National eHealth Living Lab

World eHealth Living Lab

eHealth en ai: wordt het Dr Robot of gaat innovatie ons ontzorgen?

Prof. dr. Niels H. Chavannes

Leids Universitair Medisch Centrum

(potential) COI	See below:
Relevant relations with other parties	VWS, ZorgInstituut, Saltro, Zorg & Zekerheid, Achmea, KPN Health, AstraZeneca, Boehringer Ingelheim, Sense Health, NFU, Sleutelnet, Innovatic, Stanford
• Sponsoring of projectfunding • Honorarium or other reimbursement • Stockholder • other…	• Projectfunding • • •

16
Senior researchers

32
(Inter-) national PhDcandidates

6
Board members

NeLL

6
eHealth implementation experts

Management office

8
General pactitioners & medical specialists

Learning Experience Designer

What is eHealth?

National eHealth Living Lab

"The use of information- and communication technologies, especially internet technology, to support or promote health and healthcare"

What is eHealth?

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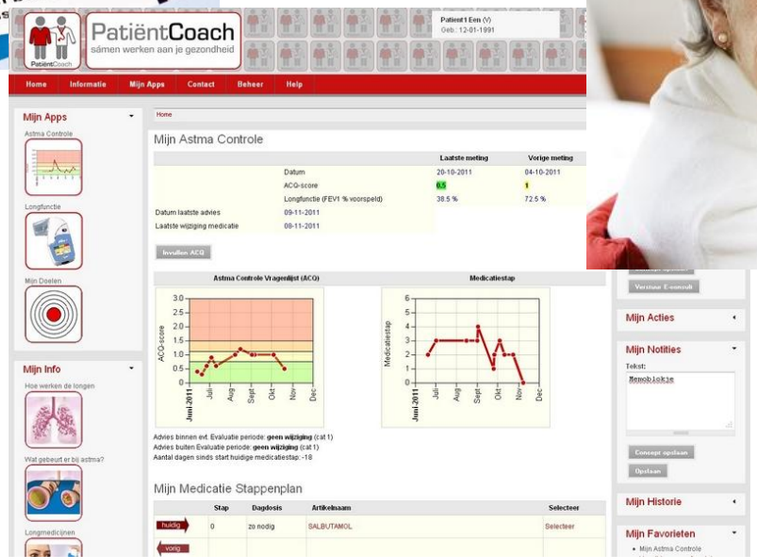
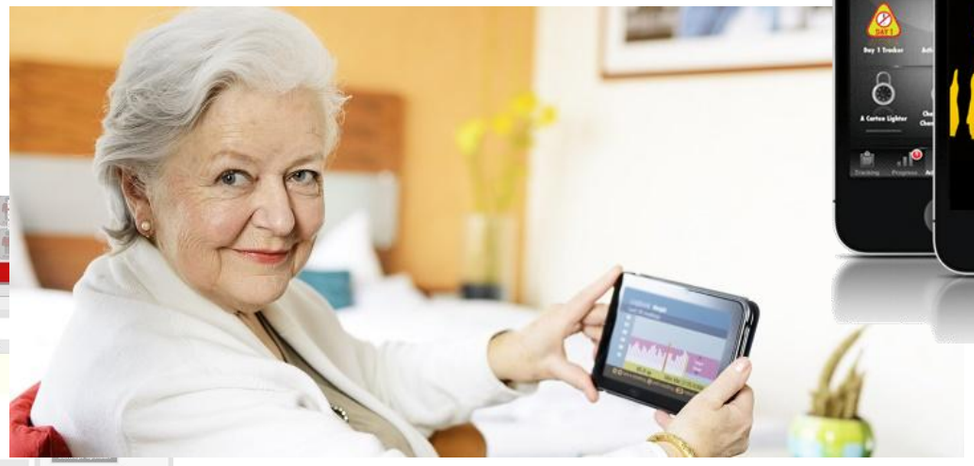
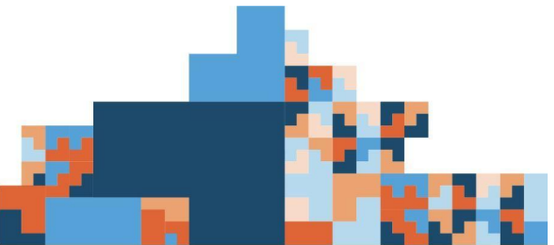


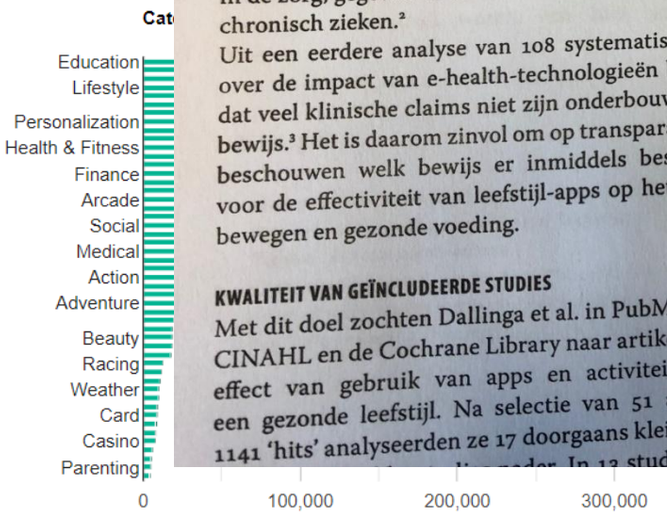


Why eHealth?

National eHealth Living Lab

- Accessible
- Tailoring (personalised medicine)
- Anonymity
- Large scale and low cost





Consumer-oriented medical apps proliferate

COMMENTAAR

Effectiviteit leefstijl-apps nog niet aangetoond

OPINIE

Niels H. Chavannes

GERELATEERD ARTIKEL Ned Tijdschr Geneeskd. 2016;160:D329

In dit nummer staan de resultaten van een systematische review waarin Dallinga en collega's zochten naar een antwoord op de maatschappelijk relevante vraag of mobiele apps aantoonbaar leiden tot een actievere en gezonde leefstijl.[1] Beleidsmakers in de gezondheidszorg verwachten veel van e-health, en soms moet het wetenschappelijke bewijs het afleggen tegen de mening van zelfverklaarde 'futuristen'. Niet zelden wordt e-health gepropageerd als panacee voor het tekort aan bemensing in de zorg, gegeven de verwachte toename van het aantal chronisch zieken.[2]

Uit een eerdere analyse van 108 systematische reviews over de impact van e-health-technologieën blijkt echter dat veel klinische claims niet zijn onderbouwd met hard bewijs.[3] Het is daarom zinvol om op transparante wijze te beschouwen welk bewijs er inmiddels beschikbaar is voor de effectiviteit van leefstijl-apps op het gebied van bewegen en gezonde voeding.

KWALITEIT VAN GEÏNCLUDEERDE STUDIES

Met dit doel zochten Dallinga et al. in PubMed, Embase, CINAHL en de Cochrane Library naar artikelen over het effect van gebruik van apps en activiteitsmeters op een gezonde leefstijl. Na selectie van 51 artikelen uit 1141 'hits' analyseerden ze 17 doorgaans kleinschalige én

voeding en gewicht wisselend is, waarbij er een trend zou zijn voor verbetering van het voedingspatroon.[1] Deze conclusies zijn voorbarig te noemen wanneer we op eenvoudige wijze differentiëren naar de kwaliteit van studies versus de hierboven veronderstelde effectiviteit.

Wanneer we in tabel 4 de 3 studies van slechte kwaliteit (3b of 4) zouden excluderen en alleen studies van matige tot goede kwaliteit zouden bekijken, blijkt namelijk dat er van het veronderstelde positieve effect van apps op fysieke activiteit een score van 4 studies met een positief effect en 3 studies met een negatief effect overblijft; voor voedingsapps is de score 3 maal een positief effect versus 2 maal een negatief effect en voor gewichtsapps zijn er evenveel studies (n = 5) met een positief als negatief effect.

Deze getallen geven nog geen overtuigende richting aan en suggereren dat wanneer er iets strenger naar de studiekwaliteit wordt gekeken, niet meer kan worden gesproken van een mogelijk positief effect. Alleen voor het effect op beweeggedrag door gebruik van activiteitsmeters lijkt er een positief signaal te zijn (3 vs. 0 studies), maar hiervan is de bewijskracht (GRADE C) te laag om conclusies aan te verbinden.

NIET KLAKKELOOS AANBEVELEN

De auteurs van de enige kwalitatief goede studie, die

National eHealth Living Lab

Our mission

- **Many** eHealth applications (325.000 health apps), but **little** scientific research (10-15% worthwhile)

- American Heart Association:

“Apps generally fail to incorporate evidence-based content and lack rigorous testing for efficacy”

American Heart Association®

Example: Instant Blood Pressure app

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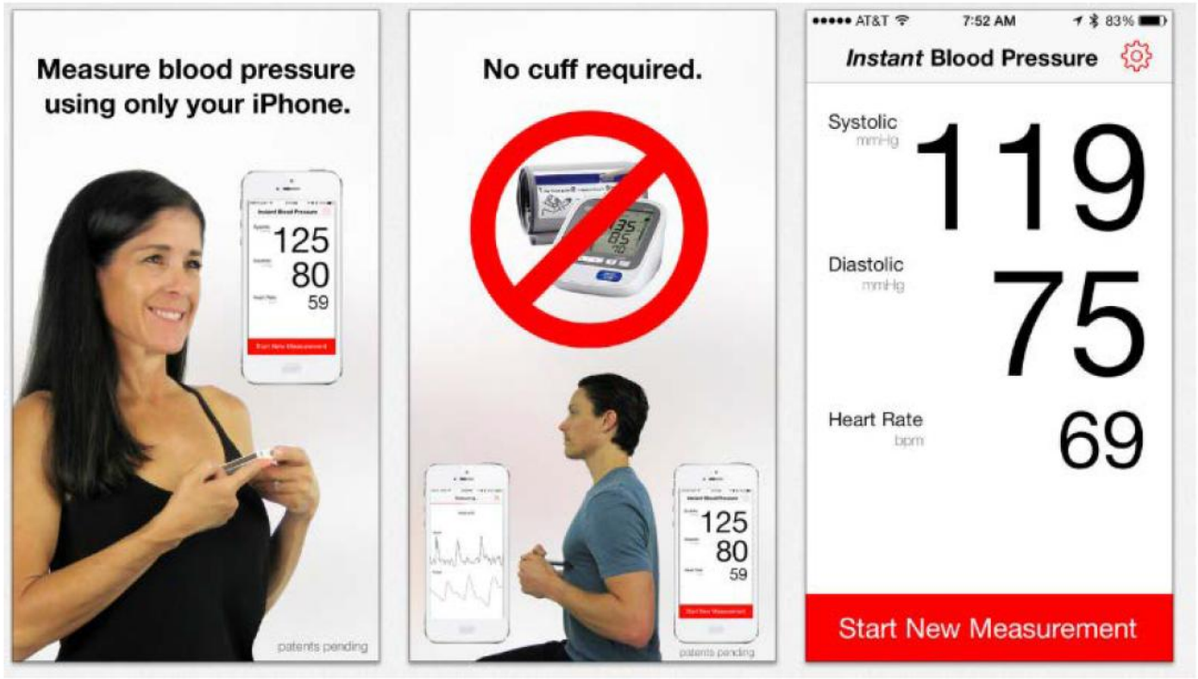
- “Measure your blood pressure using only your smartphone!”
- Top 50 best sold apps in Apples App Store after launch 2014
- Price per download $ 3,99 → 148.000 downloads

- Almost 80% of true hypertensives (high blood pressure) missed
- In July 2015 removed from App Store without disclosure



Preconditions for scaling eHealth

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Co-creation

Validation / Evaluation

Education

Ethics / eLaw

Implementation

Scale up / Finance

Co-creating eHealth applications

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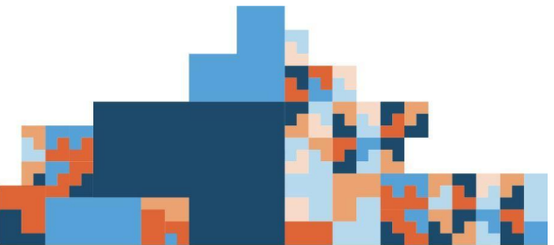
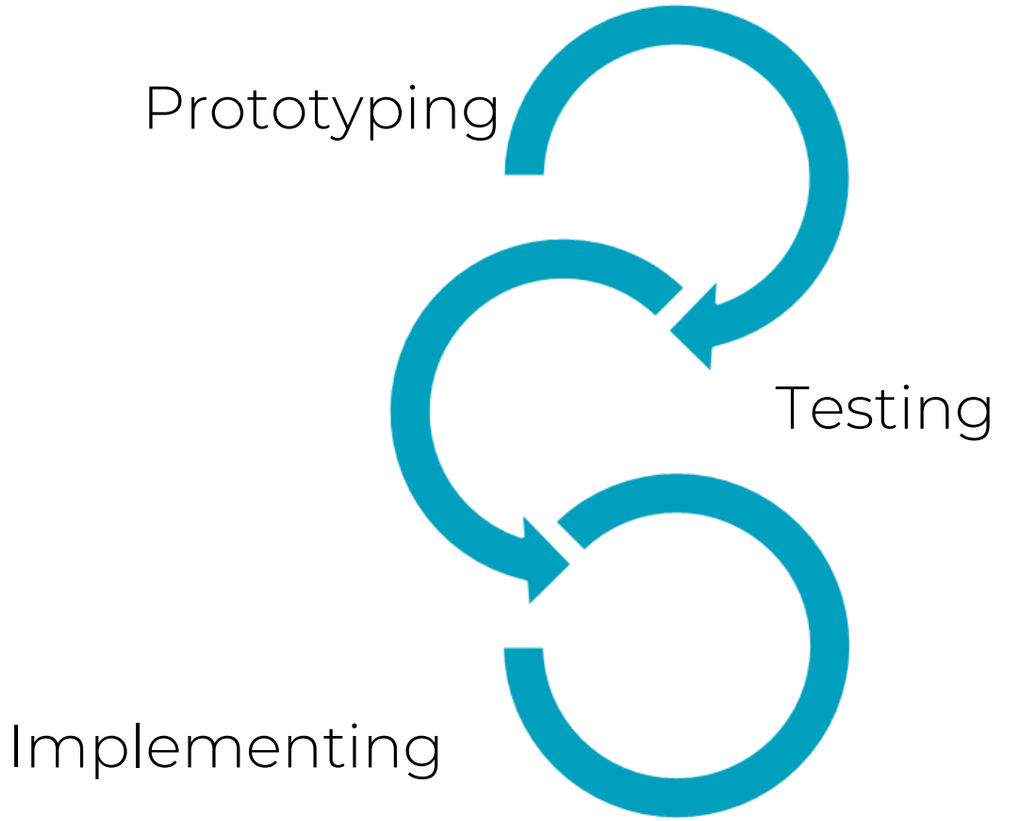
- Participatory design
  - Researchers
  - Healthcare professional
  - Software developers
  - Patients
  - Patients with low health literacy

- Feedback is gathered at all stages





Hospital Hero app

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Hospital Hero is developed to help children who are visiting the hospital for a blood test or other examination to experience less stress/anxiety

- Children/parents & healthcare professionals participate in development process
- Prototype tested with children
- Implementation in several children's hospitals

Results on depression: clinically relevant

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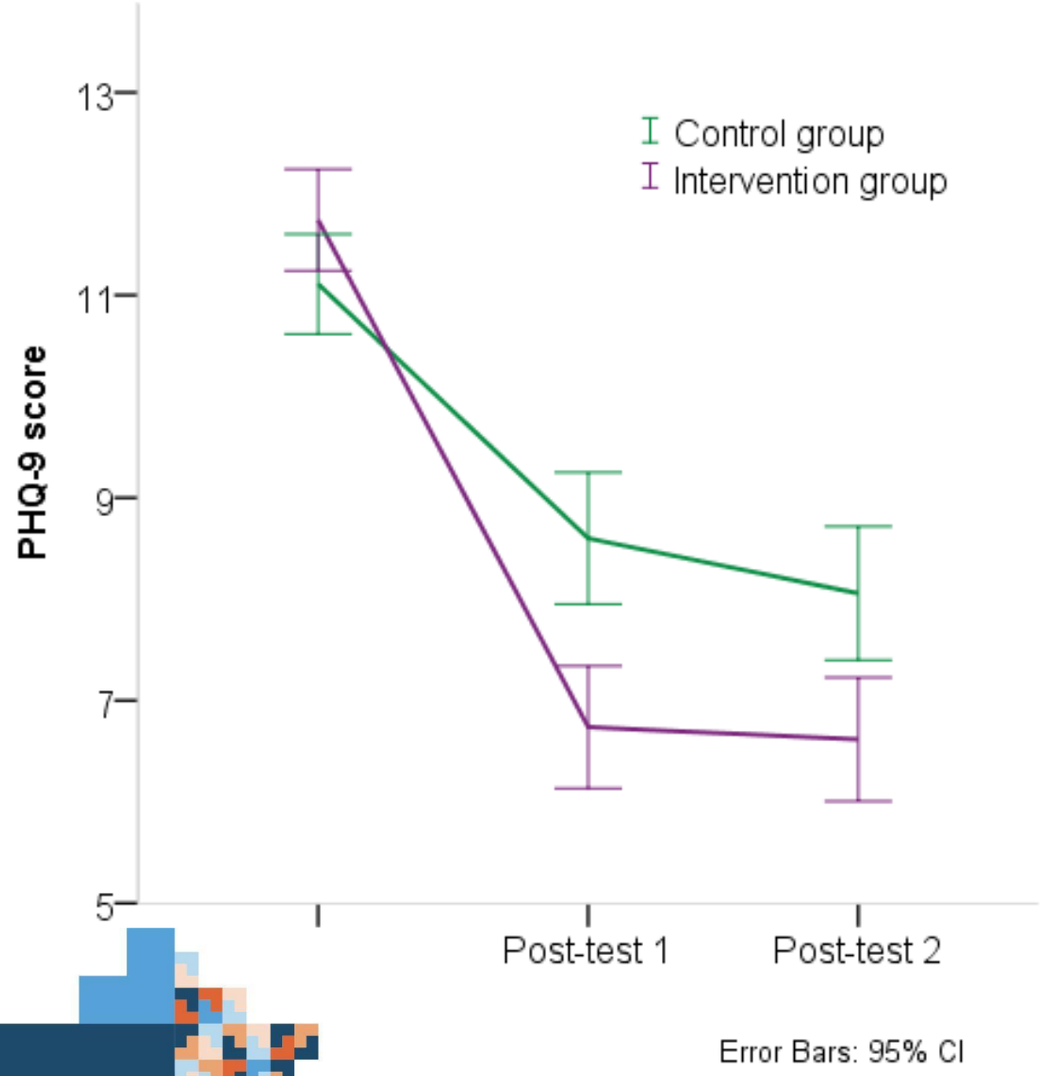

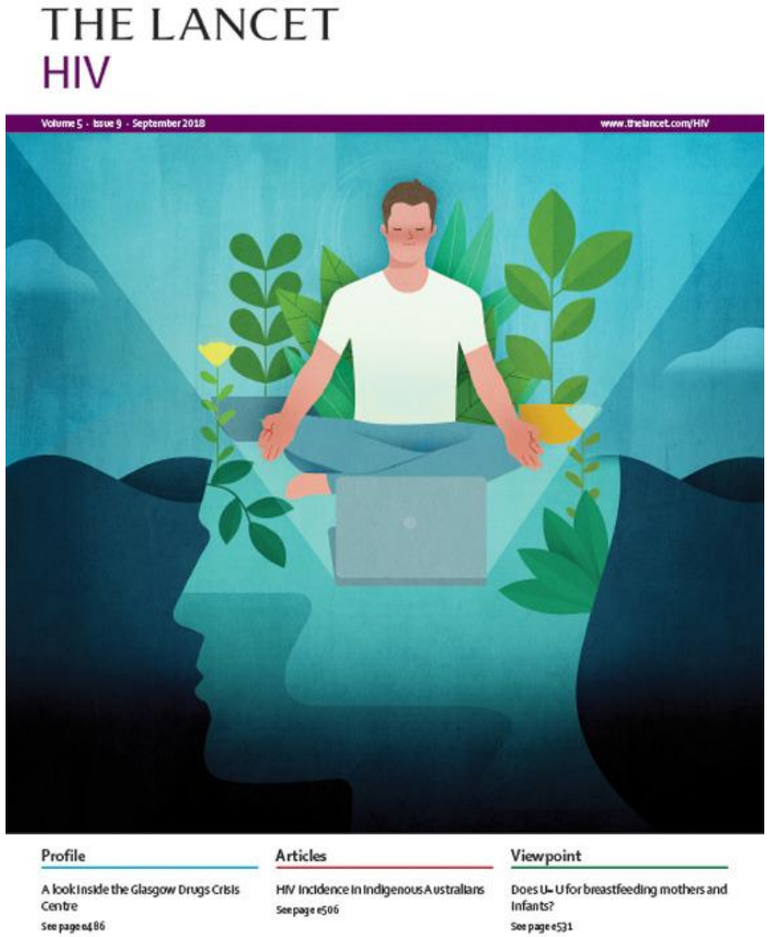

Universiteit Leiden

aidsfonds

Smart-inhaler study: ACCEPTANCE

National eHealth Living Lab

Verbetering van een slimme astma inhalator - de gebruiker als mede ontwikkelaar

Contact: Charlotte Poot, c.c.poot@lumc

Dit project is een samenwerking tussen

LUMC

rijksuniversiteit groningen

Open Access Asthma

BMJ Open Respiratory Research

Effectiveness, usability and acceptability of a smart inhaler programme in patients with asthma: protocol of the multicentre, pragmatic, open-label, cluster randomised controlled ACCEPTANCE trial

Susanne J van de Hei ,[1,2,3] Charlotte C Poot,[4] Liselot N van den Berg,[4] Eline Meijer,[4] Job F M van Boven,[3,5,6] Bertine M J Flokstra-de Blok,[2,3,7] Maarten J Postma,[1] Niels H Chavannes,[4] Janwillem W H Kocks[2,3,6,8]

Citizen science: CovidRadar app

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Aim?

Surveillance app in Covid19 symptoms and risk behaviour trends, per NL postal code region

How?

From start april 2020>250.000 users, weekly 50.000 questionnaires, total >6,2 million after pandemic

Rapid Results:

-Cough, dyspnea and loss of taste/smell most common symptoms

-Number of hours spent outside decreased with two or more symptoms

GP@Home

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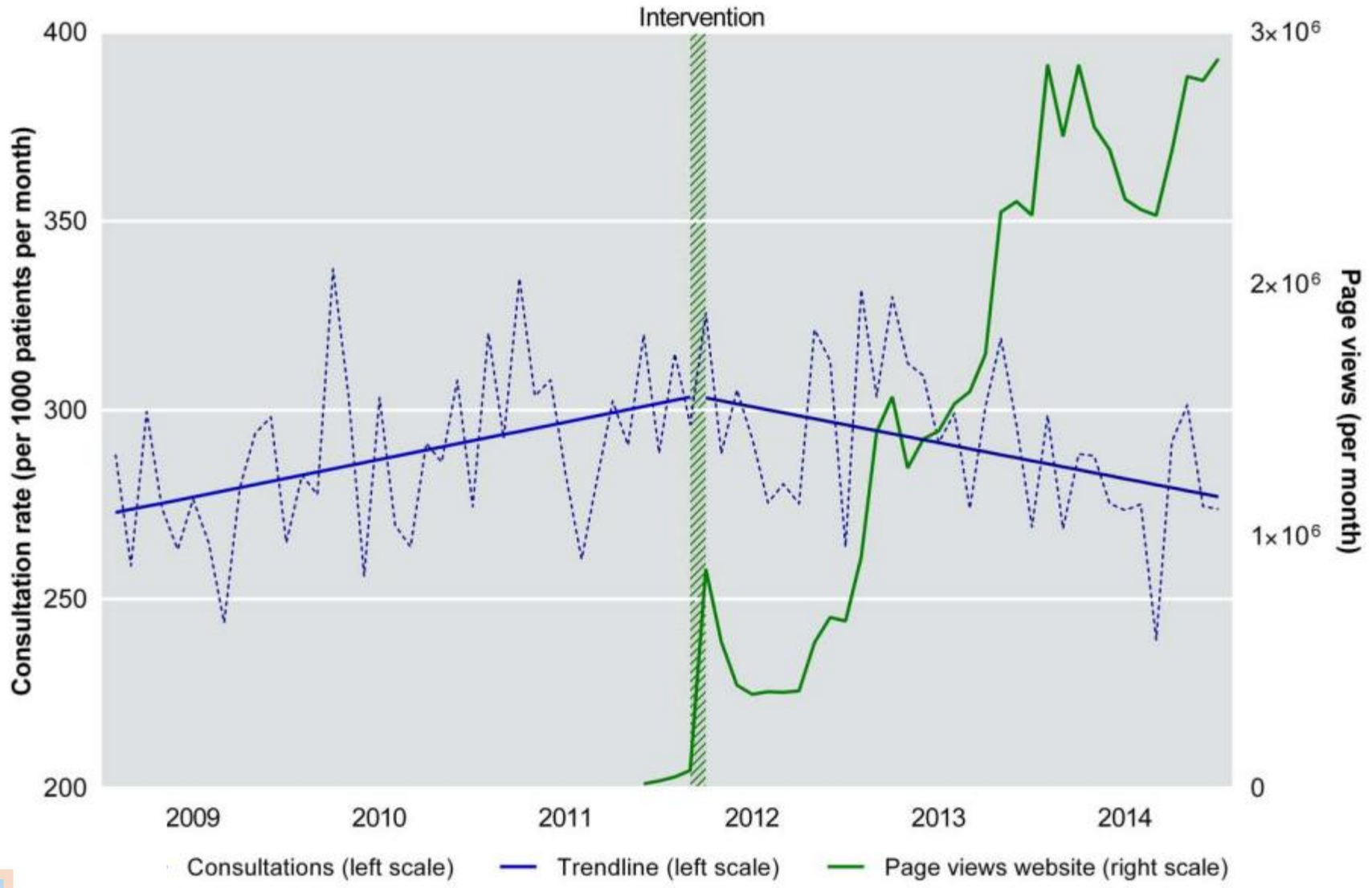
- Before/after launch comparison, ITS analysis
- Number of consultations GP
  - 230 GPs
  - 911.177 inhabitants NL
  - 18,1 million consultations

GP@Home

National eHealth Living Lab



GP@Home

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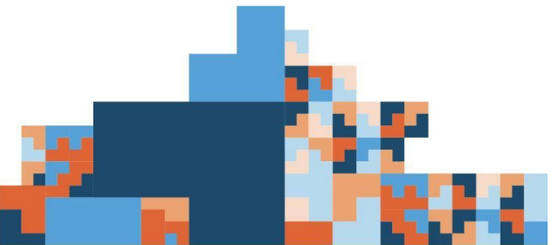
Open Access Research

BMJ Open

Effect of an evidence-based website on healthcare usage: an interrupted time-series study

Wouter A Spoelman,[1] Tobias N Bonten,[1] Margot W M de Waal,[1] Ton Drenthen,[2] Ivo J M Smeele,[2] Markus M J Nielen,[3] Niels H Chavannes[1]

➡ “The decrease in consultation rate was *also* present in the oldest subgroup. This *refutes* concerns about accessibility of older patients to online content, and supports earlier positive findings of eHealth in this age group.”



Project LUMC, Z&Z en KPN: The Box

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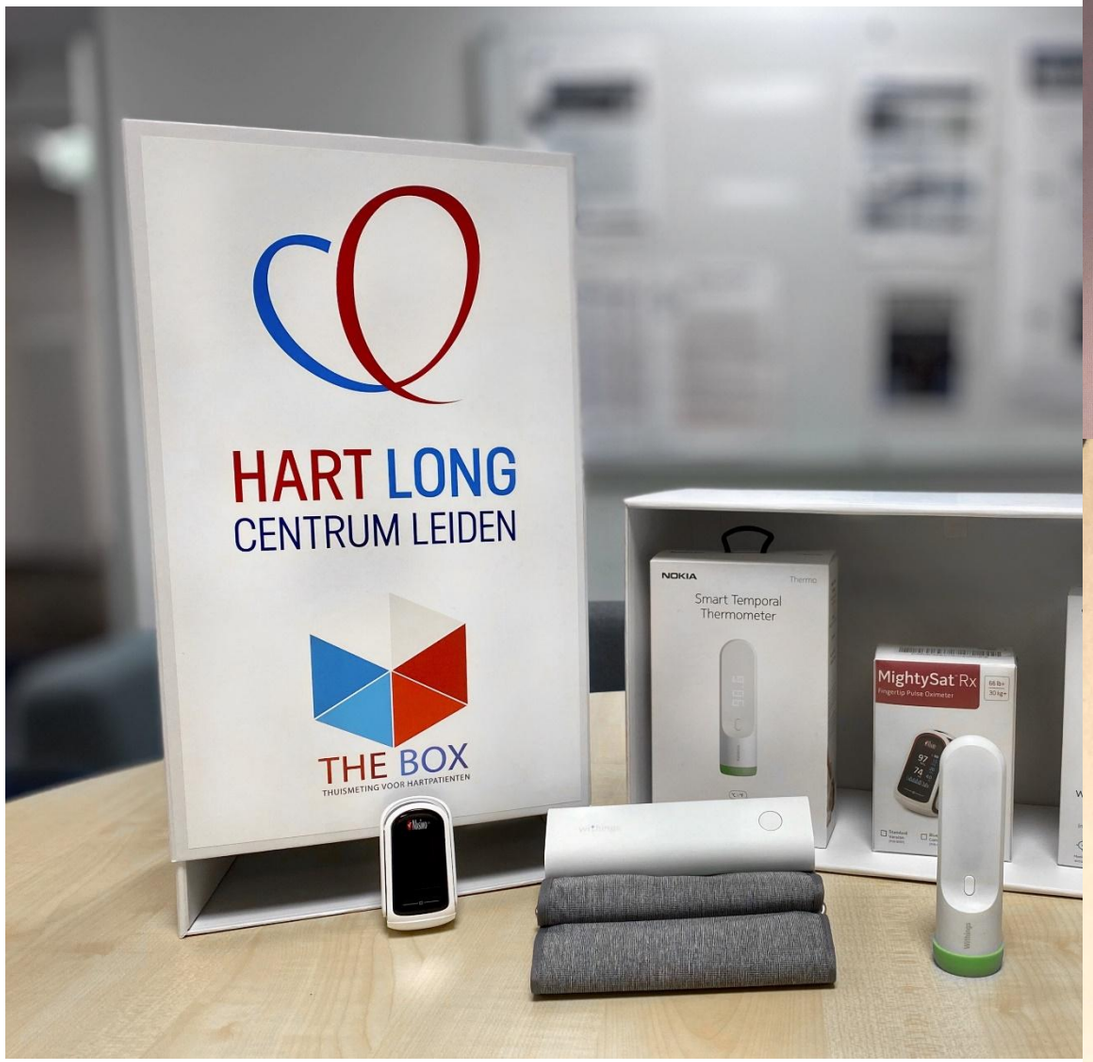
- Patients after myocardial infarction
- Box: bluetooth EKG, blood pressure meter, scale, activity tracker
- Safe video conferencing with doctor
- Improving technology with KPN Health
- Implementation in other hospitals

=> many healthcare pathways, many Boxes!

COVID Box:



JOURNAL OF MEDICAL INTERNET RESEARCH

Viewpoint

Telemonitoring for Patients With COVID-19: Recommendations for Design and Implementation

Anna V Silven[1,2*], MD; Annelieke H J Petrus[1,2*], MD, PhD; María Villalobos-Quesada[1,2*], PhD; Ebru Dirikgil[3], MD; Carlijn R Oerlemans[3], BSc; Cyril P Landstra[3,4], MD; Hileen Boosman[5], PhD; Hendrikus J A van Os[1,2,6,7], MD; Marco H Blanker[8], MD, PhD; Roderick W Treskes[9], MD, PhD; Tobias N Bonten[1,2], MD, PhD; Niels H Chavannes[1,2], MD,

EUROPEAN RESPIRATORY *journal*

FLAGSHIP SCIENTIFIC JOURNAL OF ERS

Home-monitoring reduced short stay admissions in suspected COVID-19 patients: COVID-box project

Ebru Dirikgil, Rick Roos, Geert H. Groeneveld, Christian Heringhaus, Anna V. Silven, Annelieke H.J. Petrus, Maria Villalobos-Quesada, Roula Tsonaka, Paul J.M. van der Boog, Ton J. Rabelink, Willem Jan W. Bos, Niels H. Chavannes, Douwe E. Atsma, Y.K.

Cardiovascular Risk in Primary Care

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Results

94% (189/200) of eligible patients were enrolled, of which 81% (153/189) completed the assessments after 6 months. In total, 121 technical queries sent to the technical portal of which 71% could be solved immediately. Patients rated the program as acceptable (SUS = 65.86 and CSQ-8 = 24.58). Interviews with healthcare professionals confirmed this. At 6-month follow-up, patients showed significant reductions in systolic blood pressure (baseline mean 140 mmHg, SD 18 mmHg; follow-up mean 131 mmHg, SD 14 mmHg; $p < 0.001$) and diastolic blood pressure (baseline mean 86 mmHg, SD 10 mmHg; follow-up mean 81 mmHg, SD 9 mmHg; $p < 0.001$). A 49% relative risk reduction in uncontrolled systolic blood pressure (>135 mmHg) was found at 6-months.

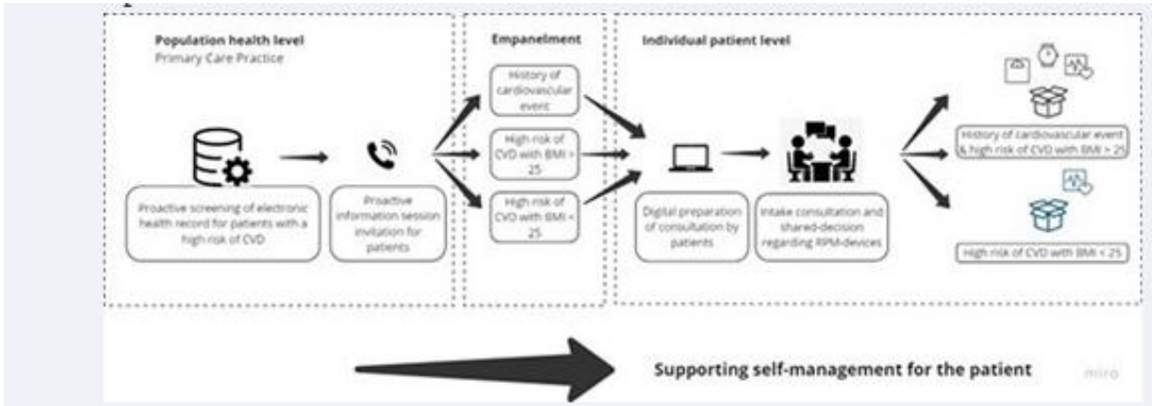
JOURNAL ARTICLE

Feasibility and preliminary effectiveness of a population health management approach to improve cardiovascular risk management in primary care: a mixed-method implementation study FREE

M Rakers, N E Van Hattem, E Hiddink, P G Van Peet, R C Vos, N H Chavannes, D E Atsma, T N Bonten, H J A Van Os Author Notes

European Journal of Preventive Cardiology, Volume 31, Issue Supplement_1, June 2024, zwae175.111, https://doi.org/10.1093/eurjpc/zwae175.111

Published: 13 June 2024



The Connect@Heart program

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Living Lab

We are WeLL
and we are building
healthcare of the future

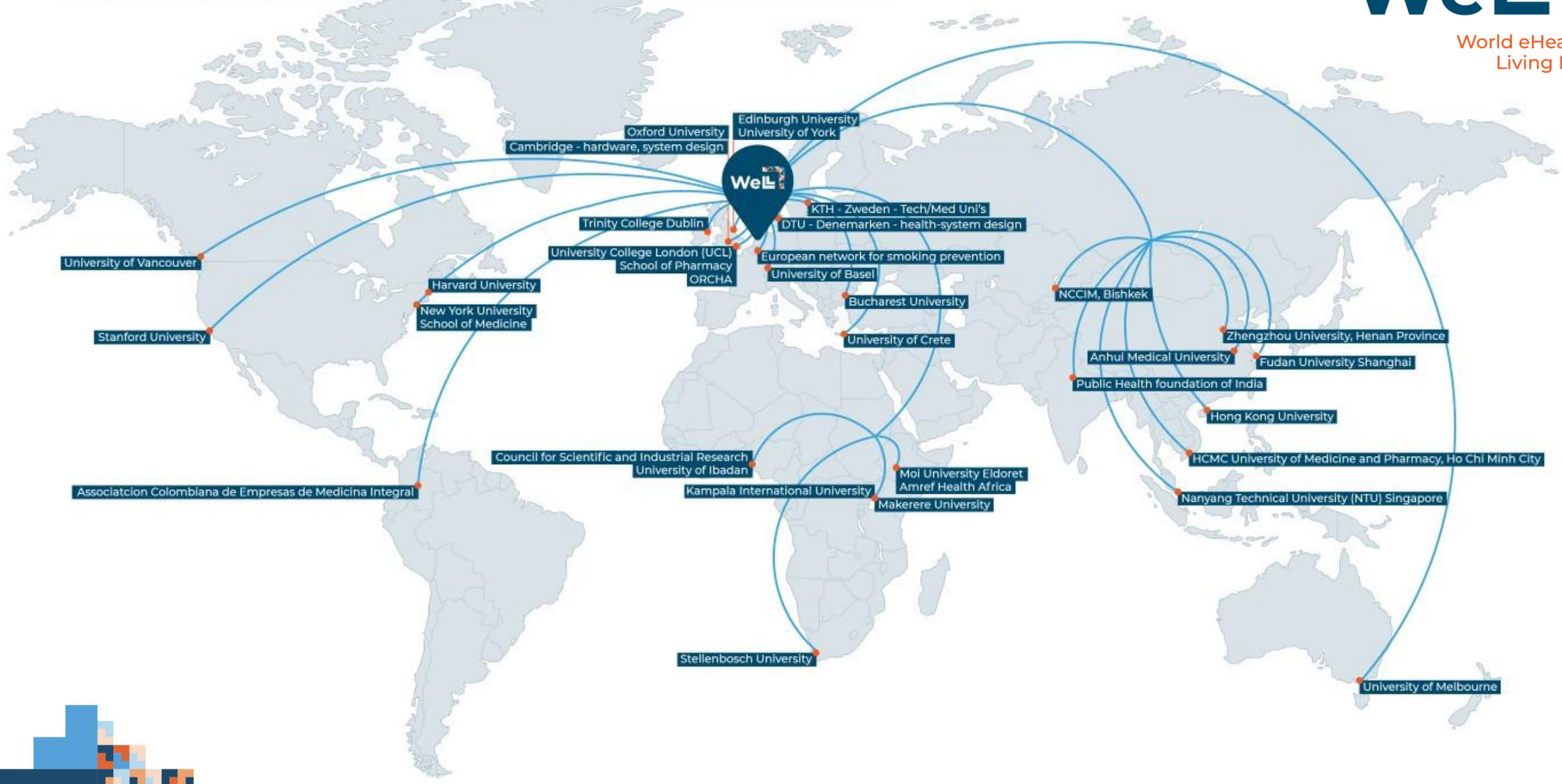
Aim of WeLL

WeLL is **forging a** global **collaborative community** of healthcare professionals, the business community, and public organisations **to share knowledge and experience.**

WeLL
World eHealth Living Lab

Institutions with which we are connected

World eHealth
Living Lab



International grants

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- NeLL has experience with many different larger (inter)national grant applications
- Both in a coordinating role and as a smaller party in consortia
- Horizon, EFRO, Interreg, ITEA, EIT, Nationaal groeifonds, and more.
- Notable examples:
  - IMPALA
  - Lable2Enable
  - FRESHAIR4LIFE
  - BreathSense
  - Kansen voor West III NeLL Fieldlab
  - Interreg NSR

IMPALA project: smart technology as a weapon against child mortality in Africa

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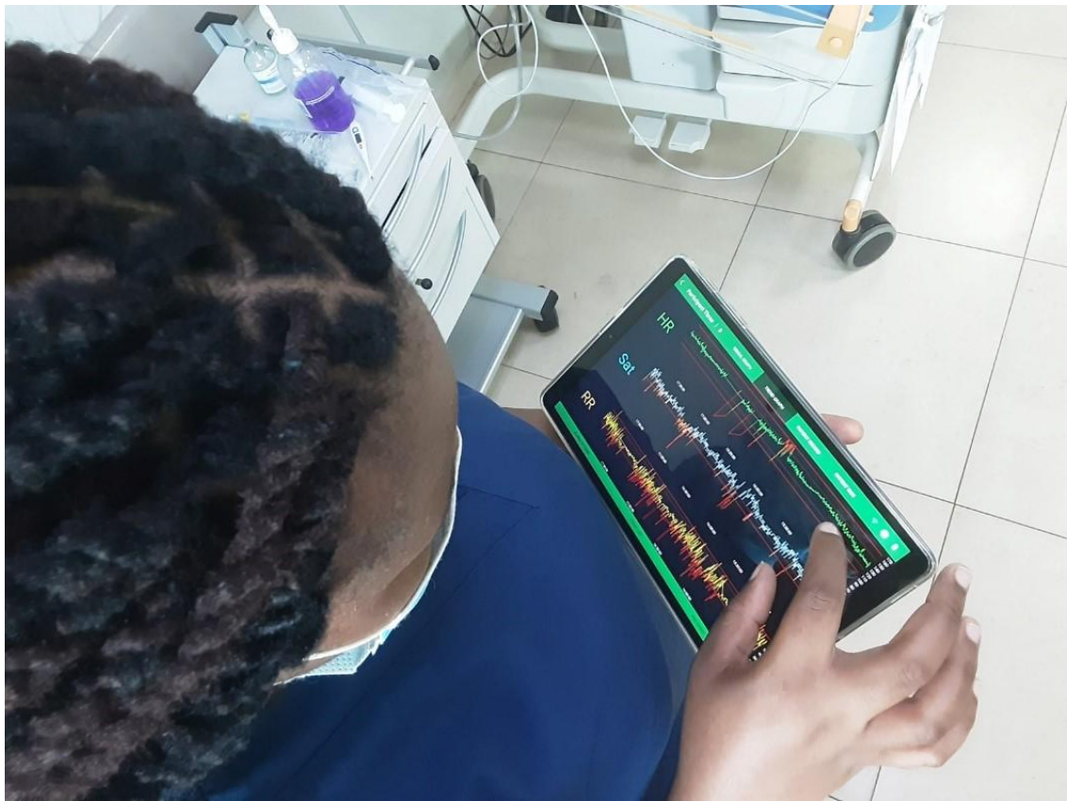
- A smart monitoring system for children in hospitals with limited resources.
- Aims to recognize small changes in children's' vital signs => *fast intervention*
- User-friendly and highly sensitive pressure sensor that is placed under the mattress



International education programs

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- International course Research and eHealth *"The Innovative Role of Nurses"*
- *Medicine across borders*; medicine students from NL and Kyrgyzstan conducting joint international implementation research to improve (digital) care for patients in remote areas.

Development of a European standard for health apps

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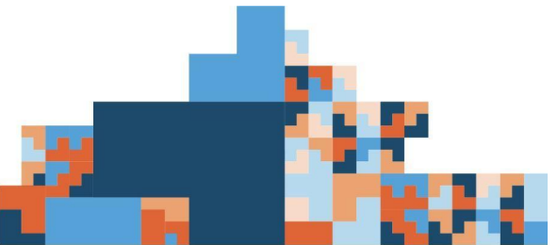
Attention for effective and trustworthy apps

NEN NORMONTWERPEN

LABEL2 ENABLE

ISO International Organization for Standardization

cen European Committee for Standardization



ISO 82304-2 - health and wellness apps quality and reliability

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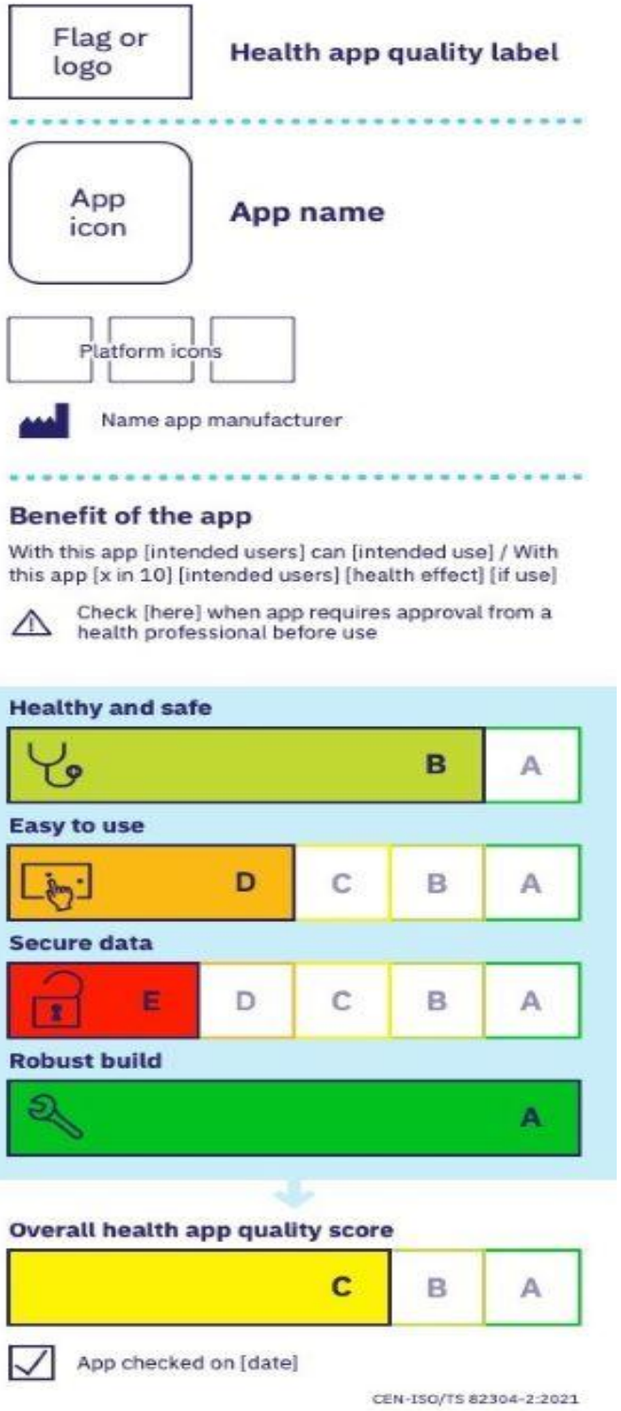


- Cooperation with several European countries
- Accepted and adopted by world standardization body ISO => *global standard*
- Single core framework = room for additional country-specific requirements

Aim: to create a single unambiguous assessment framework for health apps

Who can benefit from ISO 82304-2

App manufacturers who seek to deliver quality apps

Patients, citizens, and carers who seek to use health apps

Health and care systems and authorities who seek to review/ reimburse apps

Health care providers and professional societies who seek to recommend apps

Health App assessment organisations who seek to use a trusted, globally recognised assessment framework

App stores and libraries who seek to help their customers make informed decisions on health apps

JAMA®

QUESTION Is an artificial intelligence (AI)–led Diabetes Prevention Program (DPP) noninferior to a human-led DPP in meeting weight loss, hemoglobin A_{1c} (HbA_{1c}) reduction, and physical activity recommendations among adults with prediabetes and overweight or obesity?

CONCLUSION Among adults with prediabetes and overweight or obesity, referral to a fully automated AI-led DPP was noninferior to referral to a human-led DPP in achieving a composite outcome based on weight reduction, HbA_{1c}, and physical activity.

POPULATION

260 Women
108 Men

Adults 18 years or older with prediabetes and overweight or obesity

Median age: **58** years

LOCATIONS

2
Clinical sites in Maryland and Pennsylvania

INTERVENTION

368 Participants randomized

183

AI-led DPP group
Referred to a lifestyle intervention delivered via a mobile app and Bluetooth-enabled digital scale

185

Human-led DPP group
Referred to a lifestyle intervention delivered remotely via trained lifestyle coaches

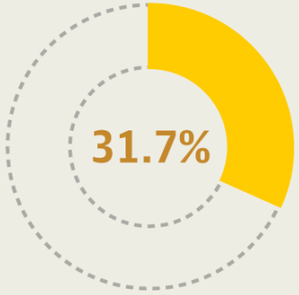
PRIMARY OUTCOME

Composite outcome of HbA_{1c} <6.5% throughout the study and ≥5% weight loss, ≥4% weight loss plus ≥150 minutes of physical activity per week, or absolute reduction in HbA_{1c} ≥0.2 percentage points

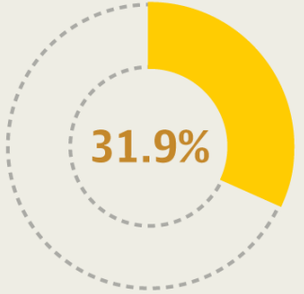
FINDINGS

Participants achieving the composite primary outcome

AI-led DPP group
58 of 183 participants



Human-led DPP group
59 of 185 participants



AI-led DPP was noninferior (noninferiority margin, 15%) to a human-led DPP:

Risk difference, −0.2% (1-sided 95% CI, −8.2%)

Mathioudakis N, Lalani B, Abusamaan MS, et al; for the AI-DPP Study Group. An AI-powered lifestyle intervention vs human coaching in the Diabetes Prevention Program: a randomized clinical trial. *JAMA*. Published online October 27, 2025. doi:10.1001/jama.2025.19563

Needs and perspectives of COPD patients regarding digital care

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- 8 focusgroups, n=59, average age 69 years, 46% male
  - Netherlands, Germany, UK, Flanders
- Barriers very diverse (next slide)
  - Therefore personalised solutions needed
- More research necessary to explore *cultural* differences
  - Increased cross border health care use
  - Cross border exchange of effective AI and eHealth innovations

Dr. Esther Metting, University Medical Center Groningen, the Netherlands

Barriers are diverse
Citations from patients

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The letters on the website are too small

Medical files do not give an explanation of difficult words

I have nobody who can help me

At home I had already forgotten the explanation

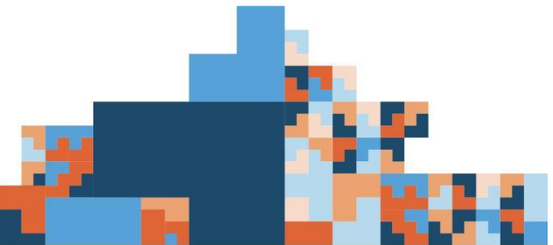
What is a QR code/back-up app?

I can't click the right thing (smartphone)

The app crashes. You see? I can't do it

If I use a video consultation, I will never see my doctor again

I wanted to take part in a digital coffeetable from Lungfund, but I do not have a webcam



Dr. Esther Metting, University Medical Center Groningen, the Netherlands

Hurdles for implementation of eHealth

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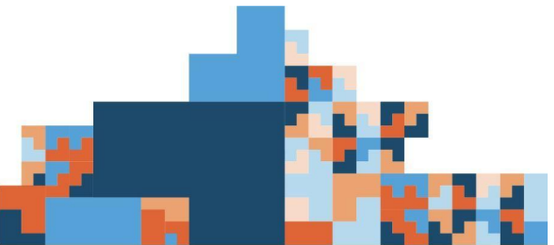
Hurdle	Possible solution
Safety of patient data	Parallel development environment for testing with temporary safe connection to existing ICT system
Less contact between patient and doctor	Blended care: eHealth as *addition* to personal contact. Degree upon which can be determined based on needs and possibilities of patient
Reimbursement	Healthcare insurers and regulatory bodies should be engaged early on in eHealth development, to enable multiyear financing in case of proven value
Does eHealth improve healthcare?	Scientific research to provide the evidence basis for eHealth




Thank You

National eHealth Living Lab

World eHealth Living Lab

Contact

Contact via

n.h.chavannes@lumc.nl

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www.wearewell.net

Contact via Social Media

www.linkedin.com/nell

www.linkedin.com/showcase/world-ehealth-living-lab-well