# Contemporary Clinical Pearls in Physical Diagnosis: A Multi-Media Look at Actual Findings & Sounds, Hemodynamics, and What the Literature Has to Say

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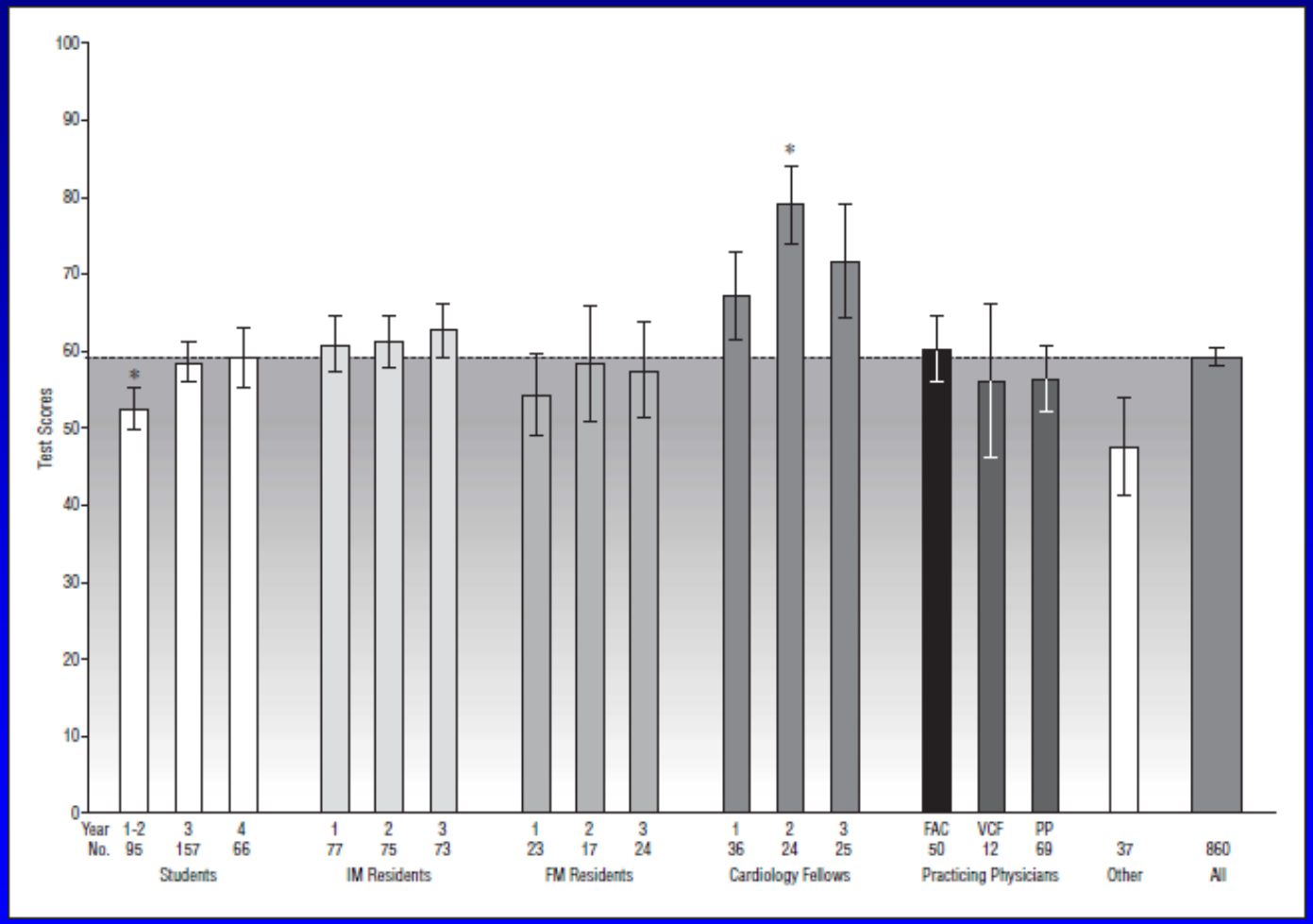
**University Hospitals Case Medical Center**

# Cardiac Exam Competency?



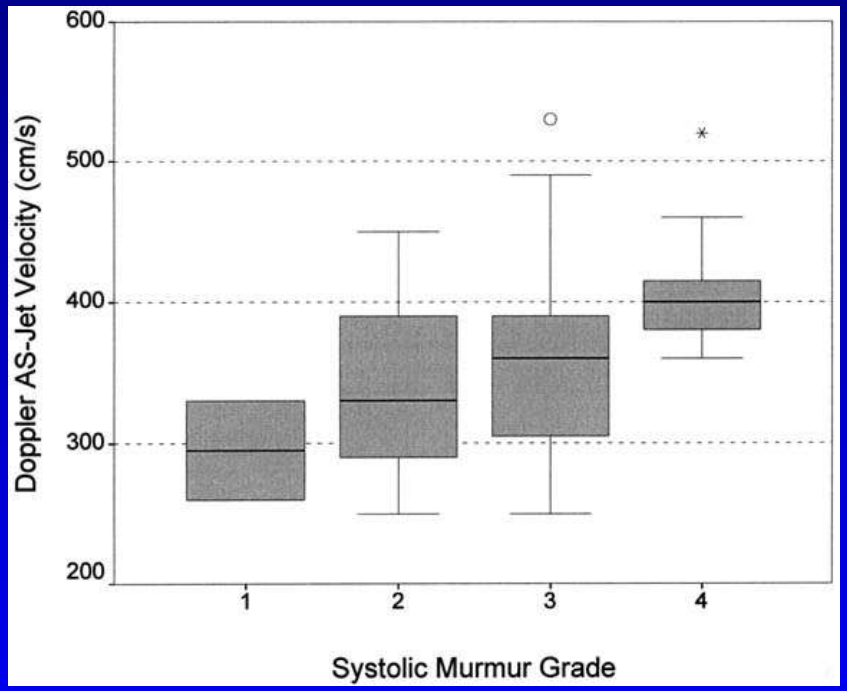

*Vukonovic-Criley JM, et al. Arch IM 2006;166:610*

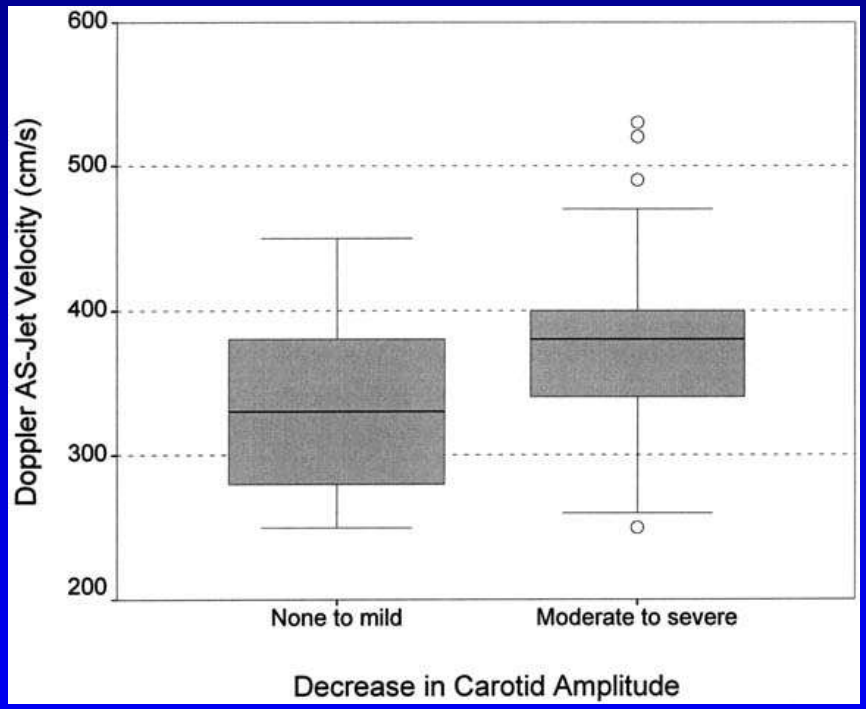
# Outline

- Auscultation
  - Gallops
  - Murmurs
- Inspection (Venous pressure)
  - Heart failure
- Palpation (Arterial pulse)
  - Pulse pressure
  - Valsalva
  - VADs
  - Precordium

# Auscultation

# Aortic stenosis, the murmur, and carotid upstrokes

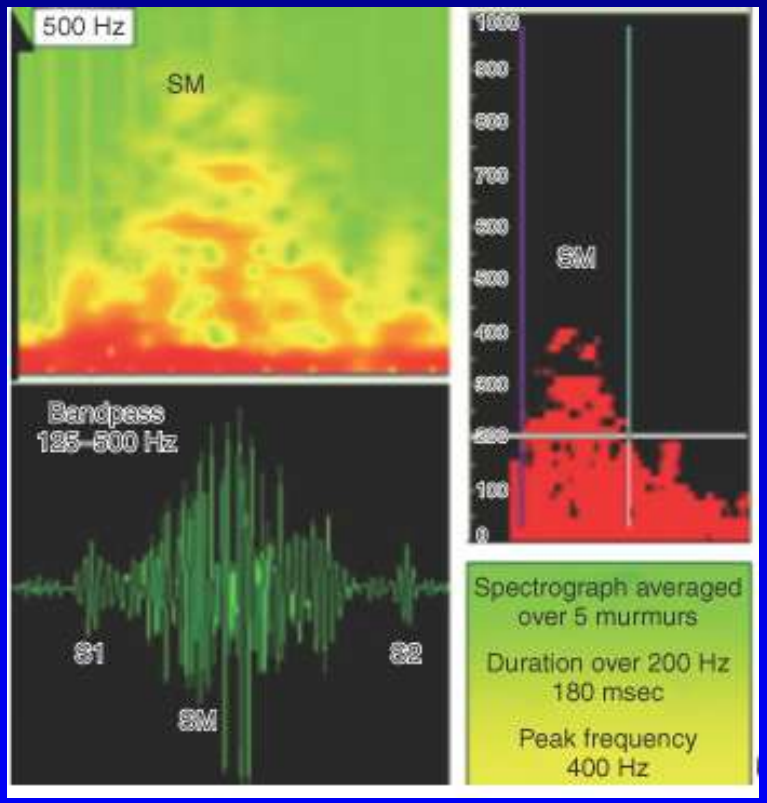


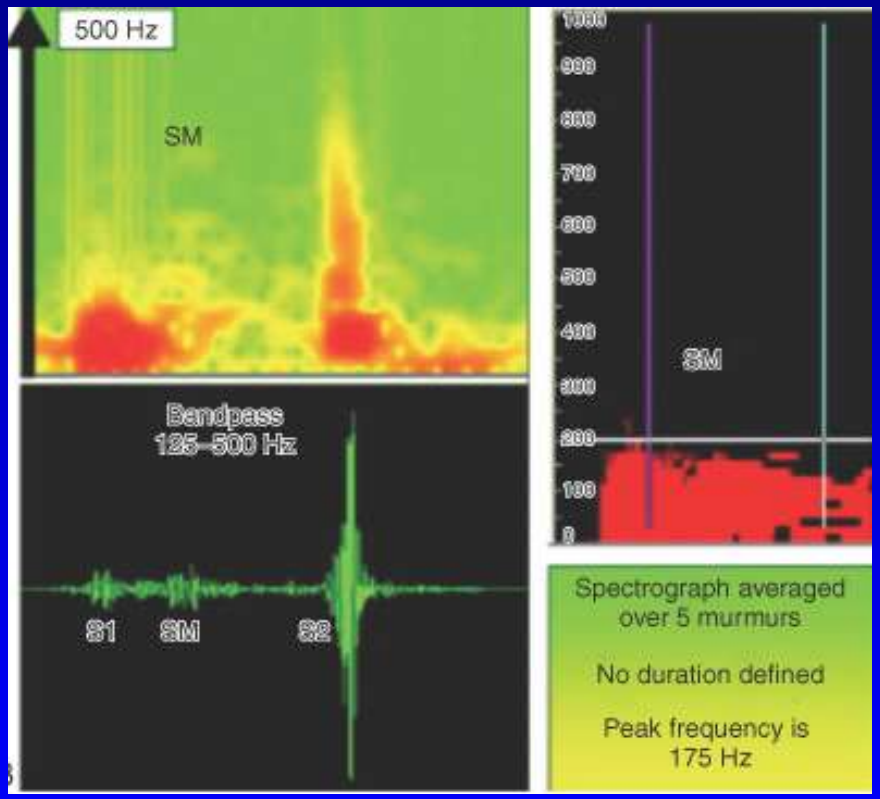




**Doppler aortic jet velocity correlated with systolic murmur intensity (*P* = .003) and timing (*P* = .0002), a single second heart sound (*P* = .01), and carotid upstroke delay (*P* < .0001) and amplitude (*P* < .0001).**
**Only carotid delay associated with outcome in multivariate analysis.**

***Munt B, et al. Am Heart J 1999;137:298***

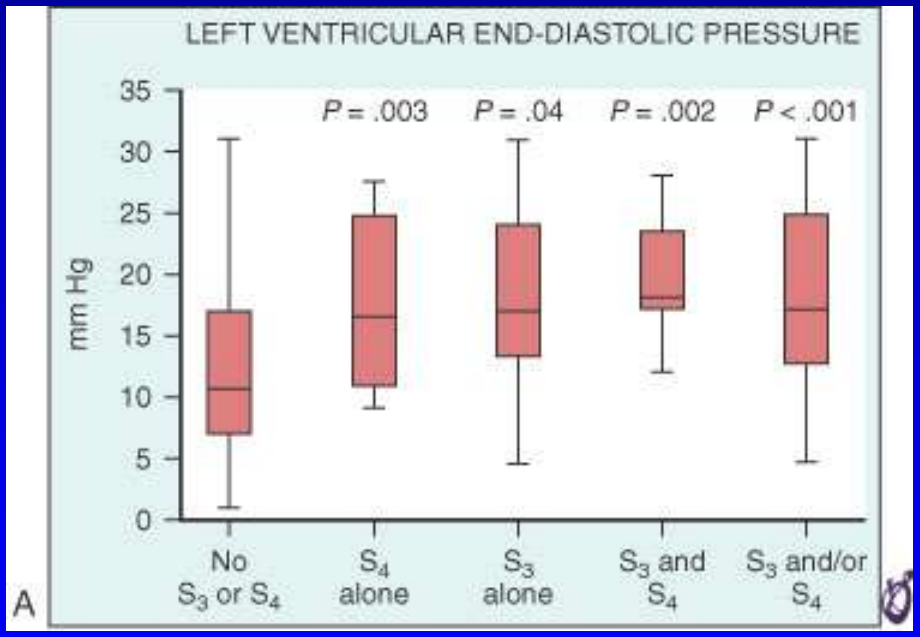
# The murmur can matter

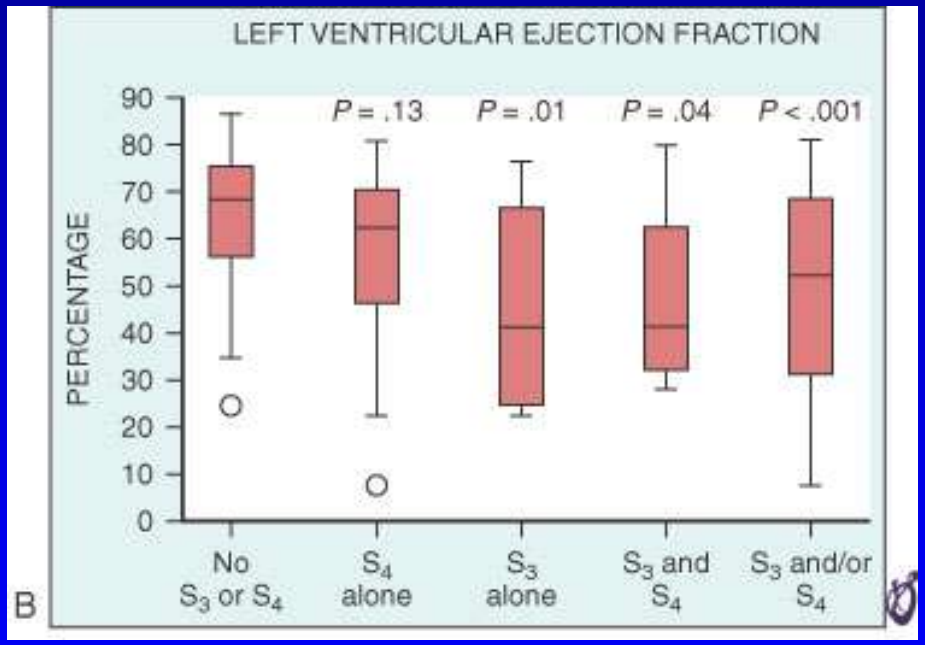



*Tavel ME. Circulation 2006;113:1255-1259*

# Do Gallops Really Reflect Hemodynamics?




*Marcus GM, et al. JAMA 2005;293:2238-2244*

# Gallops and Predictive Value

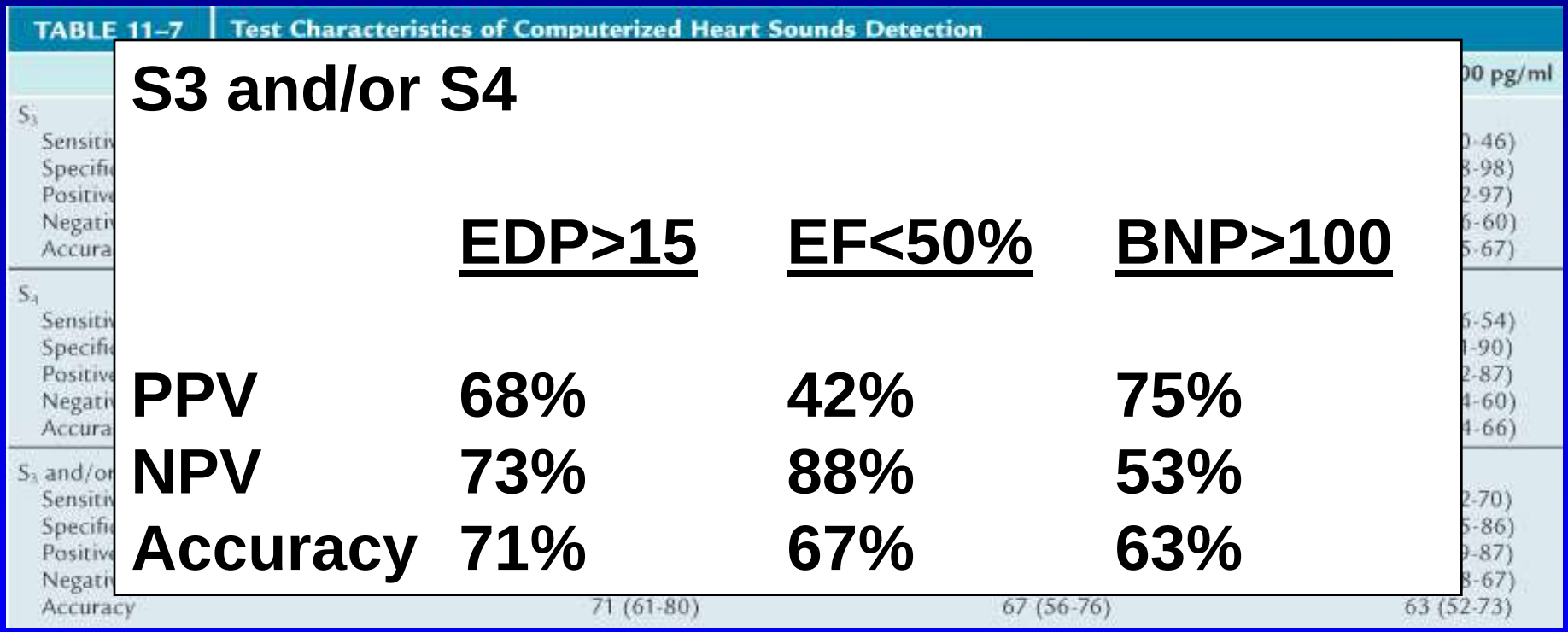


TABLE 11–7 | Test Characteristics of Computerized Heart Sounds Detection

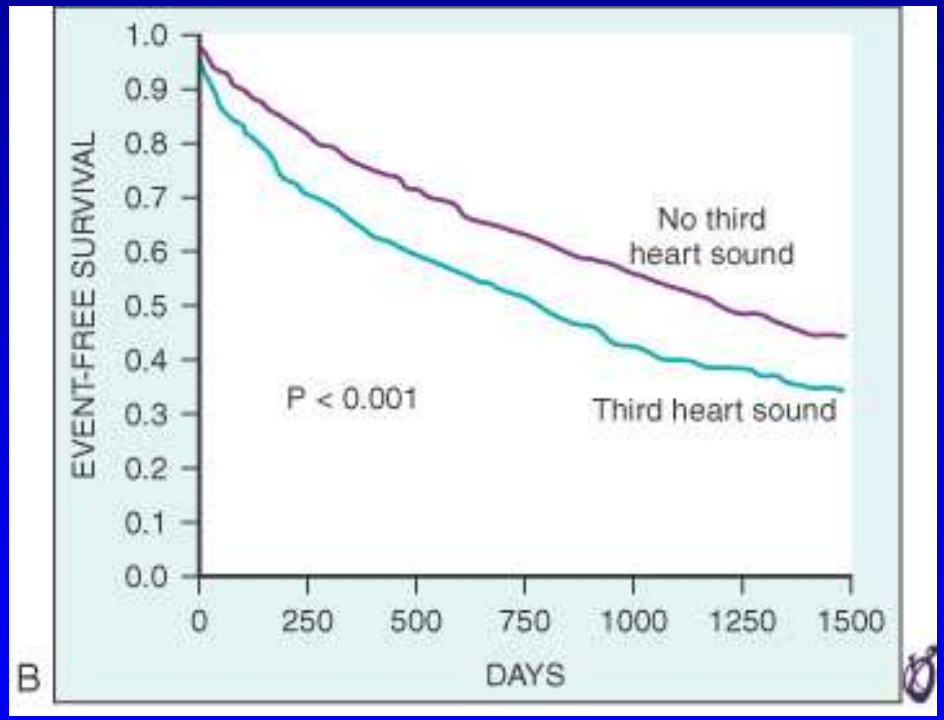
**S3 and/or S4**

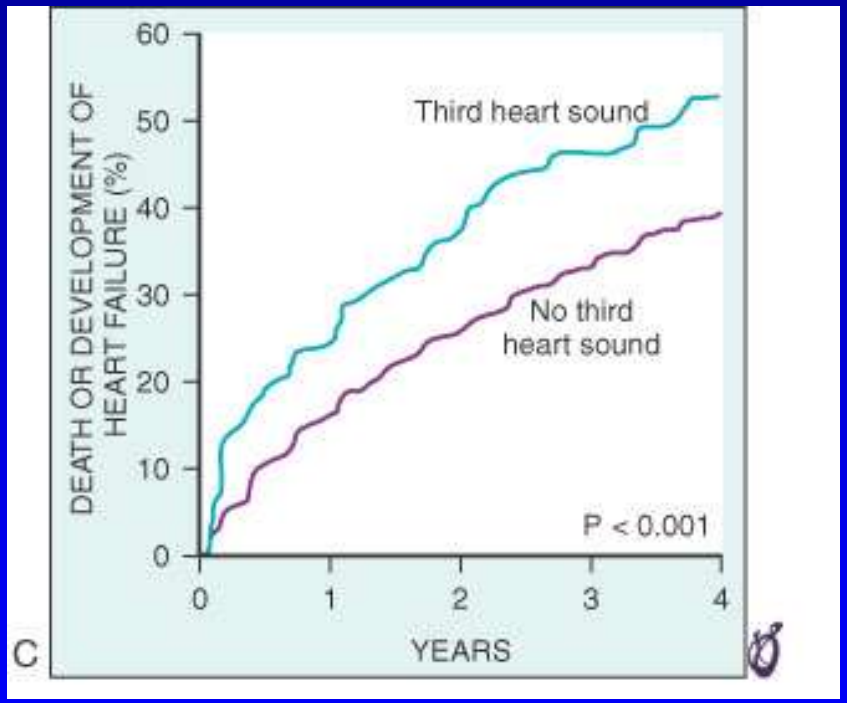
| | EDP>15 | EF<50% | BNP>100 |
|---|---|---|---|
| **PPV** | **68%** | **42%** | **75%** |
| **NPV** | **73%** | **88%** | **53%** |
| **Accuracy** | **71%** | **67%** | **63%** |

Accuracy 71 (61-80) 67 (56-76) 63 (52-73)

*Marcus GM, et al. JAMA 2005;293:2238-2244*

# The Prognostic Power of an S3




*Drazner MH, NEJM 2001;345:574*

*Drazner MH, Am J Med 2003:114:431*

# Venous pulse

# Heart failure is a clinical diagnosis

## Major criteria

- Orthopnea / PND
- Venous distension
- Rales
- Cardiomegaly
- Acute pulm edema
- JVD > 16 cm
- HJR
- Circulation time > 25 s

## Minor criteria

- Ankle edema
- Night cough
- Exertional dyspnea
- Hepatomegaly
- Pleural effusion
- Tachycardia (>120)
- Decreased VC
- Wgt loss w/ CHF tx

*CHF = 2 major or 1 major + 1 minor*

*Framingham criteria*

# Accuracy of Physical Findings for Elevated LV Filling Pressure

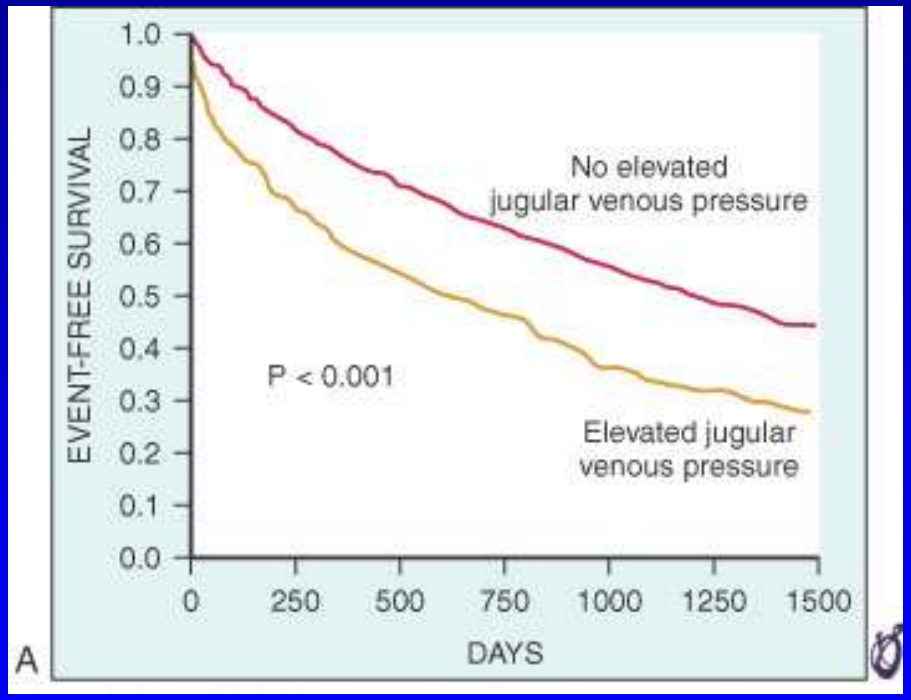
| Finding | Sensitivity | Specificity |
|---|---|---|
| Rales | 15 - 65% | 90% |
| Edema | 25 - 67% | 95% |
| Orthopnea | 90% | 95% |
| Elevated JVP | 80% | 90% |

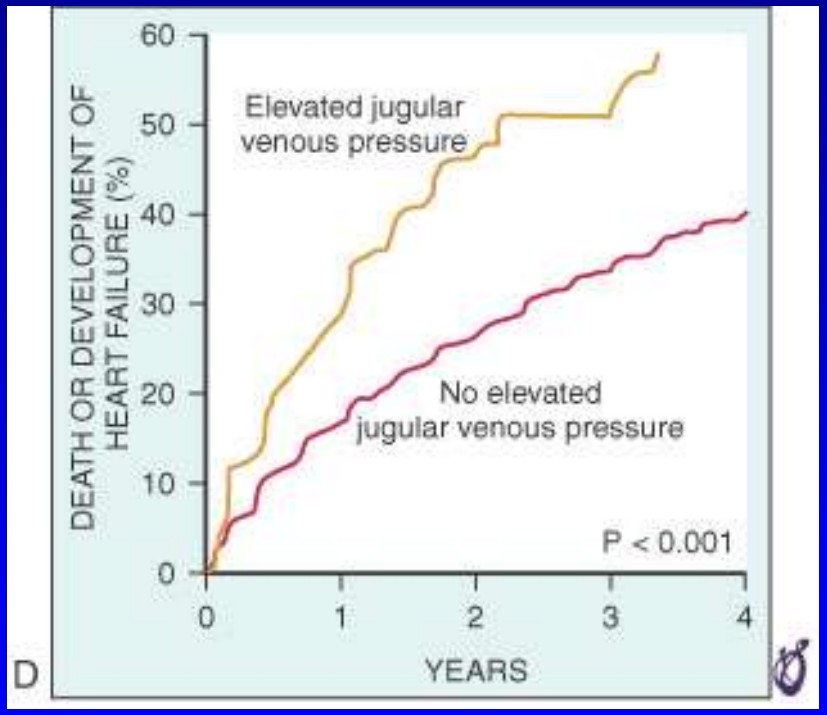
# Variable Correlation Between Estimated JVP and Measured RAP

| | |
|---|---|
| Eisenberg (1984) | 55% agree within 3 cm |
| Ducas (1983) | 86% agree within 5 cm |
| Cook (1990) | R = ~ 0.70 |
| Connors (1983) | 43% concordance with low, normal, high |

*McGee SR, AHJ 1998;136:10*

# The Prognostic Power of JVD

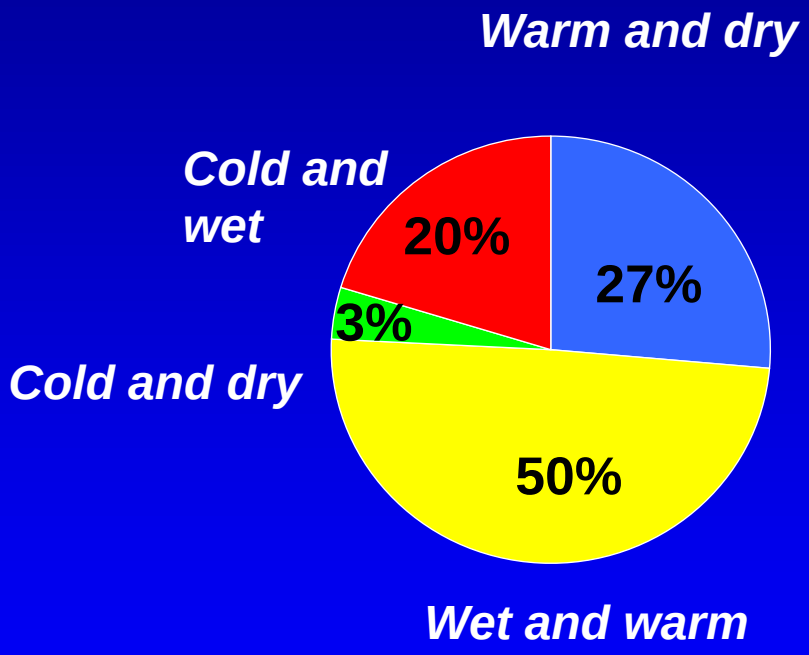


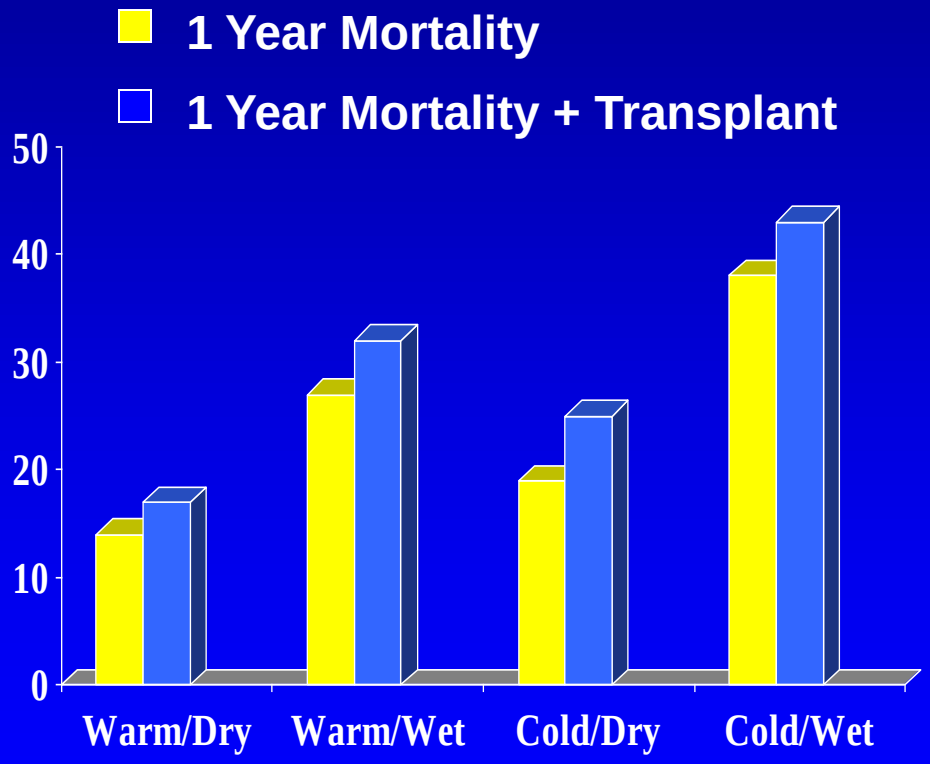




*Drazner MH, NEJM 2001;345:574*

*Drazner MH, Am J Med 2003:114:431*

# Hemodynamic Profiles and Outcomes for 500 Patients Hospitalized on a HF Service



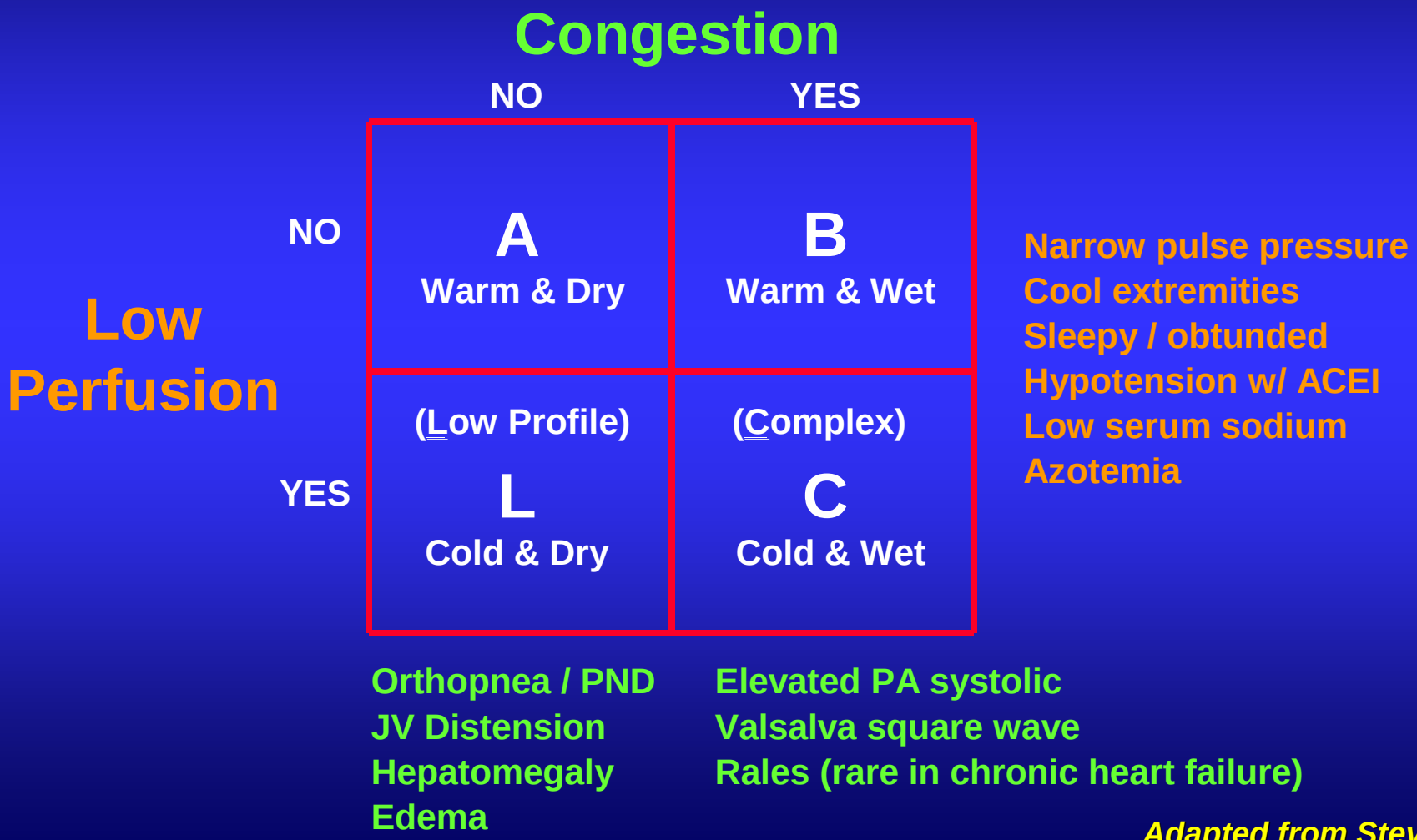

*Nohria, A et al. In Press JACC 2003*

# Rapid Clinical Assessment

- Congestion
  - orthopnea/PND
  - dyspnea on minimal exertion
  - rales, JVD, edema, ascites
  - Valsalva “square wave”
- Hypoperfusion
  - sleepy, “depressed”
  - cool extremities
  - renal insufficiency
  - narrow pulse pressure


Netter 1983

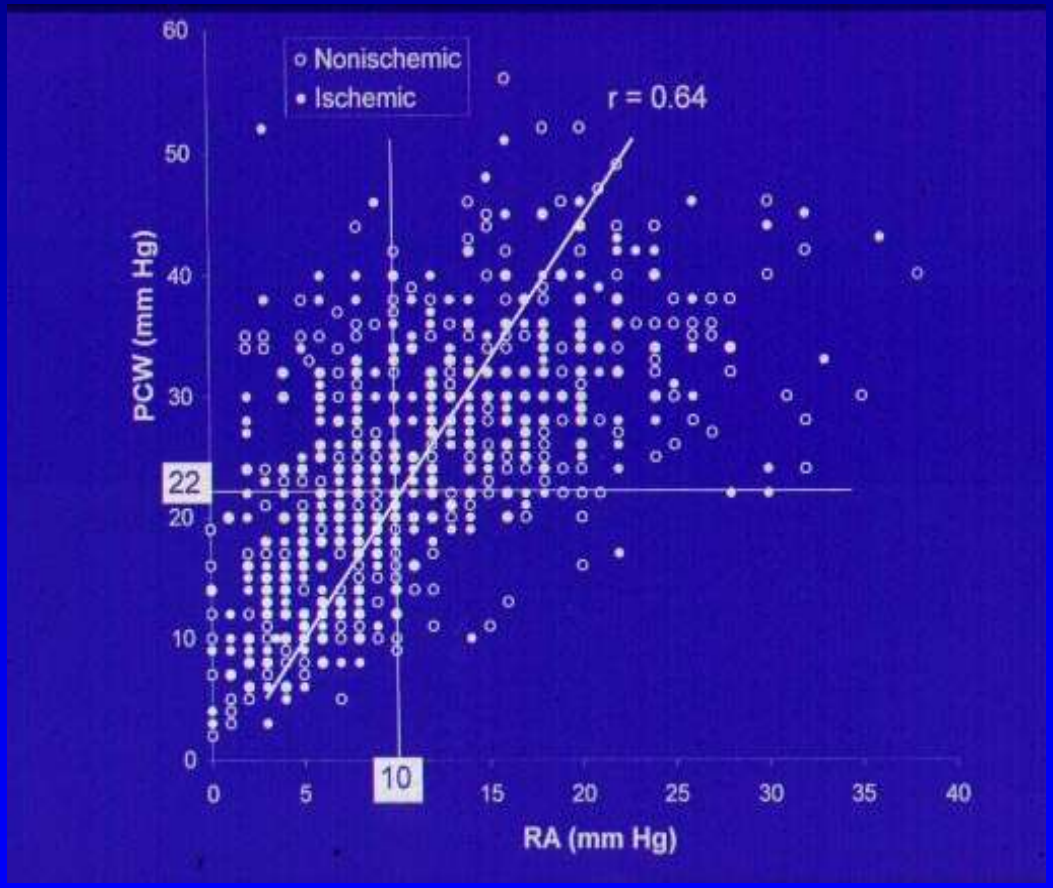
# Assessment of Hemodynamic Status



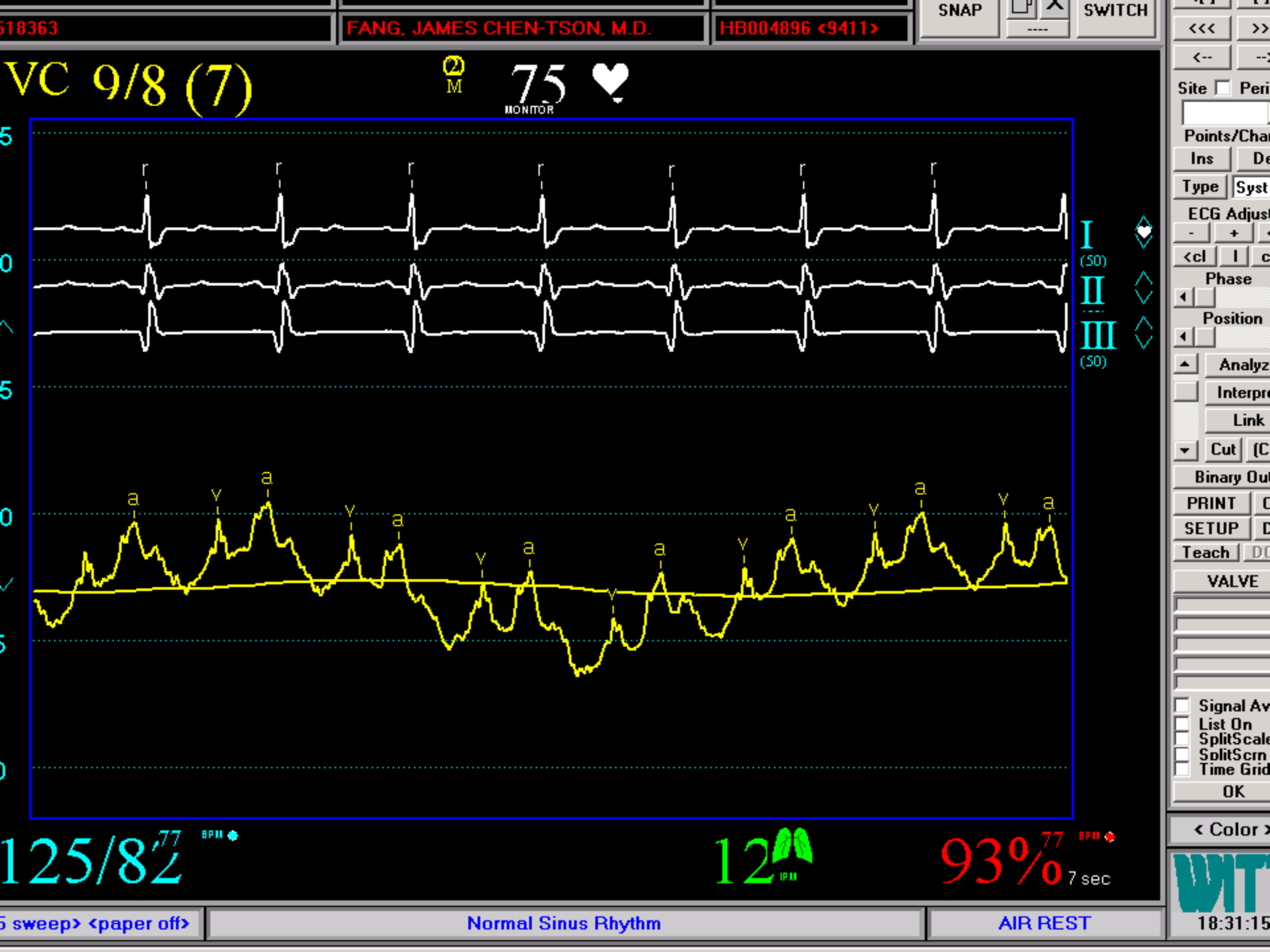

*Adapted from Stevenson*

# Assessing Volume Status at the Bedside

- PCW/RA ratio > 2 in most patients
- JVP < 10 usually implies PCW < 22
- Adjust therapies to keep JVP < 7-8
- Average diuresis approx. 4 L
- Allow time to mobilize fluid reservoirs




*Drazner et al., JHLT 2000*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FANG, JAMES CHEN-TSON, M.D.
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Normal Sinus Rhythm
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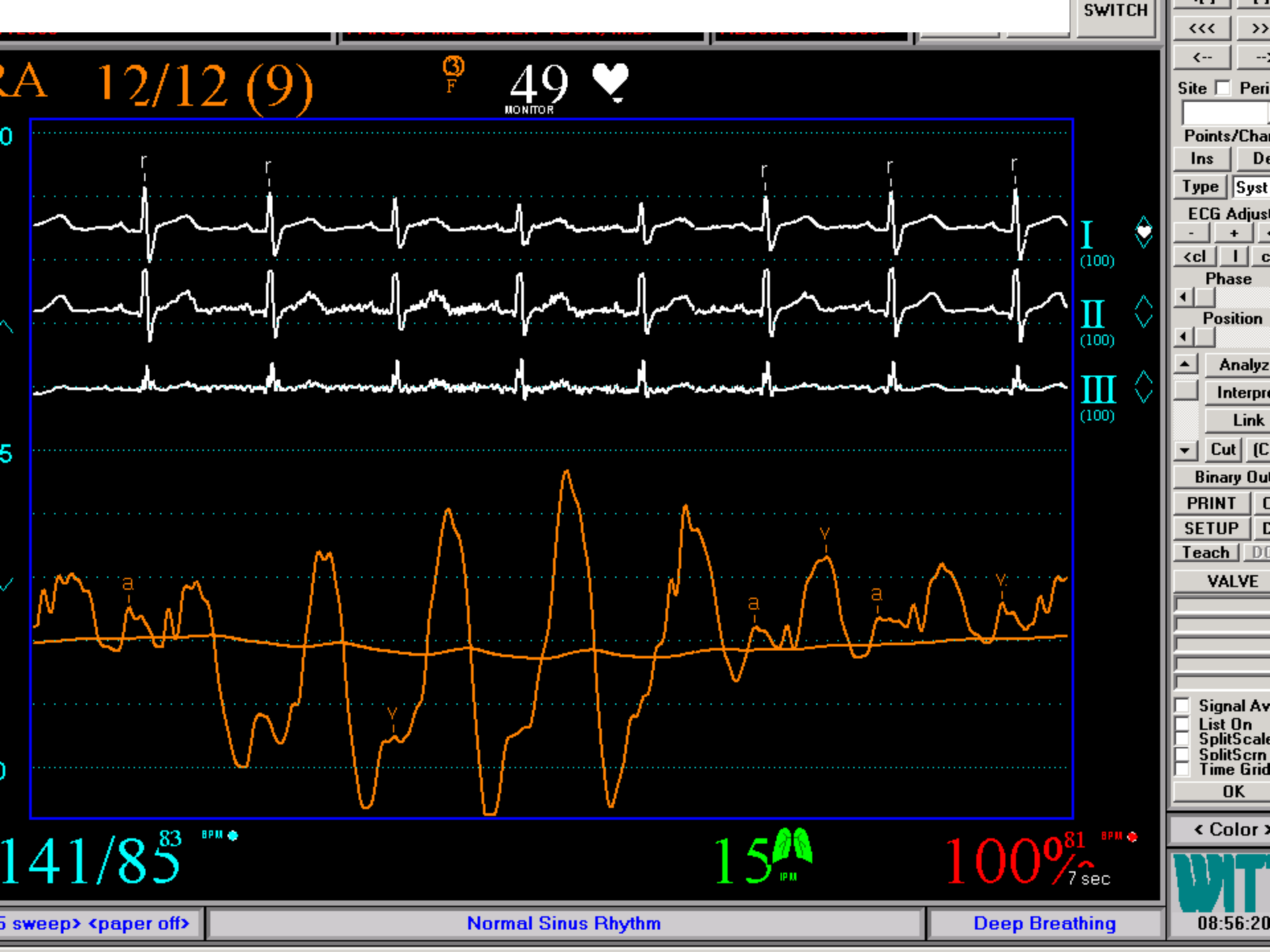
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Normal Sinus Rhythm
Deep Breathing
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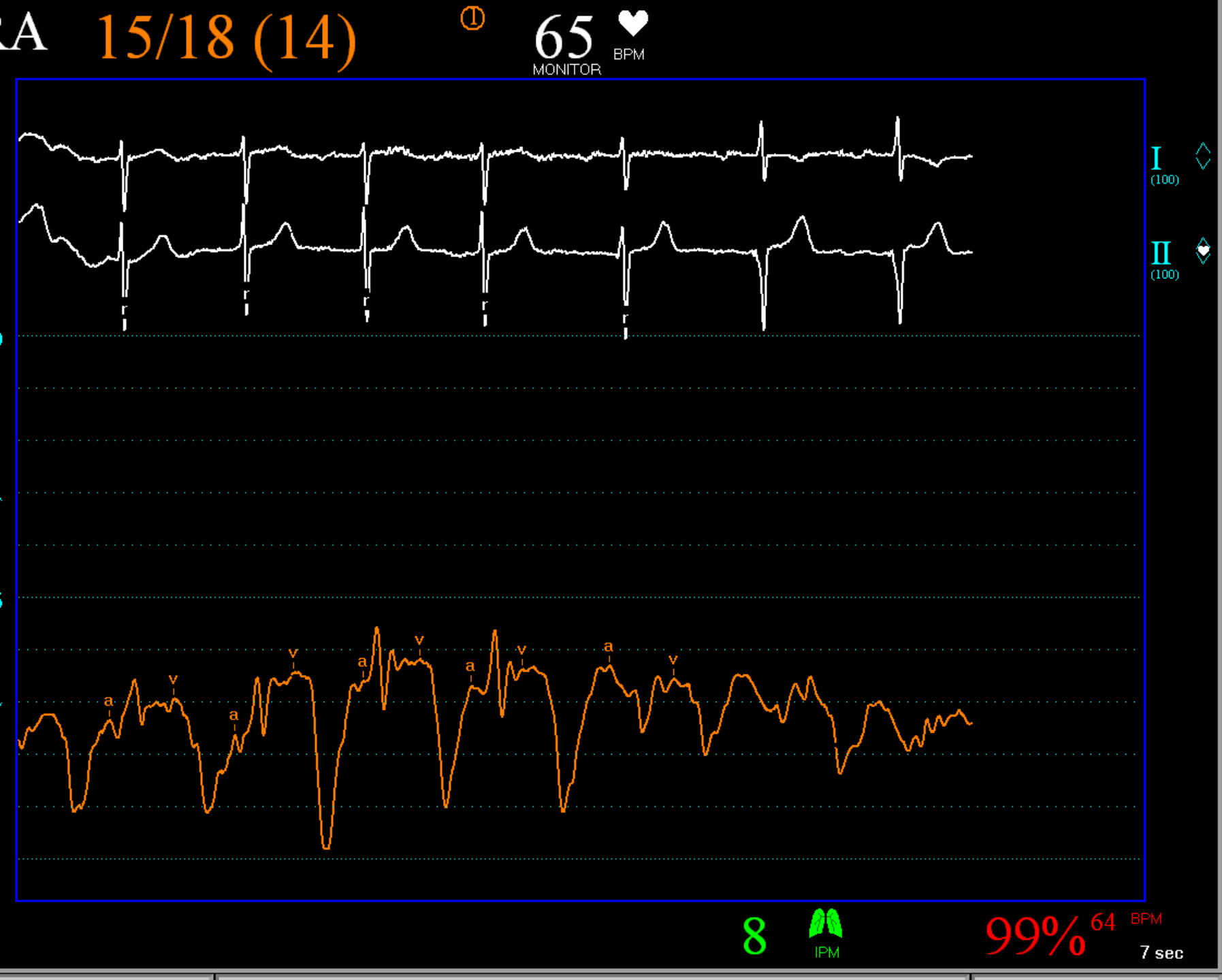
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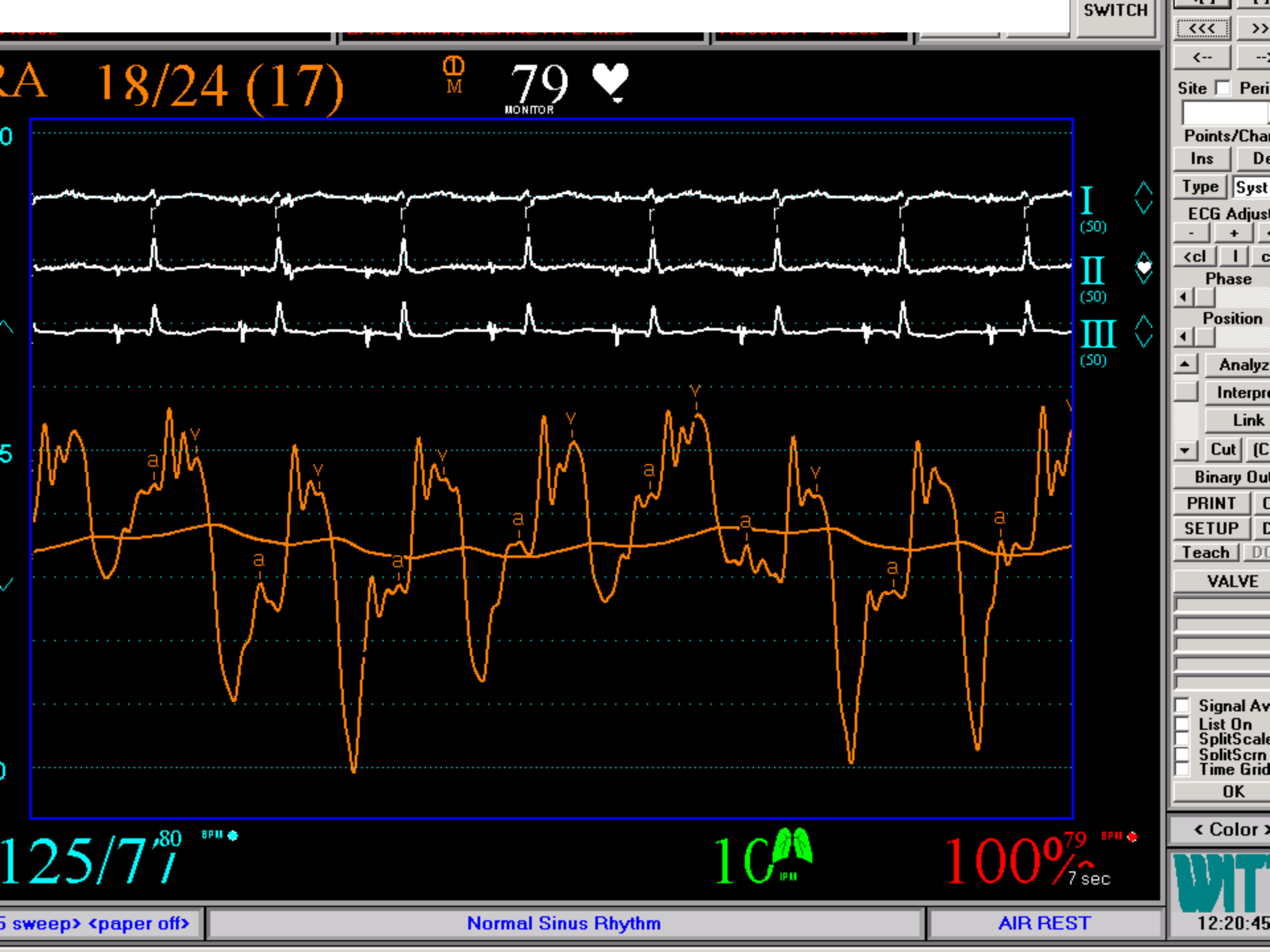
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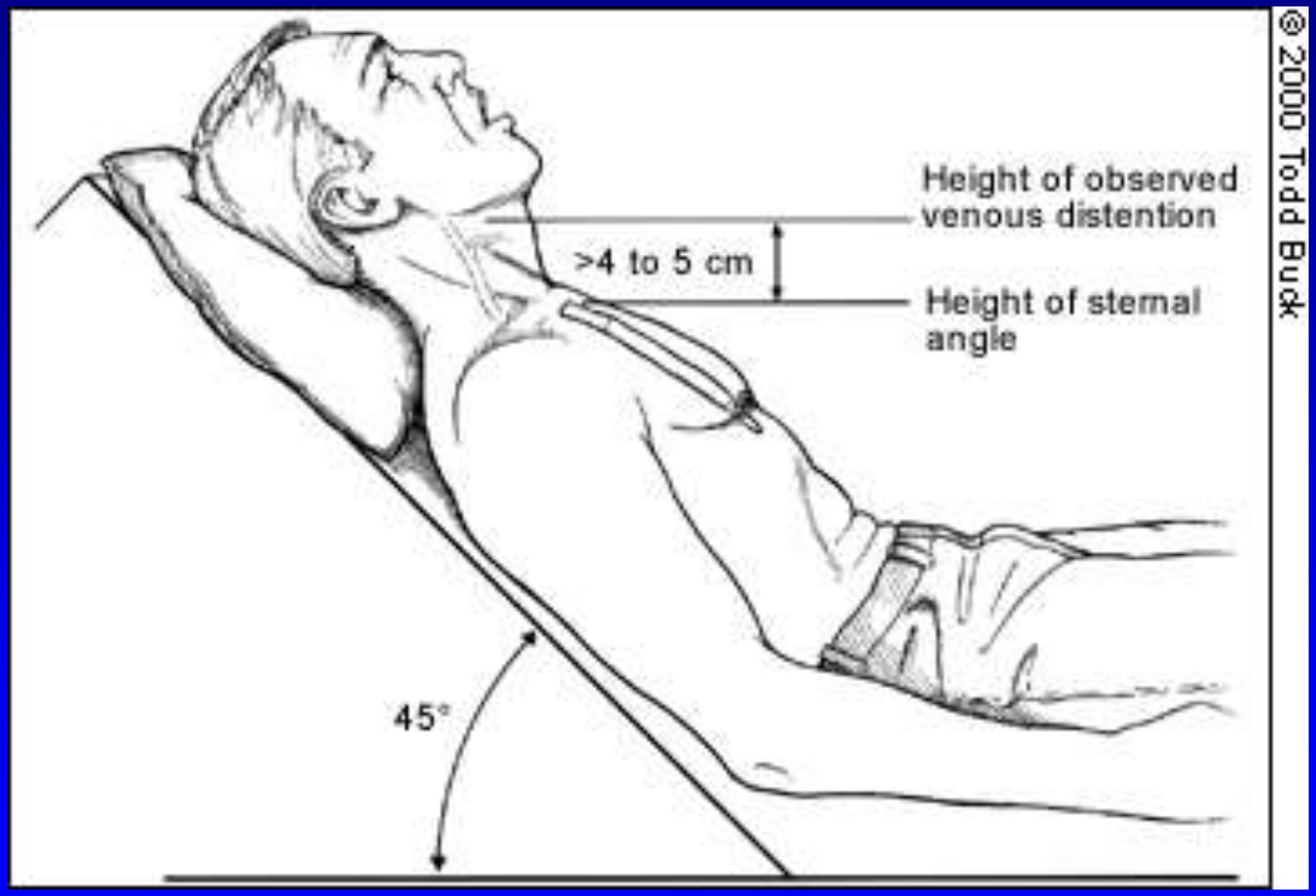
5 sweep> <paper off>
Normal Sinus Rhythm
AIR REST
12:20:45

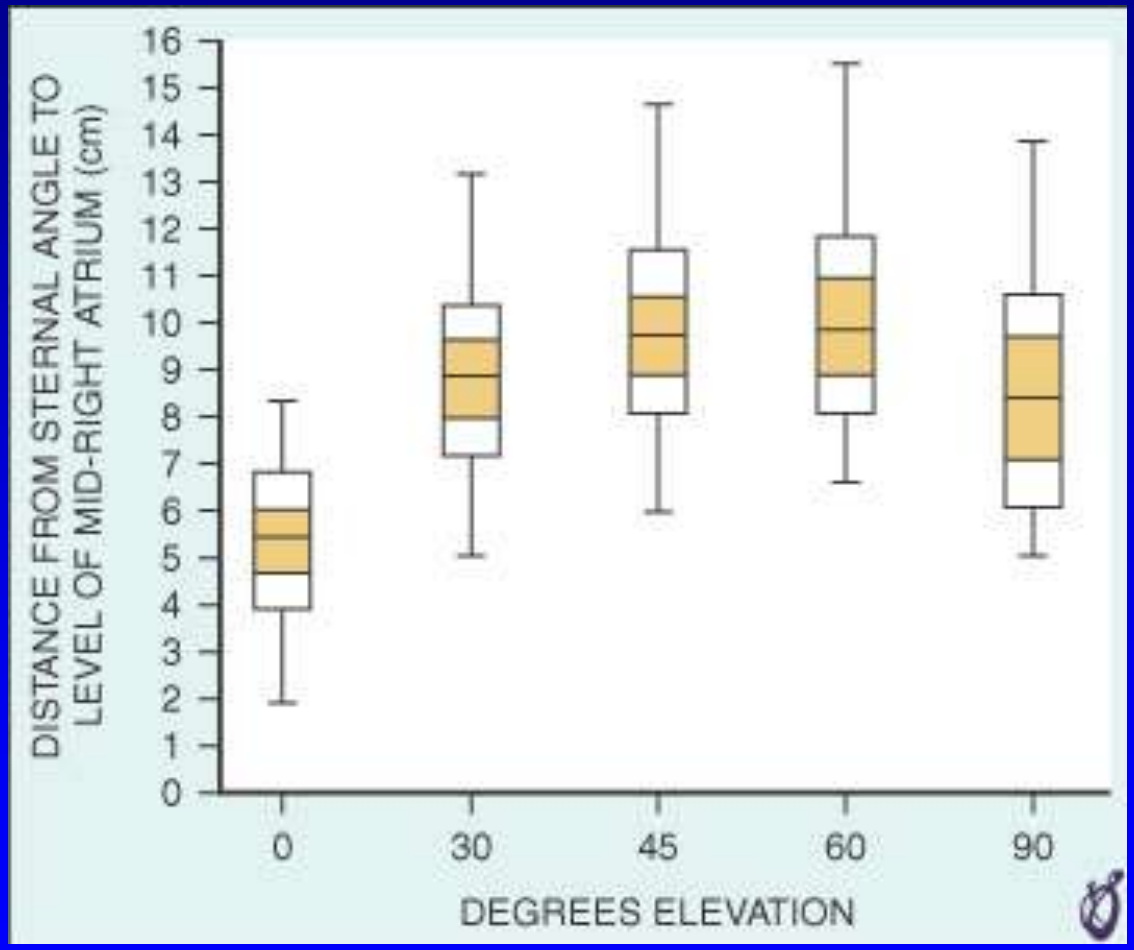
# Measuring Venous Pressure



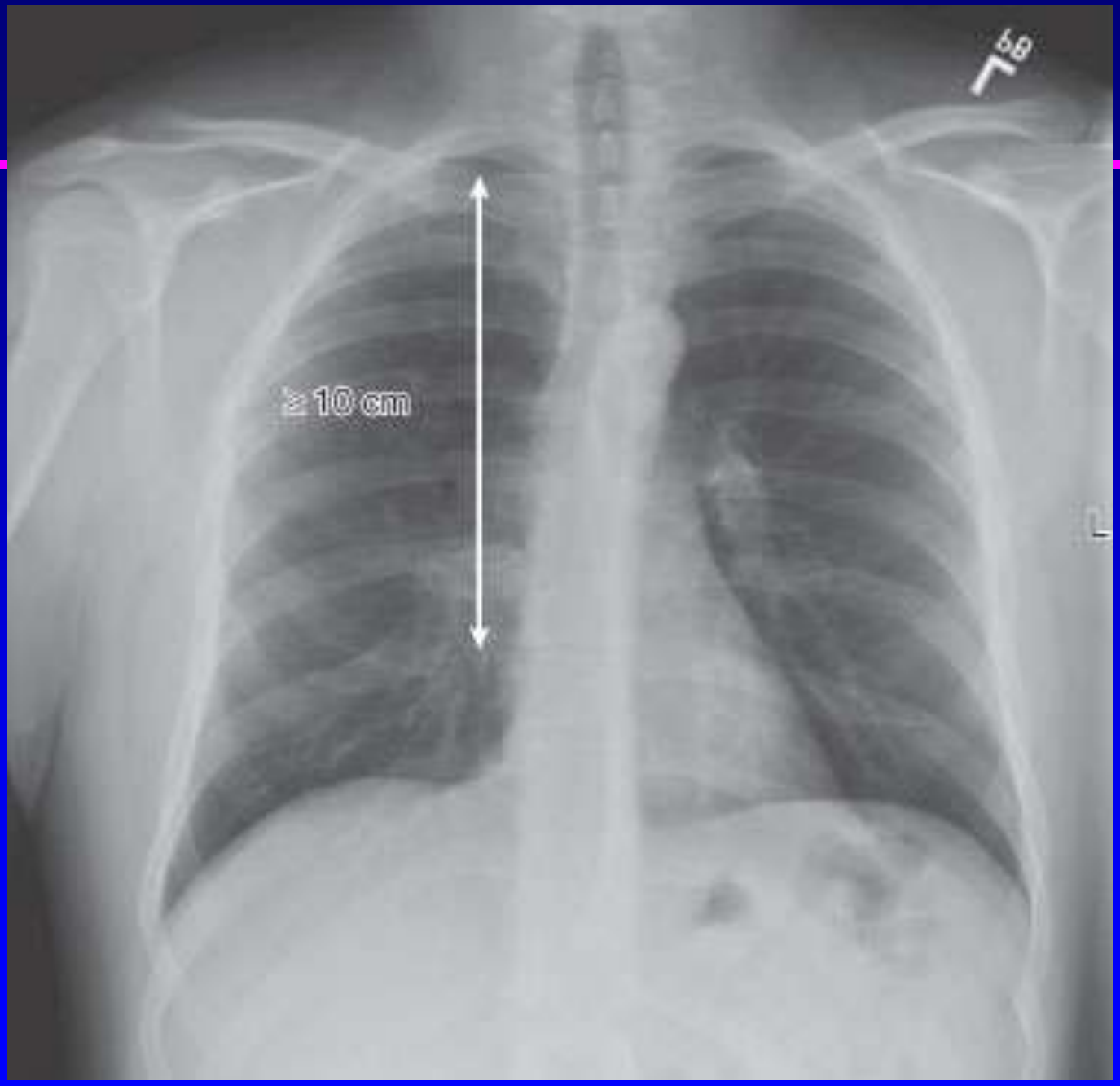

*F Shamsham, J Mitchell. Am Fam Physician. 2000 Mar 1;61(5):1319-28*

# The Angle of Louis

***Not a very good reference point…***

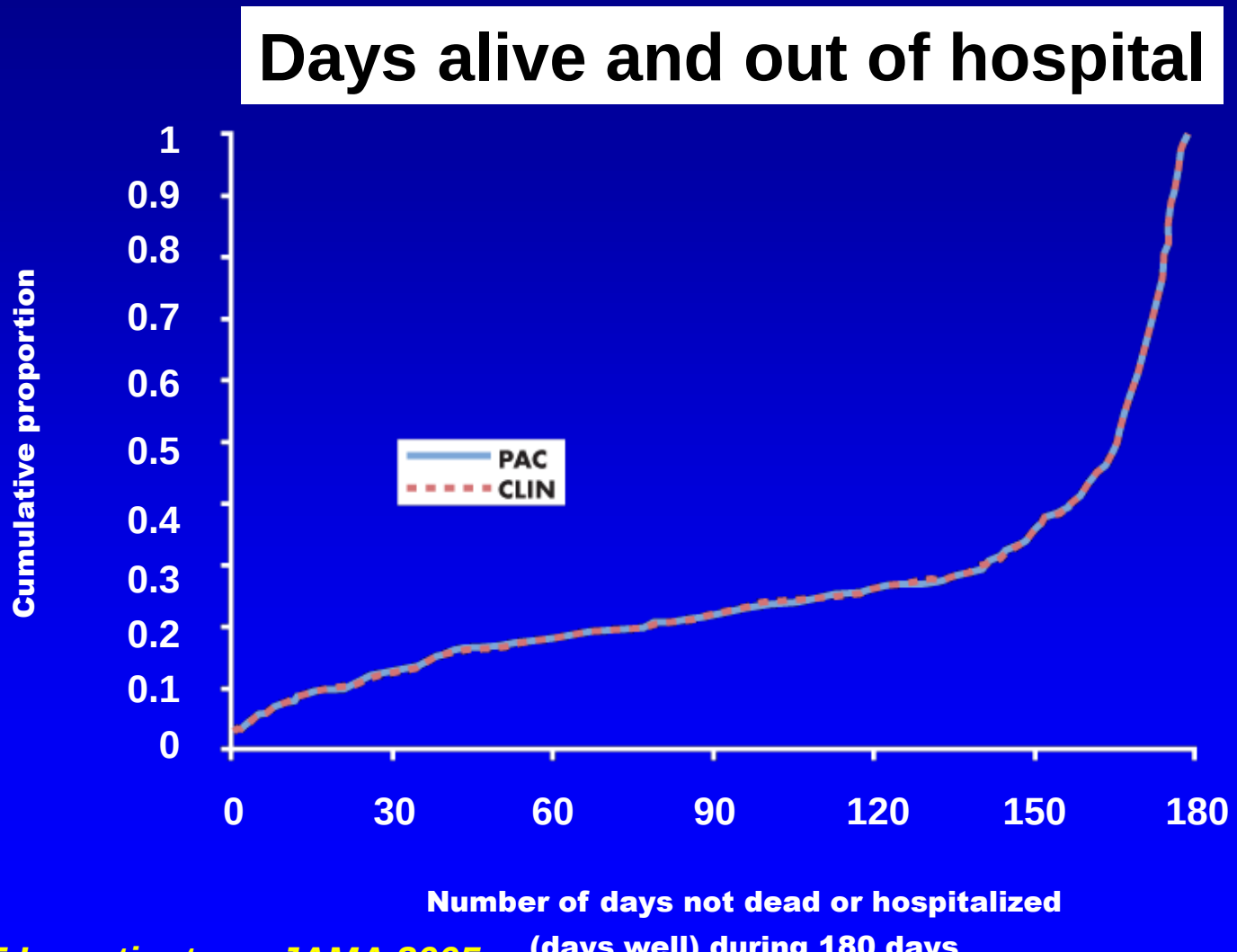



*Seth R, et al. J Gen Intern Med 2002;852-856*


≥ 10 cm

# ESCAPE Trial

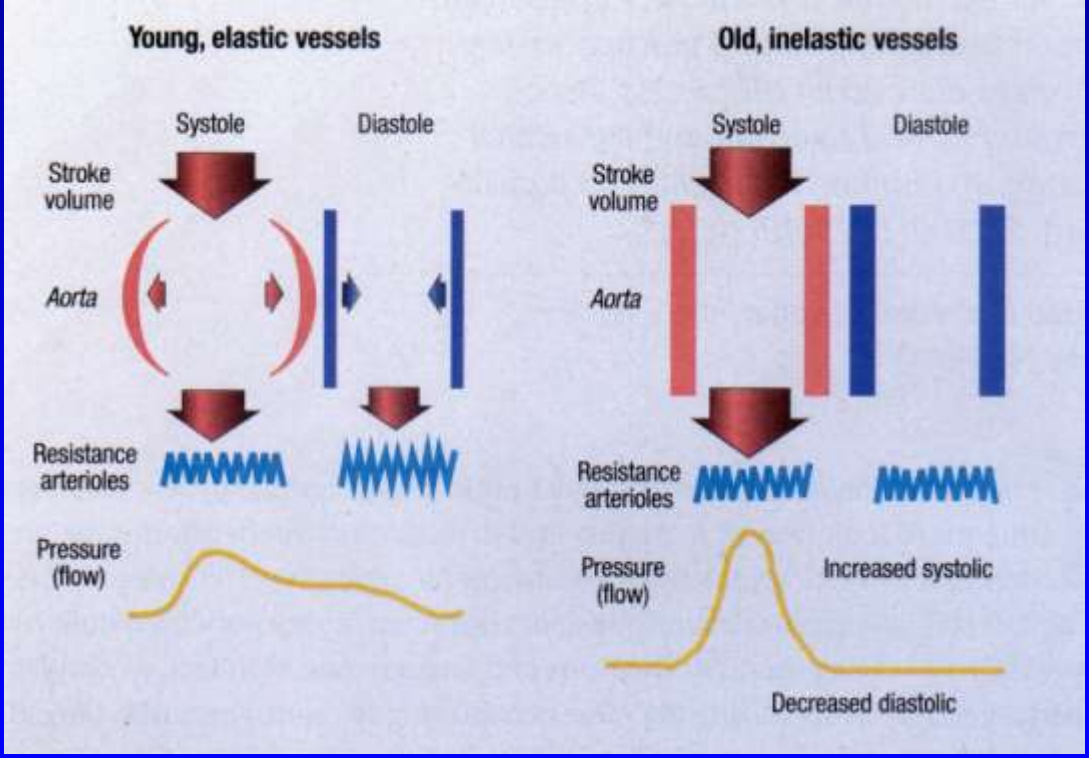
## Physical Exam versus PA catheter guided management in Advanced HF



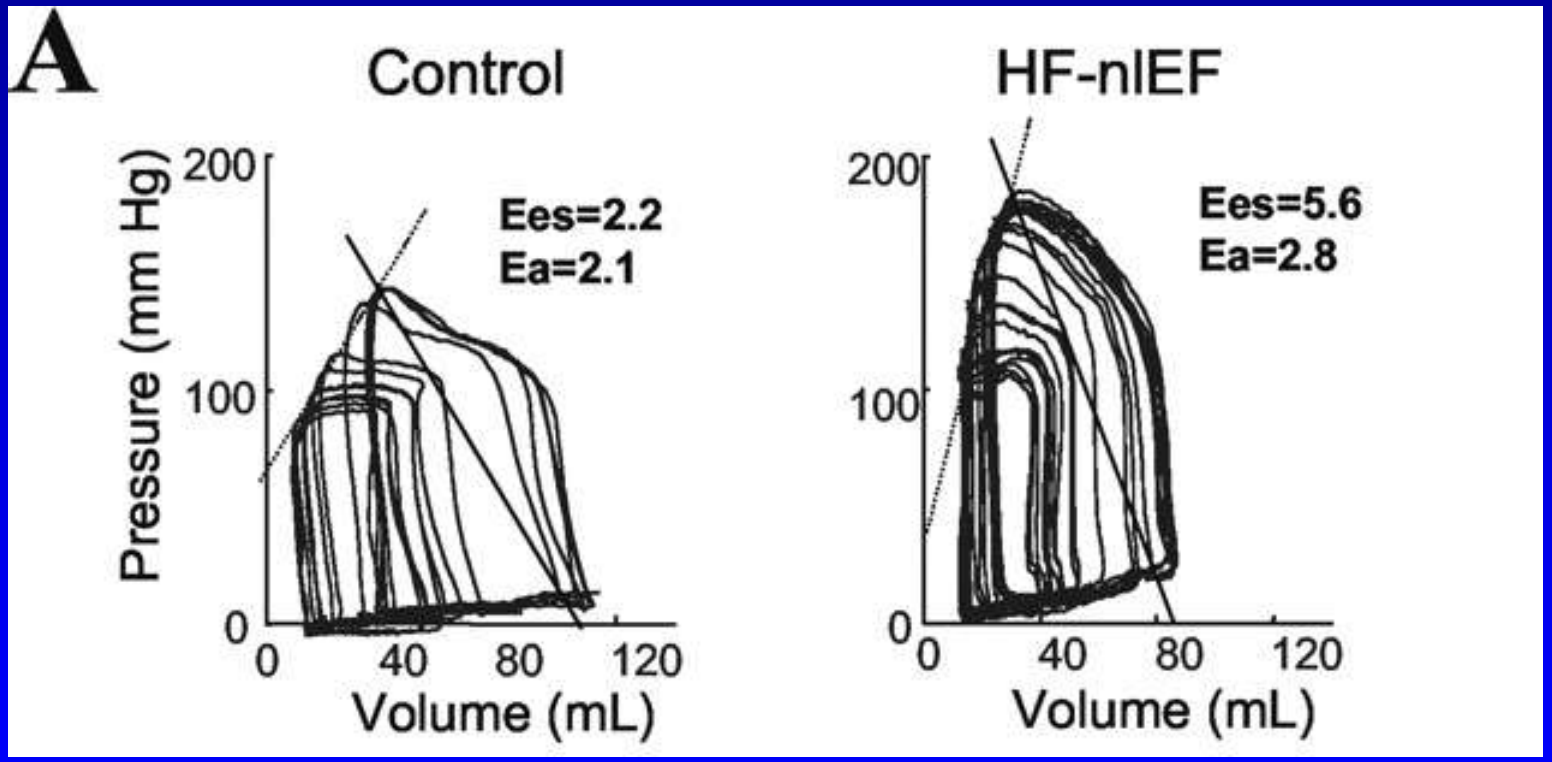

*ESCAPE Investigators, JAMA 2005*

# Arterial pulse

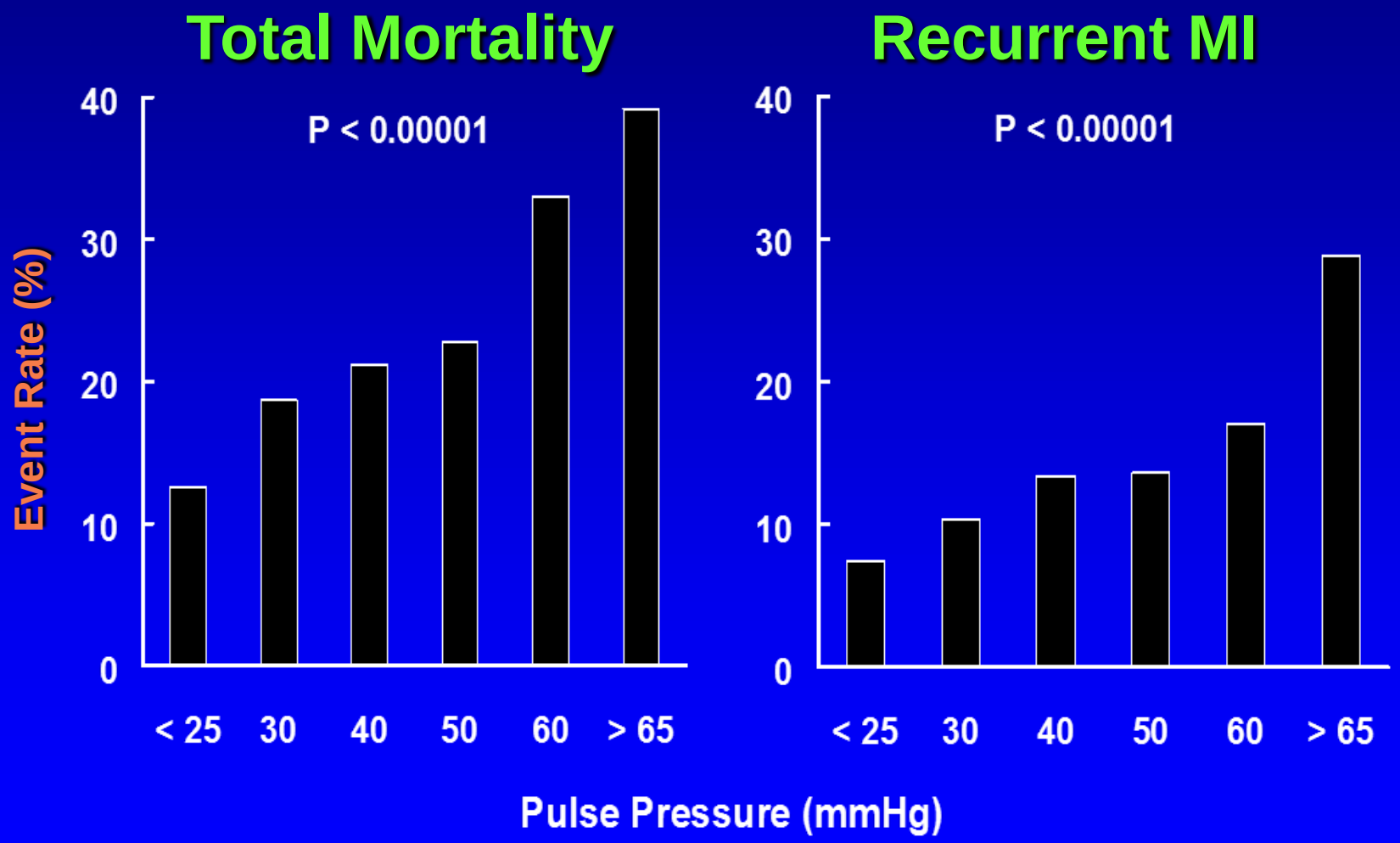
# Aorta and Pulsatile Load



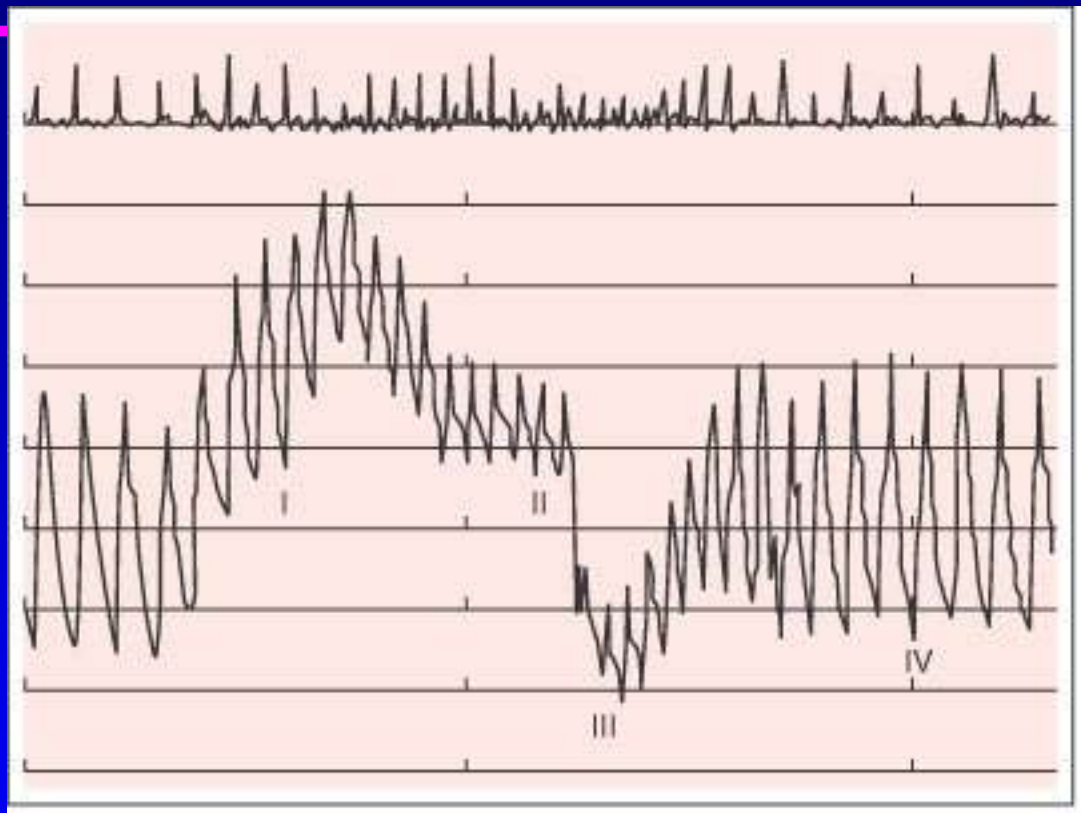
# Increased vascular stiffness leads to increased endsystolic stiffness



# Pulse pressure and CV events




*Mitchell, Circ 1997;96:4254*




**Phase I:** Increase in systolic pressure with initial strain due to increase in intrathoracic pressure

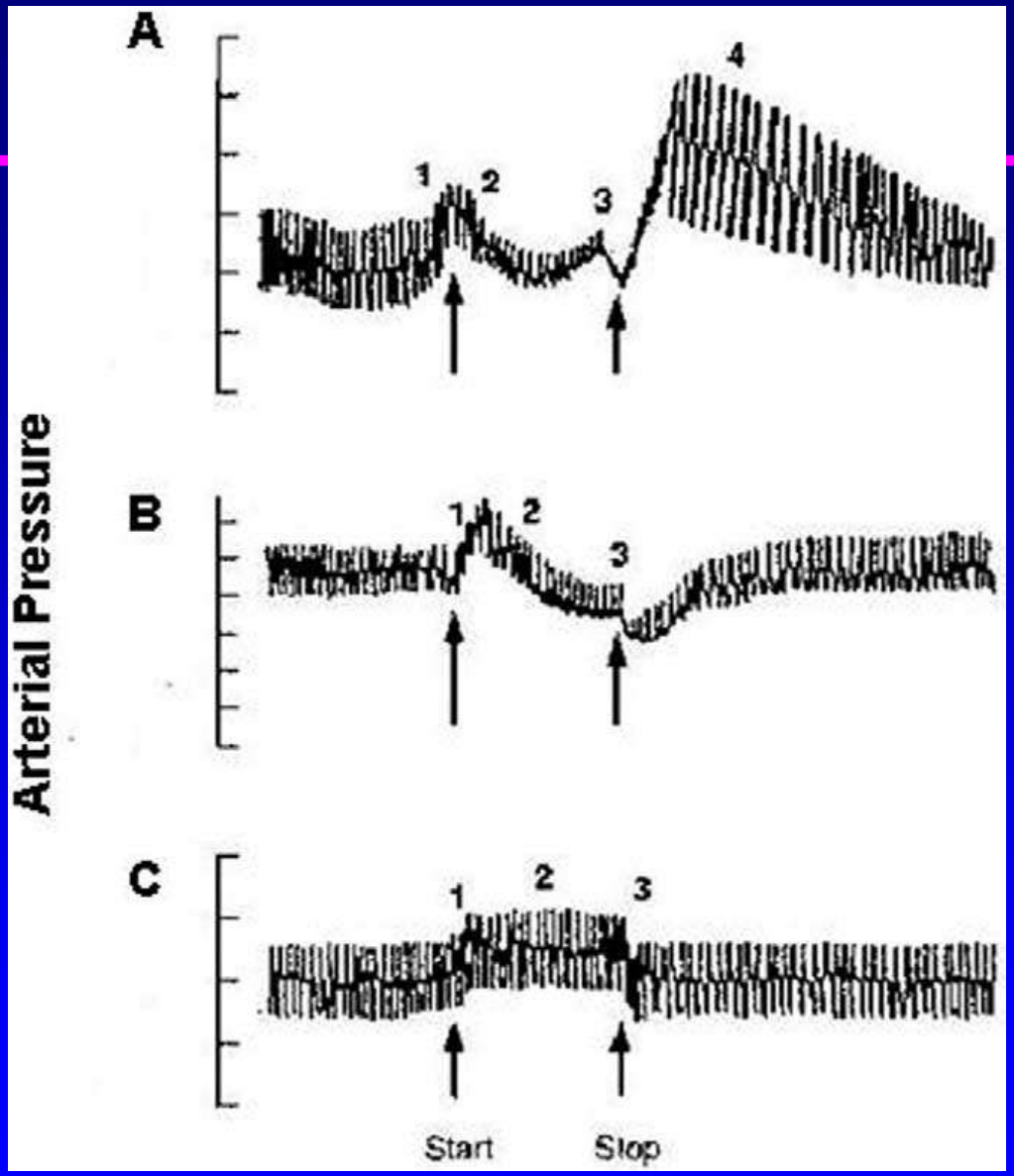
**Phase II:** Decrease in stroke volume and pulse pressure and reflex tachycardia with continued strain due to decrease in venous return and increase in vascular resistance

**Phase III:** Brief, sudden decrease in systolic pressure due to sudden decrease in intrathoracic pressure

**Phase IV:** Overshoot of systolic pressure and reflex bradycardia due to increased venous return and decreased systemic vascular resistance

**FIGURE 11–14** The normal Valsalva response.

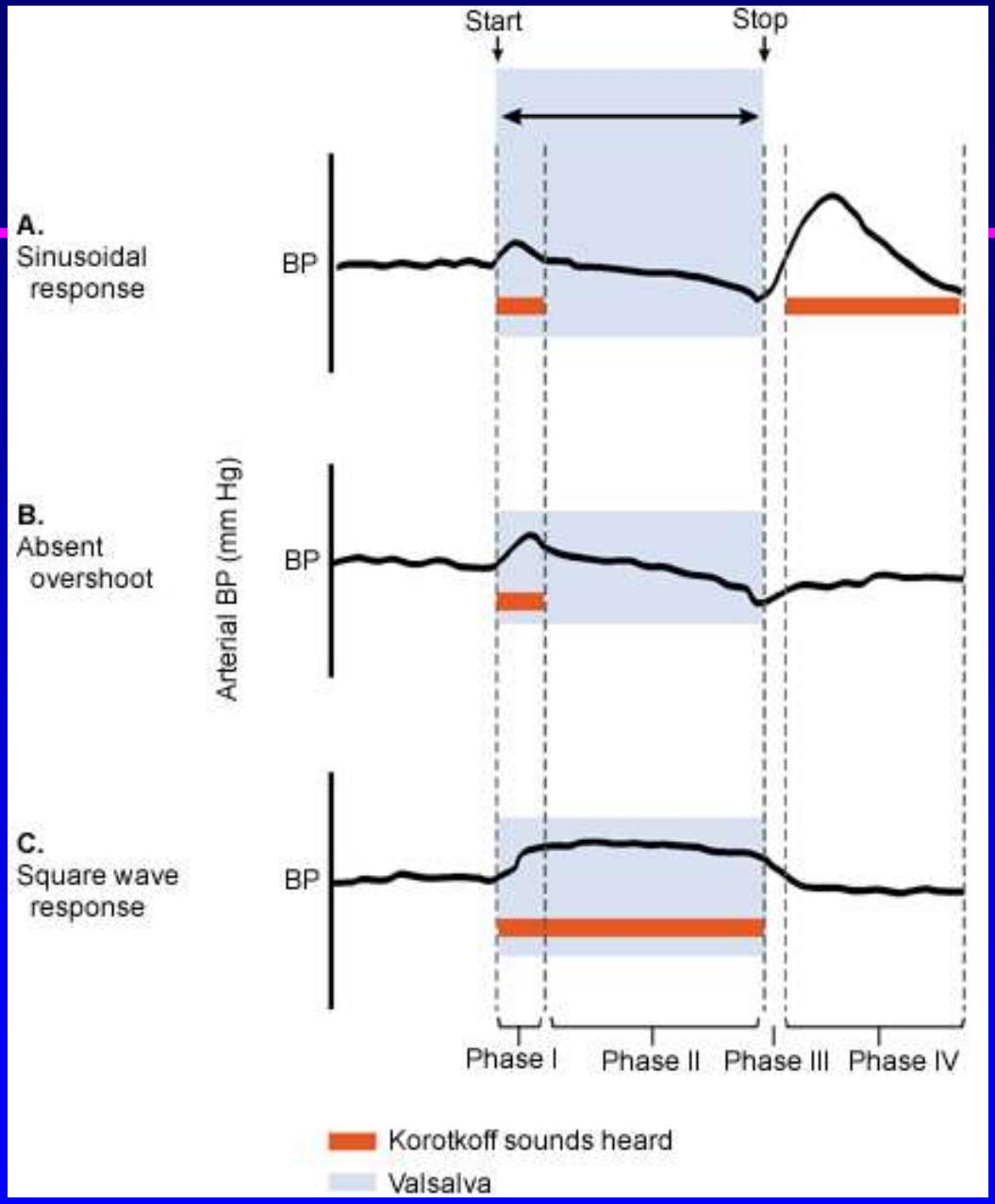
*(From Nishimura RA, Tajik AJ: Mayo Clin Proc 79:569-579, 2004.)*




**Absent overshoot**
**EF <50%**

**Square response**
**PCW > 22**

*Zema MJ, Restivo B, Sos T, et al. Br Heart J 1980;44(5):560-569.*

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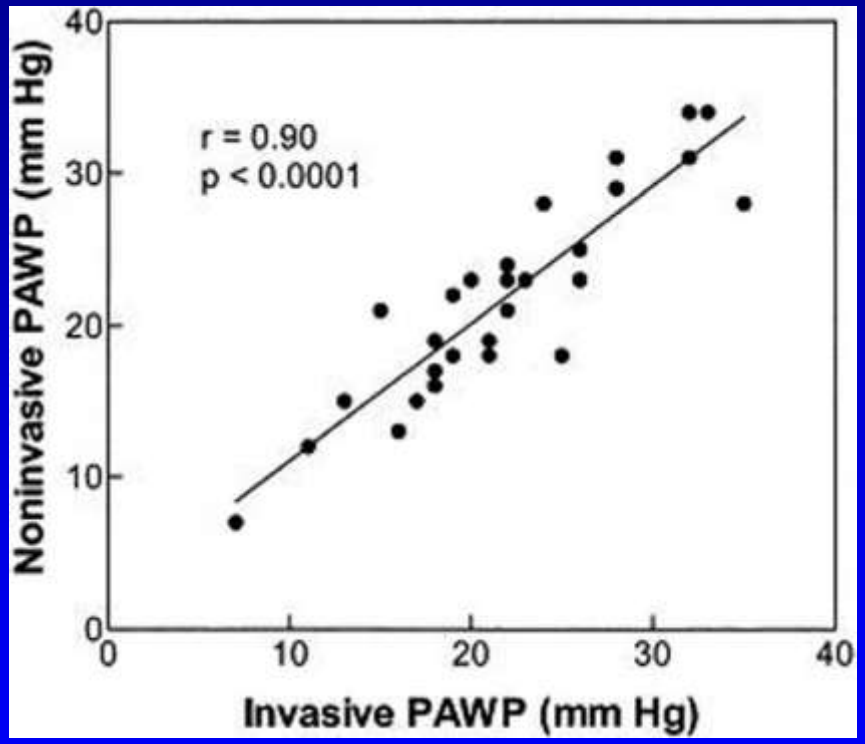
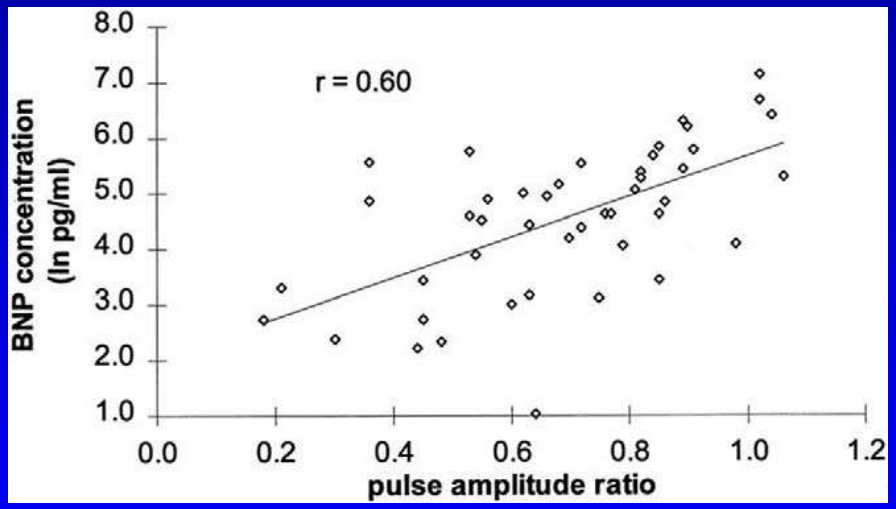
**Square response**
**PCW > 22**

*F Shamsham, J Mitchell. Am Fam Physician. 2000 Mar 1;61(5):1319-28*

# Valsalva and hemodynamics



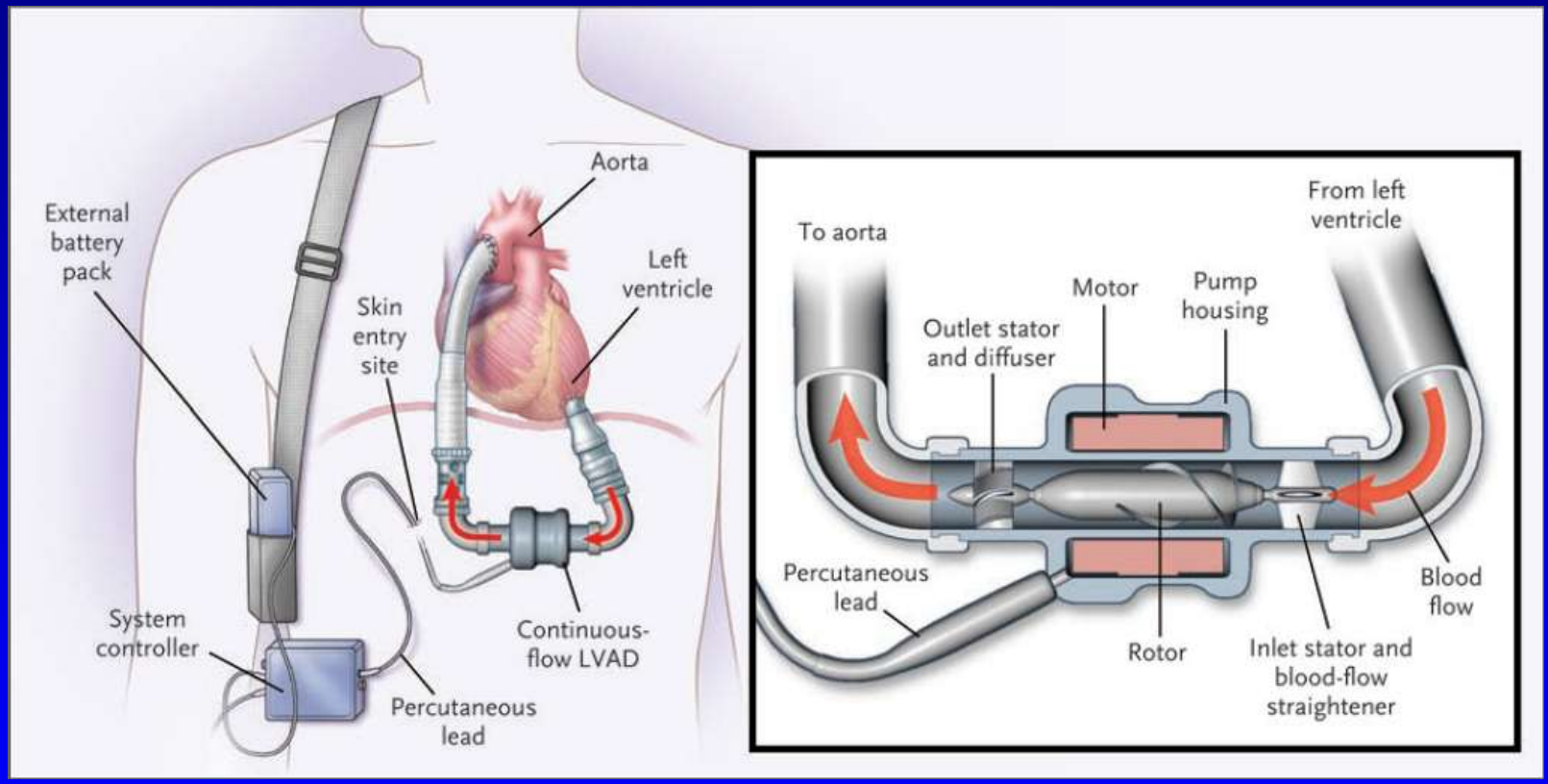

*Givertz MM, et al. Am J Cardiol 2001;87(10):1213-1215*




*Rocca HP, et al. Chest 1999;116(4):861-867*

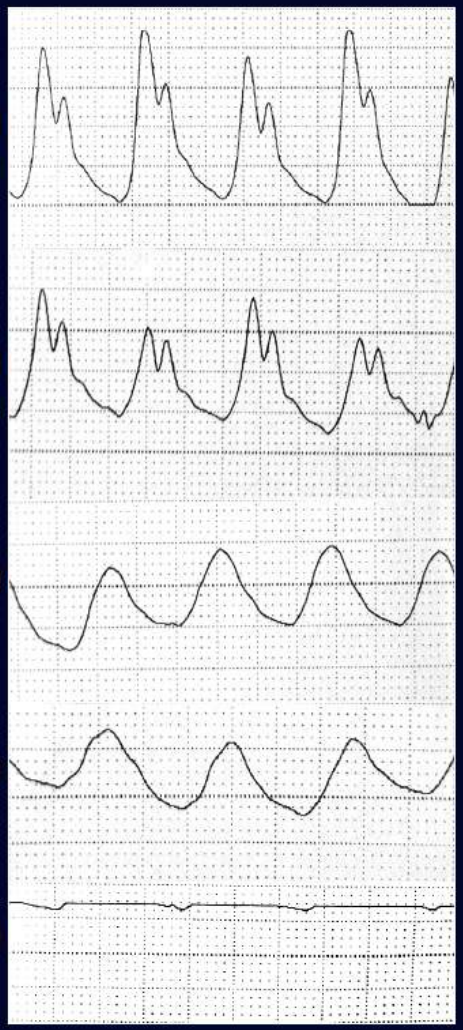
# Heartmate II LVAD

## *Continuous Flow…no pulse?*




- **Axial flow pump, simple blood path minimizes hemolysis/clotting**
- **Weighs only 375 gm, 4 cm x 6 cm**
- **Flows up to 10 L/min**

# Measuring Blood Pressure in a CF VAD Patient



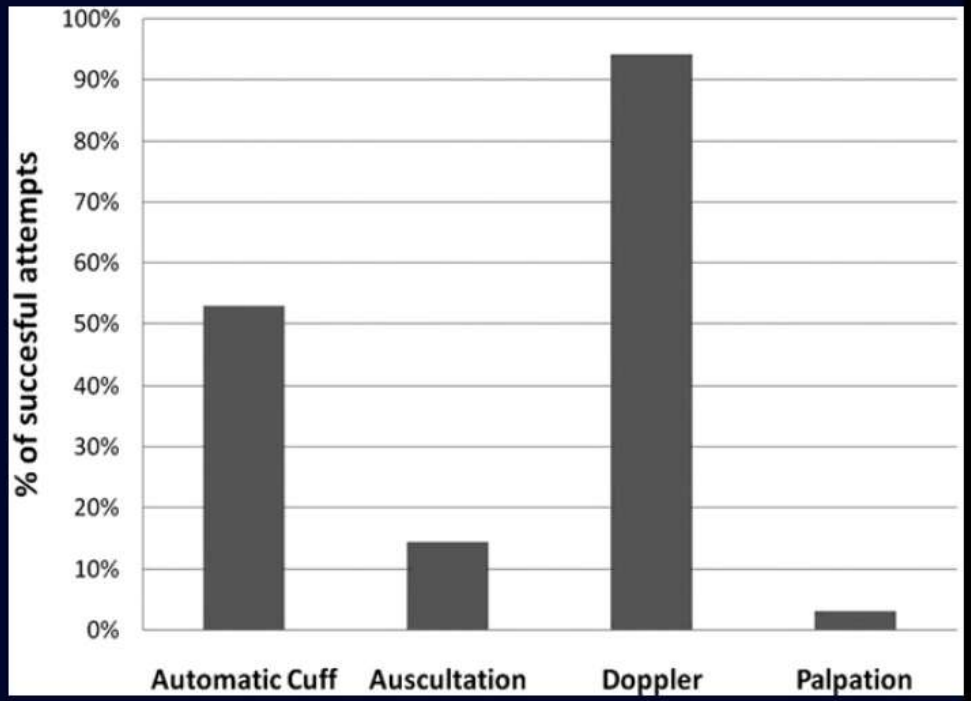
8,000 RPM — CO = 4.3, PP = 23, BP = 68

9,000 RPM — CO= 4.4, PP = 16, BP = 70

10,000 RPM — CO= 4.5, PP = 12, BP = 74

11,000 RPM — CO= 4.9, PP = 9, BP = 82

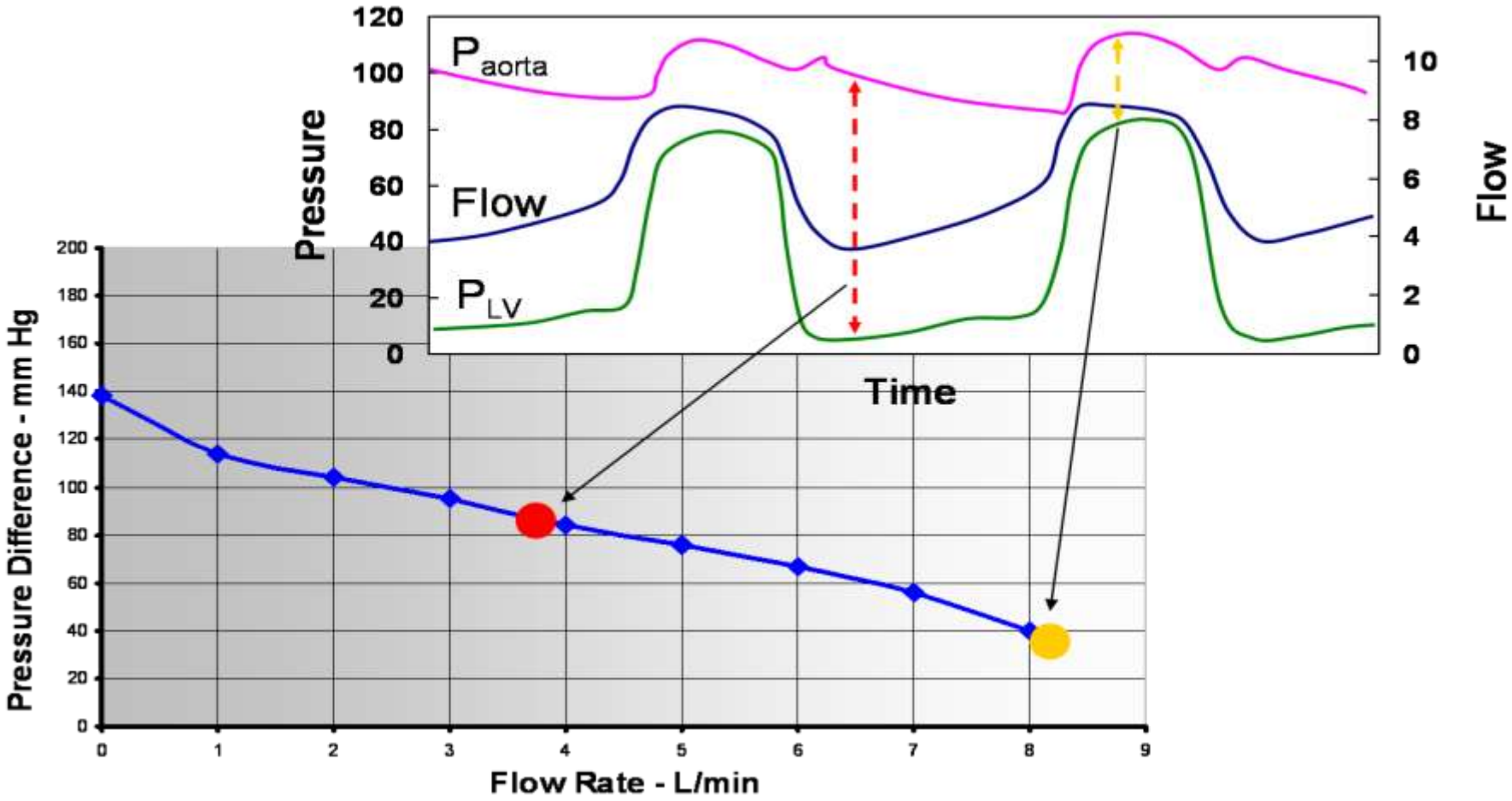
12,000 RPM — CO = 5.1, PP = 6, BP = 87




J Heart Lung Transplant 2010; 29:593-4

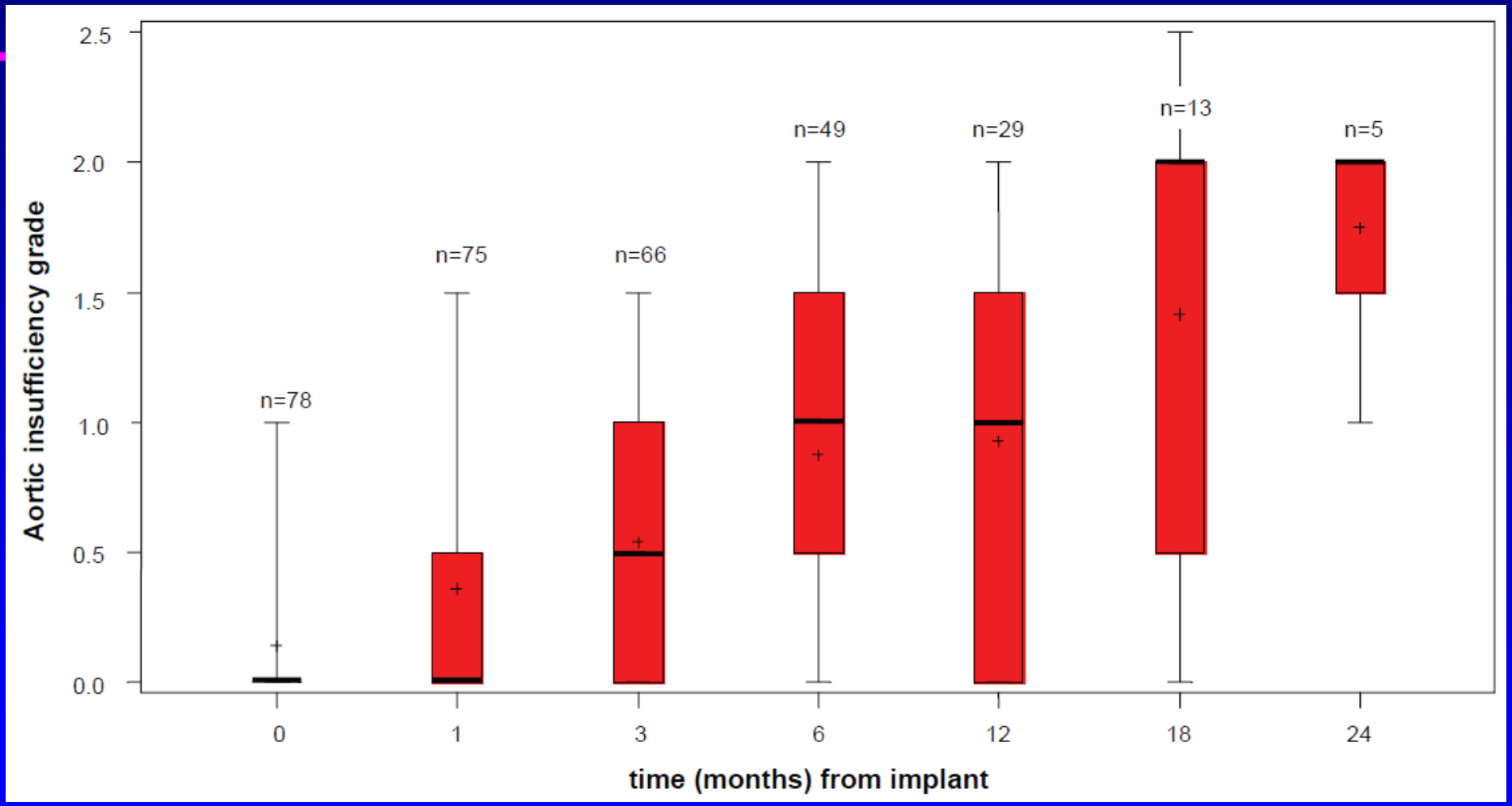
CO, cardiac output; PP, pulse pressure; BP, mean blood pressure

# Pump Flow Waveform




represents ventricular diastole

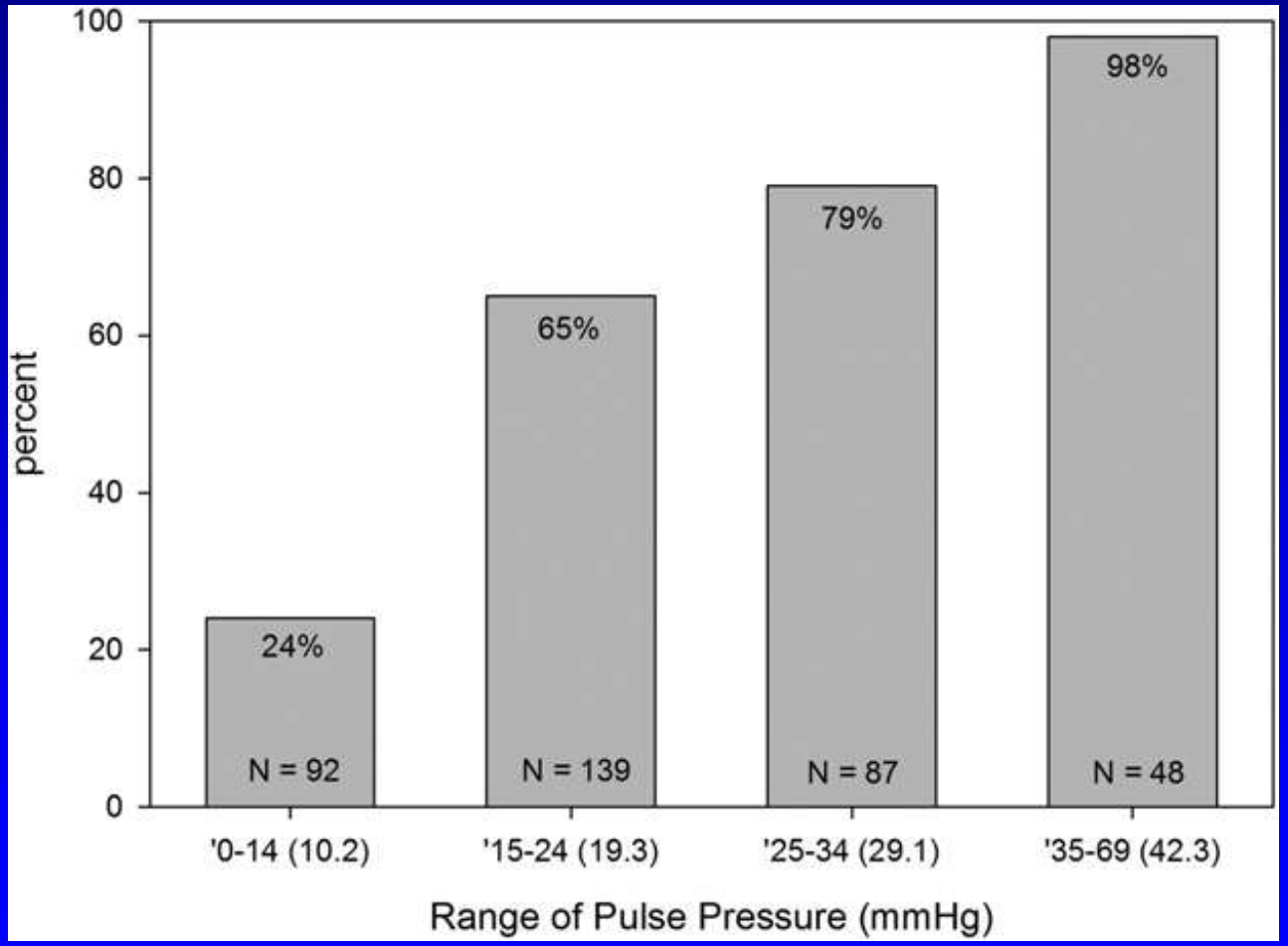
represents ventricular systole



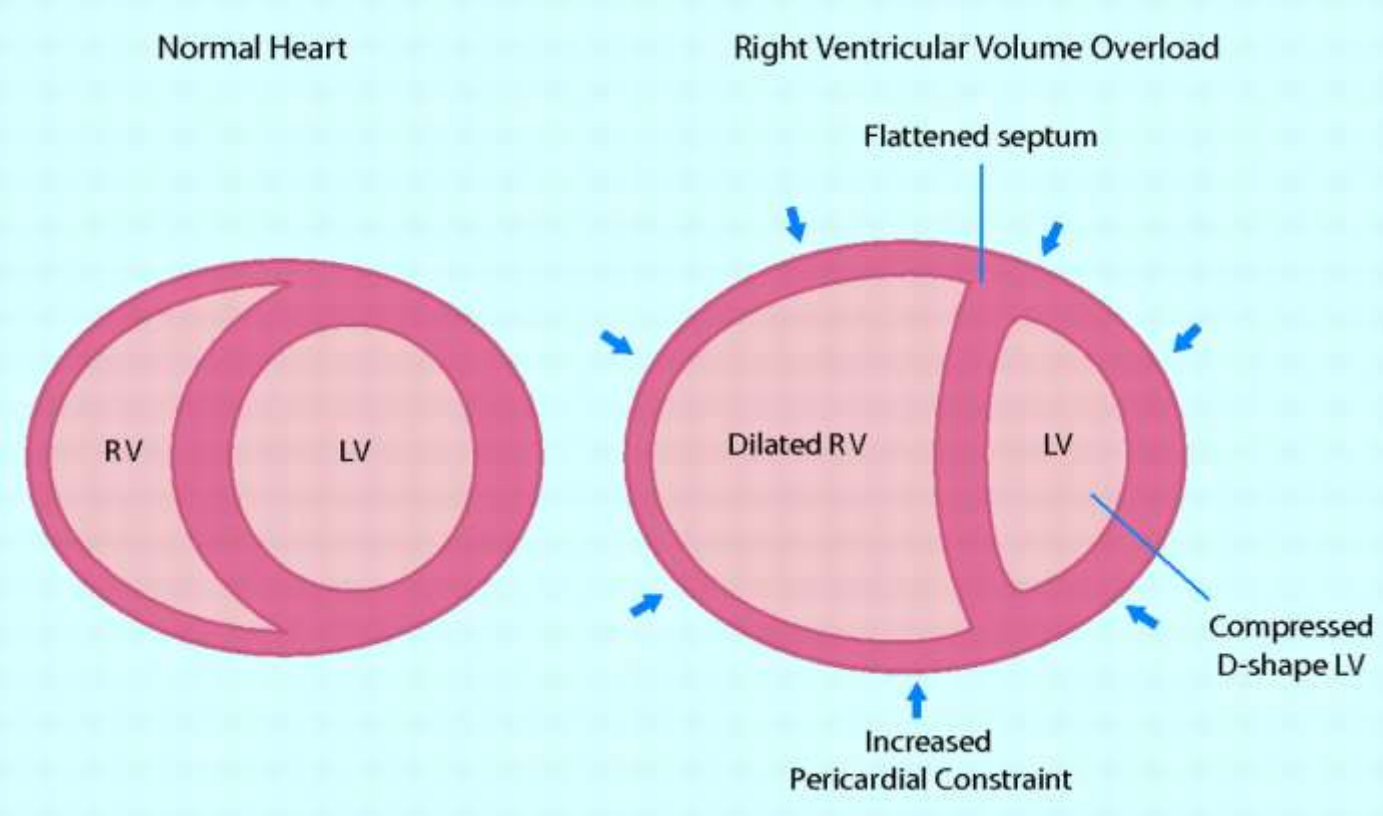

*Cowger J, et al. CircHF 2010*

*Samuels LE, et al. JTCVS 2001;122-380*

# Aortic valve opening by pulse pressure

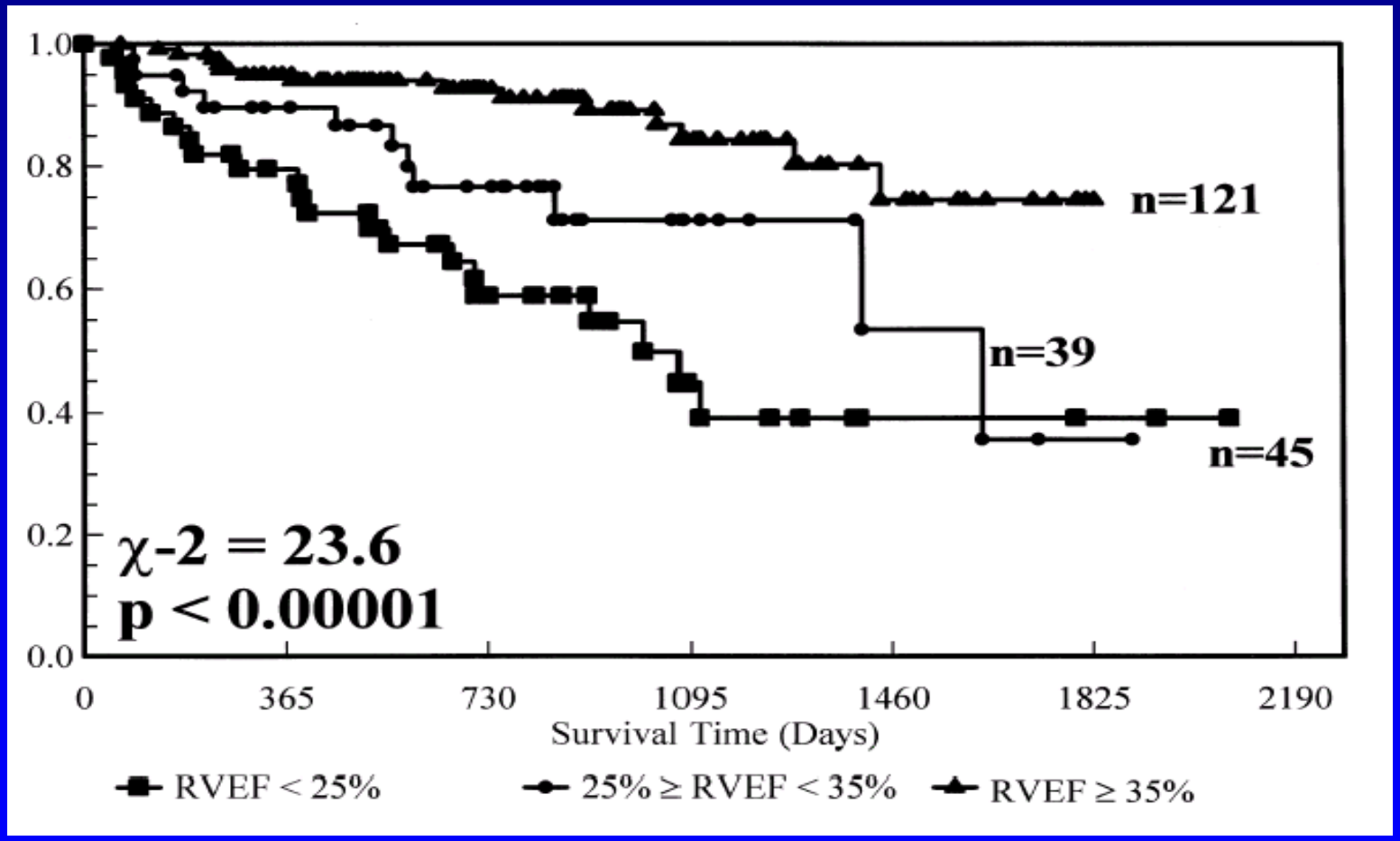


# Ventricular interdependence in RV failure




*Haddad, F. et al. Circulation 2008;117:1436-1448*

# RV Function and Mortality




*De Groote et al. JACC 1998; 32:948*

# Why do it?

- Patients expect it
- Doctors exam patients
- Inexpensive
- Establishes diagnosis
- Guides management
- Has prognostic power
- You don’t need a doctor to order a test

# Thank you