



Caring for Cliff Examining CHF

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Congestive heart failure (CHF) is one of the most common causes for hospitalization and hospital readmission in Canada and contributes significant morbidity and mortality, particularly in the elderly population.

What's causing Cliff's CHF?

It is important to clarify whether this patient has systolic dysfunction, diastolic dysfunction or both. This is best done with an echocardiogram-Doppler interpreted by a physician knowledgeable in the features of systolic dysfunction and the classification of diastolic dysfunction (Table 1).

Cliff's echocardiography shows atrial fibrillation (AF) and left bundle branch block (LBBB). Arrhythmia, such as AF, is one of the potential precipitants of CHF. The underlying etiology is presumably hypertensive heart disease, although occult coronary artery disease must still be excluded.

How should Cliff be treated?

Cliff is treated with diuretics to control congestion and digoxin to control his heart rate. He receives anticoagulant therapy because of his high embolic risk (AF, hypertension, diabetes and CHF). Cliff is started on an angiotensin-convert-

Cliff's Case



Cliff, 64, presents with a three-week history of increasing shortness of breath. He denies preceding chest pain.

- Medical history: Suboptimally treated hypertension and diabetes, smoking and chronic obstructive pulmonary disease

- Heart rate: 100 beats per minute and irregular
- Blood pressure: 170/100 mmHg
- Jugular venous pressure: Elevated and 10 cm above the sternal angle; carotid upstroke is normal
- On auscultation, there are bi-basilar rales and scattered wheezes
- Cardiac apex is not palpable
- S₁: Soft
- S₂: Single
- Soft S₃ and 2/6: Pansystolic murmur

What can you do for Cliff?

ing enzyme (ACE) inhibitor. His symptoms improve and he reverts spontaneously to sinus rhythm.



Table 1

Echocardiographic features of diastolic dysfunction

| Grade | Feature | Mitral inflow signal | Deceleration time | Tissue Doppler |
|-------|------------------------------------|--|-------------------|----------------|
| 1 | Impaired relaxation | E/A reversal | Prolonged | Reduced E' |
| 2 | Pseudo-normalization | False E/A normalization | Normalized | Reduced E' |
| 3 | Restrictive filling (reversible) | Increased E/A reversing with Valsalva maneuver | Decreased | Reduced E' |
| 4 | Restrictive filling (irreversible) | Increased E/A unchanged with Valsalva maneuver | Decreased | Reduced E' |

E/A: Mitral diastolic flow

E': Tissue Doppler imaging early diastolic motion of the lateral mitral annulus

Analysis of diastolic dysfunction is limited by the presence of AF. Fortunately, Cliff has reverted to normal sinus rhythm prior to his echocardiogram, which shows left ventricular (LV) dilatation with moderate to severe global LV dysfunction and septal asynchrony due to LBBB.

Ejection fraction (EF) is estimated at 35% \pm 5%. Diastolic function assessment reveals a restrictive filling pattern.

How can his prognosis be improved?

Use of specific beta blockers (Table 2) has shown to improve prognosis and increase EF approximately 4% to 5% on average.¹

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Use of the aldosterone antagonist, spironolactone, has been shown to provide incremental mortality benefit in class III-IV HF patients with EF < 35%, creatinine < 220 mmol/L and potassium < 5.0 mmol/L. Caution is advised in applying the RALES trial data to clinical practice without appropriate monitoring, as evidenced by the recent review identifying increased risk of hyperkalemia-associated morbidity and mortality in Ontario after publication of this trial.²

What if the patient can't tolerate ACE inhibitors?

A number of trials have been conducted with angiotensin receptor blockers (ARBs) in CHF. The 2002/2003 Canadian Cardiovascular Society CHF Consensus Conference Update draft document recommends (2005 Update pending):³

Table 2

Pharmacologic interventions to improve outcomes in CHF

| Trial | CHF patients | Number | Treatment | RRR | ARR | NNT |
|--------------|-------------------------|--------|----------------|-------|------|-----|
| US Cavedilol | II-III NYHA | 1,094 | Carvedilol | 0.35 | 4.6% | 22 |
| ANZ | II NYHA | 415 | Carvedilol | 0.74 | 13% | 8 |
| CIBIS II | EF < 35% | 2,647 | Bisoprolol | 0.66 | 4.4% | 23 |
| MERIT | EF < 40% | 3,991 | Metoprolol-CR | .0.66 | 3.8% | 26 |
| COPERNICUS | EF < 25% | 2,289 | Carvedilol | 0.65 | 7.1% | 14 |
| RALES | III-IV NYHA EF < 35% | 1,663 | Spirololactone | 0.70 | 6.7% | 15 |

CHF: Congestive heart failure
EF: Ejection fraction
RRR: Relative risk reduction

ARR: Absolute risk reduction
NNT: Number needed to treat
NYHA: New York Heart Association

- Current evidence has shown ARBs to be neither superior nor equivalent to ACE inhibitors in the treatment of HF due to LV systolic dysfunction. As such, ACE inhibitors remain the first therapy of choice (Grade A, Level 1).
- ARBs may be considered as alternatives to ACE inhibitors in cases where ACE inhibitors clearly cannot be tolerated (Grade B, Level 2).
- ARBs may be considered adjunctive therapy to ACE inhibitors when beta blockers are either contraindicated or not tolerated after careful attempts at initiation (Grade A, Level 1).³

Take-home message

- Optimal CHF management requires an integrated strategy to educate the patient, to prescribe evidence-based therapies and to ensure followup for long-term compliance.
- The Guide for HF Management provides a prospective patient management checklist with evidence integration to better manage (and audit) the process of care (see attachment).
- A variety of disease-management checklists and patient-education tools are available for free download from the CVToolbox (www.cvtoolbox.com).

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References

1. Pitt B, Zannad F, Remme W, *et al*: The Randomized Aldactone Evaluation Study Investigators: The Effect of Spirololactone on Morbidity and Mortality in Patients with Severe Heart Failure. *N Engl J Med* 1999; 341(10):709-717.
2. Juurlink N, Mamdani M, Lee D, *et al*: Rates of Hyperkalemia after Publication of the Randomized Aldactone Evaluation Study. *N Engl J Med* 2004; 351(6):543-551.
3. Canadian Cardiovascular Society: www.ccs.ca.

Guide for Heart Failure (HF) Management

Patient: _____ Diagnosis: _____

| ✓ | APPROACH | RECOMMENDATIONS |
|---|--|---|
| | SYMPTOMS & SIGNS OF HF | Fatigue (low cardiac output), SOB, ↑ JVP, rales, S ₃ , edema, radiologic congestion, cardiomegaly. Elevated BNP . CXR to r/o infection, interstitial lung disease & primary pulmonary hypertension (PPH) |
| | Ejection fraction (obtain echo or LV gated study) | <ul style="list-style-type: none"> ≤ 40% = systolic dysfunction 40%-55% = mixed systolic and diastolic dysfunction ≥ 55% = diastolic dysfunction - treat underlying disorder (HTN/ischaemia/pericardial constriction/restrictive CM (cardiomyopathy)/infiltrative disorders) |
| | Consider etiology | <input type="checkbox"/> Ischemic-CM <input type="checkbox"/> HTN-CM <input type="checkbox"/> Valvular HD-CM (AS/AR/MR) <input type="checkbox"/> Metabolic: Hyper/hypothyroidism/hemochromatosis/pheochromocytoma <input type="checkbox"/> Toxins: Alcohol/anthracyclines/cocaine/amphetamines <input type="checkbox"/> Viral CM <input type="checkbox"/> Idiopathic Dilated CM <input type="checkbox"/> Other: |
| | Identify triggers | |
| | Acute -sudden onset | Ischemia, arrhythmia, infection, pulmonary embolism, acute valvular pathology |
| | Chronic -gradual onset | Anemia, thyrotoxicosis, non-compliance, diet, Rx (<i>i.e.</i> , NSAIDs) |
| | Treatment | Correct triggers and precipitants of acute and chronic HF |
| | General measures | <ul style="list-style-type: none"> • Low sodium diet • Regular exercise/activity • Treat ischemia • Control hypertension • D/C smoking • Treat lipid abnormalities • Treat and control diabetes • Identify & Rx depression |
| | Symptomatic therapy | Diuretics -titrate to euvolemic state <ul style="list-style-type: none"> • Maintain ideal body weight (dry weight = JVP normal / trace pedal edema) • Furosemide, 20 mg-80 mg OD-BID • HCT/Zaroxolyn for refractory congestion |
| | | Digoxin -for persisting symptoms in NSR (systolic dysfunction) or symptoms and rate control in Afib. Dose: 0.125 mg-0.25 mg (Lower dose in elderly: 0.0625 mg) |
| | Therapy to improve prognosis | ACE Inhibitors -General guideline: Start low and titrate to target dose used in clinical trials or the MAXIMUM TOLERATED DOSE: <ul style="list-style-type: none"> • Captopril, 6.25 mg-12.5 mg⇒ 50 mg BID-TID • Enalapril, 2.5 mg ⇒ 10 mg BID† • Ramipril, 2.5 mg ⇒ 5 mg BID § • Lisinopril, 2.5 mg ⇒ 30 mg-40 mg OD • Trandolapril, 1 mg ⇒ 4 mg OD‡ • *Quinapril, 10 mg ⇒ 40 mg OD • *Cilazapril, 0.5 mg ⇒ 10 mg OD • *Fosinopril, 5 mg ⇒ 40 mg OD • *Perindopril, 4 mg ⇒ 8 mg OD * No large scale outcome trials SoLVD/X-SoLVD\$AIRE/AIRE‡TRACE Consider ISDN 5 mg-40 mg QID+Hydralazine 10 mg-75 mg QID for ACE-I/ARB intolerance VHeFT |
| | Consider ACE-I/ARB combination in ACE-I and/or β-blocker patients with worsening HF or hospitalization | Angiotensin II receptor antagonist (ARBs) <ul style="list-style-type: none"> • ACE-Inhibitors remain first-line therapy • ARBs indicated in ACE-I intolerant patients • (CHARM candesartan, 16 mg-32 mg OD) (Val-HeFT/VALIANT valsartan 160 mg BID) |
| | | Beta blockers -Add Beta blocker* to ACE-inhibitor/diuretic/+-digoxin in stable Class II-IV CHF/LVEF ≤ 40% (*No outcome data for other beta blockers) <ul style="list-style-type: none"> • Bisoprolol*, 1.25 mg→10 mg OD (CIBIS II Trial) • Carvedilol*, 3.125 mg BID→25 mg BID (50 mg BID if weight > 85 kg) • Metoprolol*, 12.5 mg BID→75 mg BID (MERIT Trial) |
| | <i>Caution: Diabetics/renal disease/elderly/NSAIDs & COX-2 inhibitors</i> | Aldosterone antagonist (follow K/Cr in 3-7 days/↓ furosemide to avoid azotemia) <ul style="list-style-type: none"> • Spironolactone, 12.5 mg-25 mg OD added to ACE-inhibitor/diuretic/+- digoxin in stable Class III-IV CHF/LVEF ≤ 35%/CR < 220/K < 5.0 (RALES Trial) |
| | Anticoagulant antiplatelet Rx | ASA if CAD (↓ dose to ↓ ACE inhibitor interaction) Coumadin for Afib, LV thrombus, ↓ LVEF ≤ 20%, DVT or pulmonary embolism Duration of A/C therapy: Indefinite for Afib/recurring systemic TE or DVT/PE |

Consider internal medicine/cardiology or heart failure clinic referral for initiation/titration of β-blocker. Consider EPS referral for symptomatic sustained or non-sustained ventricular arrhythmia (LVEF 30%-40%) or AICD: Prior MI/CAD (LVEF ≤ 30% with IVCD ≥ 0.12 sec: MADIT II) CHF: (NYHA II-III & LVEF < 35% SCD-HeFT) Cardiac Resynchronization Therapy (CRT): (NYHA Class III-IV with reduced ejection fractions; LVEF < 35%; QRS duration ≥ 0.13 with IVCD or LBBB: MIRACLE/MUSTIC) or both CRT/AICD: (NYHA III-IV;QRS ≥ 0.12: COMPANION). EECp/Transplant for refractory CHF.

Guide for Heart Failure (HF) Management



Patient: _____ Diagnosis: _____

| Rx | DATE ACHIEVED | DATE ACHIEVED | DATE ACHIEVED | DATE ACHIEVED | DATE ACHIEVED | DATE ACHIEVED | DATE ACHIEVED |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Weight kg/lbs | | | | | | | |
| NYHA class ¹ | | | | | | | |
| Subjective symptoms B,W, NC ² | | | | | | | |
| HR | | | | | | | |
| BP (S/D) | | | | | | | |
| ↑JVP (Y/N) ³ | | | | | | | |
| S ₃ (Y/N) | | | | | | | |
| Rales (Y/N) | | | | | | | |
| Edema (Y/N) | | | | | | | |
| ECG | | | | | | | |
| CXR (Y/N) congestion | | | | | | | |
| K+ | | | | | | | |
| Cr | | | | | | | |
| BNP (< 100 pg/ml) | | | | | | | |
| ACE-i agent/dose | | | | | | | |
| ARB agent/dose | | | | | | | |
| β-blocker agent/dose | | | | | | | |
| Aldactone | | | | | | | |
| Dig. dose | | | | | | | |
| Diuretic 1 agent/dose | | | | | | | |
| Diuretic 2 agent/dose | | | | | | | |
| Nitrate agent/dose | | | | | | | |
| Hydralazine dose | | | | | | | |

¹ Class I: No symptoms with ordinary activity; Class II: Symptoms with ordinary activity; Class III: Symptoms with less than ordinary activity; Class IV: Symptoms at rest
² B = Better, W = Worse, NC = No change
³ Y = Present, N = Absent