

Il monitoraggio remoto e la telemedicina come strumento di continuità di cura Ospedale Territorio

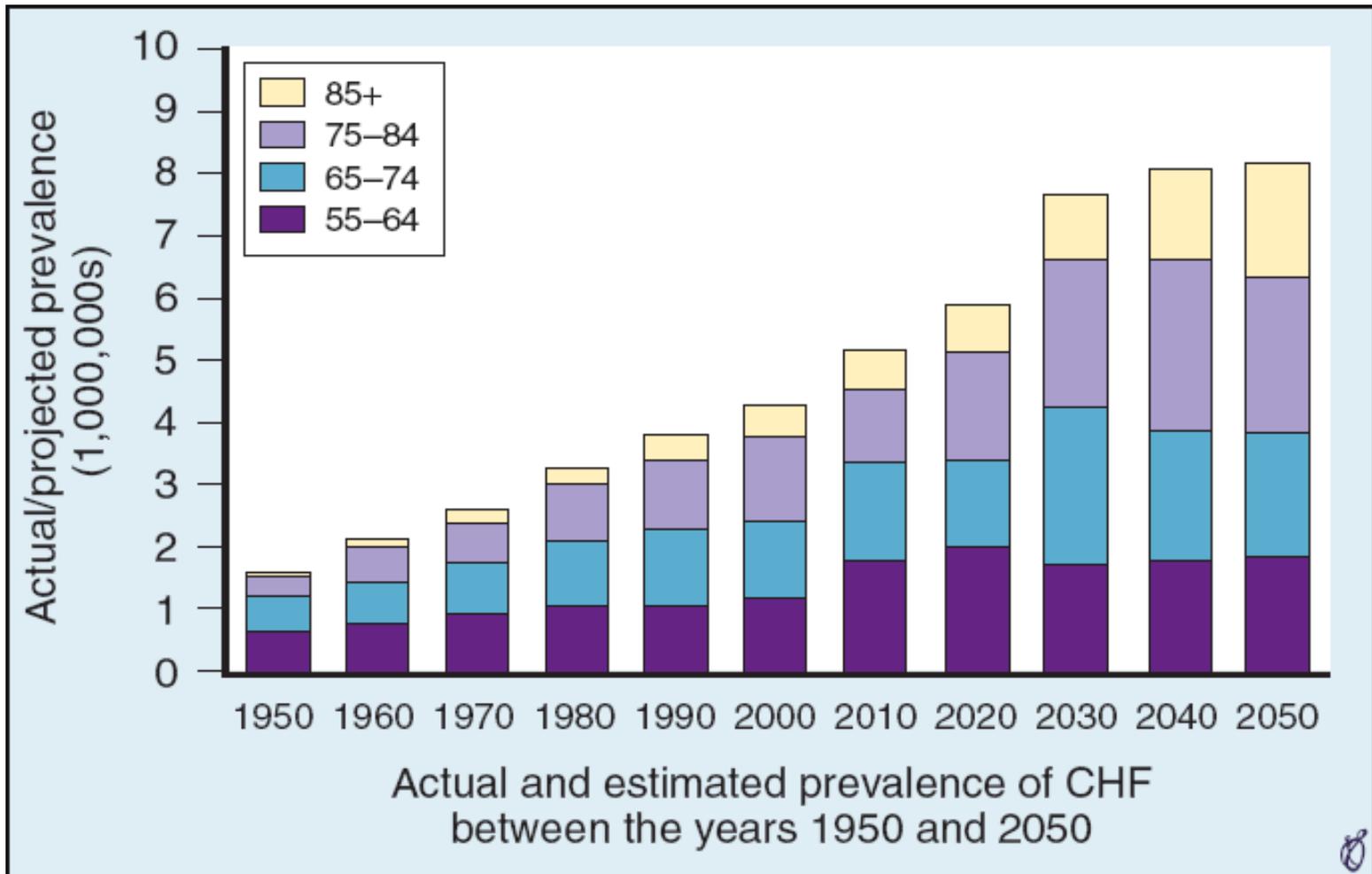
Giuseppe Stabile



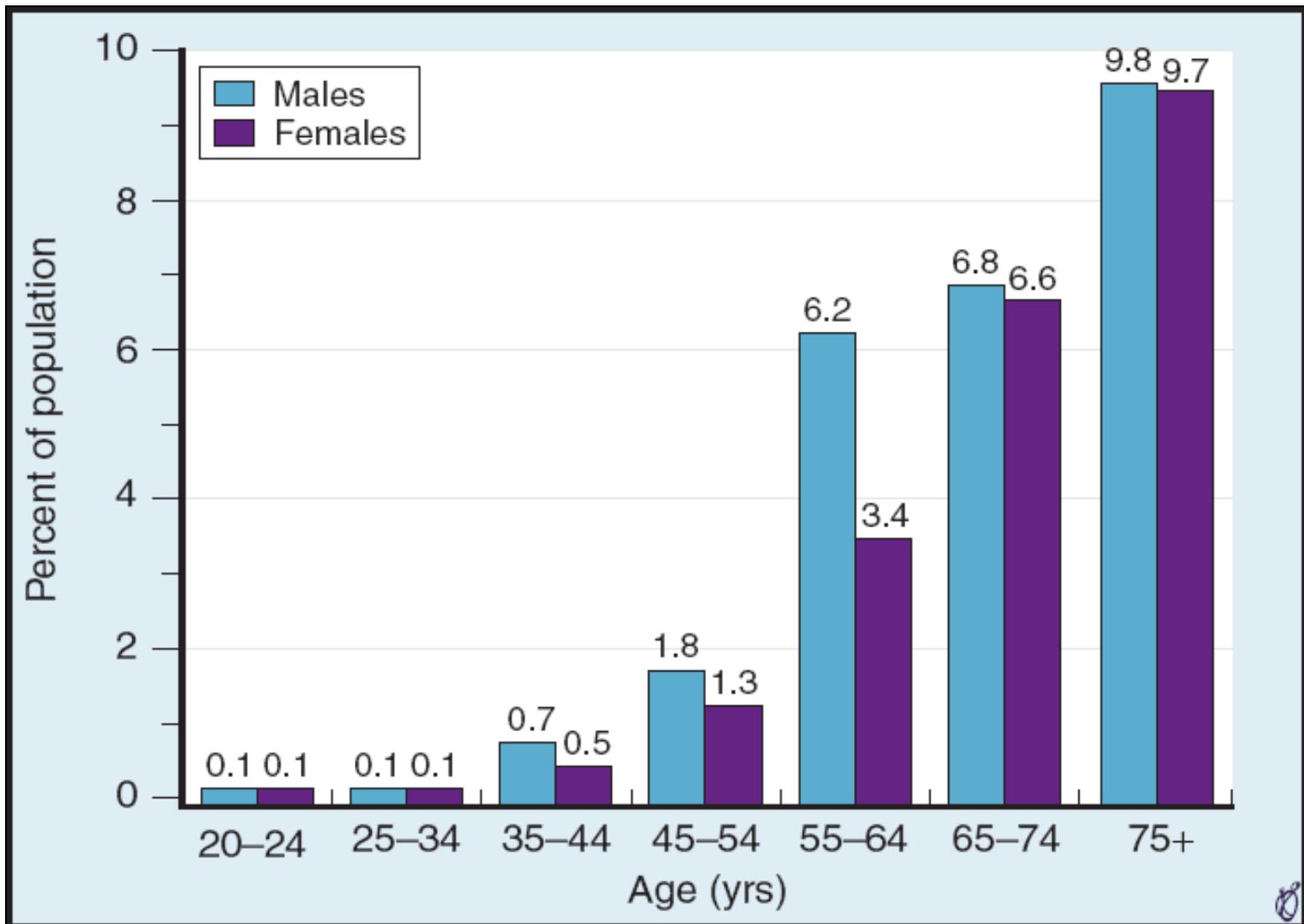
Associazione Italiana Aritmologia e Cardiolazione



Clinica Mediterranea, Napoli



www.nhlbi.nih.gov/health/public/heart/other/CHF



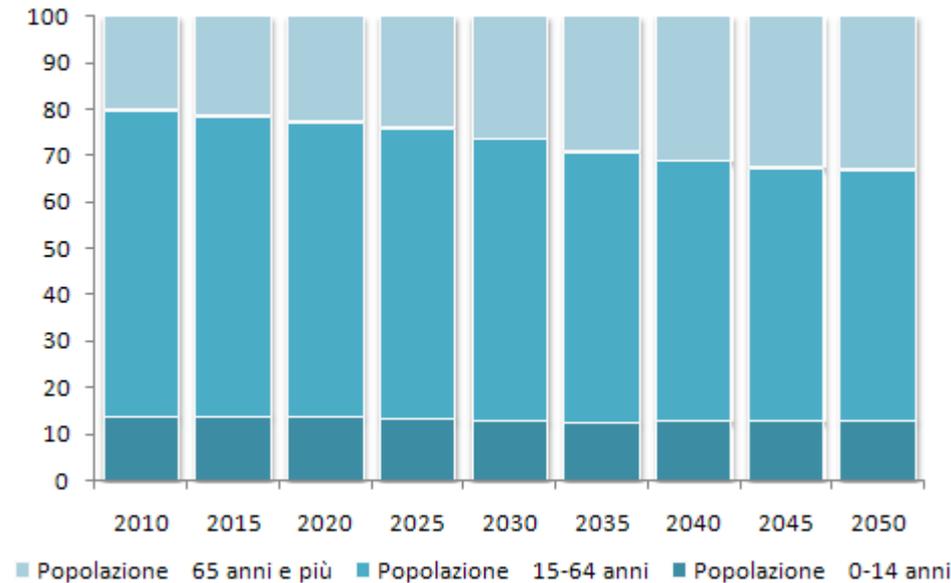
www.nhlbi.nih.gov/health/public/heart/other/CHF

Italian Population

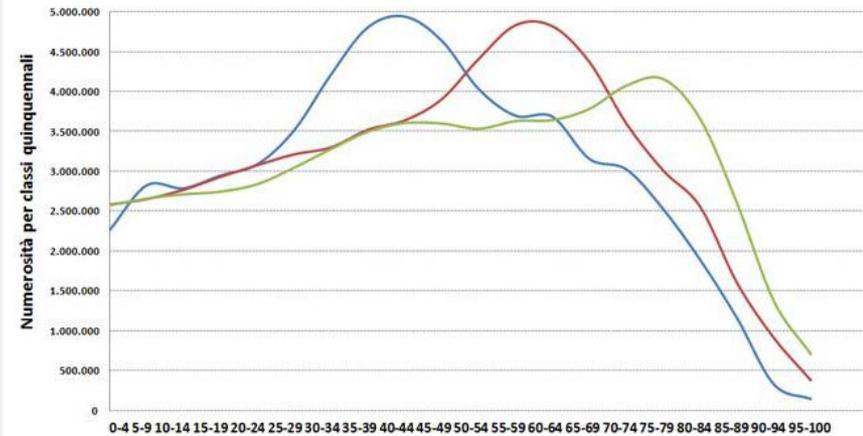
PROIEZIONE STRUTTURA POPOLAZIONE - TUTTI I RESIDENTI

FORNITORI DATI: DEMO-ISTAT Anni: 2010/2050

www.guerrecontro.altervista.org



Onda demografica della popolazione residente in Italia



Elaborazione grafica delle previsioni della popolazione residente al 1° gennaio (dati ISTAT base 1.1.2007, scenario centrale)

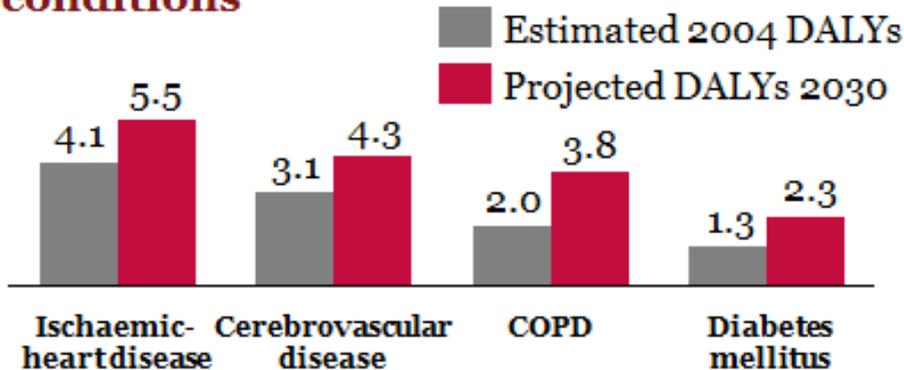
- Increased Longevity
- Increase in the population over 65 years old

Older population is at high risk to suffer of:

- **Heart Failure (HF)**
- **Atrial Fibrillation (AF)**

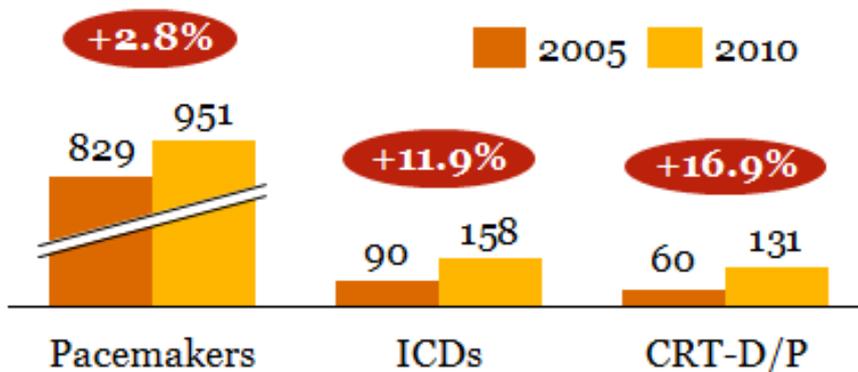
The chronic disease burden is increasing – with physician capacity rather shrinking than growing

Global DALYs for selected chronic conditions



Source: World Health Organisation, Global health risks: Mortality and burden of disease attributable to selected major risks, 2009

CIED-Implants per 1 million inhabitants



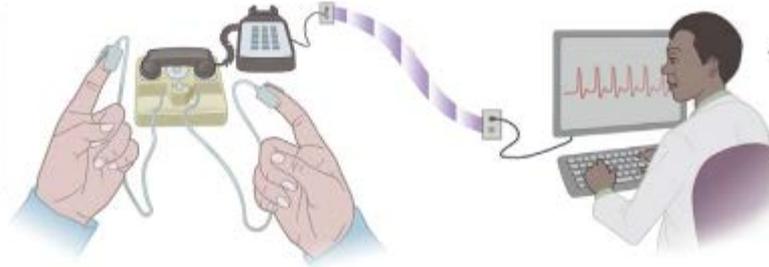
Source:

www.eucomed.org/uploads/_medical_technology/facts_figures/110518_statistics_for_cardiac_rhythm_management_products_20052010.pdf (update available for 2012)

- Increasing chronic conditions are the greatest challenge for health economies in Europe
- Chronic conditions drive the demand for medical capacity
- Yet, physician capacity will rather decrease in the future
- Required: improved disease management – and increased efficiency in the provision of care

Need for innovative solutions

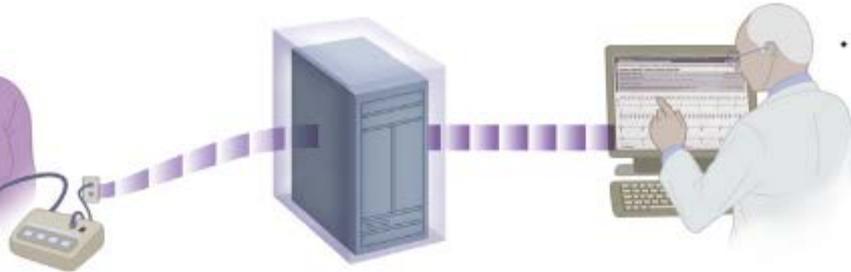
Transtelephonic



• Scheduled follow-up

1971

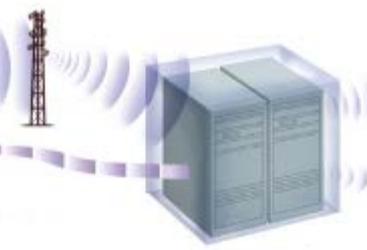
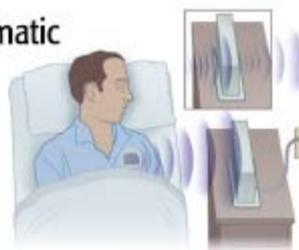
Inductive



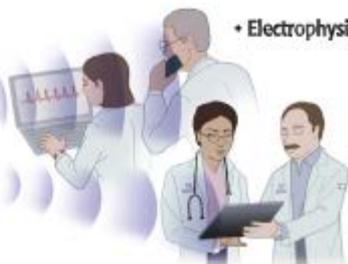
• Scheduled follow-up

1990

Automatic



Manufacturer



• Electrophysiologist

• Heart failure MD

2001

 [Informazioni sulle apparecchiature/paziente](#)

Stato del paziente Monitorato
Medico (dispositivo) Stabile, Giuseppe
Data imp. 21 Ott 2008

 [Riepilogo clinico](#)

Parametri **Misurazione più recente**
[Frequenza cardiaca media](#) 58 min⁻¹ 11 Mar 2010

 [EGM più recente:](#) 12 Mar 2010

(Fare clic per dettagli)

 [Elettrocateri](#)

 [Batteria](#)

 Tempo approssimato per espianto: 3 anni Da 12 Mar 2010



Interrogazione iniziata dal paziente On
 Da ultimo follow-up a distanza 0
 Dall'impianto 1

 [Eventi](#)

	Da ultimo follow-up
	 15 Feb 2010
Terapia FV	0
Terapia TV	0
Terapia TV-1	0
ATR > 48 h	0

Percentuale Stimol.

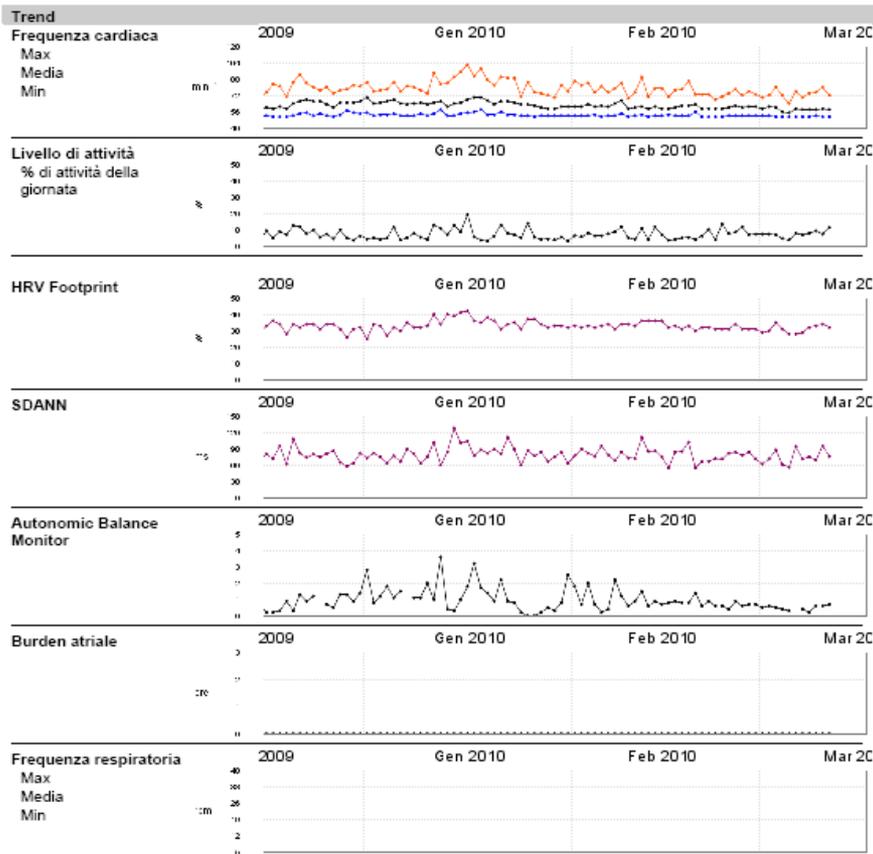
-  A 5%
-  VD 100%
-  VS 100%

 [Riepilogo impostazioni](#)

FV	200 min ⁻¹ ATP	41 J, 41 J, 41 J x 6
TV	160 min ⁻¹ ATP	41 J, 41 J, 41 J x 4
LRL - MTR	50 - 130 min ⁻¹	
Modalità	DDD-BiV	

Allarmi personalizzati

Non ci sono allarmi da visualizzare.



Eventi dall'ultimo follow-up (15 Feb 2010)

Non ci sono eventi da visualizzare.

Heart Rate Variability

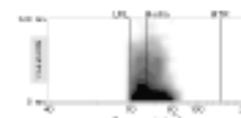
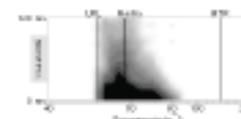
Ult misura nella 24 ore, terminata il

11 Mar 2010 22:53

% di tempo impiegato	97
Footprint	32 %
SDANN	76 ms
Modalità	DDD
Ritardo AV rilevato	100 - 130 ms
Camera di pacing	BV
LV Offset	-40 ms

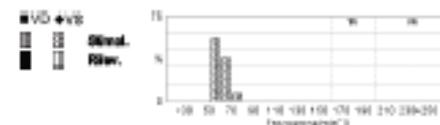
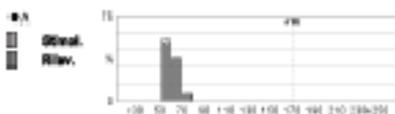
Referenza: termine del periodo di 240h del 2009 22:37

% di tempo impiegato	68
Footprint	18 %
SDANN	48 ms
Modalità	DDD
Ritardo AV rilevato	100 - 130 ms
Camera di pacing	BV
LV Offset	0 ms



See help on [REDACTED] menu to expand

istogrammi da ultimo follow-up (15 Feb 2010)



Contatori Brady e CRT dall'ultimo follow-up: (15 Feb 2010)

% di pacing	
Atriale	5 %
Ventricol. destra	100 %
Ventricol. sinistra	100 %

Cont.Li Burden Atriale da ultimo follow-up (15 Feb 2010)

Episodi per durata	
< 1 Minuto	0
1 min - < 1 h	0
1 h - < 24 h	0
24 h - < 48 h	0
> 48 h	0

Batteria OK

Tempo approssimato per espianto: 3 anni Da 12 Mar 2010

Impostazioni

Impostazioni di defibrillazione	
Zona FV	200 min ⁻¹ ATP, 8 Shock
Zona TV	160 min ⁻¹ ATP, 6 Shock

Impostazioni Brady e CRT	
Modo Brady	DDD
Limite freq. inf.	50 min ⁻¹
Max freq. trascinam.	130 min ⁻¹
Frequenza massima sensore	130 min ⁻¹
Ritardo AV stimolato	120 - 160 ms
Ritardo AV rilevato	100 - 130 ms
Camera di pacing V	BV
LV Offset	-40 ms

Dettagli sull'episodio

ID: 18
 Data di nascita: [REDACTED]
 Dispositivo: TELUDM 106-F110000275
 Modo Tachy: Monitor + Terapia

Eventi V-3 09 Feb 2010 18:58

Onset Evento TV

Frequenza A media: 73 min⁻¹
 Frequenza V media: 183 min⁻¹
 Rilevazione Rhythm ID

Rilevazione

Frequenza A media: 78 min⁻¹
 Frequenza V media: 187 min⁻¹
 zona di frequenza: TV
 Stabilità: 8 ms
 Frequenza V>A: Vero
 AFib: Falso
 RhythmID correlato: Falso
 SRD eccitato: Falso
 Timeout ATP: Falso

Tentat. 1, Raffica V ATP

Tempo trascorso
 Informazioni ATP
 Numero raffiche

Event term.: 00:00:21

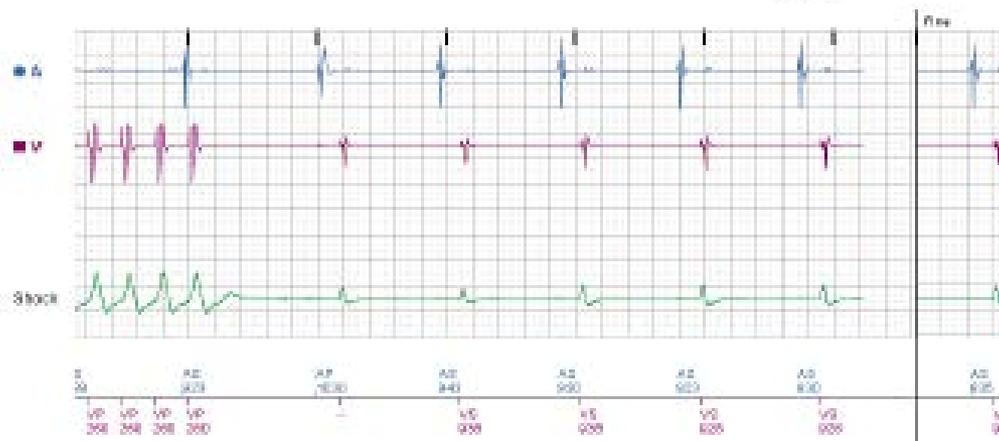
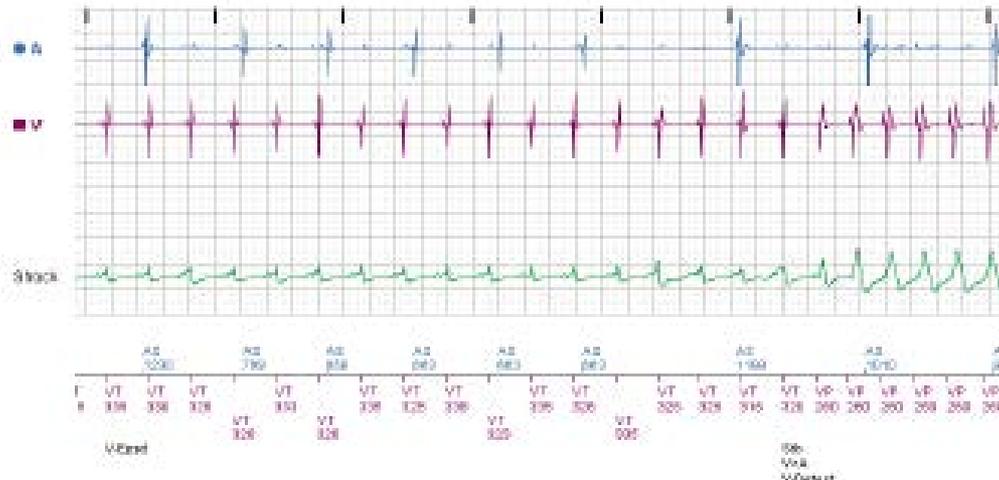
25 mm/s



Dettagli sull'episodio

18 Mar 2010

25 mm/s



TREND: PERSONALIZZATO

Selezione Trend

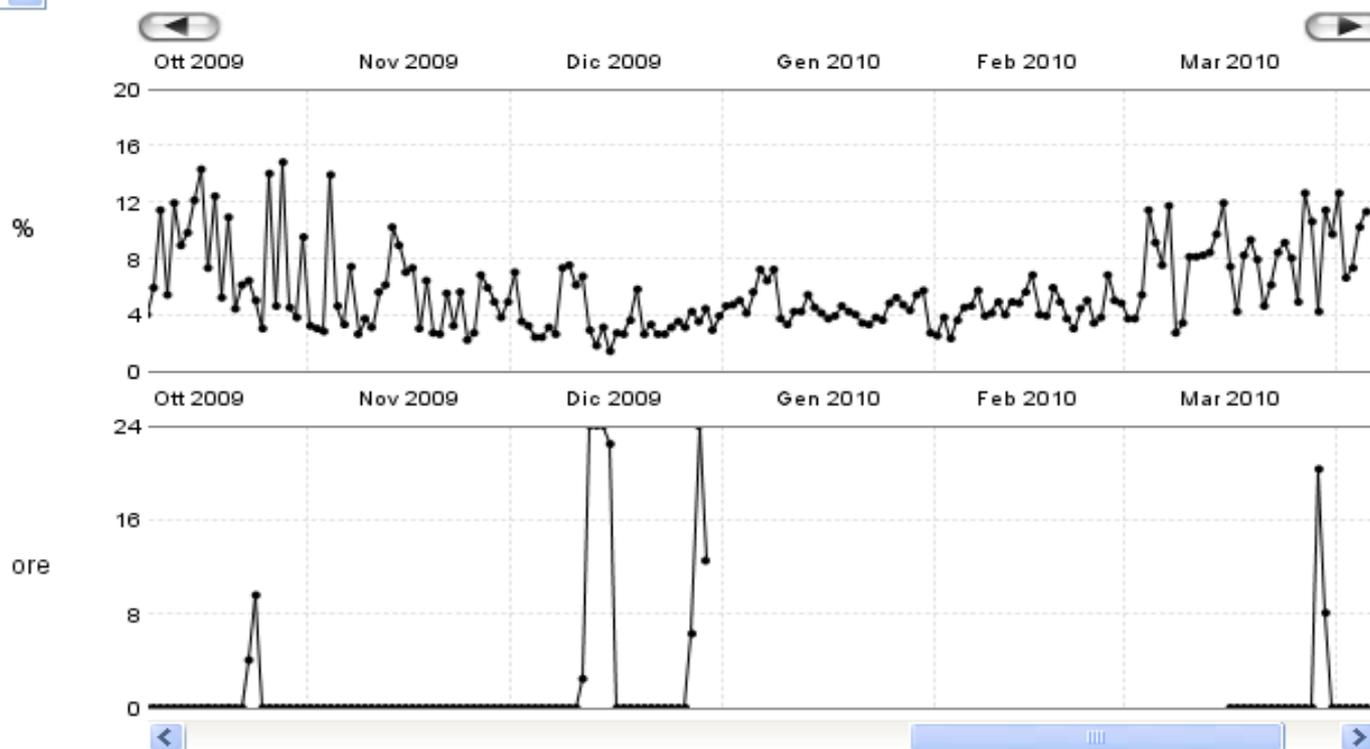
Vedi: 6 mesi

Livello di attività

% di attività della giornata

[Vedere valori](#)

Burden atriale

[Vedere valori](#)

	30 Mar 2010	31 Mar 2010	01 Apr 2010	02 Apr 2010	03 Apr 2010	04 Apr 2010	05 Apr 2010
Livello di attività (% di attività della giornata)	11,4	9,7	12,6	6,6	7,3	10,2	11,3
Burden atriale							
Tempo totale (ore)	8,1	0,0	0,0	0,0	0,0	0,0	0,0
N. di eventi	1	0	0	0	0	0	0

Sensori

Sensors:

What Clinicians ask / do during a physical exam:

 Sleep Incline *“How many pillows do you sleep on at night?”*

 Thoracic Impedance Listen to lung sounds for signs of pulmonary edema

 Respiratory Rate *“Are you out of breath? Have difficulty breathing?”*

 Activity Level *“Have you been feeling tired?”*

 Weight *“Have you gained weight?”*

 Blood Pressure *Measure blood pressure*

 Night Heart Rate *Is resting heart rate elevated?*

 Daily Heart Rate  AT/AF Burden

 Heart Rate Variability (SDANN)  RV Rating during AT/AF

 % LV Paced  V-Therapy

Indici multiparametrici

Multiple Sensor Measurements



Heart Sounds
S1 & S3



Impedance
Thoracic



Respiration
Rate & Volume



Activity
Time Spent Active



Heart Rate
Night

Combined into a single, simple index with alert

HeartLogic™ Heart Failure Index



High sensitivity: 70% in detecting heart failure events

Low burden of less than 2 alerts per patient per year

Weeks of advanced notice to clinicians of a potential event

QUARTERLY FOCUS ISSUE: HEART RHYTHM DISORDERS

Clinical Benefits of Remote Versus Transtelephonic Monitoring of Implanted Pacemakers

George H. Crossley, MD,* Jane Chen, MD,† Wassim Choucair, MD,‡ Todd J. Cohen, MD,§ Douglas C. Gohn, MD,|| W. Ben Johnson, MD,¶ Eleanor E. Kennedy, MD,# Luc R. Mongeon, PhD,** Gerald A. Serwer, MD,†† Hongyan Qiao,** Bruce L. Wilkoff, MD,‡‡ for the PREFER Study Investigators
Nashville, Tennessee; St. Louis, Missouri; Corpus Christi, Texas; Mineola, New York; Lancaster, Pennsylvania; Des Moines, Iowa; Little Rock, Arkansas; Minneapolis, Minnesota; Ann Arbor, Michigan; and Cleveland, Ohio

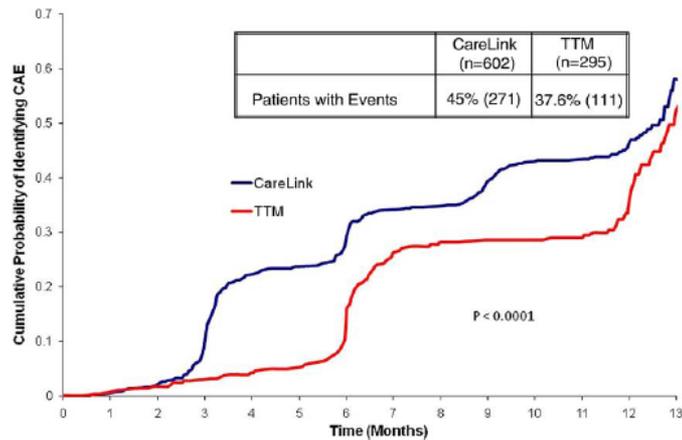


Figure 3 Composite CAE

Survival curves represent the difference in probability of clinically actionable event (CAE) identification between the Remote and Control arms. TTM = transtelephonic monitoring.

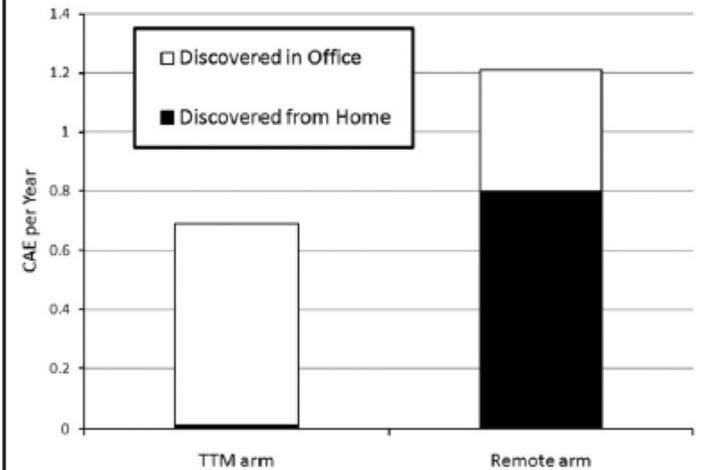


Figure 4 CAE Rate by Source

The number of clinically actionable events (CAEs) by their source. The number of CAEs discovered by transtelephonic monitoring (TTM) per year in the TTM arm was very small (0.01).

Efficacy and Safety of Automatic Remote Monitoring for Implantable Cardioverter-Defibrillator Follow-Up The Lumos-T Safely Reduces Routine Office Device Follow-Up (TRUST) Trial

Niraj Varma, MA, DM, FRCP; Andrew E. Epstein, MD; Anand Irimpen, MD; Robert Schweikert, MD; Charles Love, MD; for the TRUST Investigators



European Heart Journal
doi:10.1093/eurheartj/ehy425

CLINICAL RESEARCH

CLINICAL RESEARCH

Clinical Trial

The CONNECT (Clinical Evaluation of Remote Notification to Reduce Time to Clinical Decision) Trial

The Value of Wireless Remote Monitoring With Automatic Clinician Alerts

George H. Crossley, MD,* Andrew Boyle, MD,† Holly Vitense, PhD,‡ Yanping Chang, MS,§ R. Hardwin Mead, MD,|| for the CONNECT Investigators

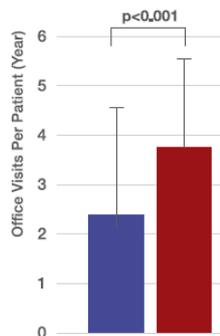
Contributions of remote monitoring to the follow-up of implantable cardioverter–defibrillator leads under advisory

Laurence Guédon-Moreau^{1*}, Philippe Chevalier², Christelle Marquié¹, Claude Kouakam¹, Didier Klug¹, Dominique Lacroix¹, Francois Brigadeau¹, and Salem Kacet¹ on behalf of the ECOST trial Investigators

A randomized study of remote follow-up of implantable cardioverter defibrillators: safety and efficacy report of the ECOST trial

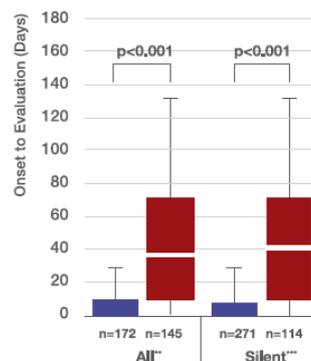
Laurence Guédon-Moreau^{1*}, Dominique Lacroix¹, Nicolas Sadoul², Jacques Clémenty³, Claude Kouakam¹, Jean-Sylvain Hermida⁴, Etienne Aliot², Michel Boursier⁵, Olivier Bizeau⁶, and Salem Kacet¹, for the ECOST trial Investigators

Reduction in In-Clinic Evaluations*



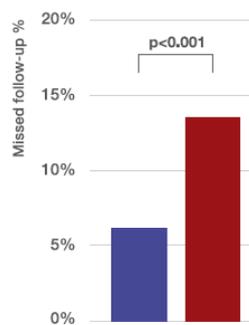
*Data from TRUST are presented and show that remote monitoring reduced in-clinic evaluations by 45% per year. A similar effect was seen in the CONNECT trial in which remote management was associated with a reduction of office visits from 6.3 in conventional care to 3.9 per person year.

Early Detection*



*Data from TRUST are presented. The CONNECT Trial shows similar results for early detection
**In CONNECT, median time from event to clinical decision was 4.6 days in the Remote arm vs. 22 days in conventional care.
***Time to detect clinically asymptomatic (silent) conditions was not reported in CONNECT*.

Rates of failed scheduled evaluations in remote only vs. conventional care over 1 year*



*Data from TRUST are presented. Rates of failed calendar-based evaluations in remote only vs. conventional care over 1 year data information was not available from the CONNECT Trial

■ REMOTE MONITORING

■ CONVENTIONAL

Il monitoraggio remoto dei PMK/ICD permette:

- Ridurre le visite ambulatoriali
- Diagnosi precoce di eventi correggibili
- Non compromette la sicurezza

Il monitoraggio remoto dei PMK/ICD ha un impatto positivo sulla soddisfazione dei pazienti e la qualità di vita:

- Riduzione costi
- Riduzione perdita ore di lavoro
- Alta compliance al follow-up
- Consolidamento rapporto paziente-medico

Un quarto dei pazienti non effettua il primo follow-up un anno dopo l'impianto di un PMK/ICD

Al-Khatib CAE 2013

DISEASE MANAGEMENT

- **Fibrillazione atriale**
- **Scompenso cardiaco**



Remote monitoring improves outcome after ICD implantation: the clinical efficacy in the management of heart failure (EFFECT) study

Antonio De Simone^{1*}, Loira Leoni², Mario Luzi³, Claudia Amellone⁴, Giuseppe Stabile⁵, Vincenzo La Rocca¹, Alessandro Capucci³, Antonio D'onofrio⁶, Ernesto Ammendola⁷, Francesco Accardi⁸, Sergio Valsecchi⁸, and Gianfranco Buja²

¹Laboratorio di Elettrofisiologia, Clinica San Michele, Via Montella, 16, Maddaloni (CE) 81024, Italy; ²Policlinico Universitario, Padua, Italy; ³Università Politecnica delle Marche, Ancona, Italy; ⁴Ospedale di Cirié - ASL TO 4, Cirié (TO), Italy; ⁵Clinica Mediterranea, Naples, Italy; ⁶Ospedale Monaldi, Naples, Italy; ⁷Ospedale Monaldi S. P. A., Naples, Italy; and ⁸Boston Scientific Italia, Milan, Italy

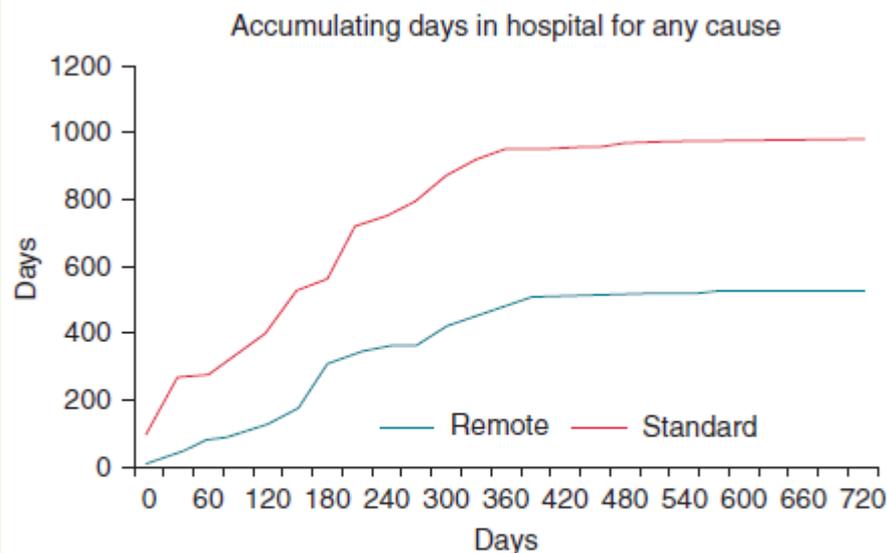


Figure 3 Graph of accumulating days in hospital over time for the two study arms.

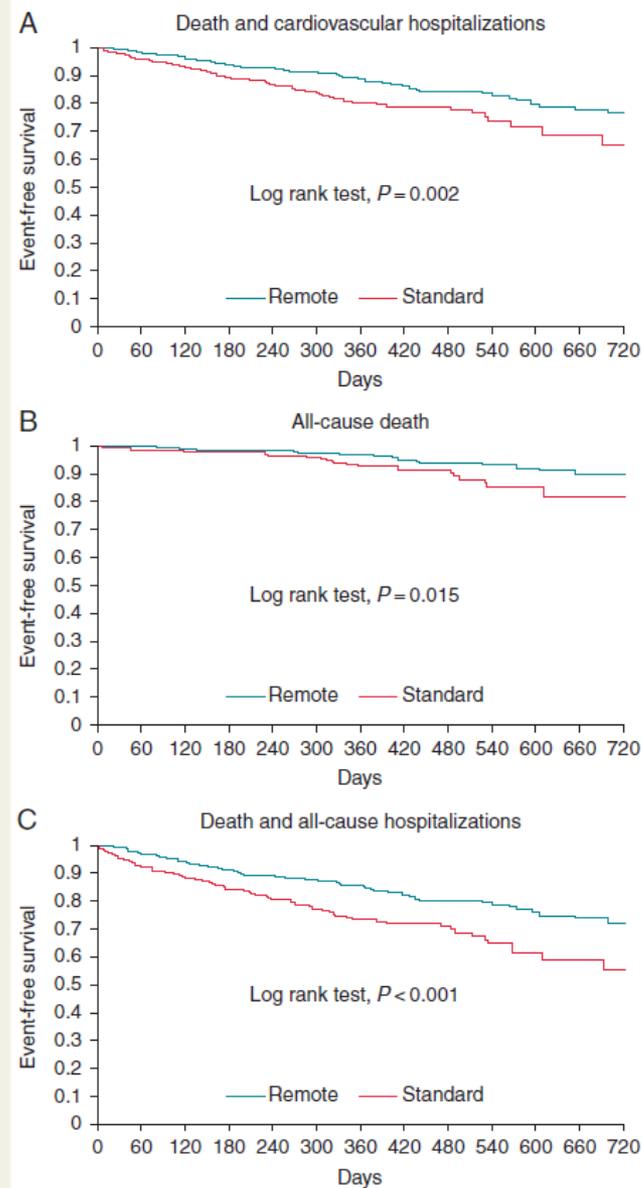
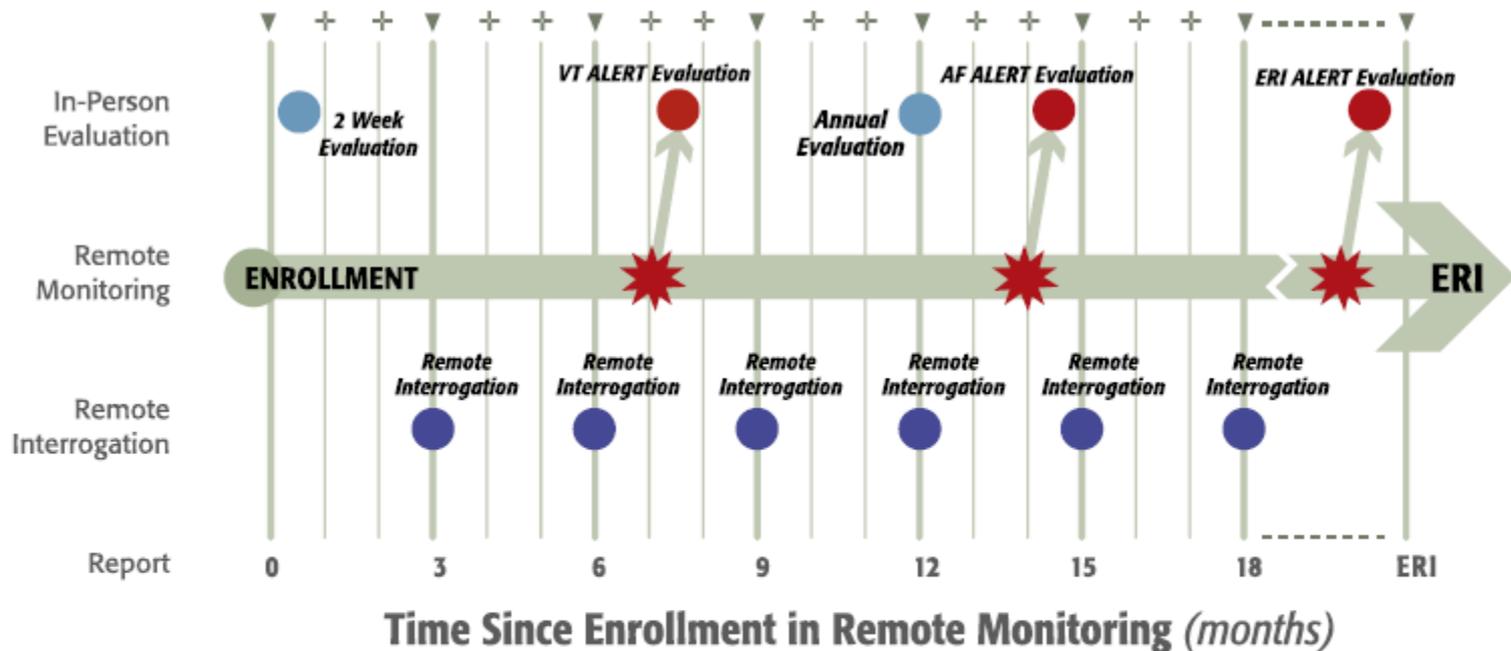


Figure 2 Kaplan–Meier estimates of the time to the primary endpoint of death or cardiovascular hospitalization (A), the time to all-cause death (B), the time to death or all-cause hospitalization (C).

HRS Expert Consensus Statement on remote interrogation and monitoring for cardiovascular implantable electronic devices

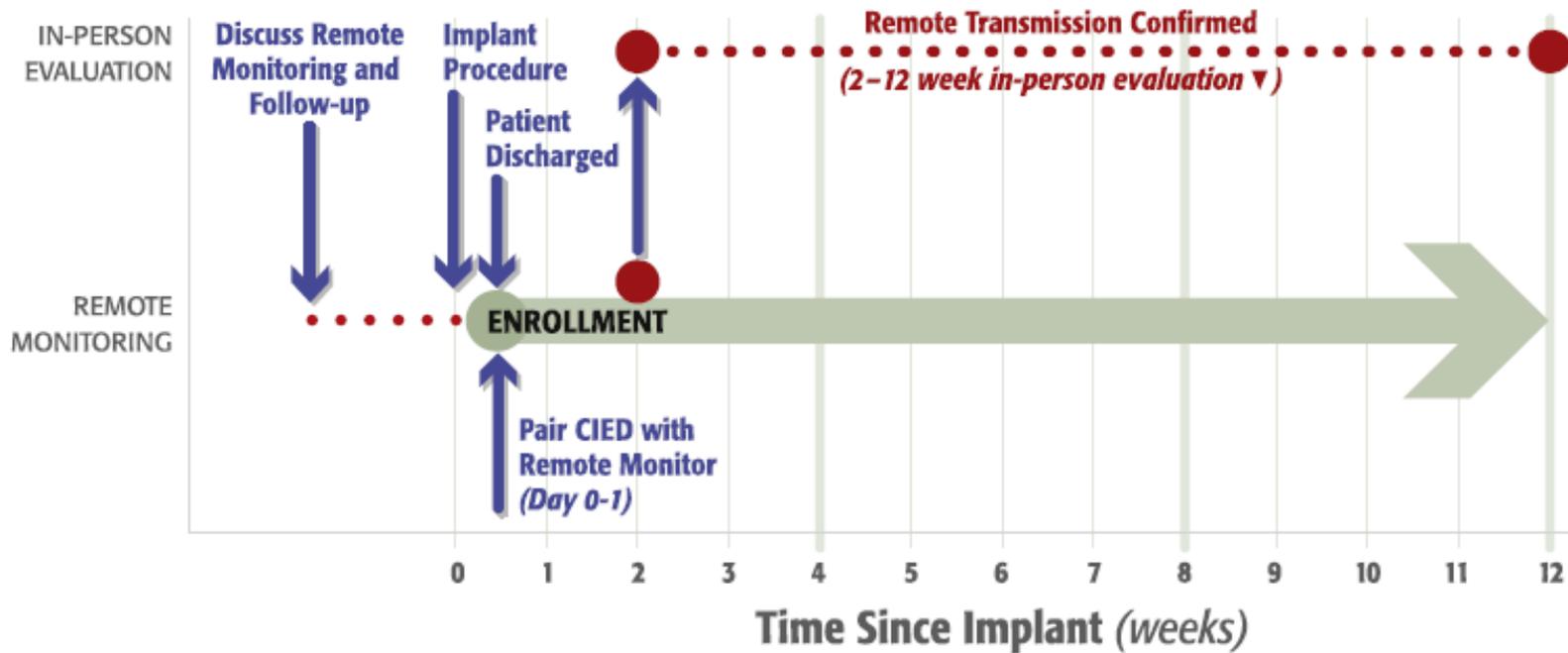


David Slotwiner, MD, FHRS, FACC (Chair),^{1#} Niraj Varna, MD, PhD, FRCP (Co-chair),^{2#} Joseph G. Akar, MD, PhD,³ George Annas, JD, MPH,⁴ Marianne Beardsall, MN/NP, CCDS, FHRS,⁵ Richard I. Fogel, MD, FHRS,⁶ Nestor O. Galizio, MD,^{7*} Taya V. Glotzer, MD, FHRS, FACC,⁸ Robin A. Leahy, RN, BSN, CCDS, FHRS,⁹ Charles J. Love, MD, CCDS, FHRS, FACC, FAHA,¹⁰ Rhondalyn C. McLean, MD,^{11†} Suneet Mittal, MD, FHRS,¹² Loredana Morichelli, RN, MSN,¹³ Kristen K. Patton, MD,^{14‡} Merritt H. Raitt, MD, FHRS,¹⁵ Renato Pietro Ricci, MD,^{13§} John Rickard, MD, MPH,¹⁶ Mark H. Schoenfeld, MD, CCDS, FHRS, FACC, FAHA,¹⁷ Gerald A. Serwer, MD, FHRS, FACC,^{18||} Julie Shea, MS, RNCS, FHRS, CCDS,¹⁹ Paul Varosy, MD, FHRS, FACC, FAHA,²⁰ Atul Verma, MD, FHRS, FRCPC,⁵ Cheuk-Man Yu, MD, FACC, FRCP, FRACP^{21¶}



- * Any wireless PM, ICD, CRT device with auto thresholds and auto-sensing algorithms
 - ▼ Interim report generation & communication with other health care providers, including heart failure data
 - ⊕ Interim (monthly) remote monitoring heart failure report
- ABBREVIATIONS: AF = atrial fibrillation; CHF = congestive heart failure; ERI = elective replacement indicator.

Figure 3 Event-based model of cardiac implantable electronic device follow-up.



▼ Interim report generation & communication with other health care providers, including heart failure data.

Figure 4 Initiation of remote monitoring. CIED = cardiac implantable electronic device.

Table 2 Goals of the Initial Education Process Before CIED Implantation

-
- Explain the clinical utility of CIED follow-up.
 - Differentiate between in-office and remote follow-up.
 - Outline the desired frequency of CIED follow-up.
 - Discuss the differences between RM and RI.
 - Understand the health care providers involved in patient's care and determine who will be responsible for CIED follow-up.
 - Assess the suitability of the patient as a candidate for RM (eg, are analog phone lines present, does the patient have an adapter to connect using cable or Voice over Internet protocols, and is the patient willing to pay for cellular-based monitoring).
 - Determine the patient's desire to access their RM data (when available).
-

CIED = cardiac implantable electronic device; RM = remote monitoring.

Il monitoraggio remoto di un PMK/ICD non gestisce l'emergenza

HRS Remote Monitoring Consensus Statement Recommendations

Device Follow-Up Paradigm	Class of Recommendation	Level of Evidence
A strategy of remote CIED monitoring and interrogation, combined with at least annual IPE, is recommended over a calendar-based schedule of in-person CIED evaluation alone (when technically feasible).	I	A
All patients with CIEDs should be offered RM as part of the standard follow-up management strategy.	I	A
Before implementing RM, it is recommended that each patient be educated about the nature of RM, their responsibilities and expectations, potential benefits, and limitations. The occurrence of this discussion should be documented in the medical record.	I	E
It is recommended that all CIEDs be checked through direct patient contact 2–12 weeks postimplantation.	I	E
It may be beneficial to initiate RM within the 2 weeks of CIED implantation.	IIa	C
All patients with an implantable loop recorder with wireless data transfer capability should be enrolled in an RM program, given the daily availability of diagnostic data.	I	E
It is recommended that allied health care professionals responsible for interpreting RM transmissions and who are involved in subsequent patient management decisions have the same qualifications as those performing in-clinic assessments and should ideally possess IBHRE certification for device follow-up or equivalent experience.	I	E
It is recommended that RM programs develop and document appropriate policies and procedures to govern program operations, the roles and responsibilities of those involved in the program, and the expected timelines for providing service.	I	E

CIED = cardiac implantable electronic device; HRS = Heart Rhythm Society; IBHRE = International Board of Heart Rhythm Examiners; IPE = in-person evaluation; RM = remote monitoring.

Device and Disease Management	Class of Recommendation	Level of Evidence
RM should be performed for surveillance of lead function and battery conservation.	I	A
Patients with a CIED component that has been recalled or is on advisory should be enrolled in RM to enable early detection of actionable events.	I	E
RM is useful to reduce the incidence of inappropriate ICD shocks.	I	B-R
RM is useful for the early detection and quantification of atrial fibrillation.	I	A
The effectiveness of RM for thoracic impedance alone or combined with other diagnostics to manage congestive heart failure is currently uncertain.	IIb	C

B-R = level of evidence B indicates a moderate level from randomized trials; CIED = cardiac implantable electronic device; ICD = implantable cardioverter-defibrillator; RM = remote monitoring.

I benefici del monitoraggio remoto

<i>Per l'OSPEDALE / SSN</i>	<i>Per il PAZIENTE</i>	<i>Per la SOCIETA'</i>
<ul style="list-style-type: none">• Riduzione del numero di visite ambulatoriali (50%)• Riduzione del tempo medico e risorse infermieristiche (60%)• Riduzione dei costi ospedalieri (60%)• Riduzione del numero e durata ospedalizzazioni• Durata del singolo FUP (4-8 minuti rispetto ai 26 min per quello tradizionale)	<ul style="list-style-type: none">• Miglior compliance e soddisfazione del paziente <p style="text-align: center;"><u>Clinici:</u></p> <ul style="list-style-type: none">• Individuazione precoce di eventi clinici e malfunzionamenti del device• Riduzione del numero di shock inappropriati• Migliore qualità di vita• Aumentata sopravvivenza <p style="text-align: center;"><u>Economici:</u></p> <ul style="list-style-type: none">• Riduzione dei costi di trasporto per i pazienti (60%)	<ul style="list-style-type: none">• Riduzione delle giornate di lavoro retribuite perse, sia per il paziente (se in età lavorativa) che per l'eventuale accompagnatore

Situazione italiana

- I sistemi di Remote Monitoring sono utilizzati in circa l' **88%** dei centri che impiantano PMK/ICD
- Sono utilizzati in circa **30.000** pazienti (< 10%) nonostante i benefici clinici ed economici

FOLLOW-UP DEI PAZIENTI IMPIANTATI CON PMK/ICD:

- Visita ambulatoriale (controllo e riprogrammazione) (codice 89.48.1) – in 4 Regioni il rimborso è differenziato in base al tipo di dispositivo (PM: 89.48.01 e ICD: 89.48.02)
- Controllo remoto del dispositivo: **attualmente nessun rimborso**

Un'eccezione: Trento

PROVINCIA AUTONOMA DI TRENTO

Deliberazione di Giunta Provinciale 13.06.2016, n. 1010

Integrazione del Nomenclatore delle prestazioni di assistenza specialistica ambulatoriale, di diagnostica per immagini e di laboratorio erogabili nell'ambito del Servizio sanitario Provinciale e altre direttive.

NOTA	CODICE	DESCRIZIONE	TARIFFA (in euro)	BRANCA
I	99.99.2	MONITORAGGIO DINAMICO DELLA GLICEMIA (HOLTER GLICEMICO). Incluso addestramento del paziente all'uso dell'apparecchio (1)	166,50	ALTRO ENDOCRINOLOGIA
IAR	99.99.3	PAC DIABETOLOGIA PEDIATRICA CONTROLLO ANNUALE < 9 ANNI (1)	117,50	ALTRO ENDOCRINOLOGIA
IAR	99.99.4	PAC DIABETOLOGIA PEDIATRICA CONTROLLO ANNUALE > 9 ANNI (1)	125,25	ALTRO ENDOCRINOLOGIA
I	89.48.2	CONTROLLO IN REMOTO DI PAZIENTI PORTATORI DI PACEMAKER, DEFIBRILLATORE E LOOP RECORDER. Massimo 4 controlli/anno (2)	25,55	CARDIOLOGIA

(1) prestazioni esentate dalla compartecipazione (codice di esenzione 013)

(2) la prescrizione è riservata allo specialista pubblico

Situazione Europea



Reimbursed



Not reimbursed:



Situazione Europea

PAESE	SITUAZIONE	Descrizione
Germania	Rimborsato	a controllo progetto pilota (Agosto – Ottobre 2014)
Italia	Non Rimborsato	
Spagna	Non Applicabile	Global budget
Francia	Rimborsato	Price premium 800 – 1.000€
UK	Rimborsato	Accordi per singolo ospedale (50% visita)
Olanda	Rimborsato	Accordi per singolo ospedale
Austria	Non Rimborsato	
Belgio	Non Rimborsato	
Finlandia	Rimborsato	119€ a paziente (compenso annuale)
Danimarca	Rimborsato	110€ a paziente (compenso annuale)
Svezia	Rimborsato	200€ per diagnosi via web, -50% se non vi è diagnosi
Portogallo	Rimborsato	25€ ogni controllo del dispositivo in remoto

grazie per l'attenzione