

## Methamphetamine Use and Cardiovascular Disease

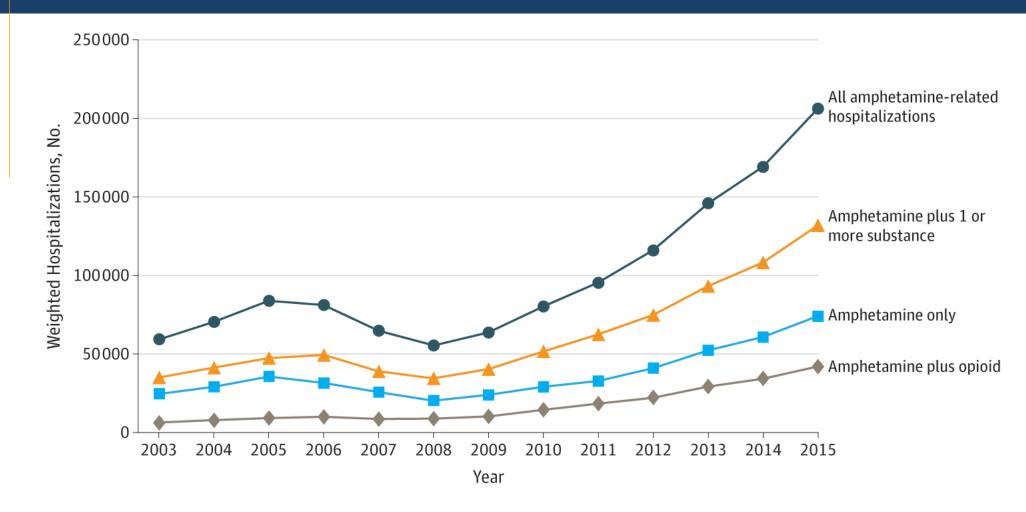
Martin Cadeiras MD Associate Professor Medical Director Advanced Heart Failure, Cardiac Transplantation and Mechanical Circulatory Support

#### **Case Presentation**

- 52 yo factory worker
- Progressive shortness of breath for the past three months
- Reports occasional chest pressure
- Admits to recreational substance abuse in general since high school and lately has been using it frequently to be able to keep with his work
- Maintains two jobs to support his wife and three children. His oldest daughter just admitted to Emory so he attributed his symptoms to the excess of activities.
- Flu like symptoms
- Cardiac enzymes (-)
- Meth (+) on emergency department



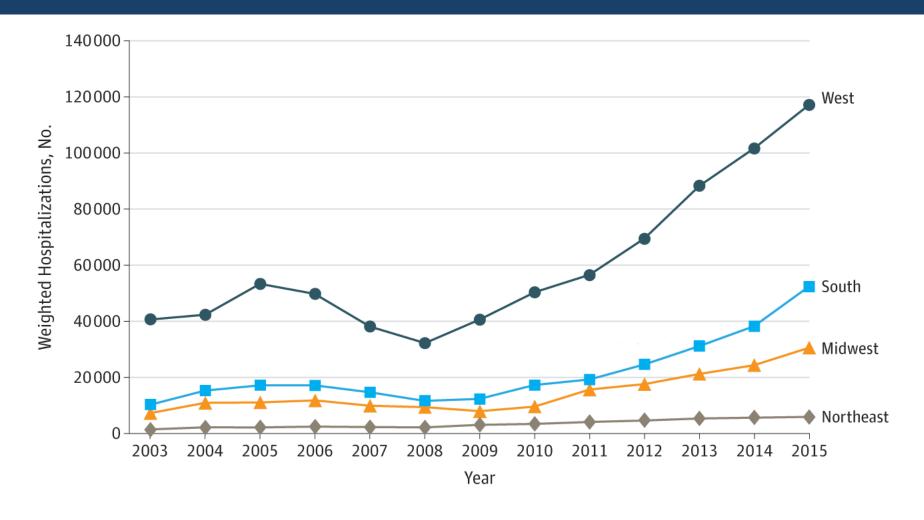
## Amphetamine-Related Hospitalizations in the United States, 2003 to 2015



Amphetamine-related admissions to hospitals soared by more than 270% between 2008 and 2015



# Amphetamine-Related Hospitalizations by US Census Region, 2003 to 2015





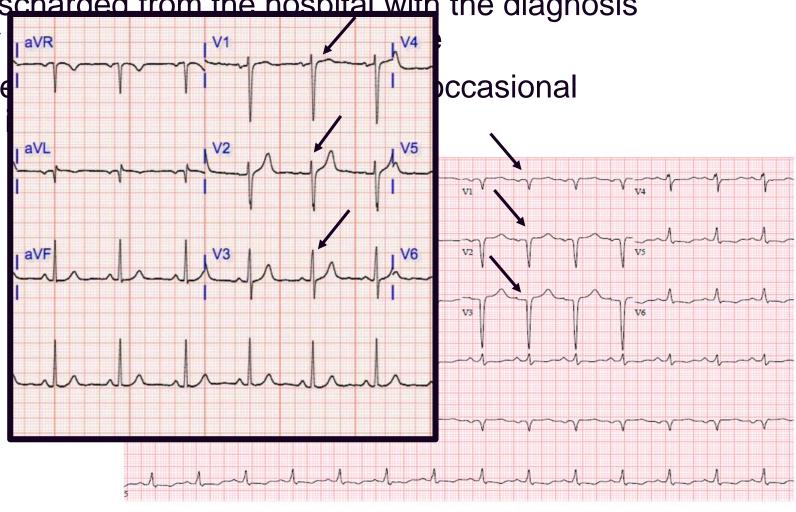
### **Case Presentation (Cont.)**

Patient has been discharged from the hospital with the diagnosis

of upper respiratory was

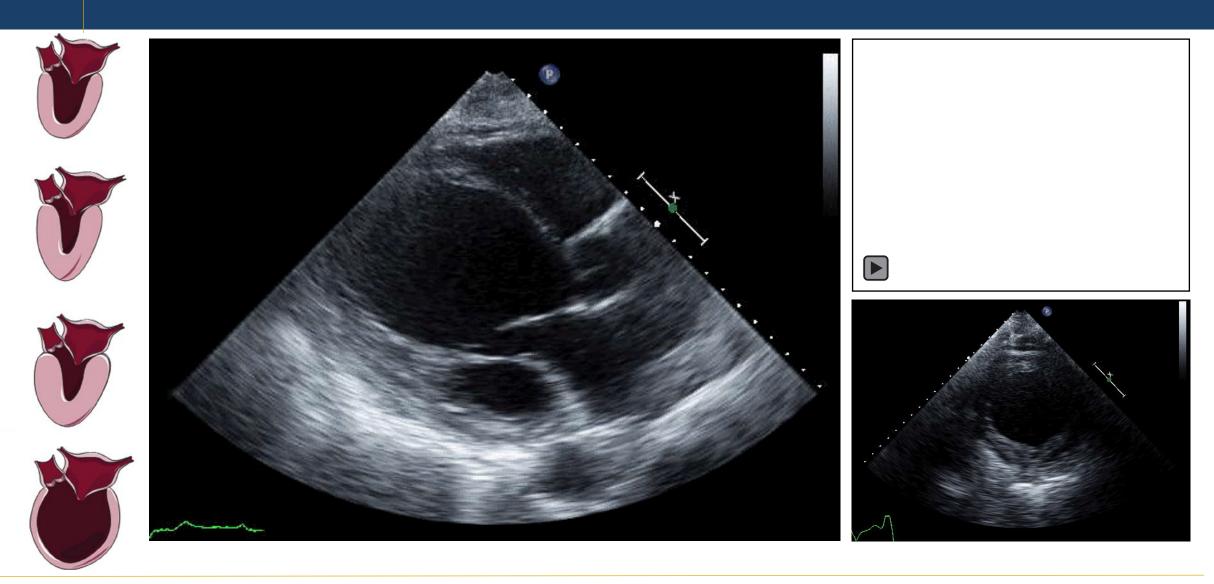
Continues to experience chest pressure and

- Leg swelling
- Further evaluation:
  - Abnormal EKG
  - Echocardiogram





## **Echocardiogram Demonstrates Heart Failure**





## Main Diagnoses Among Amphetamine-Related Hospitalizations, United States - 2014/2015

	Rank	Primary diagnosis category <sup>a</sup>	Weighted percent (95% CI)
	1	Mood disorder	13.9 (13.1-14.8)
	2	Schizophrenia and other psychotic disorder	10.2 (9.1-11.6)
	3	Substance-induced mental disorder <sup>b</sup>	6.0 (5.5-6.5)
	4	Septicemia (except in labor)	5.8 (5.5-6.2)
	5	Skin and subcutaneous tissue infection	4.3 (4.1-4.5)
	6	Poisoning by amphetamines <sup>b</sup>	4.1 (3.9-4.3)
	7	Congestive heart failure (nonhypertensive)	3.4 (3.2-3.7)
	8	Substance-related disorder	3.0 (2.7-3.3)
	9	Alcohol-related disorder	2.7 (2.5-2.9)
	10	Diabetes mellitus with complications	2.6 (2.5-2.8)
	11	Poisoning by other medications and drugs	2.0 (1.9-2.2)
	12	Poisoning by psychotropic agents	1.8 (1.6-1.9)
	13	Amphetamine dependence or abuse <sup>b</sup>	1.7 (1.6-1.9)
	14	Acute cerebrovascular disease	1.6 (1.5-1.7)
	15	Acute and unspecified renal failure	1.5 (1.4-1.6)



#### Methamphetamine induced cardiovascular disease

- Cardiovascular disease represents the secondleading cause of death among patients with methamphetamine abuse disorder following only accidental overdose
- Amphetamine-related hospitalizations were associated with a 29% higher rate of adjusted inhospital mortality.
- Higher in-hospital mortality may be associated with the known cardiovascular effects of amphetamine use



### **Methamphetamine – Cardiovascular Effects**

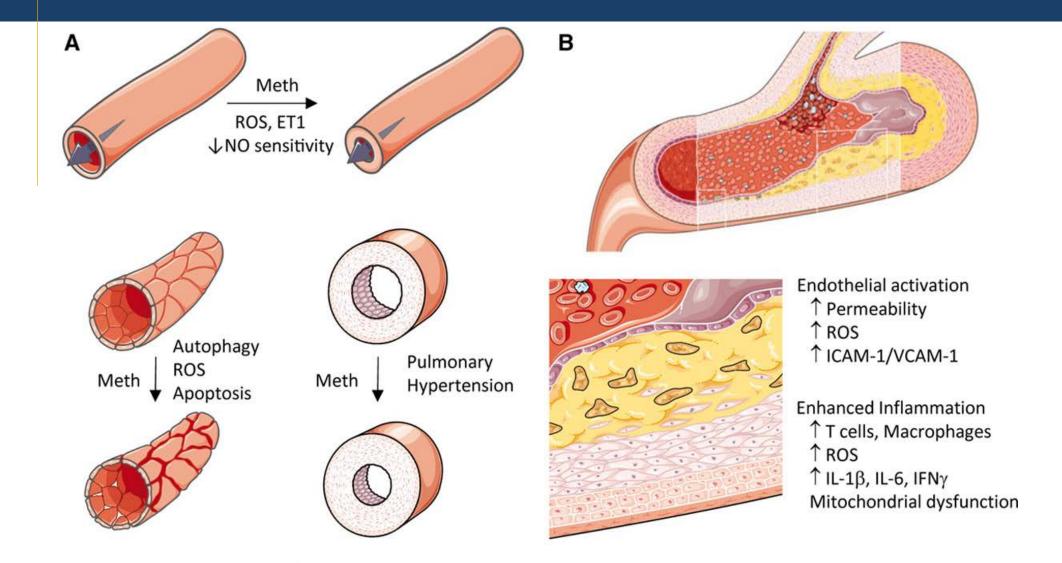
#### Methamphetamine **Direct Effects** TAAR1 σ1r $\alpha AR$ Catecholamine Toxicity **Atherosclerotic** Cardiac **Coronary Artery Arrythmias** Disease Dilated Coronary Cardiomyopathy Vasospasm

- Potent cardiovascular damage: Meth users tend to show evidence of cardiovascular disease at greater intensity and at younger-than-typical ages.
- Involves multiple mechanisms: Vasoconstriction, pulmonary hypertension, atherosclerotic plaque formation, cardiac arrhythmias, and cardiomyopathy.

**Pulmonary Hypertension** 

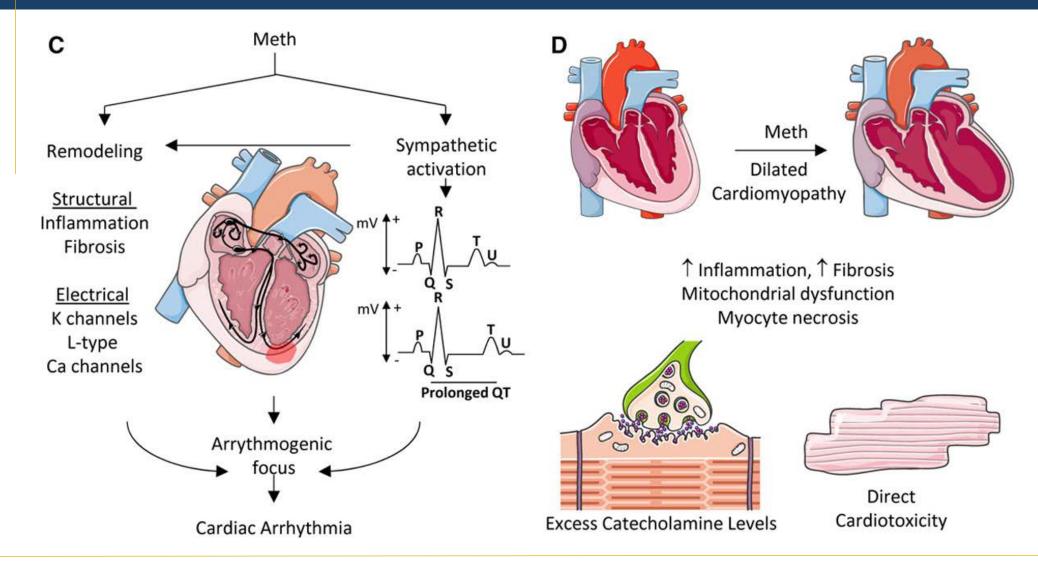


#### Methamphetamine induces vascular damage



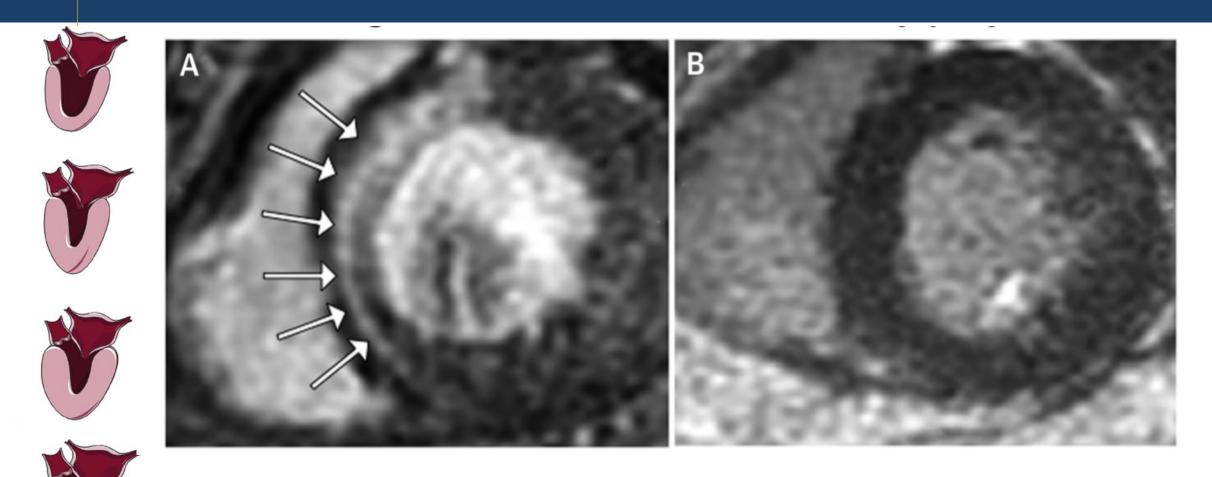


### Methamphetamine induces cardiac damage





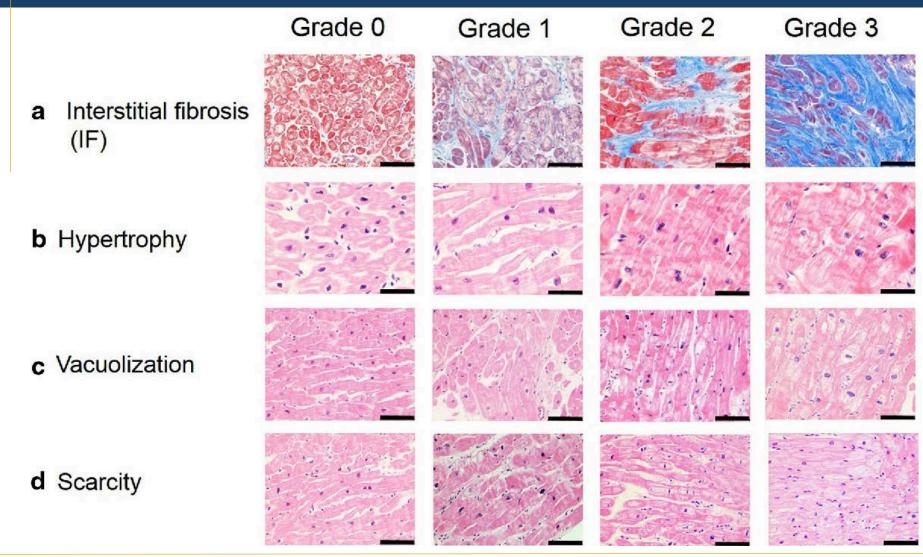
## **Methamphetamine and Heart Failure**



Methamphetamine induces cardiac fibrosis (Scarring)



## **Myocardial Fibrosis**



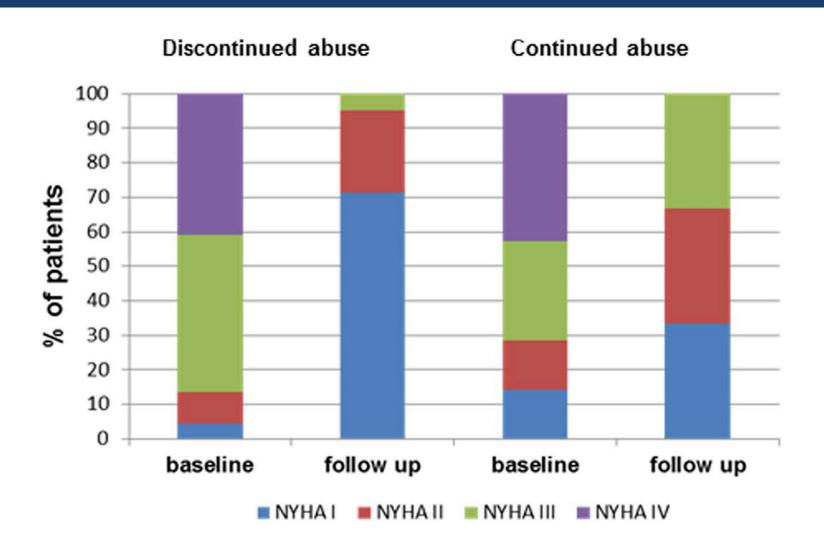


### **Case Presentation (Cont.)**

- Patient is discharged on treatment for heart failure
- No further assessment as patient is a methamphetamine abuser
- Patient received a list of resources but he feels he does not need them
- Patient is counseled about resources and discontinuation
- Patient follows in the outpatient clinic accompanied by his wife who also has history of substance abuse

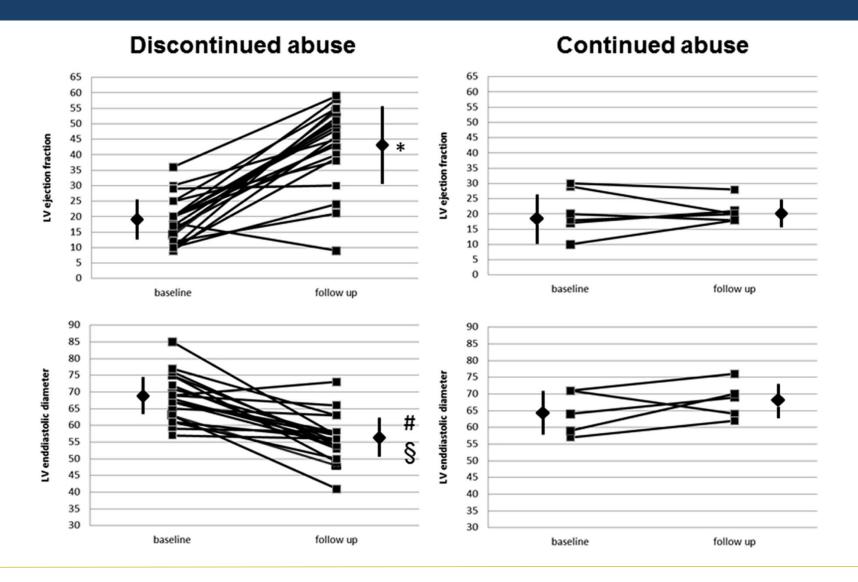


### Heart Failure Symptoms improve after discontinuation





### Cardiac function improves after discontinuation





## **Case Presentation (Cont.)**

- Patient returns to the hospital after 2 weeks with shortness of breath and chest pain
- Cardiac enzymes elevated.
- A coronary angiography is indicated



## **Coronary Artery Disease**



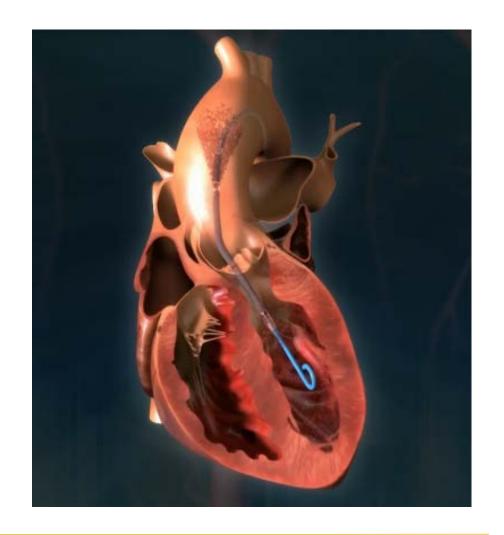


Methamphetamine induces damage to the coronary arteries



## **Case Presentation (Cont.)**

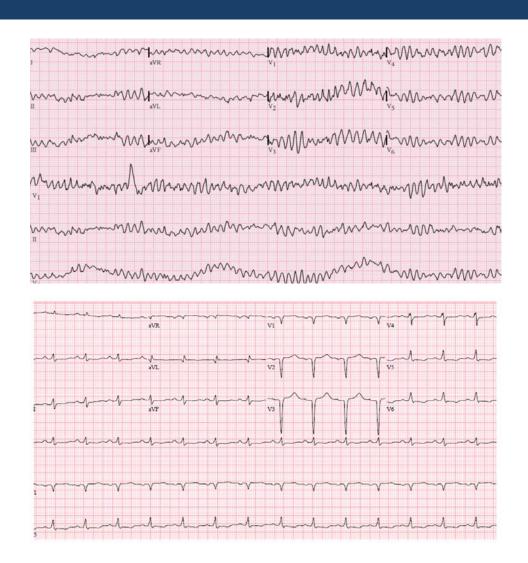
- During evaluation patient presents ventricular arrhythmia
- Patient undergoes cardiac surgery
- Requires temporary mechanical circulatory support





### **Cardiac Arrythmias**

- Cardiac structural and cellular changes typically linked to cardiac arrhythmias
- 6.5% nonaccidental deaths in methamphetamine users due to <u>sudden cardiac death</u>
- 27% increased risk of sudden cardiac death among those with meth induced cardiomyopathy





### Recognizing the problem

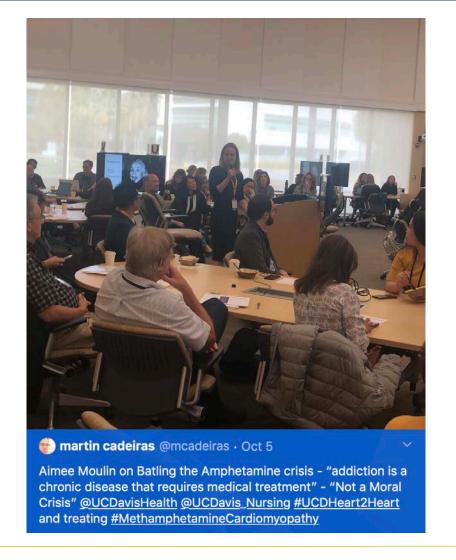


Division of Cardiology and Emergency Department joined forces to implement best practices in evaluation and management of patients with substance abuse disorders and cardiovascular disease



#### Working together to battle substance abuse and heart disease







#### **Final remarks**

- Methamphetamine use is rising globally resulting in significant morbidity and mortality driven by a poorly understood increase in multiple forms of cardiovascular disease.
- Cardiovascular disease is often diagnosed late
- Methamphetamine induced cardiomyopathy often is associated with other cardiovascular disorders
  - Coronary artery disease
  - Cardiac arrhythmias
  - Pulmonary arterial hypertension
- Cardiovascular disease treatment improve outcomes
- Substance abuse treatment improve outcomes
- Best practices should be implemented to improve the evaluation of patients with substance induced cardiovascular disease



#### o HF TEAM

- Martin Cadeiras M.D.
- Felicia Corbett P.A.
- Michael Gibson MD
- Imo Ebong MD
- Farid Dawar R.N. VAD coord
- Genevieve Lynch N.P.
- Veronica Mwathi R.N.
- Sharon Myers R.N.
- Annette Needham N.P.
- Zorana Petrovich R.N.
- Alan Rich R.N. VAD coord
- Katy Suggett R.N.
- Andreea Uleia N.P.

#### CT SURGERY

- Sabrina Evans M.D.
- Victor Rodriguez M.D.
- Nilas Young MD

#### CARE NETWORK COORDINATION

Lisa Rodriguez R.N.

#### CONNECTED HEALTH

- James Michiel MPH
- Tod Stoltz MBA

## UCDAVIS HEALTH

#### HF INTERVENTIONS

- Manoj Kesarwani M.D.
  - Reginald Low M.D.
- Jason Rogers M.D.
- Gagan Singh M.D.
- Jeffrey Southard M.D.
- Garret Wong M.D.

#### **ELECTROPHYSIOLOGY**

- Dali Fan M.D.
- Adam Oesterle M.D.
- Nayereh Pezeshkian M.D.
- Uma Srivatsa M.D.

#### HF IMAGING

- William Lewis M.D.
- Thomas Smith M.D.
- Patricia Takeda M.D.
- Sandhya Venugopal M.D.

#### CARDIAC REHABILITATION

- Javier Lopez M.D.

#### HF EDUCATION

- Sandhya Venugopal M.D.

#### HF RESEARCH AND DEVELOPMENT

- Diego Pinheiro Ph.D.
- Erick Romero M.D.
- Saad Soroya B.S.