



Campania Salute Network: l'evoluzione degli studi clinici  
sull'ipertensione arteriosa dall'era analogica a quella  
digitale

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**AOU Federico II di Napoli**



## Worldwide burden of HBP

- **HTN** affects about **40%** of the industrialized populations and its prevalence is increasing in particular for high risk pts<sup>1</sup>
- The prevalence of **HTN** is **affected by age and sex**<sup>1</sup>
- **HTN** is associated with **additional RF's** in **over 80%** of patients<sup>2</sup>
- **HNT** is a **co-morbid** condition in **over 85%** of cardiac patients<sup>3</sup>
- On a worldwide base, **NTH** is responsible for <sup>4</sup>:
  - **7.6 million deaths** each year (13.5% of total)
  - **6.3 millions of years of disability** (4.4% of total)
  - **54% of Stroke** and **47% of CHD**, **≈30% ESRD**<sup>5</sup>

1. Lawes, Hoon, Rodgers: Lancet 2008; 371: 1513-18

2. Banegas JR, Borghi C et al, Eur Heart J 2011

3. Arnett KD et al, Circulation 2014

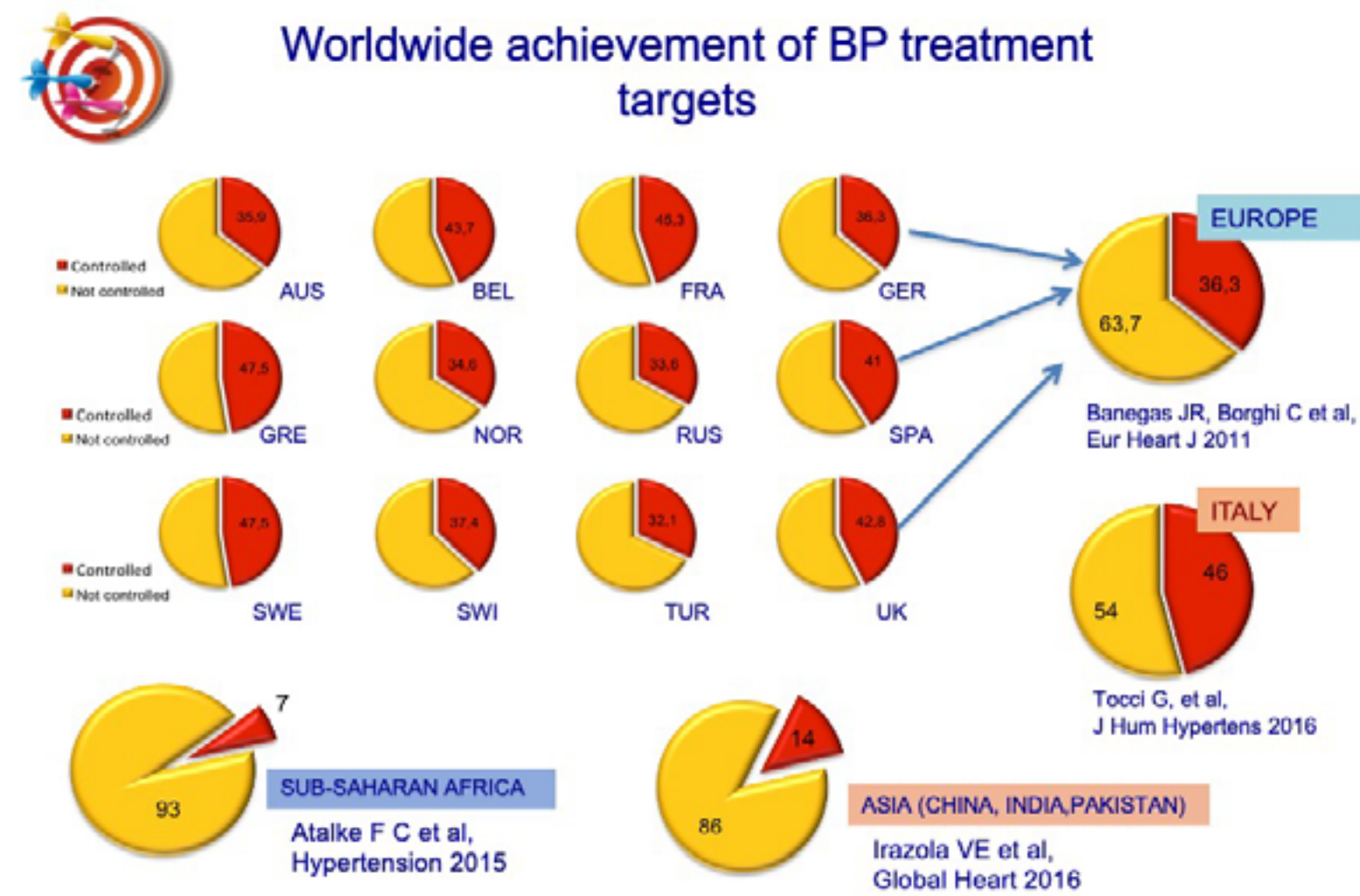
4. Lim SS et al, The Lancet 2013;380: 2224 – 2260

5.US Renal Data System .2015



## HTN, antihypertensive drugs and CVD: consolidated evidence

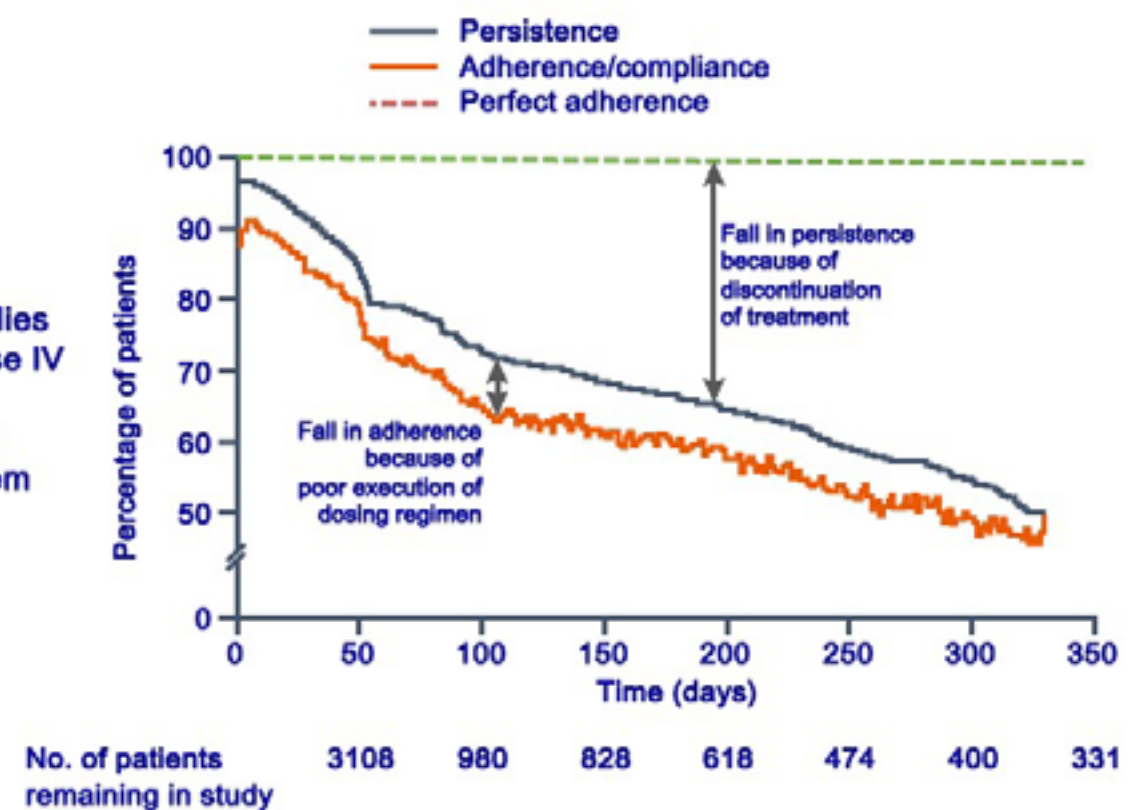
1. BP lowering is associated with a reduced morbidity and mortality and is highly cost/saving.
2. Antihypertensive treatment reduces the incidence of HTN-associated events.
3. Prevention of CV morbidity is mainly related to BP lowering per se, although other effects of the antihypertensive drugs contribute to benefit.





### Adherence/compliance in hypertensive patients typically falls over time

Study of hypertensive patients in clinical studies  
 4783 patients in 21 Phase IV trials  
 Evaluated by medication event monitoring system



Vrijens, Vincze, Kristanto, et al. *BMJ* 2008;336:1114-7



### Question: can the ESH Guidelines be applied in the Outpatient Hypertension Centers ?

• Hypertension prevalence:	20%
• Italian population:	54.000.000
• Hypertensive italian patients:	10.800.000
• Italian outpatient hypertension clinic:	≈ 500
• Number of hypertensives/clinic:	≈ 21.500
• Number of visit/year/clinic:	≈ 43.000
• Number of visit/month/clinic:	≈ 3600
• Number of visit/day/clinic:	≈ 120



www.campaniasalute.com/index\_english.html

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Versione Italiana English version

### Campania Salute Project

WEB-based connections between Specialists Centers and General Practitioners for Clinical Data-Base consultations of high Cardiovascular Risk patients

Telematic Clinical and Diagnostic evaluations Reservations & Clinical Records Consultations

General Practitioner's Program

Project Leader:  
[Prof. Bruno Trimarco](#)  
 Professor of Cardiology  
 School of Medicine and Surgery  
 University "Federico II" of Naples  
 Tel: 081-7462250/2211  
 Fax: 081-7462256  
 E-mail: [centroipertensione@unina.it](mailto:centroipertensione@unina.it)

Scientific Consultant  
 Prof. Giovanni de Simone  
 Professor of Medicine

Introduction  
 Participants  
 Goals  
 Description  
 Structure  
 Pilot Experience  
 Results  
 Services  
 Slides  
 Steering Committee  
 Proposal Studies

EMERGENCY ACCESS  
 CODICE PERSONALE PERSONAL CODE

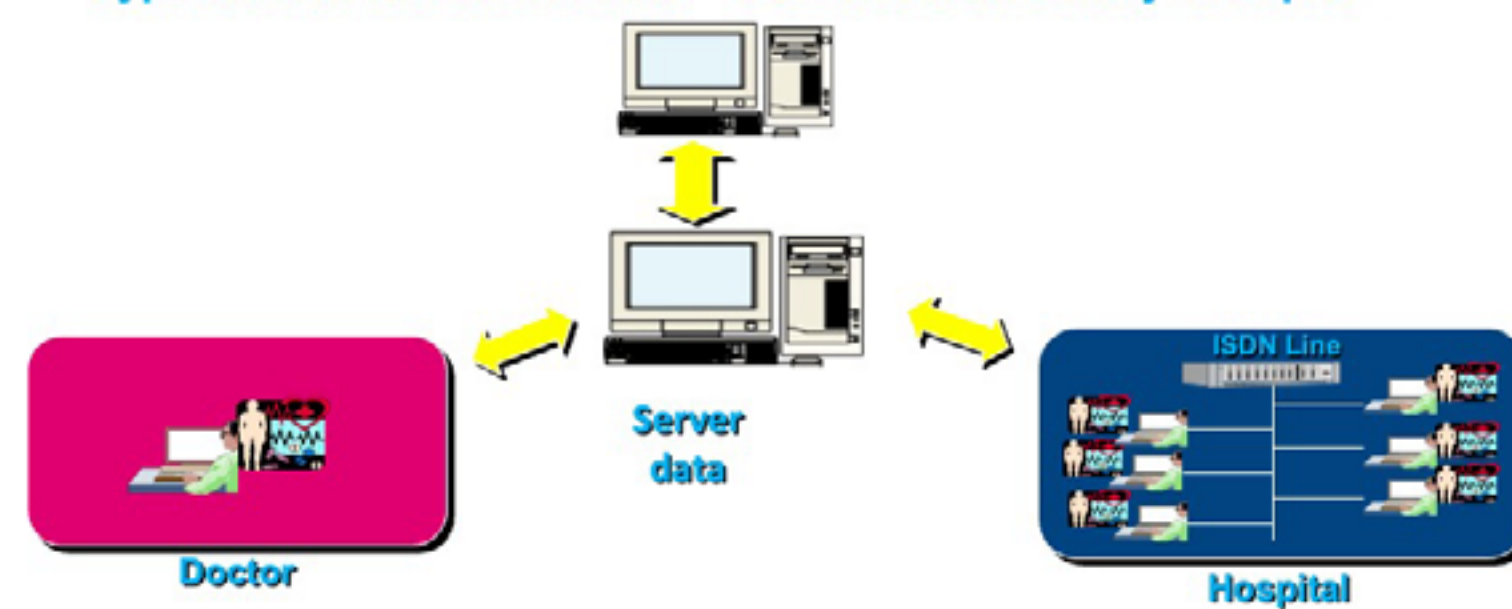
Prego inserire il codice personale ricevuto sul retro della carta, per accedere in sicurezza e con dati d'emergenza per i ricettori anagrafici. Il paziente, o chi s'è data in carico, ha autorizzato l'utilizzo. Si avverte che l'accesso a questa funzione è MONITORATO.  
 Please insert the personal code found on the backside of the card to view emergency data for any emergency. The patient which was provided with the card, authorized its use. Please note that access to these functionalities is being TRACKED.

AFA Project  
 Tosca Project  
 Telematic ECG Refertations  
 Share Project



**WWW.CAMPANIASALUTE.COM**

Hypertension Research Center – Federico II University of Naples







## The use of a telematic connection for the follow-up of hypertensive patients improves the cardiovascular prognosis

Nicola De Luca<sup>a</sup>, Raffaele Izzo<sup>a</sup>, Guido Iaccarino<sup>a</sup>, Pier Luigi Malini<sup>b</sup>, Carmine Morisco<sup>a</sup>, Francesco Rozza<sup>a</sup>, Gianni Luigi Iovino<sup>a</sup>, Maria Assunta Elena Rao<sup>a</sup>, Clara Bodenizza<sup>a</sup>, Francesca Lanni<sup>a</sup>, Luigi Guerrera<sup>a</sup>, Oreste Arcucci<sup>c</sup> and Bruno Trimarco<sup>a,c</sup>

**Background** Inadequate blood pressure (BP) control could be due to incorrect management of hypertensives caused by the lack of interaction between general practitioners (GP) and hypertension specialists.

**Objectives** To test the effectiveness on BP and total cardiovascular risk (TCVR) control of an internet-based digital network connecting specialists and GPs.

**Methods** We created a network among the Hypertension Clinic, Federico II University (Naples, Italy), 23 hospital-based hypertension clinics and 60 GPs from the area (CampaniaSalute Network, CS). Randomized GPs enrolled in CS could update online records of patients ( $n = 1979$ ). As a control, we included 2045 patients referred to the specialist clinics by GPs from outside the network. All patients completed a 2-year follow-up.

**Results** CS provided a larger reduction in BP [systolic/diastolic BP (SBP/DBP):  $7.3 \pm 0.4/5.4 \pm 0.3$  versus  $4.1 \pm 0.4/3.1 \pm 0.26$  mmHg, CS versus control;  $P < 0.001$  for both] and percentage of patients with BP  $< 140/90$  mmHg (CS versus control: baseline, 33 versus 34%, NS; end of follow-up, 51 versus 47%,  $\chi^2 = 13.371$ ;  $P < 0.001$ ). A European Society of Hypertension–European Society of Cardiology (ESH/ESC) TCVR score was calculated [from 1

(average) to 5 (very high TCVR)]. The CS group showed a reduction in the mean TCVR score (CS: from  $3.5 \pm 0.02$  to  $3.2 \pm 0$ ,  $P < 0.01$ , ANOVA; control group:  $3.5 \pm 0.03$  to  $3.4 \pm 0.03$ , NS) and, accordingly, fatal and non-fatal major cardiovascular events (MACE) were less frequent (2.9 versus 4.3%;  $\chi^2 = 5.047$ ,  $P < 0.02$ ). CS predicts fewer MACE in multiple binary regression analysis ( $\beta: -7.27$ ,  $P < 0.008$ ) reducing the risk for MACE compared to control [odds ratio (OR): 0.838; 95% confidence interval (CI): 0.73–0.96].

**Conclusion** Our results support the idea that telemedicine can achieve better control of BP and TCVR. *J Hypertens* 23:1417–1423 © 2005 Lippincott Williams & Wilkins.

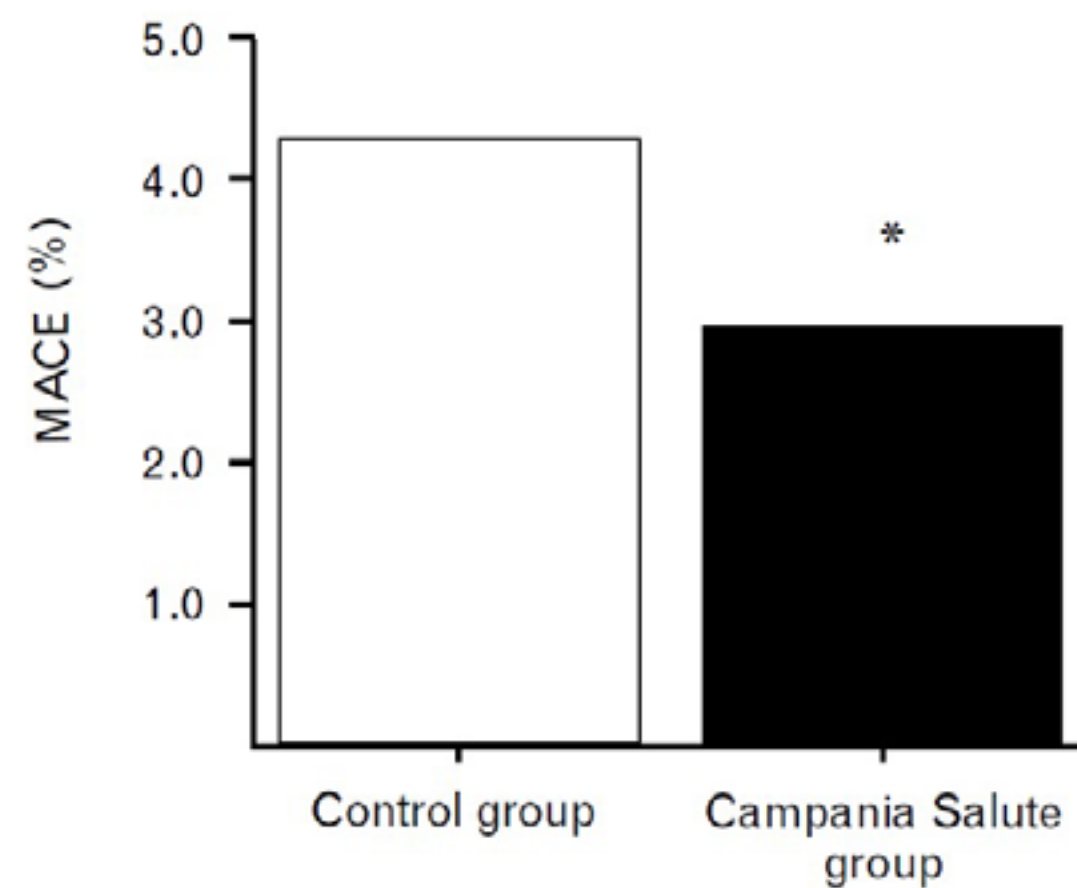
*Journal of Hypertension* 2005, 23:1417–1423

**Keywords:** hypertension, therapy, hospitalization, telemedicine

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Correspondence and requests for reprints to Professor Bruno Trimarco, Dipartimento di Medicina Clinica, Scienze Cardiovascolari ed Immunologiche, Università degli Studi di Napoli Federico II, Via Pansani 5, 80131 Naples, Italy. E-mail: trimarco@unina.it

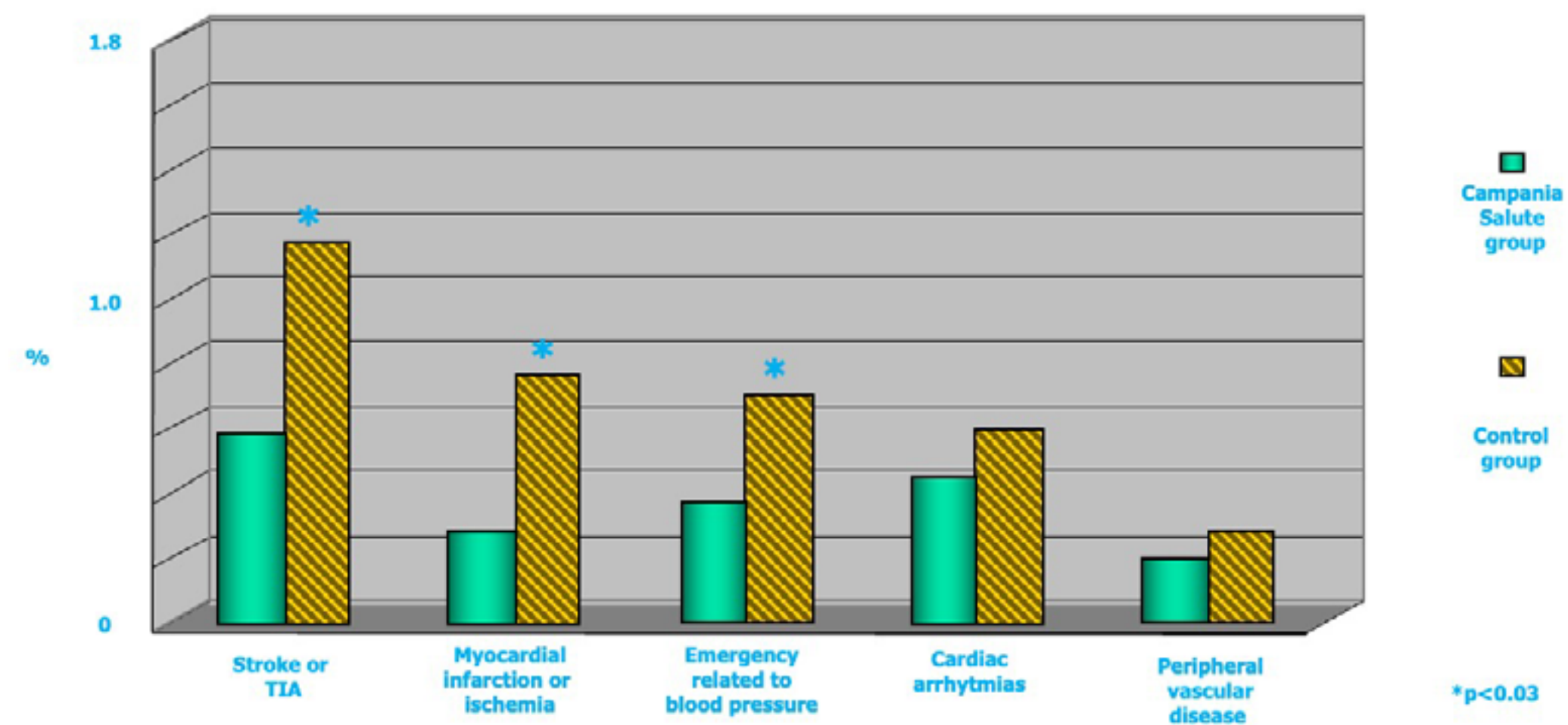
Received 14 January 2005 Revised 22 February 2005 Accepted 23 February 2005

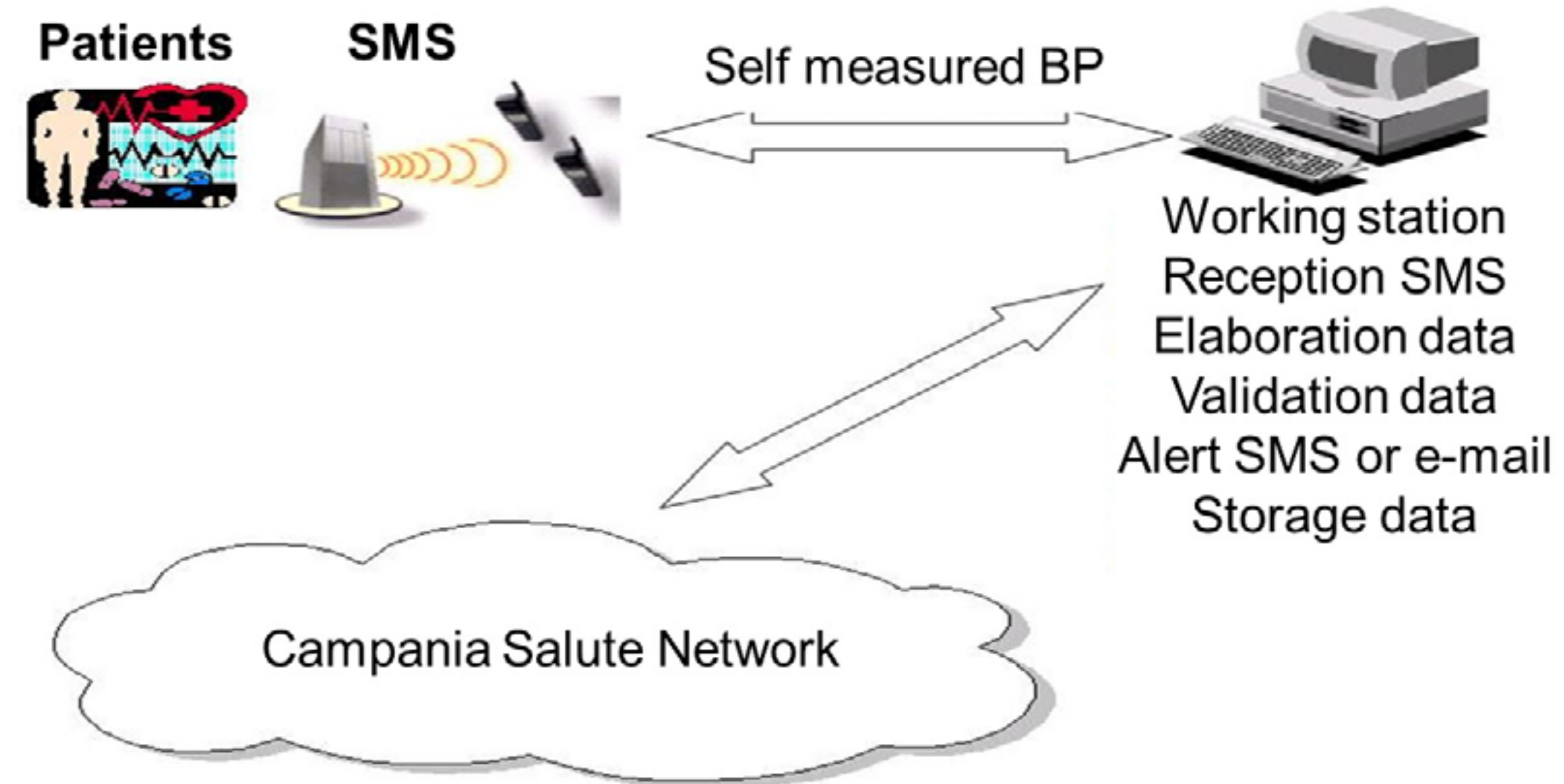


Incidence of major cardiovascular events in patients included in the control group and in the Campania Salute during the 2-year follow-up.  
\* $P < 0.02$ .



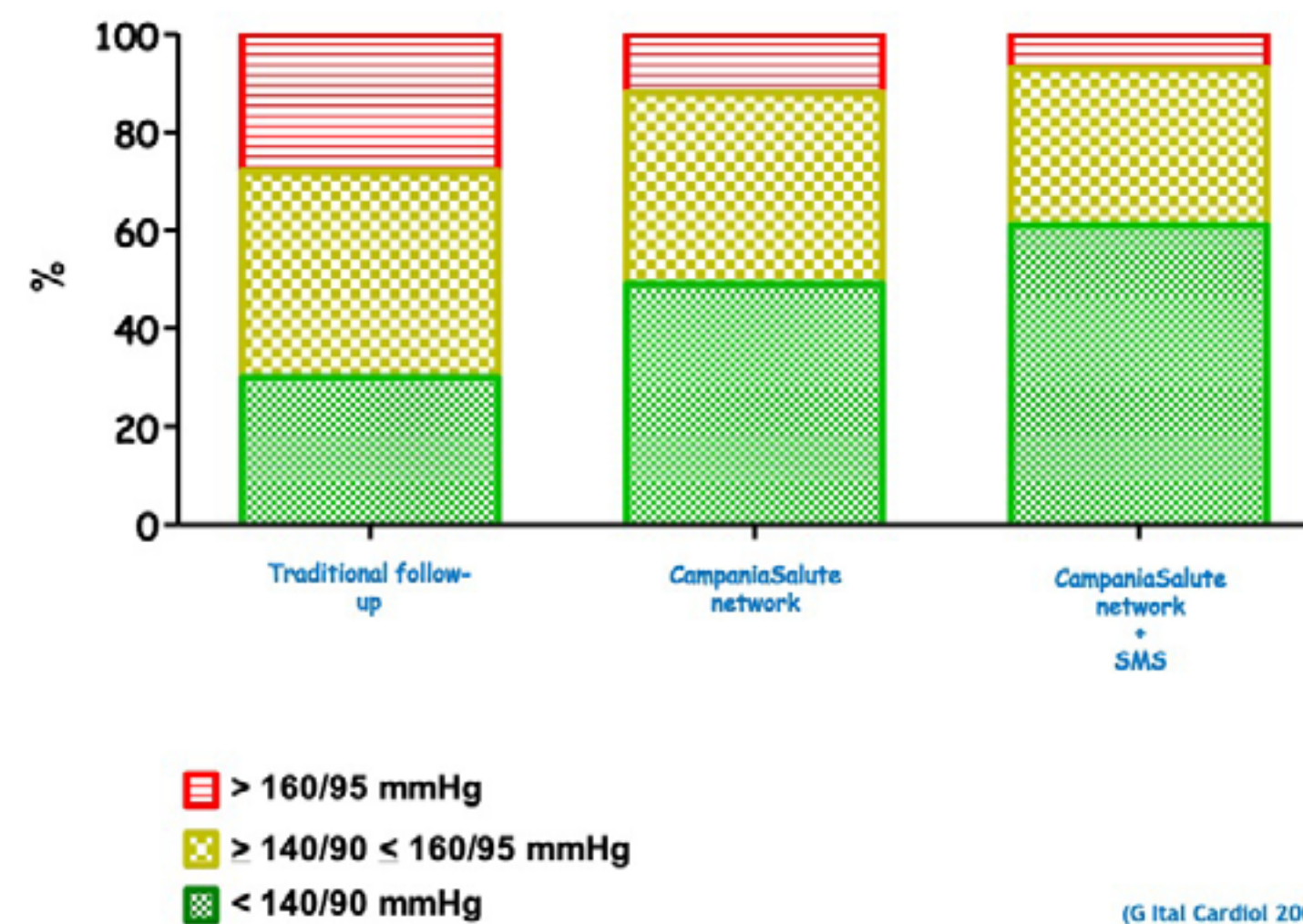
## Hospitalization





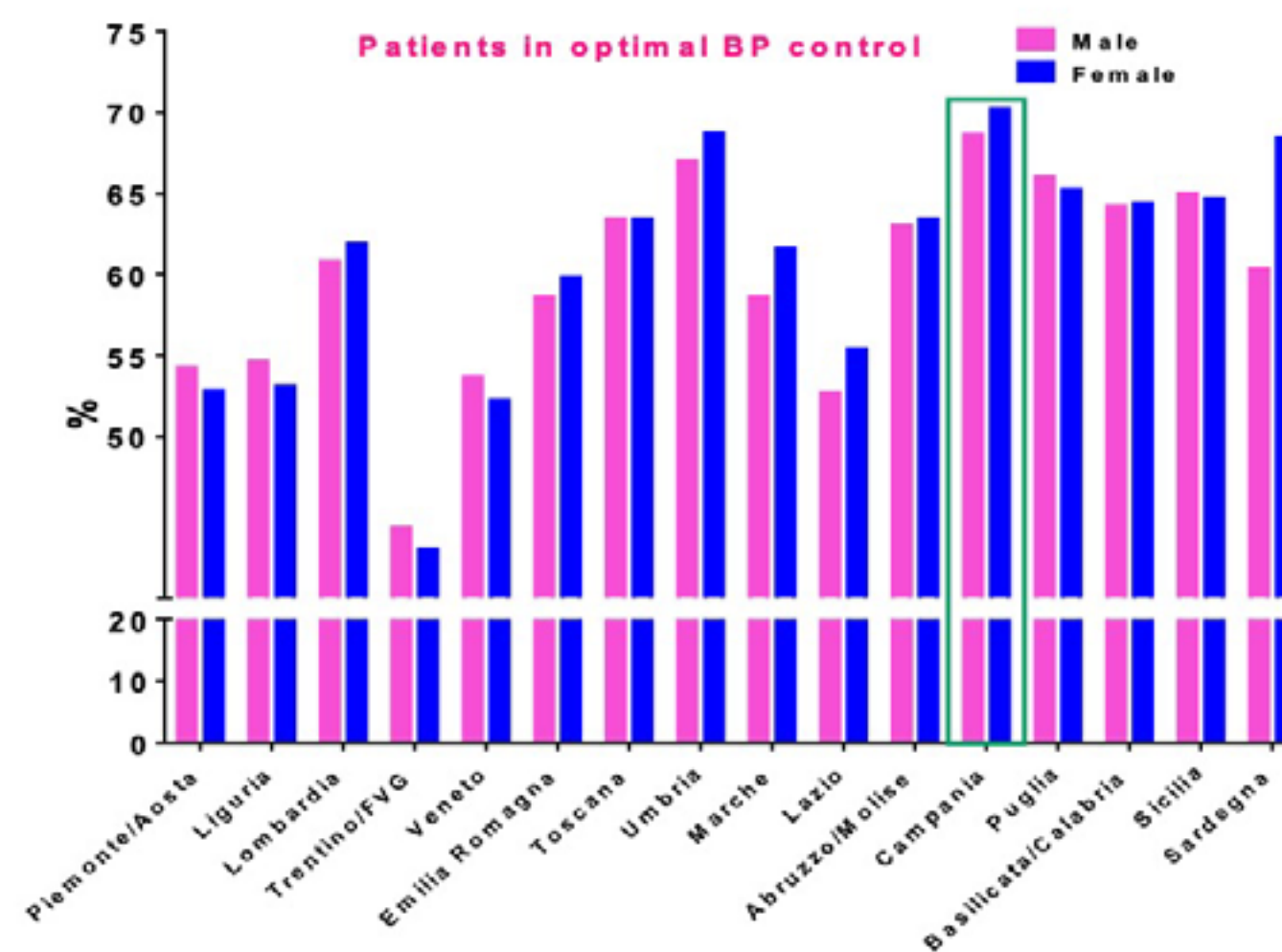


### Blood pressure control





### Controllo della Pressione Arteriosa in Italia



Tocci G, High Blood Press Cardiovasc Prev. 2016



**ORIGINAL ARTICLE**

**Aortic Root Dilatation Is Associated With Incident Cardiovascular Events in a Population of Treated Hypertensive Patients: The Campania Salute Network**  
 Grazia Candelio<sup>1,2</sup>, Costantino Mancusi<sup>1,2</sup>, Maria Angela Losi<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Diana Simone<sup>1,2</sup>, Rosanna de Santis<sup>1,2</sup>, and Medaletta Izzo<sup>1,2</sup>

**International Journal of Cardiology**

**Cardiovascular ultrasound exploration contributes to predict incident atrial fibrillation in arterial hypertension: The Campania Salute Network**  
 Maria-Angela Losi<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Marina De Marco<sup>1,2</sup>, Grazia Candelio<sup>1,2</sup>, Antonia Ripposciello<sup>1,2</sup>, Valentina Trimarco<sup>1,2</sup>, Francesco Sibile<sup>1,2</sup>, Francesco Rozza<sup>1,2</sup>, Giovanni Esposito<sup>1,2</sup>, Nicola De Luca<sup>1,2</sup>, and Bruno Trimarco<sup>1,2</sup>

**European Heart Journal Advances** Advance Access published July 23, 2023

**CLINICAL RESEARCH**

**Hypertensive target organ damage predicts incident diabetes mellitus**  
 Raffaele Izzo<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>, Valentina Trimarco<sup>1,2</sup>, Eva Gerdis<sup>1,2</sup>, Rosanna Giudice<sup>1,2</sup>, Olga Vaccaro<sup>1,2</sup>, Nicola De Luca<sup>1,2</sup>, and Bruno Trimarco<sup>1,2</sup>

**Heart**

**Development of Left Ventricular Hypertrophy in Treated Hypertensive Outpatients: The Campania Salute Network**  
 Raffaele Izzo<sup>1,2</sup>, Maria-Angela Losi<sup>1,2</sup>, Eugenio Stabile<sup>1,2</sup>, Mai Tone Lötchéviken<sup>1,2</sup>, Grazia Candelio<sup>1,2</sup>, Giovanni Esposito<sup>1,2</sup>, Emanuele Barbato<sup>1,2</sup>, Nicola De Luca<sup>1,2</sup>, Bruno Trimarco<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>

**Insufficient Control of Blood Pressure in Relation to a New Classification of Hypertensive Left Ventricular Geometric Abnormalities**  
 Raffaele Izzo<sup>1,2</sup>, MD, PhD<sup>1</sup>, Giovanni de Simone<sup>1,2</sup>, MD<sup>1</sup>, Rosanna Giudice<sup>1,2</sup>, Marina De Marco<sup>1,2</sup>, Bruno Trimarco<sup>1,2</sup>, MD<sup>1</sup>, Nicola De Luca<sup>1,2</sup>, MD<sup>1</sup>, Francesco Rozza<sup>1,2</sup>, MD, PhD<sup>1</sup>, Eugenio Stabile<sup>1,2</sup>, MD<sup>1</sup>, and Bruno Trimarco<sup>1,2</sup>

**Depressed myocardial energetic efficiency is associated with increased cardiovascular risk in hypertensive left ventricular hypertrophy**  
 Giovanni de Simone<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Maria Angela Losi<sup>1,2</sup>, Eugenio Stabile<sup>1,2</sup>, Francesco Rozza<sup>1,2</sup>, Grazia Candelio<sup>1,2</sup>, Costantino Mancusi<sup>1,2</sup>, Valentina Trimarco<sup>1,2</sup>, Nicola De Luca<sup>1,2</sup>, and Bruno Trimarco<sup>1,2</sup>

**Hypertension**

**Ethnic-Specific Normative Values for Echocardiographic LV Size, LV Mass, and Systolic Blood Pressure: A Study**  
 Raffaele Izzo<sup>1,2</sup>, MD, PhD<sup>1</sup>, Giovanni de Simone<sup>1,2</sup>, MD<sup>1</sup>, Rosanna Giudice<sup>1,2</sup>, Marina De Marco<sup>1,2</sup>, Bruno Trimarco<sup>1,2</sup>, MD<sup>1</sup>, Nicola De Luca<sup>1,2</sup>, MD<sup>1</sup>, Francesco Rozza<sup>1,2</sup>, MD, PhD<sup>1</sup>, Eugenio Stabile<sup>1,2</sup>, MD<sup>1</sup>, and Bruno Trimarco<sup>1,2</sup>

**Original Article**

**Achievement of target SBP without attention to decrease in DBP can increase cardiovascular morbidity in treated arterial hypertension: the Campania Salute Network**  
 Raffaele Izzo<sup>1,2</sup>, Costantino Mancusi<sup>1,2</sup>, Giuliano De Stefano<sup>1,2</sup>, Giovanni Albanò<sup>1,2</sup>, Maria-Angela Losi<sup>1,2</sup>, Valentina Trimarco<sup>1,2</sup>, Francesco Rozza<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>, and Nicola De Luca<sup>1,2</sup>

**ORIGINAL ARTICLE**

**High HDL (High-Density Lipoprotein) Concentrations Improve Blood Pressure Control in Patients with Resistant Hypertension**  
 Valentina Trimarco<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Pasquale Merone<sup>1,2</sup>, Maria Lesca<sup>1,2</sup>, Maria Virginia Marzilli<sup>1,2</sup>, Elisabetta De Luca<sup>1,2</sup>, Angela Izzari<sup>1,2</sup>, Pasquale Calvario<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>, Carmine Santoro<sup>1,2</sup>, and Bruno Trimarco<sup>1,2</sup>

**ORIGINAL ARTICLE**

**Decline of renal function in treated arterial hypertension: the Campania Salute Network**  
 Costantino Mancusi<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>, Maria Virginia Marzilli<sup>1,2</sup>, Grazia Candelio<sup>1,2</sup>, Eugenio Stabile<sup>1,2</sup>, Nicola De Luca<sup>1,2</sup>, Bruno Trimarco<sup>1,2</sup>, and Maria Angela Losi<sup>1,2</sup>

**ORIGINAL ARTICLE**

**Left Ventricular Mechano-Energetic Efficiency Identifies an Early Impairment of Myocardial Blood Flow in Arterial Hypertension**  
 Valentina Trimarco<sup>1,2</sup>, Raffaele Izzo<sup>1,2</sup>, Carmine Merone<sup>1,2</sup>, Pasquale Merone<sup>1,2</sup>, Maria Virginia Marzilli<sup>1,2</sup>, Angela Izzari<sup>1,2</sup>, Pasquale Calvario<sup>1,2</sup>, Giovanni de Simone<sup>1,2</sup>, Carmine Santoro<sup>1,2</sup>, and Bruno Trimarco<sup>1,2</sup>



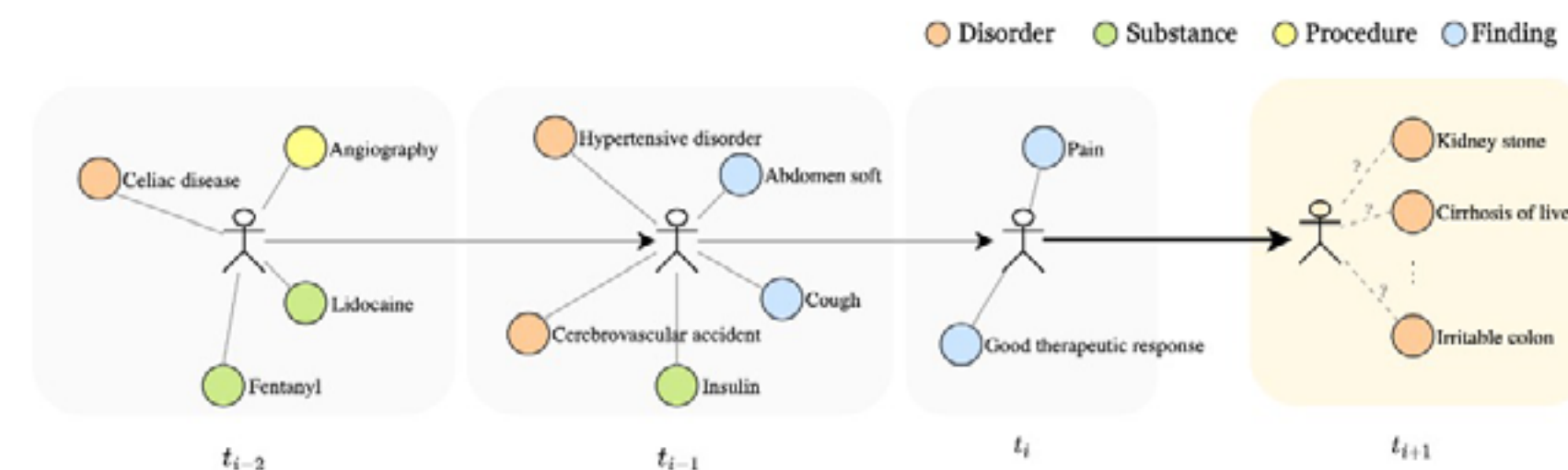
## IA nel Campania Salute Network





Potential of AI in cardiac prevention

## Our project



We aim to model medical histories with *Temporal Knowledge Graphs* capturing all the **structured** and **unstructured** information hidden in clinical notes. An AI model will then be trained to **predict links between patients and disorders** at a future time step.

In collaborazione con il gruppo del **Prof. Vincenzo Moscato**

Professore di sistemi di elaborazione delle informazioni  
 DIPARTIMENTO DI INGEGNERIA ELETTRICA E TECNOLOGIE DELL'INFORMAZIONE



## Telemedicina nel Campania Salute Network



***HSMonitor*** is a **pre-commercial procurement** (PCP) project investing in Research and Development (R&D) services towards innovative ICT-enabled monitoring solutions to improve health status and optimise hypertension care.

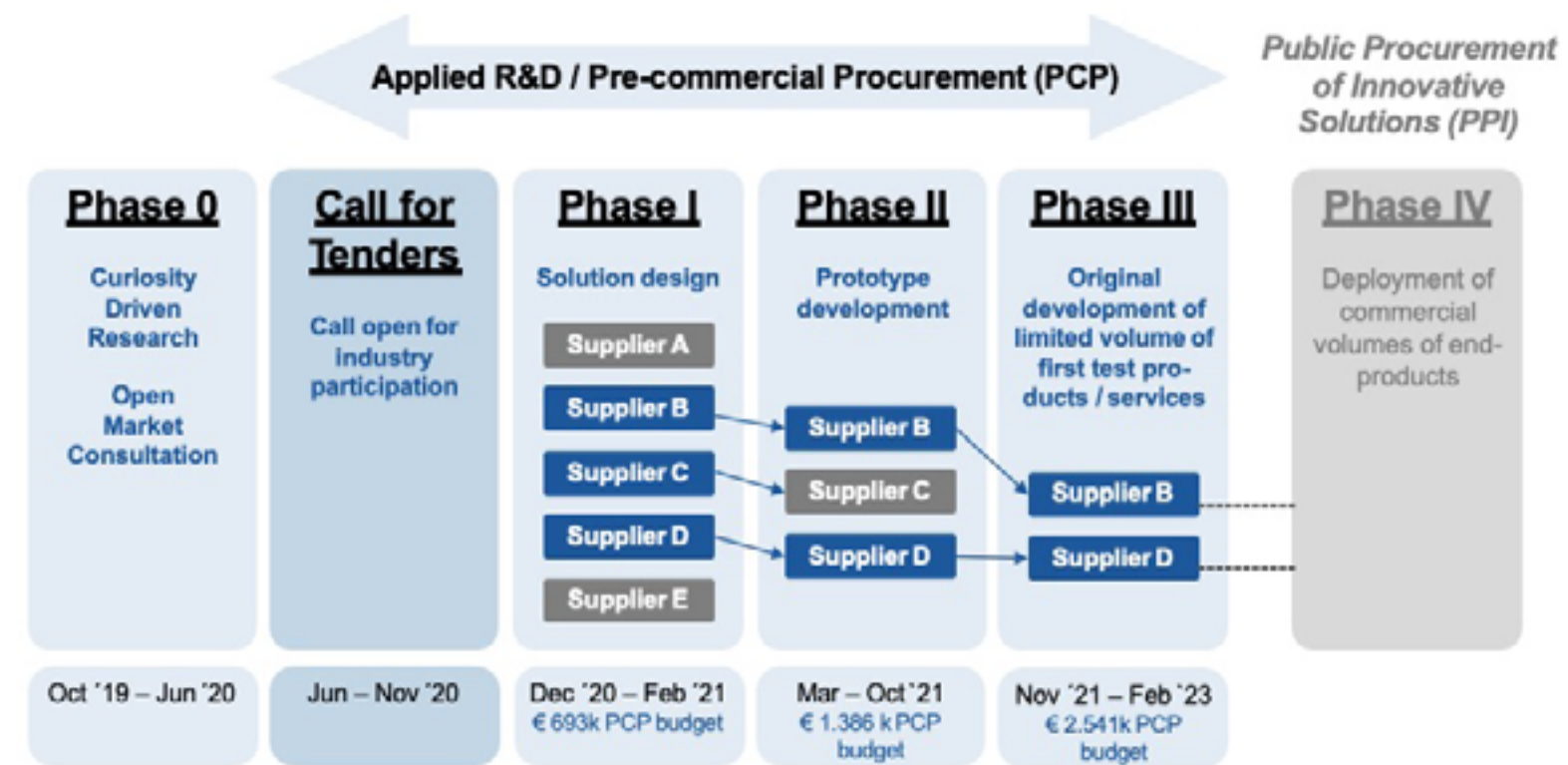


## Who we are

- > MINISTRY OF HEALTH, TURKEY
- > UNIVERSITY HOSPITAL FEDERICO II, ITALY
- ∨ REGION JAMTLAND HARJEDALEN, SWEDEN
- > HEALTH CENTER ZAGREB — CENTAR, CROATIA
- > REGION LOMBARDIA, ITALY
- > TICBIOMED, SPAIN
- > empirica Gesellschaft für Kommunikations- und Technologieforschung GmbH, GERMANY



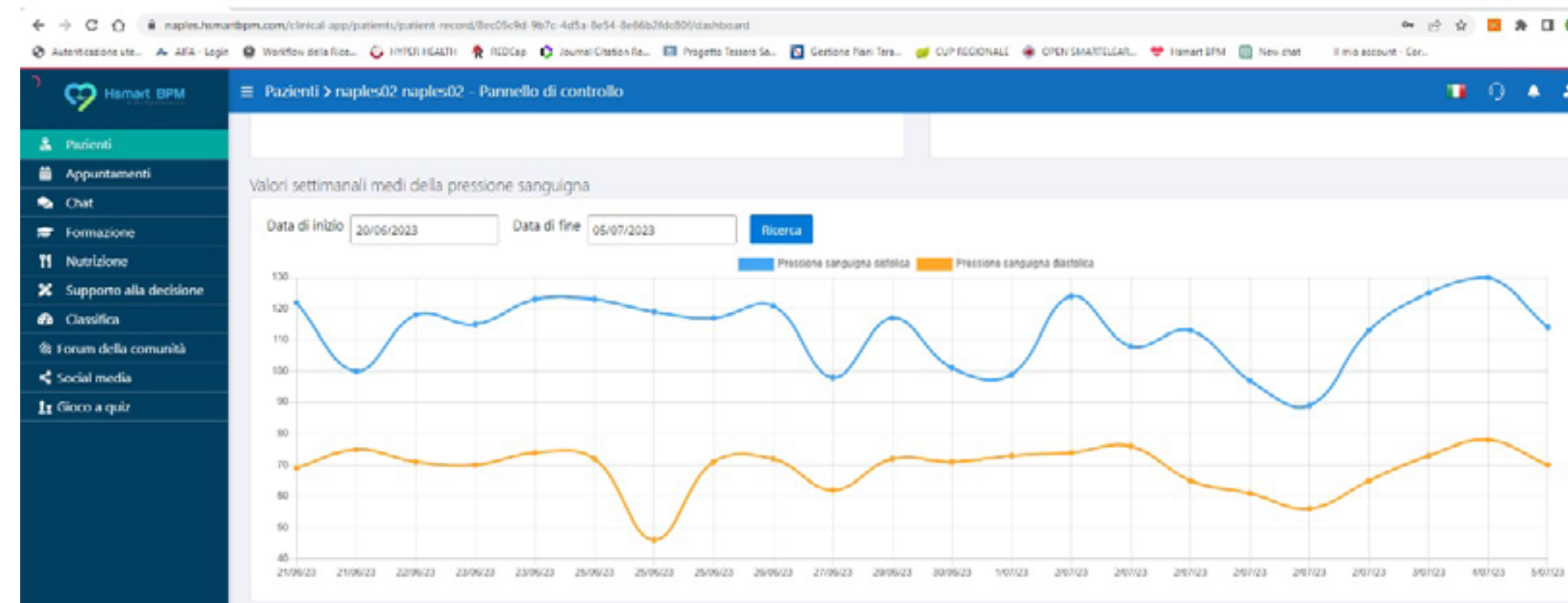
## The PCP process in HSMonitor

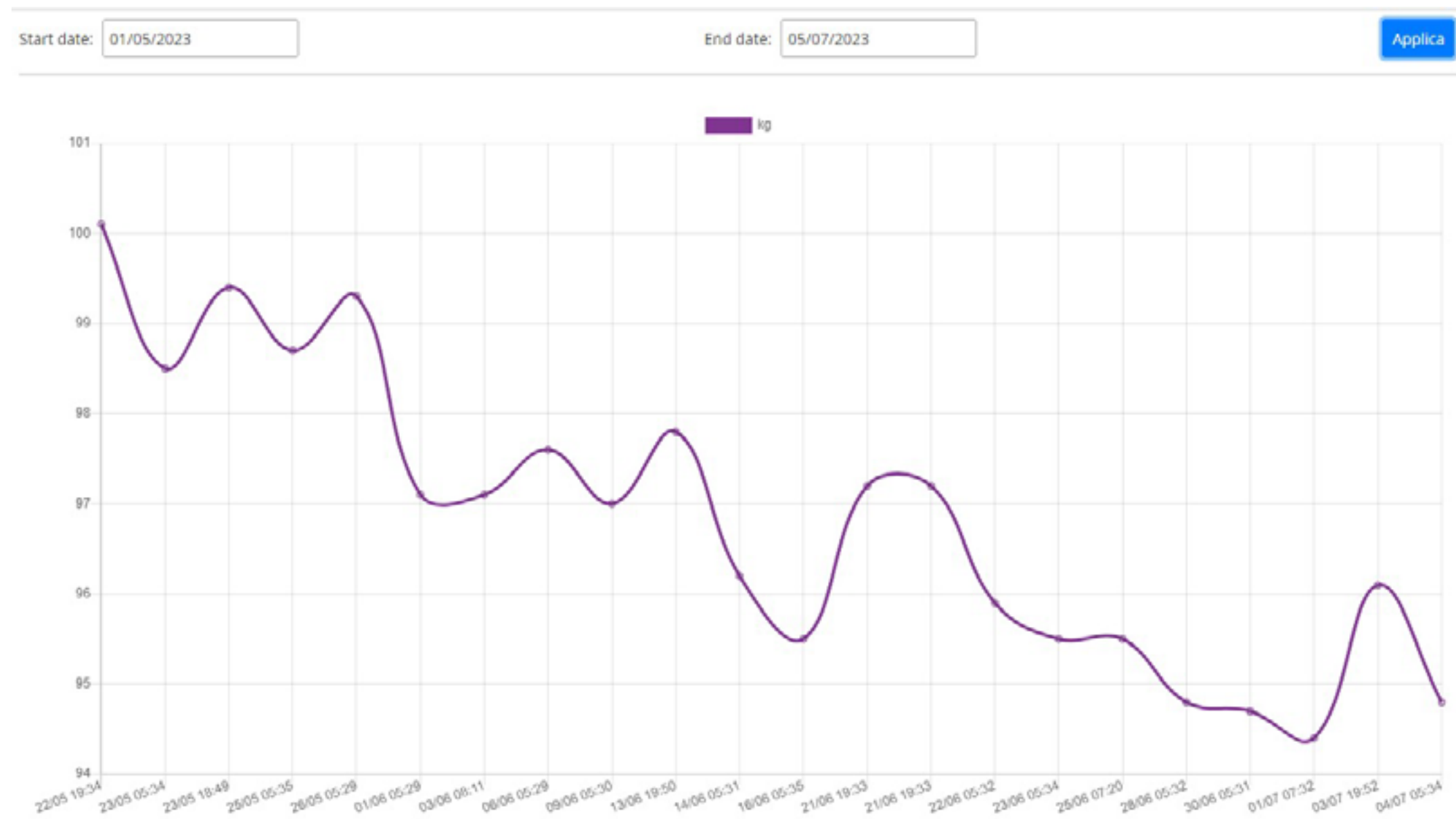


Lead Procurer: MOH, overall co-ordination of the procurers, acting on their behalf vis-à-vis the suppliers  
 Procurers (also Buyers Group): MOH, RJH, LOM, DZZC, FOUND  
 Suppliers (later Contractors) = organisations or consortia competing in the PCP process  
 Call for Tenders: one joint call submitted by the Lead Procurer on behalf of the Buyers Group  
 Open Market Consultation: the mechanism by which procurers consult potential suppliers about the scope and feasibility of the R&D



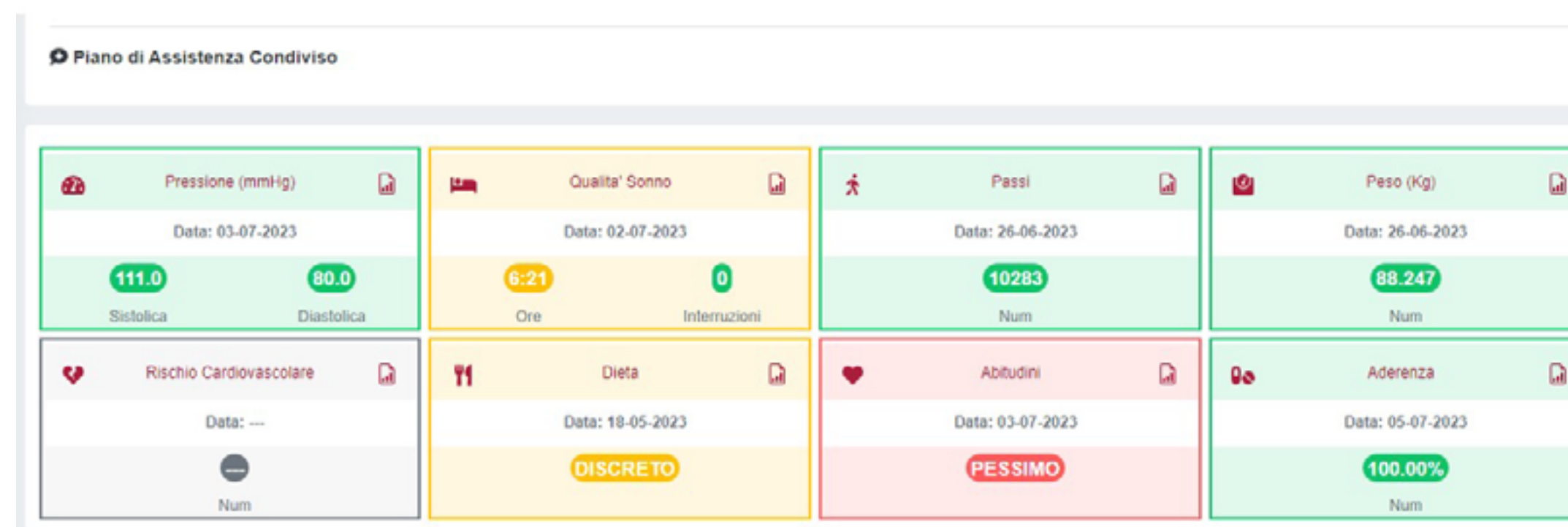
**Hsmart BPM**  
all about hypertension care







**HYPER HEALTH**

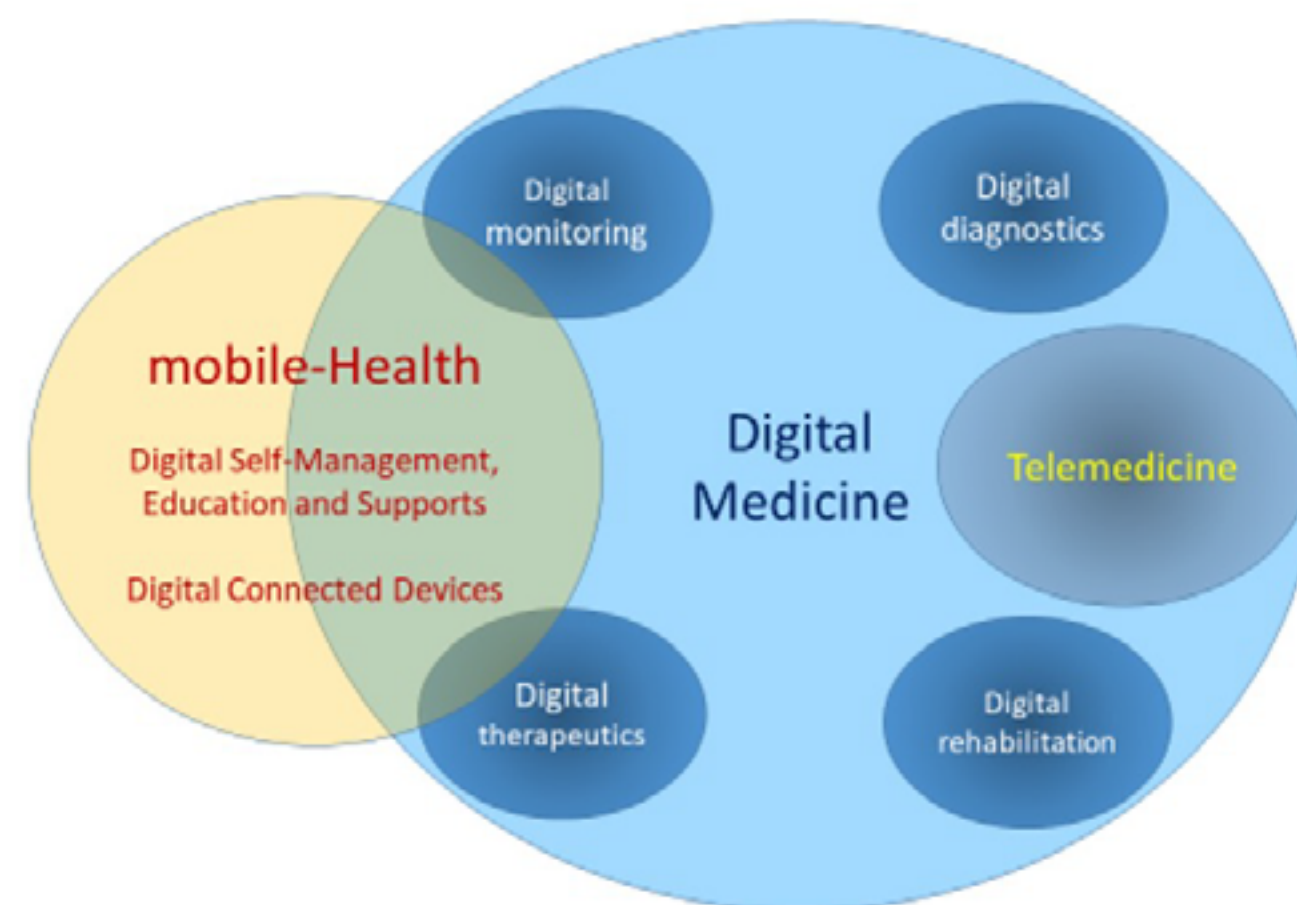






**Telemedicine and digital medicine in the clinical management of hypertension and hypertension-related cardiovascular diseases: a position paper of the Italian Society of Hypertension (SIIA)**

Pietro Minuz<sup>1</sup>, Fabio Lucio Albini<sup>2</sup>, Egidio Imbalzano<sup>3</sup>, Raffaele Izzo<sup>4</sup>, Stefano Masi<sup>5, 6</sup>, Martino F. Pengo<sup>7, 8</sup>, Giacomo Pucci<sup>9, 10</sup>, Filippo Scalise<sup>11</sup>, Massimo Salvetti<sup>12</sup>, Giuliano Tocci<sup>13</sup>, Arrigo Cicero<sup>14</sup>, Guido Iaccarino<sup>15</sup>, Carmine Savoia<sup>16</sup>, Leonardo Sechi<sup>17</sup>, Gianfranco Parati<sup>8</sup>, Claudio Borghi<sup>14</sup>, Massimo Volpe<sup>16</sup>, Claudio Ferri<sup>17</sup>, Guido Grassi<sup>18</sup>, Maria Lorenza Muiesan<sup>12</sup>, on behalf of the Italian Society of Hypertension (SIIA)





**Table 3.** Integration of digital medicine into health care systems: opportunities, challenges and potential risks.

Opportunities	Challenges	Risks
Availability of effective and continuous medical support for the entire population through communication technology.	Costs and reimbursement Digital divide in the population.	Inadequate funding from health systems. Lack of equity due to poor literacy and digital divide within the population.
Timely recording and evaluation of clinical data	Data protection throughout the digital communication system	Lack of privacy, leaks and failure in data protection.
Improved doctor-patient communication.	Validated instruments. Scientifically proven medical advice and data recordings.	Poor and non-qualified medical advice. Not scientifically proven information.
Integration into the health care systems.	Platforms, regulation and training of health personnel.	Inadequate technical support and training to health personnel. Lack of involvement of health personnel in planning and decision making.
Increased equity in health care systems.	Patients' engagement and information. Technical support and users' training.	<b>Exclusion of socially deprived and fragile persons.</b>



 Ministero della Salute <small>DIREZIONE GENERALE DELLA SANITA' E DELL'INTEGRAZIONE DEL SISTEMA</small> PNRR: M5C2_CALL 2022 Proposta completa	 Finanziato dall'Unione europea NextGenerationEU
Codice progetto:	Sezione del bando: Proof of concept
Istituzione richiedente: Campania	Richiedente/Coordinatore PI: IZZO RAFFAELE

### 1 - Informazioni generali

Codice	Argomento del progetto: A) Proof of concept
PI / Coordinatore: IZZO RAFFAELE	Istituzione richiedente: Campania
	Istituzione che esegue come UO per UO1: Azienda Ospedaliera Universitaria Federico II

Sezione del bando: Proof of concept  
 Titolo della proposta: Nuovo dispositivo di monitoraggio cardiorespiratorio multimodale per migliorare la gestione dei pazienti cronici (CARE-MODEL)

Durata in mesi: 24  
 MDC primario: Cardiologia Pneumologia  
 MDC secondario: Diagnostica  
 Classificazione del progetto IRG: Scienze e Tecnologie di Bioingegneria  
 Classificazione del progetto SS: Sviluppo di Strumentazione e Sistemi - ISD

Parola chiave del progetto 1: Automazione e integrazione: progettazione e sviluppo sia di singoli moduli di strumentazione che di sistemi integrati per la ricerca biologica o la diagnostica.

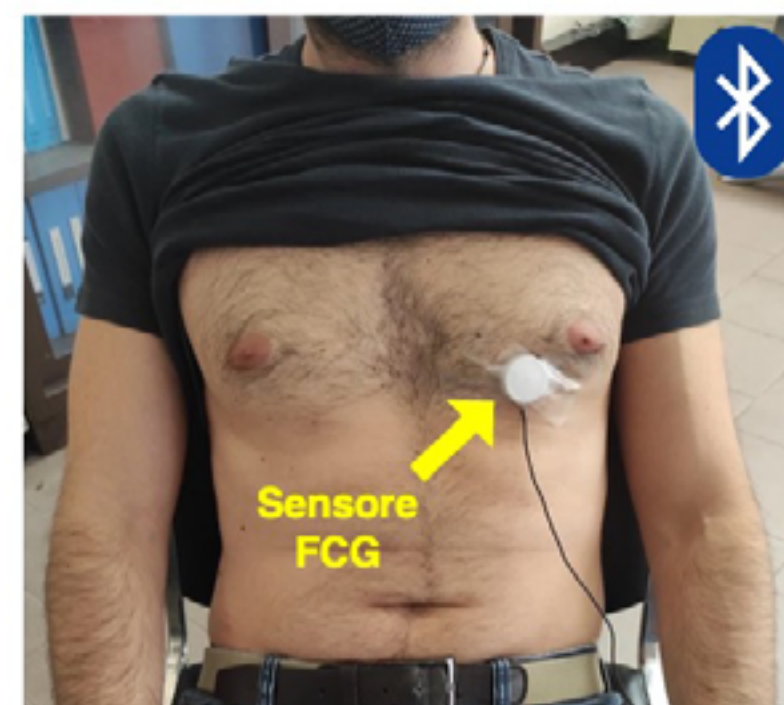
Richiesta di progetto: Animali:  Umani:  Sperimentazione clinica:   
 Numero di brevetto: WO2021072493A1 Titolare del brevetto: Inventori: GARGIULO, Gaetano; ANDREOZZI, Emilio; ESPOSITO, Daniele; BIFULCO, Paolo.

Proprietario: 3 AIM IP PTY LTD, Suite 401, 275 Alfred Street North Sydney, New South Wales 2060, AU.

Richiesta di finanziamento totale del progetto al Ministero della Salute: € 900.000

## ForceCardioGraphy per TELEMEDICINA

- Tecnologia indossabile per monitoraggio continuo e a lungo termine
- Estrema semplicità di utilizzo per il paziente
- Connettività wireless per trasmissione dei dati
- Possibilità di monitorare parametri quali:
  - Frequenza cardiaca e HRV
  - Cardiac Time Intervals (valvole)
  - Suoni cardiaci
  - Variazioni di stroke volume/cardiac output
  - Indici di contrattilità
  - Frequenza respiratoria
  - Profondità della respirazione
  - Suoni respiratori

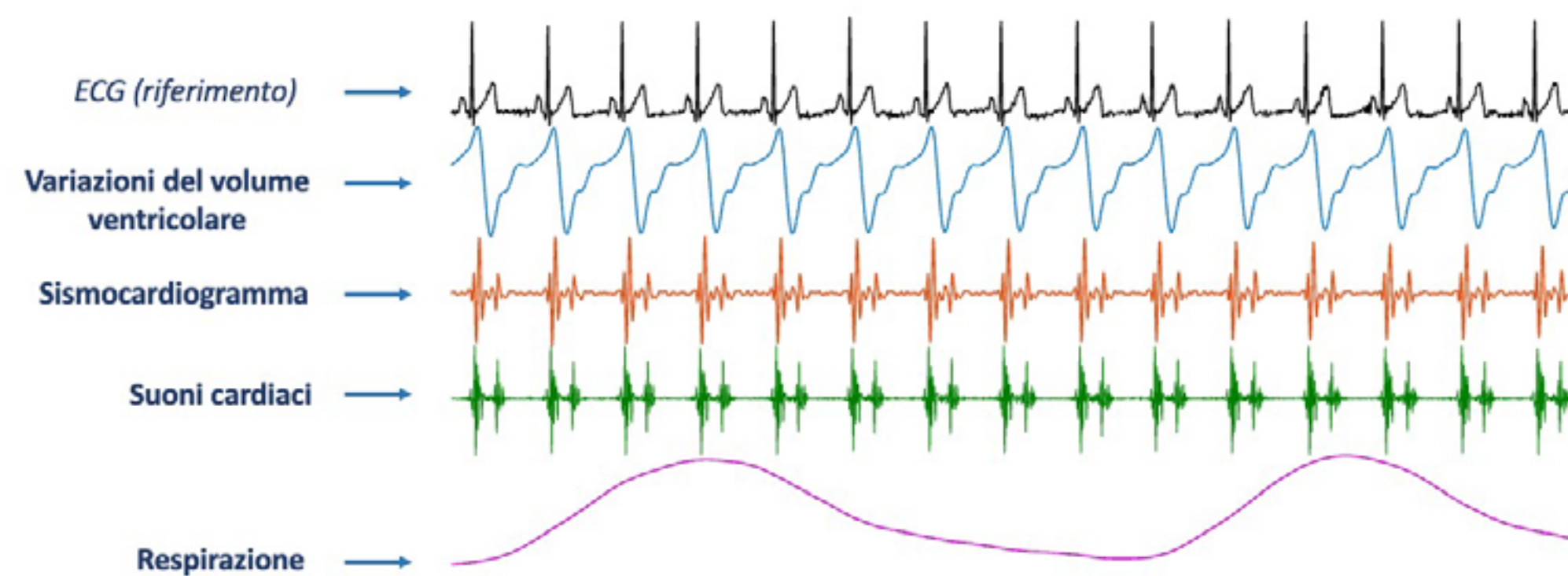


Forcecardiography (FCG) è una recente tecnica di monitoraggio cardio-respiratorio basata su sensori di forza indossabili.



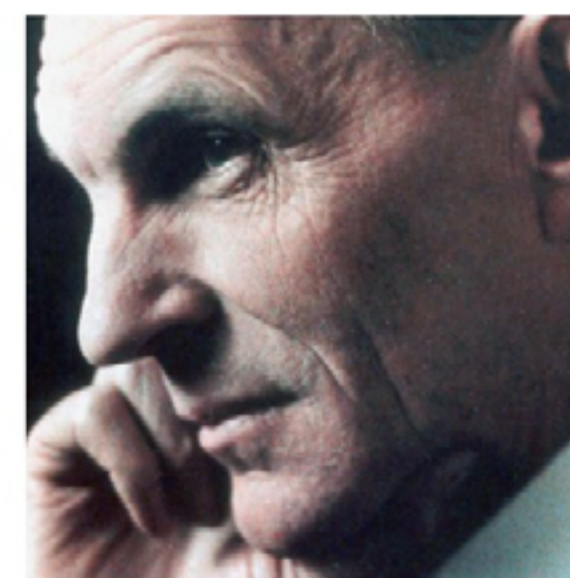
## ForceCardioGraphy per TELEMEDICINA

### Contenuto Informativo





C'è vero progresso solo  
quando i vantaggi di una  
nuova tecnologia  
diventano per tutti.



### **Delitti in materia di violazione del diritto d'autore (Art. 25-novies, D.Lgs. n. 231/2001) [articolo aggiunto dalla L. n. 99/2009]**

- Messa a disposizione del pubblico, in un sistema di reti telematiche, mediante connessioni di qualsiasi genere, di un'opera dell'ingegno protetta, o di parte di essa (art. 171, legge n.633/1941 comma 1 lett. a) bis)
- Reati di cui al punto precedente commessi su opere altrui non destinate alla pubblicazione qualora ne risulti offeso l'onore o la reputazione (art. 171, legge n.633/1941 comma 3)
- Abusiva duplicazione, per trarne profitto, di programmi per elaboratore; importazione, distribuzione, vendita o detenzione a scopo commerciale o imprenditoriale o concessione in locazione di programmi contenuti in supporti non contrassegnati dalla SIAE; predisposizione di mezzi per rimuovere o eludere i dispositivi di protezione di programmi per elaboratori (art. 171-bis legge n.633/1941 comma 1)
- Riproduzione, trasferimento su altro supporto, distribuzione, comunicazione, presentazione o dimostrazione in pubblico, del contenuto di una banca dati; estrazione o reimpiego della banca dati; distribuzione, vendita o concessione in locazione di banche di dati (art. 171-bis legge n.633/1941 comma 2)
- Abusiva duplicazione, riproduzione, trasmissione o diffusione in pubblico con qualsiasi procedimento, in tutto o in parte, di opere dell'ingegno destinate al circuito televisivo, cinematografico, della vendita o del noleggio di dischi, nastri o supporti analoghi o ogni altro supporto contenente fonogrammi o videogrammi di opere musicali, cinematografiche o audiovisive assimilate o sequenze di immagini in movimento; opere letterarie, drammatiche, scientifiche o didattiche, musicali o drammatico musicali, multimediali, anche se inserite in opere collettive o composite o banche dati; riproduzione, duplicazione, trasmissione o diffusione abusiva, vendita o commercio, cessione a qualsiasi titolo o importazione abusiva di oltre cinquanta copie o esemplari di opere tutelate dal diritto d'autore e da diritti connessi; immissione in un sistema di reti telematiche, mediante connessioni di qualsiasi genere, di un'opera dell'ingegno protetta dal diritto d'autore, o parte di essa (art. 171-ter legge n.633/1941)
- Mancata comunicazione alla SIAE dei dati di identificazione dei supporti non soggetti al contrassegno o falsa dichiarazione (art. 171-septies legge n.633/1941)
- Fraudolenta produzione, vendita, importazione, promozione, installazione, modifica, utilizzo per uso pubblico e privato di apparati o parti di apparati atti alla decodificazione di trasmissioni audiovisive ad accesso condizionato effettuate via etere, via satellite, via cavo, in forma sia analogica sia digitale (art. 171-octies legge n.633/1941).

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