

# Acute Decompensated Heart Failure and the Use of Vasodilator Therapy in Canada

Case-based Study

WARM & WET

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# Session Objectives

By the end of this session, participants will be able to:

- Identify diagnostic options for ADHF
- Differentiate patient profiles for treatment of acute decompensated heart failure (ADHF)
- Identify an appropriate patient for the use of nesiritide
- Review the practical aspects of the use of nesiritide

## Case Study – Mrs. A<sup>†</sup>

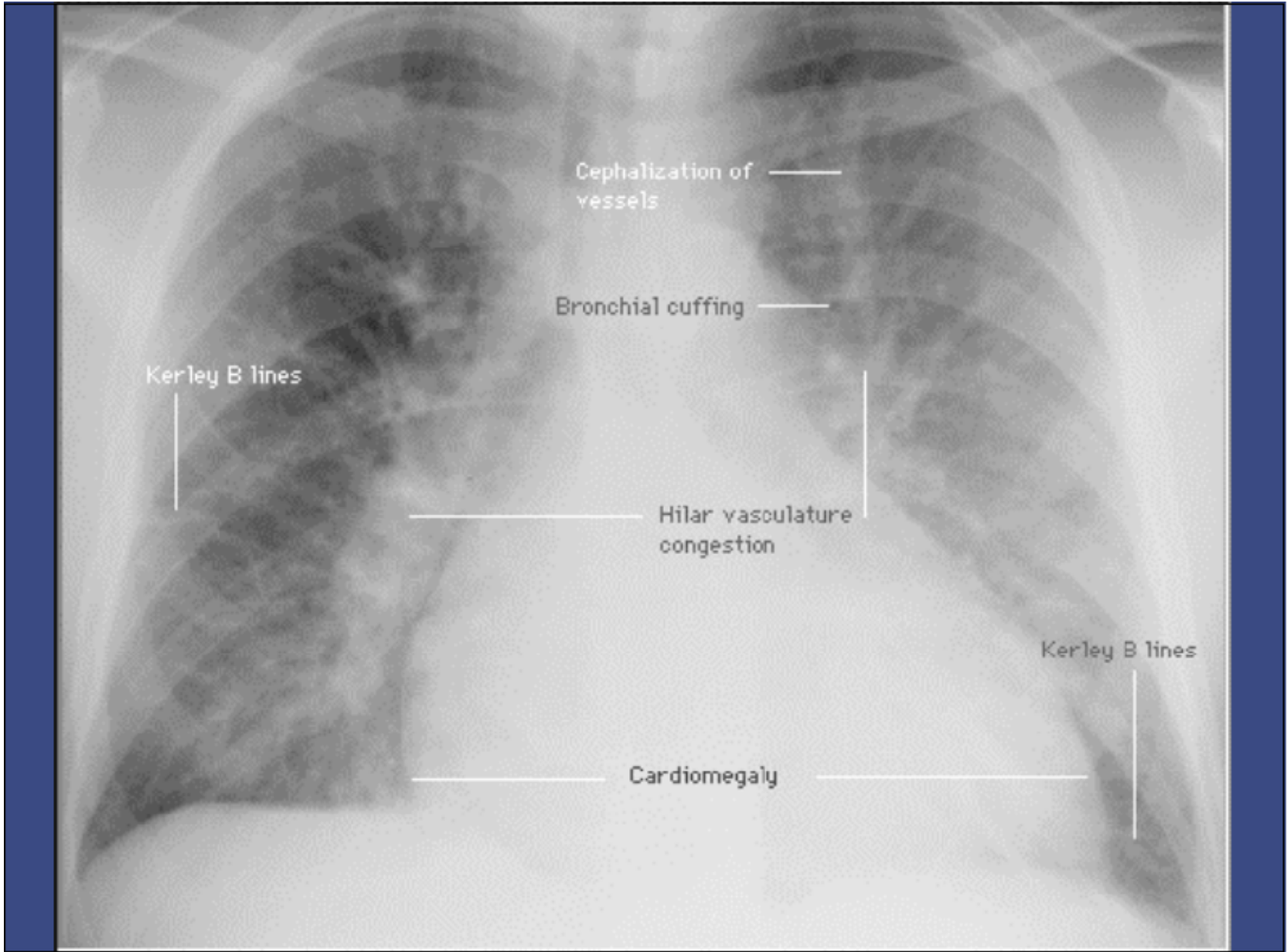
### Presentation:

- 75 year-old female with long history of atrial fibrillation and hypertension, on an ARB and CCB
- Presents to ER reporting increasing shortness of breath over the last day on exertion
- Short of breath at rest. Denied chest pain.
- History of COPD, osteoarthritis
- Physical exam:
  - BP 160/80 mm Hg
  - HR 98 beats/min average, irregular rhythm
  - RR 26 breaths/min
  - O<sub>2</sub> sat % (room air) = 92%

<sup>†</sup>Fictitious patient profile. May not be representative of all patients with ADHF.

## Case Study – Mrs. A

- JVP = 6 cm
- S1, S2, S3, no murmurs
- Occasional scattered crackles 1/3 way up, mild ankle edema
- ECG shows atrial fibrillation with rate 105 beats/min and LVH. No new ST-T changes.
- Laboratory values:
  - Troponin: mildly positive
  - Serum creatinine: 160  $\mu\text{mol/L}$
  - Blood urea nitrogen: 14.6 mmol/L
  - Na = 135 mmol/L; K = 4 .1 mmol/L
  - BNP: 2000 pg/mL (NT-proBNP 16,000–20,000 pg/mL)

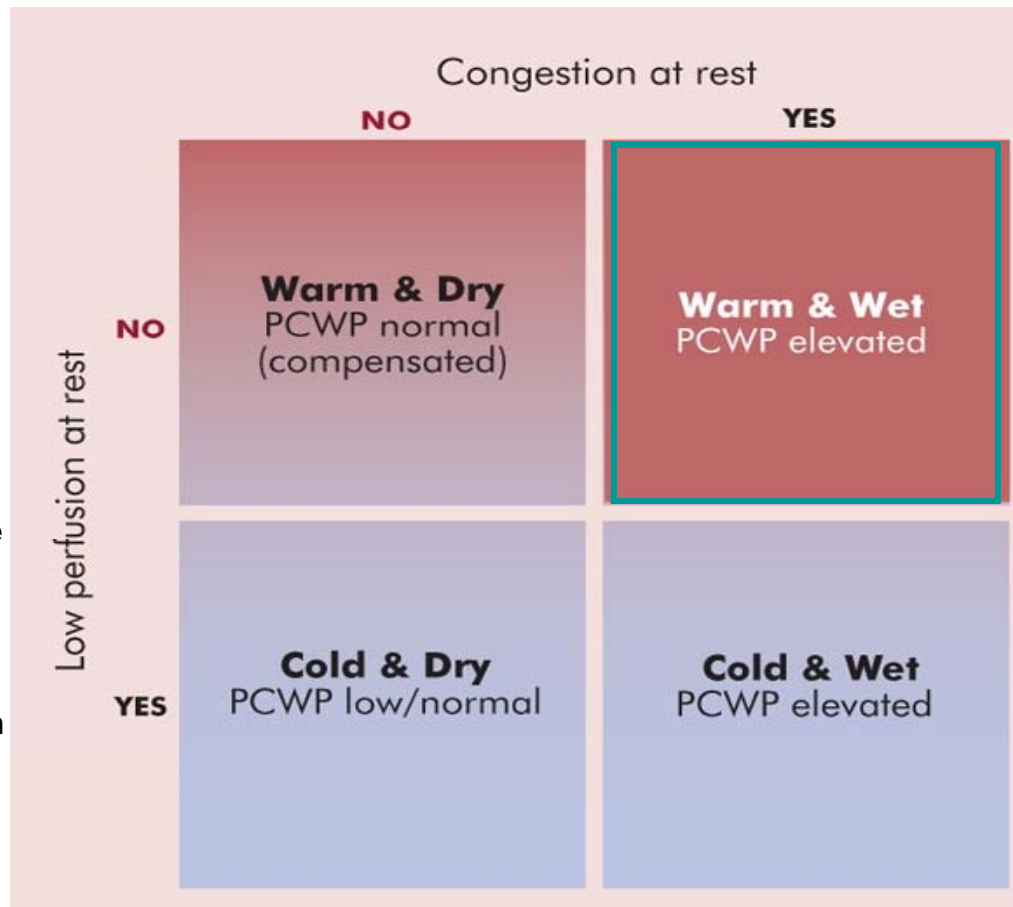


# Therapeutic Goals for ADHF

Goals	End Points
Relieve symptoms	Rapid reduction in dyspnea and other signs and symptoms of heart failure <sup>1</sup>
Reverse acute hemodynamic abnormalities	Lower PCWP with adequate systemic perfusion <sup>1</sup> Use of ACE inhibitors, aldosterone antagonists, and $\beta$ -blockers before hospital discharge <sup>1</sup>
Prevent end-organ dysfunction	Inhibit RAAS system, monitor inflammation caused by infection following a major surgery or trauma <sup>2,3</sup>
Apply treatment cost effectively	Shorten length of stay, minimize use of intensive care unit, reduce readmissions <sup>1</sup> Ease of use: require minimal patient monitoring <sup>4</sup>

1. Fonarow GC. *Rev Cardiovasc Med* 2002;3(4):S18-S27. 2. Stier CT Jr et al. *Cardiol Rev* 2002;10;97-107.  
3. Masai T et al. *Ann Thorac Surg* 2002;73;549-55. 4. VMAC. *JAMA* 2002;287:1531-40.

# Characterize ADHF



An analysis of 452 consecutive patients hospitalized with heart failure demonstrated that: 49% presented with the warm and wet profile

**Possible evidence of low perfusion**

- Narrow pulse pressure
- Sleepy/obtunded
- Low serum sodium
- Cool extremities
- Hypotension with ACE inhibitor
- Renal dysfunction

**Signs/symptoms of congestion**

- Orthopnea/PND
- Jugular venous distension
- Ascites
- Edema
- Rales

Adapted from Arnold JMO et al. *Can J Cardiol* 2007;23(1):21-45. Nohria A et al. *J Am Coll Cardiol* 2003;41(10):1797-1804.

## Mrs. A Was Given a Bolus of Furosemide 40 mg IV

- Blood pressure did not change
- No change in symptoms, O<sub>2</sub> saturation was now 90%
- IV nitroglycerin started and over 2 hours titrated to 50 µg/min by infusion
- Initially, BP fell to 150/70 mm Hg and with very modest improvement in shortness of breath, but limited diuresis
- 3 hours later, still short of breath at rest with persistent crackles. BP has now remained at 164/70 mm Hg with HR 100 beats/min.

# Q1: What Are Your Management Options Now?

- a. Increase IV nitroglycerin infusion?
  - a. What is the target dose?
- b. Change to nitroprusside?
- c. Add an inotrope?
- d. Give another IV dose of diuretic?
- e. Change to nesiritide?
- f. CPAP/intubation?

# NATRECOR\* (nesiritide)

- Nesiritide is indicated for the treatment of hospitalized symptomatic acute decompensated heart failure (ADHF) patients, presenting with moderate to severe dyspnea
- These are patients who present with signs and symptoms of persistent heart failure despite 2 hours of treatment with intravenous loop diuretics



NATRECOR\* Product Monograph, May 2008.

# But, Mrs. A's Baseline Creatinine was 160 $\mu\text{mol/L}$

Q2. What should you do?

- a. Avoid nesiritide because the serum creatinine was too high?
- b. Use lower dose of nesiritide?
- c. Use standard dose regimen?

Although nesiritide is eliminated, in part, through renal clearance, dose adjustment is not required in patients with renal insufficiency.

## Therapy and Monitoring

- Nesiritide was administered as a 2  $\mu\text{g}/\text{kg}$  bolus dose and 0.01  $\mu\text{g}/\text{kg}/\text{min}$  continuous infusion dose
- Anticipated duration of therapy was 2 days, or until Mrs. A was clinically euvolemic
- BP and creatinine was monitored throughout Mrs. A's treatment
- Invasive hemodynamic monitoring and ICU admission solely for the infusion is not required

# Preparation of Nesiritide

- Withdraw 5 mL diluent from a 250 mL plastic IV bag
- Add this 5 mL diluent to 1.5 mg vial of Nesiritide (NATRECOR\*)
- Diluents: 5% Dextrose (D5W); 0.9% NaCl; D5W and 0.45% NaCl; or D5W and 0.2% NaCl
- Rock vial gently so that all surfaces contact the diluent. The reconstituted concentration achieved is 0.32 mg/mL
- Take the reconstituted 5 mL and add to a 250 mL bag of NS or D5W to yield final concentration of 6 µg/mL

# Bolus Volume And Infusion Flow Rate

Calculate bolus volume with the following formulas:

- Bolus volume (mL) =  $0.33 \times \text{patient weight (kg)}$ \*
- Infusion flow rate (mL/hr) =  $0.1 \times \text{patient weight (kg)}$

**\*Does not pertain to the reconstituted vial  
but to the reconstituted and diluted solution.**

## Mrs. A: Day 1, 15 to 30 Minutes After Initiation of Nesiritide

- SBP decreased to 130 mm Hg after 1 hour, and another diuretic dose was given
  - Q3 – How long would you have waited before giving another dose?
- Patient appeared more comfortable and breathing improved
- Patient should be assessed for the need for more diuretic after nesiritide and periodically thereafter

## Day 2

- Less short of breath, able to lie flat for 10 minutes
- No S3, but scattered crackles persisted
- JVP = 4 cm
- Creatinine decreased to 130  $\mu\text{mol/L}$
- Evaluated for weight loss as assessment of volume loss – 3.5 kg
- BP continued to decrease (now to 110 mm Hg) but completely asymptomatic from hypotension

# Managing Asymptomatic Hypotension During Nesiritide Treatment

- Patient was re-examined for volume status and still had some crackles
- Still mildly short of breath on exertion
- Nesiritide infusion was lowered by 30% to 0.007  $\mu\text{g}/\text{kg}/\text{min}$
- Continuing diuresis in response to oral agents
- SBP was monitored and came back up to 121 mm Hg
- Wished to mobilize in room
- Infusion stopped later in the day as she was asymptomatic at rest and lying flat

## Day 3

- Chest was clear, no edema, SBP 110 mm Hg
- Other medications adjusted
- She continued to mobilize
  
- Assessed for dry weight
- Review serum Na<sup>+</sup> and creat

## Day 5

- Mrs. A continued to improve and was discharged to be followed in the heart failure clinic
- Review meds – consider sending her home with better Rx of HTN.
- Optimization of Oral meds