

# Ambulatory Heart rhythm monitoring : what is new?

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# Disclosures

Research grants from Device vendors : Medtronic and Abbott

# Clinical scenarios

**74 yr male**

**Could not speak for 2 minutes at home while watching TV**

**Otherwise healthy**

**Normal tests including ECG, bloods, CT head , ECHO , Holter .**

**Has another episode of transient facial drooping after 3 months**

**33 yr female**

**Previous VSD repair at age of 3yr**

**Discharged from Cardiology - doing very well**

**Syncope while jogging .**

**Normal tests including ECG, bloods, ECHO , Holter .**

**Has another episode of syncope after 9 months**

# Background

**Our jobs are getting more challenging**

**Medico-legal implication**

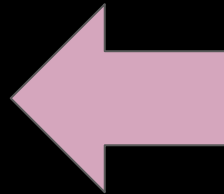
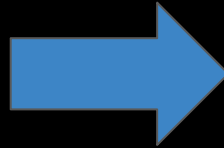
**Access to healthcare**

**Dr. Google**

**Social media / TV advertisements**

**Evolving technology**

**Physician burnout**



## **Wide variety of symptoms**

Palpitations/ flutters

Syncope

Presyncope

Tiredness

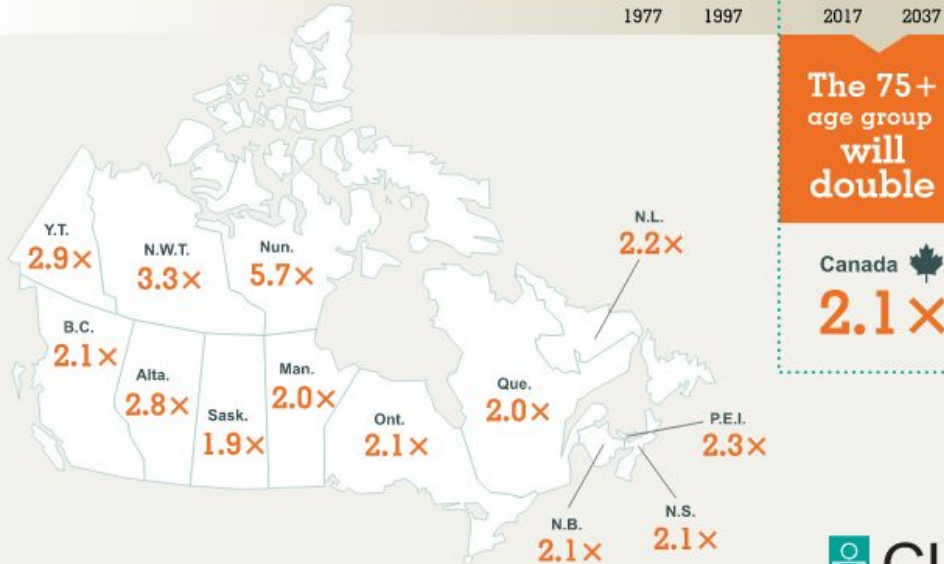
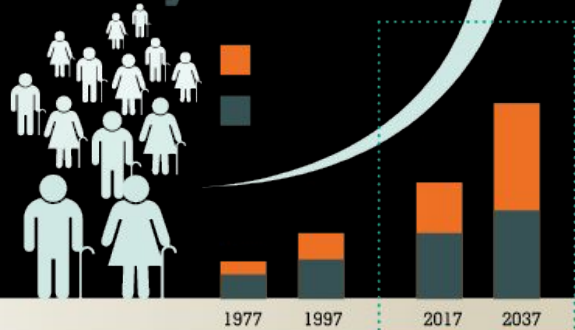
Heart failure

“Spells”

Fitness

# Canada's seniors population outlook: Uncharted territory

grow by **68%**



## Additional factors

Aging population → higher arrhythmia (AF)

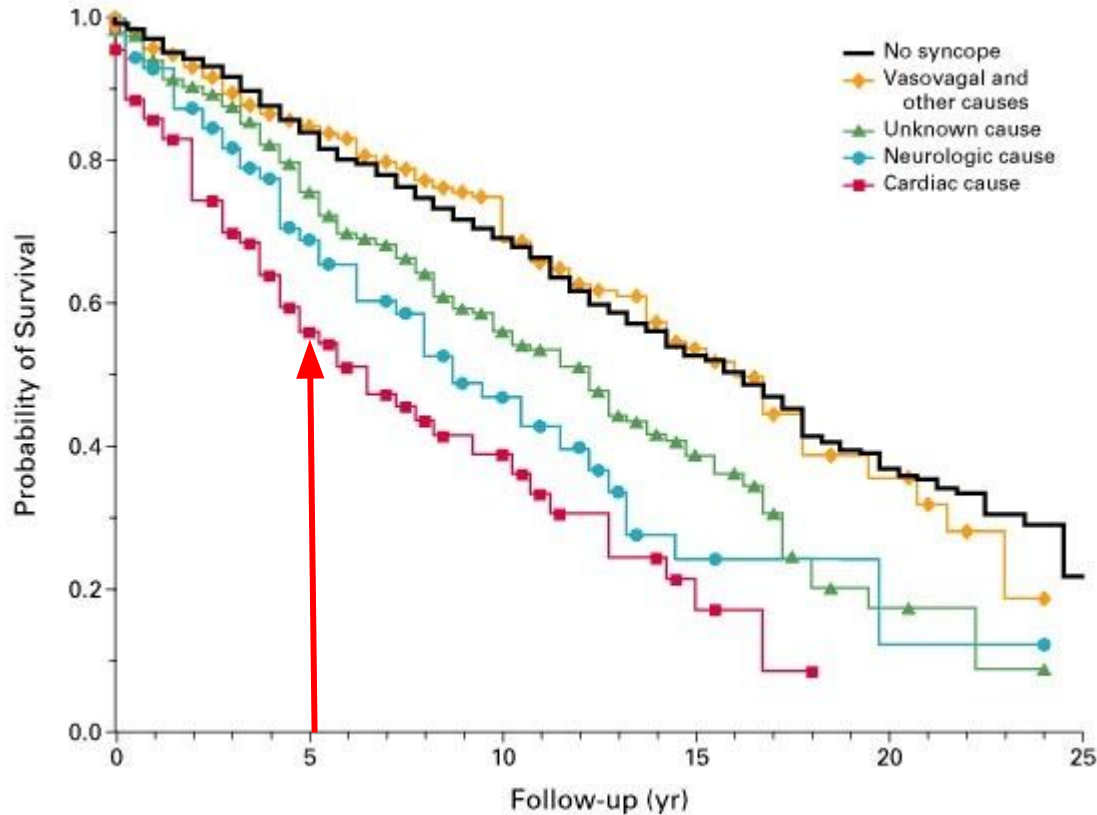
Speech, hearing impairment

History

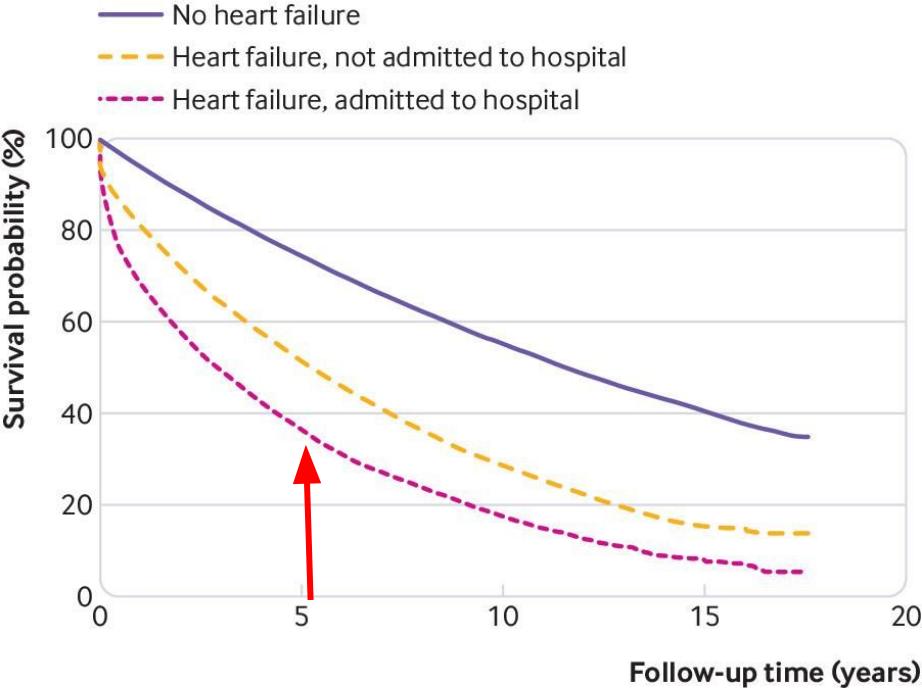
Televisits

Communication issues

# Accurate diagnosis is vital for good outcomes!!



Mortality with untreated Cardiac Disease is very high



**No at risk (number censored)**

No heart failure

278 679 (0)	105 331 (120 343)	31 494 (175 326)	3130 (199 292)
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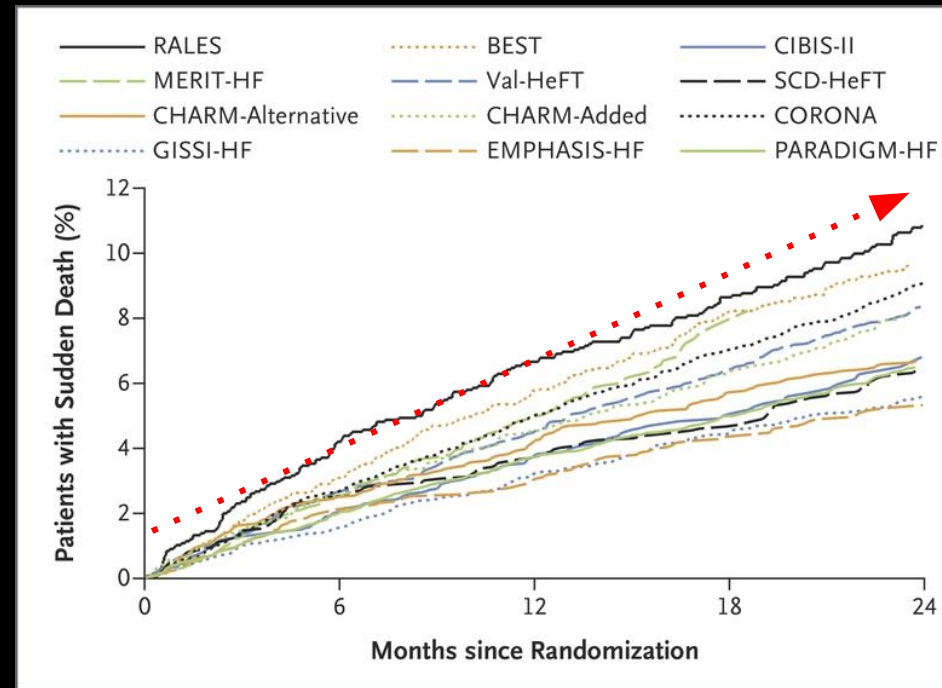
Heart failure, not admitted to hospital

31 834 (0)	9641 (9298)	2457 (13 301)	185 (14 920)
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Heart failure, admitted to hospital

24 125 (0)	4170 (7505)	729 (9457)	40 (9923)
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# All cause mortality and Sudden death in HF



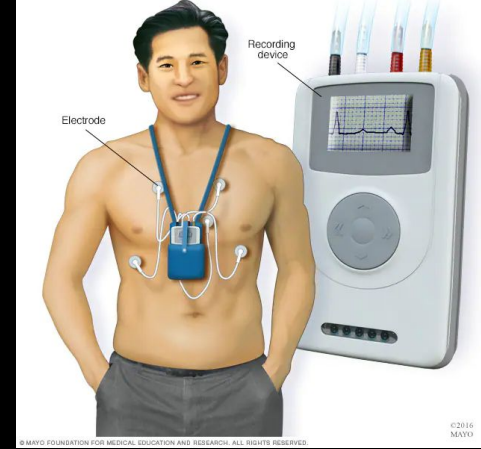
Taylor C J, Ordóñez-Mena J M, Roalfe A K, Lay-Flurrie S, Jones N R, Marshall T et al. Trends in survival after a diagnosis of heart failure in the United Kingdom 2000-2017: population based cohort study *BMJ* 2019; 364 :i223



Original Holter  
1960s



Holter 2000



Zio patch 2020



# Non invasive rhythm monitoring

	Advantages	Disadvantages	Main indications
24 h Holter	Continuous recording	Discomfort for the patient	Very frequent (daily) symptoms
	12 leads with good correlation with surface ECG	Artefacts	Permanent AF rate monitoring
	Low economic cost	Maximum recording of 24-48 h (low diagnostic yield)	Frequent ventricular premature beats
		<b>7-10 days</b>	Risk stratification of (hypertrophic) cardiomyopathies
Skin patches	Continuous recording of 7–14 d	Single use and greater economic cost	Frequent (weekly) symptoms
	Good tolerability for patients	Analysis by external companies <b>Limited access</b> Only one lead <sup>1</sup>	AF detection in cryptogenic stroke (2 wk)
External loop recorders	Loop recording (includes beginning and end of arrhythmic event)	Patient discomfort	Occasional symptoms (monthly)
	4 wk monitoring	Requires education from healthcare professional on how to correctly place the electrodes	AF detection in cryptogenic stroke (2–4 wk)
	High yield and efficiency in the assessment of palpitations		

Implantable loop recorder	Loop recording	Invasiveness and associated complications (infection, bleeding, <i>etc.</i> )	Very infrequent symptoms
	Up to 3-yr monitoring (good diagnostic yield)	Individual economic cost	AF detection in at-risk patients (cryptogenic stroke, post-ablation, <i>etc.</i> )
	Patient does not have to do anything	Single lead	Syncope
	Remote monitoring		
External event recorders/mobile devices	Easy access for the general population	Single lead <sup>1</sup>	Palpitations work-up
	Possibility of prolonged use (years)	Data management	Population AF screening (not validated)
	Screening for asymptomatic events (AF screening)	Patient has to be involved (not suitable for syncope work-up)	
	Remote monitoring		

Mannhart D et al. BASEL  
Wearable Study, JACC:  
Clinical  
Electrophysiology,  
2023



Manufacturer	Apple	Samsung	Withings	Fitbit	AliveCor
Version	Watch 6	Galaxy Watch3	ScanWatch	Sense	Kardia Mobile
Sensitivity (95% CI)	85% (72-94%)	85% (72-94%)	58% (42-72%)	66% (51-79%)	79% (64-89%)
Specificity (95% CI)	75% (67-83%)	75% (66-82%)	75% (67-83%)	79% (70-86%)	69% (60-77%)
Inconclusive tracings	18%	17%	24%	21%	26%
Preferred Choice <sup>*a</sup>	39%	12%	24%	15%	5%
Limit of HR interpretation <sup>*b</sup>	50-150 bpm	50-120 bpm	No information	50-120 bpm	50-100 bpm
Battery capacity <sup>*c</sup>	18 h <sup>*d</sup>	45 h <sup>*d</sup>	720 h <sup>*d</sup>	144 h <sup>*d</sup>	90 h / 2 y <sup>*e</sup>
Price <sup>*d</sup>	449	265	303	244	147

\*a: Out of 165 analyzed patients, 10 patients were not able to decide between the available devices

\*b: Information obtained from manufacturers website, 11/21

\*c: Time with GPS disabled

\*d: Information obtained on digitec.ch on 12.11.21, no discounts / special offers were included in the price, price includes tax / all prices in CHF

\*e: 90 h net operating time, under regular use up to 2 years

# Several options exist for accurate heart rhythm

## ECG record duration

30 – 60 s<sup>1</sup>

24 – 48 h

7 – 14 d

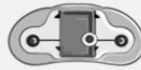
3 – 4 wk

Yr

**Event** recorders  
and  
**Mobile** devices



**Holter**  
ECG



**ECG**  
patch



**Seven-day**  
Holter



**External loop**  
recorders



**Implantable**  
loop  
recorders



**Cardiac**  
Pacemaker/  
defibrillator

**Prospective** record

**Continuous** record

**Loop / intermittent** record

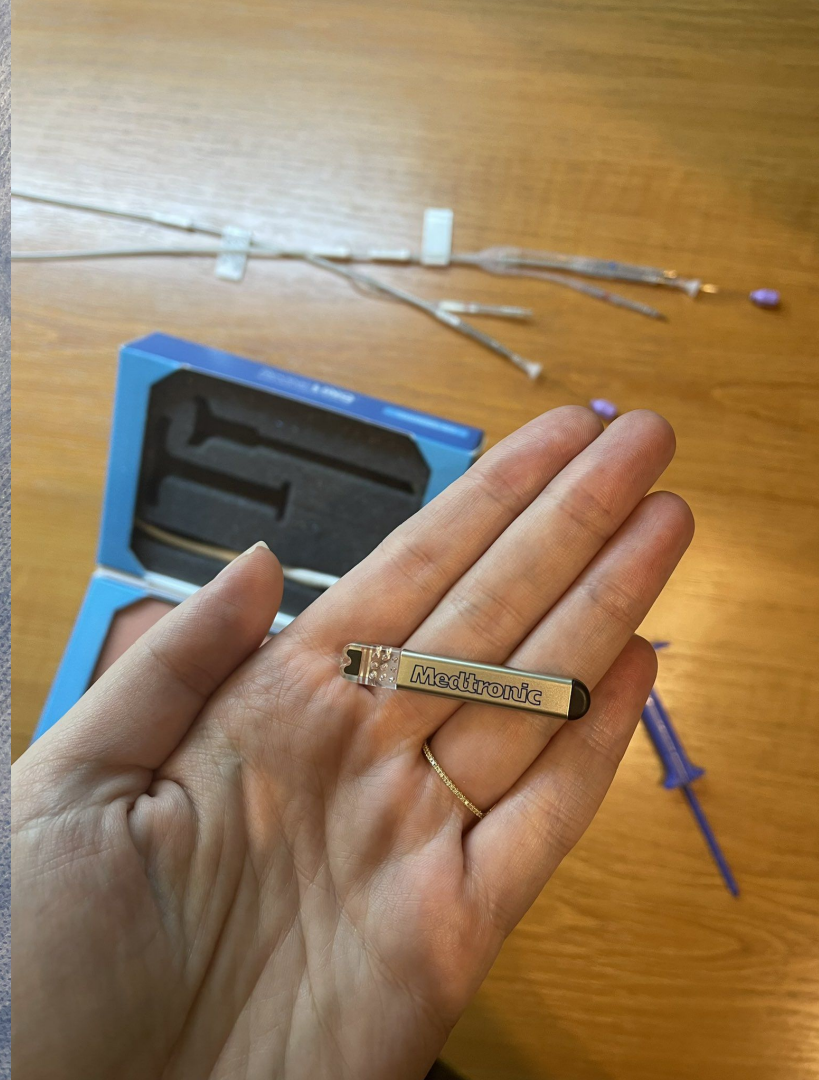
■ **Single** or two ECG leads ■ **5 - 12** ECG leads ■ **Intracavitary** electrogram

**Not good for syncope**

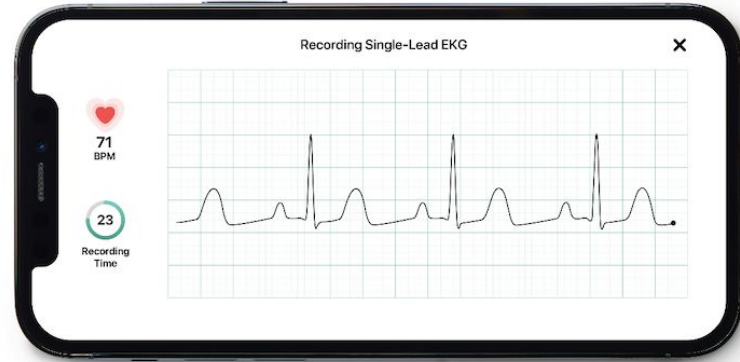




Confirm Rx  
Insertion tool



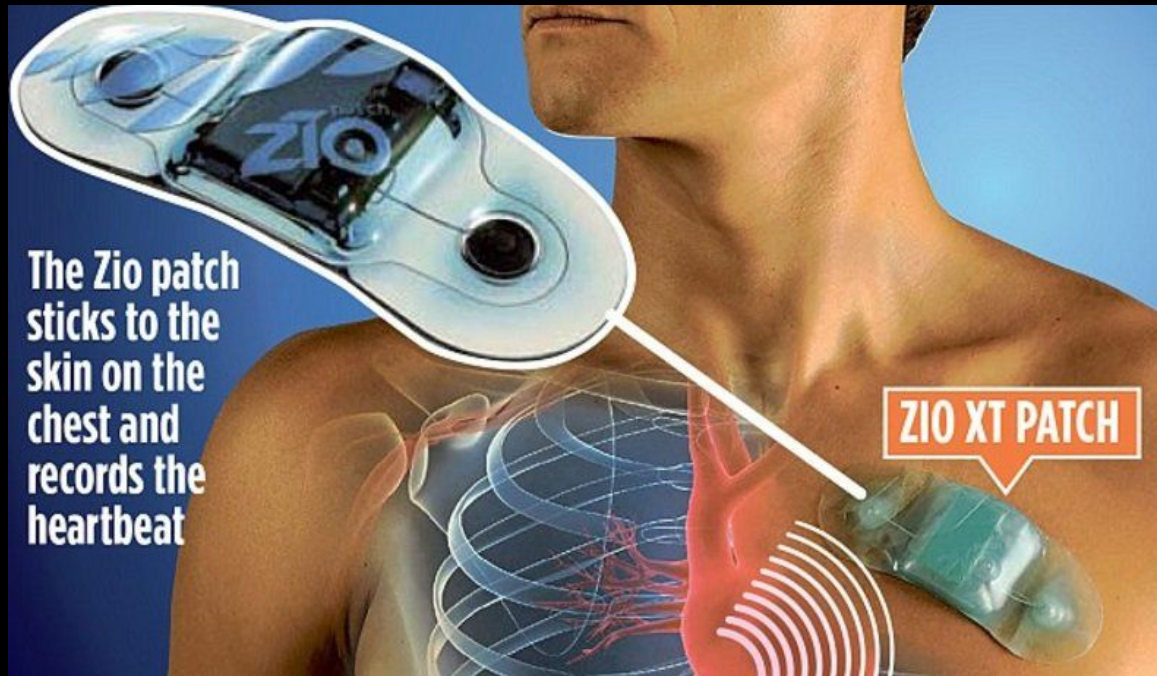
# KARDIA : Alivecor : Costco, Best buy, Amazon, etc







## Zio patch



The Zio patch sticks to the skin on the chest and records the heartbeat

ZIO XT PATCH



**Allergic  
reaction to  
Ziopatch**



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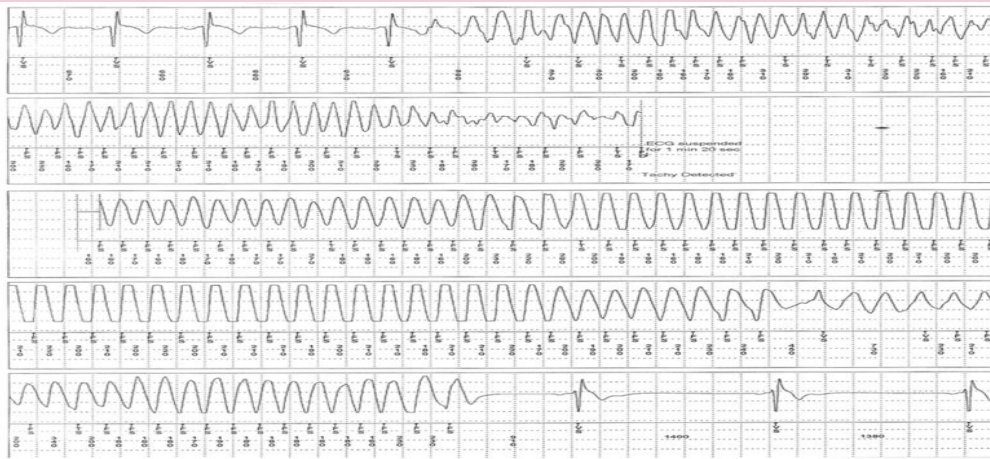
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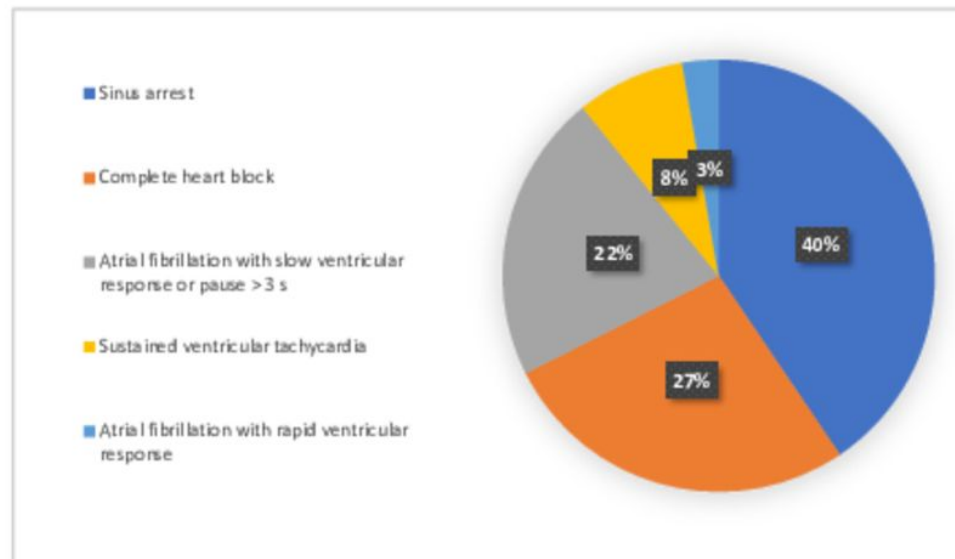
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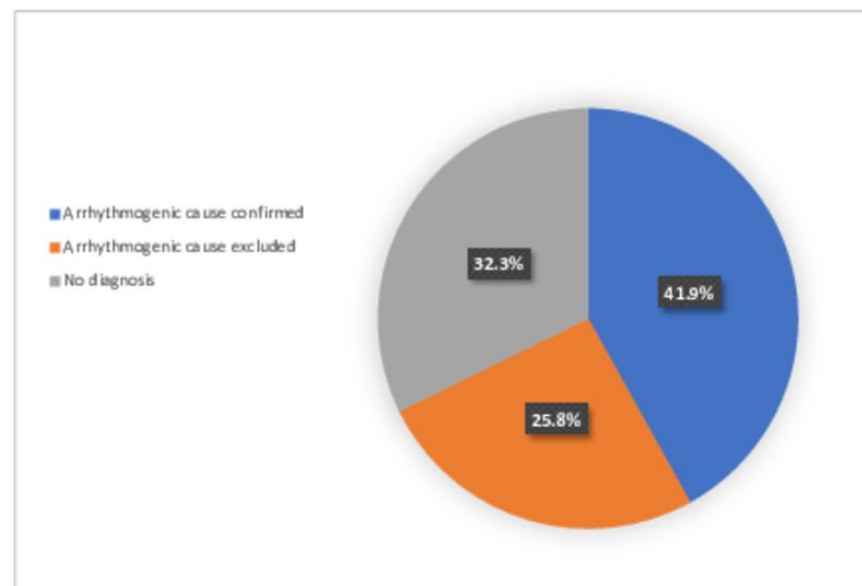


Questions and comments  
Thank you for your attention !!

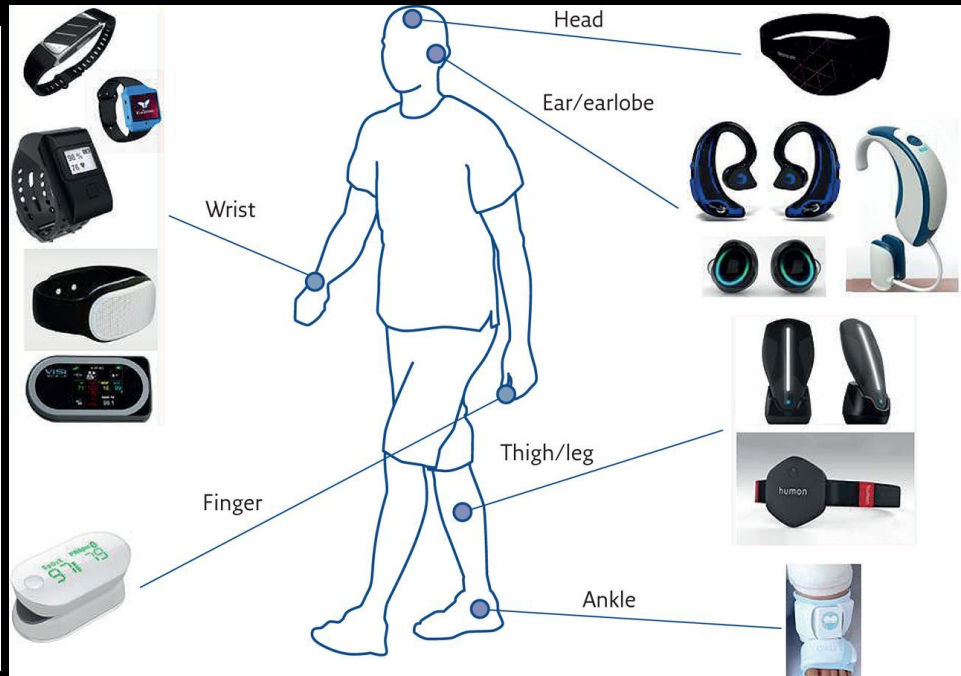
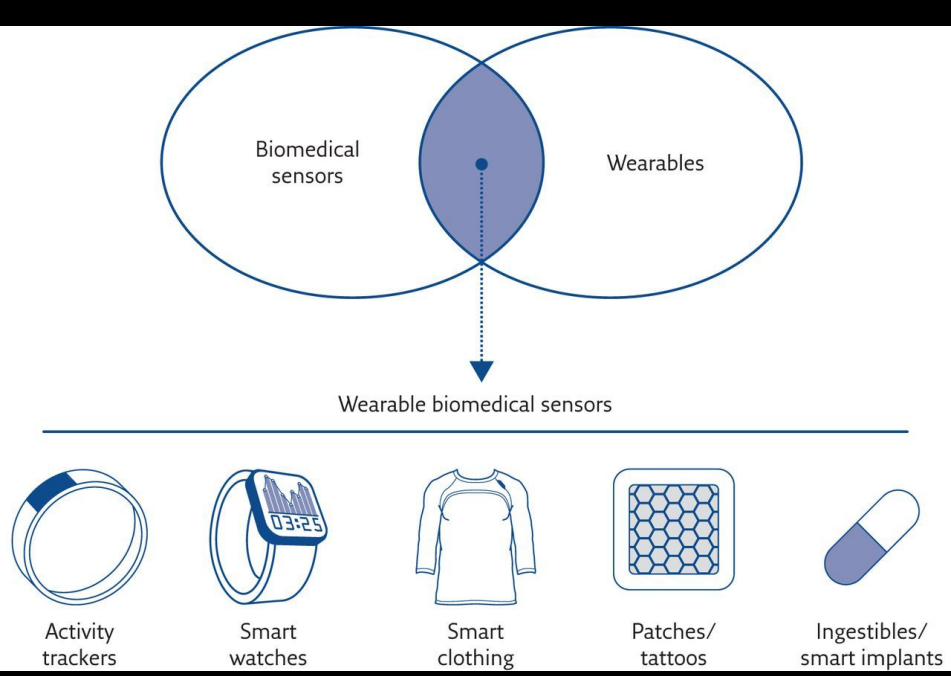
**Figure 1.** Arrhythmias registered in patients who experienced recurrent syncope or presyncope during follow-up.



**Figure 2.** Diagnostic yield of implantable loop recorders in the study population.



# The future of wearables



## Loop monitoring vs. usual care in older high-risk patients without AF



Loop monitoring  
increased  
bradyarrhythmia  
detection

HR =

**6.21**



Loop monitoring  
increased  
pacemaker  
implantation

HR =

**1.53**

Healio 

Continuous monitoring via implantable loop recorder detected bradyarrhythmia in more than 20% of high-risk patients aged 70 years or older with no history of AF.

Data were derived from Diederichsen SZ, et al. *JAMA Cardiol.* 2023;doi:10.1001/jamacardio.2022.5526