

EMPOWERING PATIENTS THROUGH TECHNOLOGY “THE QUANTIFIED SELF”



cardiauvergne

Charles VORILHON MD,

Quantified Self - CardiAuvergne

Disclosure

Nothing for this presentation

Quantified Self - CardiAuvergne

Questions

Q1: *(true or false)*

Interest of **Quantified Self** in heart failure is old

Q2: *(true or false)*

Telemedicine (QS) decrease hospitalisation for heart failure

Q3: *(true or false)*

Telemedicine (QS) decrease mortality in heart failure

Quantified Self - CardiAuvergne

INTRODUCTION

Definition

Quantified Self

From Wikipedia, the free encyclopedia

Movement



The **Quantified Self**^[1] is a movement to incorporate technology into data acquisition on aspects of a person's daily life in terms of inputs (e.g. food consumed, quality of surrounding air), states (e.g. mood, arousal, blood oxygen levels), and performance (mental and physical).

Data acquisition

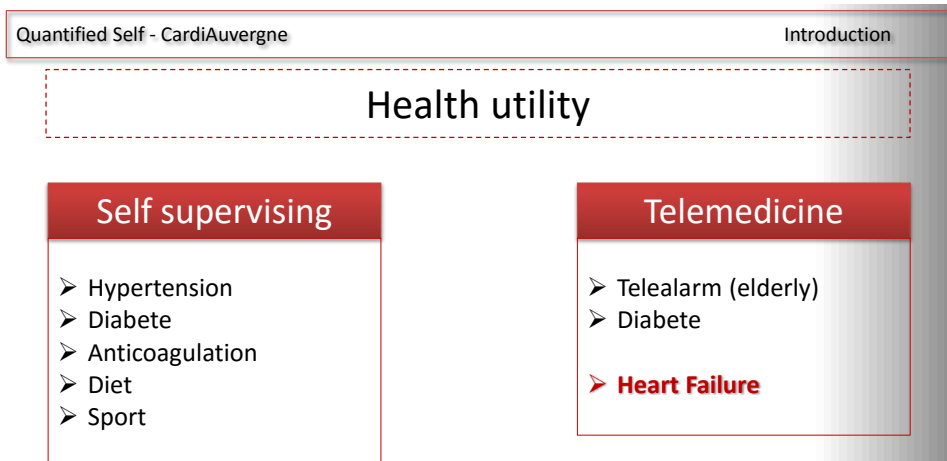
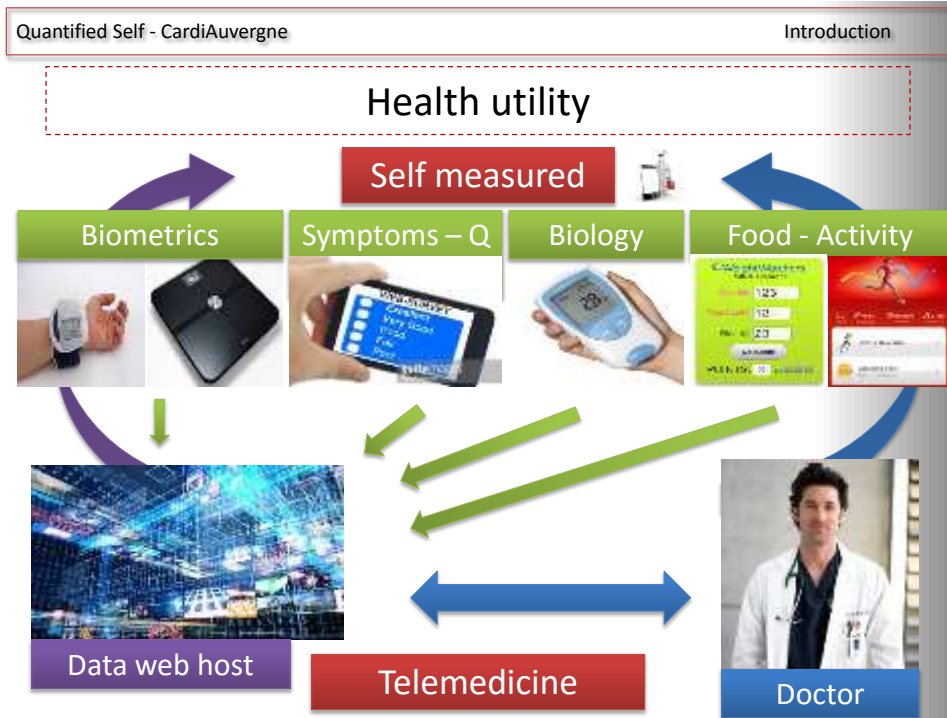


Health utility

Self measured



Self supervising



HEART FAILURE

Definition

A **syndrome** in which patients have

- **typical symptoms** (e.g. breathlessness, ankle swelling, and fatigue)
- and **signs** (e.g. elevated jugular venous pressure, pulmonary crackles, and displaced apex beat)

resulting from an **abnormality of cardiac structure or function**.

McMurray JJ, ESC Guidelines, Eur Heart J, 2012



Epidemiology

Framingham cohorte

Incidence

Prevalence

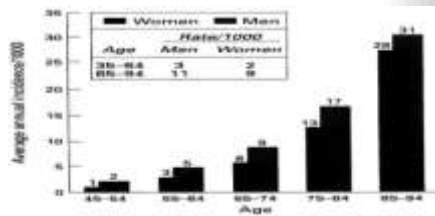
Survival

Health Economics

Epidemiology

Incidence

- ↗ with aging (exponentially)
- Stable over time
- France: 100 000 new HF / y
= 0.2 – 0.4% pop

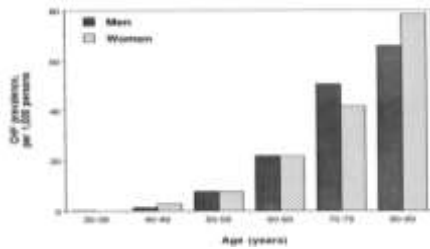


Kannel, Br Heart J 1994

PERIOD	MEN		WOMEN	
	INCIDENCE OF HEART FAILURE rate/100,000 person-yr	RATE RATIO	INCIDENCE OF HEART FAILURE rate/100,000 person-yr	RATE RATIO
1950-1969†	627 (475-779)	1.00	420 (336-504)	1.00
1970-1979	563 (437-689)	0.87 (0.67-1.14)	311 (249-373)	0.63 (0.47-0.84)
1980-1989	536 (448-623)	0.87 (0.67-1.13)	298 (247-350)	0.60 (0.45-0.79)
1990-1999	564 (463-665)	0.93 (0.71-1.23)	327 (266-388)	0.69 (0.51-0.92)

Levy, N Engl J Med 2002

Epidemiology



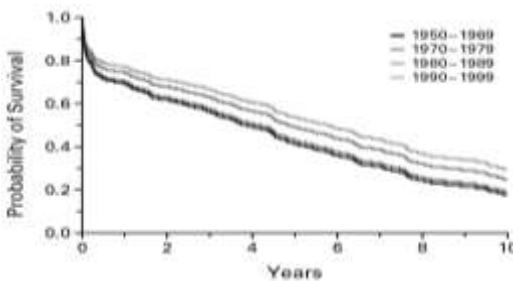
Ho, J Am Coll Cardiol 1993

Prevalence

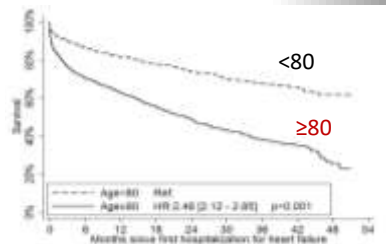
- ↗ with aging (exponentially)
- ↗ over time
 - Aging pop
 - Better diagnostic (TTE)
 - Better survival
- France: 600 000 p (1% pop)
(10% over 80 yo)

COMMON

Epidemiology



Levy, N Engl J Med 2002



Vorilhon, Eur j Clin Pharmacol, 2015

Survival

- ↗ over time
- ↘ with age
- France: 31% withing 5years

SERIOUS

Epidemiology

- 15 - 18 000 € /patient/years
- 90 % = HF hospitalization
1 hospit = 4 727 €
- Re HF hospit: 28 - 40% /y
- Mean lenght: 12 days

Health Economics

EXPENSIVE

Epidemiology

COMMON

SERIOUS

EXPENSIVE

Public Health Problem

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Heart Failure

Treatment

HF with Reduced Fraction Ejection (Systolic HF)

Pharmacological

- ACE inhibitor (or ARB)
- Beta blocker
- Mineralocorticoid AR
- Diuretic
- Ivabradine
- LCZ 696

Non Surgical Device

- Implantable cardioverter defibrillator
- Cardiac resynchronization therapy

Holistic Management

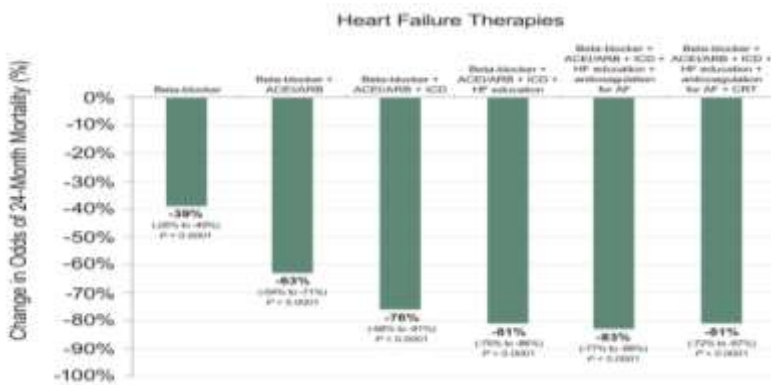
- Exercise training
- Education

Improves survival and quality of life

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Heart Failure

Treatment

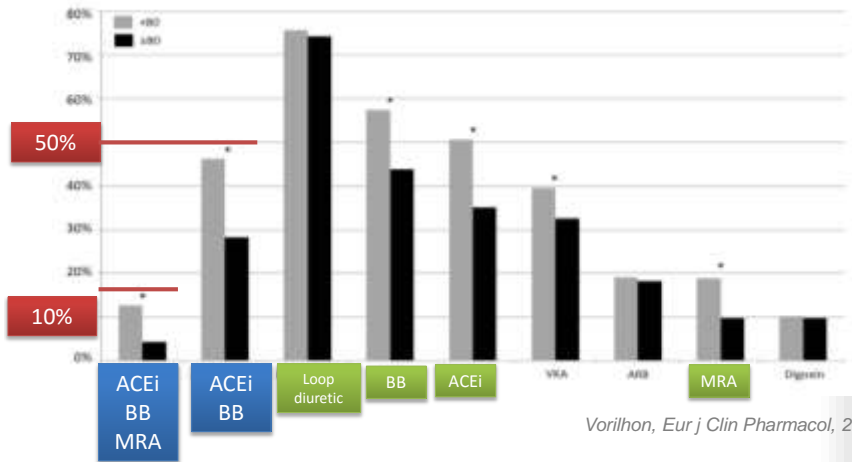


Fonarow GC, J Am Heart Assoc 2012,

Improves survival and quality of life

Problematic

Under prescription

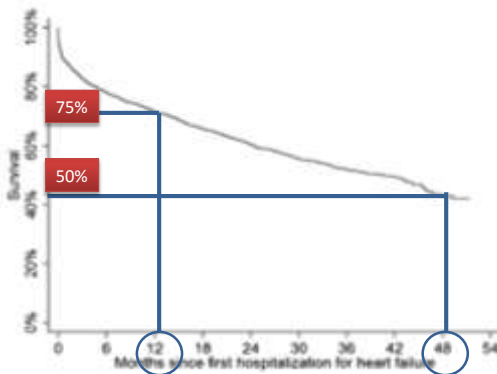


Vorilhon, Eur J Clin Pharmacol, 2015

Problematic

Under prescription

Mortality remains high



- Median survival: 40.6 months
- 1 year mortality: 28.4 %
- 4 years mortality: 56.9 %
- In hospital Mortality: 9%

Eschalier, Cardiovasc Drug Therapy, 2015

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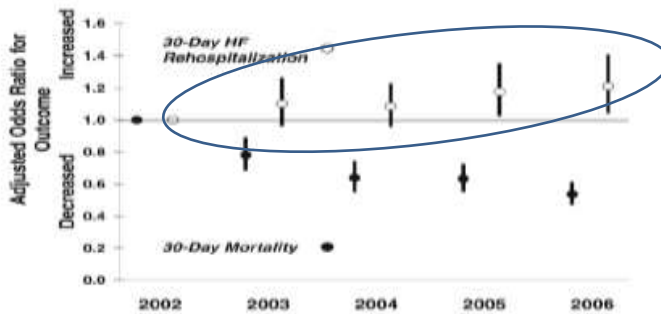
Heart Failure

Problematic

Under prescription

Mortality remains high

Increased HF Hospitalization



JAMA, July 21, 2004-vol 292, N° 3

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Heart Failure

Problematic

Under prescription

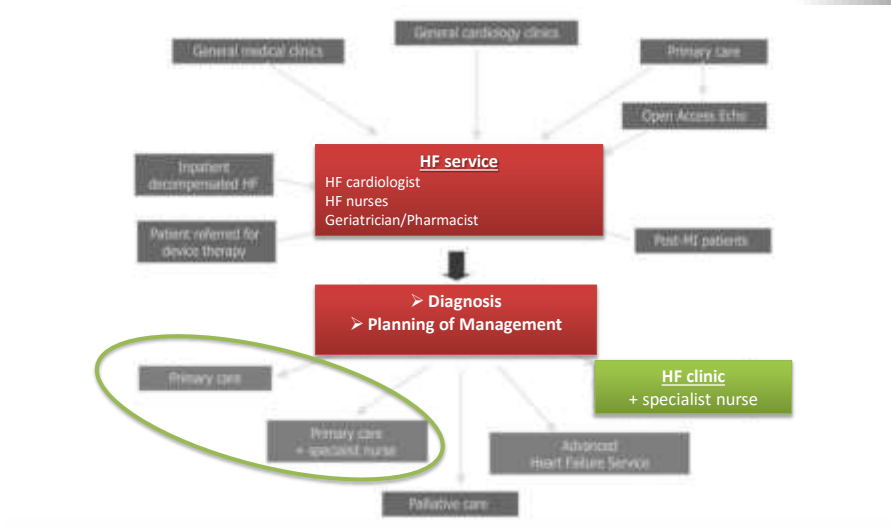
Mortality remains high

Increased HF Hospitalization



How to improve it ?

Multidisciplinary Care



McDonagh TA, Eur J Heart Fail, 2011

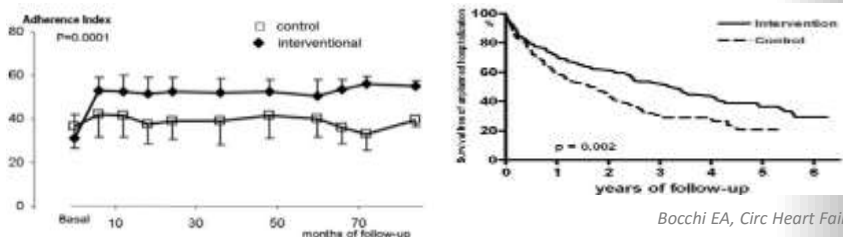
Multidisciplinary Care

Multidisciplinary Strategies for the Management of Heart Failure Patients at High Risk for Admission
 A Systematic Review of Randomized Trials

- Reduced mortality (RR=0.75, 95% CI 0.59-0.96)
- Reduced HF hospitalizations (RR=0.74, 95% CI 0.63-0.87)
- Reduced all-cause hospitalizations (RR=0.81, 95% CI 0.71-0.92)

McAlister FA, J Am Coll Cardiol, 2004

Long-Term Prospective, Randomized, Controlled Study Using Repetitive Education at Six-Month Intervals and Monitoring for Adherence in Heart Failure Outpatients: The REMADHE Trial



Bocchi EA, Circ Heart Fail, 2008

Multidisciplinary Care



Recommendations
It is recommended that patients with heart failure are enrolled in a multidisciplinary-care management programme to reduce the risk of heart failure hospitalization.

Class ^a	Level ^b
I	A

McMurray JJ, ESC Guidelines, Eur Heart J, 2012

But ...

- Not valid for geographically isolated patient

Use QS and Telemedicine

Telemedicine

Biometrics



- BP/HR



- Weight

Symptoms – Q



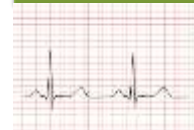
- Dyspnea

Biology



- N Peptide

ECG



- ECG

Video



Telephone



- Education

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Heart Failure

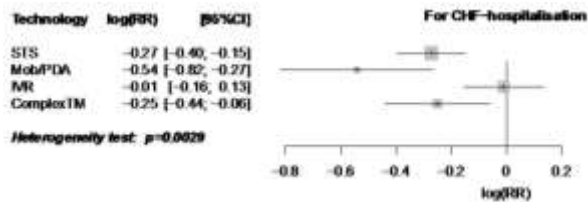
Telemedicine

Structured telephone support or non-invasive telemonitoring for patients with heart failure (Review)



All cause Mortality

- STS: **Reduce**, RR 0.87 (0.77 to 0.98) – 9222 patients
- TM: **Reduce**, RR 0.80 (0.68 to 0.94) – 3740 patients



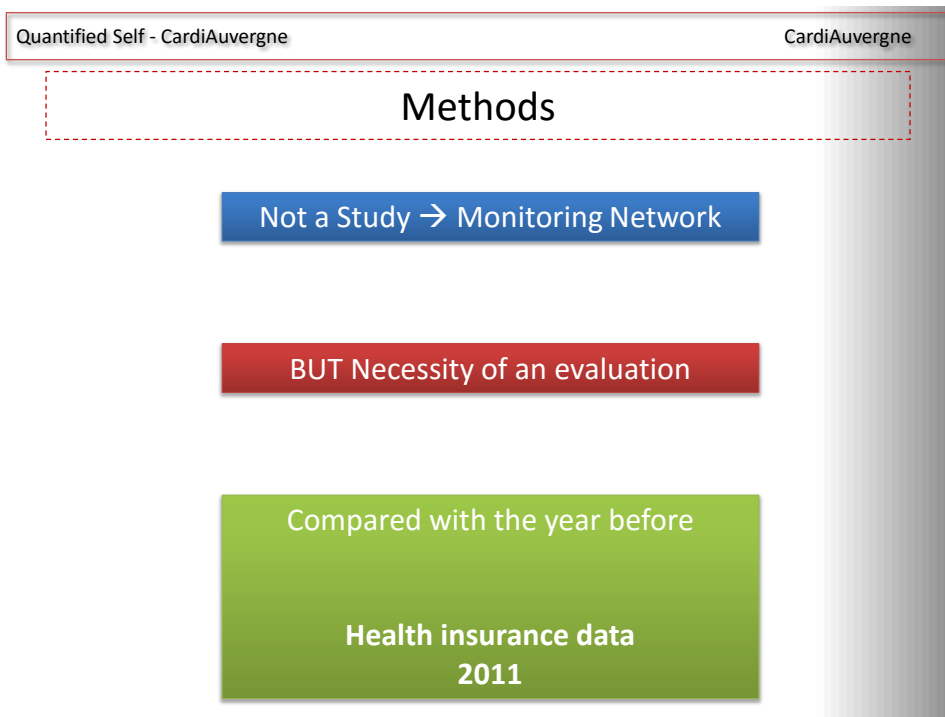
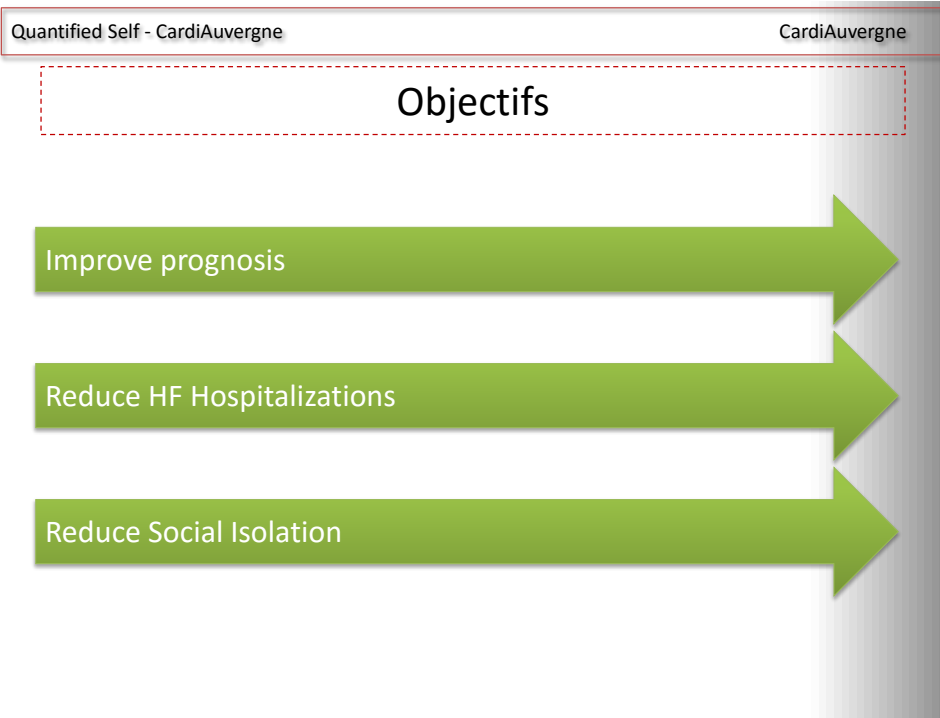
Inglis SC, Cochrane Collaboration, 2015

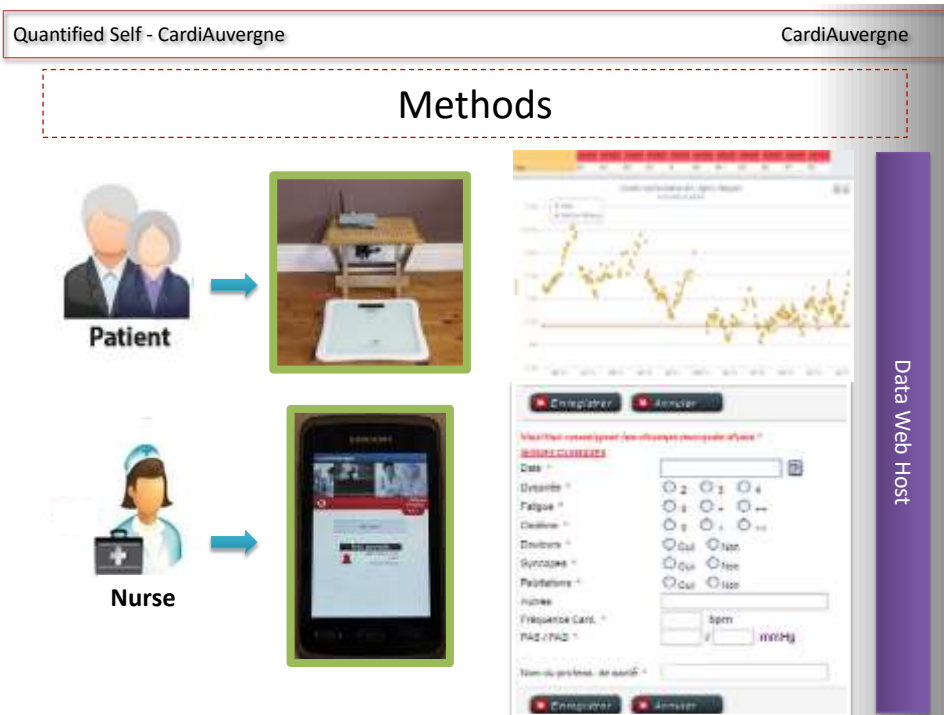
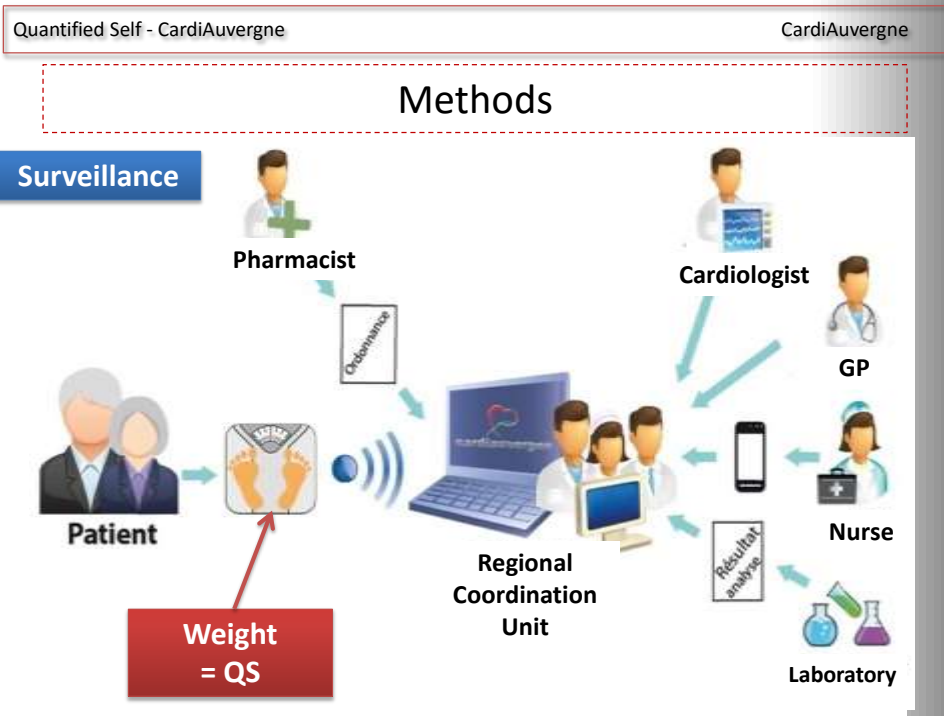
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CardiAuvergne

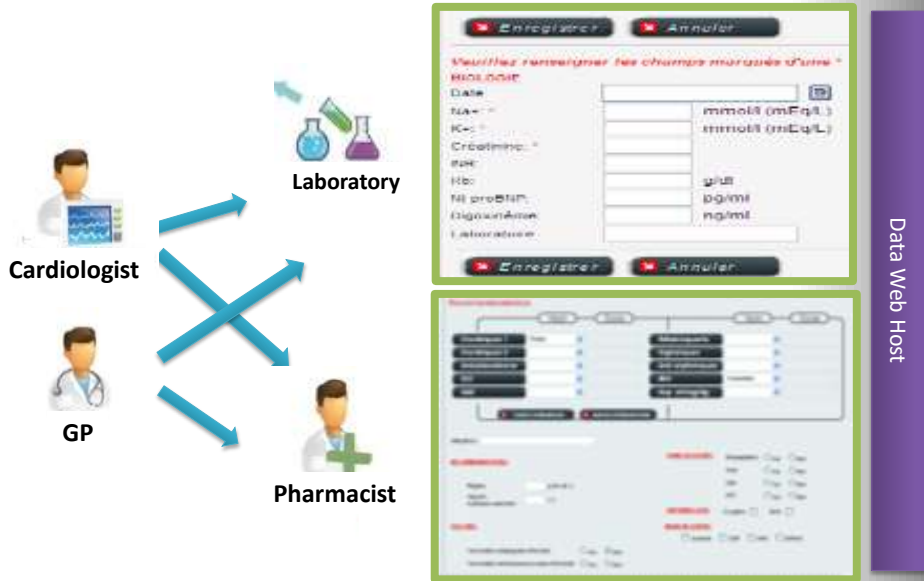


Service de télésurveillance et de coordination
des soins de l'insuffisant cardiaque

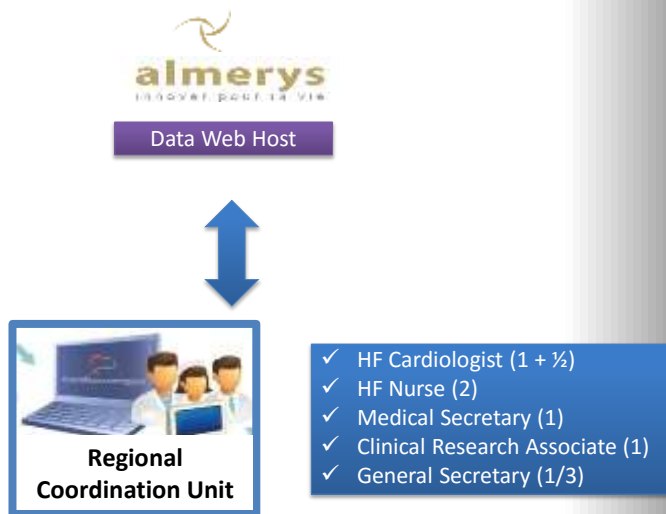




Methods



Methods



Methods

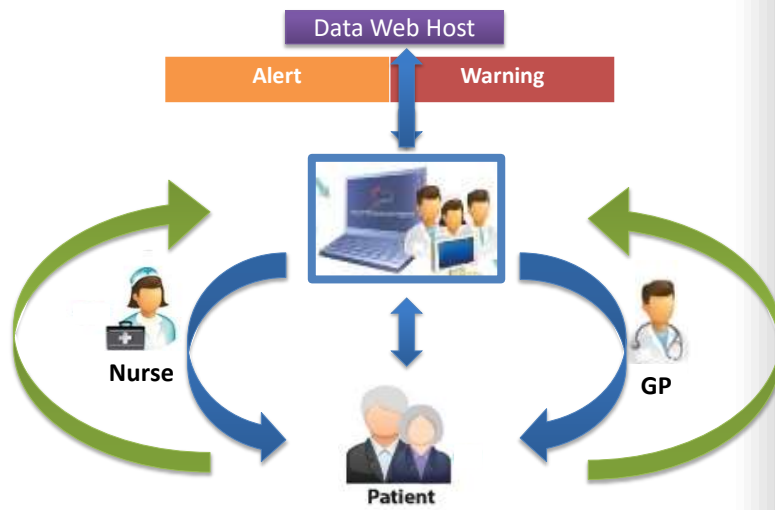


Data Web Host

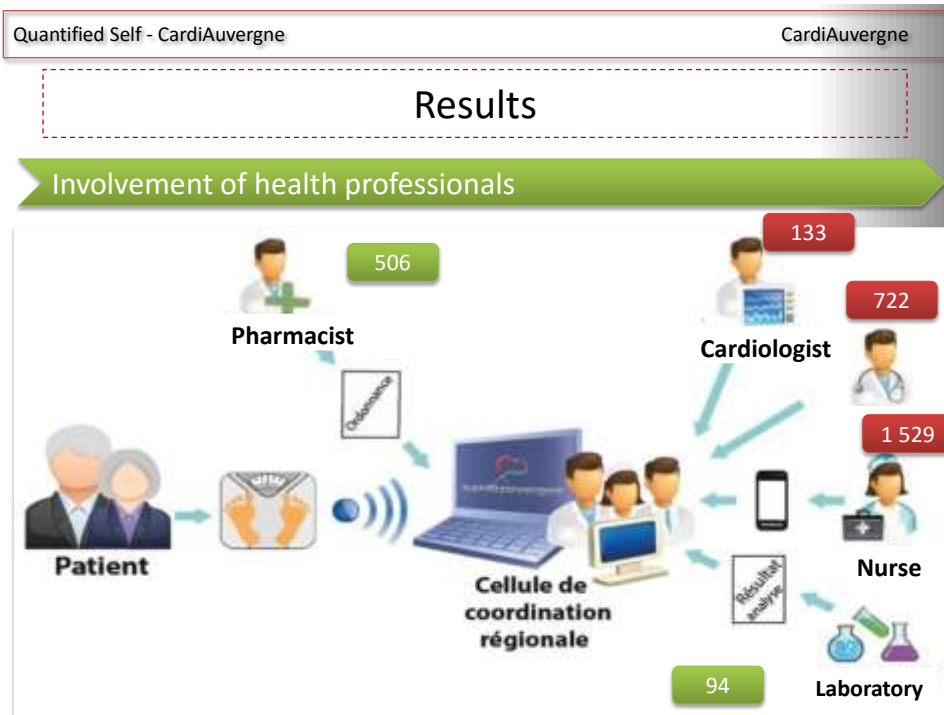
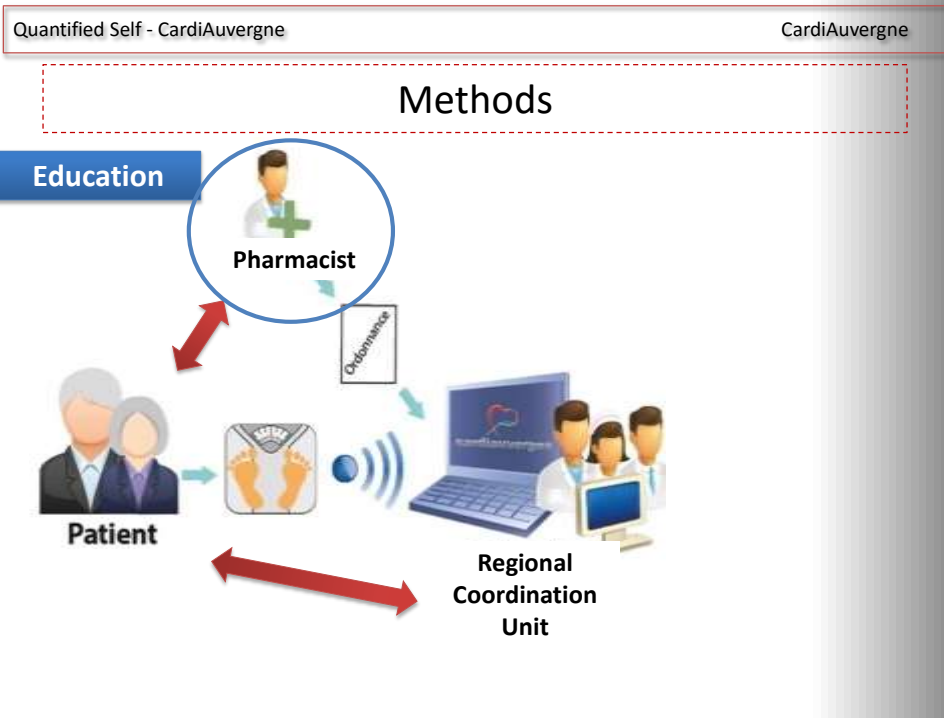
Example

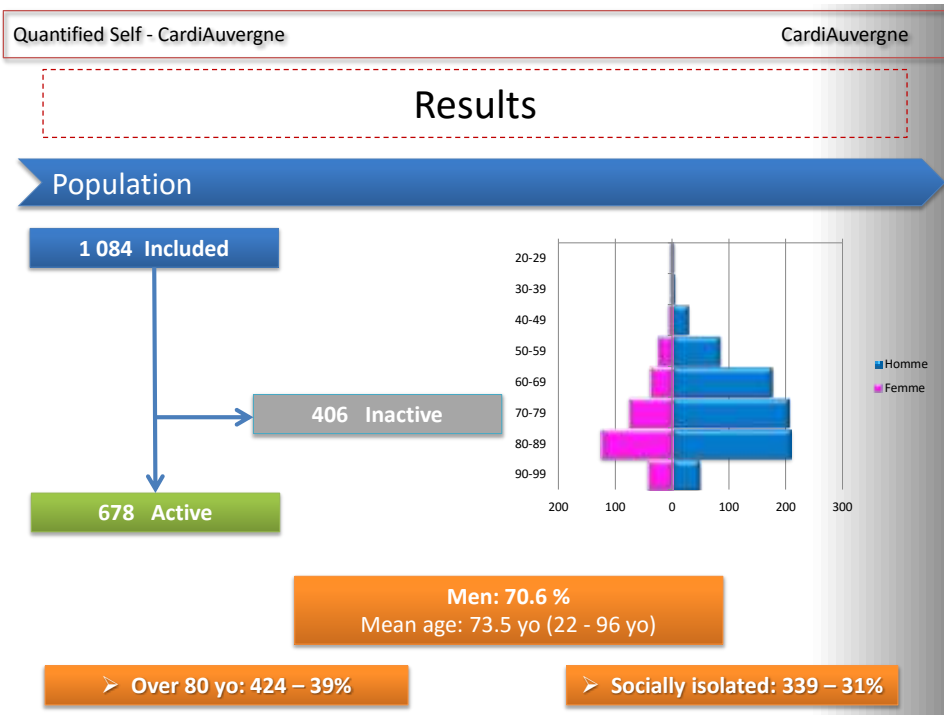
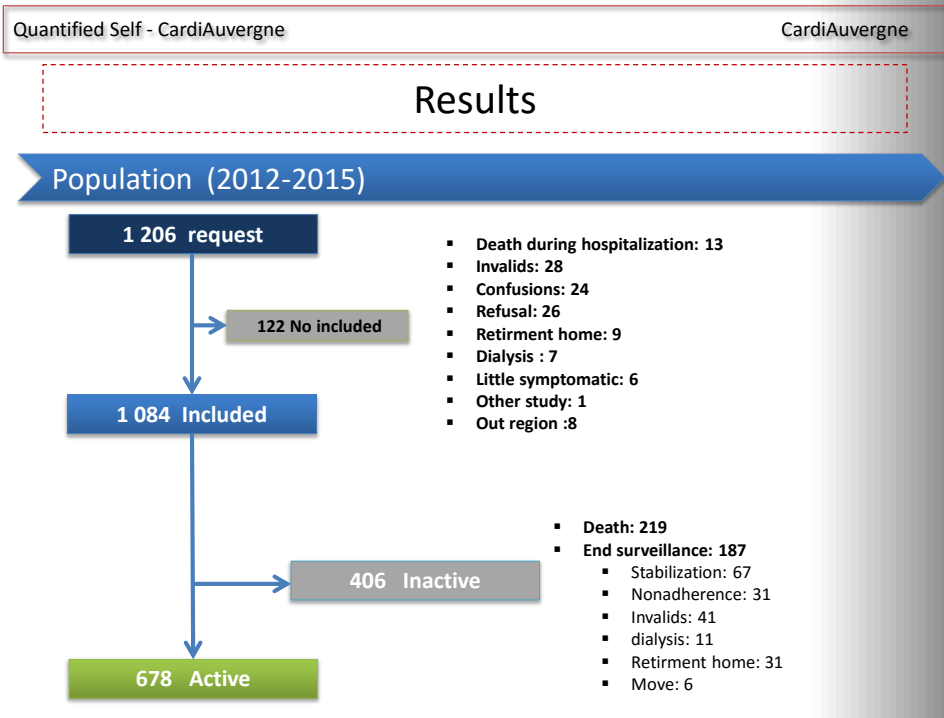
Clinic	Alert	Warning
Weight	+/- 2kg or none	+/- 5 kg
Dyspnea	≥ 1 stage	≥ 2 stage
Œdema	+	++
Chest /syncope	+	
HR	> 110 ou < 50	
BP	> 140 ou < 90	> 180 ou < 75
No Nurse's information	+	

Methods



100% Alert & Warning in 3 hours – 7 days / 7





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CardiAuvergne

Results

Mortality

➤ **6 months (999 Pts):** 5.8%

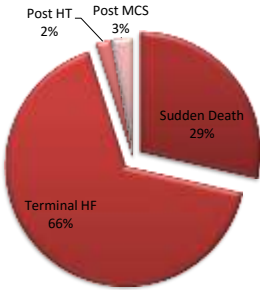
➤ **12 months (877 Pts):** 13.5%

vs 16.9%

vs 25%

Before (2011)

Cardio Vascular Death - 64%



Category	Percentage
Terminal HF	66%
Sudden Death	29%
Post HT	2%
Post MCS	3%

No Cardio Vascular Death - 36 %

- Cancer: 17 (22%)
- Infection: 18 (23%)
- Post-operative: 5 (6%)
- Stroke: 13 (16%)
- Bleeding event: 9 (11%)
- other: 17 (22%)

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CardiAuvergne

Results

HF Hospitalizations

	CardiAuvergne	Before
HF Hospitalizations /years (%)	13.8	21
Length of hospital stay (days)	9.4	11.5
Time until new HF hospitalization (days)	215	94
Emergency before HF hospitalisation (%)	33	66

Results

Economic assesment medical



Study for all patients in 2013 (246 patients)

Conclusions:

➤ **Gain estimated at 1,336,000 € /year**

➤ **5,430 € /patient/first year**

Less the cost of :

CardiAuvergne: 672 € / patient / year

IDE supervision: 79 € / Patient / year

The cost Almerys®: ??

Conclusions

Improve prognosis

Reduce HF Hospitalizations

Reduce Social Isolation ?? ... no evaluation

Reduce Healt Cost

Scientific evaluation

CORDIVA[®] **Alere**

French multicenter study

OSICAT

PIMPS
INSUFFISANCE CARDIAQUE

Reduce HF hospitalisation and Health Cost

Conclusions

HF = Public Health Problem

Quantified Self

Telemedicine

Treatments
Devices
Exercise Training
Education

Multidisciplinary Management

Reduced: Mortality / HF hospitalisation

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Questions

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