



ESC Cardiovascular Round Table

Unmet needs in the Clinical Setting in the era of AI and CDSS

This technology will solve unmet needs and definitively change the way medicine is practiced, and medical knowledge is managed



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Conflicts of interest Co-founder

naevia
MEDICAL
powered by scientific knowledge

About naevia How it works Contact esp eng

Try it, enter a clinical case

UNION EUROPEA

The complexity of today's medicine poses an ongoing challenge to organizations and practitioners

That's why we have created naevia, an AI platform powered by scientific knowledge that facilitates and improves clinical decision-making



Decision support

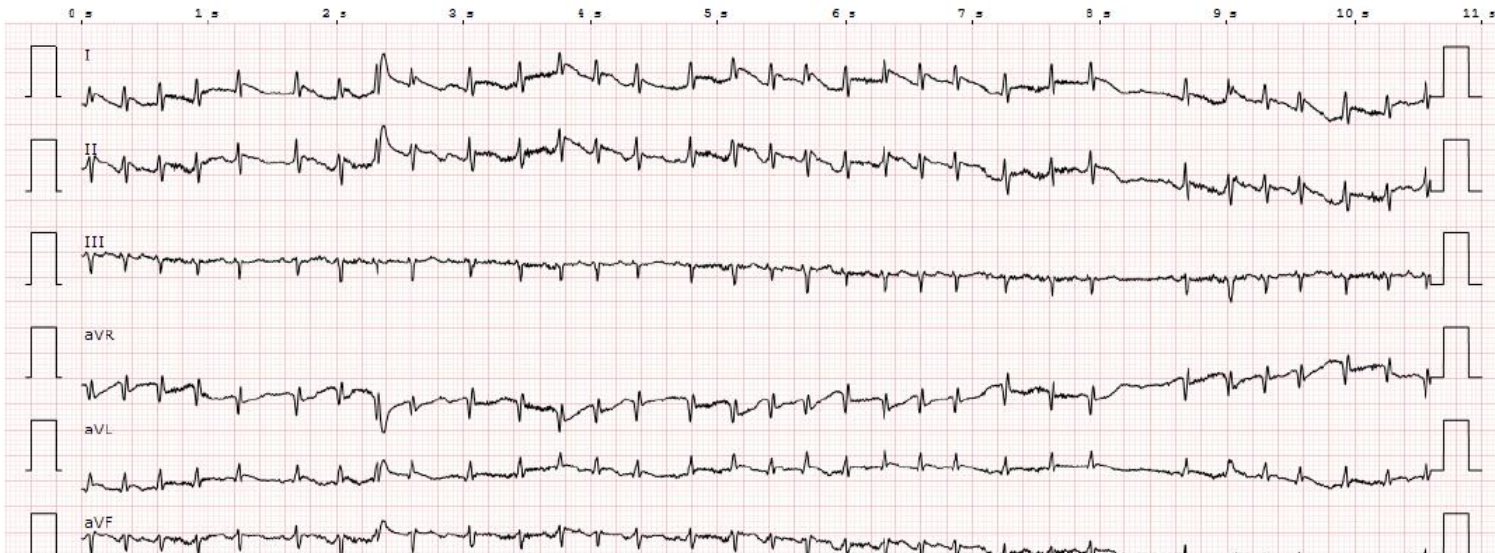
Ensuring the quality of Clinical Decisions

- Bridging the gap between scientific evidence and medical practice through better **adherence to scientific recommendations**
- Underuse vs. overuse
- Avoiding preventable medical errors
- Reducing variability

First generation CDSS Isolated interpretation of the finding

Name: Vent rate: 176 BPM
Sex: Male PR int.: 2147450879 ms
Birthdate: 05/12/1958 QRS dur.: 103 ms
Age: - QT/QTc: 295/505 ms
Patient ID: F-QRS-T axes: 2147450879 13 51
ECG Date: 25/05/2024, 21:22:31

Edad no introducida, se consideran 50 años a efectos de interpretación del ECG
Fibrilación auricular con frecuencia V alta...frecuencia A 0
Bajo voltaje en derivs miembros y precordiales...miembros<0.5mV, precordial<1.0mV
ELECTROCARDIOGRAMA (ECG)





Systems designed to assist in a single decision

A Alert displayed at time of visit for single patient

BestPractice Advisories

Preventive Care (1)

ⓘ Your patient has heart failure with a reduced ejection fraction (HFrEF) but is not on guideline-directed therapy.


Heart Failure Medication Alert


This patient with HFrEF is not on an aldosterone antagonist. The electronic record suggests no contraindications, such as hypotension (SBP <95), hyperkalemia (K>5.1), renal dysfunction (GFR <30), allergy, or pregnancy. [Guidelines](#).

Current heart failure therapies for this patient:

Beta-blocker: carvedilol - 3.125 mg
 ACE-II/ARB/ARNI: losartan - 25 mg
 Aldosterone antagonist: **NONE**

Your patient's most recent data:
 BP Readings from Last 1 Encounters:
 02/28/22 133/71

Lab Results	Value	Date
POTASSIUM	4.7	02/02/2022
EGFR MDRD NON AFRICAN AMERICAN	49.6 (L)	03/08/2020
eGFR (CKD-EPI 2021)	56.2 (L)	02/02/2022
LV Ejection Fraction TTE	25.0	02/28/2022

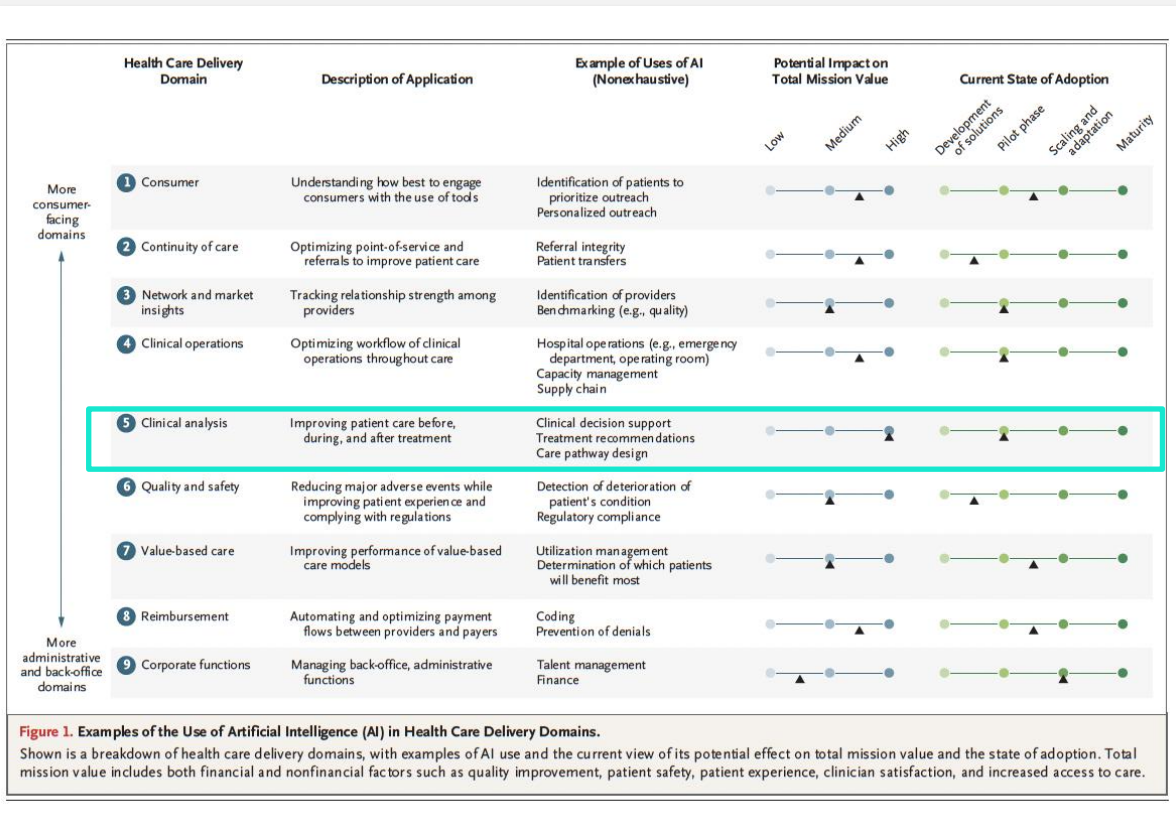
[Preview](#)

Acknowledge Reason

Ej. aldosterone antagonist

Mukhopadhyay, *Cluster-Randomized Trial Comparing Ambulatory Decision Support Tools to Improve Heart Failure Care.* JACC (2023)

CDSS is the most impactful application of AI





Data and information management

- Remove the chaos of unstructured information in EHR
- Facilitate interoperable structuring at origin
- Facilitating access to data and reporting (50% of our time)

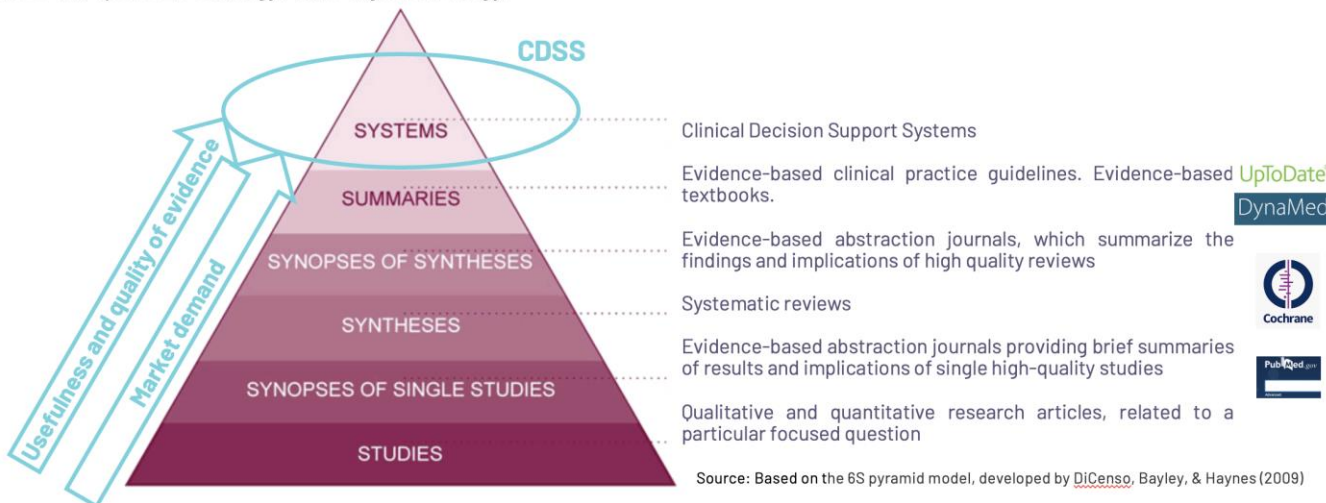
Capture of relevant information



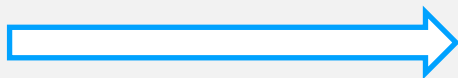
Medical Knowledge Management

“The growing patient demand for quality care has prompted healthcare systems worldwide to adopt CDSS technologies that help curtail costs, enhance care quality, prevent errors, and save time”

(Source: Europe 2020 strategy. WHO digital strategy)



Traditional way. In case of doubt of knowledge



PULL APPROACH

Enter clinical query



New model

The patient is a 76-year-old female.
Admitted by acute coronary syndrome and ST-segment elevation myocardial infarction, both diagnosed on 9/16/2024. She also has a history of hypertension, first diagnosed in 2021. Additionally, in the field of pulmonary medicine, the patient has a long-standing diagnosis of asthma, which dates to 1998.
She presents as asymptomatic in terms of cardiovascular symptoms. Her vital signs show a heart rate of 65 bpm and a blood pressure reading of 132/67 mmHg on 9/16/2024.

PUSH APPROACH

Enter patient information



Knowledge and recommendations that applies to my
specific patient

Recommendations that apply to patient characteristics

ENTER: PATIENT CLINICAL INFORMATION

The patient is a 76-year-old female. Admitted by acute coronary syndrome and ST-segment elevation myocardial infarction, both diagnosed on 9/16/2024. She also has a history of hypertension, first diagnosed in 2021. Additionally, in the field of pulmonary medicine, the patient has a long-standing diagnosis of asthma, which dates to 1998. She presents as asymptomatic in terms of cardiovascular symptoms. Her vital signs show a heart rate of 65 bpm and a blood pressure reading of 132/67 mmHg on 9/16/2024.

Management Medications

- ST elevation myocardial infarction without heart failure.** beta blocker therapy with a **beta-1-selective agent is recommended** in most patients: After initial intravenous/oral doses, continue with **Metoprolol tartrate** (immediate release preparation) 25 to 50 mg two to four times daily or **Metoprolol succinate** (extended release preparation) 25 to 200 mg daily or **Atenolol** 50 to 100 mg daily (in one or two doses).
 - REQUIRED ACTIONS: Include in report High Priority
- Recommendations for long-term management (after acute coronary syndrome):** It is recommended that **high-dose statin therapy (Atorvastatin 40 to 80 mg or Rosuvastatin 20 to 40 mg)** is initiated or continued as early as possible, regardless of initial LDL-C values.
 - REQUIRED ACTIONS: Include in report High Priority Class I Level A
- Aspirin is recommended** for all acute coronary syndrome patients without contraindications: initial oral loading dose of 150-300 mg (or 75-250 mg i.v.) and a maintenance dose of 75-100 mg o.d.
 - REQUIRED ACTIONS: Include in report High Priority Class I Level A
- In all acute coronary syndrome patients, a P2Y12 receptor inhibitor is recommended** in addition to aspirin, given as an initial oral loading dose followed by a maintenance dose for 12 months unless there is high bleeding risk (in the absence of indication for chronic anticoagulation).
 - **Prasugrel** is recommended in **P2Y12 receptor inhibitor-naïve patients proceeding to PCI** (Class I, LOE B)
 - **Ticagrelor** is recommended irrespective of the treatment strategy (invasive or conservative) (Class I, LOE B)
 - **Prasugrel** should be considered in **preference to ticagrelor** for ACS patients who proceed to PCI (Class IIa, LOE B)
 - **Clopidogrel** is recommended when **prasugrel or ticagrelor are not available, cannot be tolerated, or are contraindicated** (Class I, LOE C)
 - In older ACS patients (from 70 to 80 years of age). Frailty and comorbidities should also be taken in consideration. Especially if **high bleeding risk** (presence of a single major or two minor characteristics as defined by ARC-HBR) **clopidogrel** as the P2Y12 receptor inhibitor **may be considered**
 - REQUIRED ACTIONS: Include in report High Priority Class I Level A
- Parenteral anticoagulation** is recommended for all patients with acute coronary syndrome **at the time of diagnosis** (exceptions to parenteral anticoagulation:
 - In **antagonists, parenteral anticoagulation not recommended if INR >2.5**.
 - **venous is recommended in NSTEMI-ACS patients in whom early invasive angiography (i.e. within 24 h) is not anticipated.**
 - REQUIRED ACTIONS: Include in report High Priority Class I Level A
- Angiotensin-converting enzyme (ACE) inhibitors** (angiotensin receptor blockers in cases of intolerance) **are recommended** in acute coronary syndrome patients with heart failure symptoms, left ventricular ejection fraction <40%, diabetes, hypertension, and/or chronic kidney disease.
 - REQUIRED ACTIONS: Include in report High Priority Class I Level A
- Intravenous beta-blockers (preferably metoprolol)** should be considered **at the time of presentation** in patients undergoing PPCI (primary percutaneous coronary intervention) with no signs of acute heart failure, an systolic blood pressure >120 mmHg, and no other contraindications. Metoprolol recommended dose: **three bolus of 5 mg/2 minutes. 15 minutes after the third bolus start oral metoprolol tartrate 50 mg/6 hours for 2 days**, after 2 days, continue with metoprolol tartrate or metoprolol succinate.
 - REQUIRED ACTIONS: Include in report High Priority Class IIa Level A
- Prolonging antithrombotic therapy after acute coronary syndrome:** Adding a second antithrombotic agent to aspirin (75-100 mg o.d) for **extended long-term (after 1 year) secondary prevention** should be considered in patients with high ischaemic risk and without high bleeding risk (in the absence of indication for chronic anticoagulation). Treatment options for extended dual antithrombotic or antiplatelet therapies:
 - **Rivaroxaban** (XAPROAS) 15/2.5 mg b.i.d. Patients with coronary artery disease or symptomatic peripheral arterial disease at high risk of ischaemic events
 - **Clopidogrel** (DAPT trial): 75 mg/d Post-MI in patients who have tolerated DAPT for 1 year
 - **Prasugrel** (DAPT trial): 10 mg/d (5 mg/d if body weight < 60 kg or age >75 years) Post-PCI for MI in patients who have tolerated DAPT for 1 year
 - **Ticagrelor** (PEGASUS-TIMI 54) 60/90 mg b.i.d. Post-MI in patients who have tolerated DAPT for 1 year (60 mg preferred dose)
 - REQUIRED ACTIONS: Include in report High Priority Class IIa Level A
- Intravenous opioids** (e.g. morphine 5-10 mg) should be considered to **relieve severe chest pain** in patients with acute coronary syndrome.
 - REQUIRED ACTIONS: Include in report High Priority Class IIa Level C
- A mild tranquilizer** should be considered for the initial management in **very anxious patients** with acute coronary syndrome.
 - REQUIRED ACTIONS: Include in report High Priority Class IIa Level C
- Previous use of vasoconstrictive nasal drops** should be explored in patients with hypertension.
 - REQUIRED ACTIONS: Include in report Medium Priority
- Lipid-Lowering Agents.** In patients with acute coronary syndrome it is recommended to aim to **achieve an LDL-C level of < 1.4 mmol/L (< 55 mg/dL) and to reduce LDL-C by ≥50%** from baseline.
 - REQUIRED ACTIONS: Include in report Medium Priority Class I Level A



- Related Knowledge (output decisions)
- Diagnosis
 - Management
 - Prognosis
 - Value Propagation
 - Unclassified
 - Setting (clinical scenarios)
 - Acute: Emergency Admission
 - Subacute: Hospitalization-Discharge
 - Chronic: Ambulatory

ENTER: PATIENT CLINICAL INFORMATION

The patient is a 76-year-old female. Admitted by acute coronary syndrome and ST-segment elevation myocardial infarction, both diagnosed on 9/16/2024. She also has a history of hypertension, first diagnosed in 2021. Additionally, in the field of pulmonary medicine, the patient has long-standing diagnosis of asthma, which dates to 1998. She presents as asymptomatic in terms of cardiovascular symptoms. Her vital signs show a heart rate of 65 bpm and a blood pressure reading of 132/67 mmHg on 9/16/2024.



Suggested actions in Complementary Tests (View more...)

Complementary Tests	Fasting Glucose	Action suggested
Complementary Tests	Hb A1c	Action suggested
Complementary Tests	Creatinine	Action suggested
Complementary Tests	Albumin-Creatinine Ratio	Action suggested
Complementary Tests	hs-cTn I at 0h	Action suggested
Complementary Tests	hs-cTn T at 0h	Action suggested
Complementary Tests	EKG	Action suggested

Show

Suggested actions in Active Diagnostics and Current Problems (View more...)

Active Diagnostics and Current Problems	Acute Coronary Syndrome	Action suggested
Active Diagnostics and Current Problems	Acute Coronary Syndrome Ongoing episode	Action suggested
Active Diagnostics and Current Problems	Myocardial Infarction	Action suggested
Active Diagnostics and Current Problems	Atherosclerotic cardiovascular disease	Action suggested
Active Diagnostics and Current Problems	Asthma Caution situation	Action suggested
Active Diagnostics and Current Problems	Kidney disease	Action suggested
Active Diagnostics and Current Problems	High bone fracture probability Caution situation	Action suggested
Active Diagnostics and Current Problems	High bone fracture probability	Action suggested



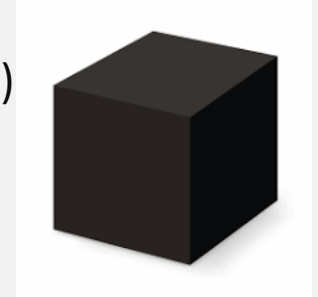
- **Knowledge-Based CDSS, automatic reasoning. Ruled based AI**

Applies clinical rules from a knowledge base



- **CDSS, Machine Learning**

Generative AI, Deep Neural Networks, Large Language Models (LLM)



A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. Preserved systolic function. Affected by hypertension and type 2 diabetes. History of appendectomy.

He was treated with Acetylsalicylic acid 100 mgs, Atenolol 50 mgs, Atorvastatin 80 mgs and Omeprazole 20 mgs.

Asymptomatic.

Blood pressure 145/80 mmHg. 49 bpm.

Sinus rhythm

Glucose 157 mg/dL, HbA1c 7%, Creatinine 1.8 mg/dL, LDL cholesterol 67 mg/dL (1.74 mmol/L), HDL 35 mg/dL, Triglycerides 160 mg/dL /1.81 mmol/L).

Is this patient well treated, should I make any diagnostic or therapeutic decisions with him?

1. Rule based CDSS

Inferences and diagnostic recommendations

A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. Preserved systolic function. Affected by hypertension and type 2 diabetes. History of appendectomy.

He was treated with Acetylsalicylic acid 100 mgs, Atenolol 50 mgs, Atorvastatin 80 mgs and Omeprazole 20 mgs.

Asymptomatic.

Blood pressure 145/80 mm

Sinus rhythm

Glucose 157 mg/dL, HbA1c mg/dL, HDL 35 mg/dL, Tri

- > Diagnosis > Diagnostic level > Suspicion and interpretation

Consider a diagnosis of chronic kidney disease: Glomerular filtration rate < 60 mL/min/1.73m2 for >3 months is a criteria for this diagnosis. 👍 ✖ More ▾

REQUIRED ACTIONS Include in report High Priority

Triggering rule	Variables	Compliance	Rule classifications
Clinical information 🔗			
Name	Value		
Complementary Tests: Glomerular Filtration Rate	38.77 mL/min/1.73m2 (BSA)		

Inferred variables

1. Rule based CDSS. Test recommendations

A 75-year-old male patient with a medical history of hypertension and hyperlipidemia. He was prescribed Atorvastatin. Asymptomatic. Blood pressure 130/80 mmHg. Sinus rhythm. Glucose 100 mg/dL, HbA1c 5.6%.

▼ It is recommended that all patients with **type 2 diabetes** are **screened for kidney disease** by assessing **eGFR** (estimated glomerular filtration rate) and **UACR** (urinary albumin-to-creatinine ratio) at least annually, regardless of treatment 👍

REQUIRED ACTIONS
 Include in report Medium Priority Level B

Triggering rule	Variables	Compliance	Rule classifications
Clinical information 🔗			
Name		Value	
Active Diagnostics and Current Problems: Diabetes Mellitus, Type 2		True	
Inferred variables			
Name		Value	
		No data available in table	

▼ Measurement of **urine albumin:creatinine ratio is recommended** in all patients with **arterial hypertension**. 👍

REQUIRED ACTIONS
 Include in report Medium Priority Class I Level B

Triggering rule	Variables	Compliance	Rule classifications
Clinical information 🔗			
Name		Value	
Active Diagnostics and Current Problems: Hypertension		True	

1. Rule based CDSS. Therapeutic recommendations

A 75-year-old male patient was diagnosed with hypertension in February 2021, with a medial right carotid artery stenosis and hypertension atherosclerosis. He was treated with Atorvastatin 80 mg daily. Asymptomatic. Blood pressure 130/80 mmHg. Sinus rhythm. Glucose 157 mg/dL, HDL 35 mg/dL.

v **Angiotensin-converting enzyme (ACE) inhibitors** (angiotensin receptor blockers in cases of intolerance) **are recommended** in acute coronary syndrome patients with heart failure symptoms, left ventricular ejection fraction $\leq 40\%$, diabetes, hypertension, and/ or chronic kidney disease 👍

Include in report High Priority Class I Level A

Triggering rule
 Variables
 Compliance
 Rule classifications

Clinical information 🔗

Name	Value
Active Diagnostics and Current Problems: Acute Coronary Syndrome	Verdadero
Active Diagnostics and Current Problems: Diabetes Mellitus	True

Inferred variables

Name	Value
No data available in table	

> In patients with **type 2 diabetes** with multiple **atherosclerotic cardiovascular disease (ASCVD) risk factors** or established ASCVD, **sodium-glucose cotransporter-2 inhibitors** (empagliflozin, canagliflozin, dapagliflozin, ertugliflozin, or sotagliflozin) are recommended to reduce the risk of heart failure hospitalization. 👍

Include in report High Priority Class I Level A

> In patients with **type 2 diabetes**, tight **glycaemic control (HbA1c < 7%)** should be considered for reducing **coronary artery disease** in the long term, preferably using agents with proven cardiovascular benefit: **sodium-glucose cotransporter-2 inhibitors** (empagliflozin, canagliflozin, dapagliflozin, sotagliflozin) or **glucagon-like peptide-1 receptor agonists** (liraglutide, semaglutide s.c., dulaglutide, efpeglenatide). 👍

Include in report High Priority Class IIa Level B

1. Rule based CDSS. Therapeutic recommendations

A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. He has a history of hypertension and hypercholesterolemia. He was treated with Aspirin 80 mg, Atorvastatin 80 mg, and Lisinopril 10 mg. Asymptomatic. Blood pressure 120/70 mmHg. Sinus rhythm. Glucose 157 mg/dL, HDL 35 mg/dL.

In patients with type 2 diabetes, **finerenone** is recommended *in addition to an angiotensin-converting enzyme inhibitor or angiotensin-II receptor blocker* in patients with:
 eGFR >60 mL/min/1.73 m² with a Albumin-Creatinine Ratio (UACR) ≥30 mg/mmol (≥300 mg/g),
 or eGFR 25–60 mL/min/1.73 m² and UACR ≥3 mg/mmol (≥30 mg/g) to reduce cardiovascular events and kidney failure.

[REQUIRED ACTIONS](#)

 Include in report
 Medium Priority
 Class I
 Level A

Triggering rule	Variables	Compliance	Rule classifications
Clinical information			
Name		Value	
Active Diagnostics and Current Problems: Diabetes Mellitus, Type 2		True	
Inferred variables			
Name		Value	
No data available in table			

1. Rule based CDSS. Adherence to scientific recommendations

A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. Preserved systolic function. Affected by

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Asympt

Blood p

Sinus r

Glucose

mg/dL,

> **Aspirin is recommended** for all acute coronary syndrome patients without contraindications: initial oral loading dose of 150–300 mg (or 75–250 mg i.v.) and an **maintenance dose of 75-100 mg o.d. for long-term treatment**. In patients with no indication for chronic anticoagulation.

COMPLIED

Include in report

High Priority

Class I

Level A

> In **ST elevation myocardial infarction without heart failure**, beta blocker therapy with a **beta-1-selective agent is recommended** in most patients: After initial intravenous/oral doses, continue with **Metoprolol tartrate** (immediate release preparation) 25 to 50 mg two to four times daily or **Metoprolol succinate** (extended release preparation) 25 to 200 mg daily **or Atenolol** 50 to 100 mg daily (in one or two doses).

COMPLIED

Include in report

High Priority

> **High-intensity statin therapy** (lowers LDL-C by $\geq 50\%$): atorvastatin 40-80mg per day or rosuvastatin 20-40mg per day.

COMPLIED

Include in report

Low Priority

A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. Preserved systolic function. Affected by

> Patients with diabetes have an individual **target LDL-C** according to their associated cardiovascular risk. If this **target is not reached with statins, combination therapy with ezetimibe** is recommended. 👍

Include in report High Priority Class I Level B

> Recommendations for long-term management (after acute coronary syndrome): If the LDL-C goal is not achieved despite **maximally tolerated statin therapy after 4–6 weeks**, the addition of **ezetimibe is recommended** (the aim is to **reduce LDL-C by >=50%** from baseline and to achieve **LDL-C < 1.4 mmol/L (< 55 mg/ dL)**) 👍

Include in report High Priority Class I Level B

> Recommendations for long term management (after acute coronary syndrome): If the LDL-C goal is not achieved after 4-6 weeks of maximally tolerated statin therapy and ezetimibe, the addition of a **PCSK9 inhibitor** is recommended. The aim is to **reduce LDL-C by >=50%** from baseline and to **achieve LDL-C < 1.4 mmol/L (< 55 mg/ dL)** 👍

Include in report High Priority Class I Level B

1. Rule based CDSS. Therapeutic recommendations

A 75-year-old male patient with a history of hypertension and diabetes. In February 2021, he was treated with Atorvastatin 80 mg daily. He is currently asymptomatic. His blood pressure is 148/85 mmHg, heart rate is 75 bpm, sinus rhythm, glucose is 157 mg/dL, HDL is 35 mg/dL.

▼ In patients with **diabetes and dyslipidemia** with associated **hypertriglyceridaemia** (i.e. triglycerides 150–499 mg/dL), **high-dose icosapent ethyl** (2 g bis in die) may be considered in combination with a **statin** 👍

REQUIRED ACTIONS
 Include in report
 High Priority
 Class IIa
 Level C

Triggering rule Variables Compliance Rule classifications

Clinical information 🔗

Name	Value
Complementary Tests: Triglycerides	160 mg/dL
Current Medications: HMG-CoA reductase inhibitors	True
Active Diagnostics and Current Problems: Diabetes Mellitus	True

Inferred variables

Name	Value
No data available in table	

▼ **Icosapent ethyl**, at a dose of **2 g b.i.d.**, can be used **in combination with a statin** in patients with ACS and **triglyceride levels of 1.5–5.6 mmol/L (135–499 mg/dL) despite statin** treatment 👍 ✖ More ▼

REQUIRED ACTIONS
 Include in report
 Medium Priority

Triggering rule Variables Compliance Rule classifications

Clinical information 🔗

Name	Value
Complementary Tests: Triglycerides	160 mg/dL
Active Diagnostics and Current Problems: Acute Coronary Syndrome	Verdadero
Current Medications: HMG-CoA reductase inhibitors	True

1. Rule based CDSS. Back office

From medical recommendations to interoperable clinical rules

Rule name	Original rule text
RL00011536	<p>Recommendations for the management of dyslipid in patients with diabetes</p> <p>High-dose icosapent ethyl (2 g b.i.d.) may be considered in combination with a statin in patients with hypertriglyceridaemia*</p> <p>*Hypertriglyceridaemia: triglycerides 150-499 mg/dL</p>
RL00010787	<p>Recommendations for long-term management after acute coronary syndrome:</p> <p>Icosapent ethyl, at a dose of 2 g b.i.d., can be used in combination with a statin in patients with ACS and triglyceride levels of 1.5-5.6 mmol/L (135-499 mg/dL) despite statin treatment</p>
RL00004800	<p>In high-risk (or above) patients with TG levels between 1.5-5.6 mmol/L (135-499 mg/dL) despite statin treatment, n-3 PUFAs (icosapent ethyl 2 x 2 g/day) should be considered in combination with a statin.</p>
RL00005793	<p>Fibrates may be administered in patients with diabetes mellitus who are statin intolerant and have high triglyceride levels. If triglycerides are not controlled by statins or fibrates, high-dose omega-3 fatty acids (4 g/day of icosapent ethyl) may be used.</p>

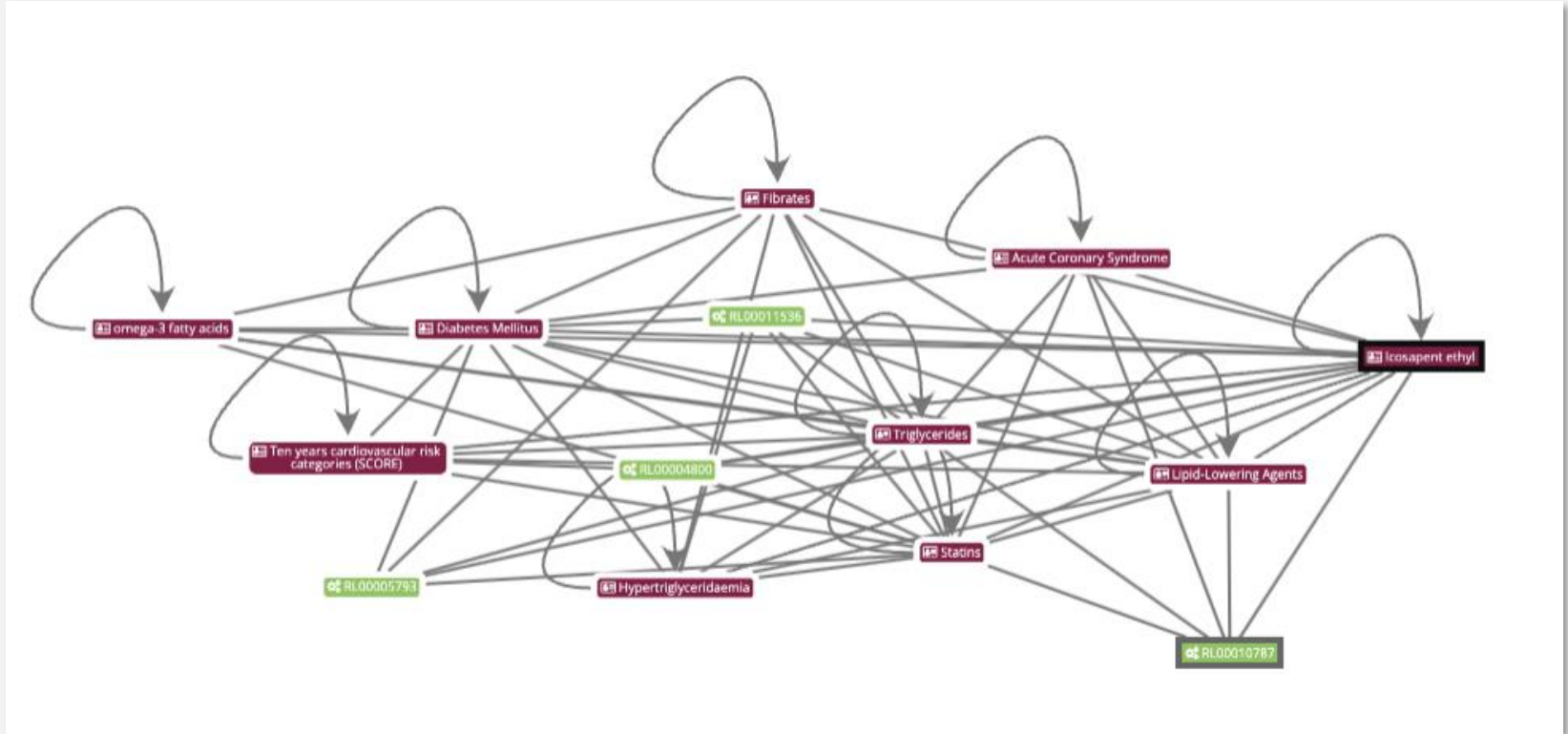
View: icosapent ethyl / Q View: RL00011536

Knowledge tester | Graph | Rule history | Translations | Comments | User activity | Peer review | Versions

Assigned to: Valentina Capelli

Original rule text: Recommendations for the management of **dyslipidaemia in patients with diabetes**. **High-dose icosapent ethyl** (2 g b.i.d.) may be considered in combination with a statin in patients with **hypertriglyceridaemia***. *Hypertriglyceridaemia: triglycerides 150-499 mg/dL.

1. Rule based CDSS. Knowledge graphs



ChatGPT 4o ▾

What can I help with?

What diagnostic and therapeutic recommendations apply to this patient. "A 75-year-old man presented with an inferior myocardial infarction in February 2021, treated with primary angioplasty with stenting over the medial right coronary artery. Preserved systolic function. Affected by hypertension and type 2 diabetes. History of appendectomy. He was treated with Acetylsalicylic acid 100 mgs, Atenolol 50 mgs, Atorvastatin 80 mgs and Omeprazole 20 mgs. Asymptomatic. Blood pressure 145/80 mmHg. 49 bpm. Sinus rhythm. Glucose 157 mg/dL, HbA1c 7%, Creatinine 1.8 mg/dL, LDL cholesterol 67 mg/dL, HDL 35 mg/dL,



Diagnostic Recommendations

1. Blood Pressure and Heart Rate Monitoring:

- Regular home or ambulatory blood pressure and heart rate monitoring would help ensure optimal blood pressure and heart rate control.

2. Glycemic Monitoring:

- Regular self-monitoring of blood glucose (SMBG) is important. In addition, periodic HbA1c tests should be conducted every 3–6 months to assess longer-term glycemic control.

3. Renal Function and Electrolytes:

- Monitor serum creatinine and electrolytes, particularly potassium, given the possible addition of an ACE inhibitor or ARB, which could impact renal function and electrolyte balance.

4. Lipid Profile:

- Regular lipid profiles (every 6–12 months) to monitor LDL, HDL, and triglycerides and assess cardiovascular risk status.

5. Cardiac Monitoring:

- Periodic ECGs to monitor for any arrhythmias, particularly if heart rate continues to be low.

6. Retinopathy and Neuropathy Screening:

- Annual eye exams and neuropathy assessments are recommended for diabetes management to detect early complications.

7. Lifestyle Recommendations:

- Encourage a heart-healthy, diabetic-friendly diet, regular physical activity (tailored to his capacity and limitations), and smoking cessation if applicable.

Therapeutic Recommendations

1. Blood Pressure Control:

- Although blood pressure is at an acceptable level (145/80 mmHg), target levels for patients with cardiovascular disease and diabetes are typically below 130/80 mmHg.
- Medication Adjustment:** Atenolol (a beta-blocker) is useful post-MI, but consider adding or switching to an ACE inhibitor or ARB, given its additional benefit for cardiovascular risk reduction in diabetic patients.
- Suggested Goal:** Target blood pressure of <130/80 mmHg.

2. Diabetes Management:

- Glucose Control:** The patient's fasting glucose is elevated at 157 mg/dL, with an HbA1c of 7%. This indicates that glucose control needs improvement, especially given the history of MI and the added cardiovascular risk of diabetes.
- Medication:** If not already on one, consider introducing an SGLT2 inhibitor or GLP-1 receptor agonist, as these have proven cardiovascular benefits in diabetic patients. Continue to monitor HbA1c with a target closer to 6.5% if possible, balancing with the risk of hypoglycemia.

3. Lipid Management:

- LDL Cholesterol:** Current LDL levels are within the target (<70 mg/dL for high-risk patients), so continuing atorvastatin at 80 mg seems appropriate.
- HDL and Triglycerides:** The HDL is low at 35 mg/dL, and triglycerides are slightly elevated at 160 mg/dL. While statins don't impact HDL significantly, increasing physical activity and possibly dietary changes may help improve HDL.
- Consider:** If triglycerides rise further, consider adding omega-3 fatty acids (EPA), especially for cardiovascular protection.

4. Antiplatelet Therapy:

- Aspirin:** The patient is on acetylsalicylic acid (aspirin) 100 mg daily, which is standard post-angioplasty and should be continued.

5. Heart Rate Control:

- The current heart rate is 49 bpm, which is low, likely due to Atenolol. Assess for symptoms like dizziness or lightheadedness. If symptoms are present, consider reducing the atenolol dose or adjusting to a different beta-blocker with a shorter half-life.

Diagnostic and Therapeutic Recommendations

Given this patient's history and recent lab results, here are the recommended diagnostic assessments and therapeutic adjustments:

Diagnostic Assessments

1. Renal Function Monitoring:

- The creatinine level (1.8 mg/dL) suggests the need to monitor kidney function more closely. Calculating the estimated glomerular filtration rate (eGFR) would provide a clearer picture of renal function.
- Regular follow-up tests for creatinine and eGFR are advised, especially since the patient is on medications such as atenolol and atorvastatin, which may impact kidney health.

2. Metabolic Control and Diabetes Evaluation:

- The fasting glucose (157 mg/dL) and HbA1c (7%) indicate suboptimal diabetes control. A full glucose profile might help to understand daily glucose variations and, if possible, continuous glucose monitoring (CGM) could be beneficial.
- The current diabetic regimen may need adjustment to improve glucose control, potentially adding or optimizing medication after assessing the current treatment plan.

3. Further Cardiovascular Evaluation:

- Although the patient is currently asymptomatic, a follow-up stress test or imaging (such as a stress echocardiogram or myocardial perfusion imaging) could be beneficial for monitoring coronary health, especially given the history of myocardial infarction.
- An echocardiogram can further evaluate ventricular function, even though he currently has preserved systolic function.

Therapeutic Recommendations

1. Blood Pressure Optimization:

- The patient's blood pressure is 145/80 mmHg, which is slightly above target levels for someone with cardiovascular disease and diabetes. Adjusting antihypertensive therapy could be beneficial to reach a target closer to 130/80 mmHg if tolerated.
- Atenolol can be continued, but an ACE inhibitor or ARB (angiotensin receptor blocker) might be considered to offer both renal and cardiovascular protective benefits, potentially substituting or adding to the current regimen.

2. Lipid Management:

- LDL cholesterol is well-controlled (67 mg/dL), likely due to atorvastatin 80 mg. However, HDL (35 mg/dL) and triglycerides (160 mg/dL) could be further optimized. Lifestyle modifications, such as dietary adjustments and physical activity, can help.
- If necessary, fenofibrate or omega-3 fatty acids could be considered, especially if triglyceride levels remain elevated.

3. Glycemic Control:

- Since HbA1c is above target, tighter glycemic control is needed. Assessing the current diabetes medication and considering an addition or adjustment (such as a GLP-1 receptor agonist or SGLT2 inhibitor) could improve glycemic control while providing cardiovascular benefits.

4. Medication Review:

- Evaluate the need for long-term omeprazole, given potential kidney impacts, especially in someone with borderline renal function.
- Aspirin and atorvastatin should continue as secondary prevention for cardiovascular disease. Regular monitoring of liver function and muscle symptoms with atorvastatin is also advised.

5. Lifestyle Modifications:

- Encourage a heart-healthy diet, regular physical activity, and smoking cessation if applicable. A diet rich in fiber, low in saturated fats, and moderate in carbohydrates can benefit both cardiovascular and diabetes management.

- **CDSS Requirements**

Reliable and accurate. Based on verified information

Reproducible. Explainable. Validated

Integrated in the care process

- **Knowledge-Based CDSS, automatic reasoning**

Require structured data (NLP)

Require programming and updating of scientific evidence

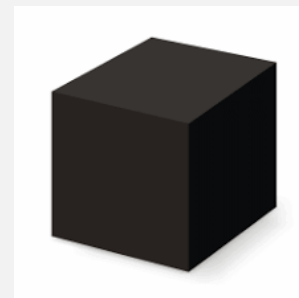
- **CDSS, machine learning**

Require complex training and infrastructure

Biases of training bases, transparency and limitation of incorporation of new evidence.

Limited reliability. Hallucinations. Inaccuracies. Omission (reliable AI)

Explainability limitation (explanatory AI).



AI in medicine: creating a safe and equitable future. Lancet 2023

The future of health AMA 2024

Patient safety and artificial intelligence IHI 2024

ABRIDGE

CLINICAL NOTE PATIENT VISIT SUMMARY

History of Present Illness

The patient, with a known history of hypertension and a family history of heart disease, presents with a complaint of chest pain that has been ongoing for the past few days. He has experienced similar episodes in the past, typically associated with periods of high stress and increased workload. The chest pain is reported to worsen with physical activity.

In addition to the chest pain, the patient has noticed an increase in fatigue with activity. He has also been experiencing an intermittent cough, although he is unsure if this is related to the current chest pain. The patient denies any associated symptoms, such as shortness of breath, fever, chills, nausea, or vomiting.

Despite being prescribed lisinopril for his hypertension, the patient admits to not taking the medication regularly due to work-related reasons.

Assesment & Plan

Chest Pain: New onset, worsened with activity, associated with fatigue. Given the patient's risk factors (hypertension, family history), there is concern for cardiac etiology.

- Order CBC, BMP, and troponins today.
- Perform EKG and echocardiogram today.
- Follow-up after results are available.

Hypertension: Elevated blood pressure in office, patient noncompliant with Lisinopril due to work-related issues.

- Encourage daily use of Lisinopril 10mg daily.
- Involve social worker to assist with improving medication compliance.
- Advise patient to keep a blood pressure diary, checking once daily at the same time for the next two weeks.

Physical Exam

VITALS: BP-160/80

TRANSCRIPT CODING

BMP and some troponins. That'll help us understand how much stress your body's under in general.

We're also going to do a echocardiogram and an EKG. How does that sound?

Whatever needs to be done. Thank you very much.

And then let's talk about your hypertension.

We really need to be taking your medication every day.

Um, so I'll, I'll have our social worker reach out on ways we might be able to improve your ability to take this medication regularly. Also, check your blood pressure once a day at the same time for the next couple of weeks, and we'll follow up with you.

How's that sound?

Sounds great.

Appreciate that.

Perfect.

Okay.

Thanks very much.

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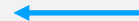
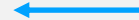
COPY ALL
SEND TO EMR

When Generative AI Is and Is Not Effective

Use-case family	Generative models' current usefulness	Example use cases
Prediction/forecasting	Low	Risk prediction, customer churn prediction, sales/demand forecasting
Decision intelligence	Low	Decision support, augmentation, automation
Segmentation/classification	Medium	Clustering, customer segmentation, object classification
Recommendation systems	Medium	Recommendation engine, personalized advice, next best action
Content generation	High	Text generation, image and video generation, synthetic data
Conversational user interfaces	High	Virtual assistant, chatbot, digital worker

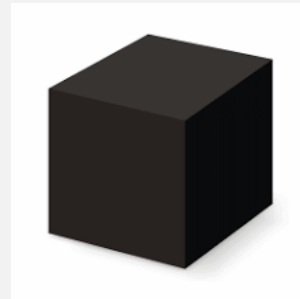
Source: Gartner
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Gartner





Complementarity of technologies



<https://www.gartner.com/en/articles/when-not-to-use-generative-ai>

Gilbert, S., Kather, J. N., & Hogan, A., Augmented non-hallucinating large language models as medical information curators. *npj Digital Medicine*, (2024).

Software as a medical device

Compared with What? Measuring AI against the Health Care We Have

Isaac S. Kohane, M.D., Ph.D.

A recent faculty recruit in my department, an expert in artificial intelligence (AI), asked me whether I could recommend a primary care doctor. I assured my colleague that I would promptly provide a set of excellent options to choose from. When I reached out to several doctors who were my contemporaries in medical training, however, I learned that they had all retired. That was not completely surprising, so I tried another tack: I contacted doctors who were of more recent vintage and whom I'd encountered in a supervisory capacity. One of them cheerfully informed me that he was no longer practicing primary care at a teaching hospital affiliated with Harvard Medical School. When I asked him whether he could recommend any high-quality practices, his tone changed, and he said that he couldn't think of any such practices that were accepting patients. Stunned, I wid-

ened my search further. I discovered that primary care clinics at some local hospitals, such as Massachusetts General Hospital and Brigham and Women's Hospital, were turning away new patients. I did not end up helping my new colleague and instead suggested contacting their health insurance company for recommendations.

Massachusetts has among the highest number of doctors per capita in the United States, which suggests that an attempt to make a referral for primary care would have been even more challenging in large swaths of the country. A recent report from the Association of American Medical Colleges on the physician workforce makes it clear that this issue is unlikely to be resolved in the short term, and most evidence in this area points to further widening of the workforce gap for primary care in the future.² In this context, the possibility of aug-

menting the work of clinicians — including doctors, nurse practitioners, and physician assistants — with AI is being seriously considered.² Yet AI tools that could reduce burdens on clinicians are most likely the tip of the iceberg when it comes to AI's influence in medicine. Whether out of desperation, frustration, or curiosity, large numbers of patients are already using AI to obtain medical advice, including second opinions — sometimes with dramatic therapeutic consequences.³ But individual anecdotes do not substitute for systematic evaluation. With any new clinical intervention, rigorous trials are the medical field's best tools to drive the establishment of best practices. In the case of AI, shouldn't we be comparing health outcomes achieved with patients' use of these programs with outcomes in our current primary-care-doctor-depleted system?

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Recruiting 1

Validation of Naevia Medical in Valvulopathies (CDSS-Valve)

ClinicalTrials.gov ID [NCT06392464](#)

Sponsor [Dilemma Solutions S.L.](#)

Information provided by [Dilemma Solutions S.L.](#) (Responsible Party)

Last Update Posted [2024-04-30](#)



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Norma Española
UNE-EN ISO 14155
Septiembre 2021



This technology will solve unmet needs and definitively change the way medicine is practiced, and medical knowledge is managed

Thank you

Open for collaborations & partnership



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