Management of Acute Decompensated Heart Failure

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ADHF

- A Syndrome characterized by
  - Severe Dyspnea due to accumulation of fluid within alveoli
  - Elevated PCWP(>18 mm Hg)

May be due to worsening of previous heart failure

Or,due to new heart failure

ADHF

- Usually with depressed LV function
- Sometimes with Diastolic heart failure
- May be with normal LV function with volume overload
    - Anemia
    - Renal failure
    - RVHT
    - Hypertension crisis

	Canada AHF	Euro heart AHF	ADHERE ADHF	OPTIMISE-HF AHF	OPTIME CHF ADHF
N			>100 000	34059	951
Age	76	71	75.2	73	66
Females(%)	50	50	52	52	33.9
EF>40	50	50	40	50	0
Renal failure	-	17	14	19	>50
DM	34	27	44	42	44
HT	-	-	72	71	68
AF	30	42	30	30	34
IHD	37	31	37	50	52

ADHF: Differential Diagnosis

- Acute non cardiogenic pulmonary edema
- Acute Bronchial asthma
- Acute Pneumonia
- Acute Pneumothorax
- Acute Pulmonary embolism

ADHF

- Events and procedures during hospital stay
  - Death- 4.1%
  - CPR/Defib- 25
  - Mech Ventillation- 5%
  - IABP— 1%
  - PA Catheter- 5%
  - HD- 5%
  - EPS 4%
  - Cath and PCI- 11%
    - Data from ADHERE registry

ADHF

- Outcome after discharge
  - Readmission at 6 mo* 50%
  - 60-d mortality/readm** 35%
  - 30-d mortality*** 11.6%
  - 1-yr mortality*** 30.1%

    - Data from *Krumholz HM,**OPTIME-CHF, ***Canada AHF

ADHF

- Clinical assesment
  - History
  - Physical Examination
  - NT Pro BNP
  - ECG
  - Echo
  - Spo2

- Signs and symptoms of congestion
  - Orthopnea/PND
  - JVPr elevation
  - Positive Abdomino jugular reflux
  - Hepatomegaly
  - Edema
  - Rales

- Features of low perfusion
  - Narrow pulse pressure
  - Cold extremities
  - Sleepy/obtunded
  - Hypotension
  - Hyponatremia
  - Elevated renal/hepatic parameters

Clinical Syndrome of AHF

Congestion at rest

Low Perfusion At rest	NO	YES
	A Warm and Dry	**B** Warm and wet
	C Cold and Dry	**D** Cold and Wet

Stevenson LW 1999

ADHF:Management

- Hospitalization in ICCU
  - Severe dyspnea,spo2<90%
  - Hypotension,altered mentation
  - Acute coronary syndromes
  - Hemodynamically significant arrhythmia including new AF/AF with FVR

2006 HFSA guidelines

ADHF: Management

- Hospitalization
  - Worsened congestion with/w-out dyspnea, wt gain >5kg
  - Signs/symptoms of pulm congestion
  - Major dyselectrolytemia
  - Assoc. comorbid conditions eg PE,DKA
  - Repeated ICD firing
  - New HF

ADHF: Management

- Inpatient monitoring: Daily

  Vital signs,spo2,ECG

  Weight,

  intake/output,

  electrolytes,BUN,creatinine

Management Goals

- Improve symptoms
- Optimize volume status
- Identify etiology
- Identify precipitating factors
- Optimize chronic oral therapy
- Minimize side effects
- Assess need for revascularization
- Address future mortality risks

ADHF: Management

- Sodium and fluid restriction
  - Sodium (<2g /d)
  - Fluid (< 1.5 lit /d)
  - Na<130,vol overload-Fluid restriction <1L/d

- Diuresis
  - IV bolus/Infusion
  - Monitor Na/K,Cr daily
  - Monitor BP strictly
  - Dialysis if necessary

DIURESIS

- Volume overload
  - IV Frusemide 40-60mg
  - Evaluate in 2-3 hr
  - Inadequate-Frusemide 100 mg IV
  - Evaluate in 2-3 hr
  - Ineffective-Frusemide 200mg IV/Infusion
  - Evaluate in 2-3 hr
  - Ineffective----ULTRAFILTRATION

ULTRAFILTRATION

- Ultrafiltration
  - RAPID-CHF Trial
    - N-40 pt, Cr>1.5,and/or anticipated diuretic resistance—UF more fluid removal and wt loss
  - UNILOAD Trial
    - N-200 pt, renal dys or diuretic resistance not an entry criteria
    - At 48 hr-significant fluid loss
    - At 90 days- significantly lower readmission
    - Adv events-similar

ADHF: Management

- Supplemental O2 and Assisted Ventilation
  - Routine supplemental O2 not recommended
  - If required-non rebreather face mask delivering 100% O2
  - NIPPV if required and no c/i
  - Invasive ventilation to those who have c/i to NIPPV or resp failure or fatigue,don’t tolerate NIPPV or worsening of symptoms

NIPPV/CPAP

- Indications
  - Spo2<90%
  - RR>25/min despite initial therapy
  - Resp acidosis (Ph<7.3)
  - Mild to moderate respiratory distress
  - Stable hemodynamics
  - Cooperative patient

NIPPV

- Contra-indications of NIPPV
  - Cardiac/respiratory arrest,CPR
  - Organ failure
  - Hemodynamic instability
  - Arrhythmia
  - Active ischemia
  - Upper airway obs
  - High risk for aspiration

MORPHINE

- Morphine sulphate
  - IIb indication in ESC guidelines
  - 2-4 mg IV,repeat after 15 min if necessary
  - Decreases anxiety,sympathetic flow,work of breathing
  - Decreases cardiac filling pressure
  - DONOT USE: Hypotension,Impending resp arrest

ADHF: Management

- Vasodilator therapy
  - Nitroglycerine
  - Nitroprusside
  - Nesiritide
  - Enalaprilat

Vasodilator Therapy

- Nitroglycerine
  - Add if SBP>100 mmHg, add to diuretic therapy
  - Reduces LV filling pressure
  - Monitor NIBP continuously
  - Tachyphylaxis common
  - Start at 5 mic/min, titrate as required

Vasodilator Therapy

- Nitroprusside
  - Potent arterial dilator
  - Reduces PCWP, improves CO
  - Start at 5 mic/min,titrate q 5 min,monitor ABP
  - Titrate to maintain SBP>90,MBP>65
  - Especially useful in Acute MR, Acute VSD, Hypertensive crisis
  - Thiocynate Toxicity if used >24 hr, dose>400 mic/min;may be fatal too
  - Don’t use continuosly >48 hr

Vasodilator Therapy

- Nesiritide (Natrecor)
  - Recombinant human BNP
  - Venous and arterial dilator
  - More effective than NTG in reducing PCP
  - When added to standard therapy,better relief in dyspnea,less 6 mo mortality
  - Dose 2mic/kg bolus followed by infusion 0.01 mic/min-0.03mic/min
  - Side effect-hypotension
  - Contraindicated in cardiogenic shock/SBP<90

Acute Inotropic Agents

- Dobutamine
- Dopamine
- Norepinephrine
- Epinephrine
- Isoproterenol
- Milirinone
- Enoximone

Inotropic Agents

- Use if low cardiac output,hypotension with pulmonary edema
- Dopa>Dobu if SBP < 70 mmHg
- Not required if CO is preserved,normal EF
- Not recommended if LVFP is not known
- Monitor NIBP Continuosly,BP may drop after starting DOBU;Replace it with NE
- Stop if hypotension/tachyarrhythmia occurs

Acute Inotropic Agents

- Milrinone
  - PDE-3 inhibitor
  - Potent inotropic and vasodilator agent
  - 50 mic/kg IV bolus followed by 0.375-0.75 mic/kg /min infusion
  - Donot use > 48 hr
  - Potent arrythmogenic,hypotensive agent
  - Increase long term mortality(OPTIME-CHF)
  - Contraindication-AMI,AS,HOCM

Acute Inotropic Agents

- Enoximone
  - PDE-3 Inhibitor
  - Same as Milrinone

Inotropic Agents

- ACEI/ARB
  - NEW THERAPY
    - Little evidence regarding safety and efficacy of initiating new ACEI/ARB in early phase of therapy(ie first 12-24 hr)
    - Patient with ADHF may develop hypotension/ worsening of renal function during initial therapy.
    - IV Enalprilat may have deletrious effect in patients with acute MI,esp when complicated by HF or aggressive diuresis(Antmann et al,ACC/AHA STEMI guidelines)

Inotropic Agents

- ACEI/ARB
  - IV Enalaprilat should be avoided in Acute MI and probably in those with other causes of AHF
  - Early initiation of oral ACEI/ARB is not recommended,and should be avoided in patients at high risk of renal failure and hypotension(hyponatremia,aggressive diuresis)

Inotropic Agents

- ACEI/ARB

  Patient on chronic therapy prior to ADHF

  continue cautiously during episode of ADHF

  discontinue if hypotension (SBP < 90), ARF, Hyperkalemia

  Patient with acute pulm edema may initially have high BP-BP drops significantly as patient improves,esp if aggressively diuresed. So ,long acting drugs, eg, ACEI/ARB should be used with caution in first few hours of ADHF

BETA BLOCKERS

- Must be used with caution in initial management of ADHF
- For patients on chronic BB therapy
  - Mild decompensation—Continue BB
  - Moderate/Severe Decompenstion or hypotension—Decrease/Discontinue BB therapy in initial phase
  - Withold BB therapy in those requiring inotropic agents

BETA BLOCKERS

- Patients not on BB therapy—Don’t start initially in ADHF, but if possible start pre-discharge.
- Please Note: all the trials using BB in HF NYHA IV-had chronic stable NYHA IV and acute/severe decompensated HF was used as exclusion criteria(MERIT-HF,COPERNICUS,BEST etc.)

Digitalis in ADHF

- In sinus rhythm and reduced LVEF(<0.25) while receiving standard therapy,in NYHA III,IV,increased LVEDD
- In AF with ADHF irrespective of EF

Endothelin Receptor Antagonists

- Bosentan
- Tezosentan(RITZ 1-4 Trial,VERITAS-1 and 2)
- Sitaxsentan
- Darusentan
  - Decrease PCWP,PVR,SVR
  - Increase CO
    - Questionable value

Vasopressin Receptor Antagonists

- Receptors
  - V1- -vasoconstriction
  - V2—water retention
  - V3—ACTH Release
  - ACTIV in CHF,EVEREST trials
  - Useful in hyponatremia,elevted BUN and low SBP

  Primarily used for hyponatremia

  Long term studies not favorable

Vasopressin Receptor Antagonists

- Unlike loop diuretics, VRA-increase renal blood flow, increase GFR, decrease RVR
- Don’t cause hypontremia-improve sodium levels
- Selective V2 blocker-Lixivaptan, Tolvaptan
- V1a/V2 blocker- Conivaptan

Calcium Sensitizers

- Increase cardiac contractility
- No effect on relaxation
- Improve diastolic function
- Coronary,peripheral and pulmonary vasodilator
- LEVOSIMENDAN,PIMOBENDAN

Calcium Sensitizers

- Levosimendon
  - Increases cardiac contractility
  - LIDO,RUSSLAN,REVIVE I,II,CASINO, SURVIVE
  - LIDO study-less 180 day mortality as compared to Dobutamine
  - SURVIVE study—same outcome at 180 day as Dobutamine
  - More AF and hypokalemia

Arrhythmia

- Triggers
  - Ischemia
  - Sympathetic drive
  - Thromboembolism(Cardiac,systemic,pulm)
  - Hyper/hypokalemia
  - Drugs
  - Sepsis
  - Sleep apnea

ARRHYTHMIA Management

- Atrial Fibrillation
  - Difficult to determine AF is cause or result of ADHF
    - AF may precipitate ADHF,ADHF may cause acute AF or AF may just be a byestander
    - Rate Control: is the initial strategy—high chance of recurrence after CV; may be a chronic AF
      - Digoxin/Amiodarone preferred

Atrial Fibrillation

- Rhythm control
  - If AF is assoc with hypotension,chest pain or cardiogenic shock
  - If AF is clearly new and cause of ADHF
  - If other therapy for Ac Pulm edema is slow or suboptimal
  - Give I V Heparin prior to CV

Arrhythmia

- Ventricular arrhythmia
  - NSVT/ undetected VT may trigger otherwise unexplained ADHF
  - VT/VF to be managed aggresively
  - Amiodarone/Lignocaine
  - Use Amiodarone carefully if baseline hypotension/bradyarrhythmia present

Mechanical Assist Devices

- IABP
  - Cardiogenic shock
  - Acute severe myocarditis
  - Acute MR
  - Persistent ischemia
  - Recurrent intractable arrhythmia with hemodynamic compromise
  - Adjunct to PCI/CABG
- LVAD

CRT/ ICD in ADHF?

- Not established in acute phase

Diastolic Heart Failure

- Treat the presenting syndrome
  - Pulm edema/congestive state
  - Systemic Hypertension
  - Myocardial ischemia
  - AF/arrhythmia

ACUTE MYOCARDITIS

- Acute fulminant myocarditis
  - Patient looks very sick,but better long term prognosis
  - Manage aggressively
  - IABP/ECMO/LVAD if required
  - Short term devices
  - Exclude giant cell myocarditis
  - Same strategy true for PPCM

Conclusion

- Management strategy-
  - Morphine
  - Vasodilators-NTG,SNP,Nesitiride
  - Fluid restriction and diuretic
  - Inotropes- add as necessary
  - Vasopressin antagonists
  - BP and Drug Choice-
    - SBP<70—Dopa/NE
    - Modest hypotension-Vasodiltor/Inotrope
    - SBP>100—NTG,Nesiritide

Pre Discharge Medications

- Reduce Mortality—ACEI/ARB,BB,Spironoltone,Eplerenone,ISDN--Hydrallazine
- Improve symptoms-Diuretics,Digoxin,Nitrates,iron for anemia
- May be harmful:
  - Inotropes,CCB,High dose digoxin

Topics not covered

- Cardiogenic shock
- Diastolic heart failure (in depth)
- AMI with HF
- Specific conditions with HF