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Cardiovascular Health update: A Broad Look JHU/APL

February 3, 2022

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Disclosure

- Intersocietal Accreditation Commission, BOD
- Certification Board Cardiac CT, vice-chair
- Pfizer HIT Advisory Council
- Pfizer Rare Disease Advisory Council



Overview

- Latest advanced in cardiology
- Latest technology
- Best advice to live a long and quality life

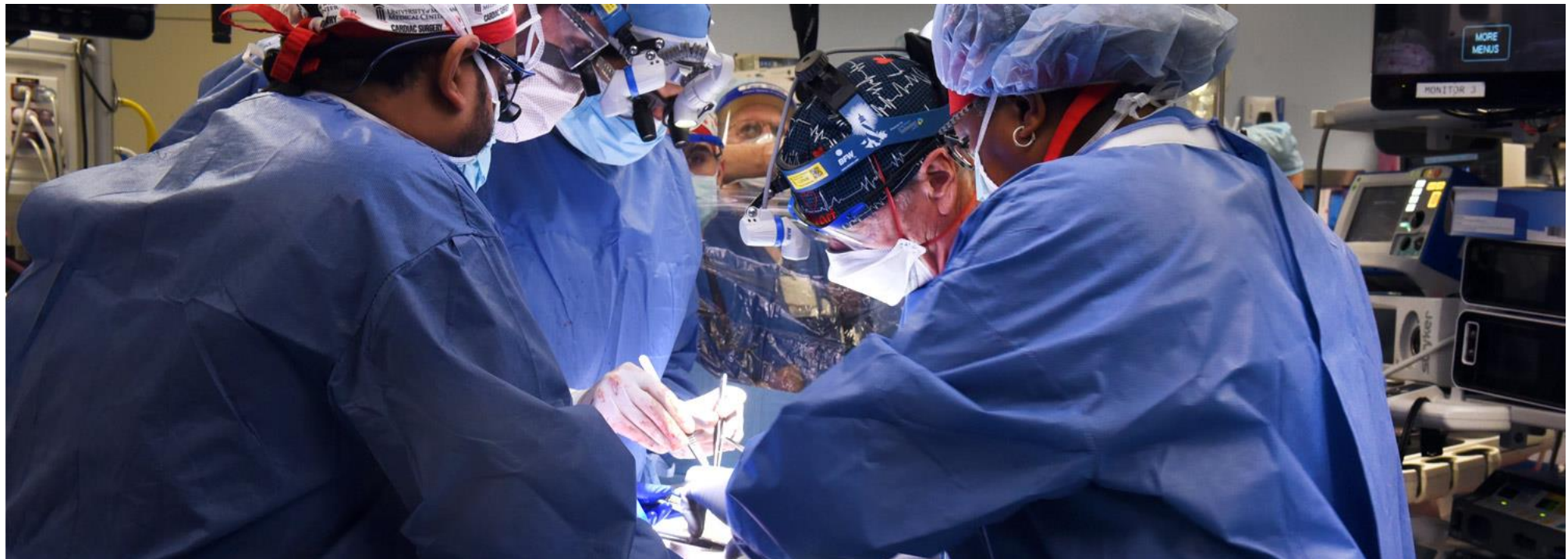


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Latest cardiology advances



University of Maryland School of Medicine Faculty Scientists and Clinicians Perform Historic First Successful Transplant of Porcine Heart into Adult Human with End-Stage Heart Disease





Transplant

- About 110,000 Americans are currently waiting for an organ transplant,
- Many patients die each year before getting a heart
- Xenotransplants (from non-human) were first tried in the 1980s
- Stephanie Fae Beauclair (known as Baby Fae) at Loma Linda University in California. Born with a fatal heart condition.
- Received a baboon heart transplant and died within a month of the procedure due to the immune system's rejection
- Xenotransplants largely abandoned



- 10 gene modified
- 4 genes knocked out, 3 that makes antibodies that produce rejection, 1 to control growth



Other Organs

Double pig kidney transplant successfully performed in brain-dead patient

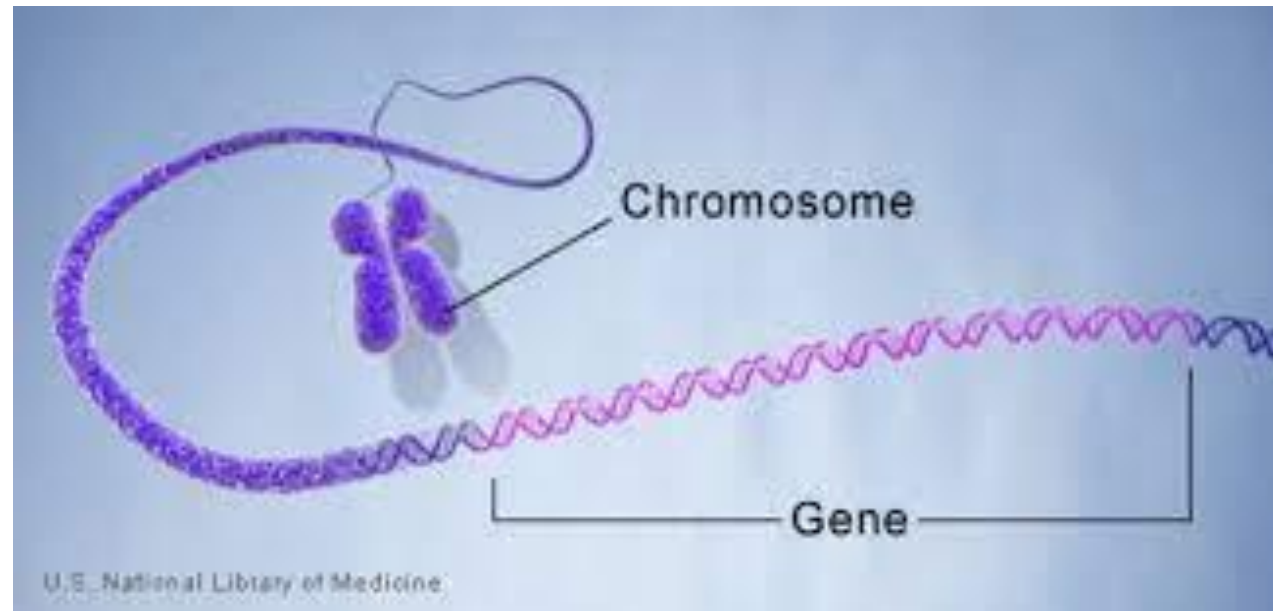
By [Nicoletta Lanese](#) published 1 day ago

The experiment was intended to assess the safety of such transplants, prior to them being tested in clinical trials.



Why is this Important

- May have an unlimited supply of nonhuman organs for the future
- This opens the door to countless options

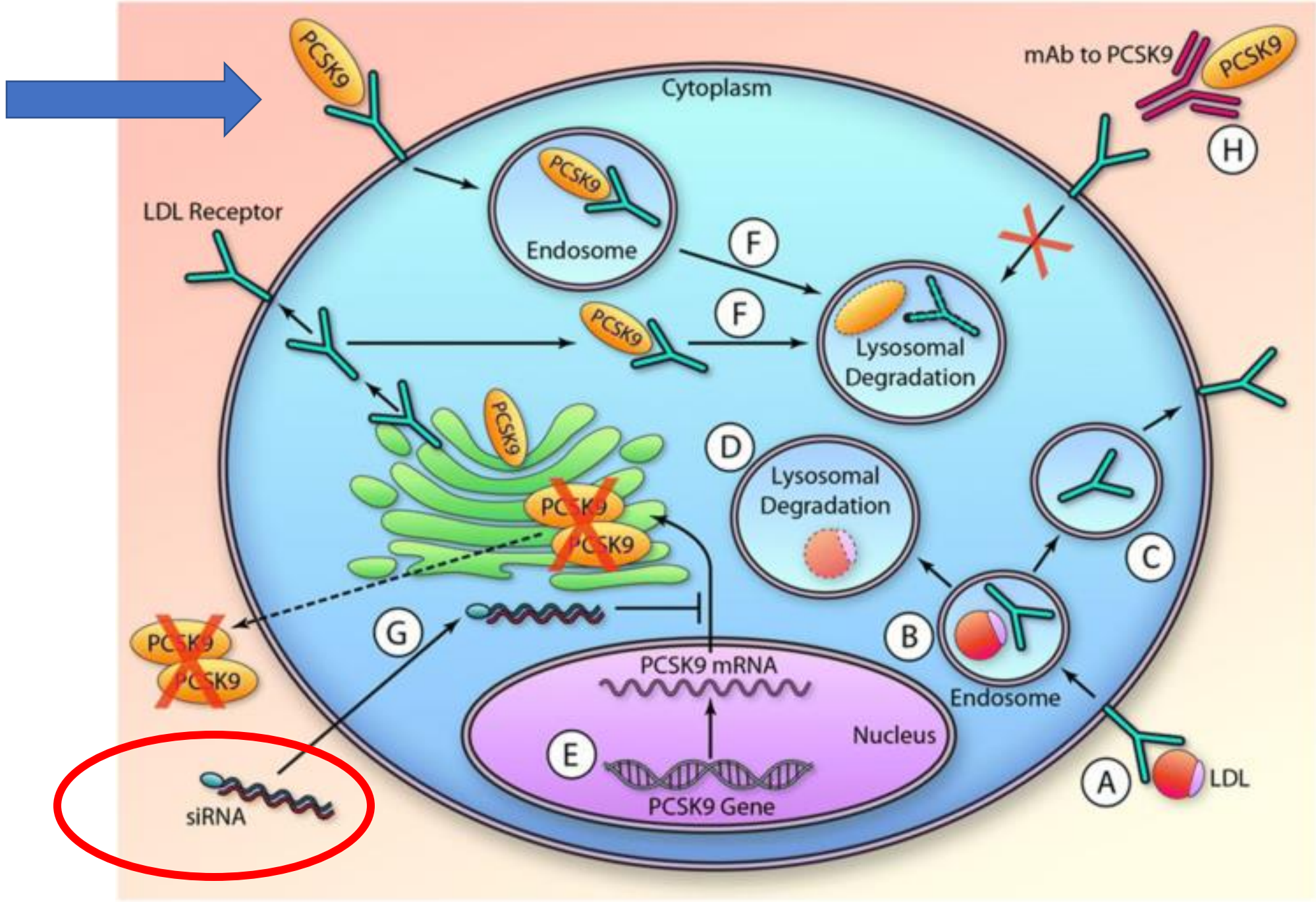




New Cholesterol Medication

- New, first in class, small interfering RNA agent
- Antibodies against cholesterol receptors
- Inclisiran, brand name Leqvio,
- Approved by the FDA in December 2021.
- Given only as a twice-a-year injection.







Why is it important

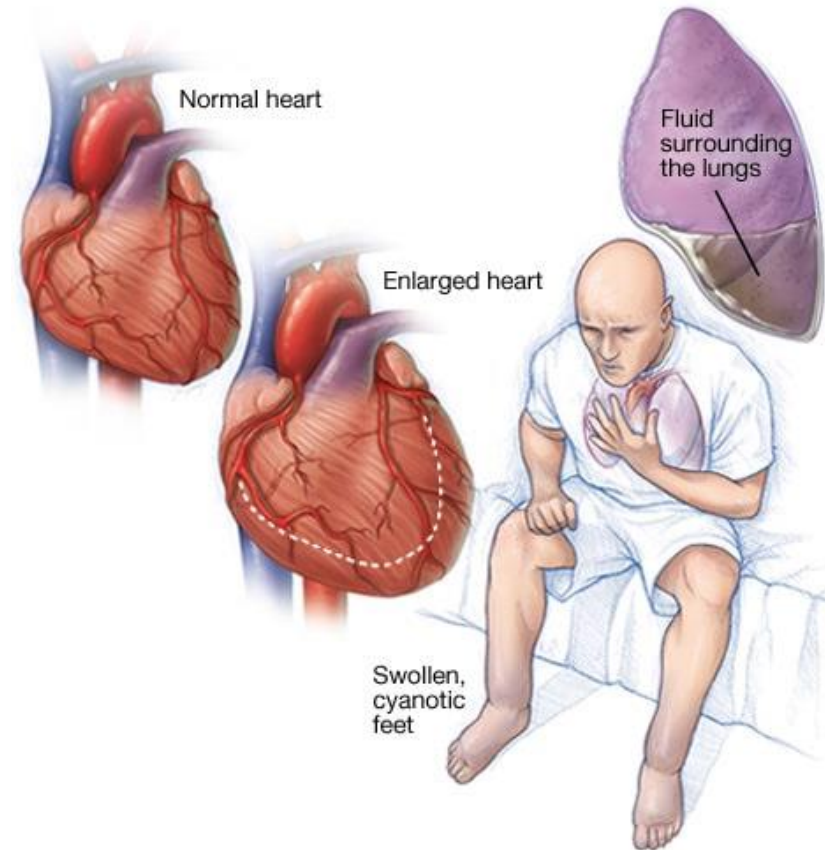
- New class of drug, more to come
- Present statins reduce risk 20-40%
- Data suggest, 25-60% of people stop taking it by 6 month
- Therefore, risk is not reduced!
- Who wants to take a pill each day?
- Deals with not just cholesterol but medical compliance





Heart failure

- This is when fluid builds up in the lungs caused by the heart
- Scope: 6.2 million in the US
- Mortality is very high
- 10% at 30 day
- 22% at 1 year
- 42% at 5 years





Diabetes medication helps heart

- A class of diabetes medications called
- SGLT2 inhibitors (Jardiance, Farxiga)
- Approximately 30% reduction in heart failure events, on top of our present treatment.

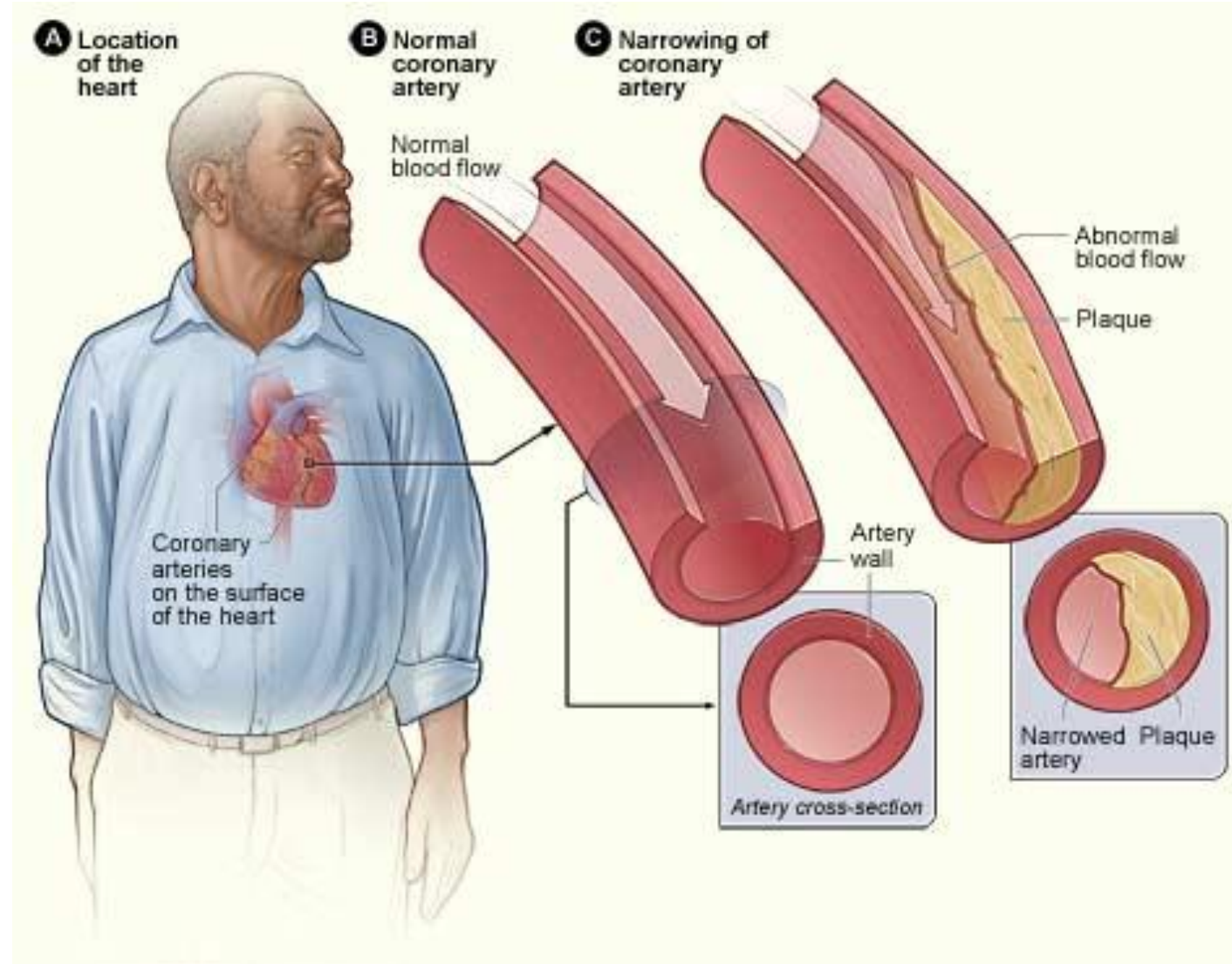


Why is this important

- One of the biggest killer in US
- To reduce mortality, in addition to what we do today



Vascular disease and Heart attacks





Icosapent Ethl, Vascepa

- This is a type of fish oil
- Given with mildly elevated blood fat (triglycerides)
- 30% reduction in events, In addition to statins





Why is this important

- These improvement were in addition to people whose bad cholesterol (LDL) was well controlled already.
- Targets and treatments
 - LDL (bad cholesterol)-Statins
 - Other meds non-statins-
 - Triglyceride - Vascepa



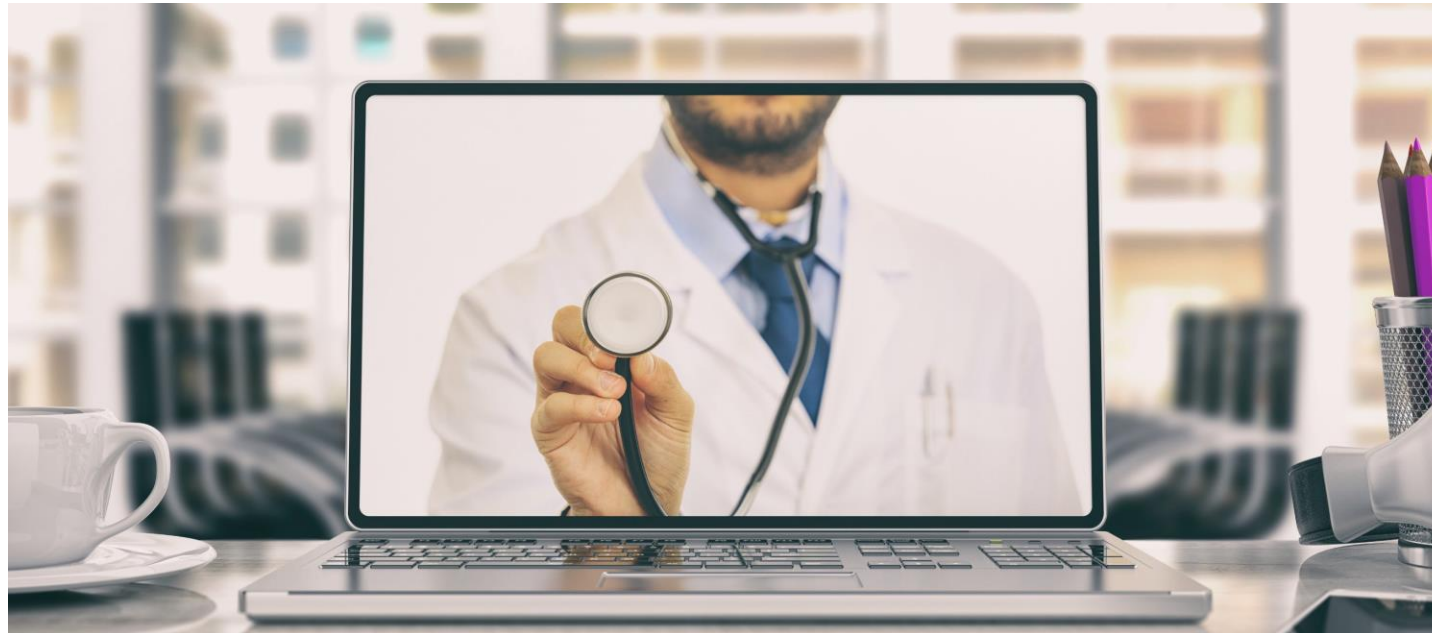
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Latest Technology



Telemedicine, Pre-COVID

- We did this some
- COVID, forced us to rapidly expand our capabilities at an accelerated rate of advancement and usage





Telemedicine

- Teleport- new platform- NOT ZOOM
- Advantages
 - Meds reconciliation
 - Show image
 - Multiple people on the call, Pharmacy, rehab
 - Easier to get the team together
 - Sometimes better follow up, had missed appt.
 - Less time needed by pts
 - Now don't have to leave home, at work, family help, transportation issues
 - Expose to cold, COVID, slip on ice





Remote Medicine **Research-Backed Remote Therapy**

- Home pulmonary rehab
- Home cardiac rehab
- Physical therapy

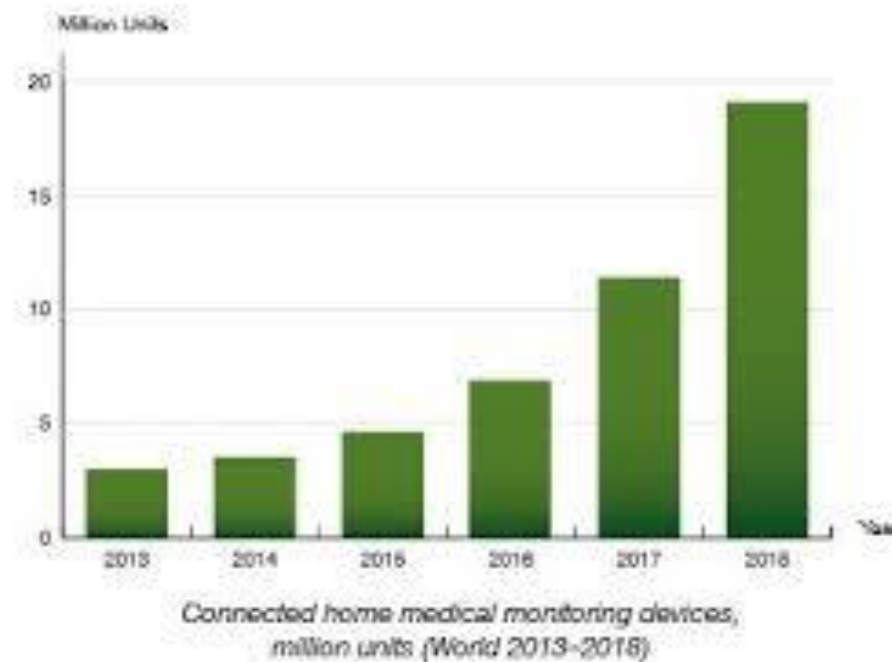
Our mission is to make proven, research-backed cardiac rehab available to millions of heart patients worldwide, right in the comfort of their home. Get live guidance and monitoring of vital signs to help you feel safe. See what a Carda Health session looks like below!





Remote Medicine

- Medicine at a distance
- Rural underserved area that do not have adequate/advanced health care.
 - BAT team
- Expand the level of expertise
- Other countries
- This is pre-COVID





Challenges with telemedicine

- Internet access
- Navigating the technology, some people can't do it
 - Development of teleport- home grown
- Physical examination
- Data points- heart rate, blood pressure, oxygen saturation, EKG...



Remote Medicine

- Simple home device
- Bp cuff,
- Pulse ox
- Heart monitor
- Relatively inexpensive, easy to obtain and use







Think back 10 years ago

- At your Drs,
- Handwritten notes
- Prescription errors,
- Un readable (if you had bad handwriting as a kid- you were off to med school)
- Find the record, the CXR, the lab- can you find it and put it together?
- Get your medical record sent (off the copy machine and mailed -)





Electronic medical records

- Instant transfer of data
- Instant image retrieval (CT, MRI...)
- Dr communicate better
- Decrease prescription error
 - Drug interactions



BIG Data

Estimate are that 99% of the population health records are in a digital form today

- Electronic medical records
- Predictive algorithms
- Population health



New study, we are preparing

- Cholesterol and prevention
- Recruit young people 18-25
- 5000 needed
- They take a pill or not
 - follow 10-15 years
- The challenge
 - How can I follow these people?
 - Beginning of their life they will travel all over the country-world, making changes every few months, non-compliant with medication's.





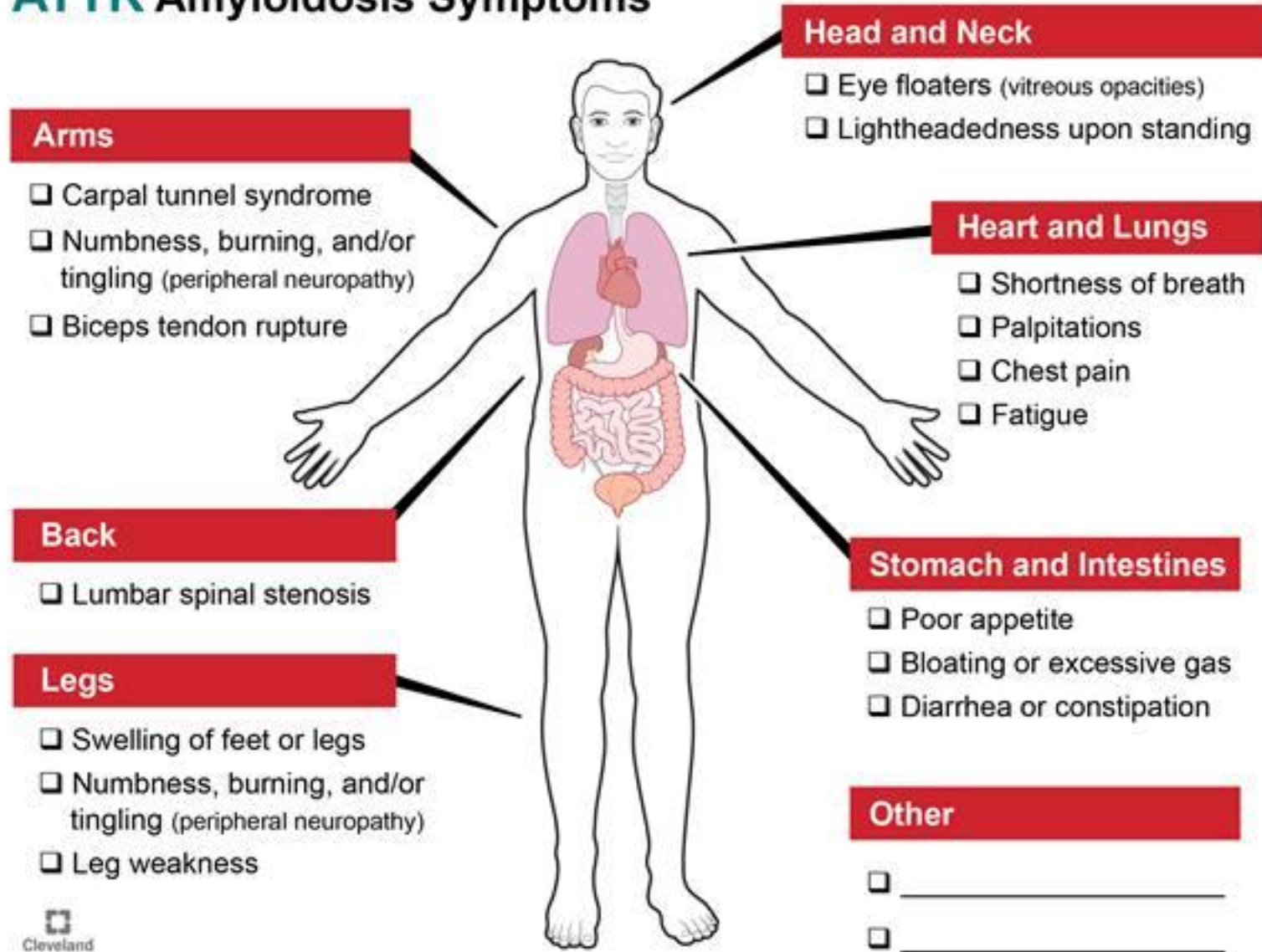
Big data

- Decentralizes trials
- Follow pts for years via phone/mobile apps
- Virtual recruitment, visits
- Engagements
 - Take the model from social media

AI



ATTR Amyloidosis Symptoms



Can occur over 10-year period before all of it is put together



AI

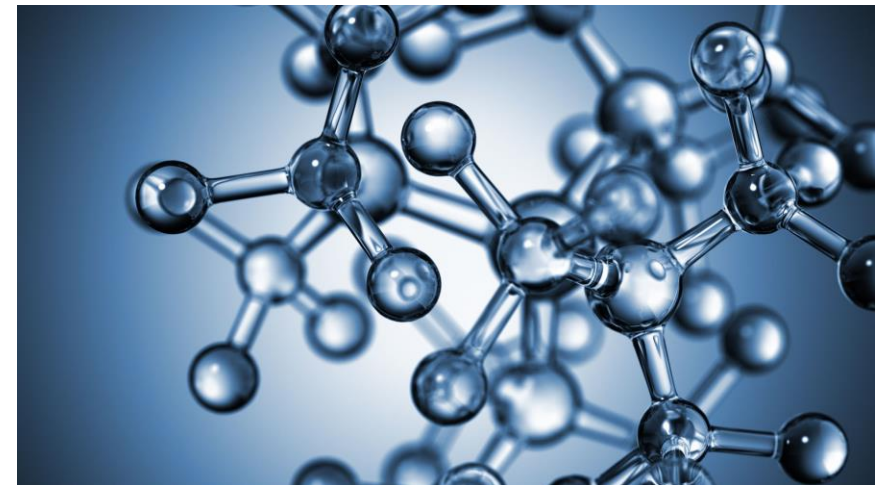
- Algorithms for early diagnosis of disease.
- I need to look and filter back 10 years at all the records from (different specialist, medical systems, geographic locations...)
- I want to make the DX ASAP and not wait for 10 year
- Earlier the treatment starts, the better the patient does



The art and science of medicine

This is a double edge sword.

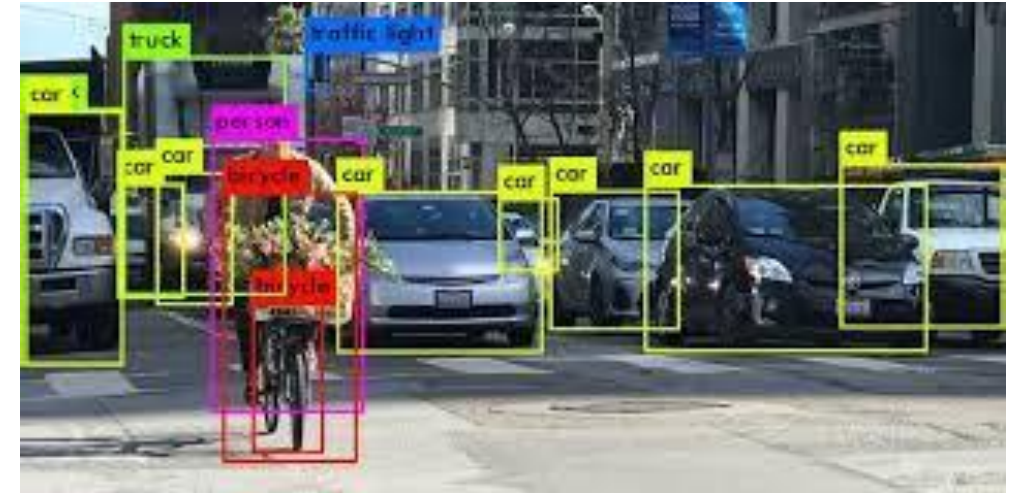
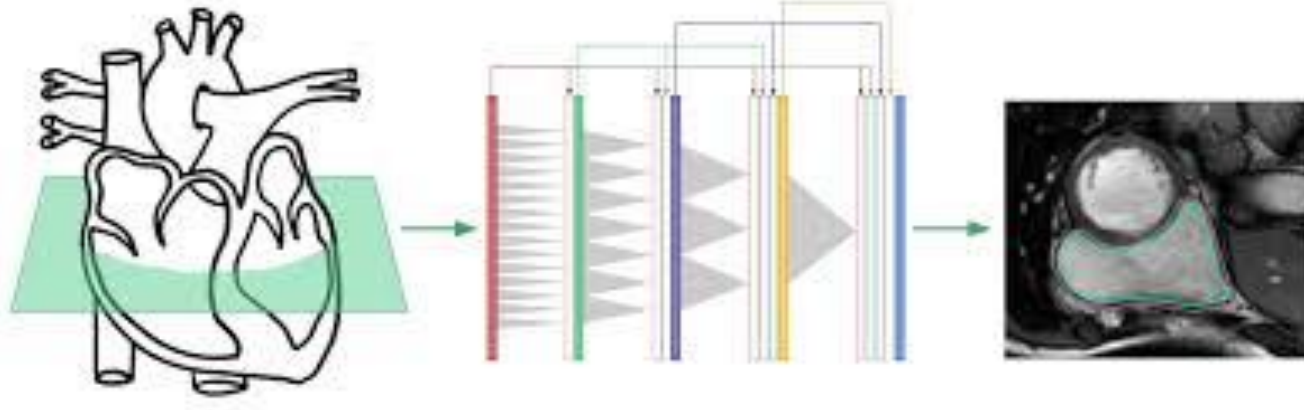
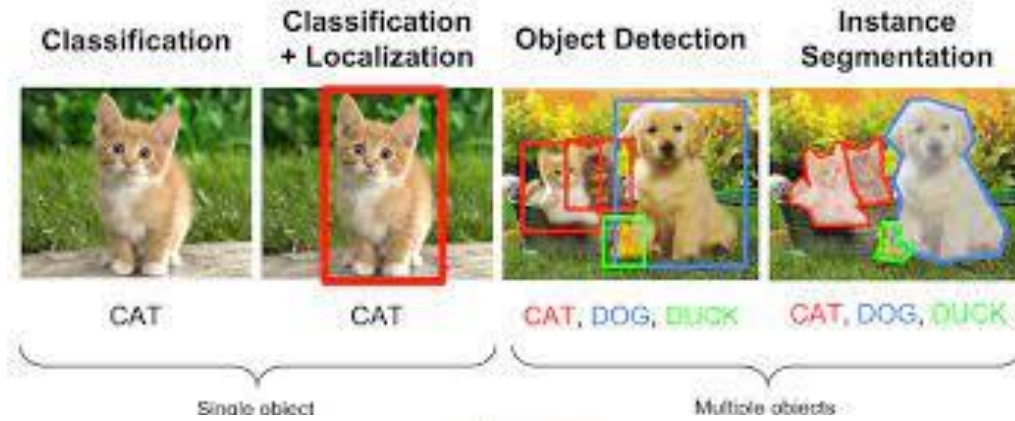
- **The art**, your doctors' experiences.
 - Experience helps making you an individual, which your doctor takes into account. The computer can't calculate all the variables that make you, you.
- **The Science**
 - You don't want them to use the last experience, that they remember to guide your therapy. (one experience is not scientific) here's where the data is needed.





Machine learning

- Digital image



So, imagine data, goes through algorithm, the computer sees the data 10,000 times, 100,000 times, 1 million times...

- Risk stratification
- Testing
- Treatment
- Diagnosis
- Prediction
- Use all the data
 - Pros, cons, pit fall, race, gender, location ...
 - Refinement, refinement, refinement
 - Every iteration is better



Connectivity

- Better communication across platforms
- Patient Portals, My chart
- This gives patients access and control of there data and care
- Health apps on your phone

Mobile apps and/or collecting data from everywhere

- Phone
- Daily travel, stress on the highway
- Environment, the weather how does that affect you, food islands
- Purchases, do you buy healthy foods, is your gym membership used
- Even your bed collects data

We are so connected that my bed sends me data

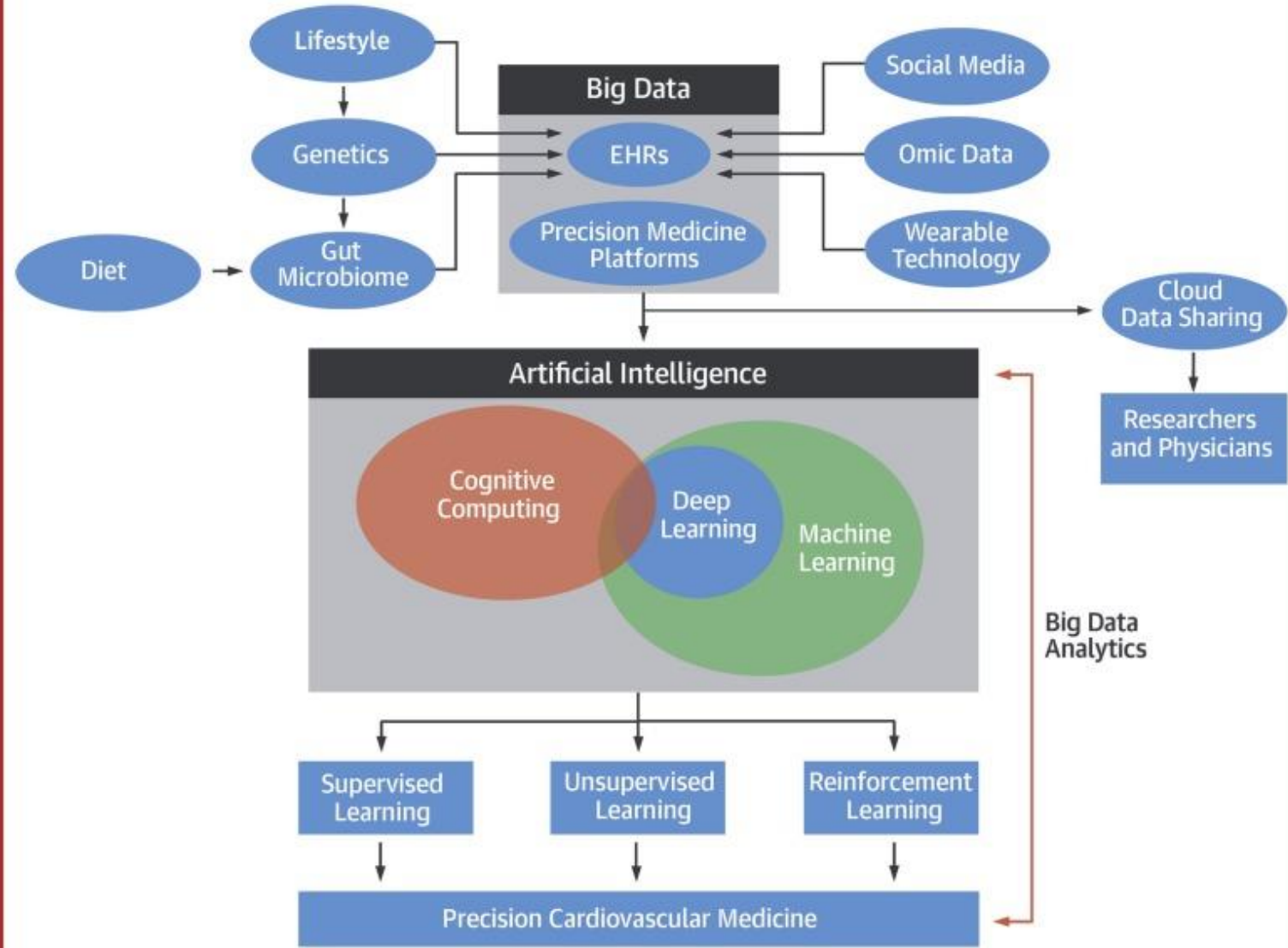
- Sleep quality
- Heart rate
- Respiratory rate
- Heart rate variability





Now use all the sources of data

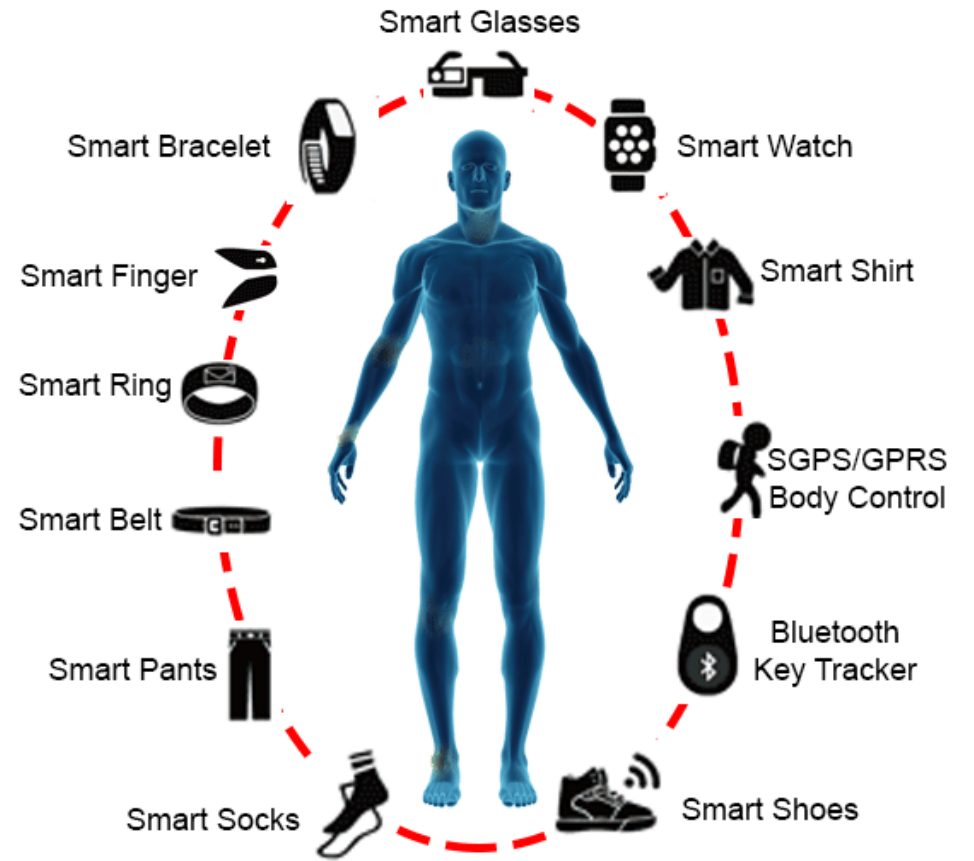
CENTRAL ILLUSTRATION: Artificial Intelligence in Precision Cardiovascular Medicine





Smart devices

- Watches, rings, scales, smart phone, bed...





Kardia

FREE Shipping by Amazon

Best Seller

KardiaMobile Personal EKG Device and Heart Monitor - Single-Lead EKG - 3 Detections - Detect AFib from Home - FDA-Cleared - by AliveCor

1 Count (Pack of 1)

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Atrial Fibrillation study

Apple Heart trial

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation

Fitbit Heart study

NIH National Library of Medicine
National Center for Biotechnology Information

PubMed.gov

Advanced

Save Email Send to Display

Clinical Trial > Am Heart J. 2021 Aug;238:16-26. doi: 10.1016/j.ahj.2021.04.003.

Epub 2021 Apr 15.

Rationale and design of a large population study to validate software for the assessment of atrial fibrillation from data acquired by a consumer tracker or smartwatch: The Fitbit heart study

FULL TEXT LINK



ACTIONS

Cite

Favorites

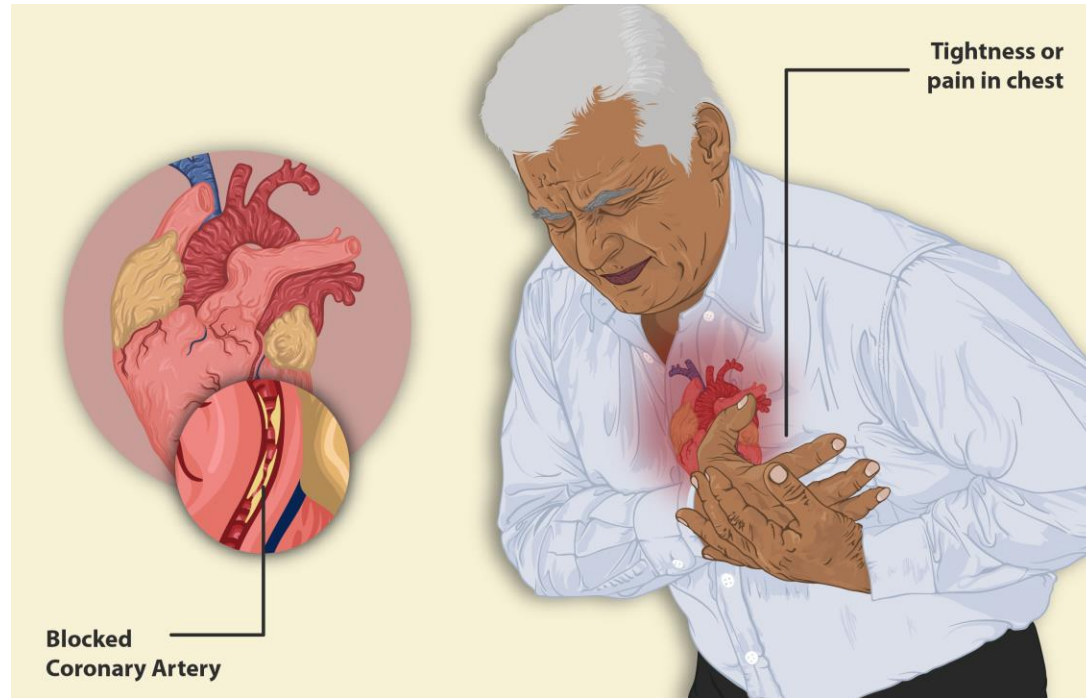


- At the start of the talk, I waved the flag on all the great reductions in cardiac event.
- You would think we cured cardiovascular disease
- WE DID NOT



How best to protect/prevent heart disease

It doesn't happen this way the majority of the time



- Look for all changes
- Fatigue
- decreased exercise tolerance
- shortness of breath
- indigestion
- trouble sleeping



Diet, you are what you eat

- Plant based diet
- Mediterranean diet

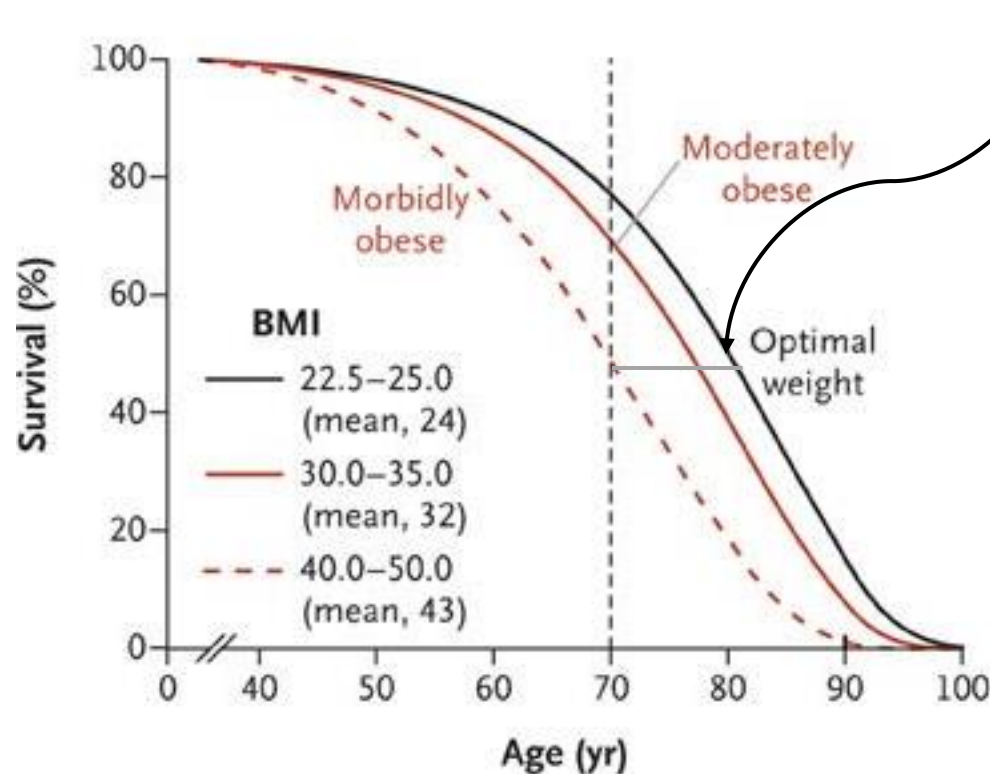




Body composition, fat is not just weight

- Fat is a hormone that causes inflammation
- Approx. 70% are overweight or obese

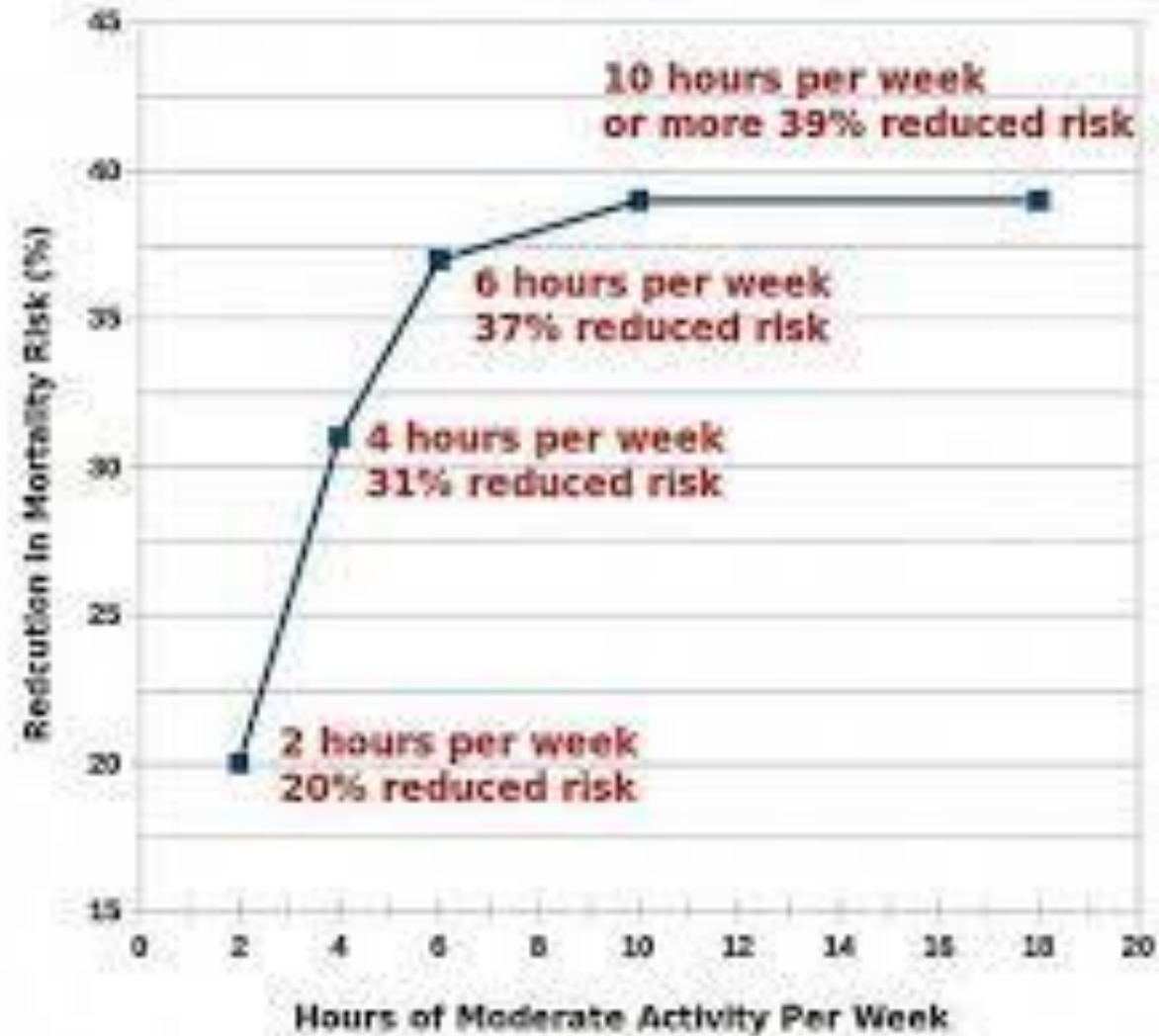
15-year reduction in life!





Exercise

Reduction in Mortality Risk With More Exercise





Don't Smoke

- 1964 Surgeon General Report
- 60 years ago
- Need I say more





Early screening

- Get early diagnosis
- Subclinical disease— before symptoms



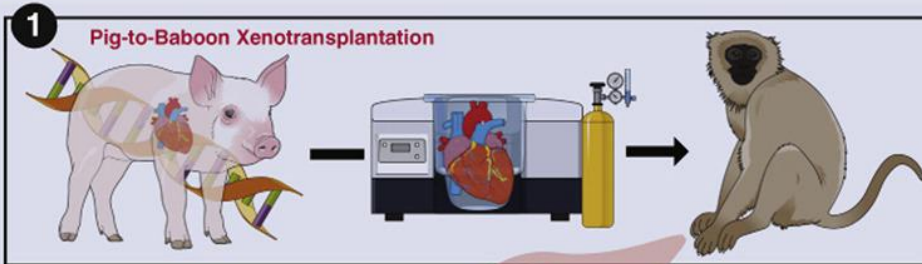
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Questions

The problem- Growth and Rejection

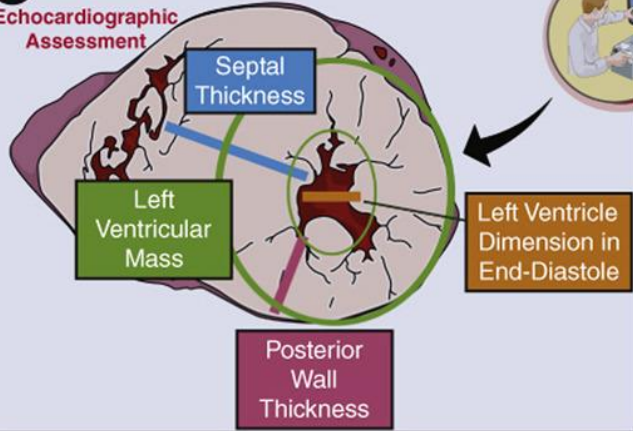
The Growth of Xenotransplanted Hearts Can Be Reduced with Growth Hormone Receptor Knockout Pig Donors

Methods:

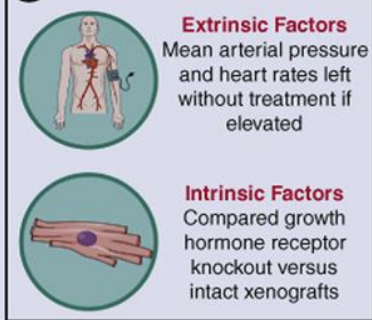


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Echocardiographic Assessment

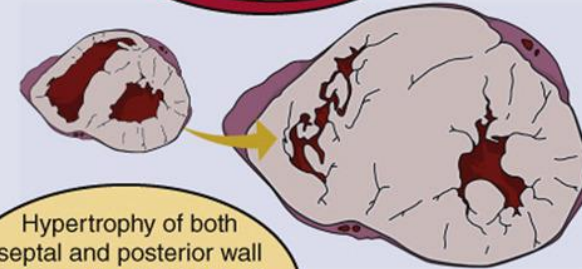


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Results:

Physiologic mismatch is present in all grafts after transplantation, which is largely independent of growth



Hypertrophy of both septal and posterior wall is markedly elevated by 2 months in grafts with growth hormone receptor intact

Minimal hypertrophy is seen in xenografts out to 6 months postoperatively when growth hormone receptor is knocked out

Implications: Cardiac growth after xenotransplantation can be reduced by genetic engineering of multi-gene cardiac xenografts with growth hormone receptor knockout. This eliminates the need for other adjuncts to reduce intrinsic and extrinsic causes of graft growth post-transplantation.

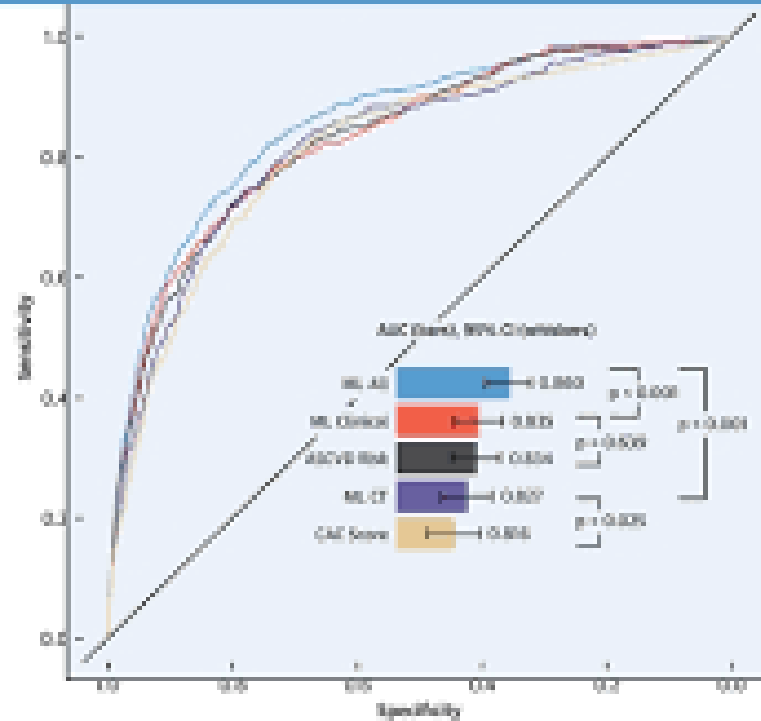
Corbin E. Goerlich, MD, Bartley Griffith, MD, Peter Hanna, MD, Susie N. Hong, MD, David Ayares, PhD, Avneesh K. Singh, PhD, Muhammad M. Mohiuddin, MD

- Angiotensin Receptor Neprilysin Inhibitor Also Struggles
- In February, [sacubitril/valsartan](#) earned [FDA approval](#) for the treatment of patients with HFpEF. This was based on the [PARAGON-HF trial](#), which compared sacubitril/[valsartan](#) to valsartan alone in patients with HFpEF. The 13% reduction in the composite endpoint of heart failure hospitalization and CV death with the ARNI drug did not reach statistical significance. After much debate at the FDA about subgroups, the approval came with vague wording: "Benefits are most clearly evident in patients with left ventricular (LV) ejection fraction (LVEF) below normal ... but ... LVEF is a variable measure, so use clinical judgment in deciding whom to treat."

So image everyt

CENTRAL ILLUSTRATION: Receiver-Operating Characteristic Curves for Prediction of Cardiovascular Disease and Coronary Heart Disease Death

B: Prediction of 10-Year Coronary Heart Disease Death (439,96,636 Events)



Nakanishi, R. et al. *J Am Coll Cardiol (reg)*. 2021;14(3):615-25.

Research-Backed Remote Therapy

Our mission is to make proven, research-backed cardiac rehab available to millions of heart patients worldwide, right in the comfort of their home. Get live guidance and monitoring of vital signs to help you feel safe. See what a Carda Health session looks like below!

