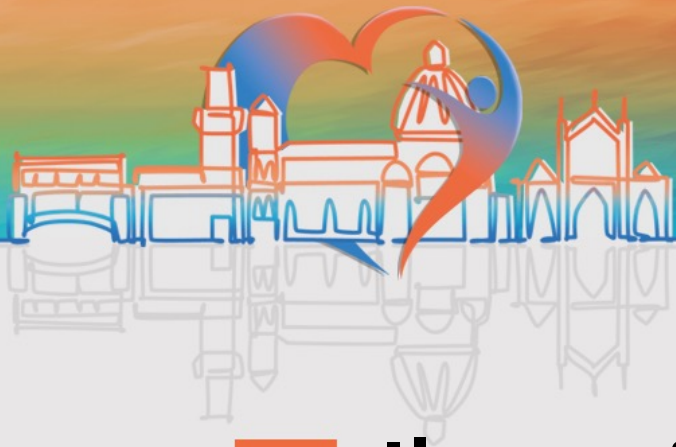




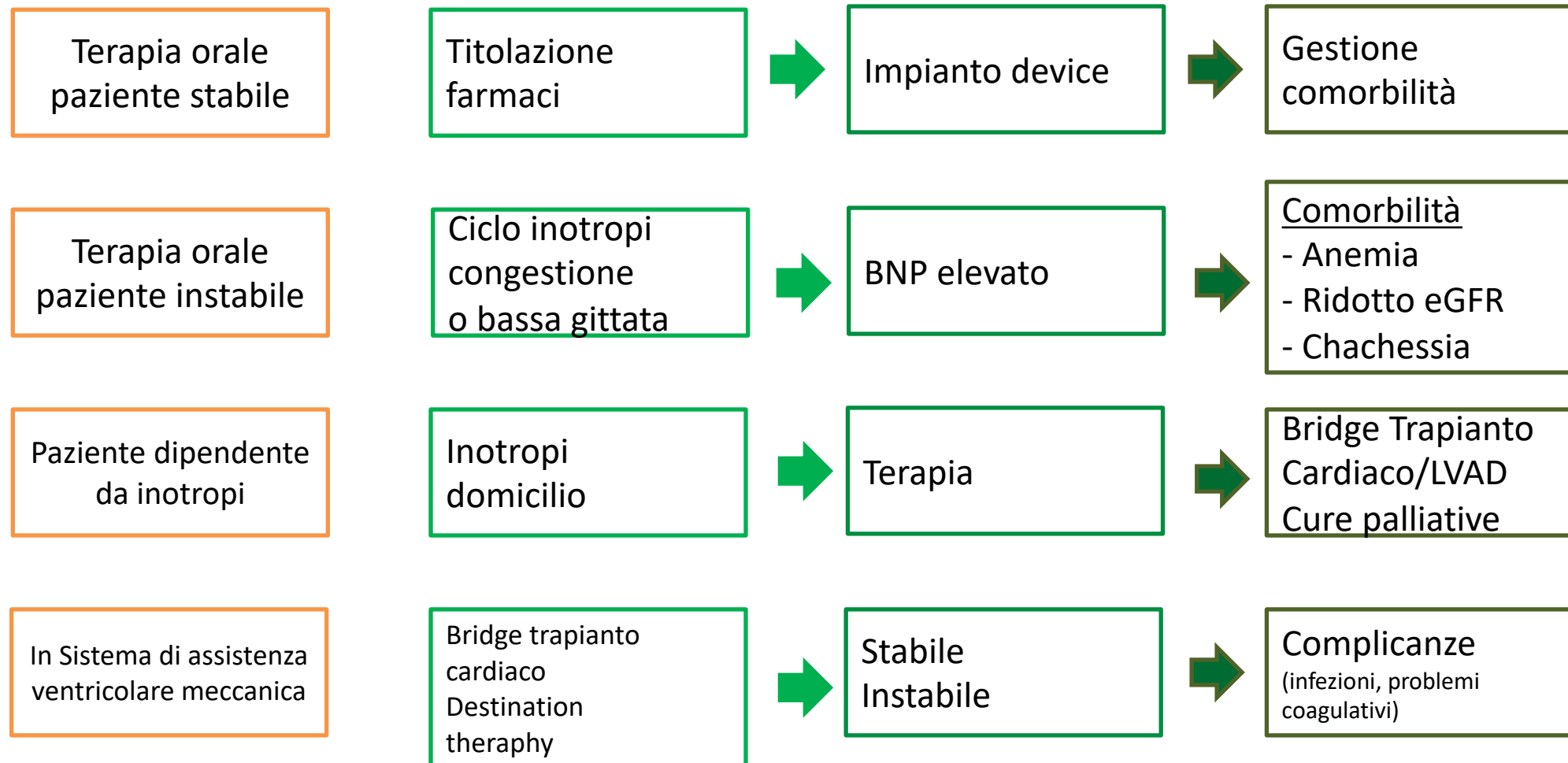
GIOVEDÌ 29

Il monitoraggio in remoto dello scompenso cardiaco grave

Angela Beatrice Scardovi, *Roma*



Profilo del paziente con Scompenso Cardiaco alla dimissione e conseguente programma di gestione





I NEED HELP

I	Inotropes	Necessità precedente o in corso inotropo
N	NYHA Class/BNP	NYHA III-IV /BNP elevati
E	End organ dysfunction	Peggioramento funzionalità renale ed epatica
E	Ejection fraction	FE < 20%
D	Defibrillator shock	Shock ricorrenti ed appropriati ICD
H	Hospitalisation	Più di una ospedalizzazione per SC negli ultimi 12 mesi
E	Edema/escalation diuretics	Persistente sovraccarico emodinamico che necessita aumento diuretico
L	Low blood pressure	PA < 90-100mmHg
P	Prognostic medication	Incapacità di proseguire o titolare farmaci raccomandati

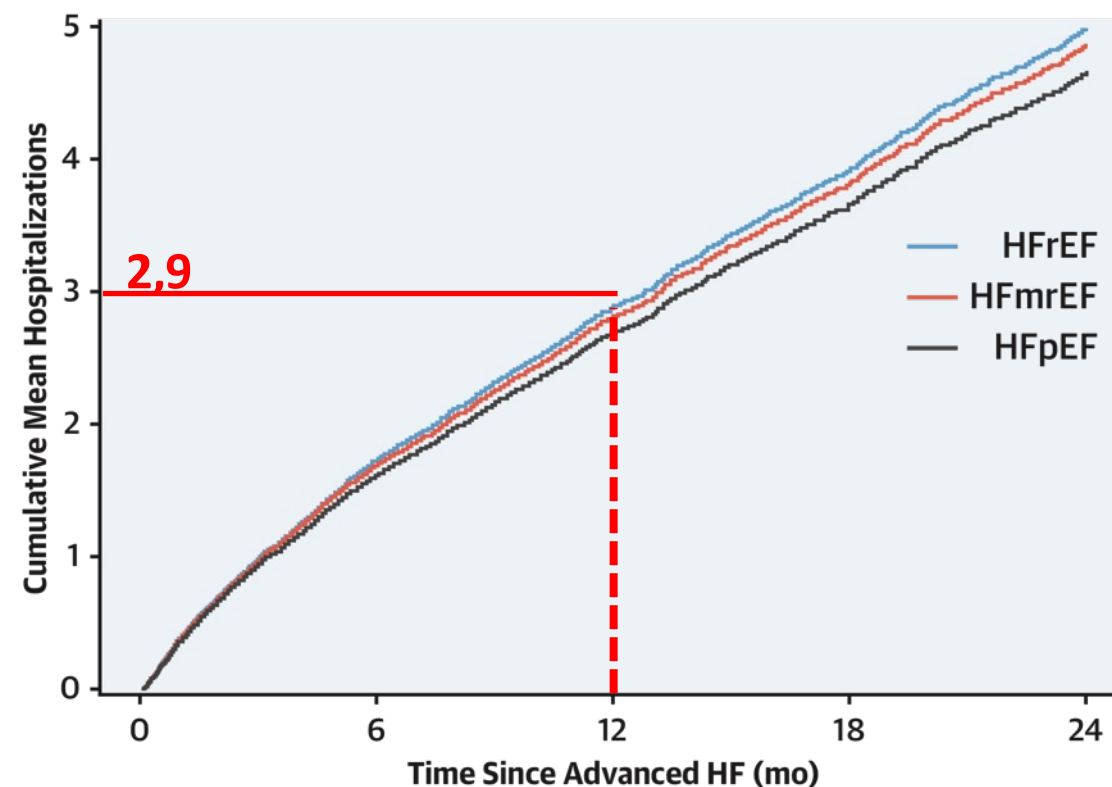
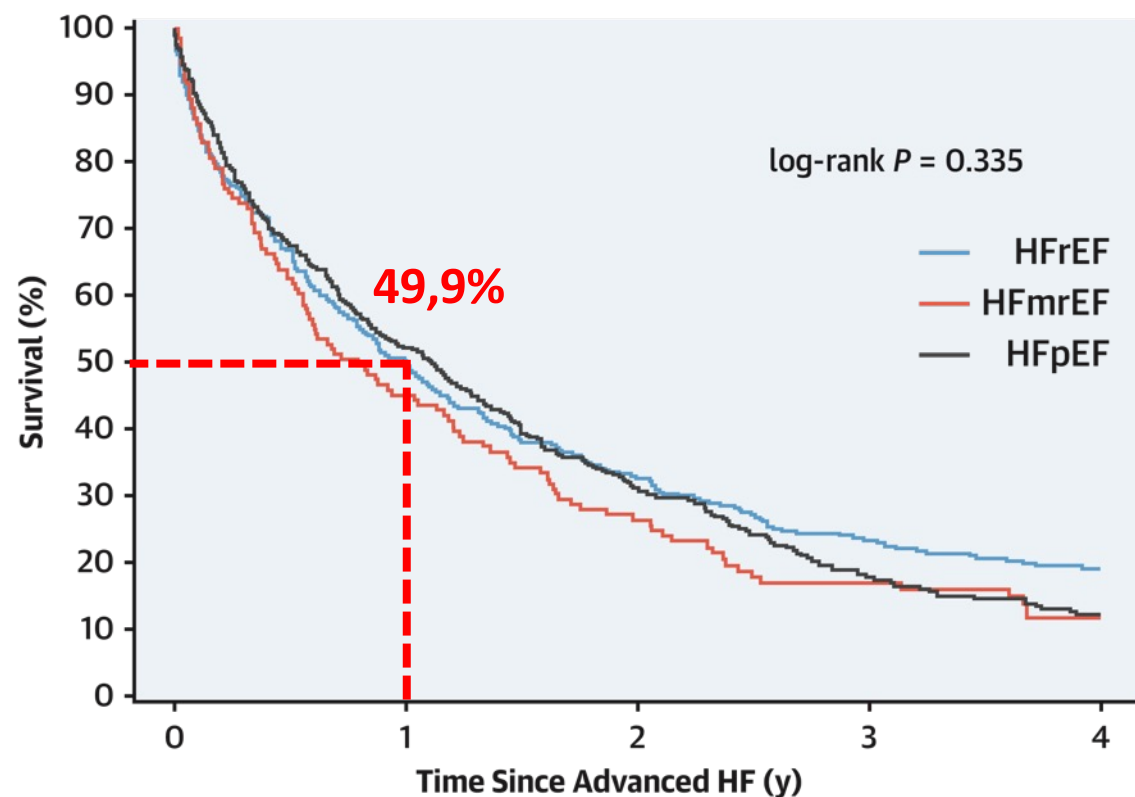
Advanced Heart Failure Epidemiology and Outcomes

A Population-Based Study

Shannon M. Dunlay, MD, MS,^{a,b,c} Véronique L. Roger, MD, MPH,^{a,b} Jill M. Killian, BA,^b Susan A. Weston, MS,^b Philip J. Schulte, PhD,^b Anna V. Subramaniam, MD,^d Saul B. Blecker, MD, MHS,^e Margaret M. Redfield, MD^a



HF 2007-2017 Olmsted County
N=6836

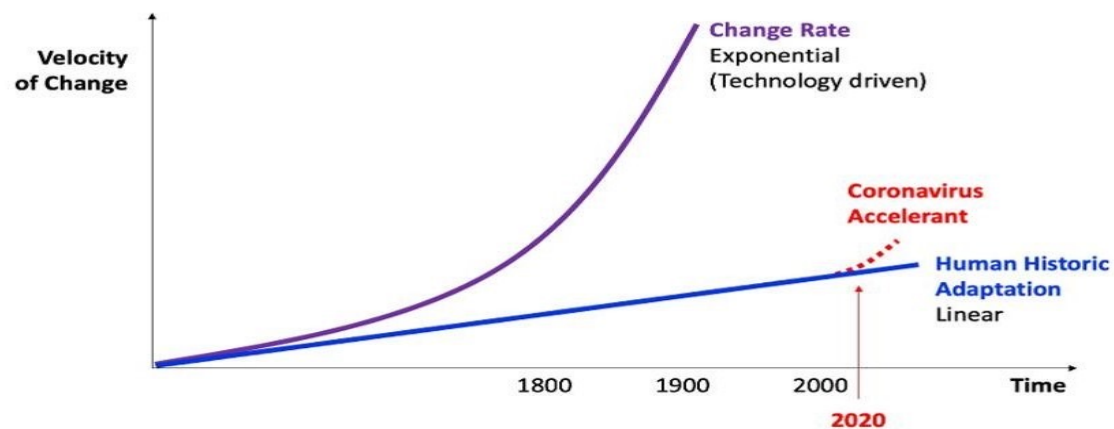




AROUND THE CORNER: DIGITAL DELIVERY OF HEALTHCARE AFTER COVID-19



CORONAVIRUS ACCELERANT: Speeds Our Digital (Human) Transformation

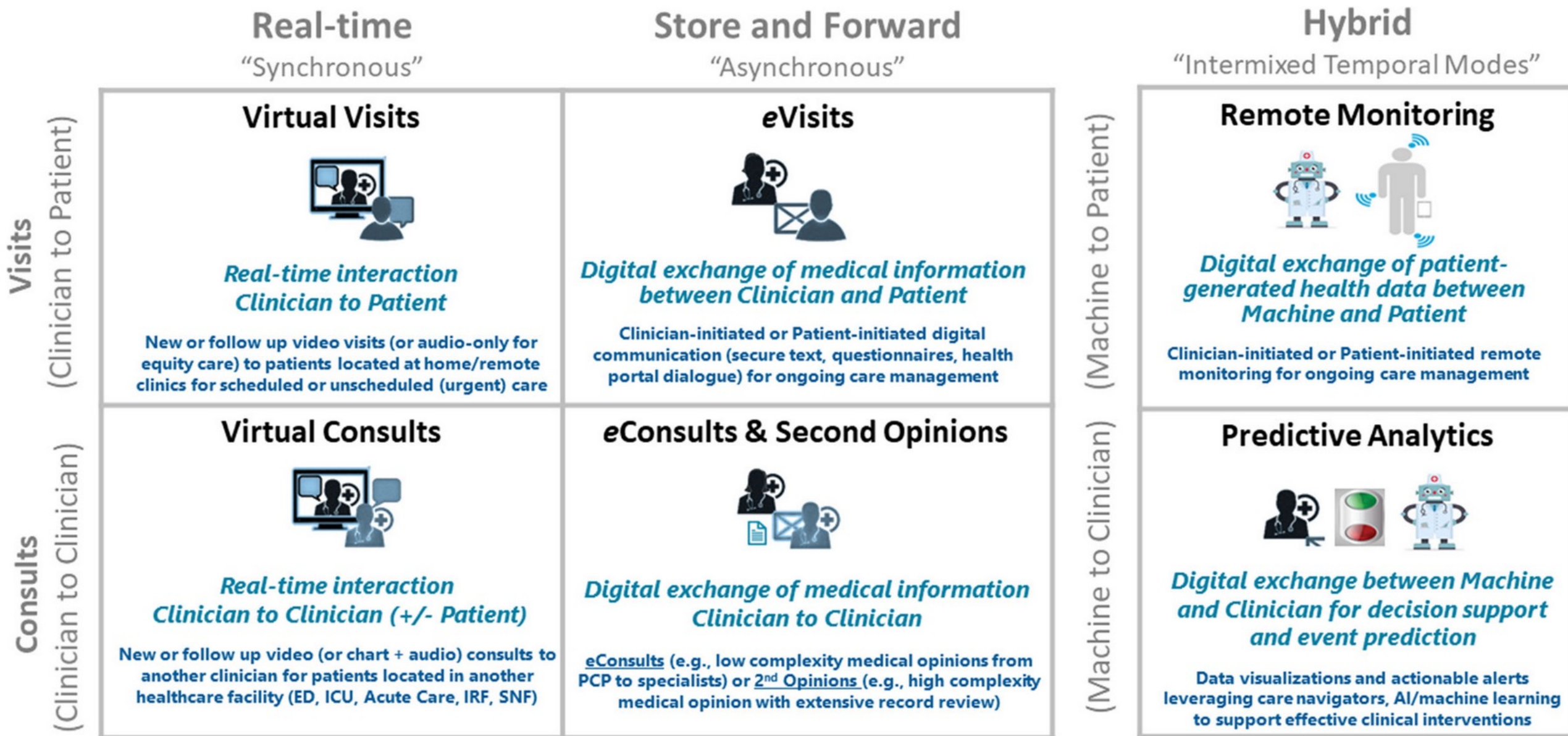


Recommendations for telemonitoring

Recommendations	Class	Level
Non-invasive HTM may be considered for patients with HF in order to reduce the risk of recurrent CV and HF hospitalizations and CV death.	IIb	B
Monitoring of pulmonary artery pressure using a wireless haemodynamic monitoring system may be considered in symptomatic patients with HF in order to improve clinical outcomes.	IIb	B

CV = cardiovascular; HF = heart failure; HTM= home telemonitoring; LVEF = left ventricular ejection fraction.

TAXONOMY OF TELEHEALTH ENCOUNTERS





ESC

European Society
of Cardiology

Europace (2022) **24**, 1372–1383

<https://doi.org/10.1093/europace/euac052>

REVIEW

Wearables, telemedicine, and artificial intelligence in arrhythmias and heart failure: Proceedings of the European Society of Cardiology Cardiovascular Round Table

Christophe Leclercq ^{1*}, Henning Witt², Gerhard Hindricks³, Rodolphe P. Kattr⁴, Dave Albert⁵, Andrea Belliger⁶, Martin R. Cowie⁷, Thomas Deneke⁸, Paul Friedman⁹, Mehdiyar Haschemi¹⁰, Trudie Lobban ¹¹, Isabelle Lordereau¹², Michael V. McConnell¹³, Leonardo Rapallini¹⁴, Eigil Samset¹⁵, Mintu P. Turakhia^{16,17}, Jagmeet P. Singh¹⁸, Emma Svennberg¹⁹, Manish Wadhwa²⁰, and Franz Weidinger²¹



AHA SCIENTIFIC STATEMENT

An Overview of Telehealth in the Management of Cardiovascular Disease: A Scientific Statement From the American Heart Association

E.A.Takahashi et al

Circulation 2022, 146, 25, e558-e568

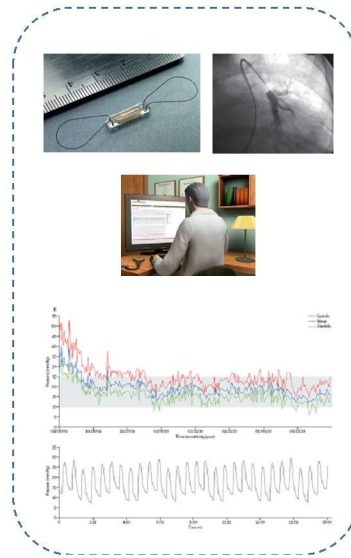


Conoscere e Curare il Cuore 2024

Tecnologia degli strumenti di controllo remoto

Le modalità di telemonitoraggio e teleassistenza

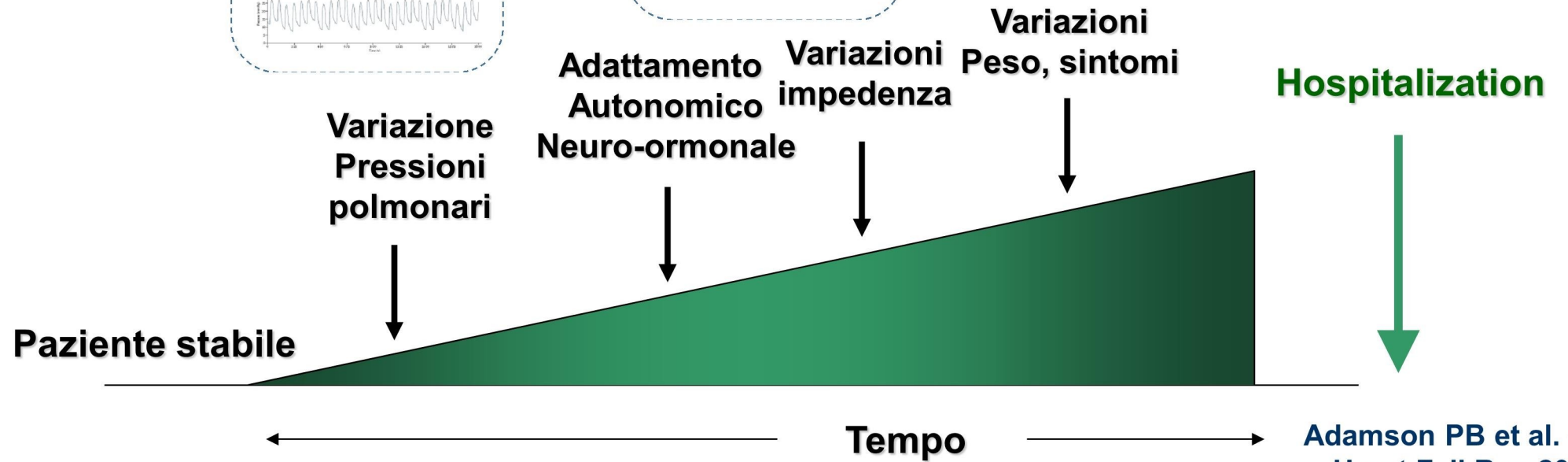
Monitoraggio con sensori
impiantabili



Monitoraggio con ICD



Monitoraggio con sensori



Adamson PB et al. Curr Heart Fail Rep 2009

Strumenti indossabili e parametri misurabili

<i>Accelerometer, barometer</i>	<i>Activity (pedometer, step counter, exercise, calories burned)</i>
<i>Photo-plethysmographic</i>	<i>Heart rate (HR), rhythm, HR variability, blood pressure, oxygen saturation, cardiac output, systolic volume, sleep and its stages</i>
<i>Electrocardiogram</i>	<i>Single or multiple leads, continuous or as-needed monitoring, arrhythmias, interval measurement, electrolyte alterations</i>
<i>Oscillometer</i>	<i>Blood pressure and heart rate</i>
<i>Biochemical sensors</i>	<i>Invasive: blood sugar and electrolytes Non-invasive: sweat, saliva, hydration status</i>

Telehealth tools for cardiovascular home monitoring

Risk factor monitoring

- Blood pressure
- Smoking
- Diet
- Weight



Medication adherence

- Medication tracking
- Smart pillbox

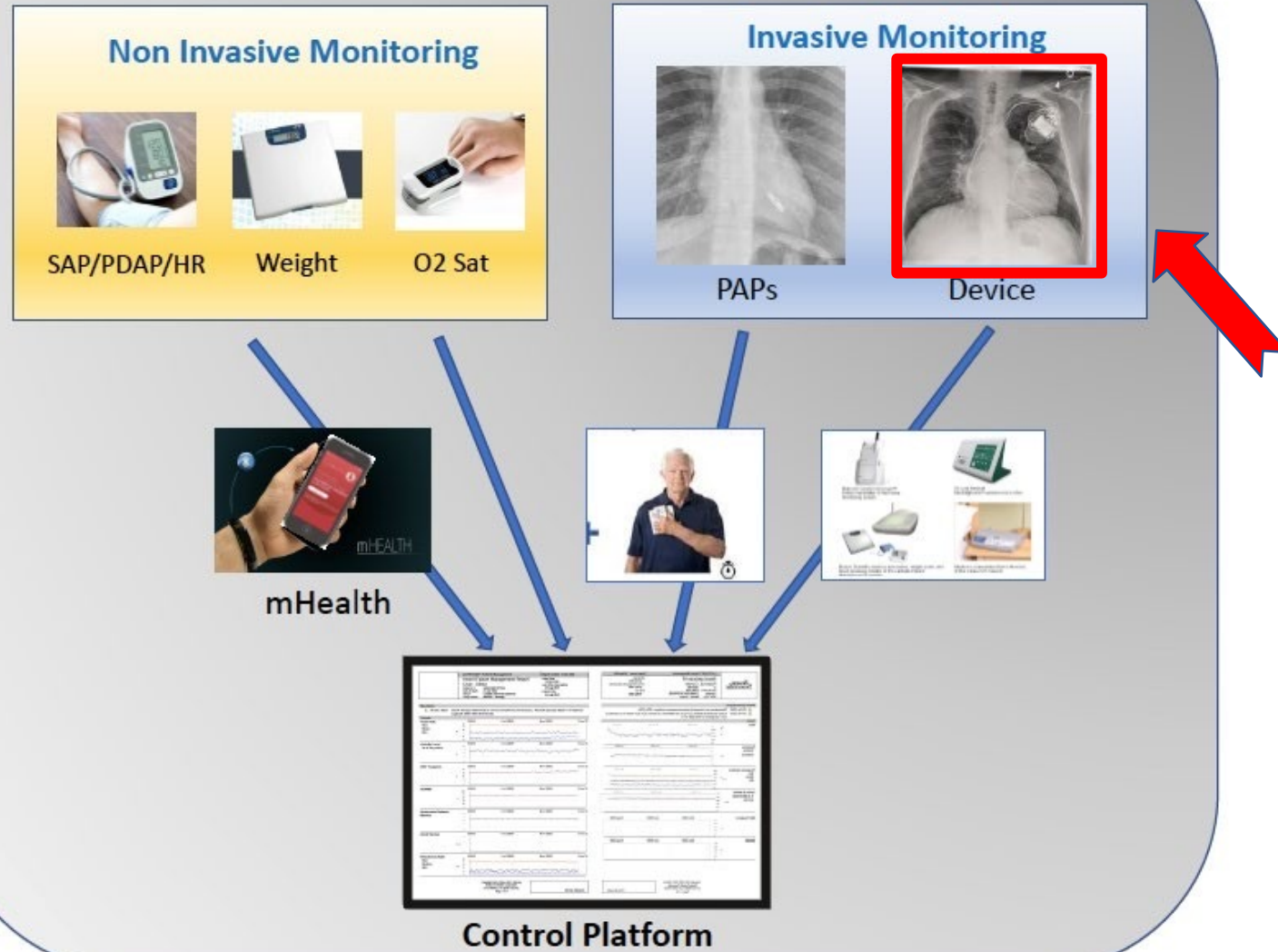


Symptom monitoring

- Home electrocardiogram
- Pulse oximeter
- Pulmonary artery pressure monitoring



Proactive Management of HF by Integrated Digital Health



Overview of available multisensor algorithms

Boston Scientific	Medtronic
HeartLogic algorithm	Triage-HF algorithm
Heart sounds (first and third heart sounds and the ratio of the two)	Optivol™ (intrathoracic impedance)
Thoracic impedance	Physical activity
Respiration rate	Night ventricular rate
Ratio of respiration rate to tidal volume	AF/Atrial tachycardia burden
Nightly heart rate	Ventricular rate during AF/AT
Physical activity	%CRT pacing
	Treated VT/VF
	Shocks

MONITORAGGIO INVASIVO ATTRAVERSO I DEVICE

Parametri	Criteri
Impedenza toracica	indice dei fluidi ≥ 60 ohm/dì
Tachicardia / fibrillazione atriale (AT/AF) parossistica	≥ 6 ore /dì
Frequenza ventricolare media durante AT / AF (parossistica o persistente)	AT/AF ≥ 24 ore & frequenza V. ≥ 90 bpm
Attività del paziente	In media < 1 ora / dì per 1 settimana
Frequenza media d/n	≥ 85 bpm per 7 giorni consecutivi
Heart Rate Variability	SDNN < 60 ms per 7 giorni consecutivi
% di stimolazione CRT	$< 90\%$ per 5 giorni su 7
Shock(s) su aritmie ventricolari	1 o più shocks

Proactive Management of HF by Integrated Digital Health

Non Invasive Monitoring



SAP/PDAP/HR

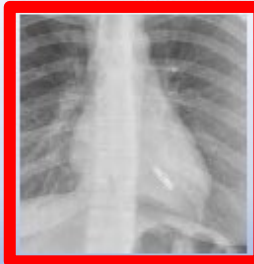


Weight



O2 Sat

Invasive Monitoring



PAPs



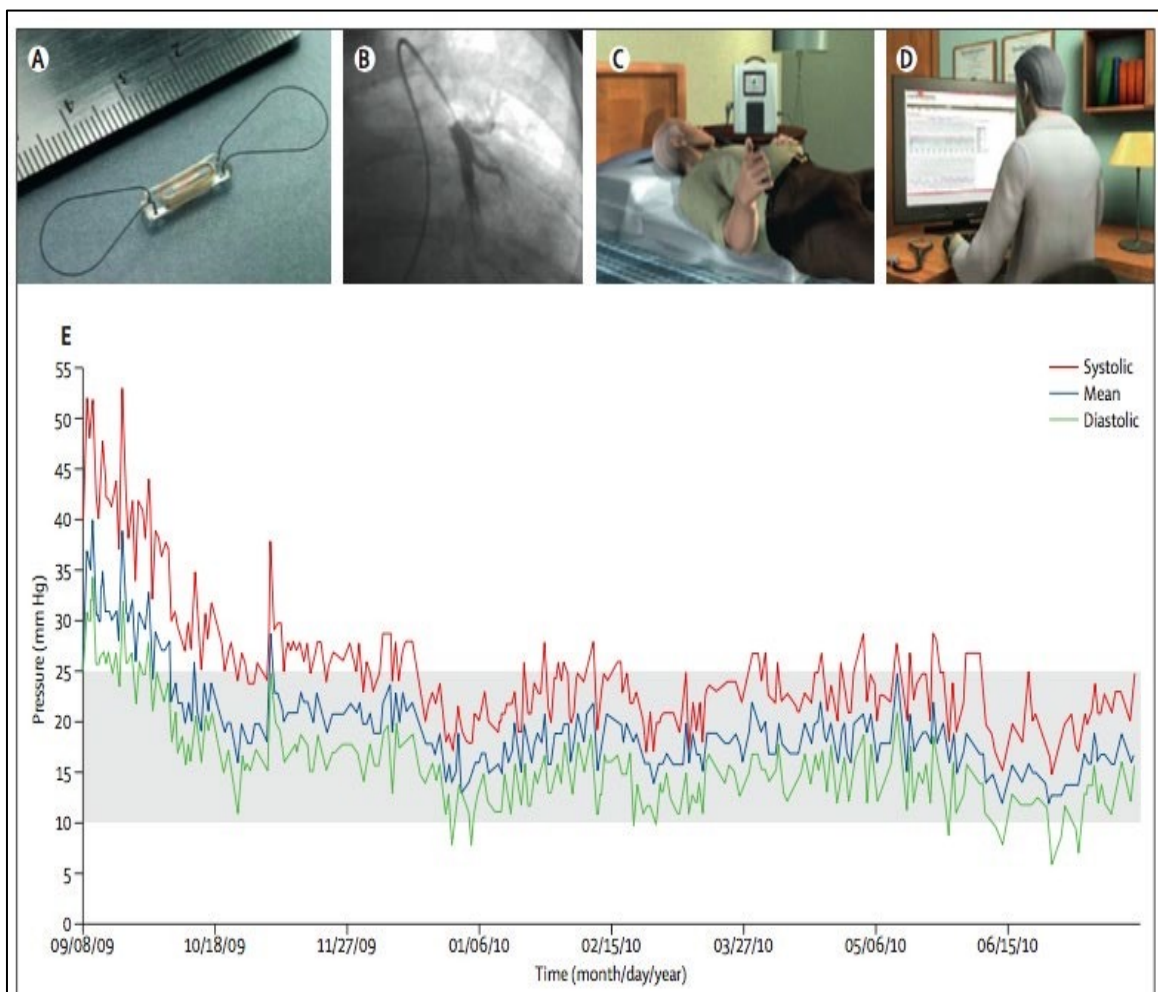
Device



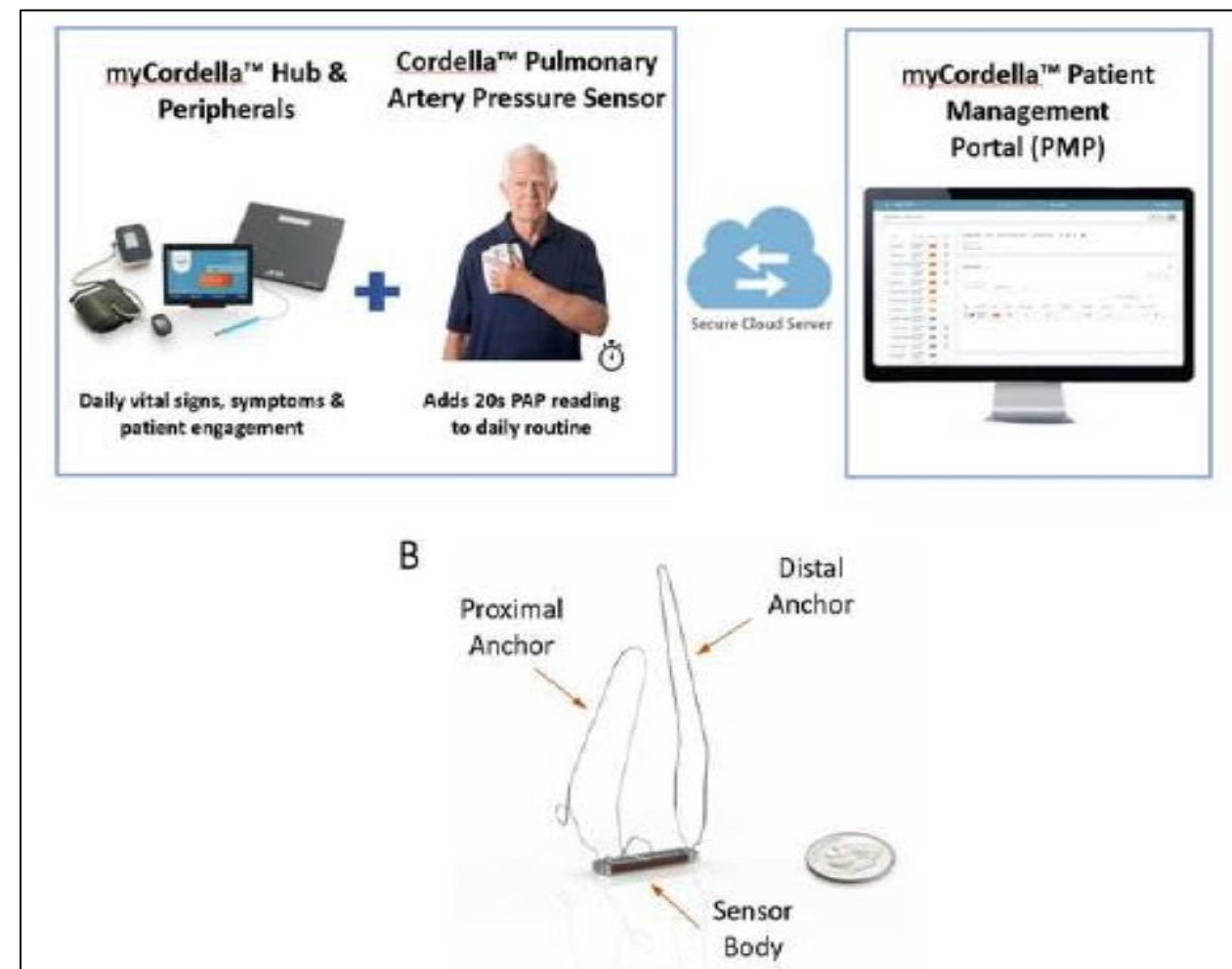
mHealth



Control Platform



CardioMEMs



Cordella System

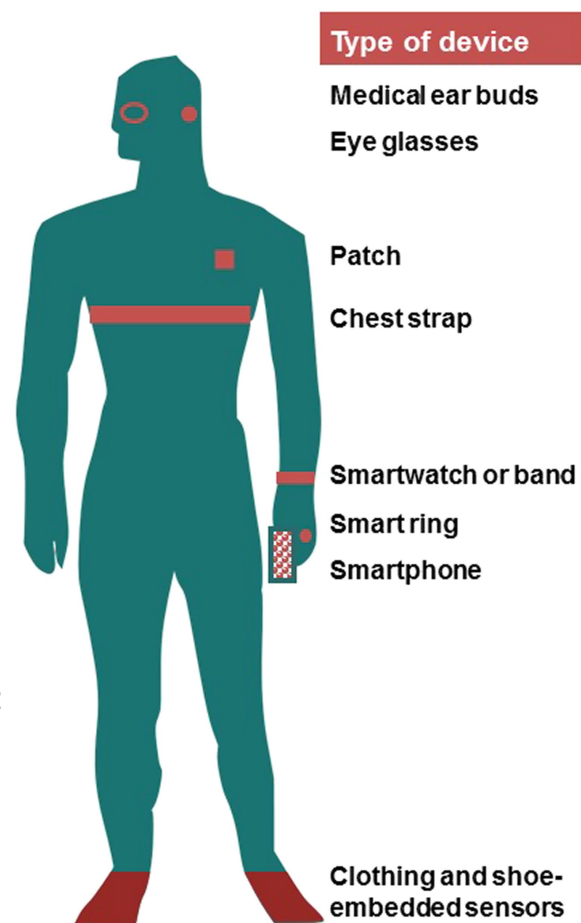
- GARANZIE TECNOLOGICHE DI ACCESSO AL SERVIZIO

Connettività e semplicità di utilizzo

- Connettività da casa del paziente:
GSM (integrato), WiFi o linea telefonica (su richiesta)
- Autonomia nell'uso dei sistemi digitali:
Sistema Elettronico Paziente indipendente, veloce e intuitivo, dotato di semplici istruzioni audio e video

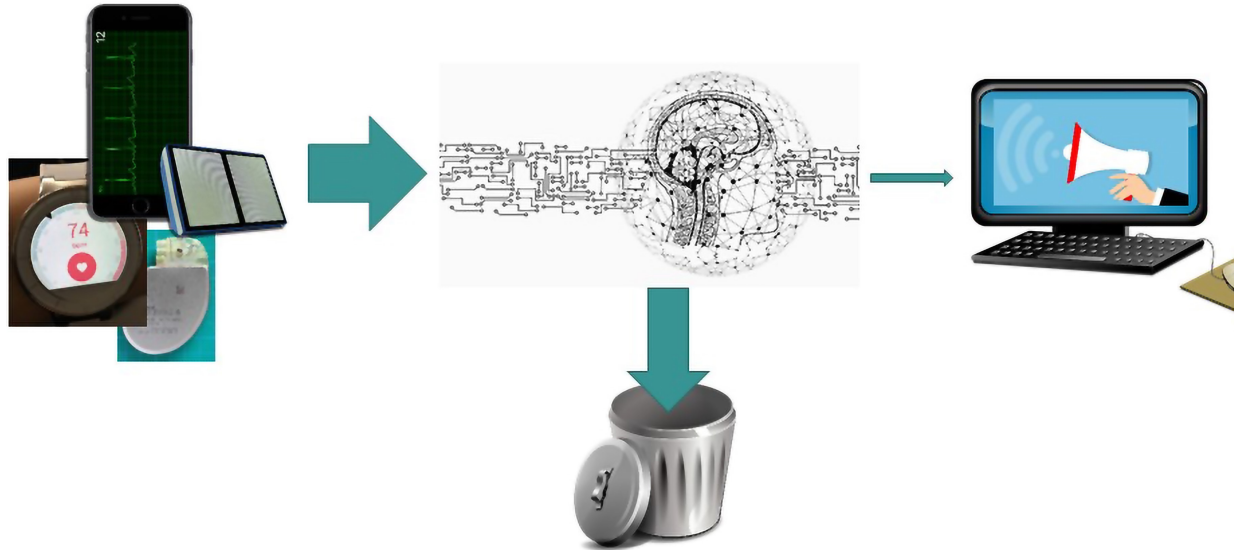


Using devices and AI algorithms in clinical practice to curate data

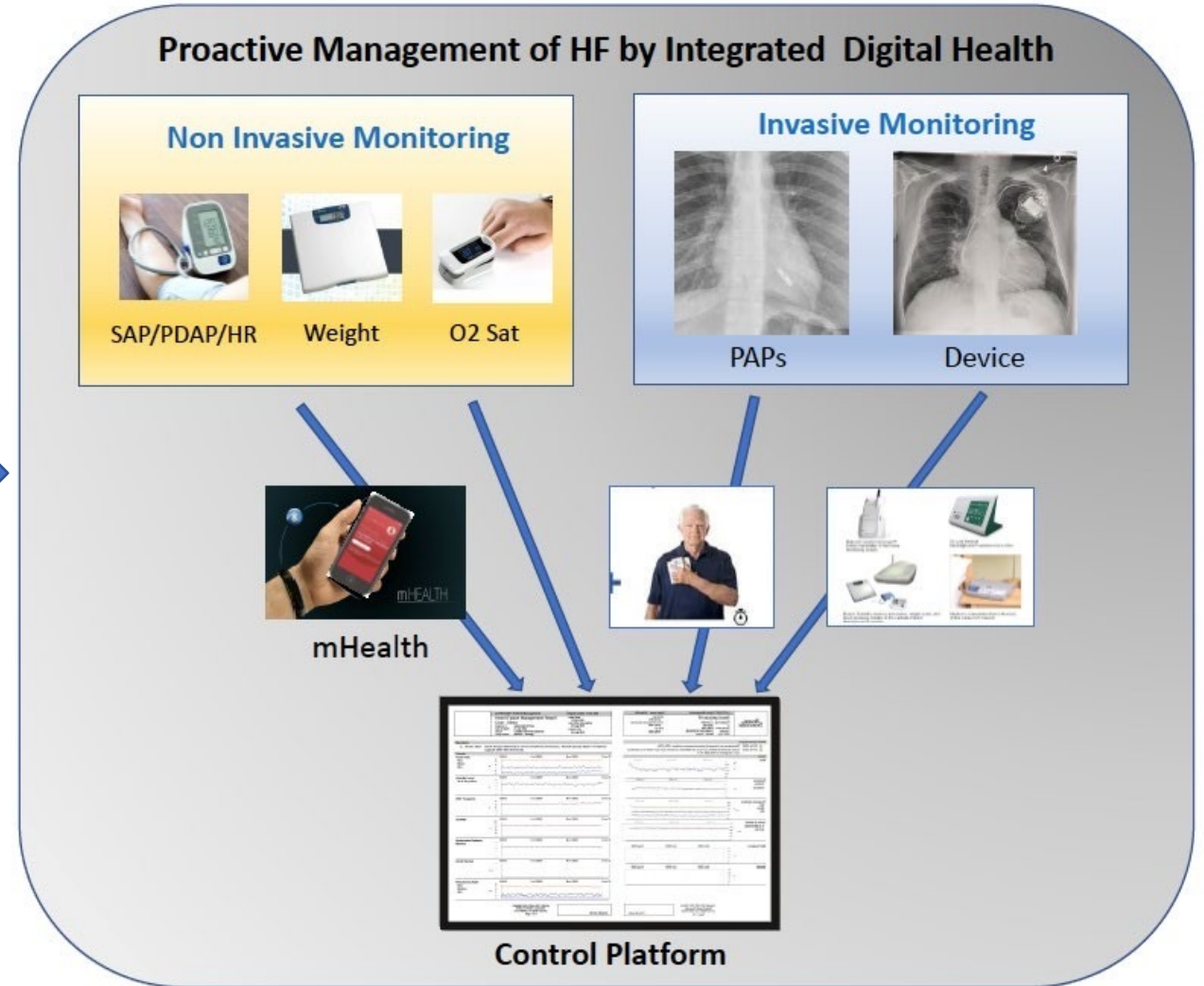
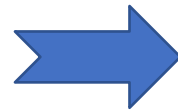


Sensors	Measurements
Accelerometer Barometer GPS	Activity (e.g., step/stair counts, exercise), estimated calories burned
PPG	HR, HRR, HRV, cuff-less BP, SaO2, cardiac output, stroke volume, pulse-based rhythm detection, sleep and its stages
ECG	Single- and multi-lead ECG, continuous or as-needed monitoring, interval measurements (e.g., QTc), arrhythmia detection, electrolyte abnormalities
Oscillometer	Wrist cuff BP
Biochemical sensors	Invasive: blood glucose and electrolyte monitoring Non-invasive: sweat and saliva electrolytes and hydration status

Using devices and AI algorithms in clinical practice to curate data



LA VISITA NON IN PRESENZA



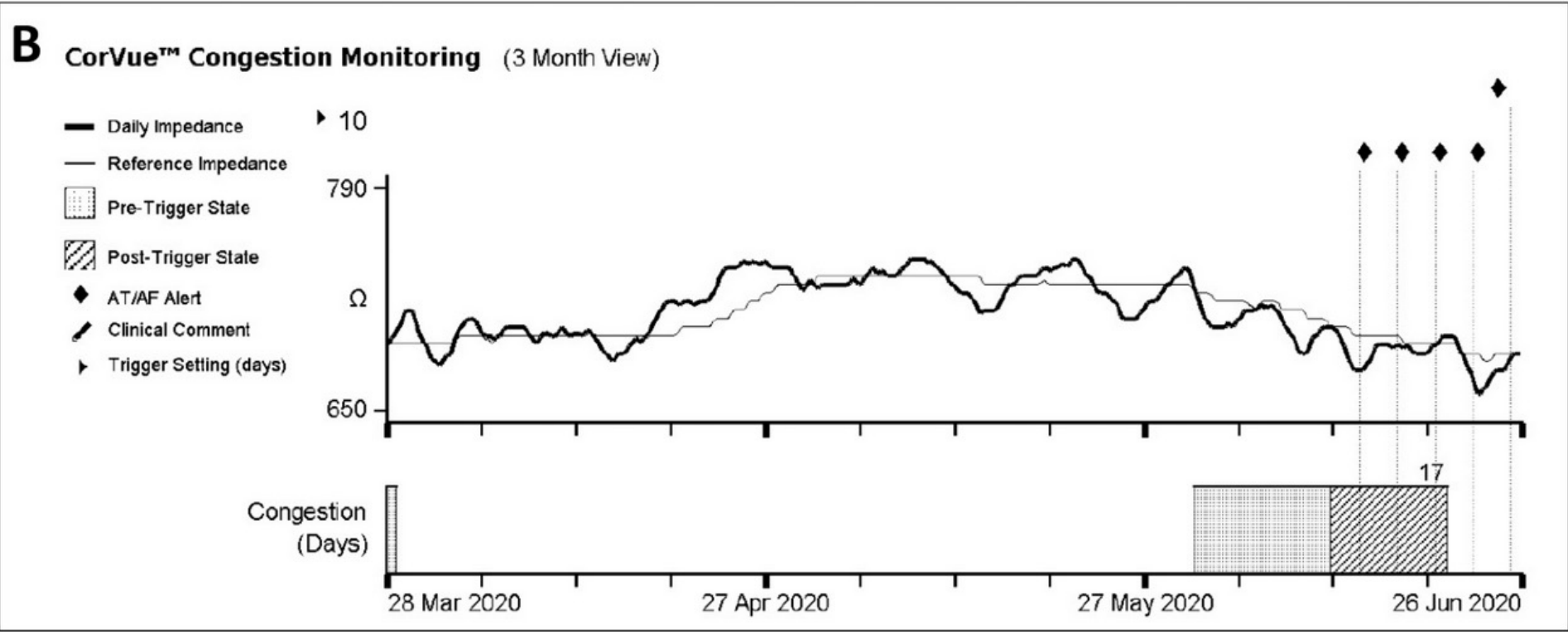
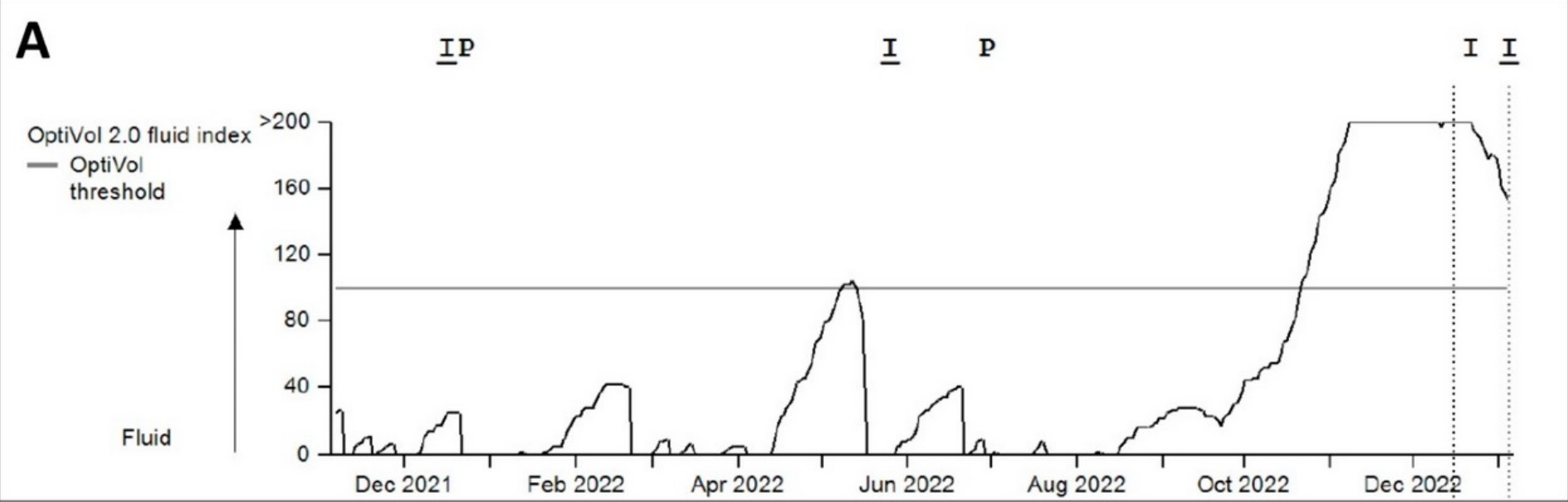


Conoscere e Curare il Cuore 2024

Controllo remoto: prove di efficacia

Cardiovascular
Implantable Electronic
Devices Enabled Remote
Heart Failure Monitoring;
What We Have Learned
and Where to
Go Next

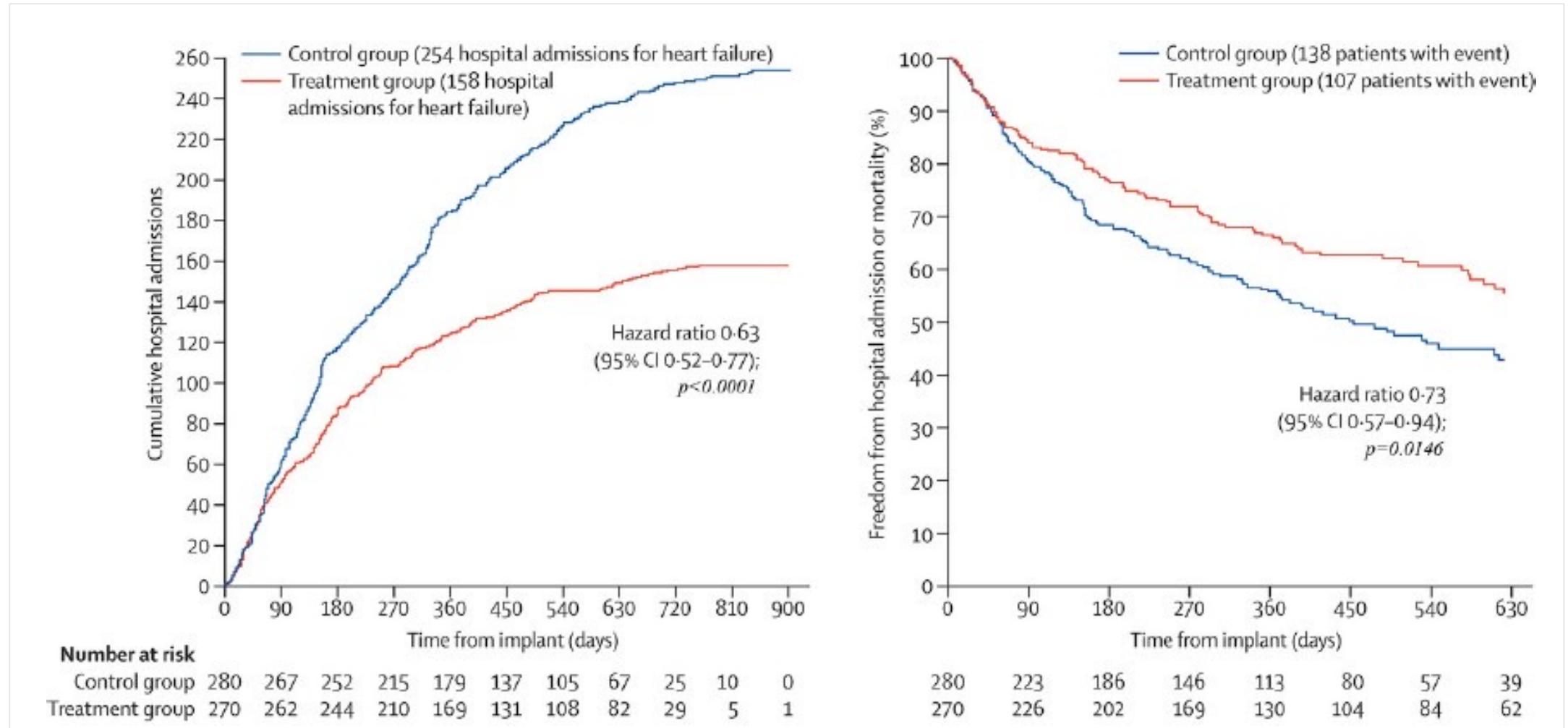
Review



MONITORAGGIO INVASIVO ATTRAVERSO I DEVICE

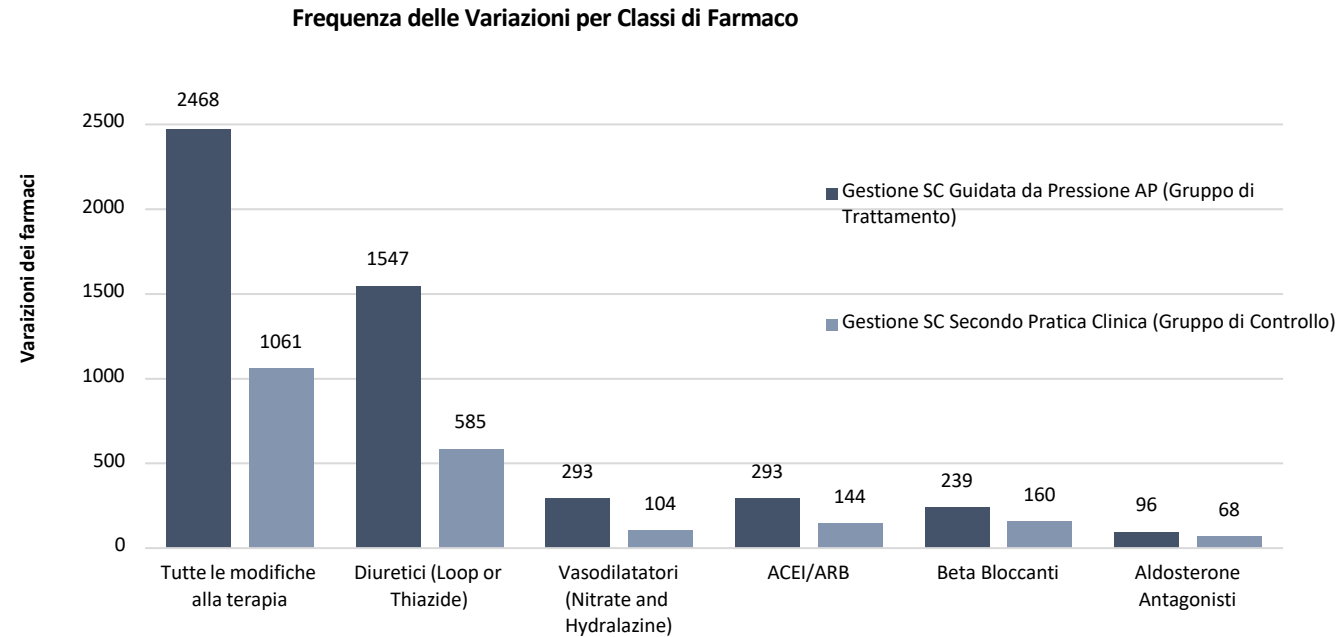
Trial/study	Author; journal; year	No. of patients	Parameter	Endpoint	Impact on HF hospitalisation
DOT-HF [16]	Van Veldhuisen et al.; Circulation; 2011	335	Intrathoracic impedance	HF hospitalisation	Increased
OptiLink [14]	Brachmann et al.; Eur J Heart Fail; 2011	1002	Intrathoracic impedance	HF hospitalisation	Non-significant
EFFECT [17]	De Simone et al.; Europace; 2015	987	Remote monitoring via ICD, or CRT	HF hospitalisation	Reduced (IRR 0.54; 95% CI 0.24–0.62)
MORE-CARE [13]	Boriani et al.; Eur J Heart Fail; 2017	865	Remote monitoring of advanced diagnostics via CRT-D	HF hospitalisation	Non-significant
REM-HF [15]	Morgan et al.; Eur Heart J; 2017	1650	Remote monitoring via ICD, or CRT	HF hospitalisation	Non-significant
COMMIT-HF [18]	Kurek et al.; J Cardiovasc Electrophysiol; 2017	574	Remote monitoring via ICD, or CRT	HF hospitalisation/ All-cause mortality	Non-significant/ Reduced all-cause mortality (HR 0.24; 95% CI 0.14–0.41)
IN-TIME [19]	Hindricks et al; Lancet; 2014	716	Remote monitoring via ICD, or CRT	HF worsening score	OR 0.63 95% Ci 0.43–0.90

Champion Study: CardioMEMs



Abraham WT et al, Lancet 2011

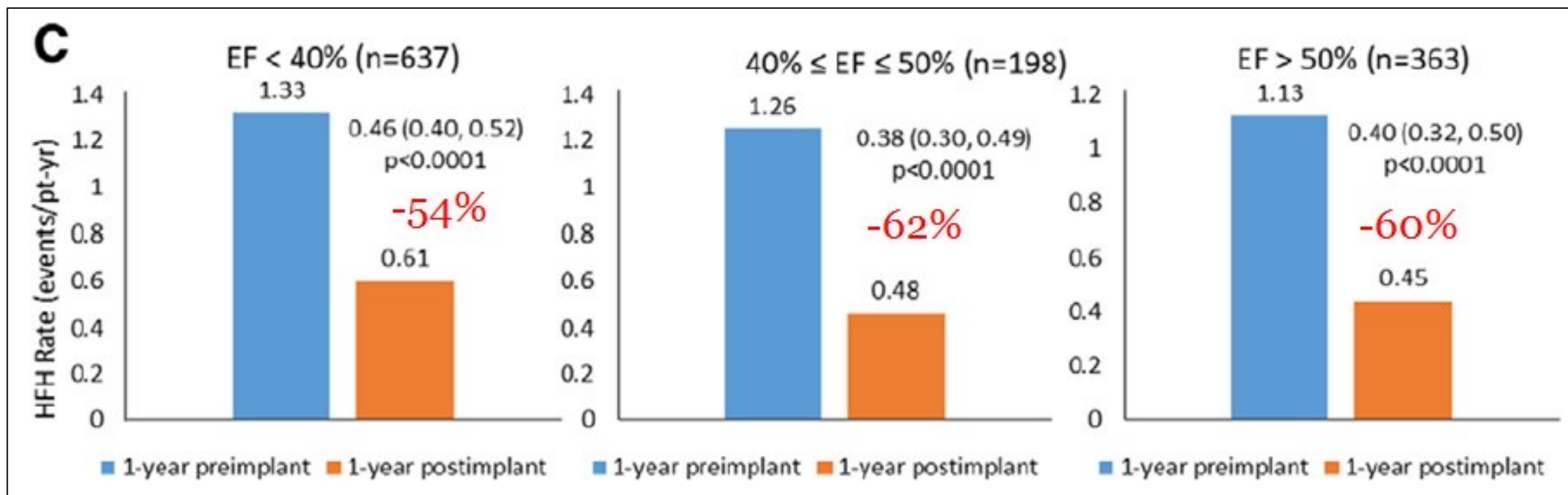
Gestione della terapia farmacologica guidata dalla pressione AP



Variazioni della terapia farmacologica basate sulle informazioni di pressione AP erano **PIU' EFFICACI NEL RIDURRE I RICOVERI PER SC** rispetto ad usare solo segni e sintomi.

Ricoveri per scompenso cardiaco: pre e post-impianto stratificato per frazione di eiezione

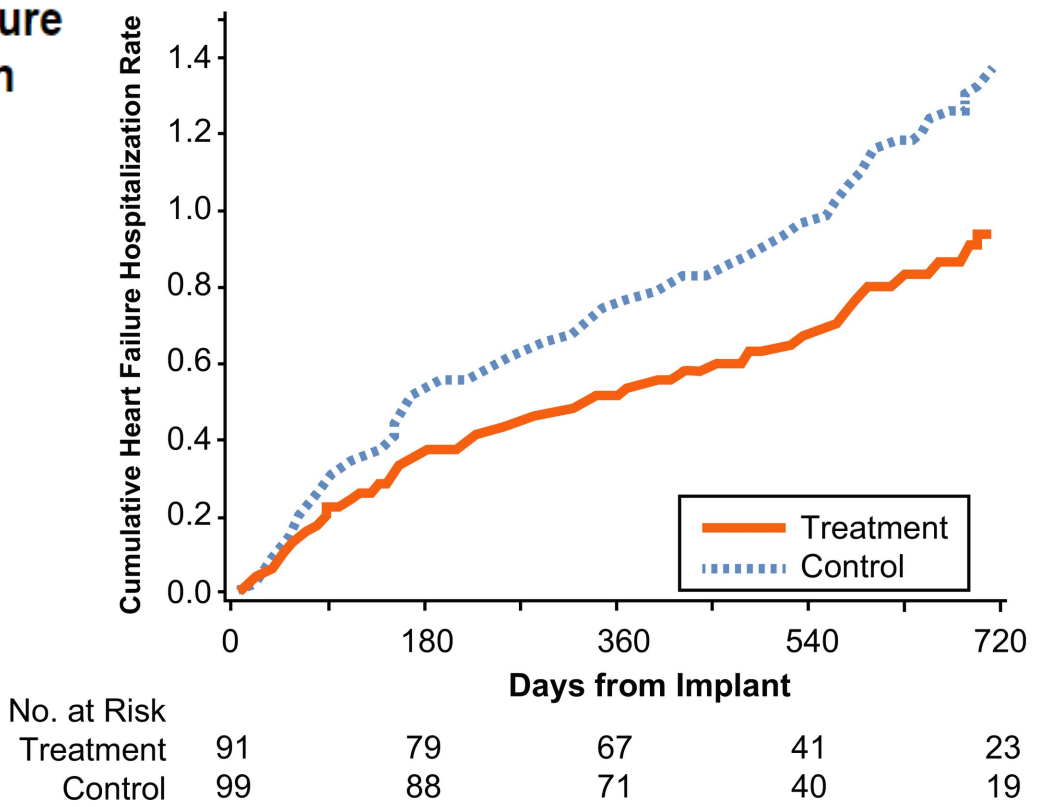
US POST APPROVAL STUDY



Shavelle et al, *Circ Heart Fail.* 2020;13:e006863. DOI: 10.1161/CIRCHEARTFAILURE.119.006863

Remote Hemodynamic-Guided Therapy of Patients With Recurrent Heart Failure Following Cardiac Resynchronization Therapy

Remote hemodynamic-guided adjustment of medical therapies decreased PA pressures and the burden of HF symptoms and hospitalizations in patients with recurring Class III HF and hospitalizations, beyond the effect of cardiac resynchronization therapy.



Hospitalization rates over time



Hemodynamically-Guided Management of Heart Failure Across the Ejection Fraction Spectrum

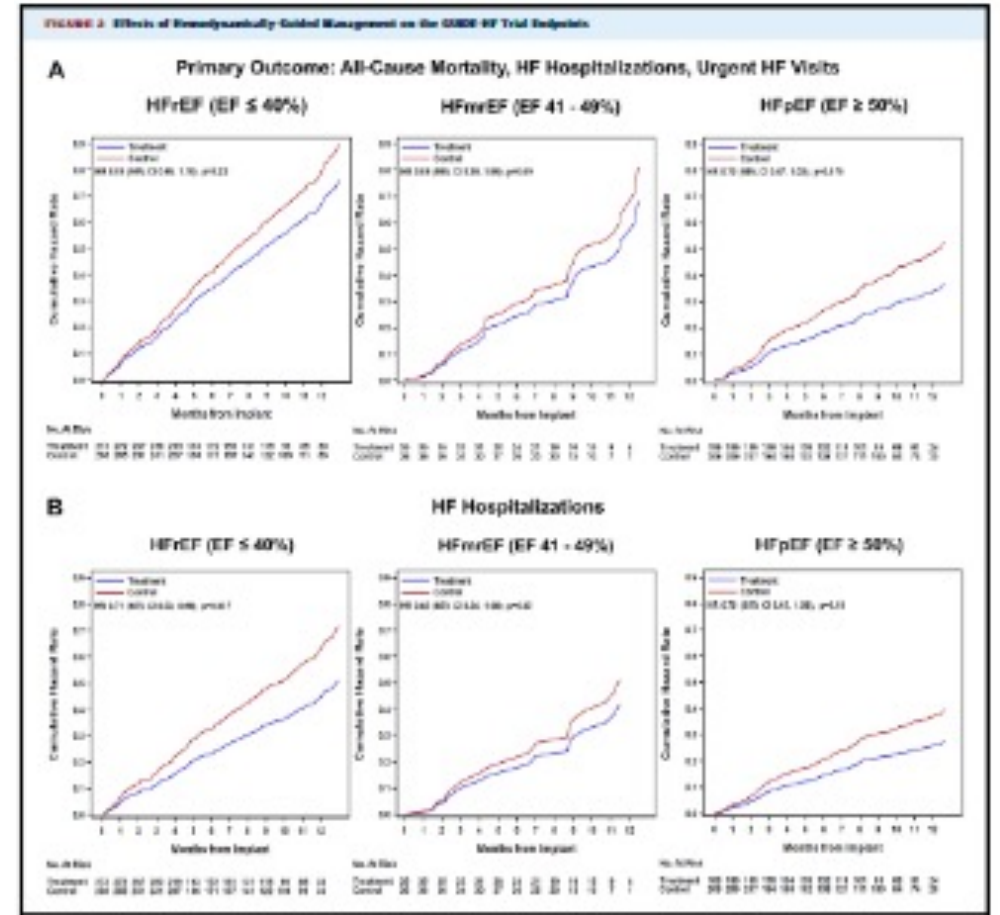
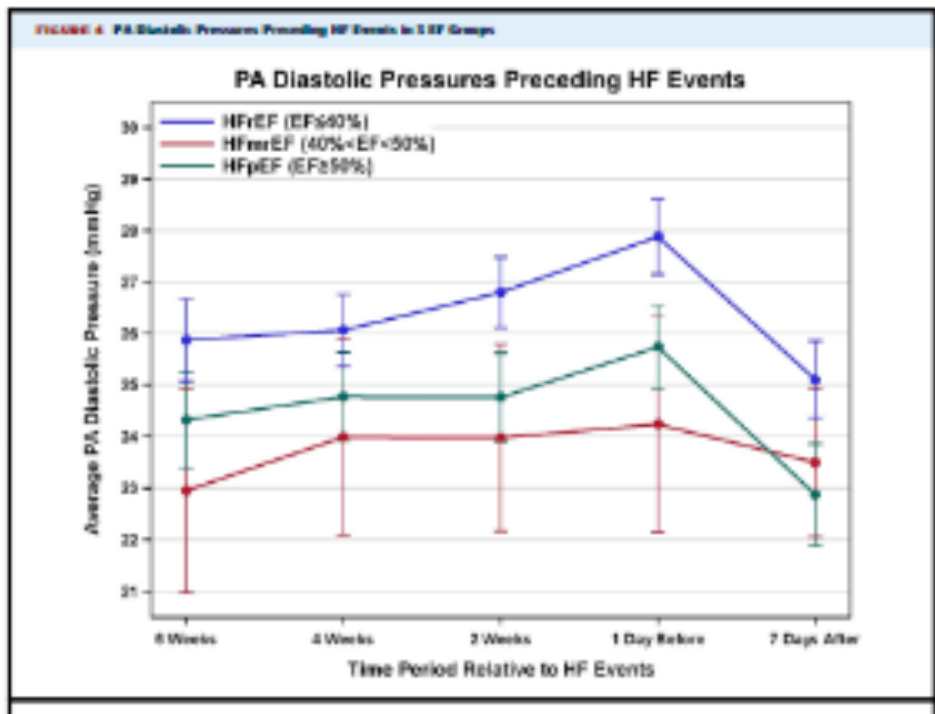
The GUIDE-HF Trial



Michael R. Zile, MD,^{1*} Mandeep R. Mehra, MD, MS,^{2*} Anique Ducharme, MD, MS,^{3*} Samuel F. Sears, PhD,⁴ Akshay S. Desai, MD, MPH,⁵ Alan Maisel, MD,⁶ Sam Paul, DNP,⁷ Frank Smart, MD,⁸ Gillian Grafton, DO,⁹ Sachin Kumar, MD,¹ Tarek O. Nassif, MD,¹ Neena Johnson, PhD,⁸ John Henderson, MS,⁸ Philip B. Adamson, MD,⁸ Maria Rosa Costanzo, MD,¹ JoAnn Lindenfeld, MD¹⁰

Hemodynamically-guided HF management decreases HF-related endpoints across the EF spectrum in an expanded patient population of patients with HF.

In a pre-specified pre –COVID – 19 impact analysis



THE LANCET

Remote haemodynamic monitoring of pulmonary artery pressures in patients with chronic heart failure (MONITOR-HF): a randomised clinical trial

[Jasper J Brugts, MD](#) ^{*} • [Sumant P Radhoe, MD](#) ^{*} • [Pascal R D Clephas, MSc](#) [†] • [Dilan Aydin, MD](#) [†] •

[Marco W F van Gent, MD](#) • [Mariusz K Szymanski, MD](#) • et al. [Show all authors](#) • [Show footnotes](#)

VOLUME 401, ISSUE 10394, P2113-2123, JUNE 24, 2023

Haemodynamic monitoring substantially improved quality of life and reduced heart failure hospitalisations in patients with moderate-to-severe heart failure treated according to contemporary guidelines.

These findings contribute to the aggregate evidence for this technology and might have implications for guideline recommendations and implementation of remote pulmonary artery pressure monitoring.

Efficacy of pulmonary artery pressure monitoring in patients with chronic heart failure: a meta-analysis of three randomized controlled trials

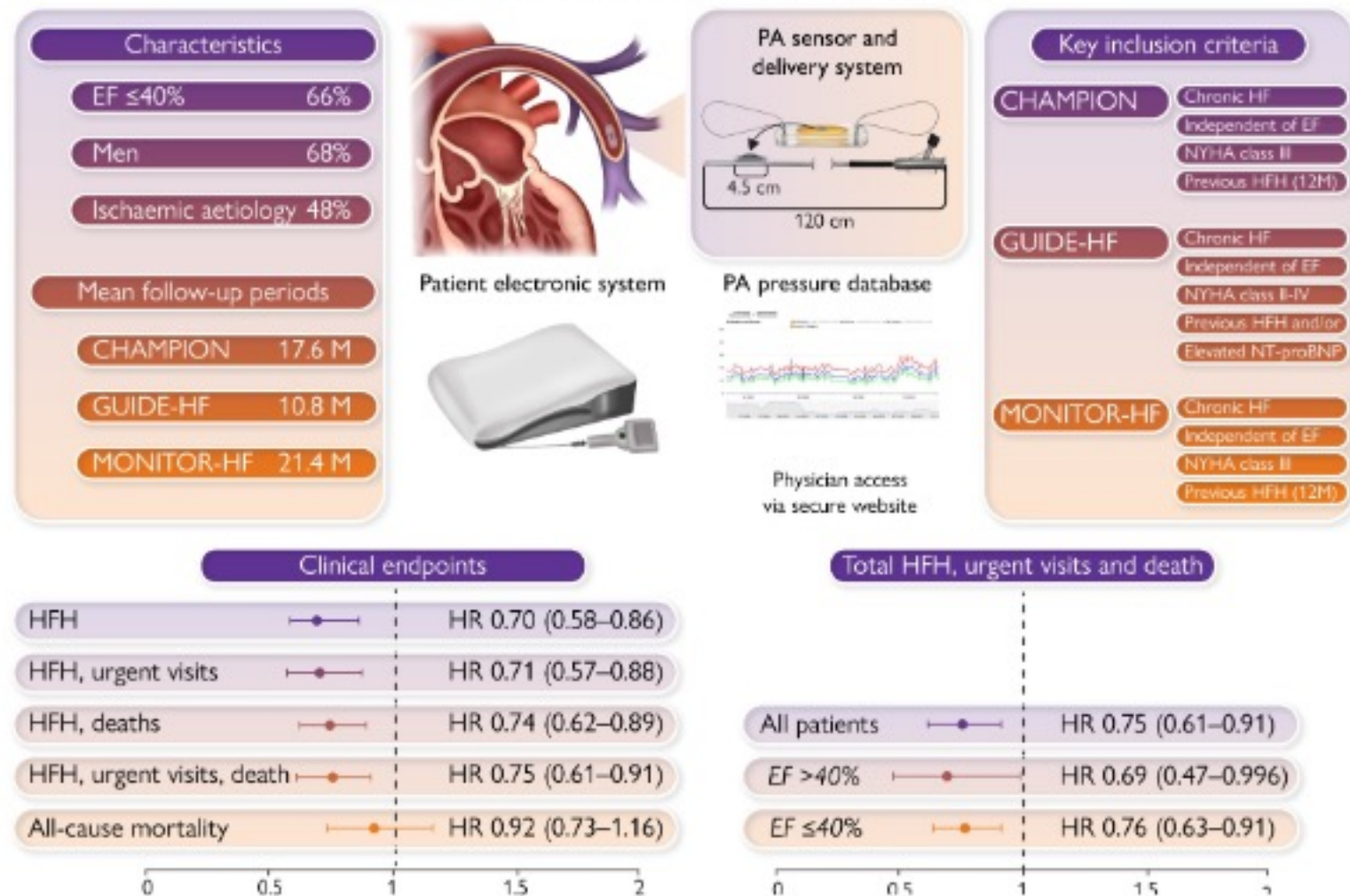
Pascal R. D. Clephas^{1†}, Sumant P. Radhoe^{1†}, Eric Boersma¹, John Gregson², Pardeep S. Jhund³, William T. Abraham⁴, John J. V. McMurray³, Rudolf A. de Boer¹, and Jasper J. Bruggts^{1*}

Ipotesi da testare: efficacia della gestione dei pazienti con SC guidata dal monitoraggio remoto della pressione polmonare.

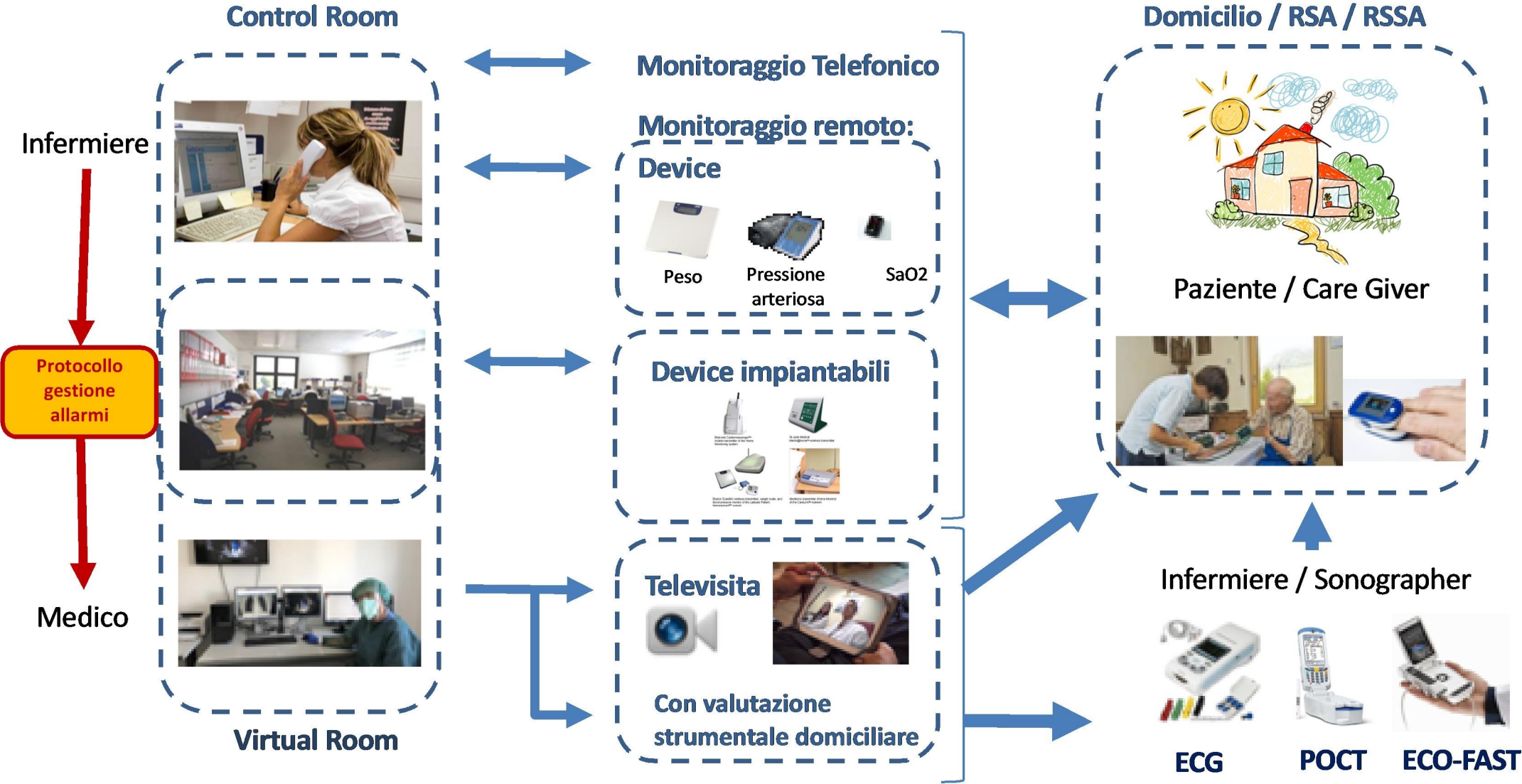
Risultato principale : la metanalisi dei 3 studi principali (1898 pazienti con SC cronico) ha dimostrato che la gestione guidata dal monitoraggio della pressione polmonare riduceva del 30% il numero delle ospedalizzazioni per SC, ma non la mortalità.

Messaggio : la gestione proattiva basata sul monitoraggio remoto della pressione polmonare riduce il rischio di peggioramento dello SC e le ospedalizzazioni per SC.

1898 patients in a pooled analysis of pulmonary pressure-guided therapy from CHAMPION, GUIDE-HF and MONITOR-HF trials



Le modalità di telemonitoraggio e teleassistenza



AMBULATORIO INFERMIERISTICO

Aspetti organizzativi

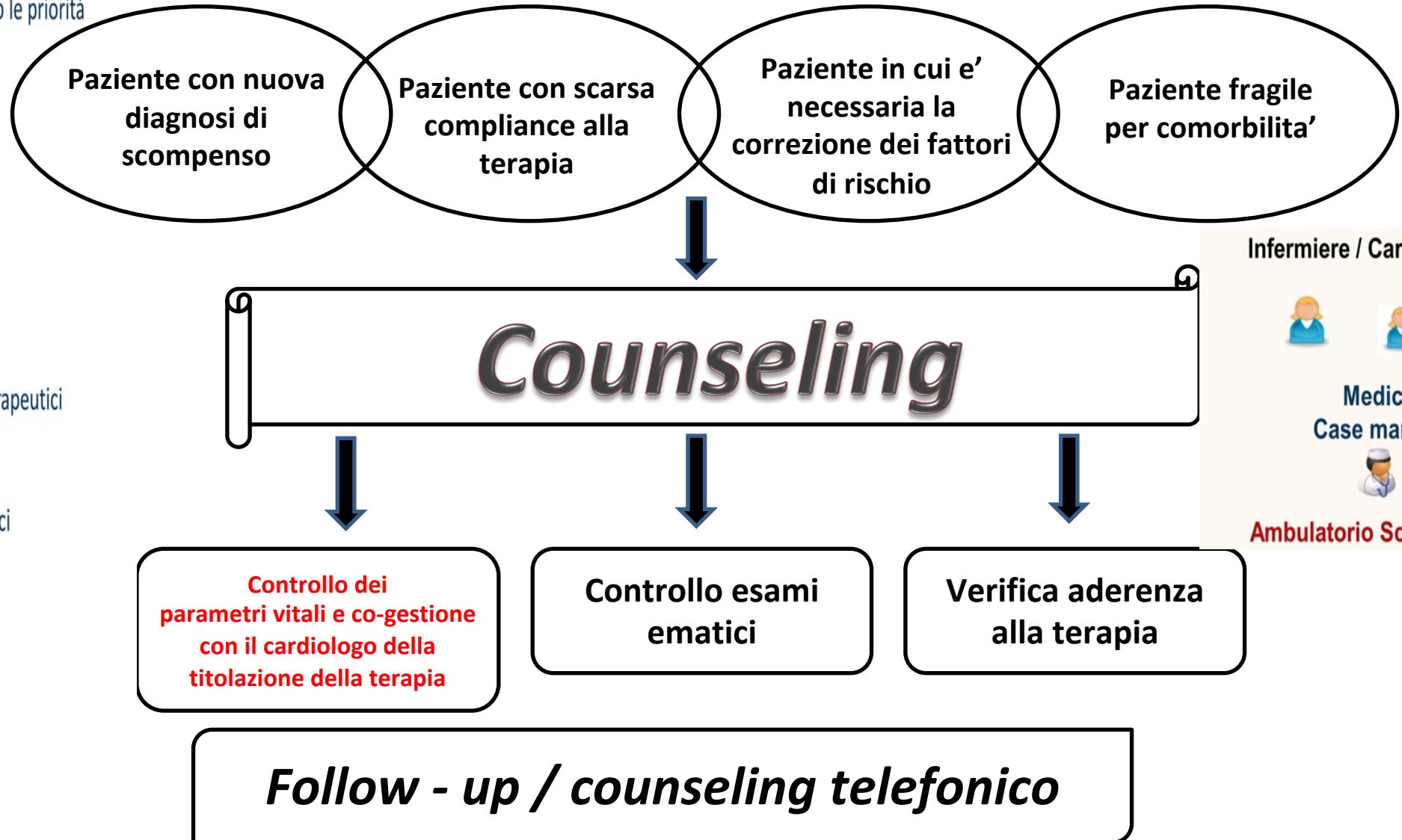
- Gestire gli appuntamenti riconoscendo le priorità
- Riconvocare i pazienti ai follow-up

Aspetti educazionali

- Counseling del paziente ed i familiari

Aspetti assistenziali

- Riconciliazione terapeutica
- Applicazione protocolli diagnostico-terapeutici
- Individuazione situazioni sfavorevoli
- Attuazione interventi non farmacologici
- Sviluppo rapporti sociali
- Follow-up telefonico
- Monitoraggio remoto
- Assistenza domiciliare



Infermiere / Care manager



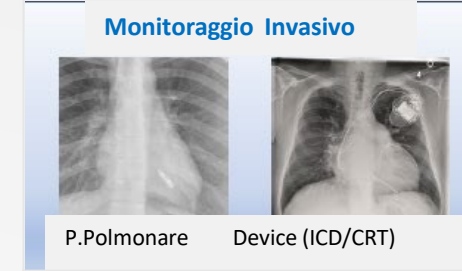
Medico /
Case manager



Ambulatorio Scompenso

TELEMEDICINA NEL PAZIENTE CON SCOMPENSO CARDIACO

Il Monitoraggio



M-Health
Mobile Phone



Inserimento in una rete che comprende l'ospedale per la cura dell'avanzato, l'ospedale di prossimità, il medico di medicina generale

Condivisione del progetto di cura che comprende le comorbidità

Controlli periodici nell'ambulatorio per la cura dello sc avanzato

Riferimenti telefonici facili per il paziente

Non frammentazione della cura

L'OSPEDALE

II TERRITORIO

Il Management



Televisita/Teleconsulto



Visita in Presenza



L'Unità Scompenso Cardiaco
(Ospedale)



L' Ospedale



La Piattaforma Digitale



Medico di Medicina Generale



Visita in Presenza



Casa della Salute



Il Paziente

Dalla Informatizzazione Sanitaria al Fascicolo Sanitario Elettronico



ATTUALI APPLICAZIONI DELLA TELEMEDICINA

- Fascicolo sanitario elettronico (alcune regioni italiane)
- Cartella clinica elettronica
- Monitoraggio dei dispositivi impiantabili
- Prescrizioni e piani terapeutici digitali
- Certificati telematici
- Televisita
- App sanitarie
- Contatto telefonico di aggiornamento



Telemedicina: criticità del sistema

- Costi elevati
- Rimborso prestazioni
- Gestione dati sensibili
- Enormi quantità di dati da gestire
- **Diverse realtà regionali (frammentazione della sanità nazionale)**
- Difficoltà di accesso per i pazienti anziani o indigenti
- **Formazione del personale medico e infermieristico**
- **I percorsi di TLM non sono avviati, non ci sono piattaforme condivise, forse sta migliorando il FSE, rarissime le visite a distanza**
- In quasi tutte le Regioni non c'è una rete e non sono identificati gli ospedali per la cura del paziente con SC Avanzato



Telemedicina: i prossimi passi

- Processo di rimborso ben documentato e standardizzato
- Politiche ospedaliere omogenee
- Privacy affidabile dei dati
- Procedure per aggiornamenti regolari
- Piattaforma comune con sistemi per l'integrazione di più dispositivi
- Includere formazione e istruzione regolari sulla tecnologia digitale per tutto il personale
- Formazione dei pazienti
- Personale sanitario digitale dedicato
- Garantire che siano applicati standard medico-legali



Conoscere e Curare il Cuore 2024

BOTH!

ONLINE



ONLIFE



**So she can keep
on smiling**