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Hypertension and heart failure

Tora Sadigova
MD PhD
Associate Professor
Department of Internal Disease
Azerbaijan Medical University

Master Course in Heart Failure 25 BAKU
Baku Marriott Hotel Boulevard
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DISCLOSURE

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✓ I have nothing to declare

Hypertension and Heart Failure

Hypertension is a leading cause of heart failure.

Approximately 50% of heart failure patients have a history of hypertension.

Latest ESC 2023 guidelines emphasize hypertension as a primary modifiable risk factor.

The AHA/ACC 2024 guidelines focus on the importance of managing blood pressure to reduce morbidity and mortality in heart failure patients.

The Complex Relationship Between Blood Pressure and Heart Failure

Complexity of BP in HF Patients:

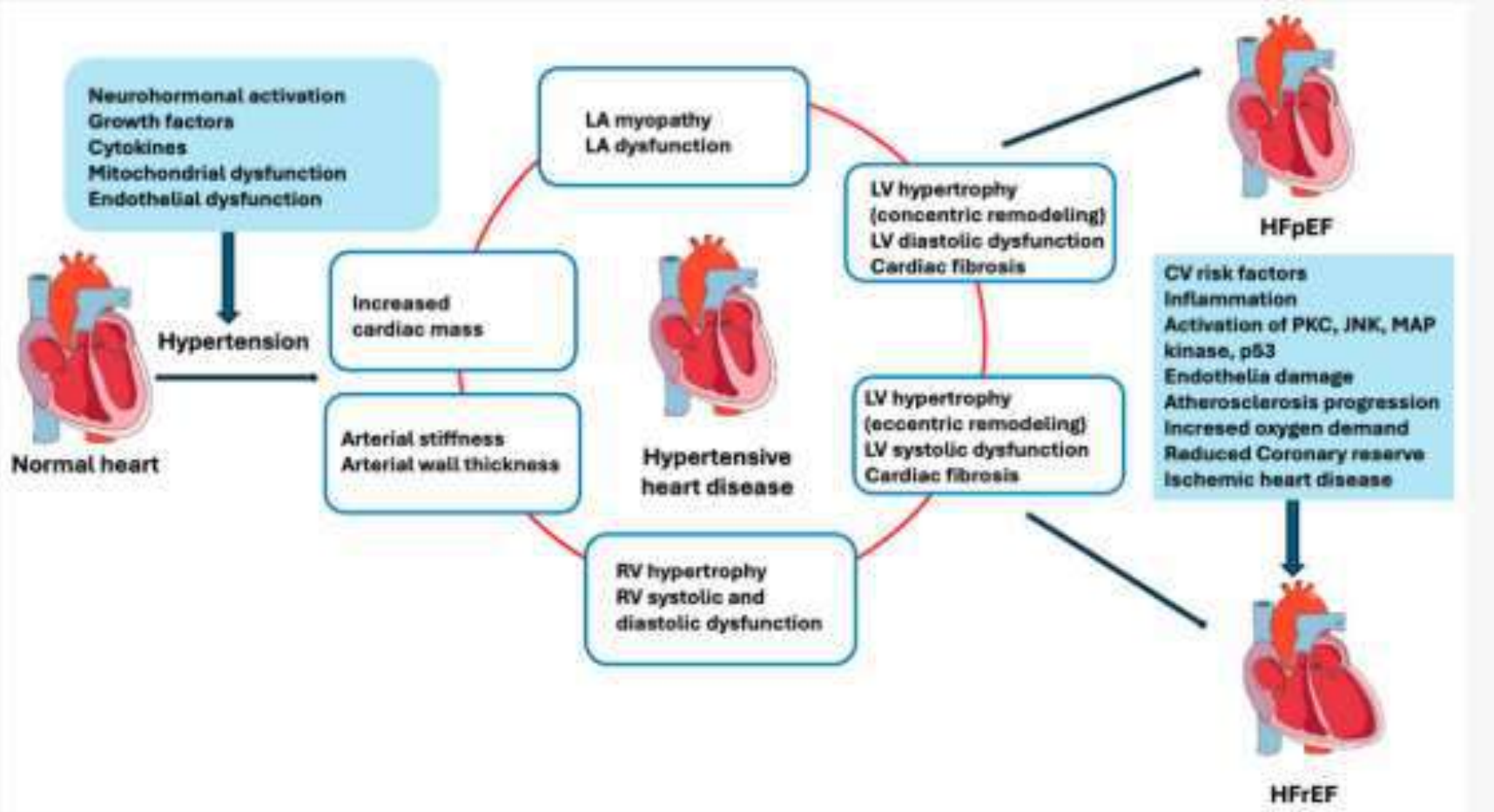
- **Systolic BP target**: < 130 mmHg for most heart failure patients.
- **ESC 2023 guidelines**: Emphasize the need for individualised treatment strategies based on patient-specific factors (age, comorbidities, and type of HF).
- Lower systolic BP (<120 mmHg) is associated with an **increased risk of adverse outcomes**, indicating that overly aggressive BP reduction may be harmful in some cases.

Prevalence and Risk Factors

Prevalence of Hypertension and Heart Failure:

- Global statistics: Over 1 billion people with hypertension.
- Increased incidence of heart failure in hypertensive patients.
- **HTN** is the most common cause of **HFpEF**, a condition primarily seen in elderly patients.
- **Risk factors**: Age, obesity, diabetes, chronic kidney disease, and a history of HTN.

Progression from hypertension to heart failure



Hypertension and Heart Failure: From Pathophysiology to Treatment

by Giovanna Gallo and Carmine Savoia *

Clinical and Molecular Medicine Department, Faculty of Medicine and Psychology, Sant'Andrea Hospital, Sapienza University of Rome, 00189 Rome, Italy

* Author to whom correspondence should be addressed.

Int. J. Mol. Sci. 2024, 25(12), 6661; https://doi.org/10.3390/ijms25126661

Molecular and Structural Mechanisms

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🩺 Hypertension

🔁 RAAS Activation

💥 Oxidative Stress & Mitochondrial Dysfunction

🧬 Signal Pathways

🦠 Cellular Effects Inflammation, Apoptosis, Fibrosis

❤️ Cardiac Remodeling, LV Hypertrophy, Diastolic Dysfunction, Fibrotic Wall Stiffness

- **RAAS Activation**
  Angiotensin II stimulates multiple harmful signaling cascades (e.g., MAPK, NF-κB, mTOR).
- **Oxidative Stress**
  Promotes mitochondrial dysfunction, protein/DNA damage, and apoptotic cell death.
- **Fibrosis and Hypertrophy**
  Chronic inflammation and fibroblast activation lead to myocardial stiffening and structural changes.
- **Outcome**
  Impaired relaxation, reduced compliance, and progression to heart failure.

Remodeling Stages and Phenotypes

Stage I – Isolated diastolic dysfunction

Stage II – Diastolic dysfunction with concentric LV hypertrophy

Stage III – Clinical HF with preserved EF

Stage IV – HFrEF with eccentric hypertrophy and chamber dilation

- Throughout these stages, other abnormalities develop: left atrial dysfunction, pulmonary hypertension, and abnormal ventricular-vascular coupling. These are especially prominent in **HFpEF**.

Pulmonary Hypertension and Right Heart Involvement

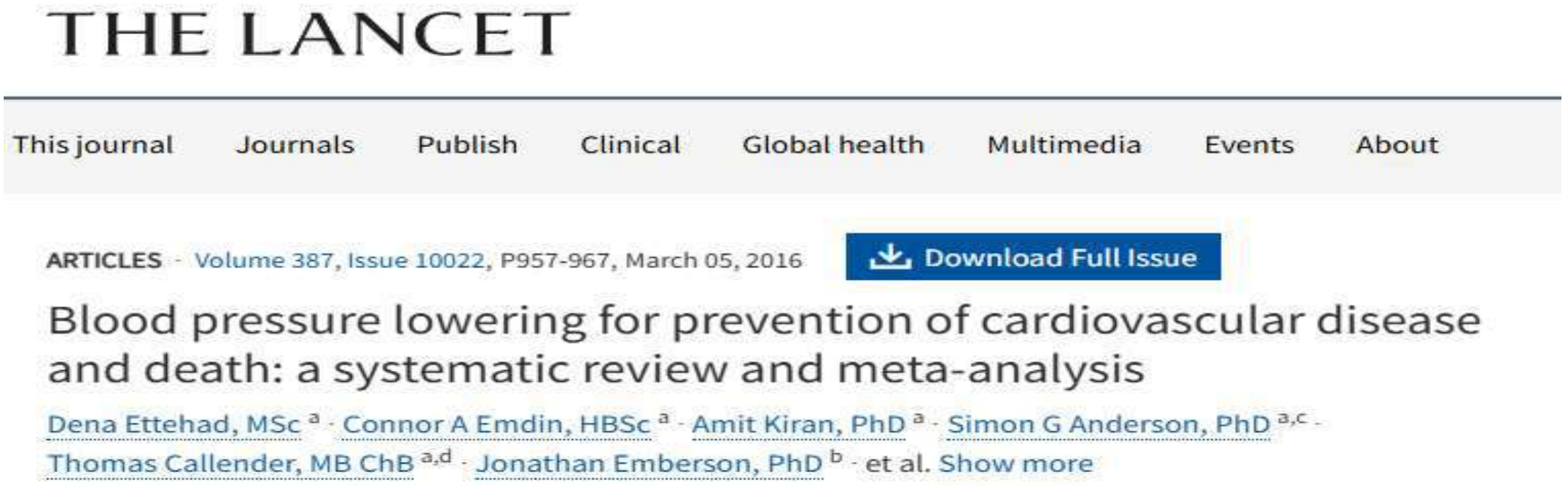
Left-sided pressure overload
Elevated filling pressures from LV lead to pulmonary hypertension.

Right ventricular dysfunction
Chronic overload impairs RV contractility → leads to fatigue and dyspnea.

Pulmonary vascular disease
Present in up to 80% of HFpEF cases, contributes to exercise intolerance.

Despite preserved EF
Output is impaired under stress — especially during exertion.

Here's the good news: controlling BP works



➢A meta-analysis of over 600,000 individuals showed that every **10 mmHg** reduction in systolic BP results in a **28%** reduction in HF risk.

So, what BP should we aim for?

Guidelines suggest a **target below 130/80 mmHg** in most hypertensive patients.

In older or frail individuals, a more conservative goal **<140/80 mmHg** may be more appropriate.

The NEW ENGLAND JOURNAL of MEDICINE

CURRENT ISSUE SPECIALTIES TOPICS

ORIGINAL ARTICLE

Final Report of a Trial of Intensive versus Standard Blood-Pressure Control

Author: The SPRINT Research Group* Author Info & Affiliations

Published May 19, 2021 | N Engl J Med 2021;384:1921-1930 | DOI: 10.1056/NEJMoa1901281 | VOL. 384 NO. 20

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Semaglutide Treatment Effect in People With Obesity and HFpEF - STEP-HFpEF

Aug 26, 2024

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Font Size A A A

Author/Summarized by Author: Dharam J. Kumbhani, MD, SM, FACC

Summary Supplemental Reviewer: Kim A. Eagle, MD, MACC

Importance of Nighttime BP and Circadian Patterns

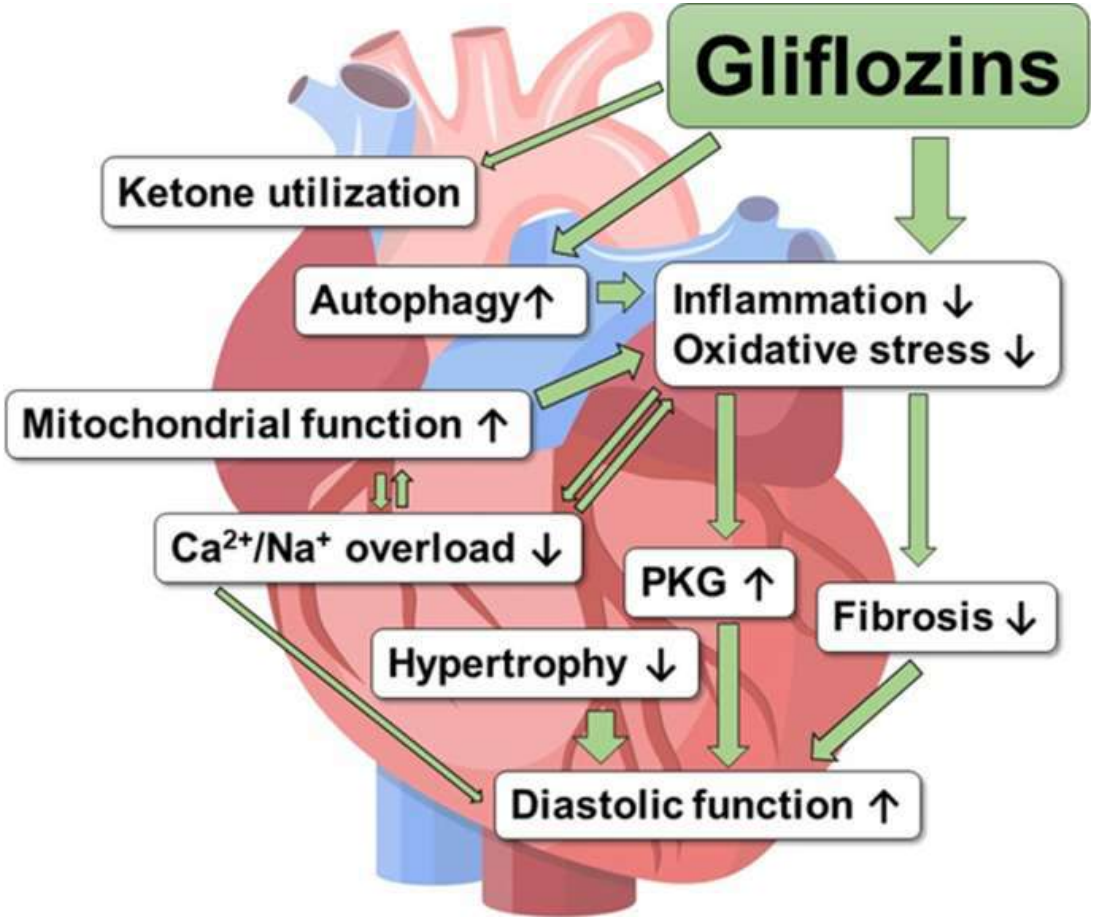
Nighttime Hypertension: Abnormal circadian BP patterns, such as **non-dipping or riser patterns**, are significant predictors of heart failure and cardiovascular events.

ESC 2023: Highlights the role of **nighttime BP** in the progression of heart failure and its impact on cardiovascular prognosis.

Drug Treatment
Established Classes

- ACE inhibitors or ARBs
- Beta-blockers
- Mineralocorticoid receptor antagonists (MRAs)
- Calcium channel blockers
- Thiazide/thiazide-like diuretics

SGLT2 Inhibitors — A Revolution



- From glucose control to heart failure protection
- The era of cardio-renal-metabolic drugs

Finerenone — New Class, Big Promise

The NEW ENGLAND JOURNAL of MEDICINE

CURRENT ISSUE SPECIALTIES TOPICS

ORIGINAL ARTICLE

Finerenone in Heart Failure with Mildly Reduced or Preserved Ejection Fraction

Authors: Scott D. Solomon, M.D., John J.V. McMurray, M.D., Muthiah Vaduganathan, M.D., M.P.H., Brian Claggett, Ph.D., Pardeep S. Jhund, M.B., Ch.B., Ph.D., Akshay S. Desai, M.D., M.P.H., Alasdair D. Henderson, Ph.D., +52, for the FINEARTS-HF Committees and Investigators* Author Info & Affiliations

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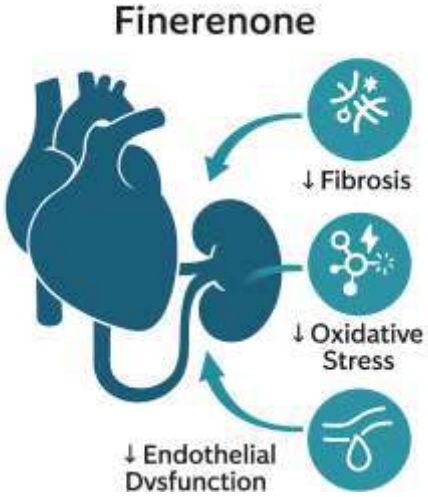
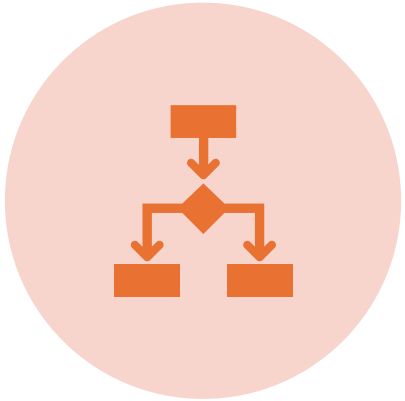


Reducing

- fibrosis
- oxidative stress
- endothelial dysfunction

Novel Agents in the Pipeline

ET-1 RECEPTOR ANTAGONISTS



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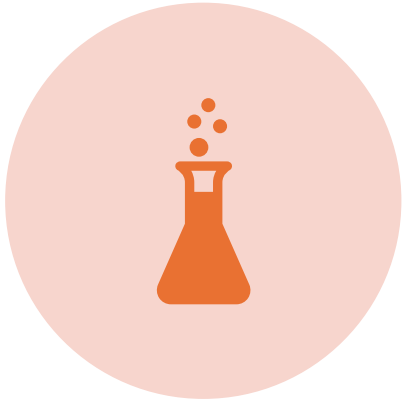

ALDOSTERONE SYNTHASE INHIBITORS

The Role of Lifestyle and Diet



What's Next?

Precision Nutrition

- Tailoring dietary interventions to **genomic and metabolic profiles**
- Integrating **AI and biomarkers** into nutritional plans
- Ongoing clinical trials in **nutrigenomics**

ESC 2024 Guidelines on Hypertension Management in Heart Failure

Key Recommendations:

- **Systolic BP target**: < 130 mmHg for most patients with heart failure.
- **ARNI** (sacubitril/valsartan) for HFrEF patients.
- **SGLT2 inhibitors** (empagliflozin, dapagliflozin) recommended for both **HFrEF** and **HFpEF**.
- **Mineralocorticoid receptor antagonists** (MRAs) are essential in managing heart failure and hypertension.

Heart failure					
In patients with HFrEF, it is recommended that BP-lowering treatment comprises an ACE inhibitor or ARB, a beta-blocker and diuretic and/or MRA if required.	I	A	In patients with symptomatic HFrEF/HFmrEF, the following treatments with BP-lowering effects are recommended to improve outcomes: ACE inhibitors (or ARBs if ACE inhibitors are not tolerated) or ARNi, beta-blocker, MRA, and SGLT2 inhibitors.	I	A
In patients with HFpEF, because no specific drug has proven its superiority, all major agents can be used.	I	C	In hypertensive patients with symptomatic HFpEF, SGLT2 inhibitors are recommended to improve outcomes in the context of their modest BP-lowering properties.	I	A
			In patients with symptomatic HFpEF who have BP above target, ARBs and/or MRAs may be considered to reduce heart failure hospitalizations and reduce BP.	IIb	B

AHA/ACC 2024 Guidelines for Hypertension in Heart Failure

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Focus Areas:

Combination therapy: **ACE inhibitors, ARBs, ARNI, and SGLT2 inhibitors**.

The guidelines stress **individualized BP management** based on patient age, comorbidities, and type of HF.

Importance of managing **nighttime BP** and recognizing **circadian rhythms** for better outcomes.

Case 1

Age: 65 years.

Gender: Male.

Complaints:

- Shortness of breath on exertion (NYHA class II).
- Fatigue, decreased physical activity.
- Occasional headaches and dizziness.
- Swelling of the legs and abdomen.

Initial Diagnosis:

The patient was initially diagnosed with hypertension

Treatment:

Only antihypertensive medications (calcium channel blockers and diuretics) were used.

Clinical Diagnostics:

Chronic heart failure with reduced ejection fraction (HFrEF)
(on the background of hypertension and type 2 diabetes)

Echocardiography: Reduced left ventricular ejection fraction (LVEF) of 35%, myocardial remodeling present.

ECG: Signs of left ventricular hypertrophy.

Blood tests: NT-proBNP ⬆️ ; HbA1 ⬆️ ; fasting glucose ⬆️

Home Blood Pressure Monitoring: Average blood pressure of 150/90 mmHg

Pharmacological Treatment:

- ARNI (sacubitril/valsartan)
- Beta-blockers (e.g., carvedilol)
- SGLT2 inhibitors (e.g. dapagliflozin)
- Mineralocorticoid receptor antagonists (spironolactone)
- Diuretics (e.g., furosemide)

Case 2

Age: 70 years.

Gender: Female.

Complaints:

- Shortness of breath on exertion (NYHA class II).
- Fatigue and reduced physical activity.
- Occasional dizziness and headaches.
- Swelling of the ankles and lower legs.

Initial Diagnosis:

The patient was initially diagnosed with - Hypertension

Treatment:

•ACE inhibitors alone for hypertension control.

Diagnostic Approach

- **Echocardiography**: Preserved left ventricular ejection fraction (LVEF) with evidence of diastolic dysfunction (impaired relaxation and filling pressures).
- **ECG**: Normal rhythm with occasional atrial ectopic beats.
- **Blood tests**: NT-proBNP ⬆️ .
- **Home Blood Pressure Monitoring**: Blood pressure of 155/95 mmHg despite the use of ACE inhibitors.

Treatment and Recommendations

Pharmacological Treatment:

- **Angiotensin receptor blockers (ARBs)**
- **SGLT2 inhibitors (empagliflozin)**
- **Diuretics (e.g., furosemide)**
- **Beta-blockers**

Lifestyle Modifications:

- Weight management and dietary modifications: Reduced sodium intake and increased potassium consumption.
- Regular physical activity, such as walking or low-impact exercises, to improve overall cardiovascular health and reduce hypertension.

Monitoring and Follow-up: ESC 2023 and AHA 2024 Guidelines

Key Monitoring Parameters:	**BP measurement**: Regular follow-ups to monitor for signs of heart failure exacerbation.
	Renal function: Monitoring renal function and electrolytes, especially when using **ARNI**, **MRAs**, and **SGLT2 inhibitors**.
	Cardiac function: Regular echocardiograms and BNP/NT-proBNP testing.
	Follow-up visits every 3–6 months or more frequently if symptoms worsen.

Challenges and Future Directions

Challenges:

- Ensuring **adherence to guideline-recommended therapies**.
- Managing patients with **multiple comorbidities**.
- Tailoring therapy based on **patient-specific characteristics**.

Future Research:

- Ongoing trials exploring **novel therapies** for heart failure and hypertension.
- The potential of **SGLT2 inhibitors**, **ARNI**, and **circadian BP management**

Key Takeaways:

Hypertension remains a leading cause of **heart failure**.

Optimal BP control, as outlined in **ESC 2023** and **AHA 2024**, is critical for **reducing morbidity** and **mortality**.

Comprehensive management includes **medication**, **lifestyle changes**, and **regular monitoring**.

We must recognize the importance of **individualized treatment** in managing hypertension in heart failure patients.

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Medicine rooted in science
Care guided by heart

Thank You!

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