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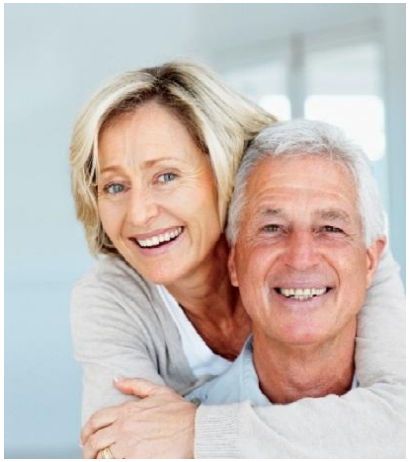

THE EXPERIENCE INTEGRATED CARE WITH TELEMONITORING: THE FUTURE FOR CARDIAC PATIENTS

SIMONETTA SCALVINI
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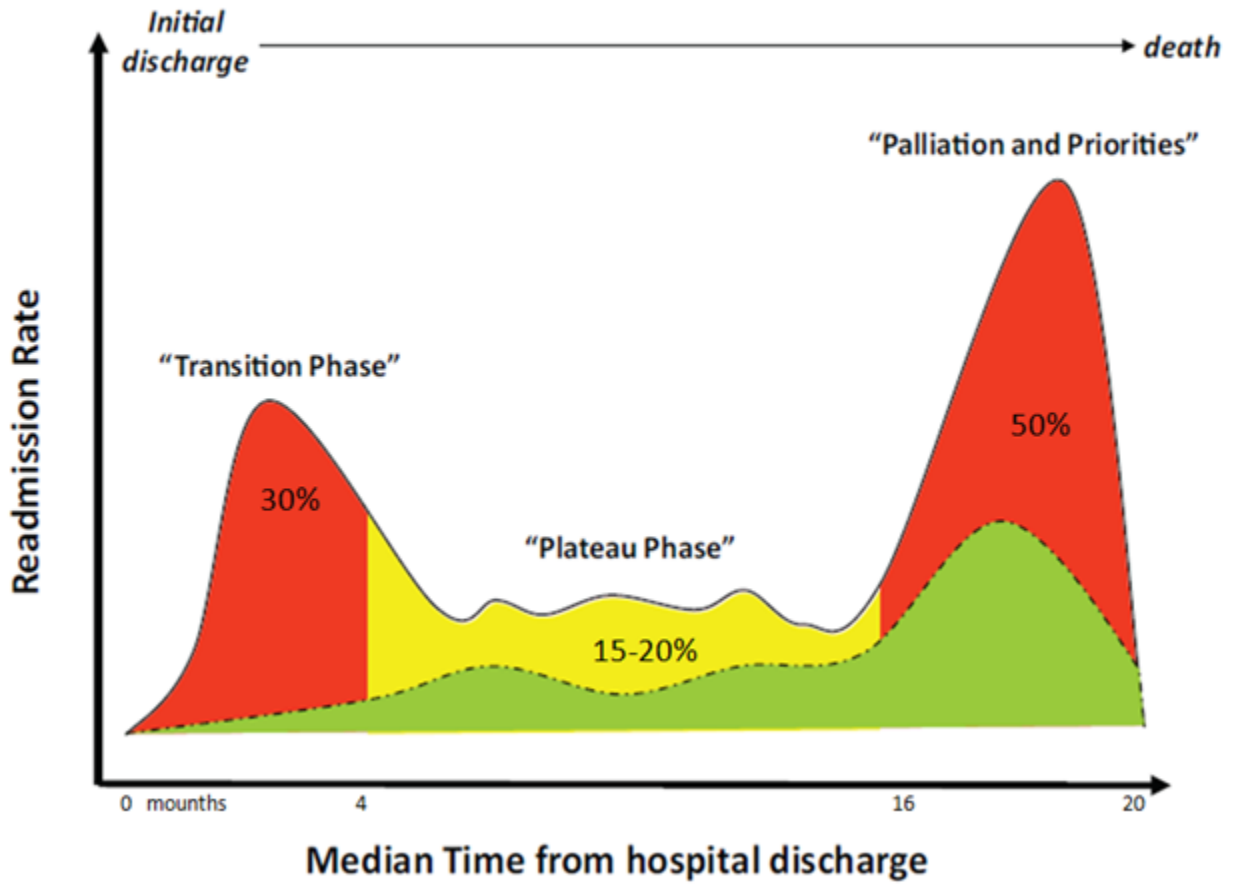
Responsabile UO di Continuità Assistenziale Ospedale Territorio
ICS MAUGERI, IRCCS, S.P.A. SB

The Three-Phase Terrain of Heart Failure Readmissions.
D Akshay. Circulation Heart Failure 2012; 5:398-400



AHA Scientific Statement

Current Science on Consumer Use of Mobile Health for Cardiovascular Disease Prevention

A Scientific Statement From the American Heart Association

Lora E. Burke, PhD, MPH, FAHA, Chair; Jun Ma, MD, PhD, FAHA;
Kristen M.J. Azar, MSN/MPH, BSN, RN; Gary G. Bennett, PhD; Eric D. Peterson, MD;
Yaguang Zheng, PhD, MSN, RN; William Riley, PhD; Janna Stephens, BSN, PhD(c), RN;
Svati H. Shah, MD, MHS; Brian Suffoletto, MD, MS; Tanya N. Turan, MD, FAHA;
Bonnie Spring, PhD, FAHA; Julia Steinberger, MD, MS, FAHA; Charlene C. Quinn, PhD, RN;
on behalf of the American Heart Association Publications Committee of the Council on Epidemiology and Prevention, Behavior Change Committee of the Council on Cardiometabolic Health, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, Council on Quality of Care and Outcomes Research, and Stroke Council

European Heart Journal (2016) **37**, 63–66
doi:10.1093/eurheartj/ehv416

EHJ POSITION STATEMENT

e-Health: a position statement of the European Society of Cardiology

Martin R. Cowie[1]*, Jeroen Bax[2], Nico Bruining[3], John G. F. Cleland[4], Friedrich Koehler[5], Marek Malik[6], Fausto Pinto[7], Enno van der Velde[2], and Panos Vardas[8]

Management programmes for HF pa

Characteristics	Should employ a multidisciplinary approach (cardiologists, primary care physicians, nurses, pharmacists, physiotherapists, dieticians, social workers, surgeons, psychologists, etc.).
	Should target high-risk symptomatic patients.
	[illegible] and professionally educated staff.[617]
Components	Optimized medical and device management.
	Adequate patient education, with special emphasis on adherence and self-care.
	Patient involvement in symptom monitoring and flexible diuretic use.
	Follow-up after discharge (regular clinic and/or home-based visits; possibly telephone support or remote monitoring).
	Increased access to healthcare (through in-[illegible] follow-up and by telephone contact[illegible] through remote [illegible]).
	Facilitated access to care during episodes of decompensation.
	Assessment of (and appropriate intervention in response to) an unexplained change in weight, nutritional status, functional status, quality of life, or laboratory findings.
	Access to advanced treatment options.
	Provision of psychosocial support to patients and family and/or caregivers.

Recommendations for exercise

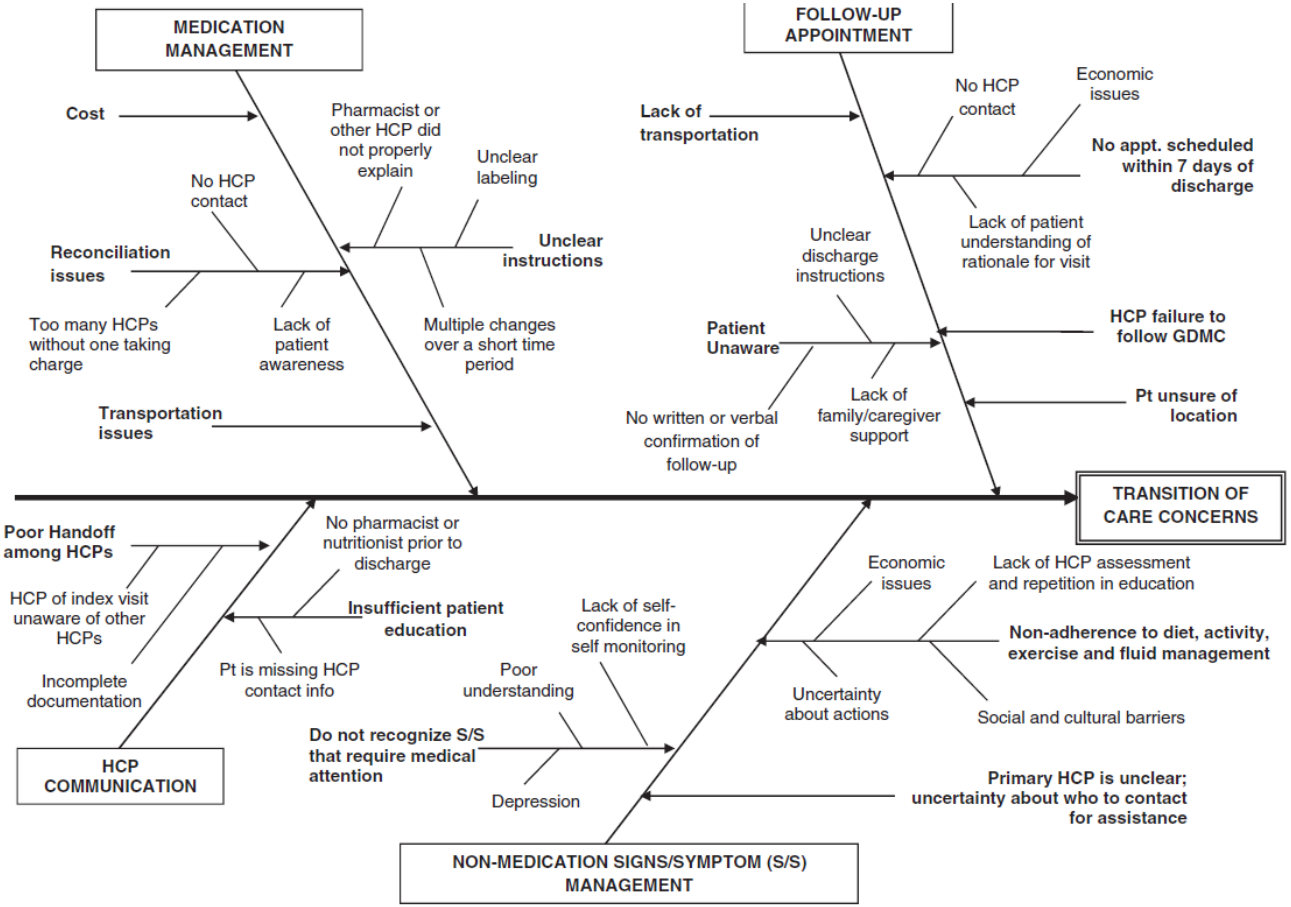
Recommendations	Class [a]	Level [b]
It is recommended that regular aerobic exercise is encouraged in patients with HF to improve functional capacity and symptoms.	I	A
It is recommended that regular aerobic exercise is encouraged in stable patients with HFrEF to reduce the risk of HF hospitalization.	I	A
It is recommended that patients with HF are enrolled in a multidisciplinary care management programme to reduce the risk of HF hospitalization and mortality.	I	A
Referral to primary care for long-term follow-up may be considered for stable HF patients who are on optimal therapy to monitor for effectiveness of treatment, disease progression and patient adherence.	IIb	B
Monitoring of pulmonary artery pressures using a wireless implantable haemodynamic monitoring system (CardioMems) may be considered in symptomatic patients with HF with previous HF hospitalization in order to reduce the risk of recurrent HF hospitalization.	IIb	B
Multiparameter monitoring based on ICD (IN-TIME approach) may be considered in symptomatic patients with HFrEF (LVEF ≤35%) in order to improve clinical outcomes.	IIb	B

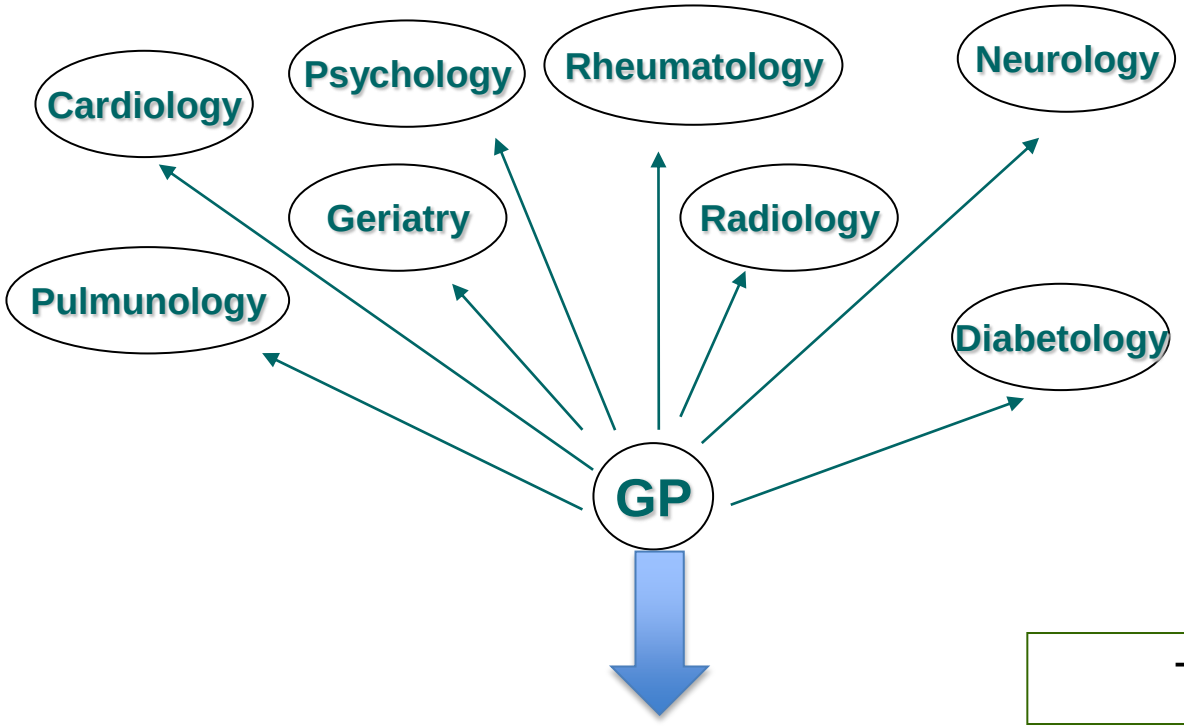
2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal (2016) 37, 2129–2200

AHA Scientific Statement

Transitions of Care in Heart Failure

A Scientific Statement From the American Heart Association





Therapy

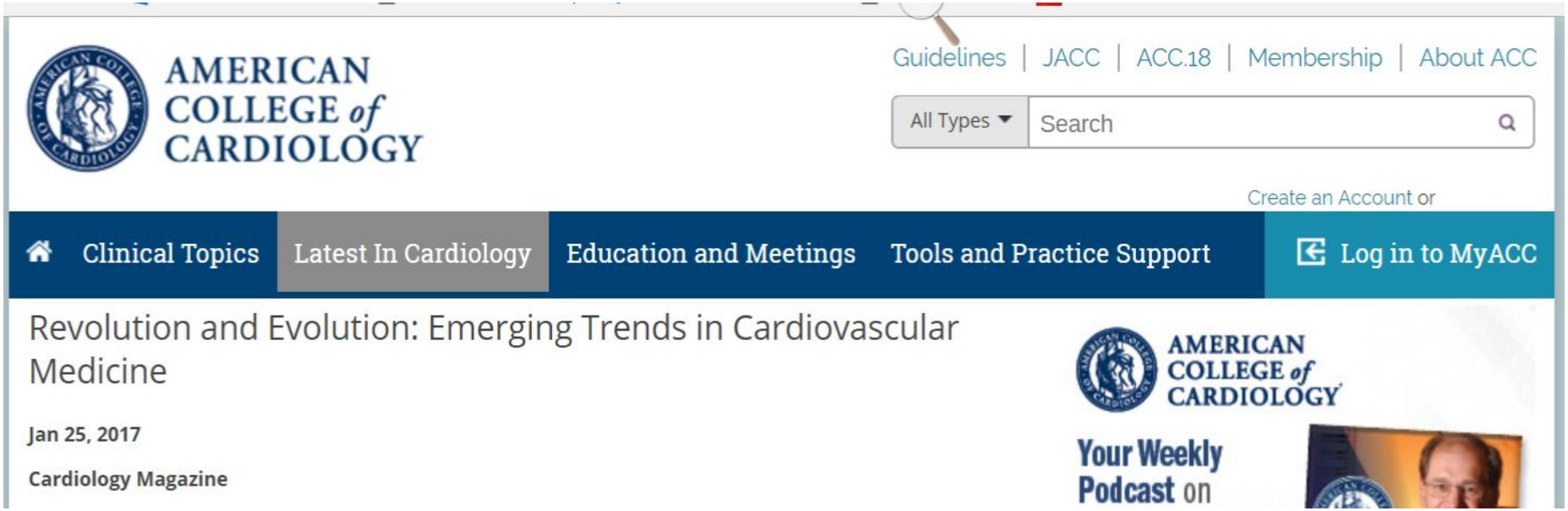
Training

Ventilation therapy

Psychologist

Nutritionist

Therapist



Digital health and mobile technology solutions will evolve during 2017 to manage health and disease. Eagle predicts an increasing investment in the development of these mobile interfaces, and hopes they will encourage more accountability by patients for their daily health habits. Already they are being used to transmit heart rhythms in patients experiencing palpitations. Virani adds there is a lot of promise these solutions can be used to improve risk factor management, and comparative effectiveness studies will begin to identify “the real winners.”

Virani also sees **mobile technology as a valuable tool to improve interaction with patients worldwide,** noting that a great majority of the global population has access to a cell phone, including low- and middle-income countries. This also provides an innovative platform for pragmatic, epidemiologic studies, by collecting data via cell phones from large numbers of patients, for example to better understand cardiovascular risk factors.

Digital health solutions will be used to better manage the deluge of data, and platforms will be developed to integrate the data into knowledge that can be employed by health care providers.

"**Remote monitoring of data is the future**, but is a challenge now because of the infrastructure and data management it requires. Efforts to improve transition of care and develop risk prediction models using **electronic health records** are evolving. **Individualized treatment approaches** using biologic markers, DNA, and pharmacogenomics variance to determine resistance or sensitivity to a drug are being explored. Smaller mechanical support devices and smaller, safer implantable pumps with fewer complications, along with wearables, are being developed.

Five ways digital health technology will change cardiovascular disease

- **1. Start by getting a handle on health data**

- Real-time curation and analysis of patient health data sets over periods of time across disparate electronic health record systems is critical. In addition, patient reported outcomes must be included. This type of data collection and analysis, if performed with incorporated practice guidelines can facilitate changes to prevent CVD.

ARTICLE IN PRESS

IJCA-24578; No of Pages 5

International Journal of Cardiology xxx (2017) xxx–xxx

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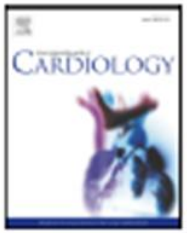


Trends in heart failure hospitalizations, patient characteristics, in-hospital and 1-year mortality: A population study, from 2000 to 2012 in Lombardy

Maria Frigerio [a,1], Cristina Mazzali [b], Anna Maria Paganoni [c], Francesca Ieva [c], Pietro Barbieri [d], Mauro Maistrello [d], Ornella Agostoni [e], Cristina Masella [b], Simonetta Scalvini [f,*], On behalf of the HF Data Project:

[a] De Gasperis Cardiocenter, Niguarda-Ca'Granda Hospital, Milan, Italy
[b] Department of Management Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy
[c] MOX – Department of Mathematics, Politecnico di Milano, Milan, Italy
[d] ASST Melegnano e della Martesana, Milan, Italy
[e] Cardiovascular Department, Santi Paolo e Carlo, Presidio San Carlo, Milan, Italy
[f] Rehabilitation Cardiology Department and Continuity Care Unit, Istituti Clinici Scientifici Maugeri, IRCCS, Lumezzane, Brescia, Italy

Casi incidenti per gruppo e anno

I casi incidenti sono stati considerati dal 2005 al 2012 in modo da avere un periodo di 5 anni privo di ospedalizzazioni per scompenso.

Tutti	2005	2006	2007	2008	2009	2010	2011	2012	Total
G1	19˙358	19˙593	18˙543	18˙632	18˙243	19˙507	18˙541	17˙709	**150˙126**
	(19˙326)	(19˙548)	(18˙503)	(18˙588)	(18˙180)	(19˙454)	(18˙475)	(17˙659)	**(149˙733)**
G2	4˙566	4˙329	4˙048	4˙005	3˙582	3˙243	3˙182	2˙940	**29˙895**
	(4˙522)	(4˙289)	(4˙000)	(3˙950)	(3˙537)	(3˙192)	(3˙128)	(2˙897)	**(29˙515)**
G3	4˙648	4˙474	4˙671	4˙582	4˙492	4˙681	4˙632	4˙653	**36˙833**
	(4˙646)	(4˙470)	(4˙666)	(4˙580)	(4˙490)	(4˙677)	(4˙630)	(4˙643)	**(36˙802)**
G4	80	112	121	136	133	58	53	41	**734**
	(80)	(112)	(120)	(135)	(133)	(58)	(53)	(41)	**(732)**
Total	**28˙652**	**28˙508**	**27˙383**	**27˙355**	**26˙450**	**27˙489**	**26˙408**	**25˙343**	**217˙588**
	(28˙574)	**(28˙419)**	**(27˙289)**	**(27˙253)**	**(26˙340)**	**(27˙381)**	**(26˙286)**	**(25˙240)**	**(216˙782)**

- **2. Make healthcare participatory not passive**

NRS approach:
Structured Telephone Support + Telemonitoring

- It is a structured telephone support with a multidisciplinary care approach referring to medical/nursing interventions made over telephone, with the possibility to transmit biological signals over existing telephone lines to a workstation through a single Call Center. Patients assigned to the NRS receive, before hospital discharge, a portable device transferring by a fixed or mobile telephone, some data to a receiving station, where a nurse or doctor were available 24 hours, 7 days/week.

Cardiology

Psychology

Rheumatology

Neurology

Geriatry

Radiology

Pulmunology

Diabetology

GP

NURSE TUTOR

Therapy

Training

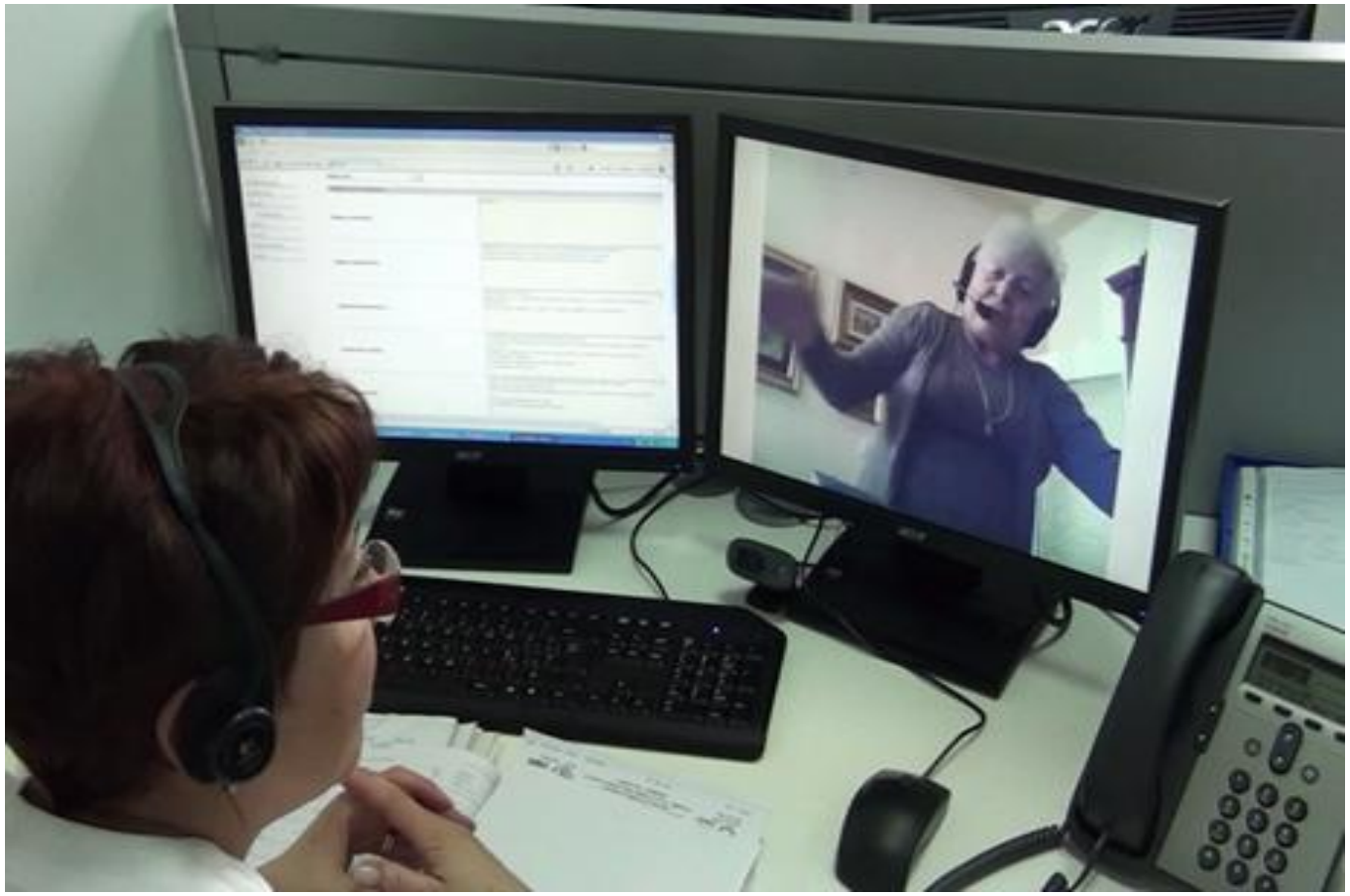
Ventilation therapy

Psychologist

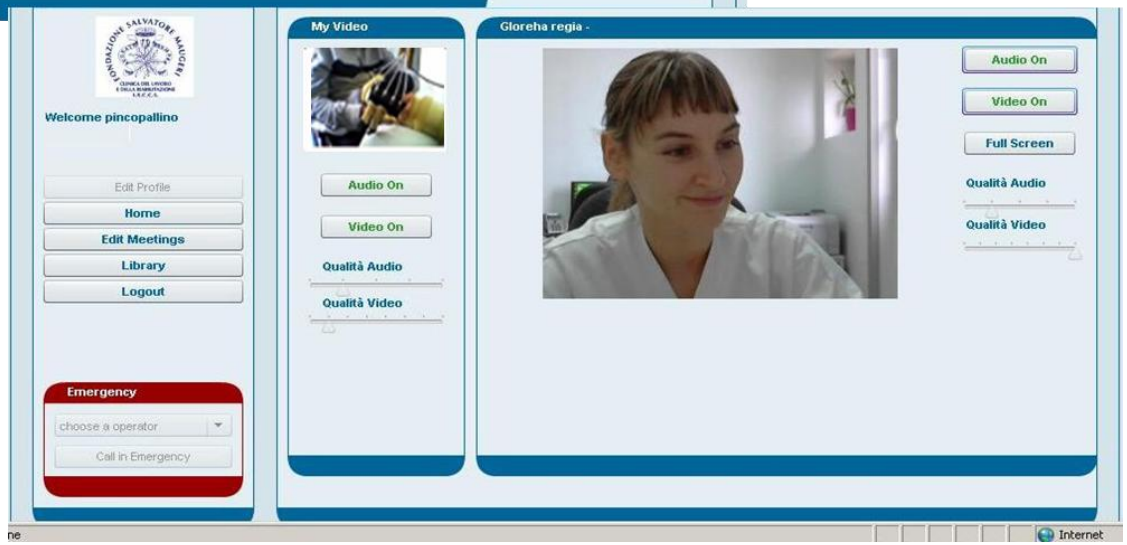
Nutritionist

Therapist

Nurse Tutor



Lato regia



Lato paziente


TeleriabWeb - Windows Internet Explorer
Teleriab - build version: Online 3.1.2
Menu
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Doriana Baratti
doriana.baratti@fsm.it
Edit Profile
Home
New User
Edit Users
New Meeting
Edit Meetings
Library
Private
Logout
Emergency
choose a patient
Call in Emergency
Private Library
Meetings List
piccinelli 2011-10-24 13:44:32.0
borghetti 2011-10-19 14:58:03.0
piccinelli 2011-10-10 11:31:00.0
lussignoli 2011-10-07 15:14:49.0
dadda 2011-10-06 13:51:30.0
gaforini 2011-10-05 14:11:16.0
lussignoli 2011-10-04 14:53:09.0
Emergencies List
Doriana Baratti - Emilio Ferraglio
Doriana Baratti - Cornelia Gnutti
Doriana Baratti - Giuseppe Goffi
Doriana Baratti - Vittorio Plebani
Claudio Napoli - Doriana Baratti
Claudio Napoli - Doriana Baratti
Claudio Napoli - Doriana Baratti
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CARDIOASPIRIN


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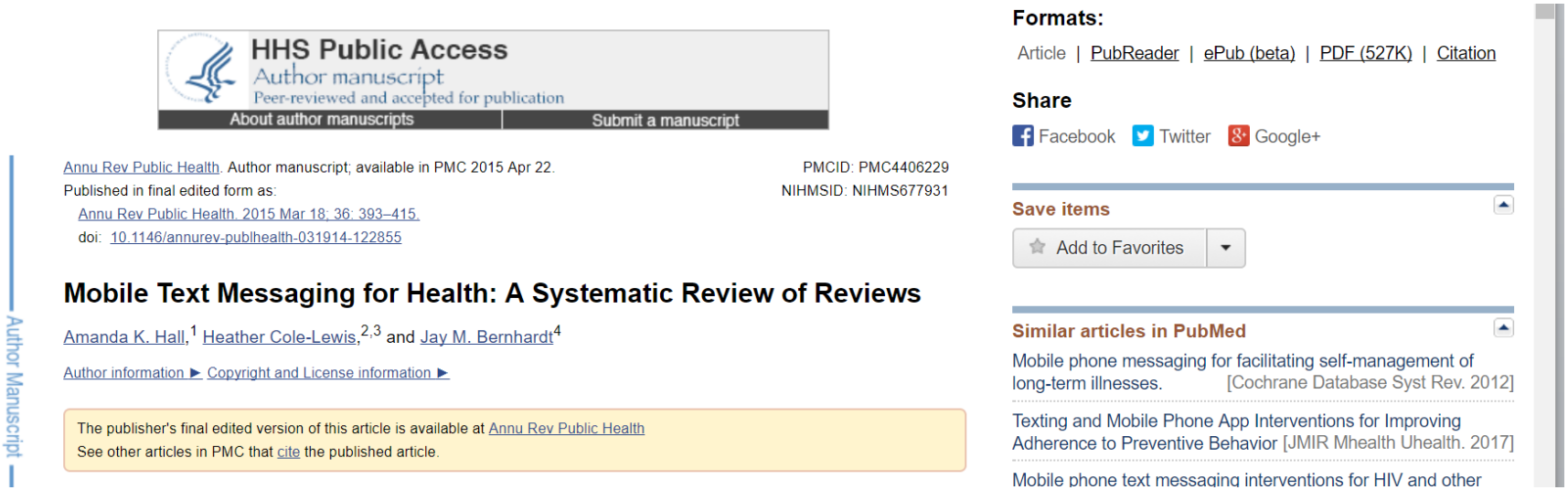
Multidisciplinary Approach

- During these appointments the trained hospital nurse carried out a standardised interview.
- Information was obtained about the general clinical condition of the patients and dietary treatment.
- Specifically questions were asked about the daily intake of fluids, the patient's knowledge of fluid restriction and the regular weight surveillance.
- Additional questions were asked about salt and alcohol intake, intake of analgesics and smoking habits.
- The nurse asked about the self- measurement of weight and blood pressure etc..



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Published in final edited form as:
Annu Rev Public Health. 2015 Mar 18; 36: 393–415.
doi: 10.1146/annurev-publhealth-031914-122855

PMCID: PMC4406229
NIHMSID: NIHMS677931

Mobile Text Messaging for Health: A Systematic Review of Reviews

Amanda K. Hall,[1] Heather Cole-Lewis,[2,3] and Jay M. Bernhardt[4]

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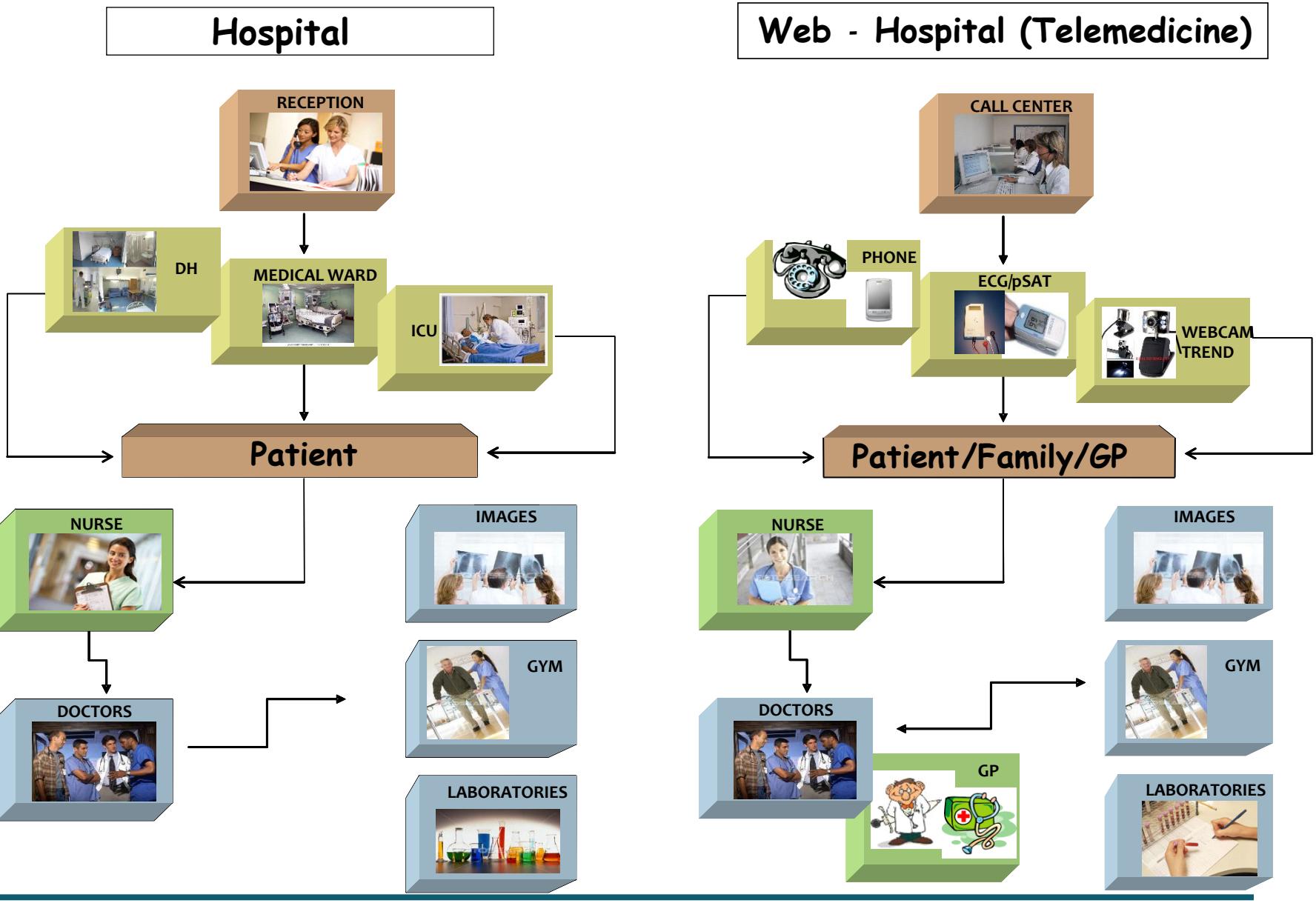
Mobile phone messaging for facilitating self-management of long-term illnesses. [Cochrane Database Syst Rev. 2012]
Texting and Mobile Phone App Interventions for Improving Adherence to Preventive Behavior [JMIR Mhealth Uhealth. 2017]
Mobile phone text messaging interventions for HIV and other

Mobile phones have become the most accessible form of mediated communication in world history, and text messaging has become one of the most frequently used forms of mobile communication. Public health researchers have sought to capitalize on this potentially game-changing communication modality by developing and testing TMIs designed to provide information that results in improved health outcomes and/or changed health behavior. This systematic review of reviews identified and coded the results of the highest-quality reviews and found that **the majority of published TMIs were effective at addressing diabetes self-management, weight loss, physical activity, smoking cessation, and medication adherence for ART.**

- **3. Transform points of living into points of care**

- Wearable technologies combined with video encounters with healthcare professionals create non-traditional, convenient and more realistic points of care.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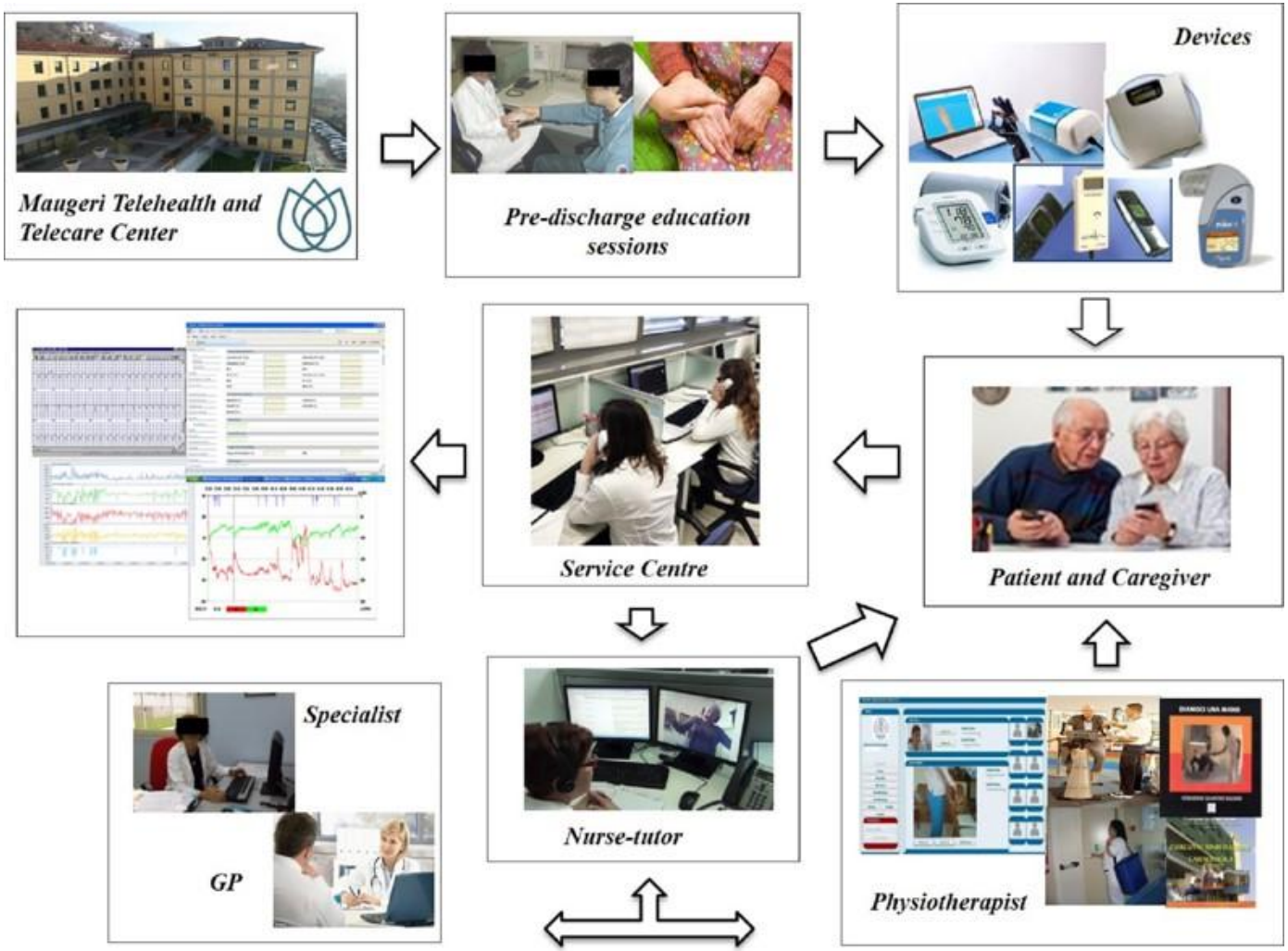
RECEPTION
DH
MEDICAL WARD
ICU
Patient
NURSE
IMAGES
GYM
DOCTORS
LABORATORIES
Web - Hospital (Telemedicine)
CALL CENTER
PHONE
ECG/pSAT
WEBCAM
TREND
Patient/Family/GP
NURSE
IMAGES
GYM
DOCTORS
GP
LABORATORIES

MAUGERI CENTRE FOR TELEHEALTH AND TELECARE



• 4. Remote monitoring

The Digital Health Corner

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Posted on March 29, 2013

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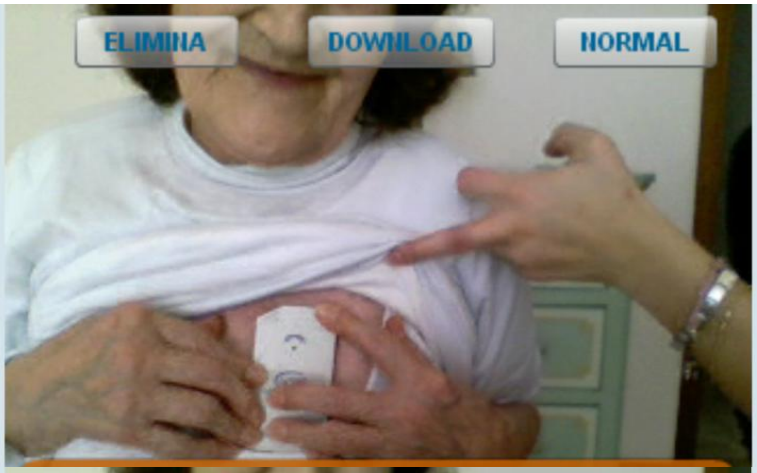
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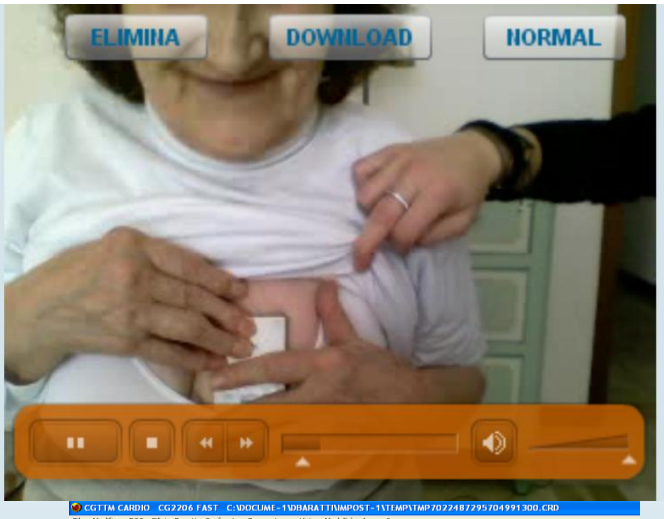
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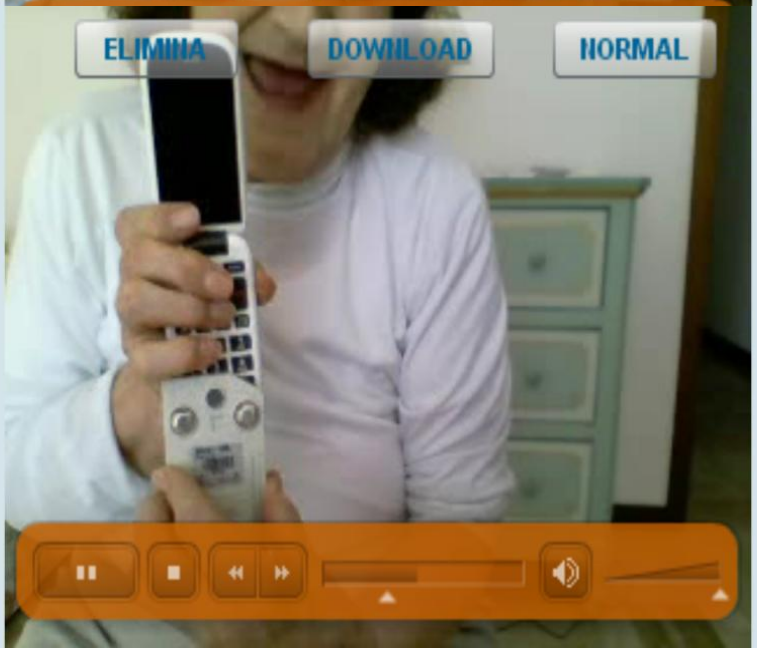
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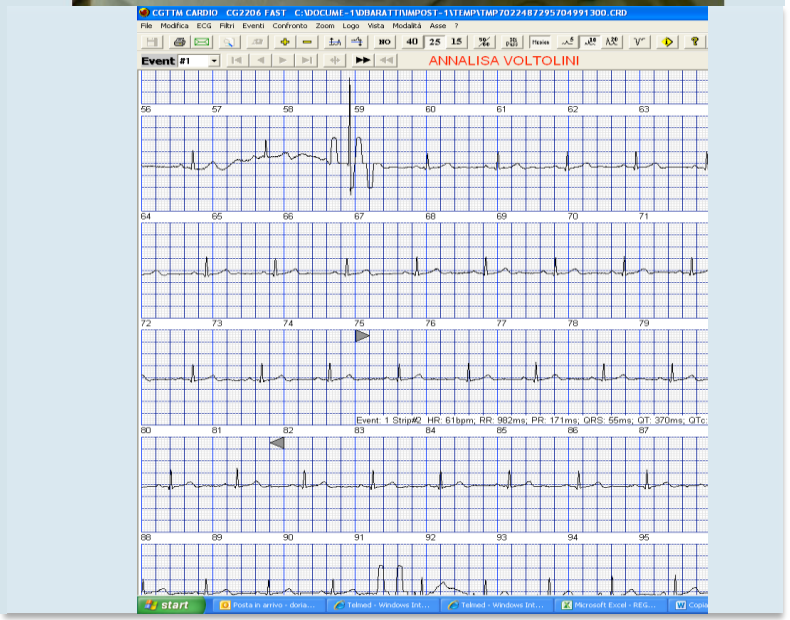

ANNALISA VOLTOLINI

REHABILITATION

Smartphone-based cardiac rehabilitation—a first RCT

Tim Geach

Nature Reviews Cardiology **11**, 498 (2014) | doi:10.1038/nrcardio.2014.103
Published online 15 July 2014

The uptake of cardiac rehabilitation (CR) has many barriers, including the time taken to complete a programme and patient reluctance to be involved in group programmes. However, can the growing use of smartphones enable new home-based methods of CR delivery? In the first known randomized, controlled trial of smartphone-delivered CR,…

- **5. Personalized medicine: Connecting the dots of genomics, lifestyle, and treatments**

- While there is aggregated evidence from multiple clinical trials that digital health interventions can improve CVD outcomes with a positive impact on risk factor reduction, there is much more work to do. There has long been evidence of gender and racial bias in the care of patients with CVD. Furthermore, the use of mobile technology to bridge gaps in healthcare is not a new concept.

- **Simple, easy to use digital health technologies with easy to interpret data layered with artificial intelligence will have a significant impact in the prevention, management, and research into CVD.**

Indications

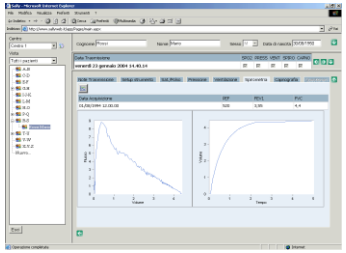
- Chronic heart failure
- Diabetes
- Chronic obstructive pulmonary disease (COPD)
- Chronic respiratory failure (CRF)
- Neuromuscular diseases (NMD)
- Tele-monitoring of ventilator-assisted individuals (VAIs)
- Home based pulmonary rehabilitation (telerehabilitation)
- Stroke
- Behavioral health
- Staff education and training
- Primary care

Ambrosino *et al. Multidisciplinary Respiratory Medicine* (2017) 12:9

Interventions

- Real time or “store and forward” video or telephone links between patients and care-givers in both directions;
- Internet-based tele-communication;
- Digital/broadband/satellite/wireless or Bluetooth transmission of physiological parameters with feedback to the patient.

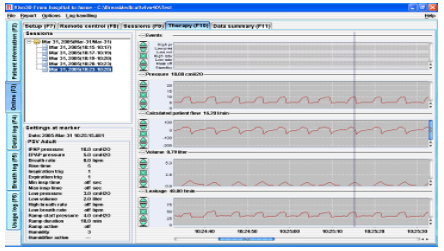
Ambrosino *et al. Multidisciplinary Respiratory Medicine* (2017) 12:9



spirometry

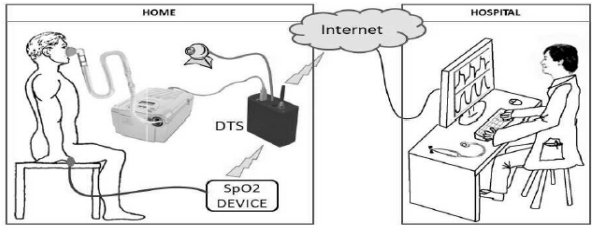
Breathing pattern trend

Images



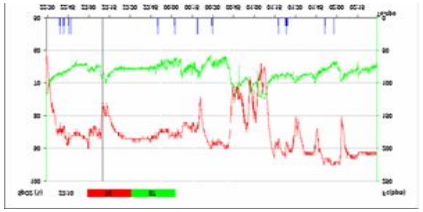
Ventilators' memory trend

- Biological sensors of patient' s vital signs and physiological data such as: spontaneous breathing tidal volume, respiratory and heart rate, pulsossimetry, capnography;
- Data from medical equipment such as tidal volume, pressures of mechanical ventilators;
- Devices for transmission of data from those sensors and equipments such as: phone calls, sms, email, video phones, websites or mobile phones, videoconferencing;



polisonnigrafy

Video-conference



Saturimetric trend

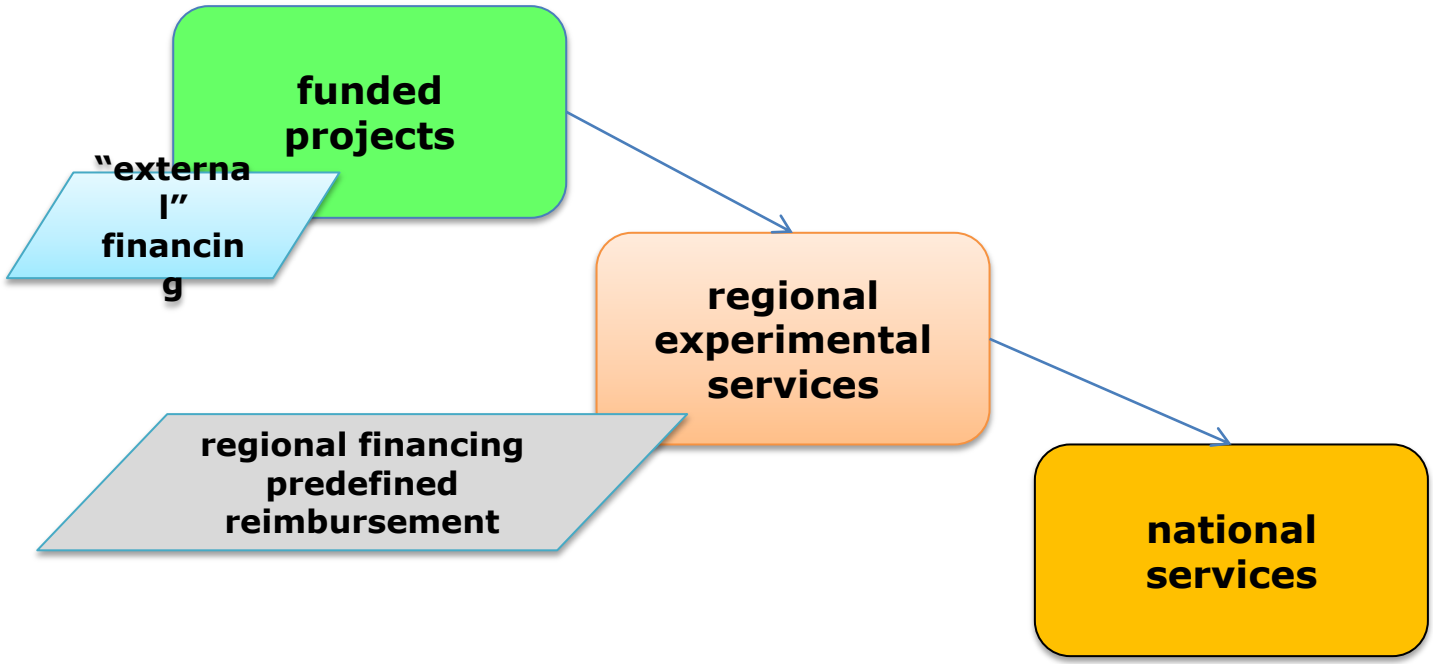
Patient monitoring

The correct level of technology to be used would be:

i) safe
ii) feasible
iii) effective
iv) sustainable
v) flexible to different patients condition

The experience of Lombardy Region

From projects to services



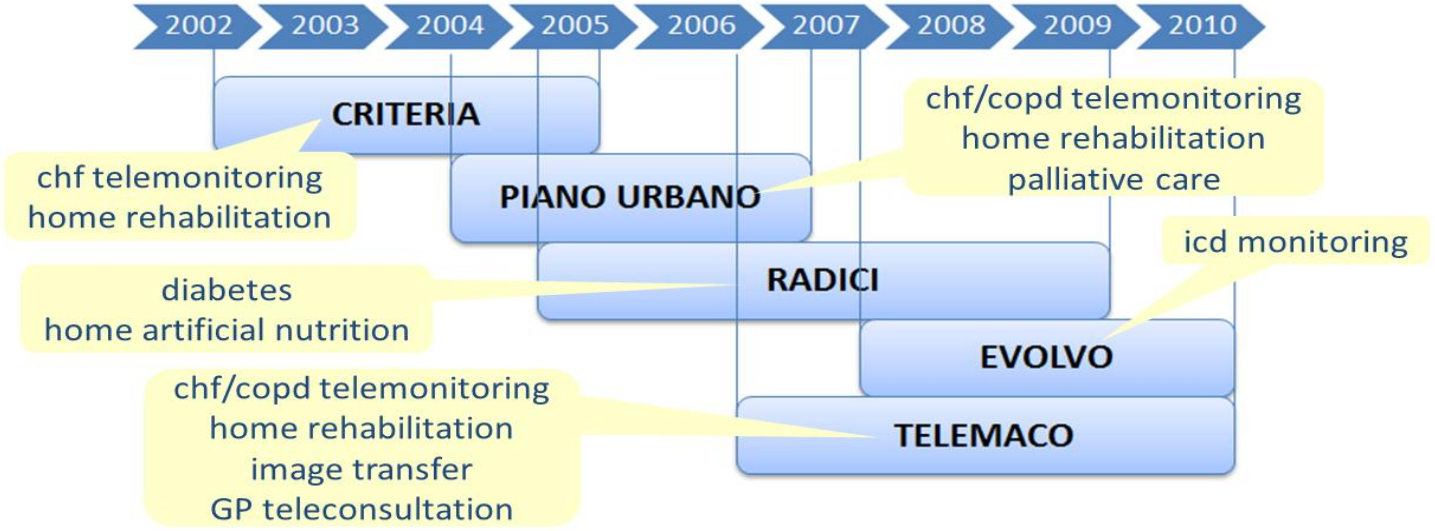
This is a roadmap that starts from projects (funded by EU, Ministry of Health research grants, private institutions) to arrive to «routine» services coming through an intermediate step called «experimental services».

The Lombardy Region

9,8 Million Inhabitants - 17b€ healthcare expenditure - 17% of the Italian total spending

2002-2004 Regional Social-Health Plan

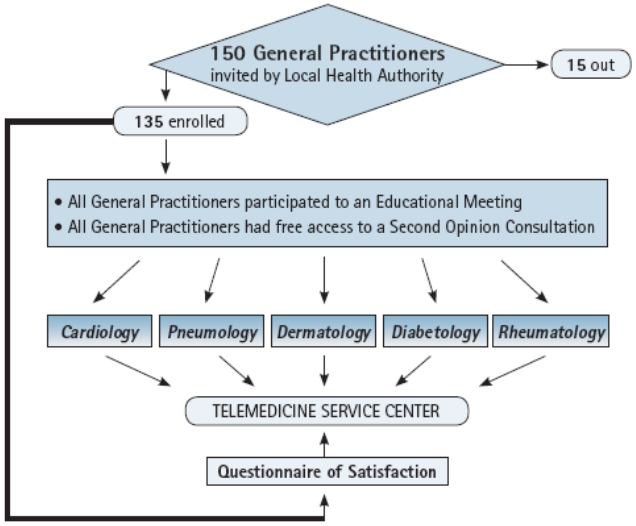
- Gradual shift from Hospital to Home through the deployment of some **experimental projects supported by telemedicine**



Positive preliminary outcomes and the considerable diffusion, pushed the Regional Authorities to further support their development

The SUMMA Project: a feasibility study on telemedicine in selected italian areas

- Involved 135 GPs of 3 Italian Regions and 70 Specialists
- Evaluated feasibility, accessibility, safety, professional satisfaction, usefulness and cost-effectiveness.



- A total of 1,396 calls were received: 1,264 for cardiology, 65 for dermatology, 32 for diabetology, 22 for rheumatology, and 13 for pneumology.
- In cardiology, telemedicine was used to address all problems without further action in 733 cases (61%).
- Ninety-eight percent of responders indicate satisfaction with telemedicine
- The cost of telemedicine was estimated to be 25.36 Euros/contact.

Table 4. Evaluation of the Efficacy of the Intervention of Telemedicine Contact by GPs in Cardiology

ACTION TAKEN	*WITHOUT* TELEMEDICINE (NO.)	*WITH* TELEMEDICINE (NO.)	VARIATION
Examinations requested for diagnosis	33	180	147
EDs	138	104	-34
No action	86	733	647
Therapy modifications	0	156	156
CSs consultations	945	29	-916
Total	1,202	1,202	0

Table 6. Sensitivity Analysis of Costs

DEVIATION	TELEMEDICINE CONSULTATIONS (NO.)	BREAK-EVEN COST	VARIATION
-75%	349	€ 75.73	198.6%
-50%	698	€ 42.14	66.2%
-30%	977	€ 32.55	28.4%
0%	1,396	€ 25.36	0.0%
30%	1,814	€ 21.48	-15.3%
50%	2,093	€ 19.75	-22.1%
75%	2,441	€ 18.16	-28.4%

Scalvini S et al., Telemedicine & E-Health, 2009:15 (3):1-9

	Method	Disease	Involved on 31/12/2016
NRS – New Healthcare Networks	Home remote surveillance (PTS)	CHF patients II-III-IV NYHA	Since 2006 **23 Hospitals** **4.719 patients**
	Home hospital care (POD)	Cardiaca: Riabilitazione postcardiochirurgica	Since 2006 **3 Hospitals** **793 patients**
	Home remote surveillance (PTP)	COPD –III-IV stadio GOLD	Since 10.9.2010 **13 Hospitals** **3.496 patients**
	Specialist opinion for GPs (TCS)	Cardio, pneumo, dermo and diabetic	Since 10.9.2010 **3 Local Health Units** **4.037 Teleconsultations**

THE AMERICAN JOURNAL OF MANAGED CARE

Objectives: To verify implementation and use of TELEMACO (TELEMedicina Ai piccoli COmuni lombardi; http://www.telemaco.regione.lombardia.it/), which provides specialized continuity of care with innovative healthcare services in remote areas of the Lombardy region of Italy; to design a network in the territory for sharing of continuity-of-care programs; and to allow the relevant health authorities to collect cost data to establish a model for sustainable pricing for implementing these services.

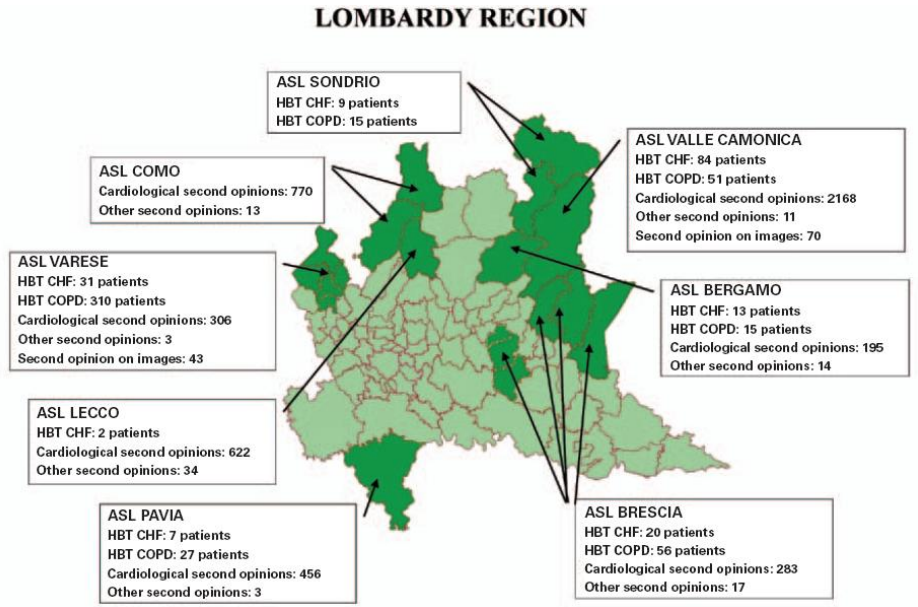
Methods: TELEMACO provides home-based telemanagement services for patients with chronic heart failure and chronic obstructive pulmonary disease (COPD), as well as second-opinion teleconsultations in cardiology, dermatology, diabetology, and pulmonology for general practitioners and second-opinion teleconsultations on digital images in cases of traumatic brain injury and stroke. A total of 2 service centers, 10 cardiology and pneumology departments, 30 specialists, 176 general practitioners, 40 nurses, 2 emergency departments, and 2 consultant hospitals were involved.

Results: A total of 166 patients with chronic heart failure and 474 patients with COPD were enrolled. There were 4830, 51, and 44 second-opinion teleconsultations for cardiologic, dermatologic, and diabetic conditions, respectively. There were 147 second-opinion teleconsultations on digital images, 68 for stroke, and 79 for traumatic brain injury. Implementation of TELEMACO introduced innovations in working methods and provided evidence to the health authorities for allocating funds for such services.

Conclusions: TELEMACO provided evidence that there is a growing need for home management of patients using telemedicine, a common and efficacious approach that can ensure care continuity, especially in chronic diseases.

MANAGERIAL

Healthcare Continuity From Hospital to Territory in Lombardy: TELEMACO Project



Take-Away Points

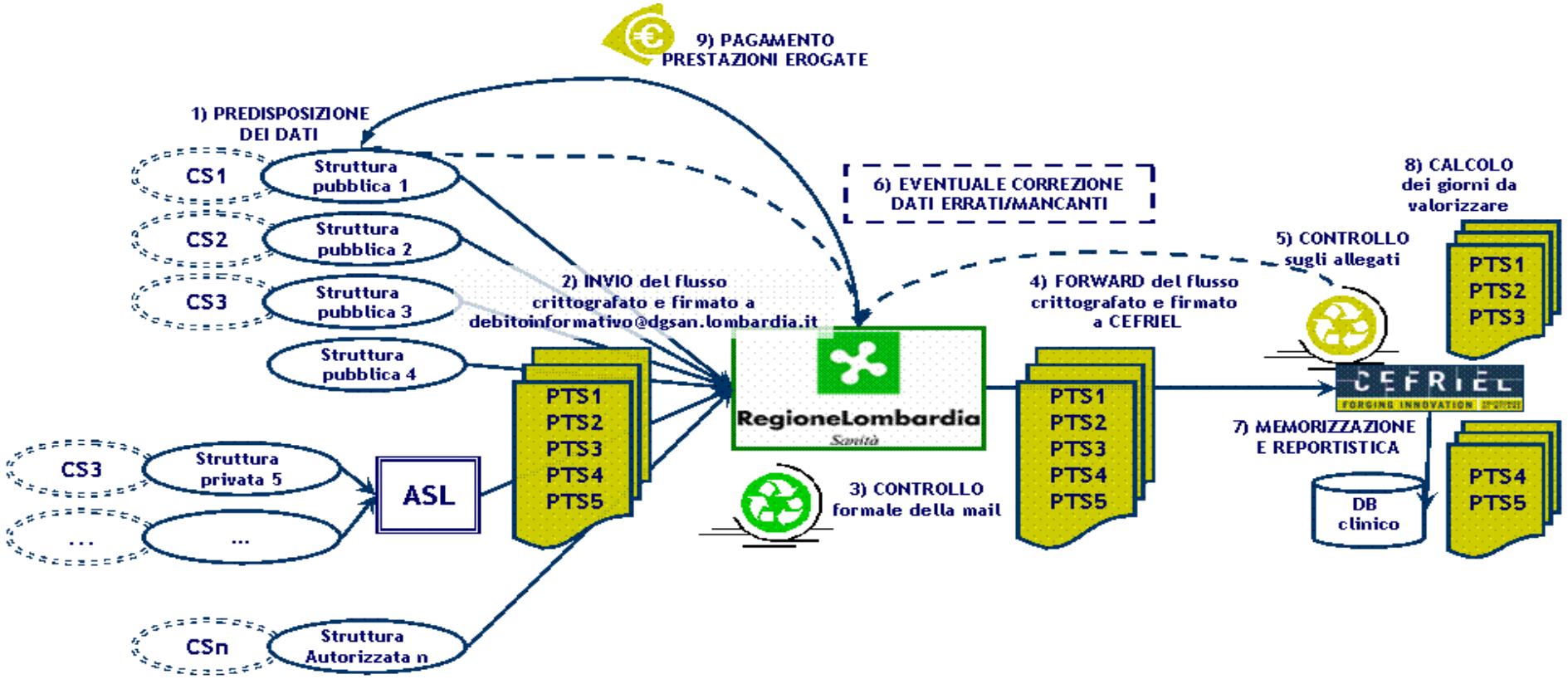
- The TELEMACO project enabled structured management of patients with chronic heart failure and chronic obstructive pulmonary disease who lived in remote areas of the Lombardy region of Italy.
- TELEMACO demonstrated the potential of telemedicine to support general practitioners in management of cardiologic conditions.
- TELEMACO also allowed development of innovative medical and nursing skills that are becoming part of the routine medical care practice.
- Overall evaluation of services showed that more than 95% of patients had a degree of satisfaction with the project.

Bernocchi et al. Am J Manag Care. 2012;18(3):e101-e108

Methods

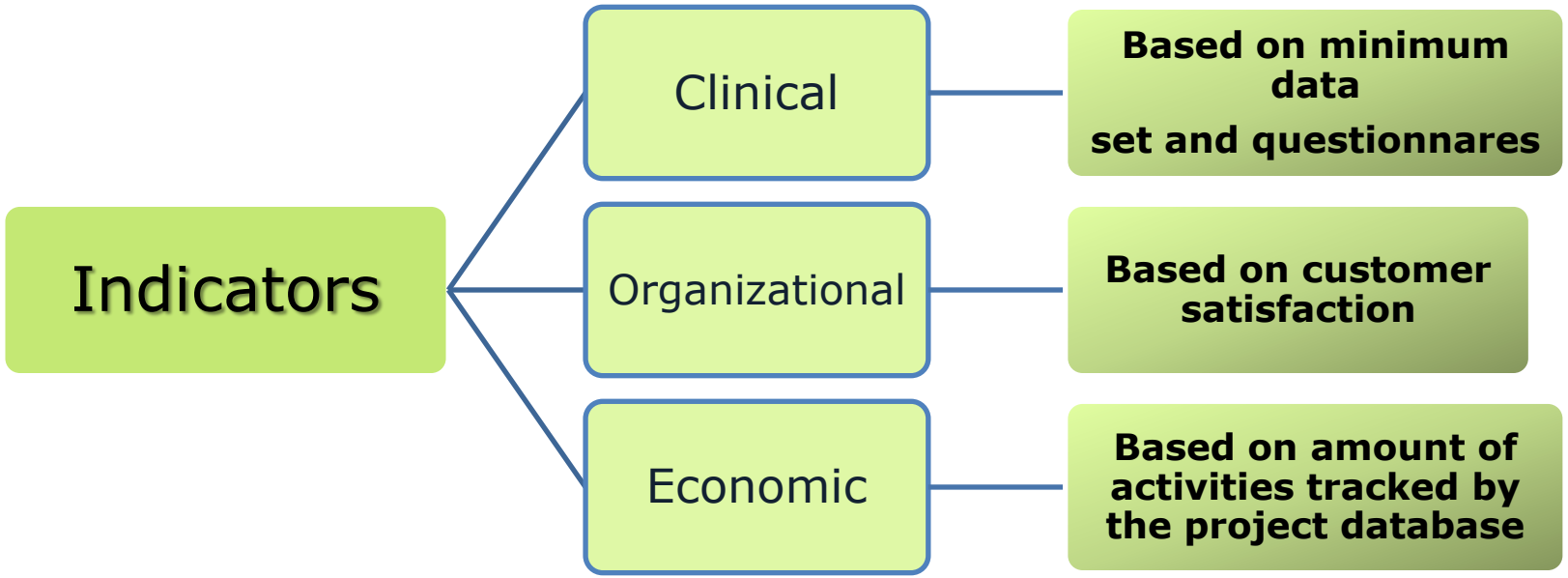
- Drafting of research protocols in restricted meetings of Experts and representatives of Lombardy Region.
- Application of the protocols in the “Experimental activity” in pilot hospitals.
- Protocol dissemination
- Organization of large meetings open to the Operative Units and administrative leaders of the Lombardy hospitals, to allow a better understanding of the procedures and give the opportunity to contribute with changes and suggestions
- Publication on websites of the protocols, working material, results .....

Data gathering procedures



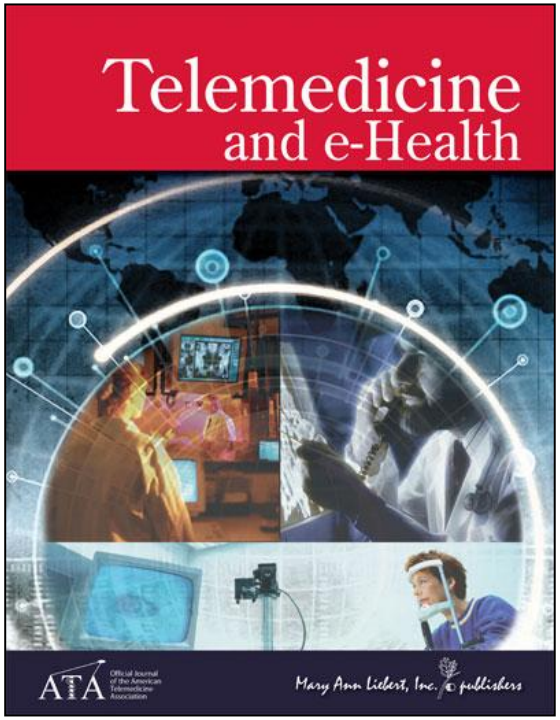
Results

- Quantitative and qualitative data analysis
- Interpreting data
- Reporting data
- Building indicators



Scientific Publications

HOME-BASED TELESURVEILLANCE PROGRAM IN CHRONIC HEART FAILURE: EFFECTS ON CLINICAL STATUS AND IMPLICATIONS FOR 1-YEAR PROGNOSIS



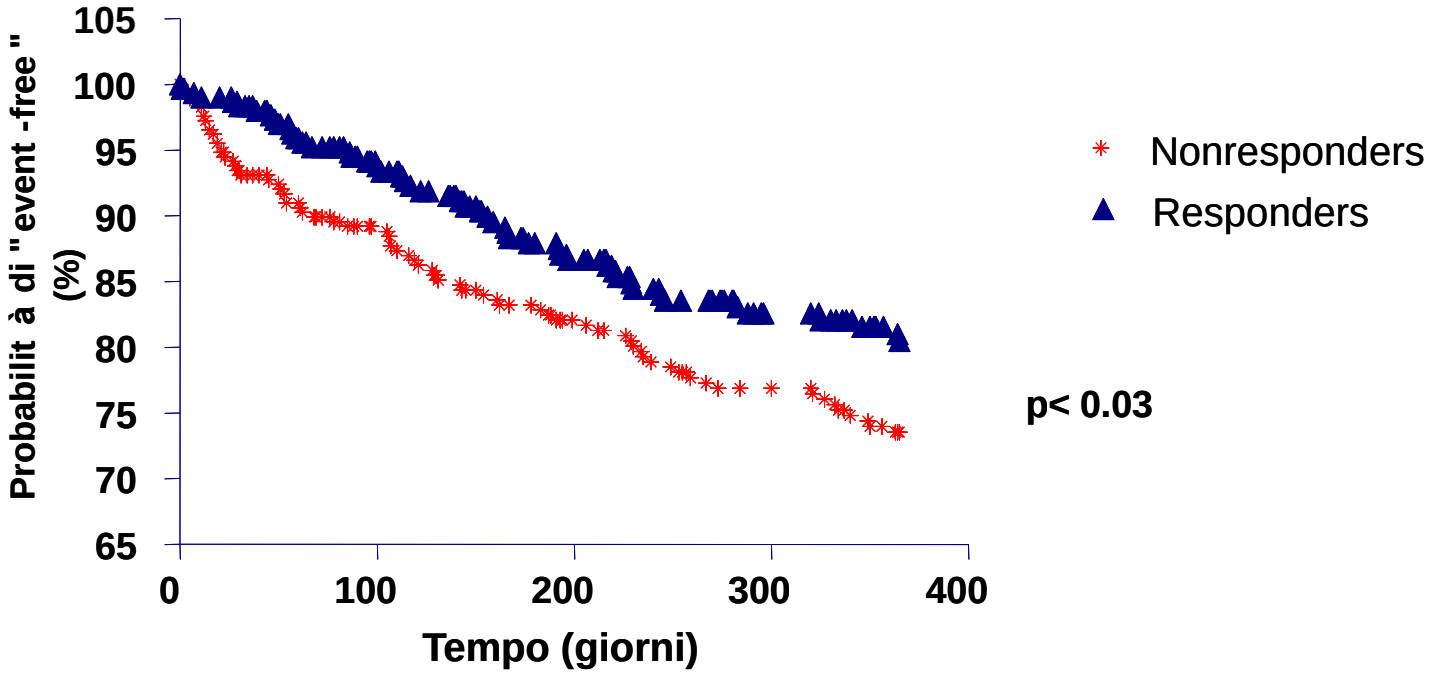
Aim:

- Reduction in rehospitalization
- Reduction in access to Emergency Dpt.
- Increase in quality of life

Giordano A et al, Telemed J E Health. 2013;19(8):605-12.

Independent predictors:

Non-responders	RR 1.46 (1.01-2.09)*
ICD	RR 1.69 (1.11-2.54)**
Comorbidities ≥ 2	RR 1.26 (1.05-1.51)**



Cumulative probability of event-free survival during 1 year of follow-up (Kaplan-Meier) . Relative risk (RR) with 95% confidence intervals is given for independent predictors (Cox).

Six-month programme on lifestyle changes in primary cardiovascular prevention: a telemedicine pilot study

P Bernocchi, D Baratti, E Zanelli, S Rocchi, M Salvetti4, A Paini and S Scalvini

Eur J Cardiovasc Prev Rehabil 2011

Table 1. General characteristics of the patient population at T0 and T6

Characteristic	T0	T6	p
Patients (*n*)	27		–
Male/female (%)	63/37		–
Mean age±SD (years)	54.9±9.0		–
Mean follow-up (days)	198±23		–
Weight (kg)	92±18	88±16	0.002
Waist circumference (cm)	110±14	106±13	0.001
BMI (kg/m^2)	32±6	31±5	0.01
37% patients with BMI 25–30 kg/m^2 at T0	28±1.4	27.4±2	NS
56% patients with BMI ≥30 kg/m^2 at T0	36±5.2	34±4.0	0.02
Smoking (*n*)	4	4	NS
Systolic BP (mmHg)	132±12	130±11	NS
Diastolic BP (mmHg)	78±7	77±6	NS
Blood glucose (mg/dl)	114±29	115±33	NS
33% patients with blood glucose ≥110 mg/dl at T0	144±32	141±43	NS
Total cholesterol (mg/dl)	230±43	222±46	NS
HDL cholesterol (mg/dl)	50±9.6	47±8.3	NS
Total cholesterol/HDL cholesterol	4.7±1.2	4.9±1.4	NS
Triglycerides (mg/dl)	193±17	151±76	NS
Micro-albuminuria (%)			
Patients with values <20 mg/l (%)	85	89	NS
Patients with values >20 mg/l (%)	15	11	NS
Framingham (%)	10±6	8±6	0.05
Patients at risk >10% (%)	44	33	−11
Progetto CUORE (%)	10±8	8±7	0.05
Patients at risk >10% (%)	44	37	−7
Medication (%, *n*)			
β-blockers	41 (11)	56 (15)	NS
Angiotensin-converting enzymes/sartanic	81 (22)	85 (23)	NS
Calcium antagonists	41 (11)	33 (9)	NS
Diuretics	37 (10)	41 (11)	NS
Antiplatelet agents	22 (6)	26 (7)	NS
Statins	22 (6)	33 (9)	NS
Hypoglycaemic agents	15 (4)	15 (4)	NS

A home multidisciplinary programme for primary cardiovascular disease prevention is simple, efficacious, and very well accepted by the patients with the majority of patients showing reduction in cardiovascular risk scores.

Table 2. Physical activity programme at home

Parameter	Measurement
Mean sessions/patient (total sessions)	64.4±23 (1740)
Mean 1-lead trace electrocardiogram recording (total)	51±25 (1366)
Maximal workload (Watt)	46±25
Mean sessions/patient/week	2.7±1.0
Percentage patients with <2 sessions/week (mean sessions/week)	11 (1.3±0.03)
Percentage patients with 2–3 sessions/week (mean sessions/week)	70 (3±0.5)
Percentage patients with >3 sessions/week (mean sessions/week)	19 (4±0.5)

BMC
Medical Informatics & Decision Making

Home based telemedicine intervention for patients with uncontrolled hypertension: – a real life - non-randomized study

Bernocchi *et al. BMC Medical Informatics and Decision Making* 2014, **14**:52

Table 1 Characteristics of the two patient populations at baseline (T0)

Patients	HBT group n = 74	UC group n = 94	P=
M/F (%)	38/36 (51/49%)	50/44 (53/47%)	0.77
mean age ± SD (years)	59.7 ± 12.5	59.1 ± 13.3	0.76
Mean follow-up (days)	80 ± 25	82 ± 28	0.54
Pts followed for 40–65 days	21	29	
Pts followed for 66–99 days	38	33	
Pts followed for 100–120 days	10	25	
Pts followed for 120–130 days	5	7	
Diagnosis:			
Hypertension (H)	74 (100%)	94 (100%)	
H + hypertensive cardiomyopathy	10 (14%)	9 (10%)	
H + ischemic cardiomyopathy	1 (1.4%)	2 (2%)	
BMI	27 ± 6	28 ± 5.2	0.25
Risk factors (%):			0.45
Diabetes	12 (16%)	18 (19%)	
Obesity	21 (28%)	30 (32%)	
Family History	66 (89%)	77 (82%)	
Dyslipidemia	20 (27%)	29 (31%)	
Smokers	12 (16%)	10 (11%)	
Ex-smokers	13 (18%)	8 (9%)	
Patients with >2 risks	43 (58%)	50 (53%)	

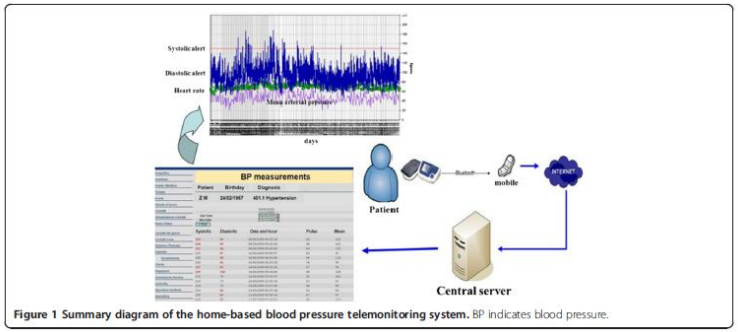
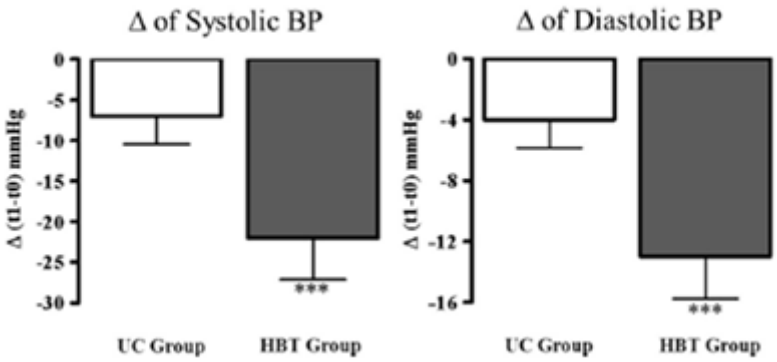


Figure 1 Summary diagram of the home-based blood pressure telemonitoring system. BP indicates blood pressure.

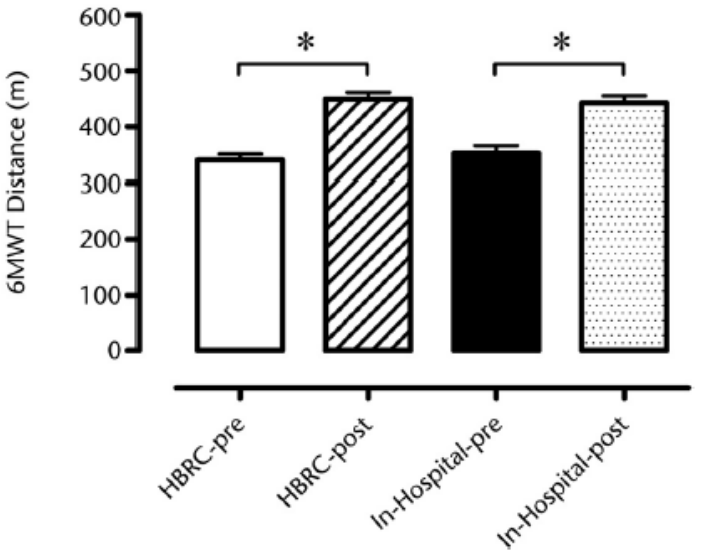


Home-Based Versus In-Hospital Cardiac Rehabilitation After Cardiac Surgery: A Nonrandomized Controlled Study

Simonetta Scalvini, Emanuela Zanelli, Laura Comini, Margherita Dalla Tomba, Giovanni Troise, Oreste Febo, Amerigo Giordano

Physical Therapy 2013

- La riabilitazione all'esercizio dopo intervento cardio-chirurgico ha effetti benefici soprattutto nel lungo periodo.
- Obiettivo era confrontare la teleriabilitazione domiciliare con la riabilitazione ospedaliera in pazienti a basso rischio (Euro-SCORE 0–10) dopo un intervento cardio-chirurgico
- Il programma domiciliare era sicuro, efficace e comparabile con l'approccio svolto in ospedale indicando che questa riabilitazione domiciliare può essere implementata efficacemente quando programmata a casa con il supporto di un servizio integrato di telemedicina.



Home-Based Versus In-Hospital Cardiac Rehabilitation After Cardiac Surgery: A Nonrandomized Controlled Study

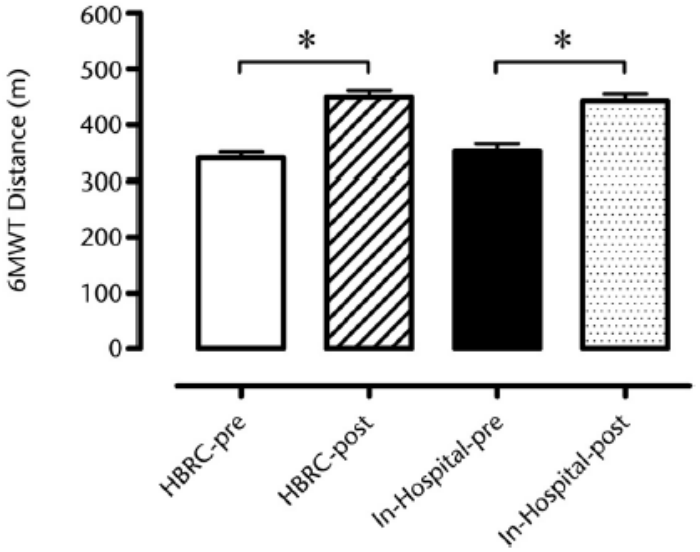
Simonetta Scalvini, Emanuela Zanelli, Laura Comini, Margherita Dalla Tomba, Giovanni Troise, Oreste Febo, Amerigo Giordano

Physical Therapy 2013

- 200 patients at low to medium risk (EuroSCORE 0–5) following cardiac surgery
  - 100 in-hospital rehabilitation (in patients)
  - 100 home-based cardiac rehabilitation (HBCR)

- to evaluate the feasibility of implementing an in-hospital rehabilitation protocol in a home setting with an up-to-date telemedicine platform

- to compare key efficacy indicators such as exercise capacity (assessed using the Six-Minute Walk Test [6MWT])



BioMed Central
The Open Access Publisher

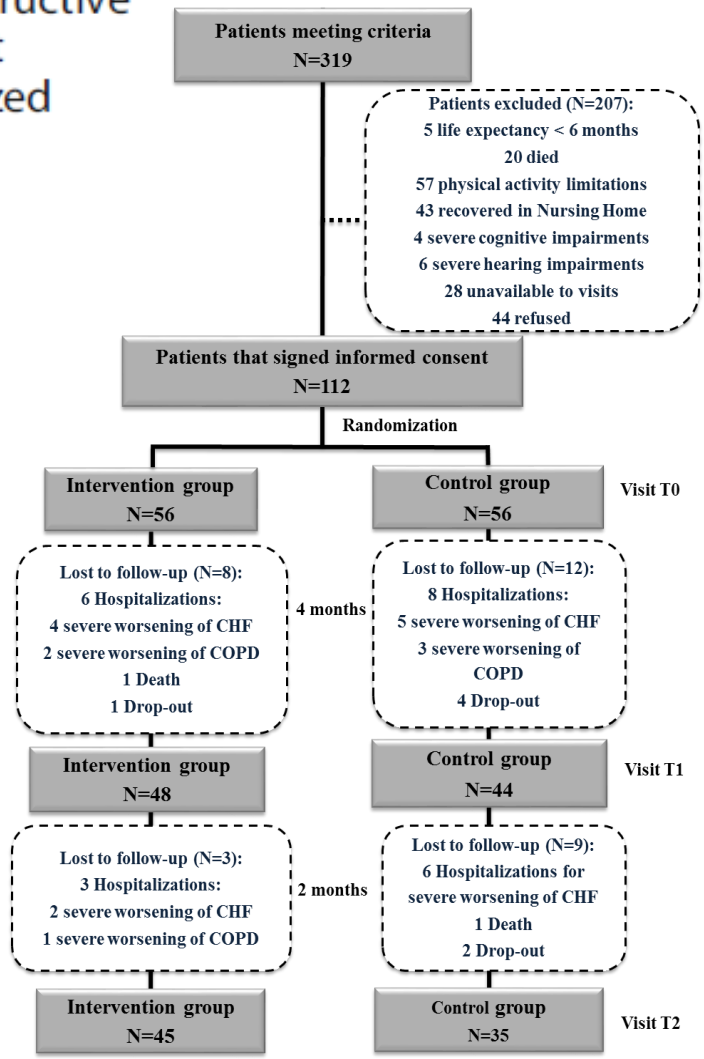
Trials

Trials (2016) 17:462

A multidisciplinary telehealth program in patients with combined chronic obstructive pulmonary disease and chronic heart failure: study protocol for a randomized controlled trial

Palmira Bernocchi[1*], Simonetta Scalvini[1,2], Tiziana Galli[3], Maria Paneroni[3], Doriana Baratti[1], Ottavia Turla[3], Maria Teresa La Rovere[4], Maurizio Volterrani[5] and Michele Vitacca[3]

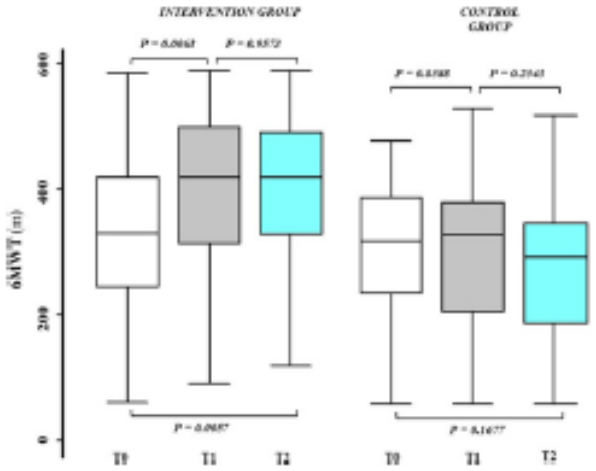
- We studied the feasibility and efficacy of an integrated telerehabilitation home-based programme (Telereab-HBP), 4 months long, in patients with combined COPD and CHF.
- The primary outcome was exercise tolerance evaluated at the 6-min walk test (6MWT).
- Secondary outcomes were time-to-event (hospitalisation and death), dyspnoea (MRC), physical activity profile (PASE), disability (Barthel) and QoL (MLHFQ and CAT).
- Randomized, open, controlled, multicenter trial.
- The Telereab-HBP included remote monitoring of cardiorespiratory parameters, weekly phone-calls by the nurse, and exercise programme, monitored weekly by the physiotherapist. All outcomes were studied again after 2 months of a no-intervention period.

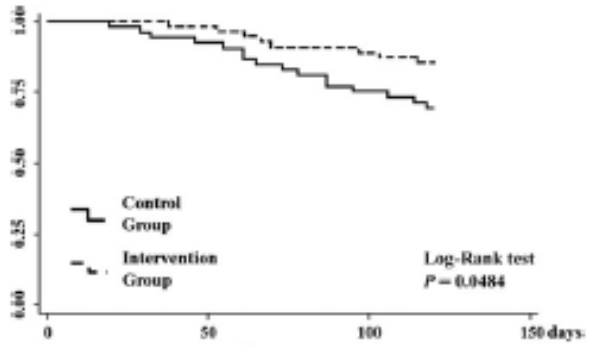


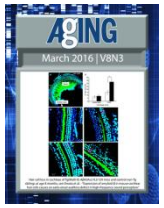
Home-based telerehabilitation in older patients with chronic obstructive pulmonary disease and heart failure: a randomised controlled trial

Palmira Bernocchi[1], Michele Vitacca[2†], Maria Teresa La Rovere[3†], Maurizio Volterrani[4†], Tiziana Galli[2], Doriana Baratti[1], Mara Paneroni[2], Giuseppe Campolongo[4], Barbara Sposato[4], Simonetta Scalvini[1,5] Age and Ageing 2017

- 112 patients were randomized, 56 per group, Their age was 70 (9) years, and 92 (82.1%) were male.
- After 4 months:
  the IG were able to walk further than at baseline: mean (95% CI) Δ6MWT was 60 (22.2,97.8) metres; the CG showed no significant improvement: -15 (-40.3,9.8) metres; p=0.0040 between groups.
- In IG, the media time to hospitalisation/death was 113.4 days compared with 104.7 in the CG (p=0.0484, log-rank test).
- MRC (p=0.0500), PASE (p=0.0015), Barthel (p=0.0006), MLHFQ (p=0.0007) and CAT (p=0.0000) were significantly improved in the IG compared with the CG at 4 months.
- IG maintained the benefits acquired at 6 months for outcomes.







Exercise: a "new drug" for elderly patients with chronic heart failure

Roberto Antonicelli[1*], Liana Spazzafumo[2*], Simonetta Scalvini[3*], Fabiola Olivieri[4,5], Maria Vittoria Matassini[6], Gianfranco Parati[7], Donatella Del Sindaco[8], Raffaella Gallo[9], and Fabrizia Lattanzio[10]

AGING, March 2016, Vol 8 No 3

- Patients with CHF experience progressive deterioration of functional capacity and quality of life (QoL).
- This trial assesses the effect of exercise training (ET) protocol on functional capacity, rehospitalization, and QoL in CHF patients older than 70 years compared with a control group.
- A total of 343 elderly patients with stable CHF (age, 76.90±5.67, men, 195, 56.9%) were randomized to ET (TCG, n=170) or usual care (UCG, n=173).
- The ET protocol involved supervised training sessions for 3 months in the hospital followed by home telemonitored sessions for 3 months.
- Assessments, performed at baseline and at 3 and 6 months, included: ECG, resting echocardiography, NT-proBNP, 6-minute walk test (6MWT), Minnesota Living with Heart Failure Questionnaire, and comprehensive geriatric assessment with the InterRAI-HC instrument.

- i) significantly increased 6MWT distance (450±83 vs. 290±97 m, p<0.001);

	TCG	UCG	P value*
6MWT (metres)			
T0	299±120	270±120	<0.001
T1	380.7±120.3	300.6±125.7	
T2	394.1±123.6	301.2±125.8	

- ii) increased ADL scores (5.00±2.49 vs. 6.94±5.66, p=0.037);

InterRAI_HC	UCG T0 (n=173)	TCG T0 (n=170)	UCG T2 (n=173)	TCG T2 (n=170)	p value
IADL (mean±SD)	5.1±3.32	4.98±4.59	5.67±5.32	5.18±4.75	0.408
ADL (mean±SD)	5.50±4.10	5.45±4.32	5.00±2.49	6.94±5.66	**0.037**

- iii) 40% reduced risk of rehospitalisation (hazard ratio=0.558, 95%CI, 0.326-0.954, p=0.033);

	TCG (n=150)	UCG (n=163)	P	HR (95%CI)
All-causes hospitalizations	25 (15.2%)	60 (36.8%)	<0.001	2.91 (1.70-4.97)

AGING, March 2016, Vol 8 No 3

- iv) significantly improved perceived QoL (28.6±12.3 vs. 44.5±12.3, p<0.001)

	TCG	UCG	P value*
MLHFQ			
T0	42.0±14.9	46.8±16.8	**<0.001**
T1	29.9±9.8	34.7±9.3	
T2	28.6±12.3	44.5±12.3	
NT-proBNP- pg/ml			
T0	1236 (2038)[§]	618 (520)[§]	**<0.001**
T1	350 (137)	290 (241)	
T2	440 (208)	2143 (1638)	

In hospital and home-based telemonitored exercise confer significant benefits on the oldest CHF patients, improving functional capacity and subjective QoL and reducing risk of rehospitalisation.

AGING, March 2016, Vol 8 No 3

Maugeri Centre for Telehealth and Telecare: A real-life integrated experience in chronic patients

Journal of Telemedicine and Telecare
0(0) 1–8

DOI: 10.1177/1357633X17710827
journals.sagepub.com/home/jtt
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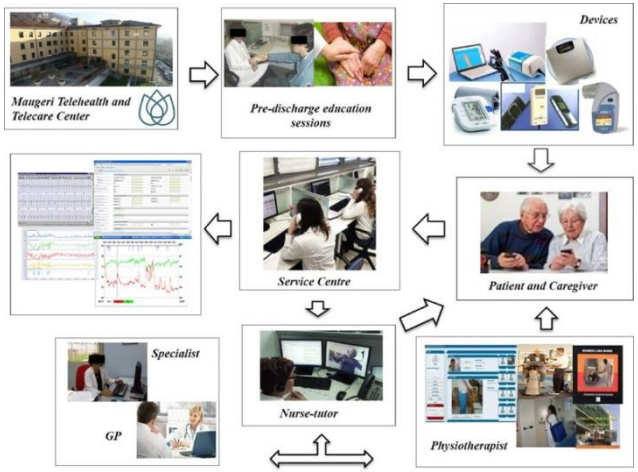
Simonetta Scalvini MD[1,2], Palmira Bernocchi[1], Emanuela Zanelli[2], Laura Comini[3] and Michele Vitacca[4]; on behalf of the Maugeri Centre for Telehealth and Telecare (MCTT)



Diseases	*Main Inclusion criteria*	*Main Exclusion criteria*	*Services utilized*	*Funders*	*Duration of program*	*Ref.*
COPD/CRI	1. Patients in GOLD class III-IV and in the previous 12 months: 2. One hospitalization or 2 severe relapses for acute COPD, or 3. Prescription ex novo of LTOT at home, or 4. Start of non-invasive ventilation.	1. Use of Invasive mechanical ventilation, 2. Illness with poor prognosis (<12 months) 3. Non-collaborative patients.	Pulse oximeter device	Lombardy Region	6 to 12 months	*11,12*
ALS	All patients with ALS – confirmed with El Escorial criteria – referred to the hospital for rehabilitation		Pulse oximeter device	Lombardy Region Patients association	Till death	*13*
POST-STROKE	1. Age > 18 years 2. Stroke due to cerebral ischemia or haemorrhage 3. Functional deficit of the upper limb.	1. Presence of severe cognitive deficits and/or 2. Absence of a caregiver who could provide informal care for the entire period of home rehabilitation.	A portable 1-lead ECG device or BP measuring device (if needed) Videoconference Robot for head rehab	Health Ministry	3 months	*14*
CHF	1. Patients with CHF (NYHA classes II-IV) 2. LVSD with EF<40% or with LVDD and 3. At least one episode of hospitalization for CHF within the previous 6 months	1. Illness with poor prognosis (<12 months) 2. Non-collaborative patients.	A portable 1-lead ECG device	Health Ministry Lombardy Region	6 to 12 months	*15,16*

Diseases	*Main Inclusion criteria*	*Main Exclusion criteria*	*Services utilized*	*Funders*	*Duration of program*	*Ref.*
POST-CARDIAC SURGERY	1. EuroSCORE between 0 and 5 2. No major complications after surgery 3. Haemoglobin value >8.5 g/dL 4. Availability of a caregiver at home	1. Insulin-dependent diabetes or 2. Overt CRI	A portable 1-lead ECG device BP measuring device (if needed) Videoconference Cycle-ergometer for rehab	Health Ministry Lombardy Region	28 days	*17*
CHF and COPD combined	1. COPD - GOLD classification (B, C and D class) 2. Systolic and/or diastolic HF - NYHA class II, III and IV 3. At least one hospitalization or office visit due to HF or COPD exacerbation in the previous 12 months	1. Physical activity limitations due to non-cardiac and/or pulmonary conditions 2. Limited life expectancy 3. Severe cognitive impairments	Pulse oximeter device A portable 1-lead ECG device	Health Ministry	4 months	*20*
Falls	Medium/high fall risk profile defined by: 1. History of fall within the last 12 months and/or 2. Berg Balance scale score ≤ 45, and/or 3. At least one fall event during in-hospital stay.	1. Low risk of fall recurrence 2. MMSE < 18 3. Patient living in a nursing home 4. Permanently bedridden, or fully dependent on a wheelchair.	A portable 1-lead ECG device and/or Pulse oximeter device and/or BP measuring device Videoconference	Health Ministry	6 months	*21*

		COPD/CRI (n=530)	ALS (n=127)	Post-Stroke (n=36)	CHF (n=780)	Post-cardiac surgery (n=162)
Mean age (years)		74±6	61±11	72±5	66±13	63±12
Female		27 %	39 %	38 %	32 %	11 %
Nurse Scheduled n. calls/patient		25.6±7.6	38.7±27	16.7±5.2	28.3±11.6	64.3±17.6
Nurse Unscheduled n. calls/patient		0.7±1.2	18±14.4	0.9±1.8	2.7±3.7	0.6±1
Physical Therapist Scheduled n. calls/patient		-	-	1.6±0.9	-	-
Physical Therapist n. home visits/patient		-	1.3±0.8	1.2±0.4	-	2.5±1.0
Physical Therapist/Nurse n. videoconferences/patient		-	-	9.5±0.8	-	21±2.4
Intervention:	**Nurse**	73 %	50 %	44 %	82 %	39 %
	Specialist	27 %	24 %	12 %	18 %	27 %
	Physical Therapist	-	26 %	44 %	-	34 %
Quality of life (pre-post intervention)		Improved	Not assessed	Improved	Improved	Not assessed
Satisfaction of patient/caregiver		Very high 80% High 20%	Very high 57% High 36%	Very high 87% High 10%	Very high 90% High 10%	Very high 95% High 5%

HEART FAILURE

Optimal postdischarge management of chronic HF

- A personalized hospital-discharge programme, founded on individuals' needs and risk profiles, might be the best approach to plan the follow-up care of patients with chronic HF.

- Information and communication technologies will be helpful to disseminate clinical information to all health-care professionals in real time, and thus reduce the time and duplication of procedures and improve the overall care and health of patients.

- Telemedicine has been used to support integrated care in the management of chronic diseases and, in particular, to provide education to improve self-management, enable information transfer (such as by telemonitoring), facilitate contact with health-care professionals (such as via telephone support and follow-up), and improve electronic records.

Scalvini, S. & Giordano, A. *Nat. Rev. Cardiol.* advance online publication 20 November 2012; doi:10.1038.nrcardio.2012.161

Virtual Visits — Confronting the Challenges of Telemedicine

Telemedicine will almost certainly expand in the coming years. As health care becomes more consumer-driven, tech-savvy patients will want **more flexibility in how they seek care.** And as health care becomes more value-oriented, accountable care organizations and other integrated health care providers will **increasingly rely on technology to improve efficiency. Telemedicine is uniquely positioned to address both of these needs.**

Kahn, N Engl J Med 2015; 372:1684-1685

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

Edward W. Campion, M.D., *Editor*

State of Telehealth

E. Ray Dorsey, M.D., M.B.A., and Eric J. Topol, M.D.

Three trends are currently shaping telehealth:

- The first is the transformation of the application of telehealth from increasing access to health care providing convenience and eventually reducing costs
- The second is the expansion of telehealth from addressing acute conditions to also addressing episodic and chronic conditions
- The third is the migration of telehealth from hospitals and satellite clinics to the home and mobile devices

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