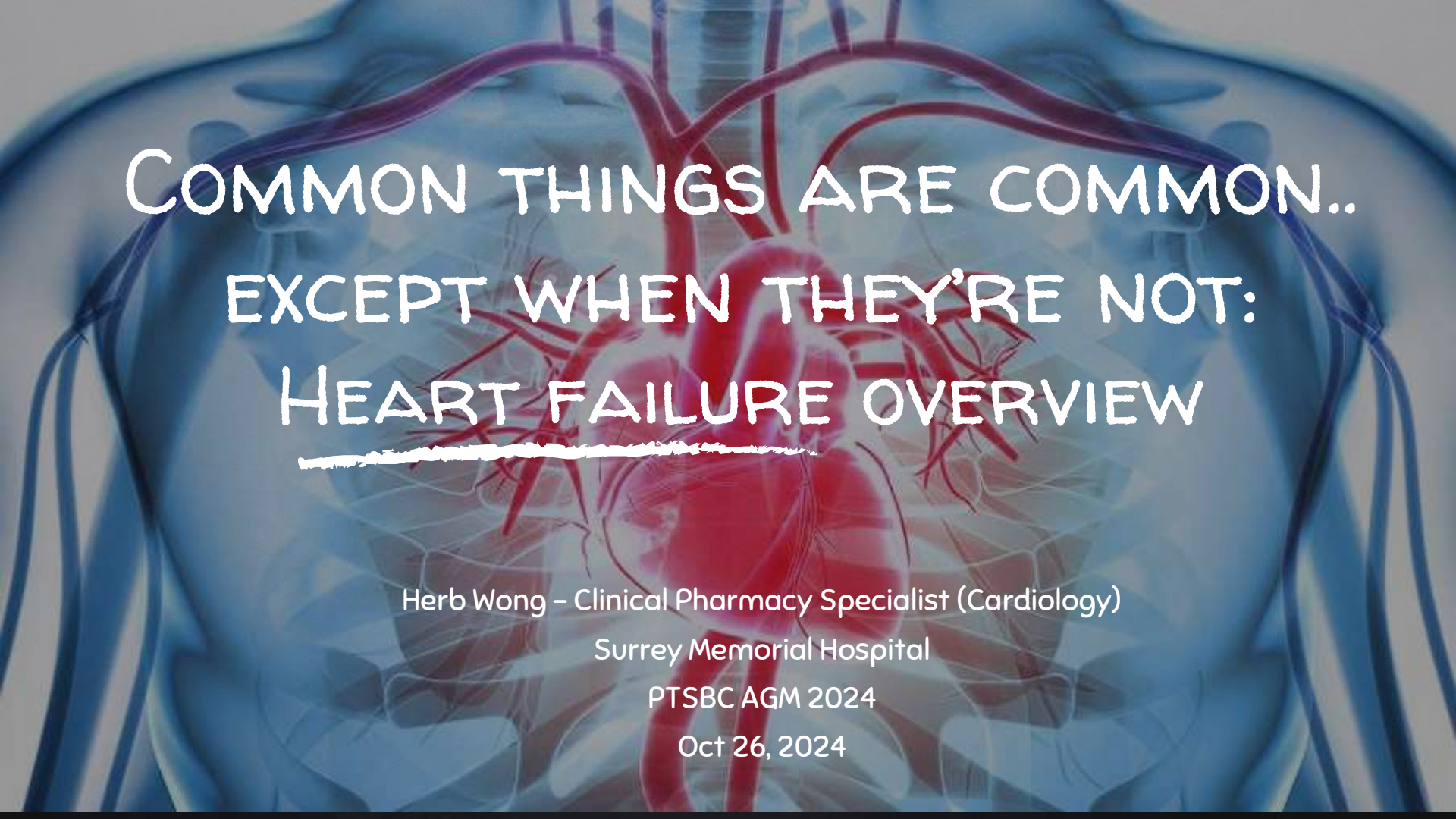


Common things are common.. except when they're not: Heart failure overview

Herb Wong – Clinical Pharmacy Specialist (Cardiology)
Surrey Memorial Hospital

PTSBC AGM 2024

Oct 26, 2024

Land Acknowledgement

I acknowledge that we are gathered on the traditional and unceded territory of the Musqueam, Tsawwassen, and Kwantlen First Nations.

Disclosures

I have received a speaker's fee from the PTSBC for this learning activity

I have no actual or potential COI in relation to this program or presentation

This program has received no financial or in-kind support from any commercial or other organization

The Heart Pharmacist

@theheartpharmacist · 820 subscribers · 147 videos

People laugh when they see the irony that I'm a pharmacist and my name is Herb - but w ...more

Customise channel | Manage videos

Home | Videos | Shorts | Playlists | Community

For you

Apixaban (Eliquis) is BETTER than Rivaroxaban (Xarelto) for non-valvular atrial fibrillation

4.8K views · 7 months ago

WATCH THIS BEFORE BUYING PRECARDIX (REVIEW)

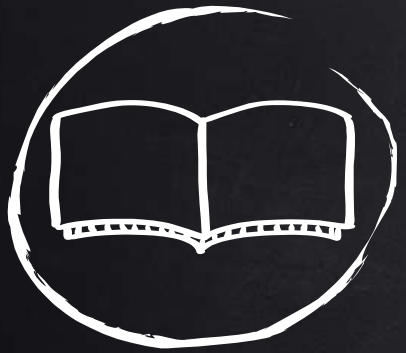
536 views · 1 year ago

ULTIMATE-DAPT trial Journal Club, DAPT duration review, opinion

349 views · 4 months ago

Atrial fibrillation is NOT a standalc condition (usually) #medicine #ec

16K views · 5 months ago



OBJECTIVES

1. Appreciate the socioeconomic impact of heart failure (HF)
2. Define heart failure
3. List 3 classic signs / symptoms of HF
4. Classify the different types of left-sided HF
5. List 3 common causes of HF
6. List 5 common modifiable risk factors for coronary artery disease
7. List 4 drugs/classes for HFrEF and two side effects for each
8. Name 1 example of an infiltrative cardiomyopathy that is growing in recognition and a drug used to treat it

BURDEN

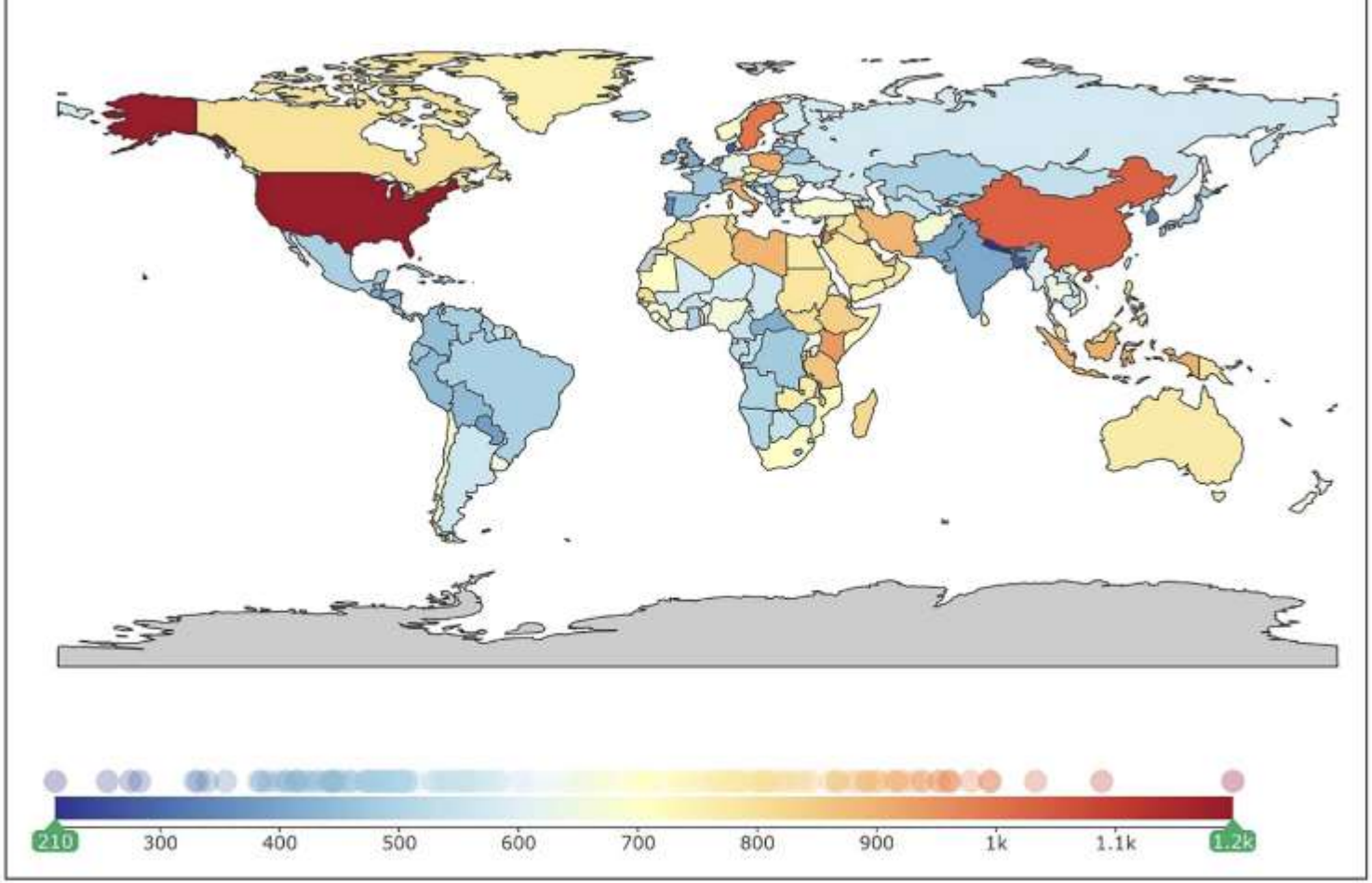


Figure 1. Global age-standardized point prevalence rate of heart failure per 100 000 population in 2019. Visualization using the Global Burden of Diseases compare tool (https://www.healthdata.org/data-visualization/gbd-compare).

750, 000

Canadians living with HF

>100,000

Canadians diagnosed yearly

#3 TOP REASON

for hospital admission

https://ccs.ca/heart-failure/
https://www.cihi.ca/

>2.8 BILLION/YR

costs by 2030

4 OUT OF 10

don't understand HF is

1 OUT OF 5

come back to hospital within 30 days

https://ccs.ca/heart-failure/
https://www.cihi.ca/

Challenges

Lack of education
Human error

Lack of skill

Poor assumptions

Not enough time

Misdiagnoses
Unrealistic expectations

Clinical inertia

Trust

Treatment failure

Competing priorities

Burnout
overload

Nonadherence

Information

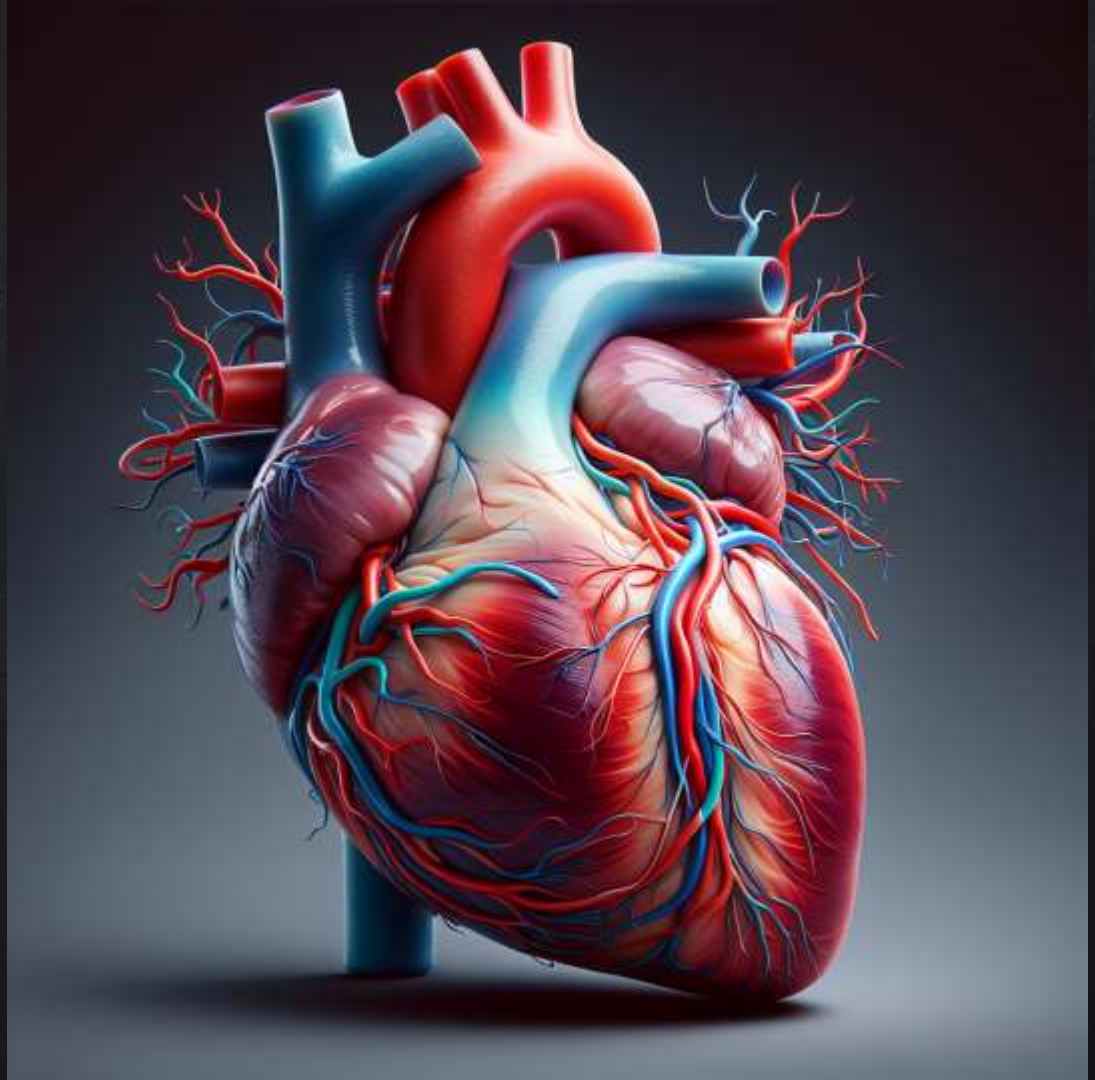
Cost

Beliefs

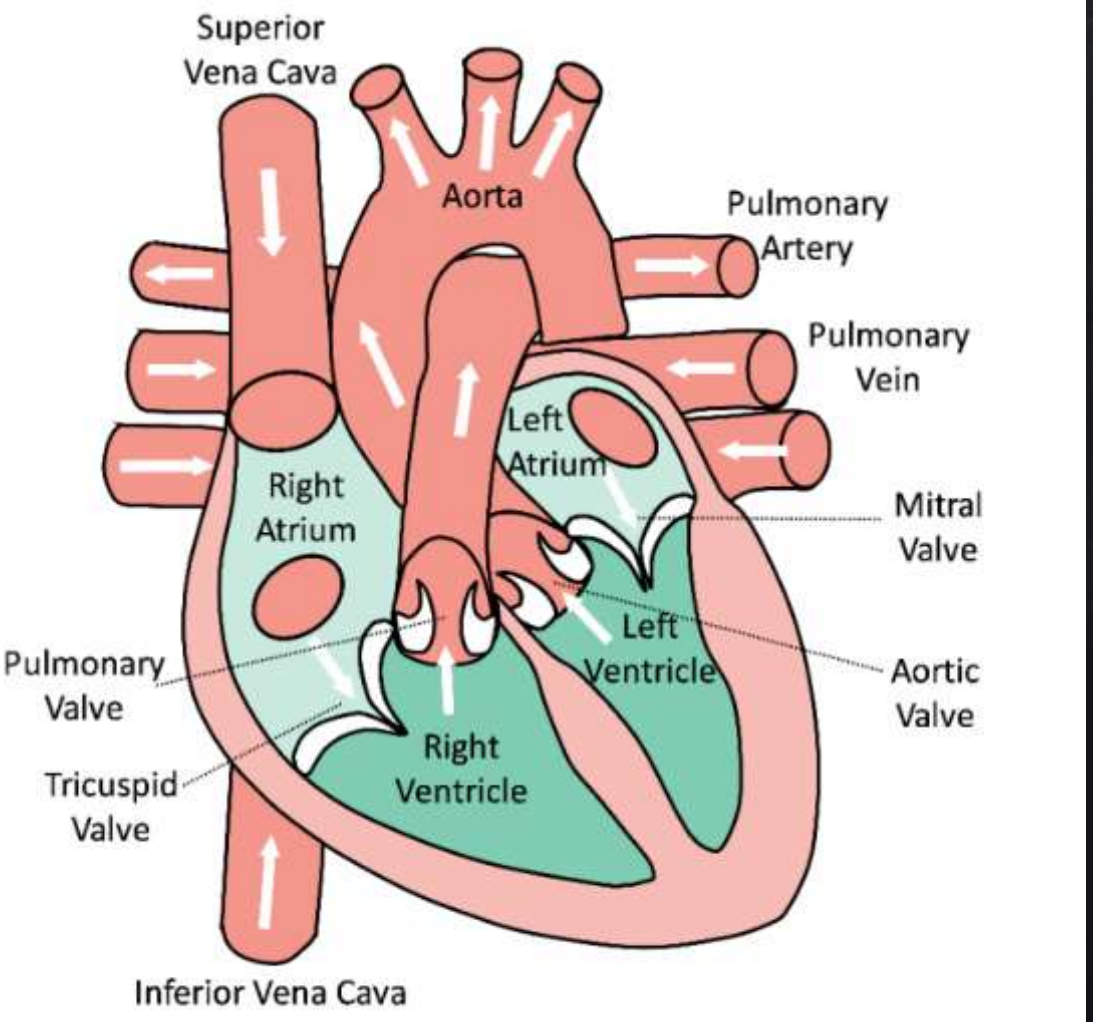
Apathy

Culture

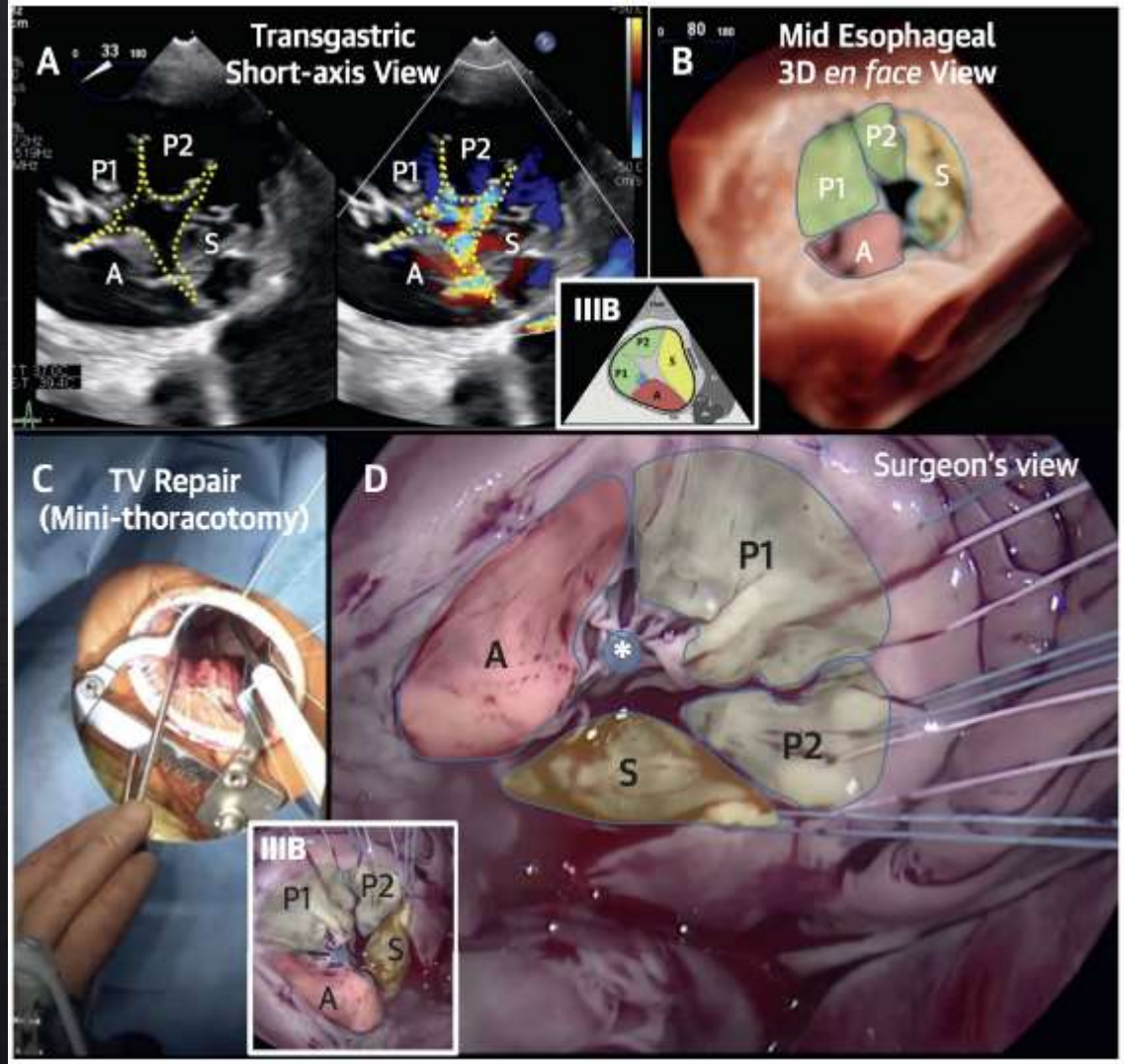
Habits



https://easy-peasy.ai/

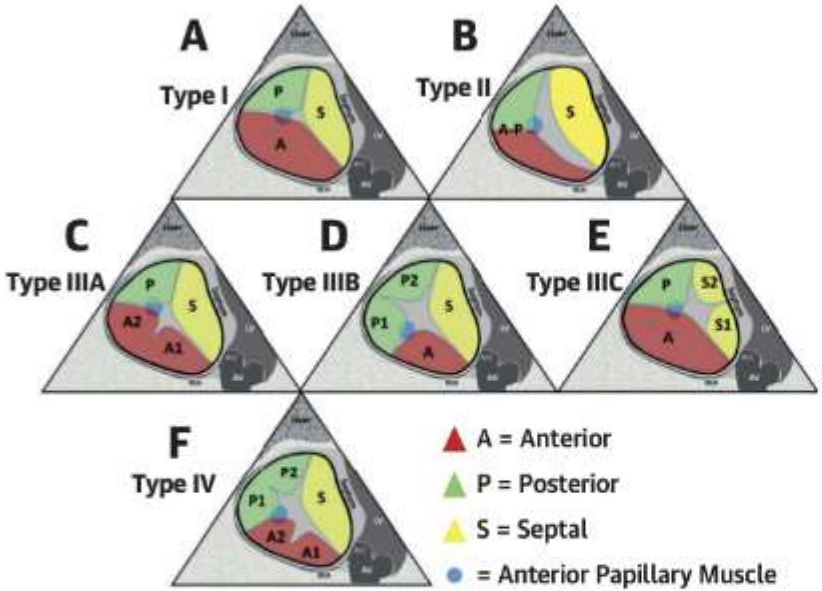

Superior
Vena Cava
Aorta
Pulmonary
Artery
Pulmonary
Vein
Left
Atrium
Right
Atrium
Mitral
Valve
Left
Ventricle
Aortic
Valve
Pulmonary
Valve
Right
Ventricle
Tricuspid
Valve
Inferior Vena Cava

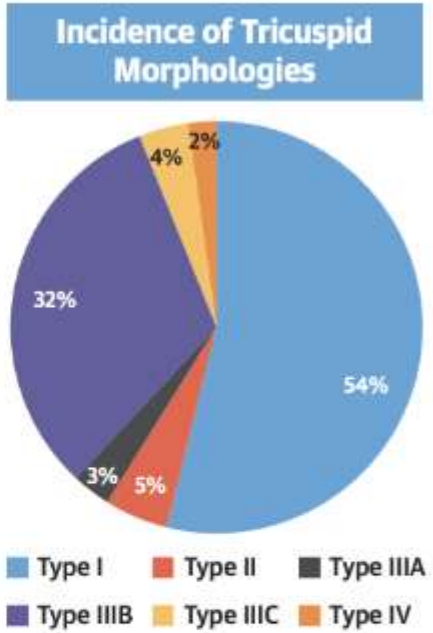
Li, 2016


A
Transgastric
Short-axis View
P2
P1
S
A
B
Mid Esophageal
3D en face View
P2
P1
S
A
IIIB
C
TV Repair
(Mini-thoracotomy)
D
Surgeon's view
P1
A
*
P2
S
IIIB
P1
P2
S
A

Hahn R, 2021

CENTRAL ILLUSTRATION Tricuspid Valve Nomenclature Classification Scheme

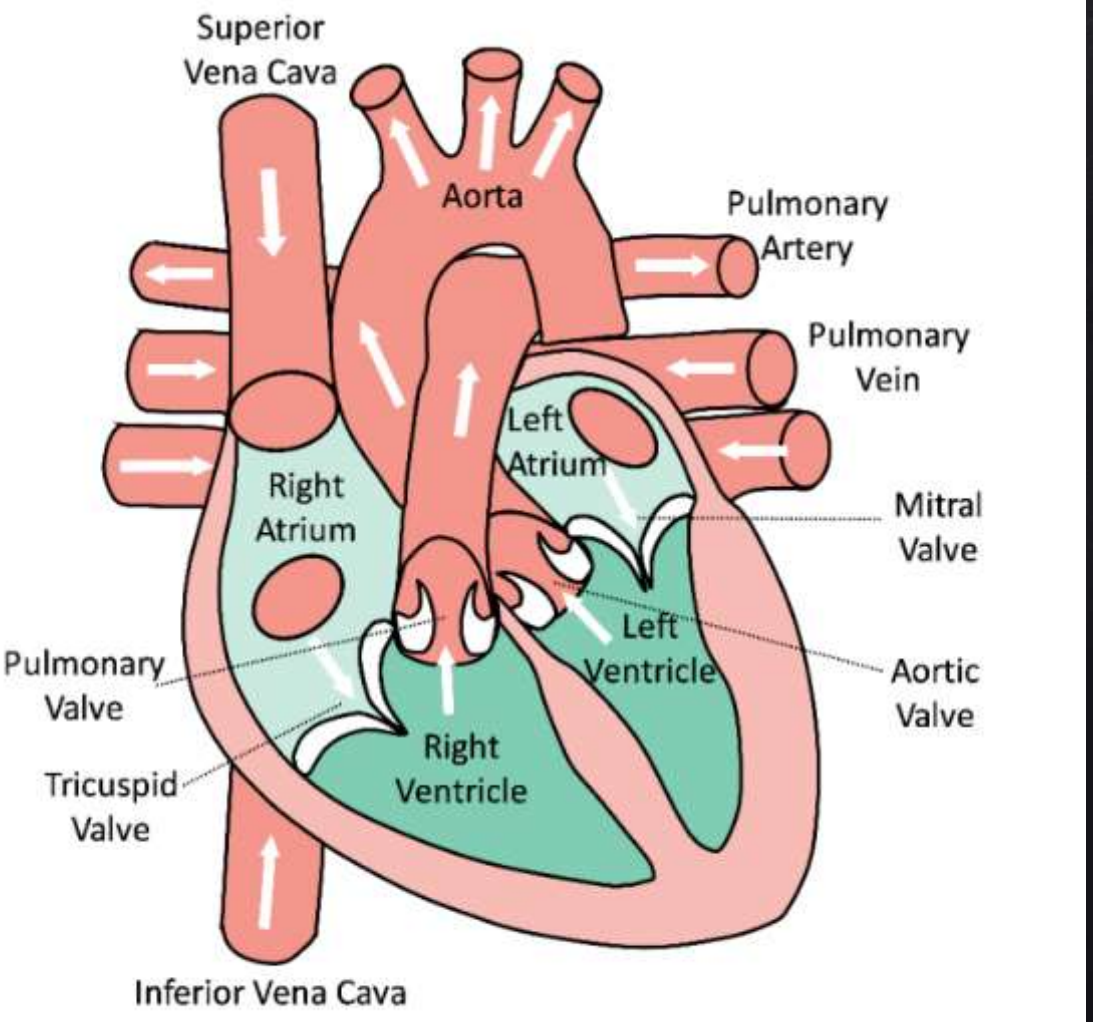




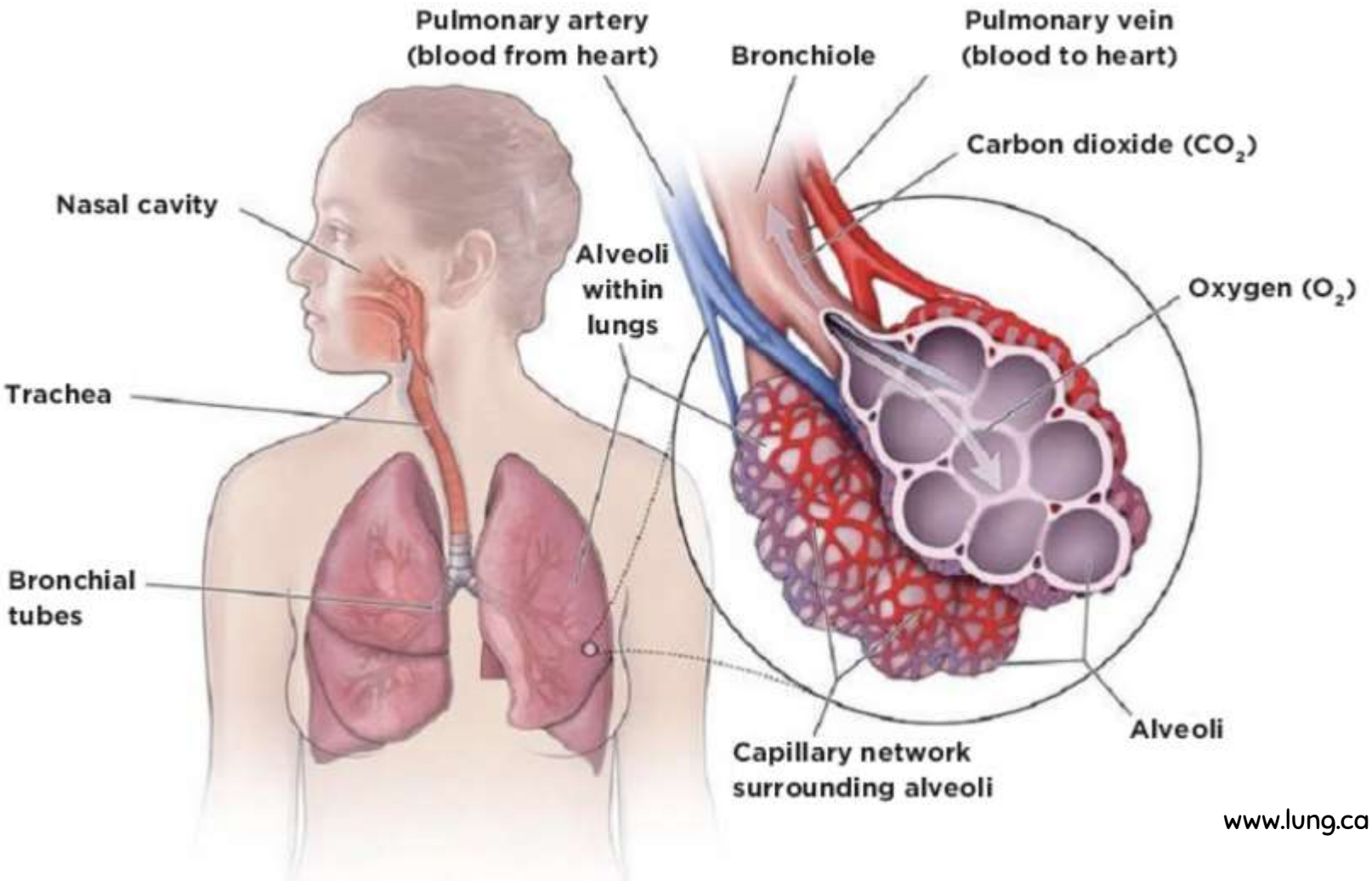
Hahn, R.T. et al. J Am Coll Cardiol Img. 2021;14(7):1299-305.

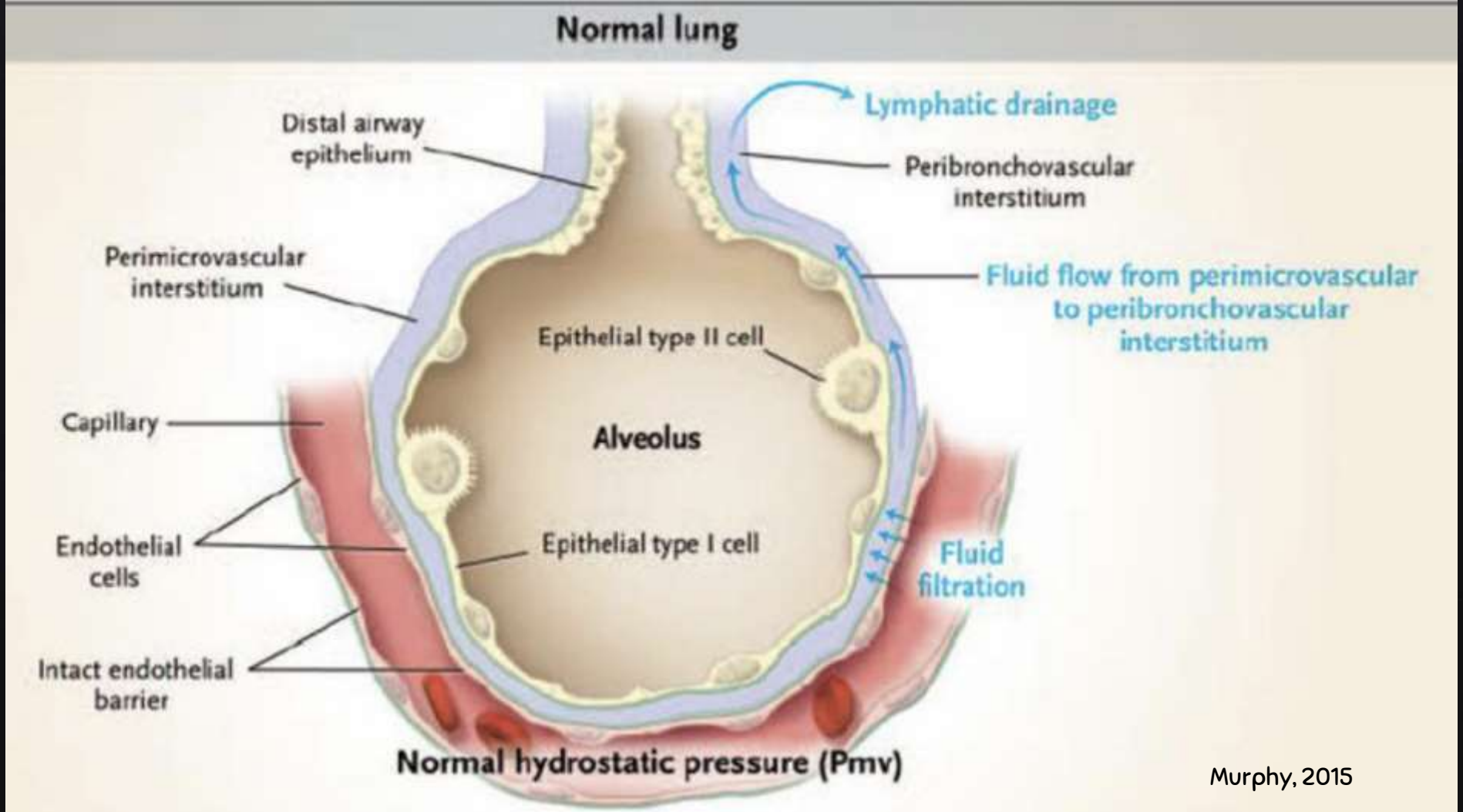
(Left) A proposed tricuspid valve nomenclature classification scheme is shown. The anterior papillary muscle is indicated as a **blue circle** and defines the separation of the anterior from the posterior leaflets. **(A)** Type I: 3-leaflet configuration. **(B)** Type II: 2-leaflet configuration. **(C to E)** Type III: 4-leaflet configurations. **(F)** Type IV: 5-leaflet configuration. **(Right)** Incidence of each morphology in the present study of 579 patients. A = anterior leaflet; AV = aortic valve; LV = left ventricle; NCC = noncoronary cusp; P = posterior leaflet; RCC = right coronary cusp; S = septal leaflet.

Hahn R, 2021

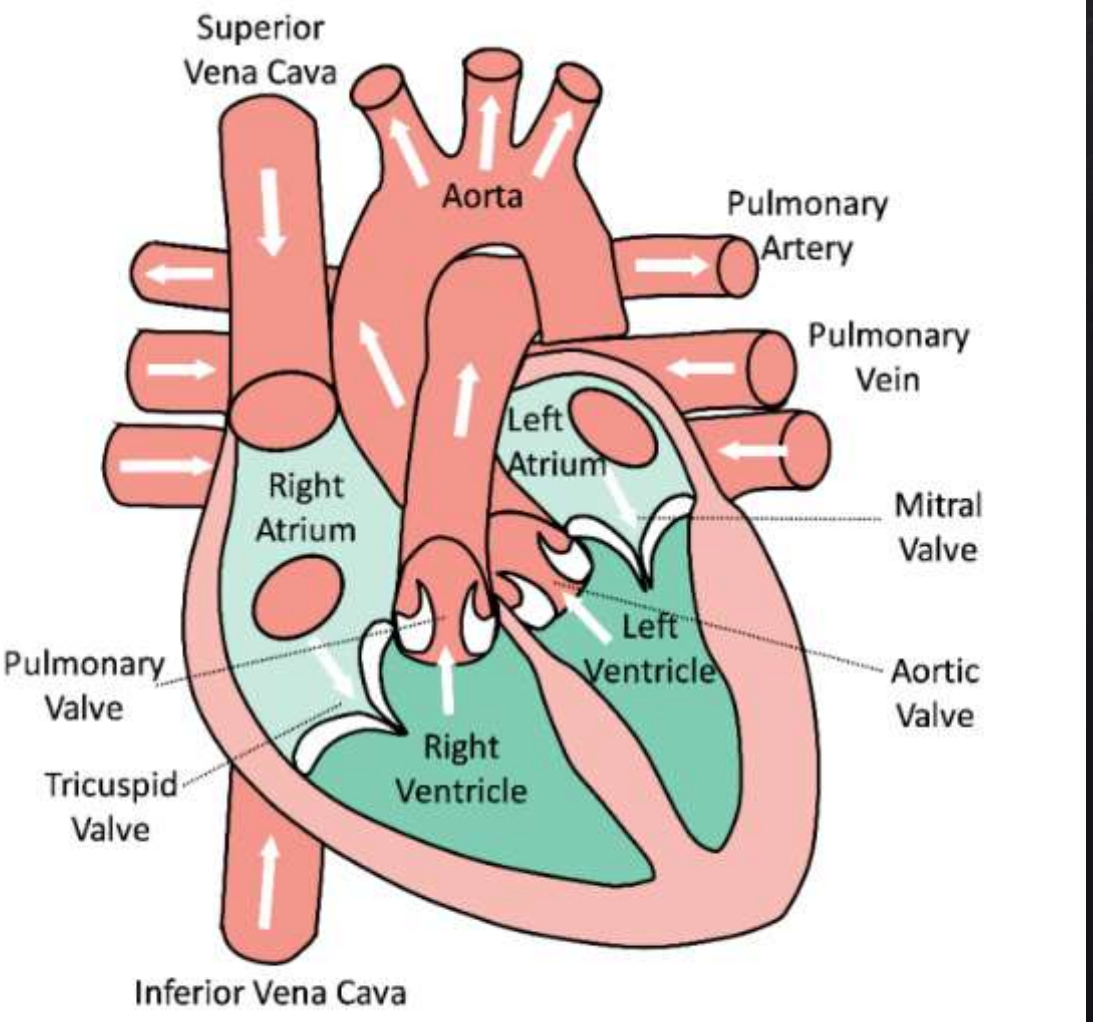

Superior
Vena Cava
Aorta
Pulmonary
Artery
Pulmonary
Vein
Left
Atrium
Right
Atrium
Mitral
Valve
Left
Ventricle
Aortic
Valve
Pulmonary
Valve
Right
Ventricle
Tricuspid
Valve
Inferior Vena Cava

Li, 2016


Pulmonary artery
(blood from heart)
Bronchiole
Pulmonary vein
(blood to heart)
Carbon dioxide (CO_2)
Nasal cavity
Alveoli
within
lungs
Oxygen (O_2)
Trachea
Bronchial
tubes
Alveoli
Capillary network
surrounding alveoli
www.lung.ca


Normal lung
Lymphatic drainage
Distal airway epithelium
Peribronchovascular interstitium
Perimicrovascular interstitium
Fluid flow from perimicrovascular to peribronchovascular interstitium
Epithelial type II cell
Capillary
Alveolus
Endothelial cells
Epithelial type I cell
Fluid filtration
Intact endothelial barrier
Normal hydrostatic pressure (Pmv)

Murphy, 2015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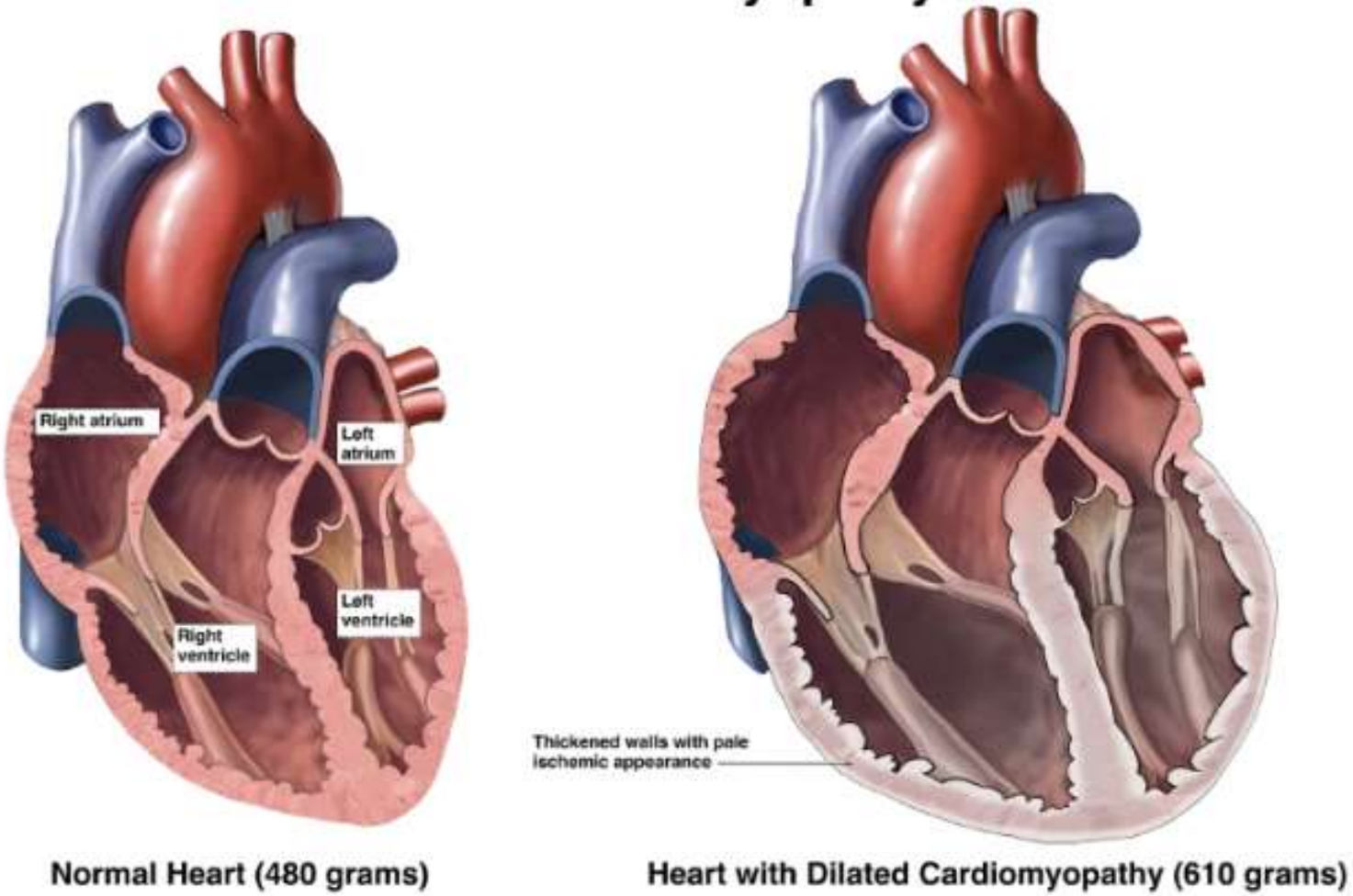
Pulmonary
Valve
Right
Ventricle
Tricuspid
Valve
Inferior Vena Cava

Li, 2016

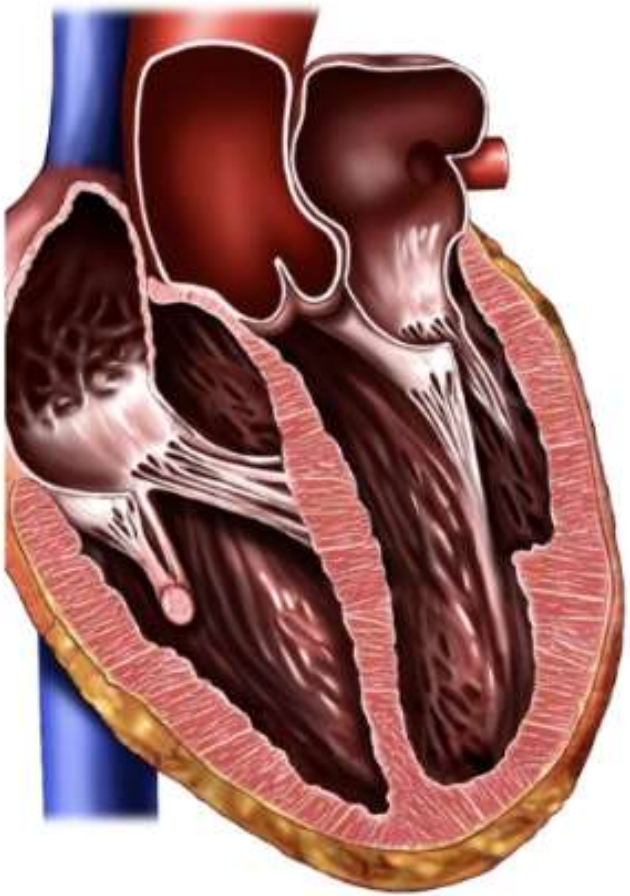


Normal Heart (480 grams)

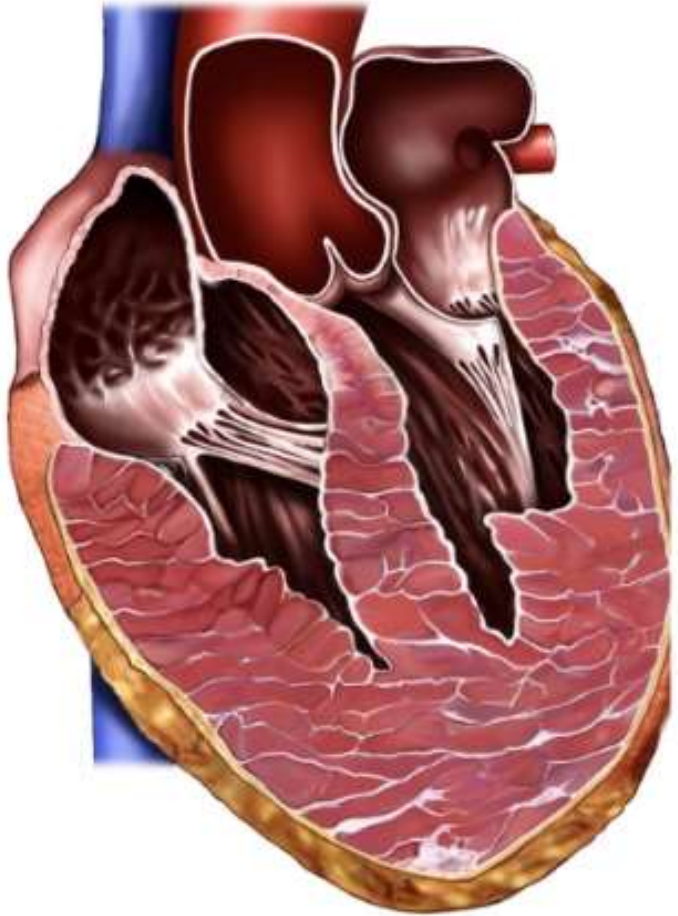
Heart with Dilated Cardiomyopathy (610 grams)

Medical Legal Art

www.nhlbi.nih.gov

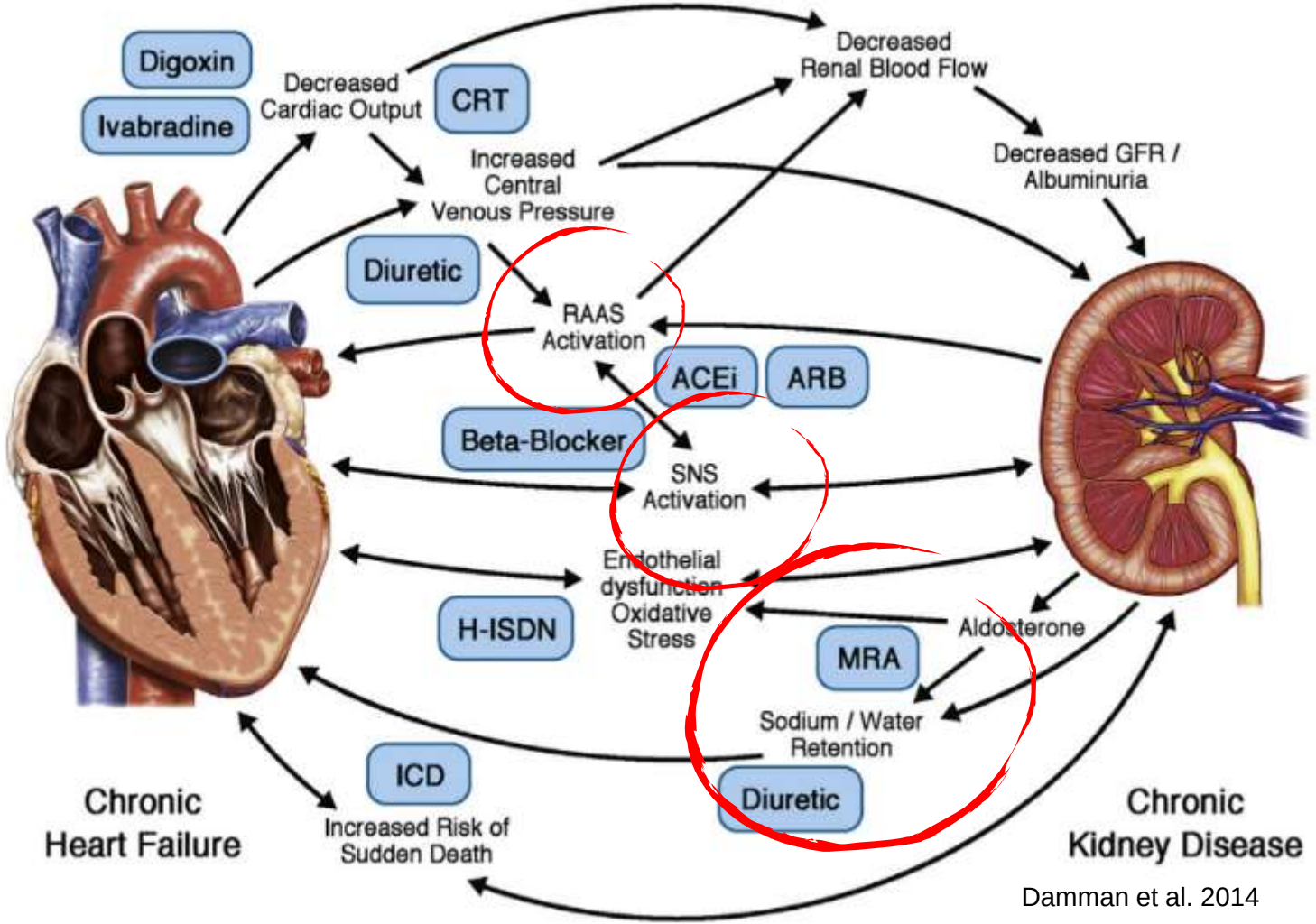


Normal heart
(cut section)

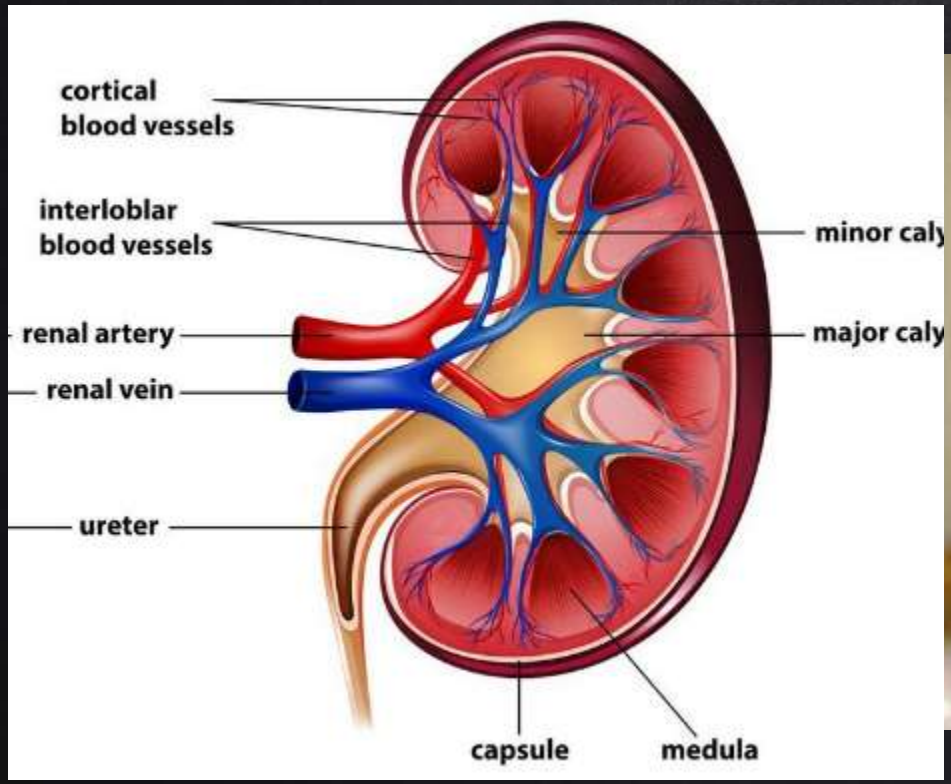


Hypertrophic
cardiomyopathy

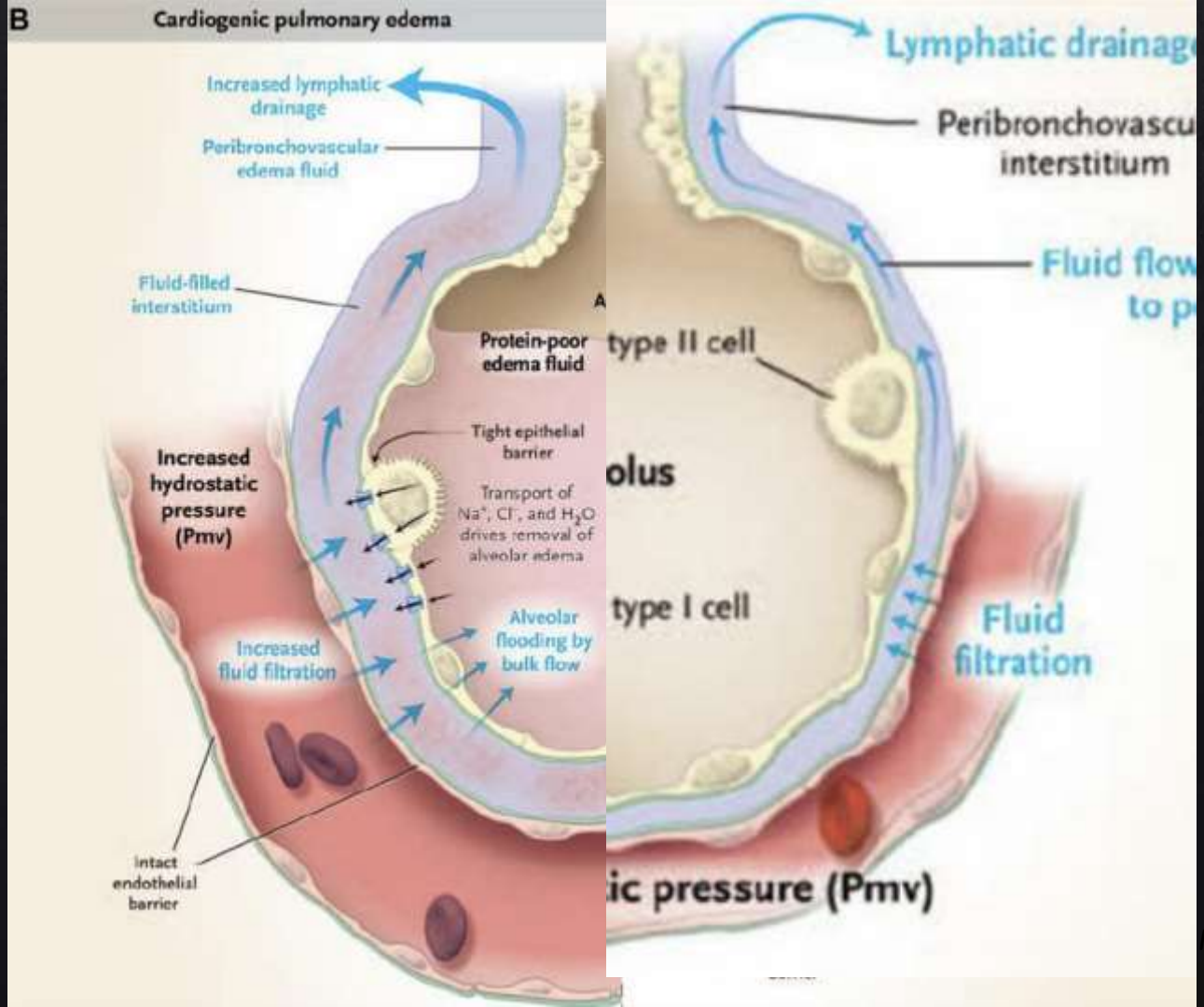
www.nhlbi.nih.gov



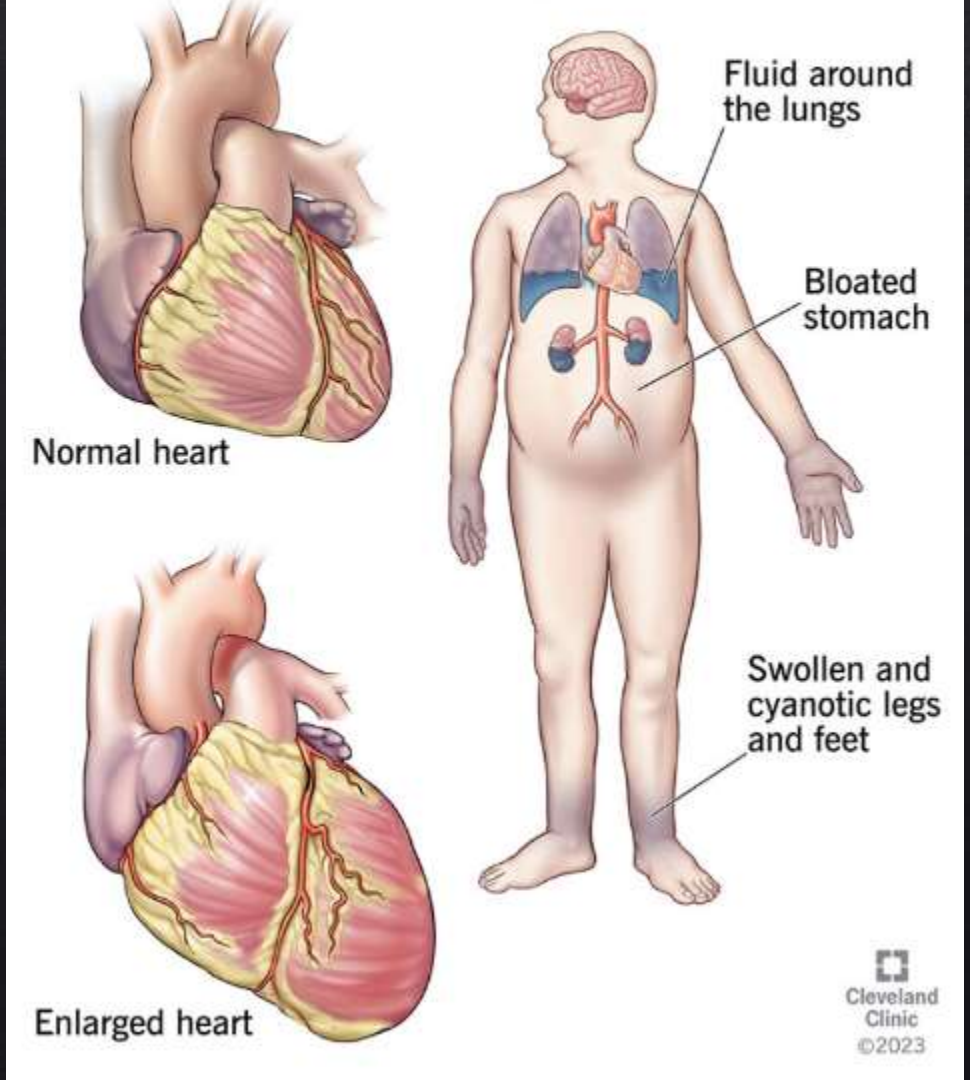
Damman et al. 2014

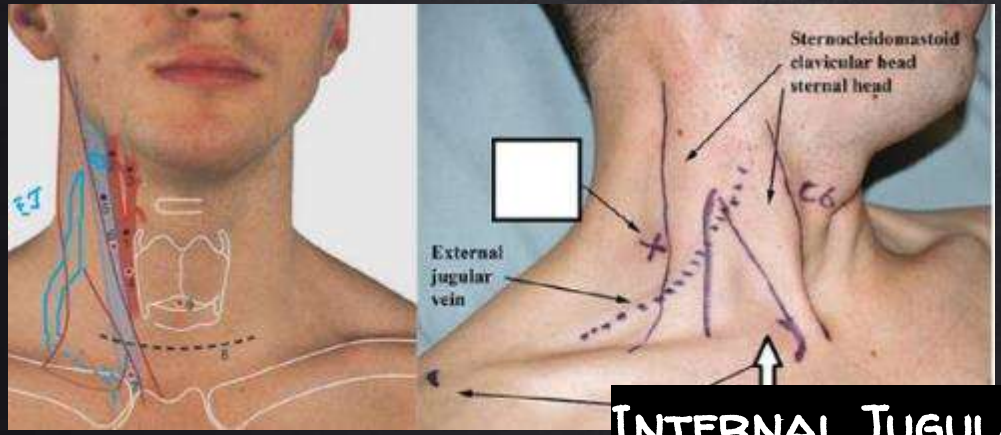


https://kidneycareuk.org
https://www.livestrong.com



Murphy, et al. 2015





Internal Jugular Vein

https://www.grepmed.com/
https://emedicine.medscape.com/
https://missiongastrohospital.com/
https://en.wikipedia.org/

Signs/Symptoms

"Classic"

- Fatigue
- Edema / Swelling
- Dyspnea / shortness of breath (SOB)

--> Sleep sitting up/need pillows

--> Arrhythmias
--> Wake up suddenly (paroxysmal nocturnal dyspnea)
--> Feel bloated, abdominal discomfort,
--> Nauseated, low appetite, malnourished
--> Edema pain
--> Infections
..and more

TESTS

Investigations:

- Elevated NTproBNP
- Chest X-ray
- Echocardiogram (heart ultrasound) "echo"

Other tests for the underlying CAUSE:

- Electrocardiogram (ECG)
- Coronary Angiogram
- Cardiac MRI

... and many many others

GET TRICKED

COPD exacerbation

Pneumonia (bacteria/viral)

Pulmonary hypertension

Obesity hypoventilation syndrome

Pulmonary embolism

Pneumothorax

Liver failure

Kidney failure

Nephrotic syndrome... the list goes on

Golla M, et al. 2024

Chest X-ray

NORMAL

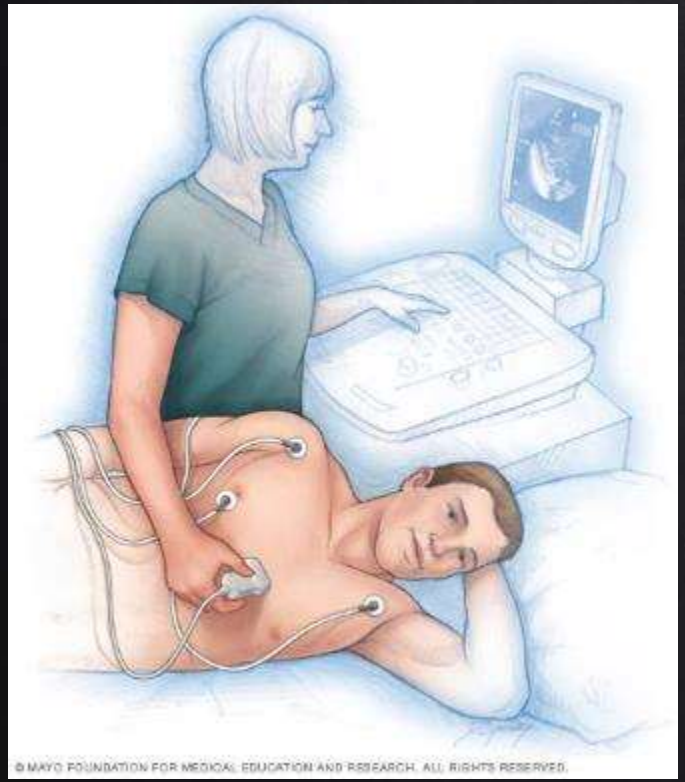
Vascular congestion

Interstitial edema

Alveolar edema

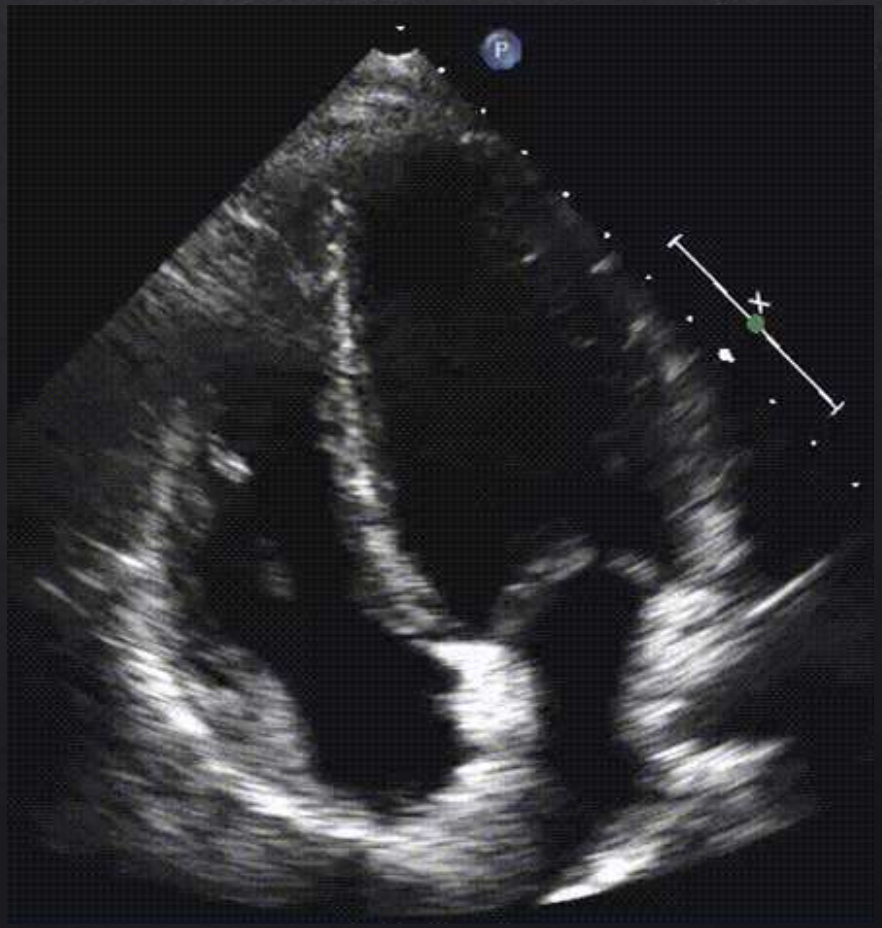
www.csail.mit.edu

"ECHO"



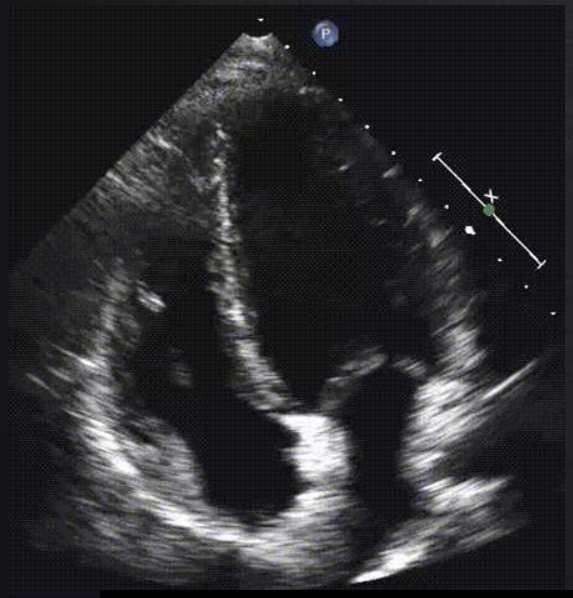
- Heart ultrasound
- Characterizes:
  - heart structure (muscle contraction, valves, etc.) and function
  - speed and direction of blood flow
  - pressures within heart (estimates using math)
  - blood clots, masses, etc.

www.mayoclinic.org



makeagif.com

NORMAL



EF >55-60%

makeagif.com

Left Ventricular Ejection fraction

"Reduced"	"Mildly reduced"	"Preserved"
≤ 40%	41–49%	≥ 50%
HFrEF	HFmrEF	HFpEF

Right Ventricular dysfunction

It's complicated.

"mild" "moderate" "severe"

Bech-Hanssen, 2021
Imayama, 2024

Left Ventricular Ejection fraction

"Reduced"	"Mildly reduced"	"Preserved"
≤ 40%	41–49%	≥ 50%
HFrEF	HFmrEF	HFpEF

UNDERLYING CAUSE?

V ascular, vaccine
I diopathic, infiltrative, infectious
T oxic, trauma, Takotsubo
A rrhythmia, autoimmune
M etabolic
E ndocrine, environmental
N eoplastic, neuromuscular
C ongenital

Case Reports > J Community Hosp Intern Med Perspect. 2023 Sep 2;13(5):97-100.
doi: 10.55729/2000-9666.1242. eCollection 2023.

A Case of Grave's Thyrotoxicosis–Induced Takotsubo Cardiomyopathy Presenting with Cardiac Arrest After Winning the Lottery

David Philippides [1], Angelina Hong [1], Amanda Eukovich [2], Ali Chaudhry [3]

Affiliations + expand

PMID: 37868663 PMCID: PMC10589048 DOI: 10.55729/2000-9666.1242

Abstract

Takotsubo syndrome (TTS) is a nonischemic cardiomyopathy with transient apical ballooning of the left ventricle and reduced ejection fraction that can be caused by severe emotional or physical stress, with diverse clinical presentations. This case describes a patient who went into cardiac arrest at a casino after winning the lottery. She was found to have Takotsubo cardiomyopathy, in the setting of uncontrolled hyperthyroidism. This is a very unique case of TTS presenting with cardiac arrest, and is also an uncommon example of TTS triggered by a positive rather than negative emotional life event.

Keywords: Cardiac arrest; Cardiomyopathy; Grave's; Hyperthyroidism; Takotsubo; Thyrotoxicosis.


www.washingtonpost.com

Case Reports > BMJ Case Rep. 2019 Sep 20;12(9):e230065. doi: 10.1136/bcr-2019-230065.

Takotsubo cardiomyopathy triggered by wasabi consumption: can sushi break your heart?

Alona Finkel-Oron [1], Judith Olchowski [1], Alan Jotkowitz [1], Leonid Barski [1]

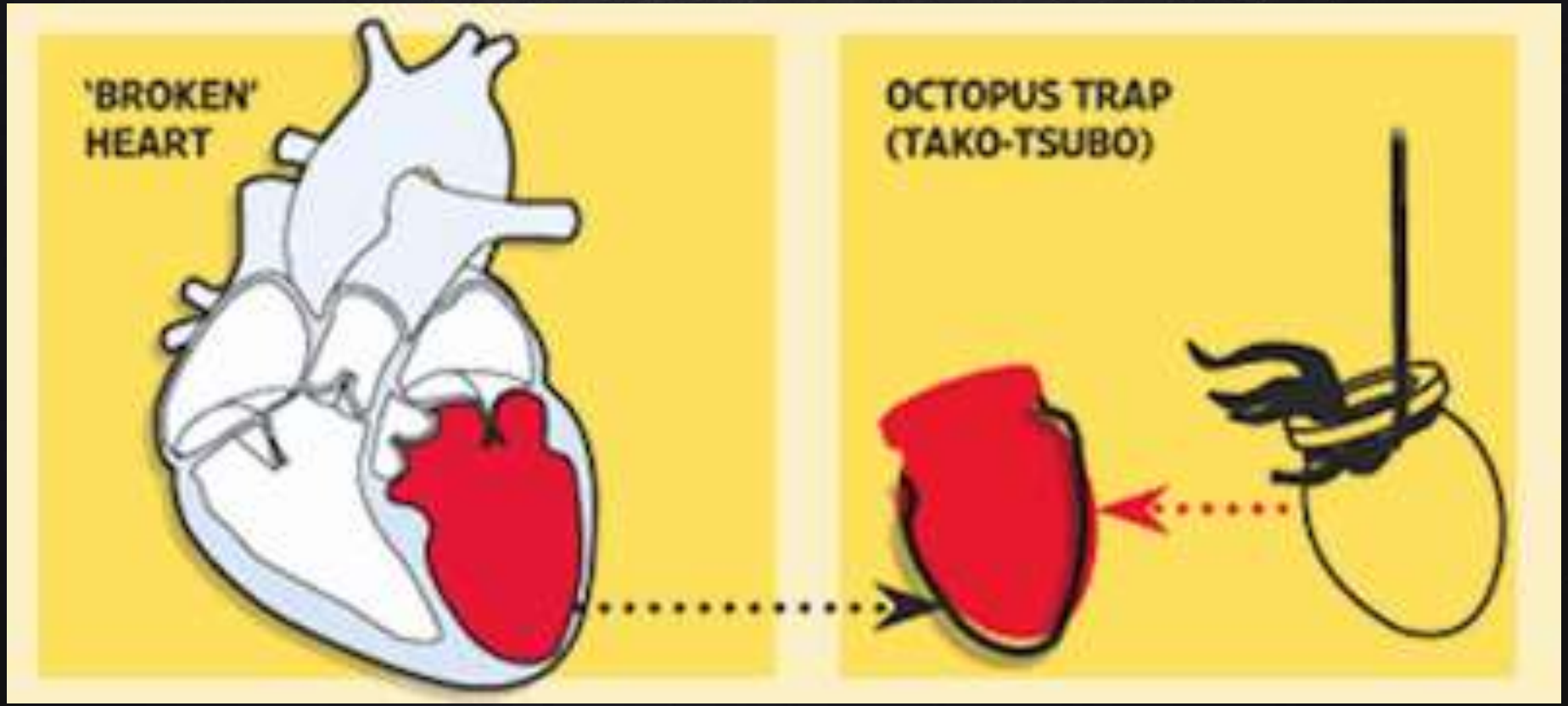
Affiliations + expand

PMID: 31540920 PMCID: PMC6768342 DOI: 10.1136/bcr-2019-230065

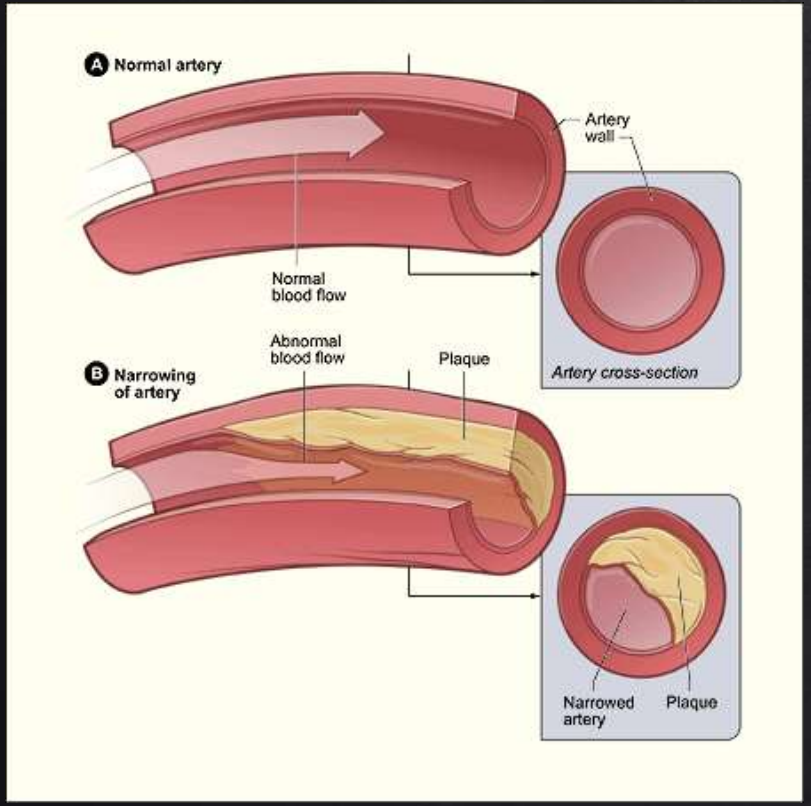
Abstract

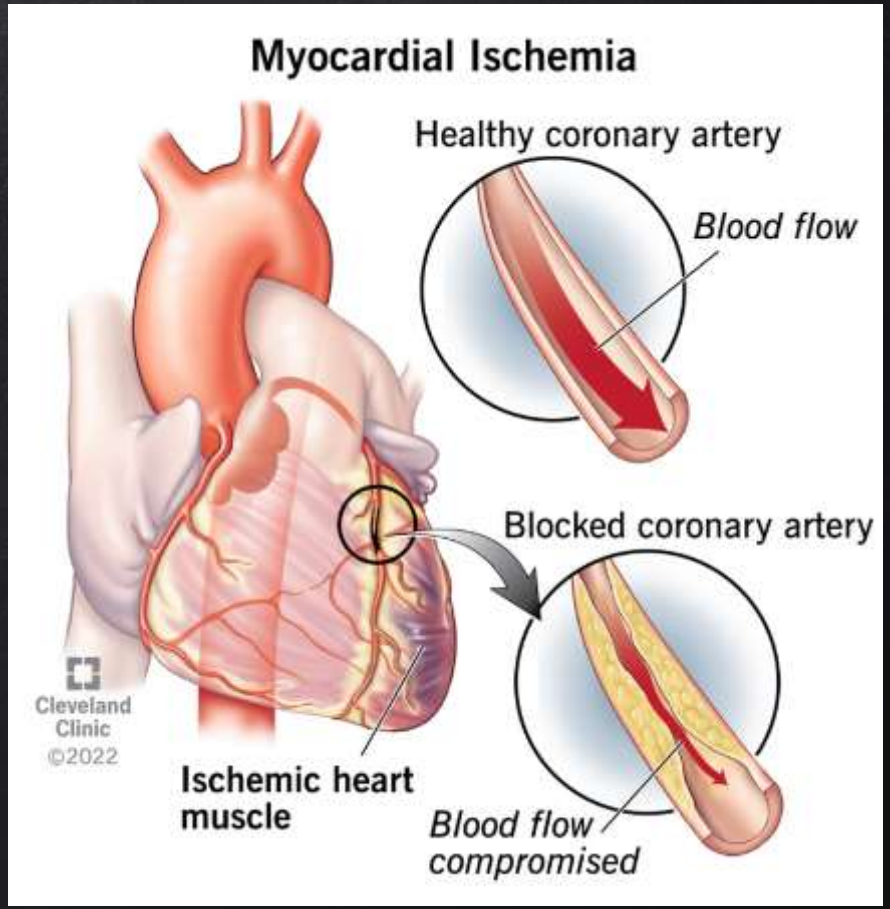
Takotsubo cardiomyopathy is a left ventricular dysfunction that typically occurs after sudden intense emotional or physical stress and mimics myocardial infarction. We describe a case of a 60-year-old woman that presented to the emergency department with chest pain after she attended a wedding and ate a large amount of wasabi, assuming it to be an avocado. To the best of our knowledge, this is the first report of takotsubo cardiomyopathy triggered by wasabi consumption.

Keywords: cardiovascular medicine; interventional cardiology.



www.aliem.com





https://en.wikipedia.org/
my.clevelandclinic.org

Coronary artery disease
Risk factors

Non-modifiable

- Age
- Gender
- Ethnicity
- Family history

Modifiable

- Hypertension
- Dyslipidemia
- Diabetes
- Obesity
- Smoking
- Diet
- Sedentary lifestyle

Novel/Investigational risk factors

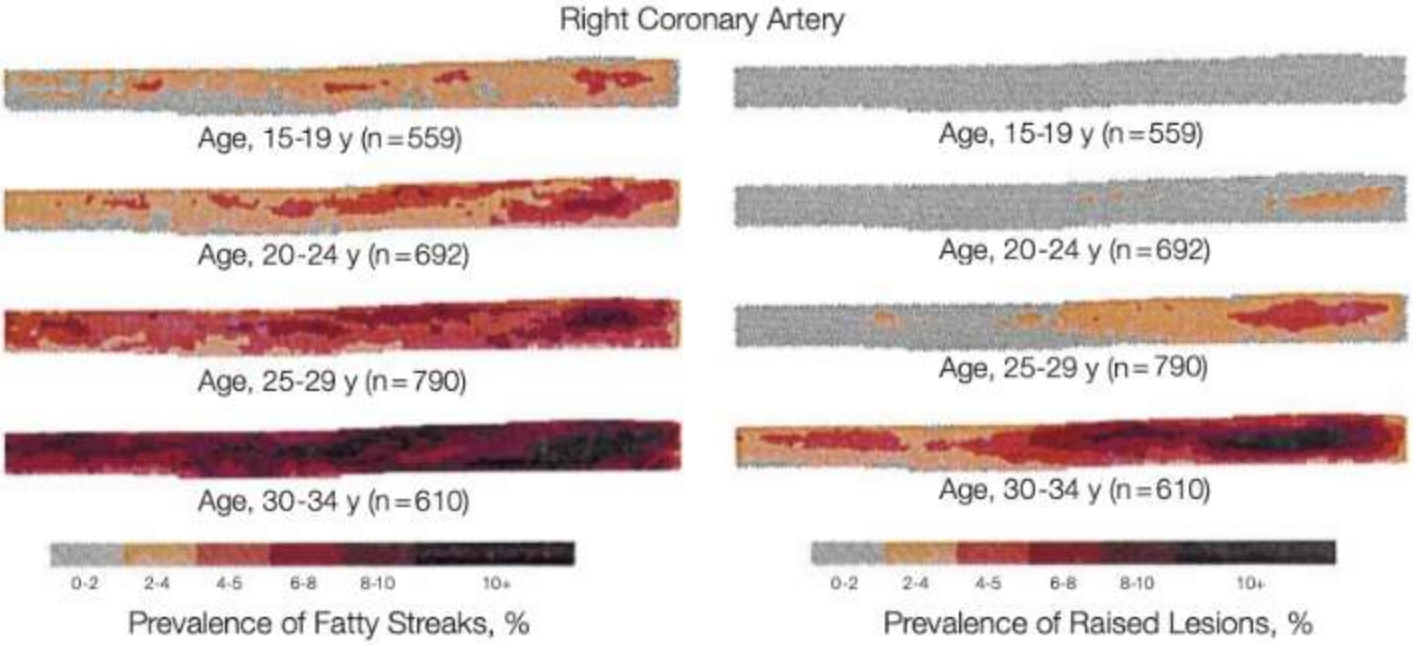
- Nonalcoholic fatty liver
- Chronic kidney disease
- Rheumatoid arthritis
- Systemic lupus erythematosus
- Inflammatory bowel disease
- HIV
- Thyroid disease?
- Testosterone?
- Vitamin D deficiency?

Brown, 2024

When does it start?

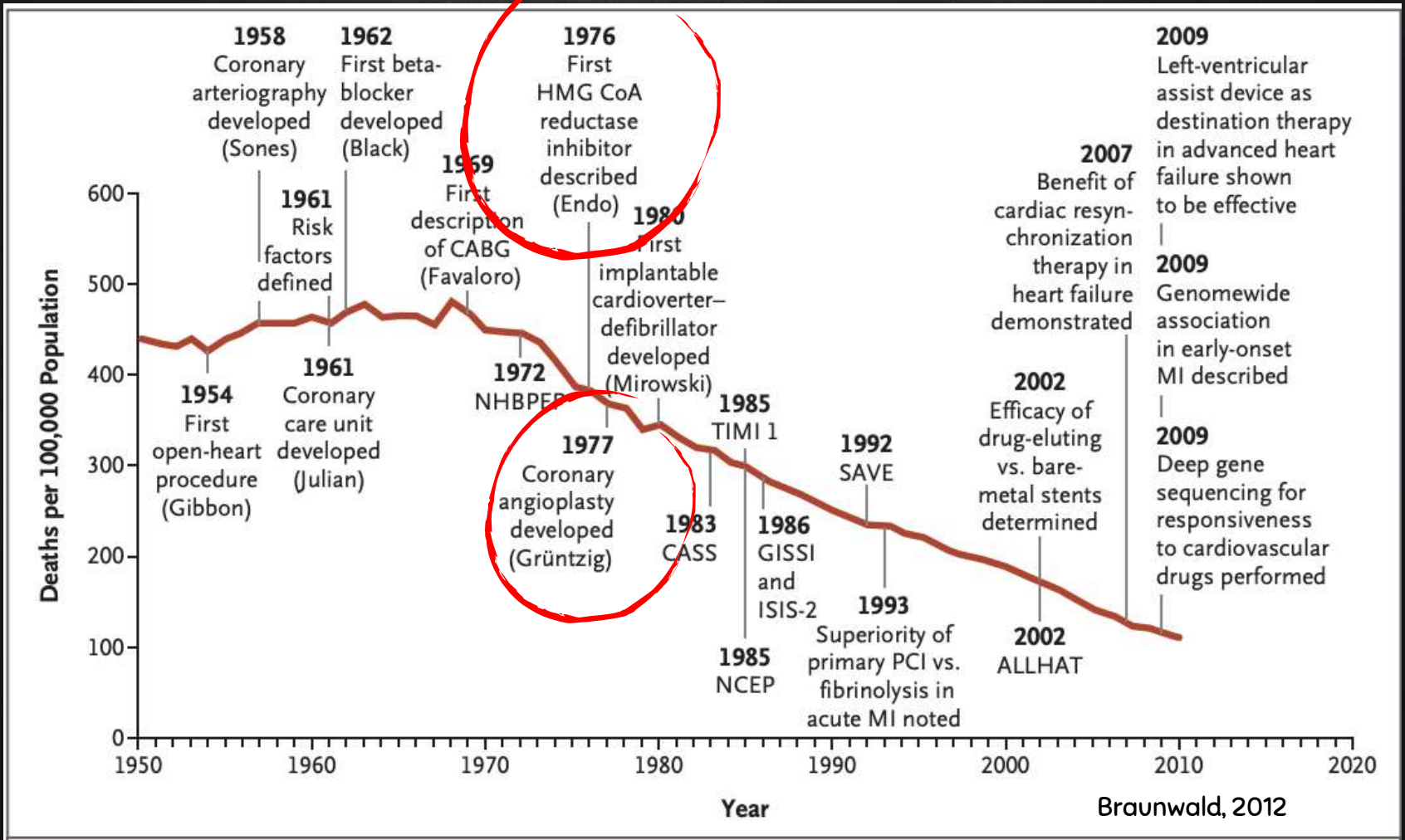
makeagif.com

Figure 3. Prevalence Maps of Fatty Streaks and Raised Lesions for the Right Coronary Artery



The maps for fatty streaks and raised lesions are displayed in expanded isopleths.

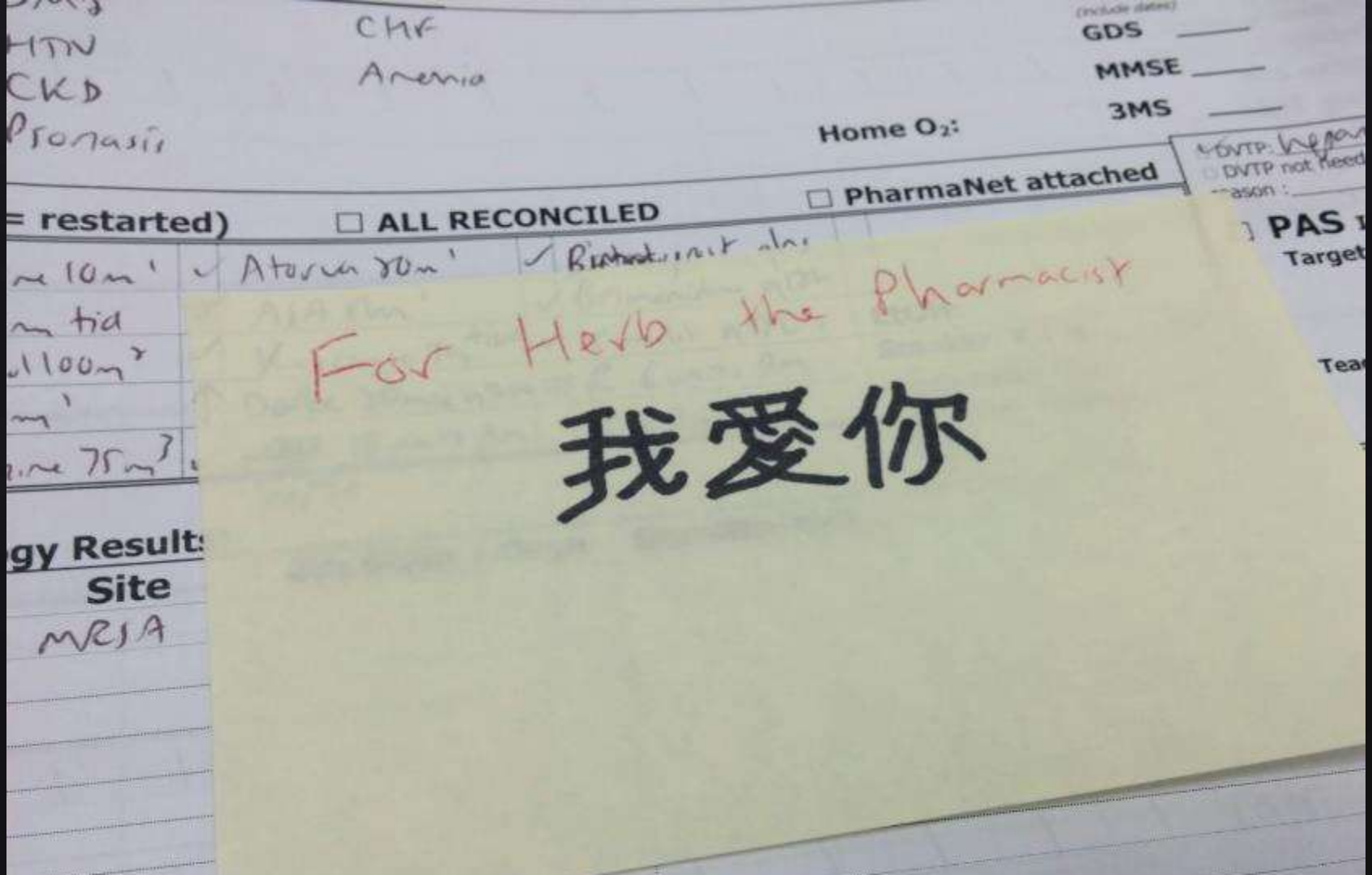
Strong, 1999



Braunwald, 2012

Figure 1. Decline in Deaths from Cardiovascular Disease in Relation to Scientific Advances.

Kandler 2011


HTN
CKD
Psoriasis
CHF
Anemia
GDS
MMSE
3MS
Home O2:
PharmaNet attached
restarted)
ALL RECONCILED
Atorva 80m'
tid
Site
MRSA
PAS
Target
For Herb the Pharmacist
我爱你


HERB
WONG

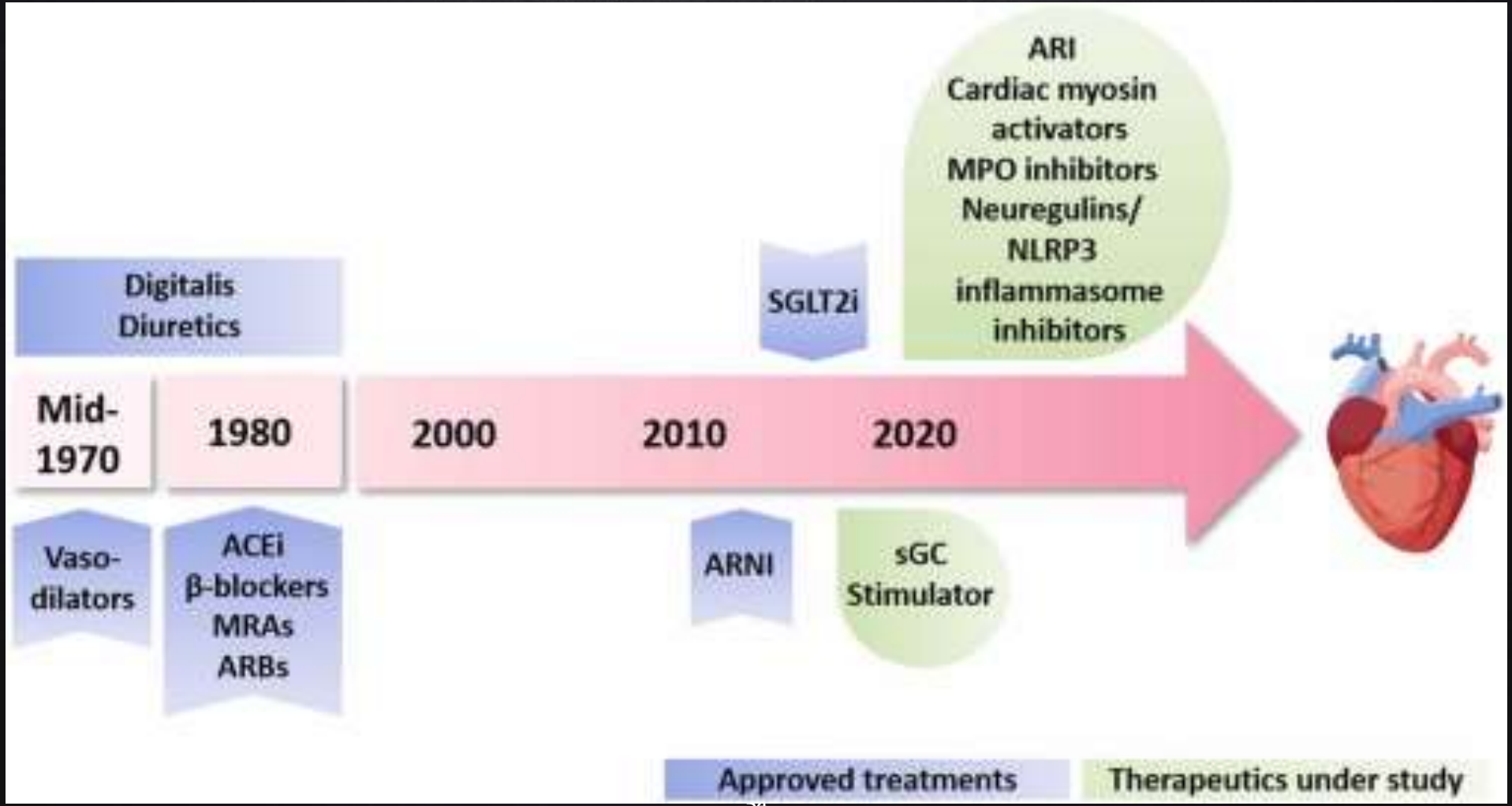
CAD "TREATMENTS"

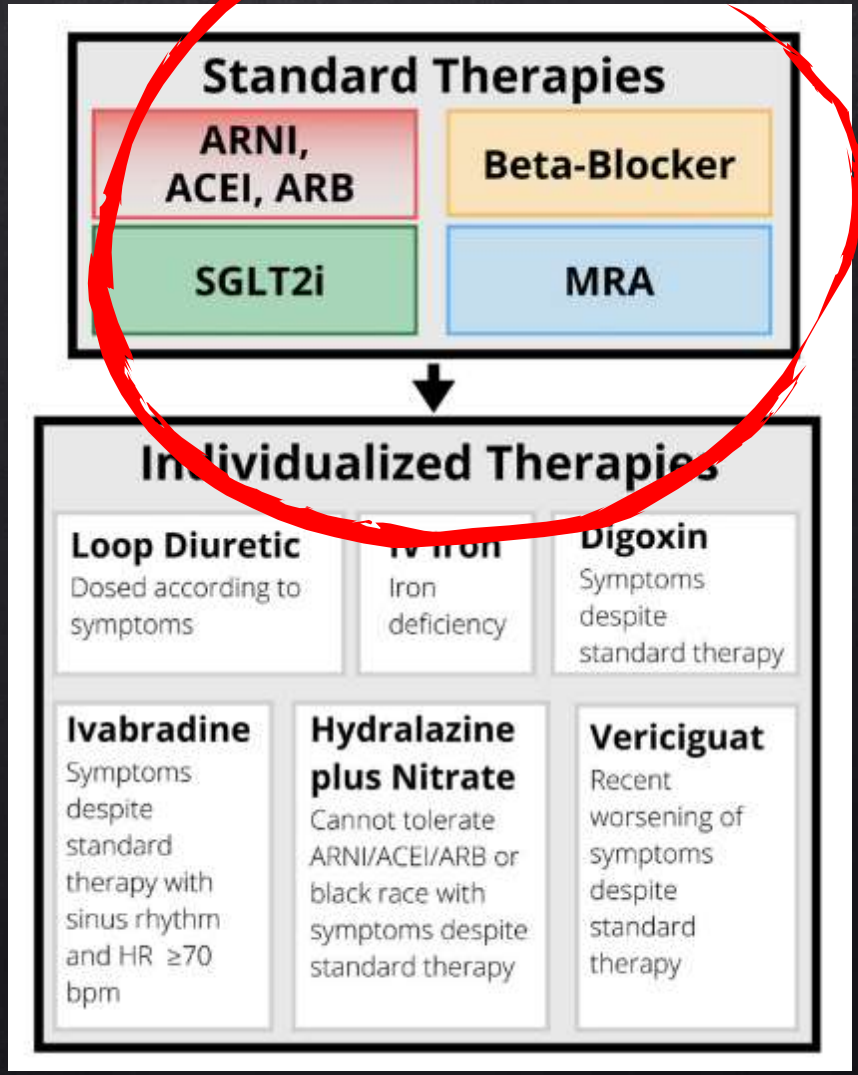
- Percutaneous coronary intervention (PCI)
- Coronary artery bypass graft surgery (CABG)
- Medications:
  - Antiplatelets (ASA, clopidogrel, ticagrelor, prasugrel)
  - HMG-CoA reductase inhibitors / "statins"
  - ACE inhibitors (if HTN, DM, CKD or LV dysfunction)
  - Beta blockers/calcium channel blockers/nitrates (if angina)

....but sometimes..

"HFrEF"

"GDMT" for HFrEF


ARI
Cardiac myosin activators
MPO inhibitors
Neuregulins/ NLRP3 inflammasome inhibitors
Digitalis
Diuretics
SGLT2i
Mid-1970
1980
2000
2010
2020
Vaso-dilators
ACEi
β-blockers
MRAs
ARBs
ARNI
sGC Stimulator
Approved treatments
Therapeutics under study



MacDonald, 2023

ACEI / ARB

Class: Angiotensin-converting enzyme inhibitor, Angiotensin Receptor II Blocker (commonly referred to as "RAAS inhibitors" (renin-angiotensin aldosterone system))

Examples: ACEI: ramipril, enalapril, lisinopril, captopril, perindopril, fosinopril

ARB: candesartan, valsartan, irbesartan, losartan

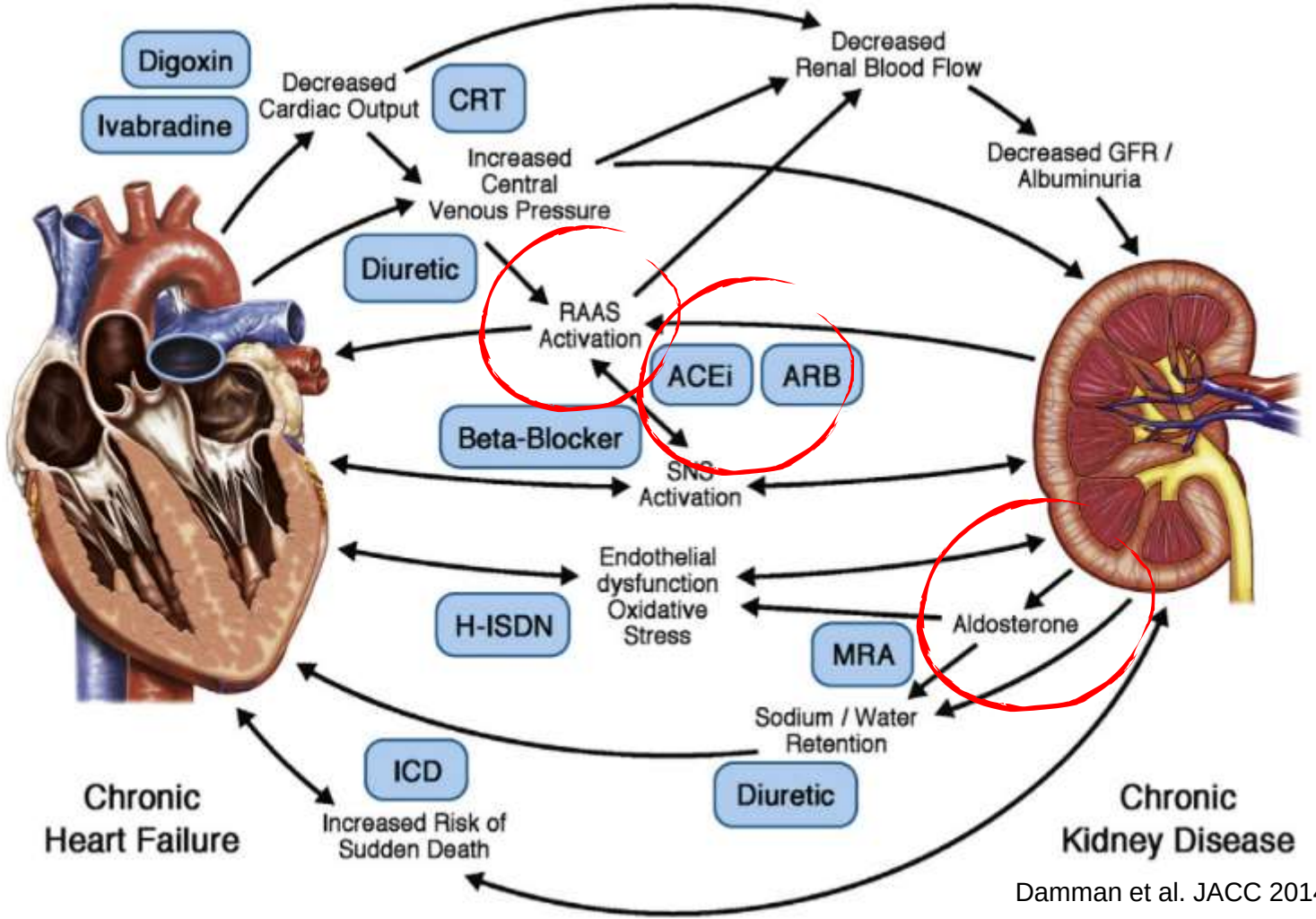
Mechanisms:

- Don't make as much angiotensin II (vasoconstrictor) or blocks its effects
- Lowers aldosterone secretion which lowers sodium and water retention
- Less heart remodeling/scarring

Common side effects:

- Dizziness, lightheadedness, hyperkalemia (high potassium)
- Dry cough, angioedema (ACEI, usually not ARB)

UpToDate LexiDrugs, 2024



Damman et al. JACC 2014

Clarification:

ACEI/ARBs are NOT nephrotoxic.

They're not nephrotoxic on their own (usually).
Higher risk for kidney injury when dehydrated.
When used appropriately, they prevent need for dialysis in cardiac/diabetic patients and can save lives – they don't just lower blood pressure.
Some clinicians don't use them because they're labeled as 'nephrotoxic' for even stable low kidney function.
May deter patients from ever wanting them restarted
Be careful if patient dehydrated/acutely ill – 'sick day' guidance

Clin Med (Lond) 2018 Oct;18(5):384–386
National Kidney Foundation, 2024

ARNI

Class: Angiotensin Receptor/Neprilysin Inhibitor; "Entresto" (Sacubitril/Valsartan)

Mechanisms:

- Don't make as much angiotensin II (vasoconstrictor) or blocks its effects
- Lowers aldosterone secretion which lowers sodium and water retention
- Less heart remodeling/scarring

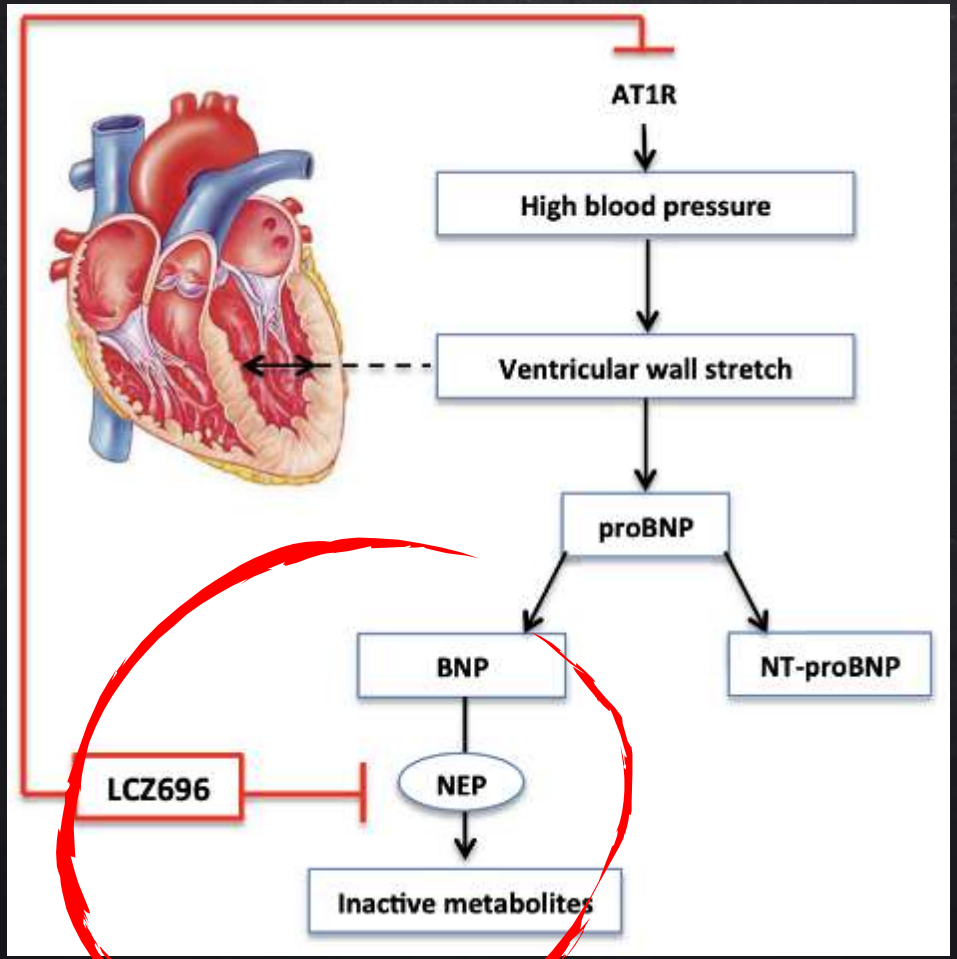
PLUS: get rid of more sodium

Common side effects:

- Dizziness, lightheadedness, hyperkalemia (high potassium)

*Caution: Patients should NEVER be on ACEI at the same time. Needs >36hr gap if switching (+++angioedema risk otherwise)

UpToDate LexiDrugs, 2024



Curr Hypertens Rep **18**, 86 (2016)

Iran J Allergy Asthma Immunol 2015; 14(6):642-645

Beta Blockers

Class: B-adrenergic receptor antagonists

Examples: bisoprolol, metoprolol, carvedilol; other BB generally not used in HFrEF

Mechanisms:

- Lowers "sympathetic drive" (effects of adrenaline/noradrenaline)
- Lowers heart rate (allow for better filling of ventricles)
- Lowers heart remodeling

Common side effects:

- Dizziness, lightheadedness, fatigue, low mood, vivid dreams, asthma exacerbations, cold hands and feet, lowers libido

UpToDate LexiDrugs, 2024

MRA

Class: Mineralocorticoid Receptor Antagonists, potassium sparing

Examples: spironolactone, eplerenone, finerenone (new nonsteroidal MRA)

Mechanisms:

- Gets rid of sodium, potassium and water, thus less work on the heart
- Lowers heart remodeling and scarring

Common side effects:

- Dizziness, lightheadedness, high potassium
- Gynecomastia*, menstrual irregularities*, lowers libido*

*spironolactone only

UpToDate LexiDrugs, 2024

SGLT2I

Class: Sodium-glucose co-transporter 2 inhibitor

Examples: empagliflozin, dapagliflozin; other SGLT2 inhibitors generally not used of HFrEF

Mechanisms:

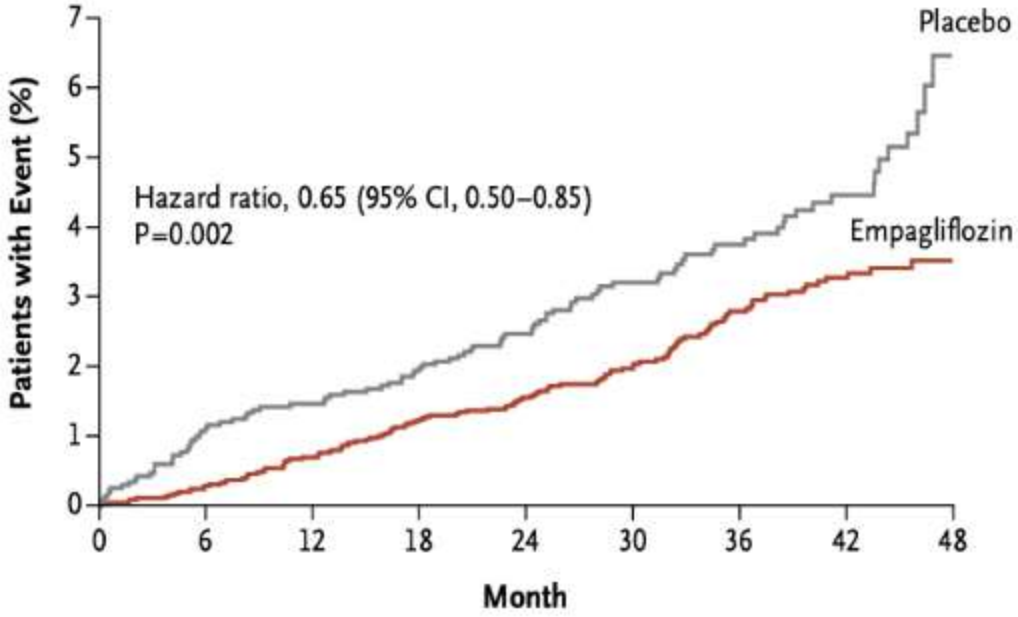
- Get rid of sugar and sodium, thus water (and blood volume)
- Lowers amount of work the heart has to do (pumps more efficiently)
- Helps heart to burn energy more efficiently (instead of relying heavily on sugar)
- Lowers inflammation and oxidative stress

Commons side effects:

- Genital infections (bacterial and fungal), dizziness, lightheadedness, dehydration, hypoglycemia (not common on it's own), euglycemic DKA (diabetic ketoacidosis; diabetic emergency with dangerous buildup of ketones (acids))

UpToDate LexiDrugs, 2024

D Hospitalization for Heart Failure



No. at Risk									
Empagliflozin	4687	4614	4523	4427	3988	2950	2487	1634	395
Placebo	2333	2271	2226	2173	1932	1424	1202	775	168

N Engl J Med 2015;373:2117-28

How good ARE they?

	NNT – prevent 1 death every year (Number of people you Need to Treat)
ACEI/ARB	77
ARNI	80
BB	28
MRA	18
SGLT2i	63

lower number = better

López-Sendón et al. (2022)

WITH YOUR HELP

WE SAVE LIVES.

LVEF

"Reduced"	"Mid-Range"	"Preserved"
≤ 40%	41–49%	≥ 50%
HFrEF	HFmrEF	HFpEF

TABLE 6 Selected Comorbidities in Individuals With HFpEF

Comorbidity	Association With HF Outcomes	Clinical Trial Evidence for Modulating Comorbidity	Suggestions/Actions
Hypertension	Inverse for mortality. Strong for HF hospitalization.	Strong for prevention	■ Treat as per the current ACC/AHA guidelines for the prevention, detection, evaluation, and management of high blood pressure in adults[108] ■ Target systolic BP <130 mm Hg, unless evidence for symptomatic orthostasis, labile blood pressure, or observed impact on kidney dysfunction.
Obesity	Inverse or U-shaped for mortality	Moderate	■ Calorie restriction and aerobic exercise to improve functional status and quality of life ■ Consideration for treatment for obesity, including drug or bariatric surgical therapy and/or referral to an obesity specialist.
Diabetes mellitus	Strong	Medication dependent	■ Treat according to ACC ECDP on novel therapies for CV risk reduction in patients with T2DM[109] and current ADA standards of medical care in diabetes[110] ■ SGLT2is as first-line therapy for T2DM ■ GLP1-RAs are an option in individuals with high cardiovascular risk and/or obesity ■ Finerenone in diabetic kidney disease ■ Metformin is a safe, affordable additional agent ■ Avoid thiazolidinediones, saxagliptin, alogliptin ■ Collaborative care with endocrinologist
Atrial fibrillation/flutter	Strong	Moderate	■ Treat as per the current AHA/ACC/HRS guideline for the management of patients with AF[111]
CAD	Moderate	Weak	■ Evaluate for CAD if suggestive symptoms and revascularization candidate ■ Treat as per the current ACC/AHA/SCAI guideline for coronary artery revascularization,[112] and the ACC/AHA/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain[113]
Sleep-disordered breathing	Moderate for HF hospitalization	None	■ Testing for sleep apnea if high suspicion ■ Referral to sleep specialist ■ Treat OSA for improvement in daytime sleepiness, improved sleep quality, and quality of life ■ Treatment of severe nocturnal hypoxemia ■ Treat OSA in individuals with drug-resistant hypertension (3 or more drugs) and consider in individuals with AF managed with rhythm control strategies
Chronic kidney disease	Strong	Moderate	■ Treat as per current KDIGO clinical practice guidelines for the evaluation and management of chronic kidney disease,[114] and the KDIGO clinical practice guideline for diabetes management in chronic kidney disease[115] ■ Optimize RAAS inhibitors in individuals with proteinuria and with diabetic kidney disease ■ SGLT2is ■ Collaborative care with nephrology specialist, especially for moderate and severe chronic kidney disease

JACC. 2023 May, 81 (18) 1835–1878

Medication	Cardiovascular death or HF hospitalization*		HF hospitalization*		Death		Strength of recommendation, certainty of evidence		
	Absolute reduction per y†	HR or RR (95% CI)	Absolute reduction per y†	HR or RR (95% CI)	Absolute reduction per y†	HR or RR (95% CI)	CCS	ESC	AHA/ ACC/ HFSA
HFpEF									
ARB[33]	—	0.95 (0.79–1.14)	—	0.91 (0.74–1.13)	—	1.18 (0.95–1.47)	Weak, moderate	None	2b, B-R
MRA[34]	—	0.87 (0.72–1.04)	—	0.85 (0.69–1.04)	—	0.88 (0.71–1.10)	Weak, moderate	None	2b, B-R
ARNI[36,58]	—	0.93 (0.81–1.08)‡	—	0.94 (0.80–1.11)‡	—	0.97 (0.7[illegible]–1.25)‡	§	None	2b, B-R
SGLT2i[37,59]	**–1.9**	**0.79 (0.69–0.90)**	**–2.0**	**0.71 (0.60–0.83)**	—	1.[illegible]0 (0.87–1.[illegible]5)	§	§	2a, B-R
HFmrEF									
ACEI/ARB[33]	**–2.3**	**0.76 (0.61–0.96)**	**–2.0**	**0.73 (0.55–0.95)**	—	0.79 (0.60–1.04)	§	[illegible] C	2b, B-NR
MRA[34]	**–4.4**	**0.55 (0.33–0.91)**	—	0.60 (0.32–1.10)	**–2.5**	**0.58 (0.34–0.99)**	§	IIb, C	2b, B-NR
β-blocker, sinus rhythm[35]	—	0.83 (0.60–1.13)	—	0.95 (0.68–1.32)	—	0.59 (0.34–1.03)	§	IIb, C	2b, B-NR
β-blocker, AF	—	1.06 (0.58–1.94)	—	1.15 (0.57–2.32)	—	1.30 (0.63–2.67)			
ARNI[36,58]	—	0.89 (0.73–1.10)‡	—	0.83 (0.65–1.06)‡	—	0.94 (0.69–1.28)‡	§	IIb, C	2b, B-NR
SGLT2i[37,59]	**–2.0**	**0.79 (0.69–0.90)**	**–2.1**	**0.71 (0.60–0.83)**	—	1.00 (0.87–1.15)	§	§	2a, B-R

CJC Open 5 (2023) 629e640;1835–1878

HFpEF treatment

It's very complicated.

"Treat the underlying causes".

SGLT2 inhibitors
GLP1-agonists (semaglutide)
MRA?

HFpEF MIMICS

Myocarditis

High-output heart failure

Pericardial disease

Cardiac amyloidosis

Cardiac sarcoidosis

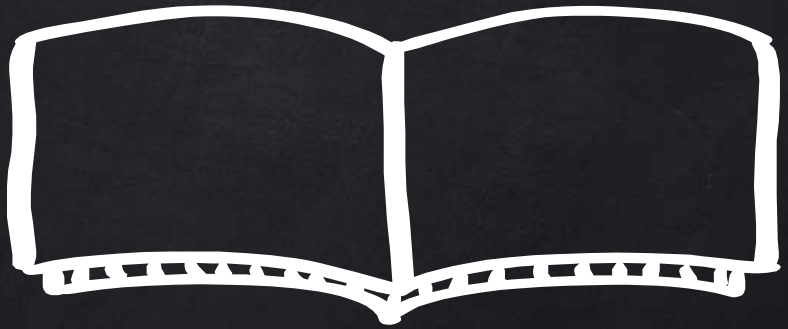
Hypertrophic cardiomyopathy

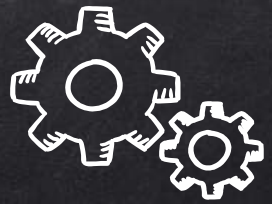
Fabry disease

Hemochromatosis

JACC. 2023 May, 81 (18) 1835–1878

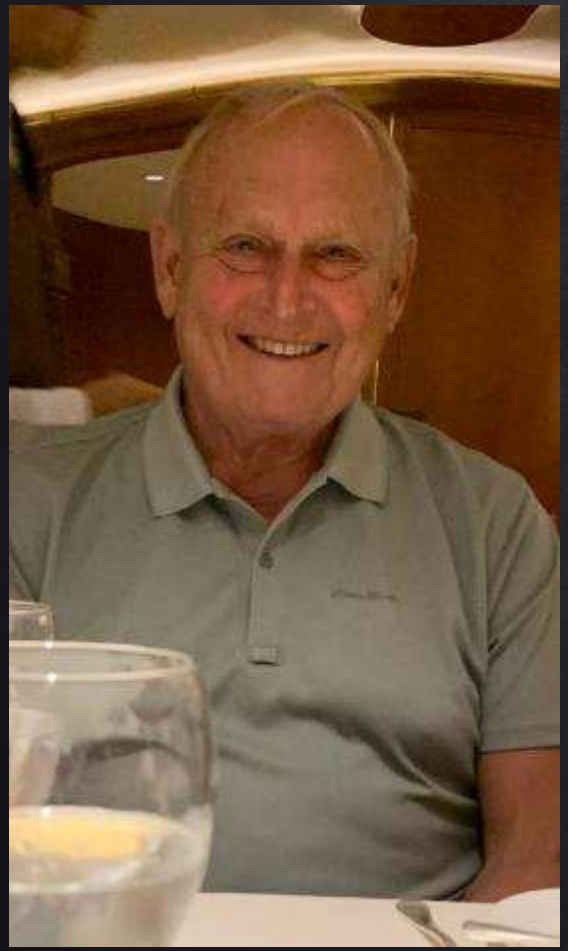
Story time





Clinical Pharmacy Technician

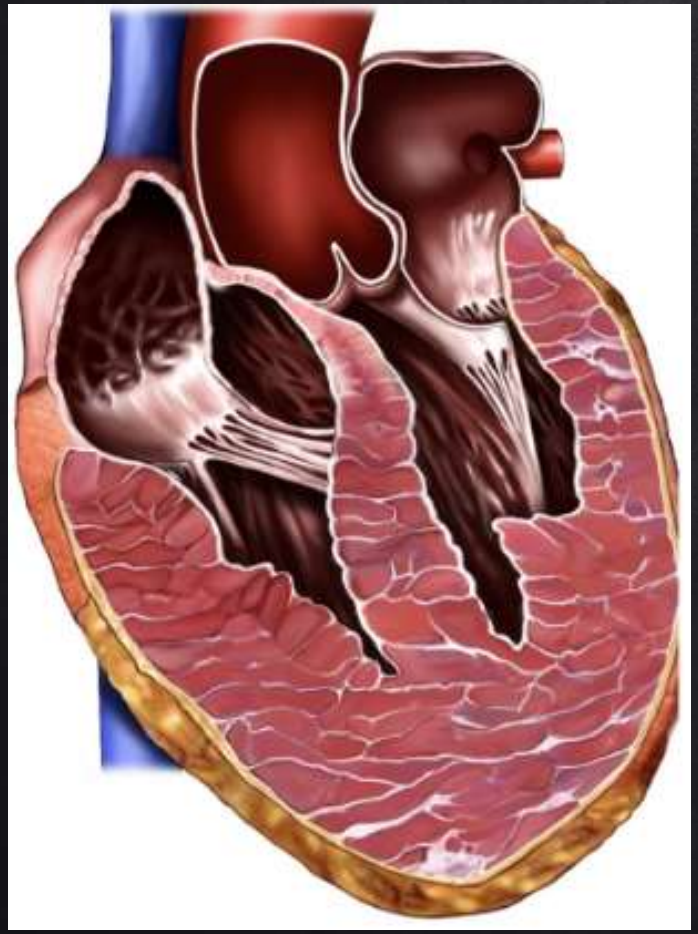
- Run reports and collates/triages dispensary troubleshooting items
- "Best-possible medication histories" (BPMH) or medication clarifications *(before we had BPMH pharmacists)*
- Compile complex medication calendars for patients
- Special authority requests and documentation
- Pharmacare plan checks
- Liaising with community pharmacies for various thing
- Ensures continuity of important medications like ARVs..
- Patients own meds.. etc.



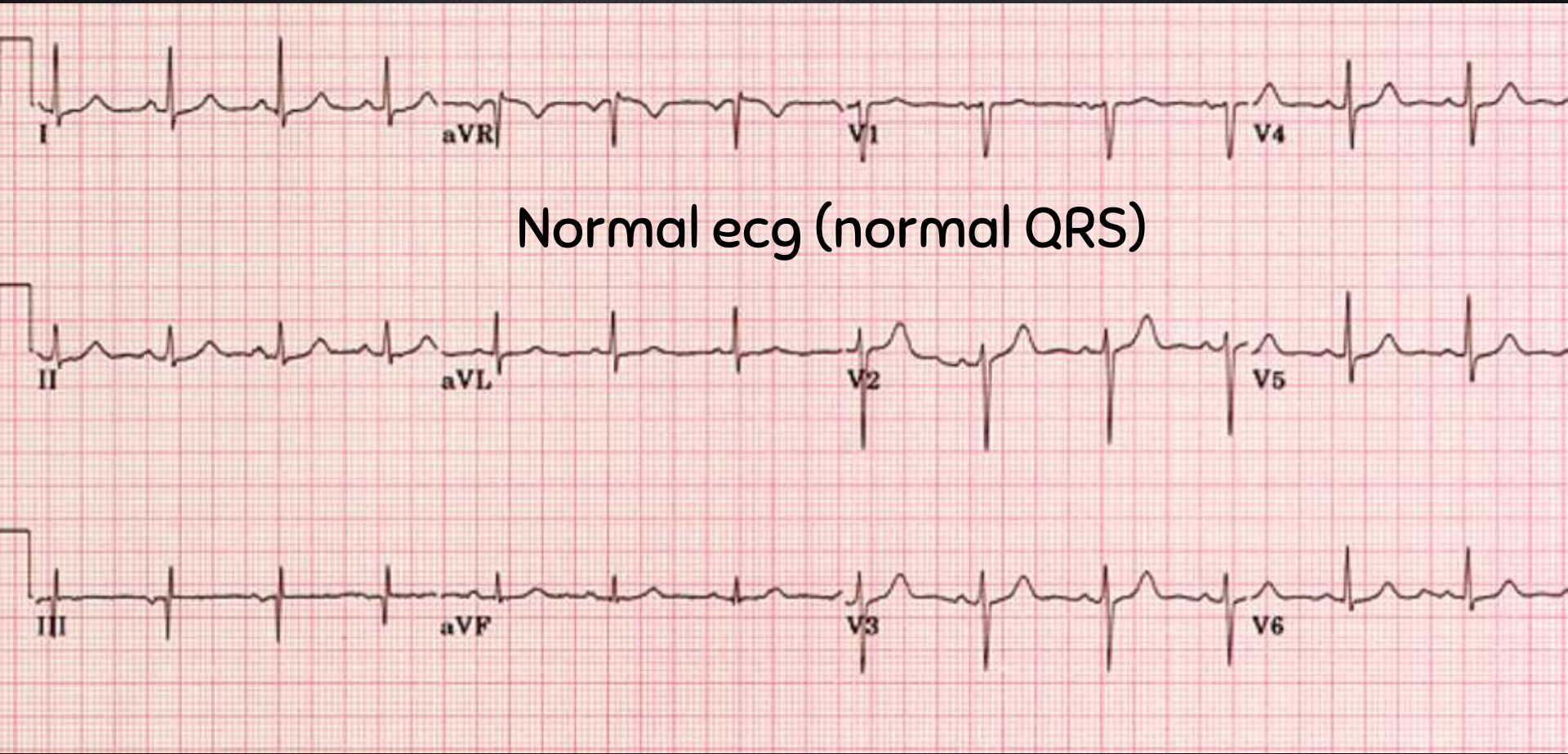
68M, retired police officer, admitted for "HFpEF" and rapid atrial flutter

<u>Past Med History:</u>
Atrial flutter
"Hypertension"
"COPD"
"Liver cirrhosis"
Bilateral carpal tunnel surgery 2009
Bilateral knee surgery 2010/13/17

<u>Med at home:</u>
-Rivaroxaban 20mg daily
-Diltiazem 360mg CD daily .....?
-Salbutamol prn as needed



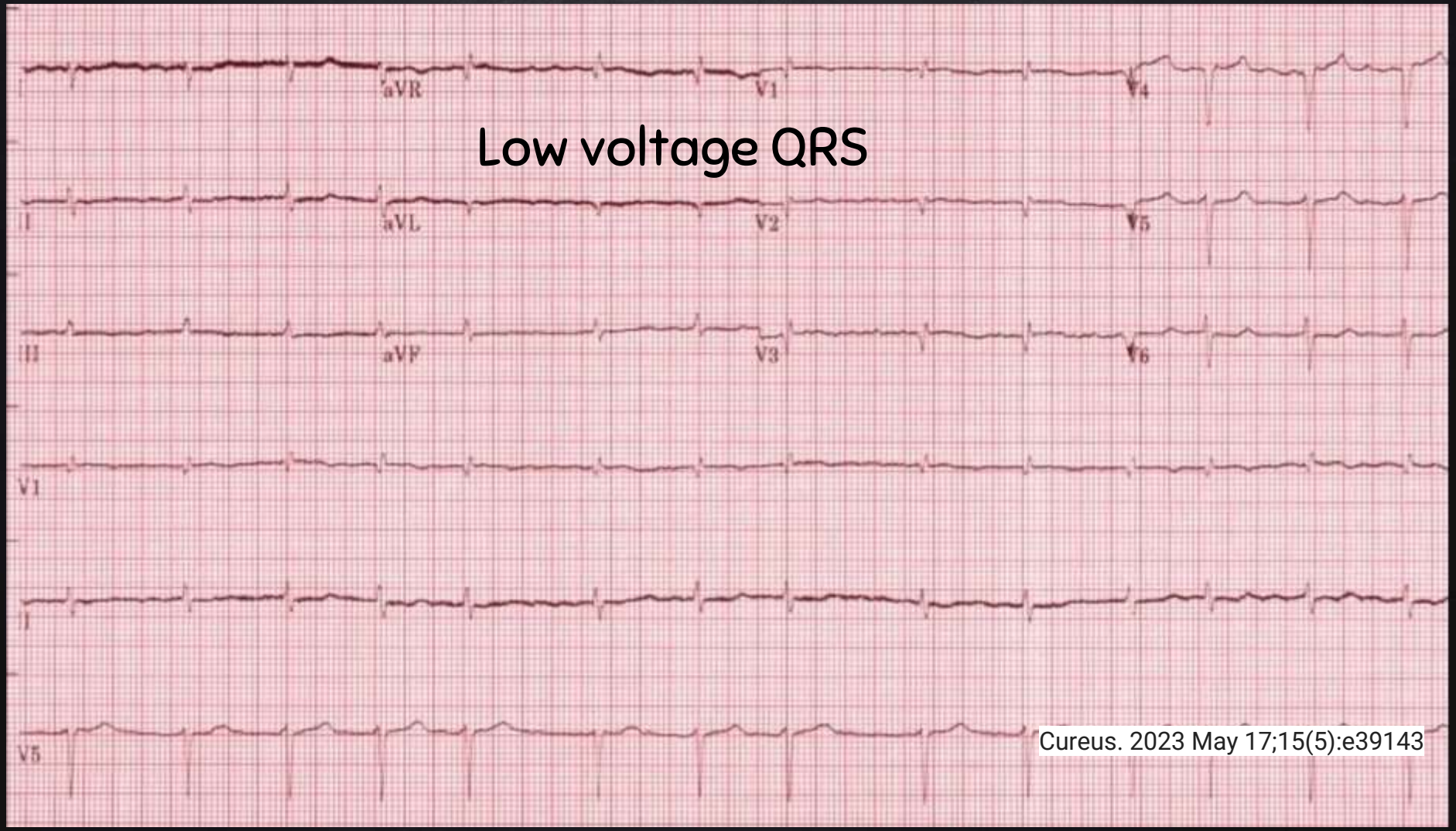
makeagif.com
www.nhlbi.nih.gov



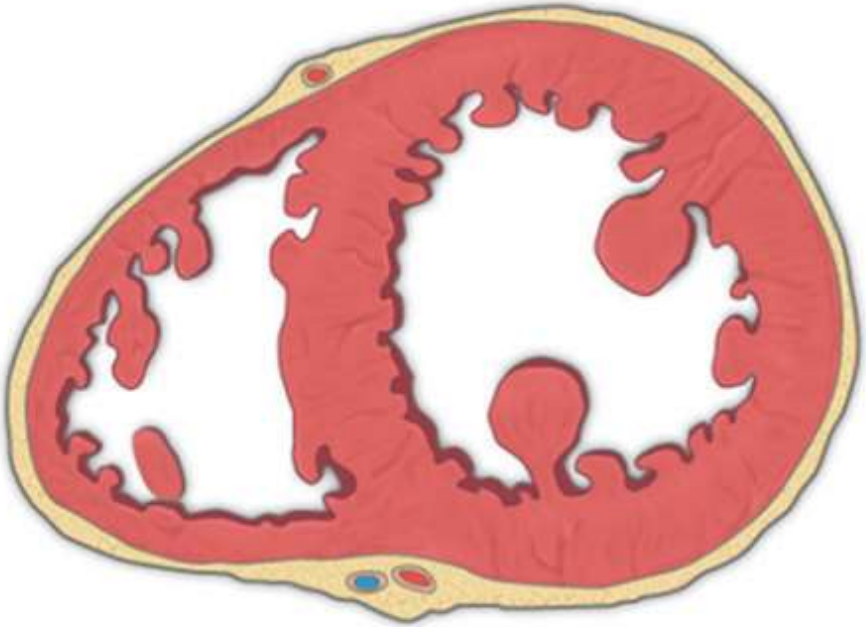
Normal ecg (normal QRS)

elentra.healthsci.queensu.ca

Low voltage QRS



Cureus. 2023 May 17;15(5):e39143



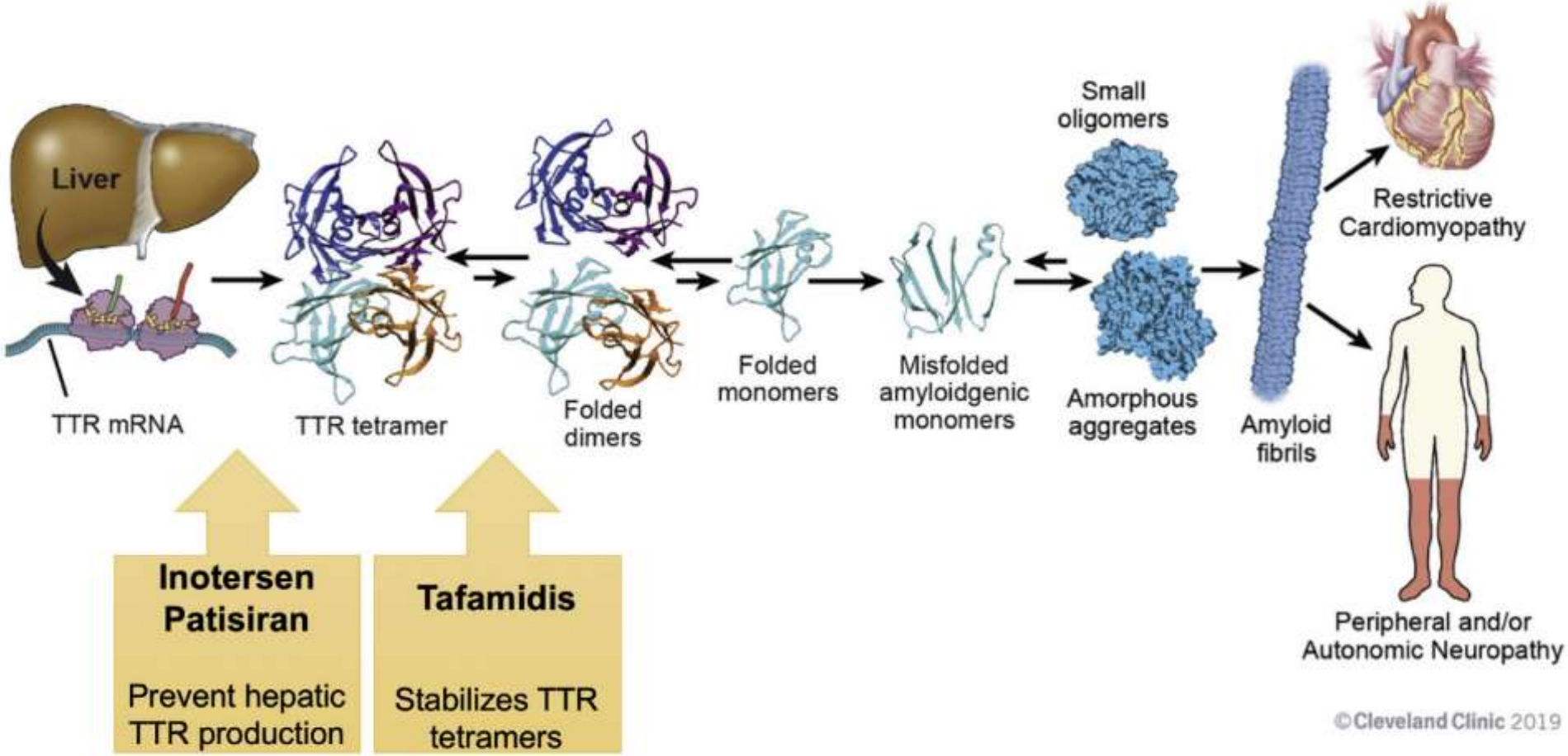


Figure 6. Disease-modifying therapies for transthyretin amyloidosis. TTR, transthyretin. Modified from Ruberg et al.[6] with permission from Elsevier.

TABLE 1 Clues Suggesting a Diagnosis of Cardiac Amyloidosis

Cardiac Manifestations	Extracardiac Manifestations
Clinical	**Musculoskeletal**
■ Fatigue	■ Bilateral carpal tunnel syndrome
■ Heart failure symptoms	■ Lumbar/cervical spinal stenosis
■ Family history of heart failure	■ Spontaneous biceps tendon rupture
Electrical	■ Hip or knee replacement
■ Conduction system disease/pacemaker	**Neurologic**
■ Atrial fibrillation	■ Peripheral neuropathy
■ Pseudoinfarct pattern	■ Family history of neuropathy
■ Discordant QRS voltage for degree of increased left ventricular wall thickness on imaging	■ Autonomic dysfunction
Imaging	■ Intolerance to vasodilating antihypertensive medications
■ Increased left ventricular wall thickness	■ Orthostatic hypotension
■ Grade 2 or worse diastolic function	■ Gastroparesis
■ Abnormal longitudinal strain with apical sparing	■ Urinary incontinence
■ Diffuse subendocardial or transmural late gadolinium enhancement on cardiac magnetic resonance imaging with increased extracellular volume fraction	■ Erectile dysfunction
Laboratories	**Renal**
■ Persistent low-level troponin elevation	■ Nephrotic syndrome
■ Elevated B-type natriuretic peptide or N-terminal pro-B-type natriuretic peptide	

JACC 2023. 81(11);1076–1126

JACC: Heart Failure

Achieving a Definitive Diagnosis of ATTR-CM

Once ATTR-CM is suspected, a timely, definitive diagnosis is recommended. On average, ATTR-CM patients have an approximate survival of 3 to 5 years from diagnosis **(39)**, with the median survival time in ATTRm ranging from 26 to 62 months **(35,40,41)**, and the median survival time in ATTRwt ranging from 43 to 67 months from diagnosis **(13,30,31,35,40)** and 73 months from symptom onset **(31)**. Features ascertained from electrocardiography, echocardiography, CMR, and cardiac biomarkers are routinely used to identify cardiac abnormalities **(3)**, and neurologic, ophthalmologic, and gastrointestinal assessments can help to identify noncardiac symptoms **(7)**. A diagnosis can and should be achieved as soon as possible once suspicion has been raised, and noninvasive approaches to definitively diagnose ATTR-CM are available (**Figure 2**).

JACC: Heart Failure, 7(8), 709–716.

Review Article

A systematic review and meta-analysis of the prevalence of transthyretin amyloidosis in heart failure with preserved ejection fraction

Mohamed Magdi[1], Mostafa Reda Mostafa[1], Waiel Abusnina[2], Ahmad Al-abdouh[3], Ramy Doss[4], Sarah Mohamed[5], Chidera Philippa Ekpo[5], Richard Alweis[1], Bipul Baibhav[6]

[1]Department of Internal Medicine, Rochester Regional Health, NY, USA; [2]Department of Cardiology, Creighton University School of Medicine, NE, USA; [3]Department of Medicine, University of Kentucky, KY, USA; [4]Department of Internal Medicine, Baylor University Medical Center, Dallas, Texas; [5]Department of Ophthalmology, Cairo University, Cairo, Egypt; [6]Department of Cardiology, Rochester General Hospital, NY, USA

Received March 2, 2022; Accepted May 2, 2022; Epub June 15, 2022; Published June 30, 2022

Abstract: Background: Heart failure with preserved ejection fraction is a complex clinical syndrome marked by different phenotypes and related comorbidities. Transthyretin amyloidosis is an underestimated phenotype. We aim to evaluate the prevalence of transthyretin amyloidosis in heart failure with preserved ejection fraction. Methods: This meta-analysis was conducted according to PRISMA guidelines. A search strategy was designed to utilize PubMed/Medline, EMBASE, and Google scholar to locate studies whose primary objective was to analyze the prevalence of transthyretin amyloidosis in heart failure preserved ejection fraction. Results: Of 271 studies initially identified, 5 studies comprising 670 patients were included in the final analysis. The prevalence of transthyretin amyloidosis was 11%. Patients with transthyretin amyloid cardiomyopathy were more likely to be males (RR 1.38; 95% CI 1.09 to 1.75; P<0.01; I^2=37%), and more likely to have low voltage criteria on ECG (RR 2.98; 95% CI 1.03 to 8.58; P=0.04; I^2=75%) compared with transthyretin negative group. They also have higher SMD of age (SMD 0.73; 95% CI 0.48 to 0.97; P<0.01; I^2=0%), and NT-proBNP (SMD 0.48; 95% CI 0.02 to 0.93; P=0.04; I^2=36%) compared with transthyretin negative group. On reported echocardiogram, they have higher SMD of mass index (SMD 0.77; 95% CI 0.27 to 1.27; P<0.01; I^2=65%), posterior wall thickness (SMD 0.92; 95% CI 0.62 to 1.21; P<0.01; I^2=0%), and septal wall thickness (SMD 1.49; 95% CI 0.65 to 2.32; P<0.01; I^2=87%) compared with transthyretin negative group. Conclusion: Transthyretin amyloidosis affects 11% of HFpEF patients. Therefore, screening HFpEF patients at risk of cardiac amyloidosis is warranted.

TTR amyloidosis Affects ~10% of HFpEF patients.

Am J Cardiovasc Dis 2022;12(3):102–111

Consequences of Delayed or Misdiagnosis Of TTR cardiac amyloidosis

- Patients' symptoms not improved
- Progression of disease to later stages, more amyloid fibril deposition
- Evaluation by multiple health care professionals
- Patients receive inappropriate treatment and diagnostic tests
- ~70% ATTR-CM patients reported seeing 2 or more different doctors/cardiologists before diagnosis
- ATTR-CM patients hospitalized 17 times (including 3 inpatient hospital admissions) in 3 years prior to diagnosis
- ? survival

Cardiol Ther (2021) 10:141–159

What happened..

November 16, 2021:

Technetium pyrophosphate scan – Strongly positive for cardiac amyloid

November 22, 2021:

Cardiac MRI – Typical features of amyloidosis present

November 23, 2021:

Coronary angiogram – normal coronaries

RV endomyocardial biopsy confirmed: ATTR cardiac amyloidosis

Genetic test negative for TTR gene mutation, therefore "wild-type"

Started Tafamidis 80mg daily within 3 weeks of discharge home.

Cost of tafamidis?

Tafamidis

Class: Transthyretin (TTR) stabilizer

Trade name: Vyndaqel, Vyndamax

Mechanism:

- Stabilizes TTR protein to prevent amyloid fibrils from deposit into tissue/organs where it doesn't belong

Benefit:

- Improves survival by 30%
- lowers HF hospitalizations by ~30%
- Improves quality of life

Side effects:

- None listed

UpToDate LexiDrugs, 2024

ORIGINAL ARTICLE

Vutrisiran in Patients with Transthyretin Amyloidosis with Cardiomyopathy

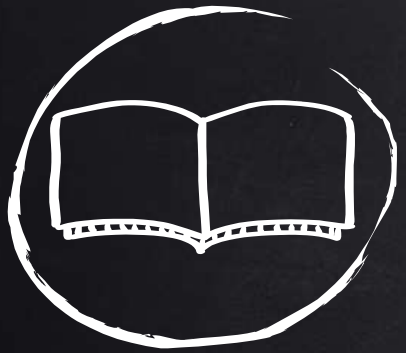
Authors: Marianna Fontana, M.D., Ph.D., John L. Berk, M.D., Julian D. Gillmore, M.D., Ph.D., Ronald M. Witteles, M.D., Martha Grogan, M.D., Brian Drachman, M.D., Thibaud Damy, M.D., Ph.D., +30, for the HELIOS-B Trial Investigators* Author Info & Affiliations

Published August 30, 2024 | DOI: 10.1056/NEJMoa2409134

Abstract

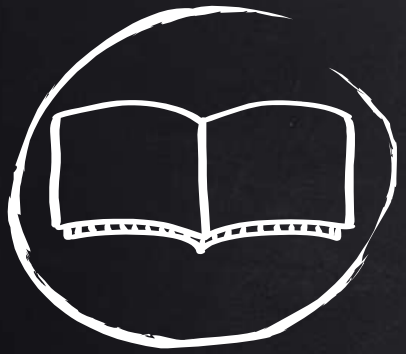
BACKGROUND

Transthyretin amyloidosis with cardiomyopathy (ATTR-CM) is a progressive, fatal disease. Vutrisiran, a subcutaneously administered RNA interference therapeutic agent, inhibits the production of hepatic transthyretin.



OBJECTIVES

1. Appreciate the socioeconomic impact of heart failure (HF)
2. Define heart failure
3. List 3 classic signs / symptoms of HF
4. Classify the different types of left-sided HF
5. List 3 common causes of HF
6. List 5 common modifiable risk factors for coronary artery disease
7. List 4 drugs for HF reduced ejection fraction (HFrEF) and two side effects for each
8. Name 1 example of an infiltrative cardiomyopathy that is growing in recognition and a drug used to treat it



RECAP

1. Yes, it's scary and expensive.
2. Can't pump to meet oxygen needs of the body.
3. Fatigue. Edema. Dyspnea
4. HFrEF, HFmrEF, HFpEF.
5. VITAMENC mnemonic.
6. Triple threat (HTN, DLD, DM), smoking, sedentary lifestyle
7. ACEI/ARB/ARNI (↓BP, ↑K+), BB (↓HR, fatigue), MRA (↑K+, gynecomastia), SGLT2i (genital fungal infxn, euglycemic DKA)

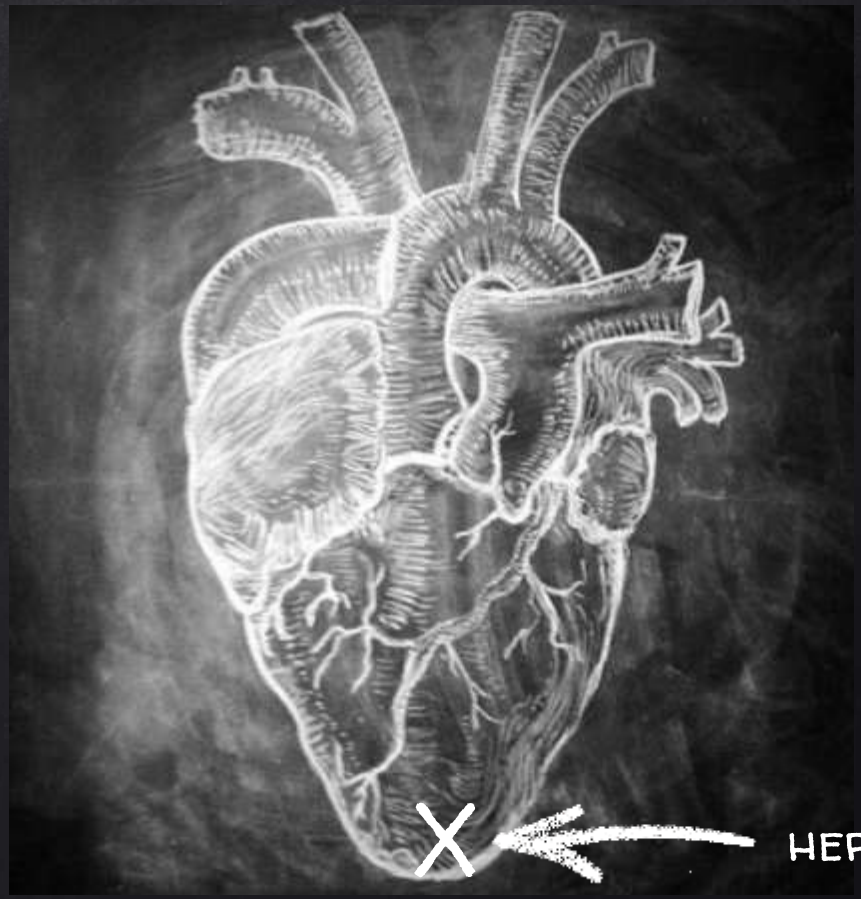
1. Transthyretin cardiac amyloidosis, tafamidis ($200k/yr) ..

.... maybe vutrisiran soon?

Special thanks:

- Ray Jang
- Atamjit Bassi
- Mike Kandler
- Jackie and Carl
- SMH Pharmacy technicians

Thank you!!



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