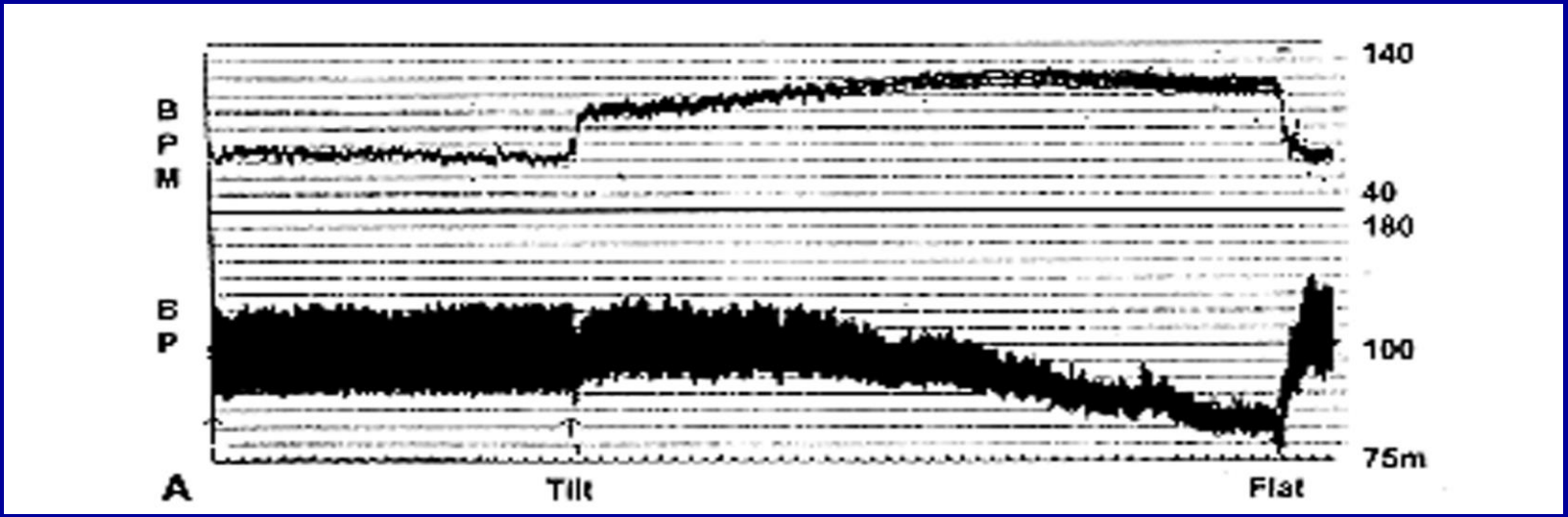
Vasodepressor response



Postural Orthostatic Tachycardia Syndrome (POTS)

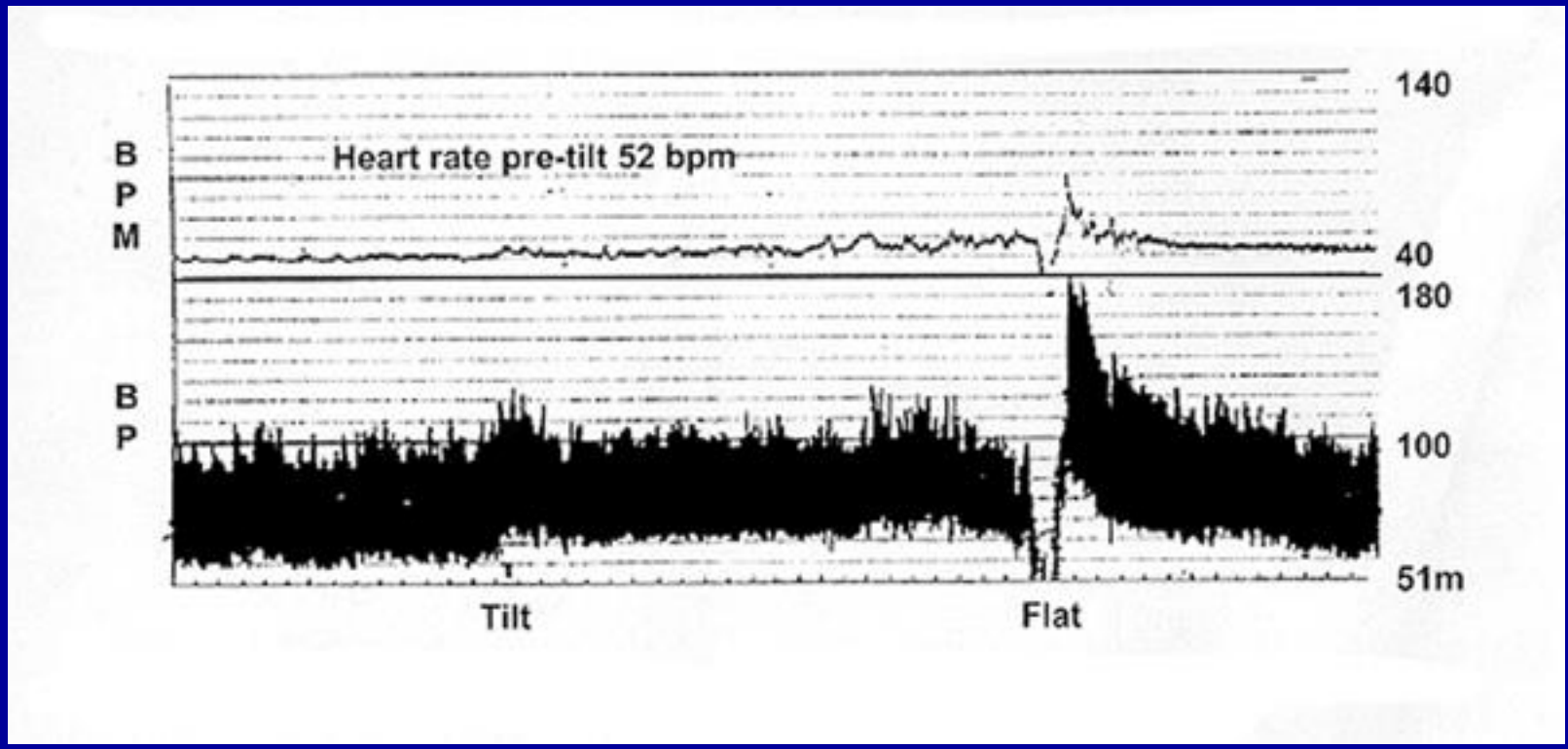


Mixed POTS and Vasodepressor

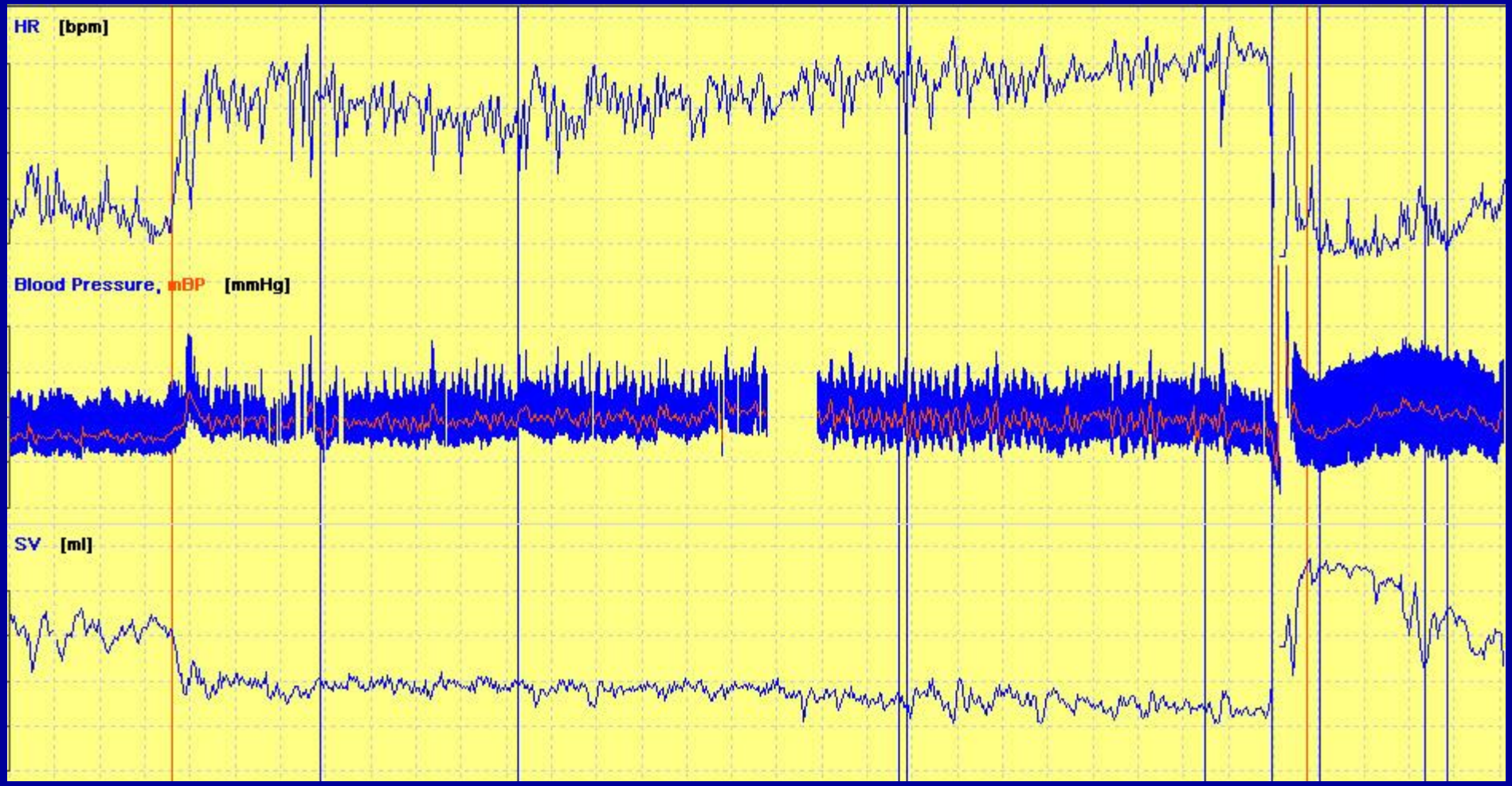


Sutton and Bloomfield Am J Cardiol 84, 1999

Cardio-inhibitory Response

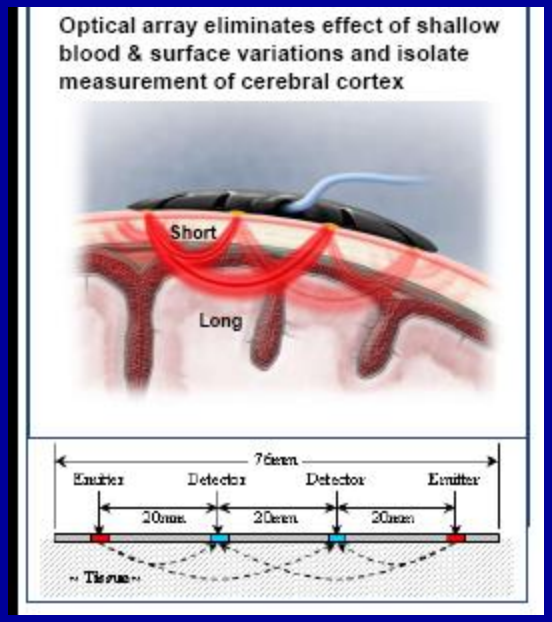


POTS with decreased Stroke Volume

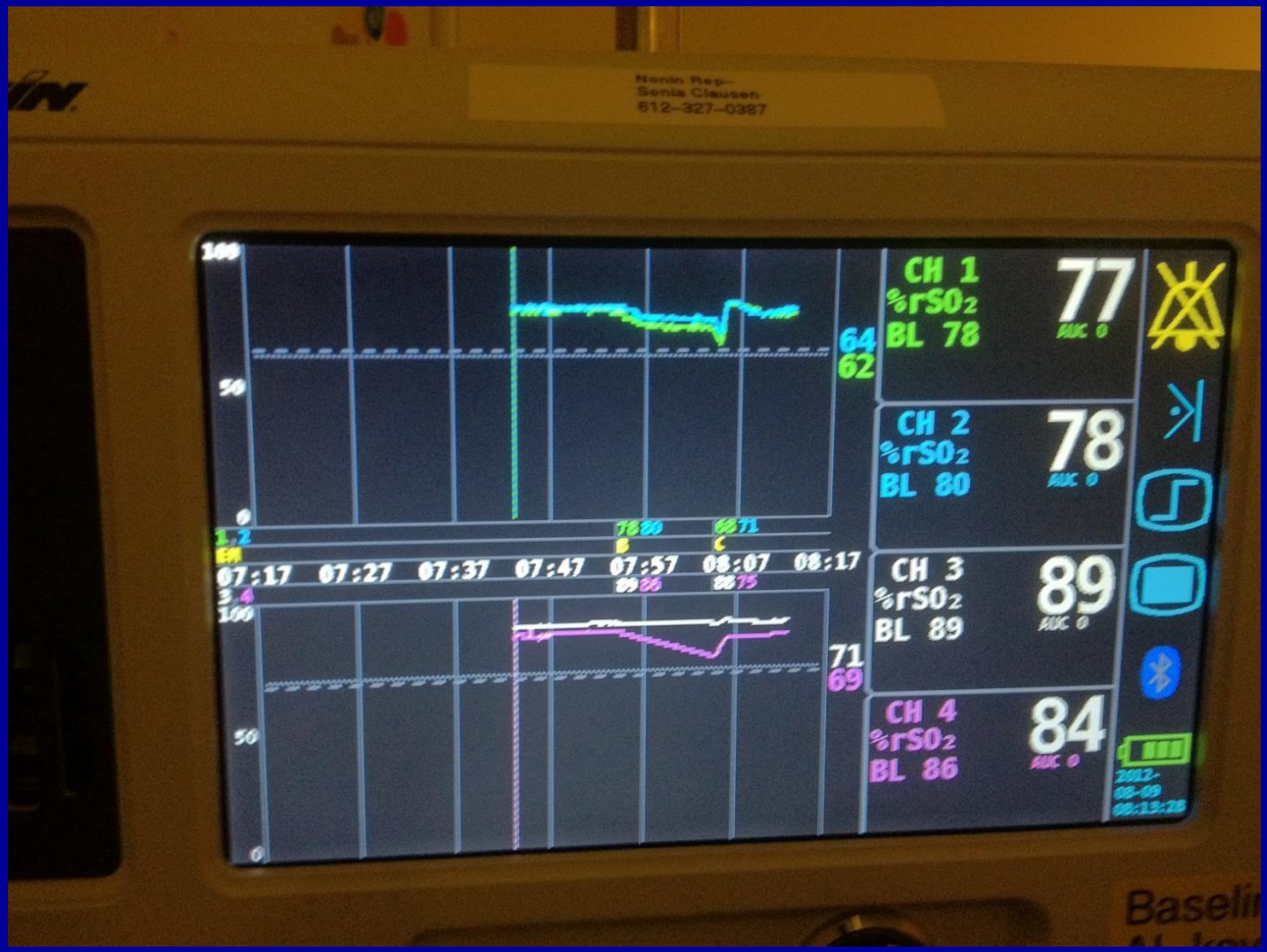


Cardiac asystole during HUTT

Near Infra Red Regional Saturation (NIRS)



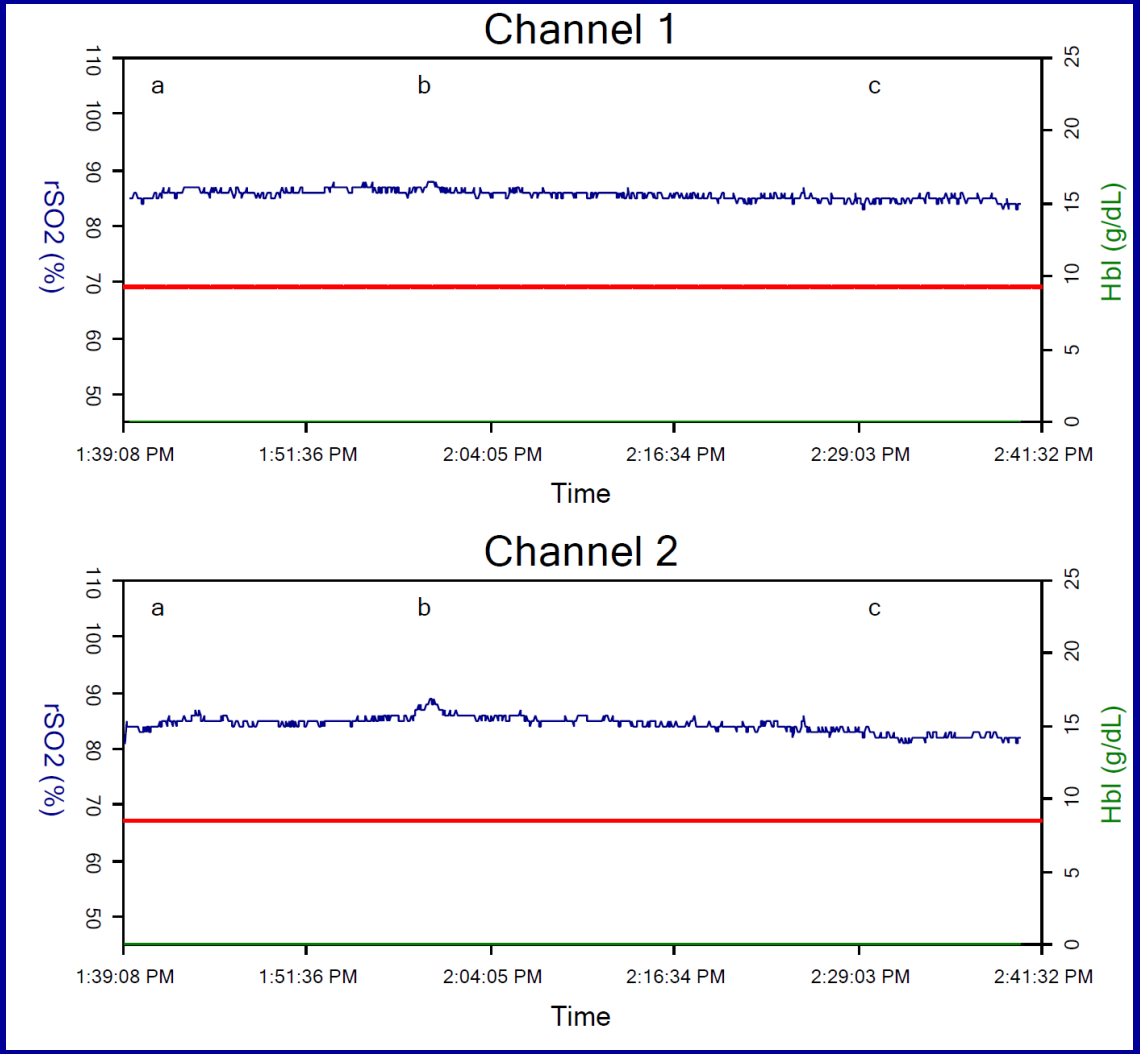
NIRS of the Bilateral Head, upper muscles (Deltoid) and lower muscles (Calf)



Cerebral Perfusion in Normal subject depicted by NIRS

Channel 1: NIRS of right cerebral hemisphere →

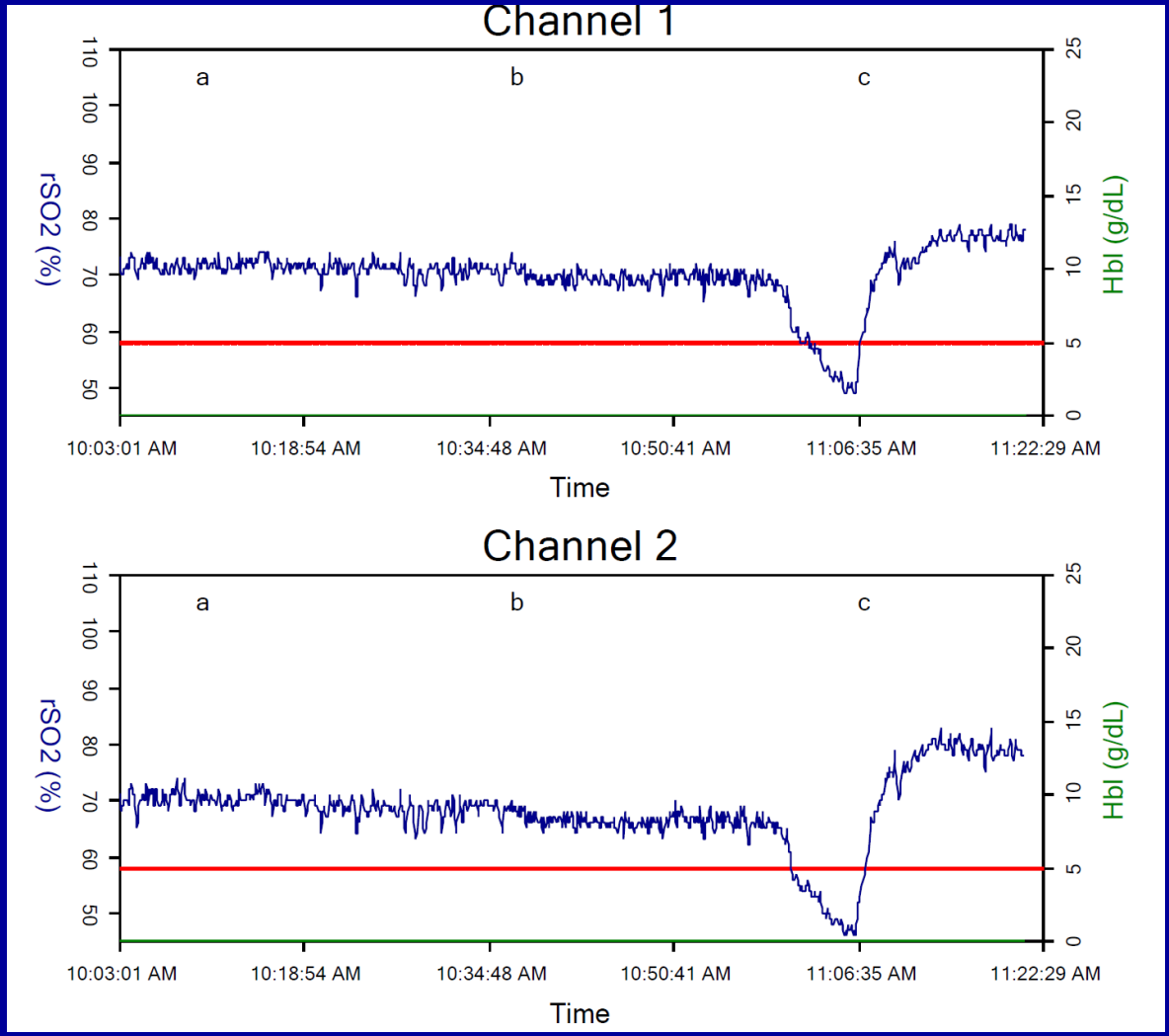
Channel 1: NIRS of left cerebral hemisphere →



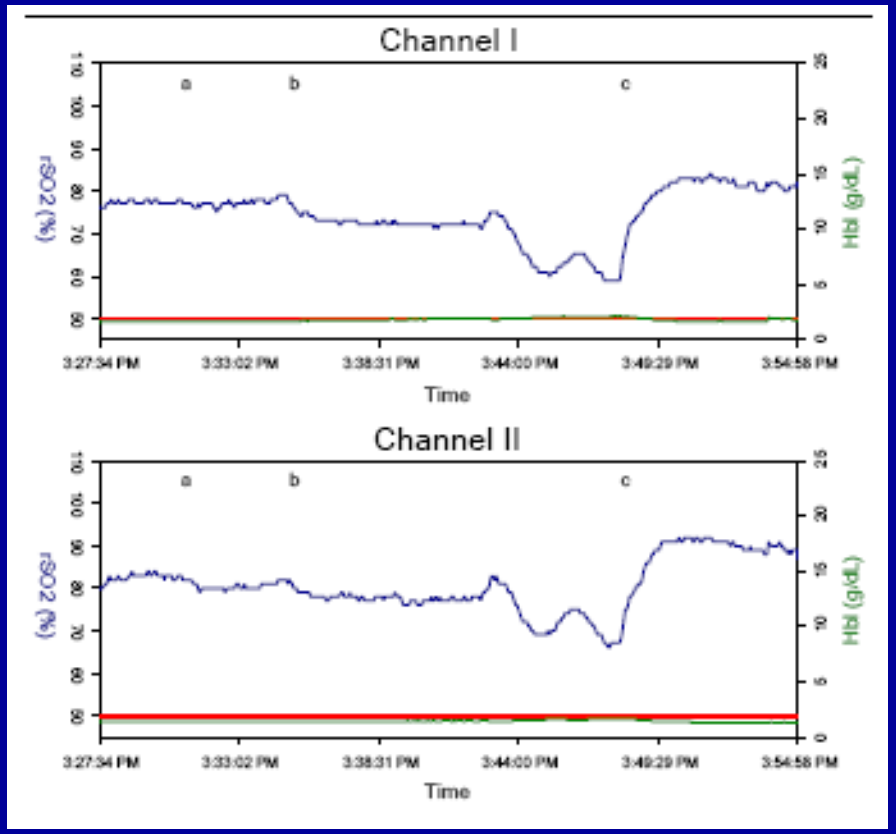
Cerebral Perfusion in “Syncope” subject depicted by NIRS

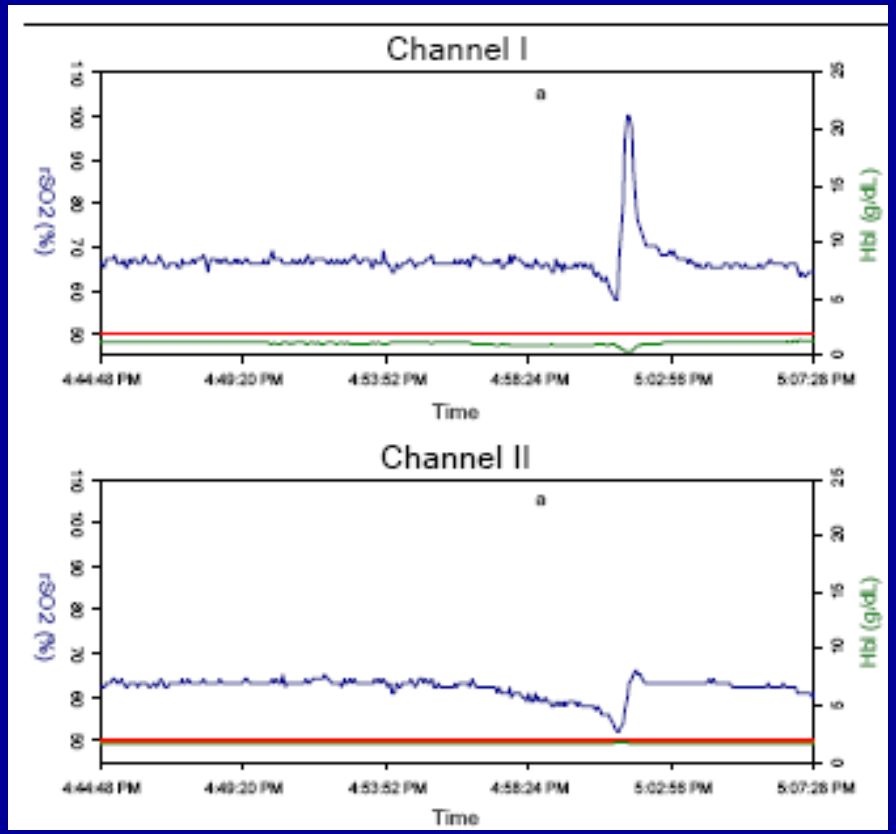
Channel 1: NIRS of right cerebral hemisphere →

Channel 1: NIRS of left cerebral hemisphere →

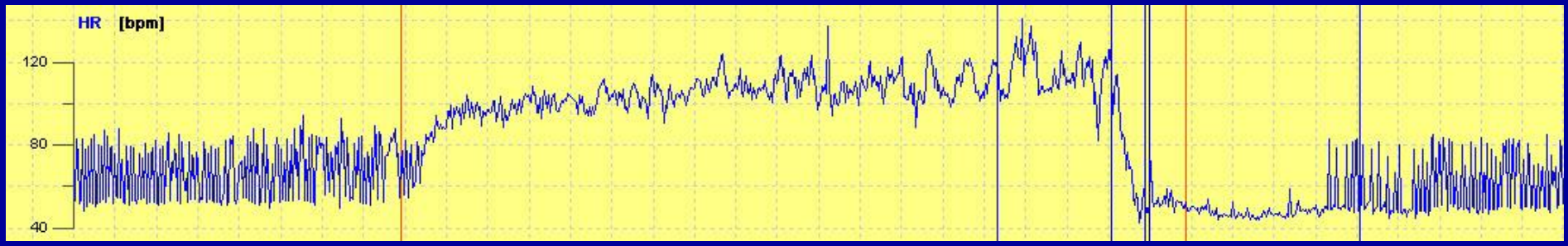


Brain NIRS in two different patients with more severe symptoms during HUTT



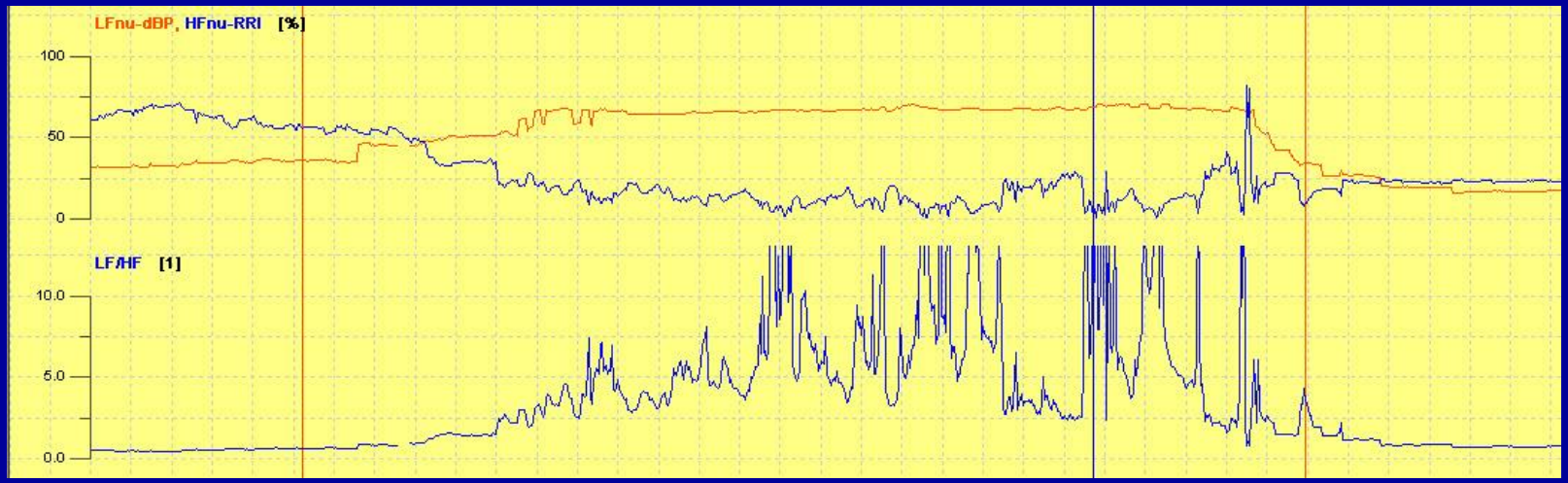


Heart rate variability during HUTT



Sympathetic and parasympathetic tones during different stages of HUTT

Patient 1

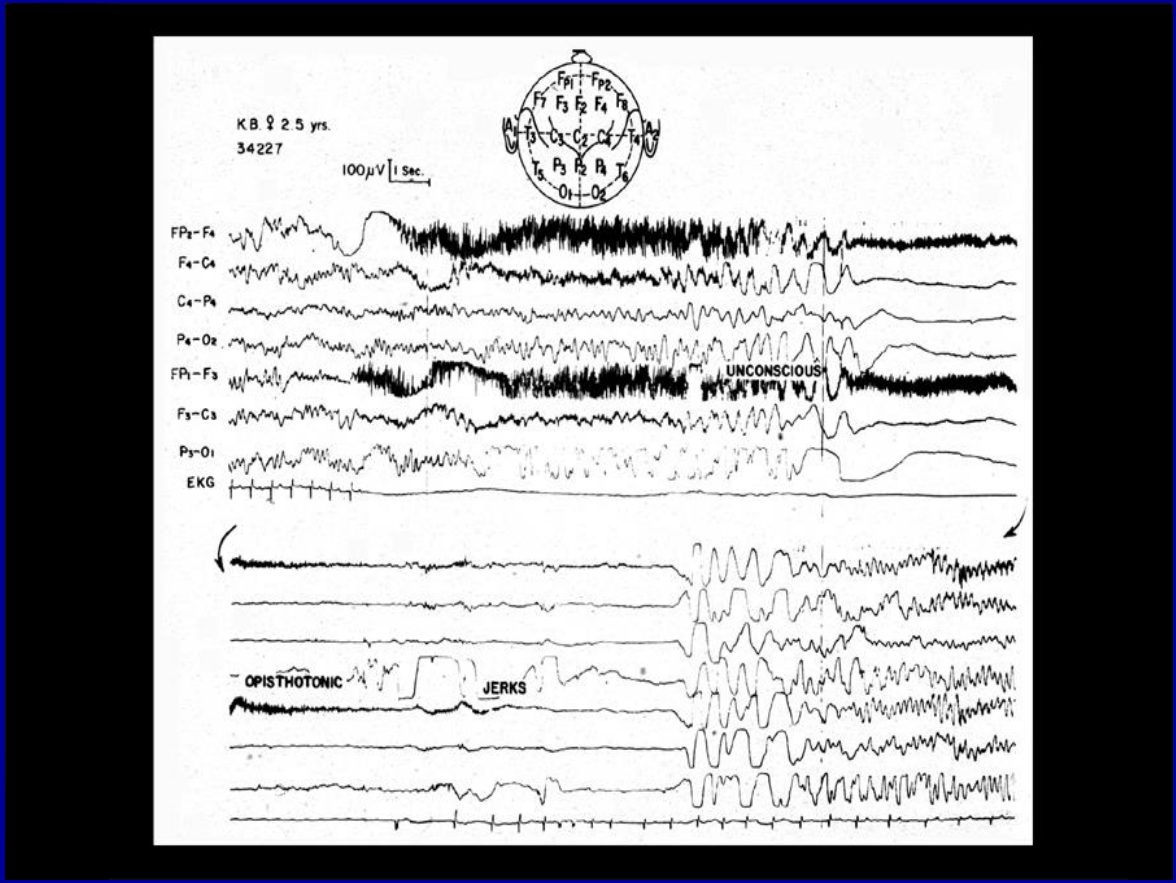


Patient 2

EEG Recording in Neurocardiogenic Syncope

E. Vicenzini a S. Pro a S. Strano b P. Pulitano a M. Altieri a V. Di Piero a G.L. Lenzi a N. Accornero a O. Mecarelli

More abundant and pronounced delta-theta activities and alpha slowing were found in patients than in control subjects



Summary

- Adequate blood perfusion of vital organs is necessary to maintain their functions
- Blood/Plasma volume significantly affected by gravitational forces
- Circulation and perfusion is tightly controlled by neuro-hormonal mechanisms involved sympathetic/parasympathetic tone, Renin-Angiotensin-Aldosterone system, Baro and mechanical receptors, negative chest pressure and musculoskeletal pumps.
- Derangement of this tight control can involve one system or multiple systems.
- In evaluating these derangements, it is important to study the hemodynamic and autonomic nervous system.
- Treatment of these derangements should be directed towards the defected physiology

Thank you