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Report

A review of the use of mHealth to promote healthy ageing and support the delivery of age-friendly health and long-term care services

by

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Foreword

The WHO Western Pacific Regional Office (WPRO) has identified healthy ageing as a key public health challenge. Equitable access to safe and high quality age-friendly health services is an important component of universal health coverage. At the World Health Organization (WHO) regional meeting on ageing and health in the western pacific, held in Manila in July 2017, the member states recommended incorporation of a whole systems approach towards healthy ageing. As part of a whole-of-systems approach to addressing this challenge, tele-/electronic-/mobile-health applications and technology transfer to low and middle-income countries were identified as an important strategy. Healthcare innovations for ageing, including *mobile health* (mHealth) interventions provide an unique opportunity to enhance access and equity of health service delivery to the elderly in LMICs (Low and middle-income countries).

The UNSW Sydney's School of Public Health and Community Medicine was selected to undertake a review on the use of mHealth to enhance healthy ageing and aged care services. We scoped and reviewed the literature to answer four questions:

1. How is mHealth being used by all stakeholders to promote healthy ageing and support the delivery of age-friendly health and long-term care services?
2. What are the effective models for implementing mHealth?
3. What are the lessons learnt from implementing mHealth initiatives?
4. Is there enough evidence to support the impact of mHealth?

This report presents the findings from the review.

Professor Siaw-Teng Liaw

on behalf of the UNSW review team

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Definitions

The following definitions were adopted for this review:

1. **mHealth:**
    - mHealth is defined by the WHO Global Observatory for eHealth (GOE) as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs) and other mobile wireless devices.
    - mHealth involves the use and capitalisation on a mobile phone's core utility of voice and short messaging service (SMS), as well as more complex functionalities and applications including general packet radio service (GPRS), third, fourth and fifth generation mobile telecommunications (3G, 4G and 5G systems), global positioning system (GPS) and Bluetooth technology.
    - Wearable technologies such as activity trackers and self-monitoring devices, that may be linked with non-mobile devices such as a computer, will be included in this review.
2. **Healthy ageing:**
    - WHO(1) defines healthy ageing as 'the process of developing and maintaining the functional ability that enables wellbeing in older age,' where 'functional ability comprises the health-related attributes that enable people to be and to do what they have reason to value'.
3. **Age-friendly environments:**
    - The 2015 WHO World report on ageing and health(1) describes eight domains of the age-friendly environments:
        1. Housing,
        2. Social participation,
        3. Respect and social inclusion,
        4. Civic participation and employment,
        5. Communication and information,
        6. Community support and health services,
        7. Outdoor spaces and built environment, and
        8. Transportation.

Glossary

apps	Applications
AT	Assistive technology
BP / DBP / SBP	Blood Pressure / Systolic Blood Pressure / Diastolic Blood Pressure
CAD / CVD	Coronary Artery Disease / Cardiovascular Disease
CASP	Critical Appraisal Skills Programme
COPD	Chronic Obstructive Pulmonary Disease
EHR	Electronic health record
GPS	Global positioning system
HbA1c	Glycosylated Hemoglobin A1c, an indicator of diabetes control
HIS	Health Information System
HRM	Human Resource Management
ICT	Information & Communication Technology
IHD	Ischaemic Heart Disease
IoT	Internet of Things
LIS	Laboratory information system
LMIC	Low and Middle-Income Countries
MCH	Maternal and Child Health
mHealth	Mobile health
MDGs	Millennium Development Goals
PICO	Population, Intervention, Comparator, Outcome
POC	Point of Care
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
QoL	Quality of Life
RCT	Randomised Control Trial
RE-AIM	Reach, Effectiveness, Adoption, Implementation, Maintenance
RIS	Radiology information system
SDGs	Sustainable Development Goals
SMS	Short Messaging Service
UI	User Interface
VOIP	video-over-internet protocols
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

Summary

Background

The WHO Western Pacific Regional Office (WPRO) has identified healthy ageing as a key public health challenge and recommended a whole systems approach to address this challenge. Tele-/electronic-/mobile-health applications and technology transfer to low and middle-income countries was identified as an unique opportunity to enhance access and equity of health service delivery to the elderly in low and middle income countries.

Objectives

Conduct a review of the literature and Google play store to answer the following questions:

1. How is mHealth being used by all stakeholders to promote healthy ageing and support the delivery of age-friendly health and long-term care services?
2. What are the effective models for implementing mHealth?
3. What are the lessons learnt from implementing mHealth initiatives?
4. Is there enough evidence to support the impact of mHealth?

Methods:

A comprehensive literature review and a search of the Google play store for apps related to aging and aged care.

Key Findings

- Conclusive evidence for the cost-effectiveness of mHealth to improve healthy ageing and support aged friendly health services is currently lacking.
- Feasibility and usability studies are well designed and confirm positive attitudes to mHealth with high intention-to-use and positive trends in user participation, uptake and engagement.
- Pilot studies on adoption and implementation should include safety and reliability testing, accuracy of underlying algorithms and validity and reliability of decision support rules.
- Heterogeneity in study design, implementation and measurements must be addressed and standardised to enable meta-analysis to further understand the impact of mHealth on clinical and patient outcomes.
- Innovation in research and evaluation methodology is important to translate feasibility studies into definitive clinical trials focused on outcomes. Mobile technology and electronic health records have important roles in broadening the reach and representativeness of RCTs, while substantially reducing the time to determine intervention effectiveness and reducing study costs.
- Future research needs experimental study designs and a holistic approach that addresses multilevel determinants (clinical, behavioural, and care coordination) of shared care, self-care and proactive collaborations between health care professionals and patients.
- The rapid pace of technological change and the rapid development, adoption (and demise) of mHealth apps presents crucial challenges for clinicians, users and policy makers.
- The gaps in mHelath to support sexual health, violence and injury, drug and alcohol abuse, and age-friendly environments highlighted need to be addressed. This may require a paradigm change from the biomedical model to a more holistic biopsychosocial one.

- Good implementation is important and must consider sociotechnical requirements of all the actors to optimise the use of mHealth in achieving the quadruple aims cost-effective beneficial outcomes for the patient and the community, patient satisfaction and provider well-being.
- Good collaborative partnerships among all the actors in the design, development, testing, implementation and evaluation of mHealth apps are essential.
- A participatory design approach is needed in which target users are involved in the co-development of cost-effective and personalized mHealth apps that are sufficiently mature before implementation.
- Healthcare organizations need to consider the risk of fragmenting clinical practice within the organization as a result of too many apps being developed or used.
- Robust governance frameworks are essential to anticipate and/or act on intended and unintended clinical outcomes and consequences of integrating mHealth tools and associated information into electronic health records (EHRs) and health information system (HIS) either directly or through an Internet of Things infrastructure.
- A robust governance framework for the use of mHealth tools and integration with the EHR and HIS is important.

Background and rationale

WHO regional context

WHO Member States are grouped into 6 WHO regions:

1. African Region,
2. Region of the Americas,
3. South-East Asia Region,
4. European Region,
5. Eastern Mediterranean Region, and
6. Western Pacific Region.

WHO Member States are also grouped into 4 income groups (low, lower-middle, upper-middle, and high) based on the World Bank list of analytical income classification of economies for the fiscal year, which is based on the annually released Atlas gross national income per capita estimates.

Countries are further separated into 6 World Bank regions: East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa. A 7th group comprising high-income countries in each of the 6 regions is also used in determining the reporting of **UN Sustainable Development Goals (SDGs)** indicators in 2017. In contrast, the **UN Millennium Development Goals (MDGs) program classified regions** into "developing" and "developed" regions, with further categorisation into the subregions.

The financial categorisation is important because, while the LMICs have the health of their people and the delivery of better health services as core development goals and eHealth is a recognized part of eGovernment, there are resource constraints. In LMIC the role of ICT and eHealth is largely limited to the collection and management of health data in contrast to upper-middle and high income countries where eHealth and eGovernment play a major role in improving health outcomes, for example, electronic health records (EHRs), clinical decision support and telehealth.

Population and mHealth context

The proportion of people aged over 60 years is increasing globally; it is expected to double by the year 2050[1]. This is due to a longer life expectancy which can be attributed to advancement in healthcare as well as improved access to health services worldwide. The increase in longevity is especially rapid in low and middle-income countries (LMICs), which is a major public health concern. According to the WHO (2014), there were 240 million people aged 60 years and above in the Western Pacific Region in 2010, of which 78% were from LMICs.

In this context, it has been estimated that there are over 3.2 billion unique mobile phone users(2) and approximately 1.75 billion smartphone users worldwide(3). The smartphone market, including the health information technology market, is shifting from Apple iOS towards the Android operating system, with current estimates that the ratio of *iOS:Android* smartphone is almost 20:80(3). The use of Android-based apps is due to a number of reasons: low- and medium-end hardware, availability in various screen sizes, multiple specifications, pricing and favourable costs.

Studies have emphasised the smartphone's efficiency as a communication tool, educational tool, information source and decision-support resource for patients and providers(2). Specific examples include the use of the 3D accelerometer for actimetric, body posture and falls monitoring; camera for evaluating cardiovascular system parameters, blood oxygen saturation, and eye pathologies; and microphone for recognizing diseases of the respiratory or cardiovascular systems(4). A recent meta-analysis examining the effects of mobile technology utilisation on psychotherapy outcomes found that patients who utilized mobile technology (including apps) as either a supplement to treatment or as a substitute for direct therapist contact experienced superior outcomes as compared with patients who did not receive mobile technology(5).

Positive drivers from a public perception perspective, market and population surveys have consistently demonstrated that patients, regardless of patient's age, race, gender or income, have positive perceptions of physicians who use smartphones in the clinical setting(6).

Mobile telephony and smartphones in aged care settings

The process of aging leads to sensory and motor deficits as well as changes the interactions between cognitive and sensory motor aspects of behaviour. Older adults may adapt to these changes by focusing cognitive resources serially, for instance by stopping conversation while putting on shoes(7). This strategy of approaching tasks serially may preclude older adults from getting the information that they need in a social or clinic setting. Within this context of serial cognitive resource allocation, interactive games provide older adults with opportunities to practice parallel processing of everyday tasks. Games that improve psychological health and cognitive functioning of older adults have demonstrated a positive impact on self-management and behaviour change(8)

Apps can be used as assistive technologies (ATs) for overcoming age-related sensory deficits, for detecting accidents and incidents while ageing in place, for supporting older adults with chronic diseases, and for enhancing personal communication and social companionship (9). Many authors have identified health-related ATs on smartphones as having the greatest potential for older adults; including services for improving diagnosis, investigation, monitoring, treatment, self-management and adherence(4).

Despite the increasing ubiquity of portable smartphones globally, the adoption and use of smartphones is highly age-dependant as demonstrated by recent population-based figures from the USA and the UK. For instance in 2013, while 58% of adults owned a smartphone in the USA, the percentage of younger old adults (aged 55-64) was 49% and the 65 and older age group was only 19%(10). The UK Office of Communication reported a similar age-related gap in the UK in 2013: while 62% of adult Britons owned a smartphone, only 20% of those aged 65-74 years and only 5% of those aged 75 years and over used smartphone. The inequitable age-dependent gap is likely to be similar, if not more, pronounced in LMICs.

The research to address this age inequity has recommended that:

1. Smartphones and smartphone apps should have an optimal design that is appropriate for older adults to accommodate their age-related perceptive, cognitive, and movement control resources(11). Accordingly, it is argued that gestural interfaces and other design characteristics of smartphones such as a large display could overcome existing barriers related to the use of feature phones(12, 13).
2. The uptake of smartphones could be fuelled by the proliferation of user-friendly

services and apps, called “launchers”, that meet people’s social and personal needs as well as generating positive expectations in terms of their quality of life(12, 14).

Launchers can be designed to ease older adults' use of smartphones and other assistive technologies by addressing perceptual, cognitive, and motoric changes that might hinder their ability to operate smartphones. Launchers enable older adults to be more successful and efficient in operating the smartphone(15). The overall completion rate of tasks for the age-adapted launcher was much higher than for the standard Android user interface (UI) with the participating older adults perceived the age-friendly launcher's UI as more comfortable and efficient than the standard Android UI(16). The trends point to the design of holistic frameworks related to different components of the Quality of Life (QoL) models(14).

Readiness to accept, adopt/adapt and use mHealth

Research using the Mobile Health Technology Acceptance Model (M-TAM) suggests that Performance Expectancy, Mobile Anxiety, Perceived Service Availability and Personal Innovativeness were major influencing factors of Behavioural Intention. Information gathering and communication were the major enablers in mHealth app usage, partly explaining why Communication and Consulting, Clinical Decision Making, Reference and Information Gathering, and Information Management are the most popular app categories(17). Major barriers to mHealth app usage include lack of knowledge and lack of investment.

Khatun et al (2015) developed a conceptual framework to assess community readiness for mHealth, consisting of three high level dimensions: technological, motivational and resource readiness(18). This has been tested in a rural sub-district in Bangladesh, where it was found that the community has some technological readiness but inequity was observed for human resource readiness and technological capabilities. The study population was motivated to use mHealth.

Liaw et al (2017) developed an informatics capability maturity framework to assess the readiness of health organisations to adopt and use eHealth and mHealth in their practice(19). This includes five dimensions:

1. Data collection, integration and management in the health information system and electronic health record;
2. Information sharing in the heath neighbourhood;
3. Managing health ICT implementation and change;
4. Data quality management and information governance; and
5. Using health intelligence to improve care and population health.

This was tested in some Australian Integrated Primary Care Centres in the context of enabling and supporting integrated care(19). The WHO integrated person-centred health services framework provides the broader context within which mHealth to support healthy ageing and age-friendly health services operates. The ultimate aim is to achieve improved cost-effectiveness, integration, safety and quality of care.

Maturity and usability of mHealth apps

The usual sequence of questions from a health care professional or clinician user with regards to the maturity and usability of mHealth apps is:

1. Will the app do any good in promoting health and or improving safety and quality of care?
2. Can I rely on the information gathered from the apps and is it evidence-based?
3. Can I rely on the robustness of the app including the maturity and reliability in its performance?
4. Will this app save me time and how easy is it to use in my routine workflow?

These are important questions to consider in the design, development and implementation of mHealth apps. It applies equally to all users from clinicians to managers to patients and carers.

Any proposed design and development of an app must carefully consider what's important from the perspective of the user, the environment and the resource constraints under which the user may be using the app. There must be iterative testing and evaluation for safety and effectiveness before any app is distributed or marketed.

There are different development and implementation requirements depending on the complexity of the app. We see these levels of complexity as including:

1. Stand-alone applications providing limited and specific point-of-care information for one particular use case or specialty.
2. Integrated with other third party systems to provide them with patient information from electronic health records (EHR), laboratory information (LIS) or radiology information system (RIS).
3. Clinical documentation to capturing patient and encounter data via a mobile device is complex when used in the routine clinical workflow.
4. Clinical decision support and complex tasks such as medication management with alerts for drug-drug interactions, drug-allergies, food allergies and so on.

The same levels of complexity apply for apps designed as patient decision aids. They should be considered in any evaluation of apps.

It is with this background that we developed the framework for the methodology (**Figure 1**) to answer the four review questions as framed below:

Review questions:

1. **How is mHealth being used by all stakeholders to promote healthy ageing and support the delivery of age-friendly health and long-term care services?**
    - *To answer this question, we assessed the extent of use as a proportion of an estimated total number of mHealth apps available for health care.*
    - *We also asseseds the pattern of use in terms of how, by whom, when and for what. The framework for the use of mHealth apps includes information sharing, education and training, healthy ageing behaviour, self-management, disease management, care delivery, organisational and managerial strategies and social approaches.*
    - *The overall context is the Internet of Things (IoT) and the characteristics of the population from middle age onwards (aged >45 years) to understand healthy ageing, with a sub-categorisation into the healthy and frail aged as ageing progresses.*
2. **What are the effective models for implementing mHealth?**
    - *We used the RE-AIM and access frameworks (20, 21) to assess the*

effectiveness of models to implement mHealth apps to promote healthy ageing and to support the provision of age-friendly aged care services.

- *These implementation models were reviewed according to the*
    i. *WHO themes of healthy ageing, including:*
        1. *Management of health,*
        2. *Healthier eating,*
        3. *Active living,*
        4. *Tobacco-free living,*
        5. *Reducing harmful alcohol and drug use,*
        6. *Mental health,*
        7. *Violence and Injury,*
        8. *Prevention of falls,*
        9. *Sexual health, and*
        10. *Age-friendly environments.*
    ii. *Level of health care, including:*
        1. *Self-care,*
        2. *Clinical care by a multi-professional team,*
        3. *A healthcare organisation, and*
        4. *The health system and in the social context.*

3. What are the lessons learnt from implementing mHealth initiatives?

- *What are the success factors, barriers, challenges and facilitators for implementing mHealth initiatives?*

4. Is there enough evidence to support the impact of mHealth?

1. *The answer to this question considered the study methodology, quality of evidence, domains of healthy ageing, self-management, information or behaviour, implications for practice and/or policy.*

Figure 1 describes the conceptual framework that guided the review and methodology adopted. There are 2 phases in the development cycle for mHealth apps:

- "mHealth app in development" through a formal design, development and testing cycle, and
- implementation and evaluation of mHealth apps that have been tested and found to be mostly mature i.e. reliable.

Testing of mHealth apps includes feasibility, acceptability or usability studies.

We described the implementation using the RE-AIM framework.

Evaluation may use qualitative or quantitative methods including time series, pre- and post-intervention studies or randomised control trials (RCTs). These will be assessed using the Critical Appraisal Skills Program (CASP) or PICO templates.

Figure 1 Overall framework for the inclusion of papers for the review

<table>
<tr><td>Included Users & Stakeholders</td><td colspan="3">mHealth app “in development”
To qualify there must be some testing such as feasibility/acceptability/usability/pilot studies</td><td colspan="2">Implementation and evaluation of “tested” mHealth app</td></tr>
<tr><td rowspan="3">1. Patients aged 45+ years
2. Clinicians
3. Health professionals
4. Managers</td><td>Design</td><td>Development</td><td>Testing</td><td>Implementation
May be qualitative or quantitative or use RE-AIM framework</td><td>Evaluation
May include time series, cohorts, pre- and post-intervention, quasi-experimental studies and RCTs.</td></tr>
<tr><td colspan="3">These 3 columns address Question 1</td><td>This addresses Question 2</td><td>This addresses Question 4</td></tr>
<tr><td colspan="5">All these columns address all review questions, but especially Questions 1 and 3</td></tr>
</table>

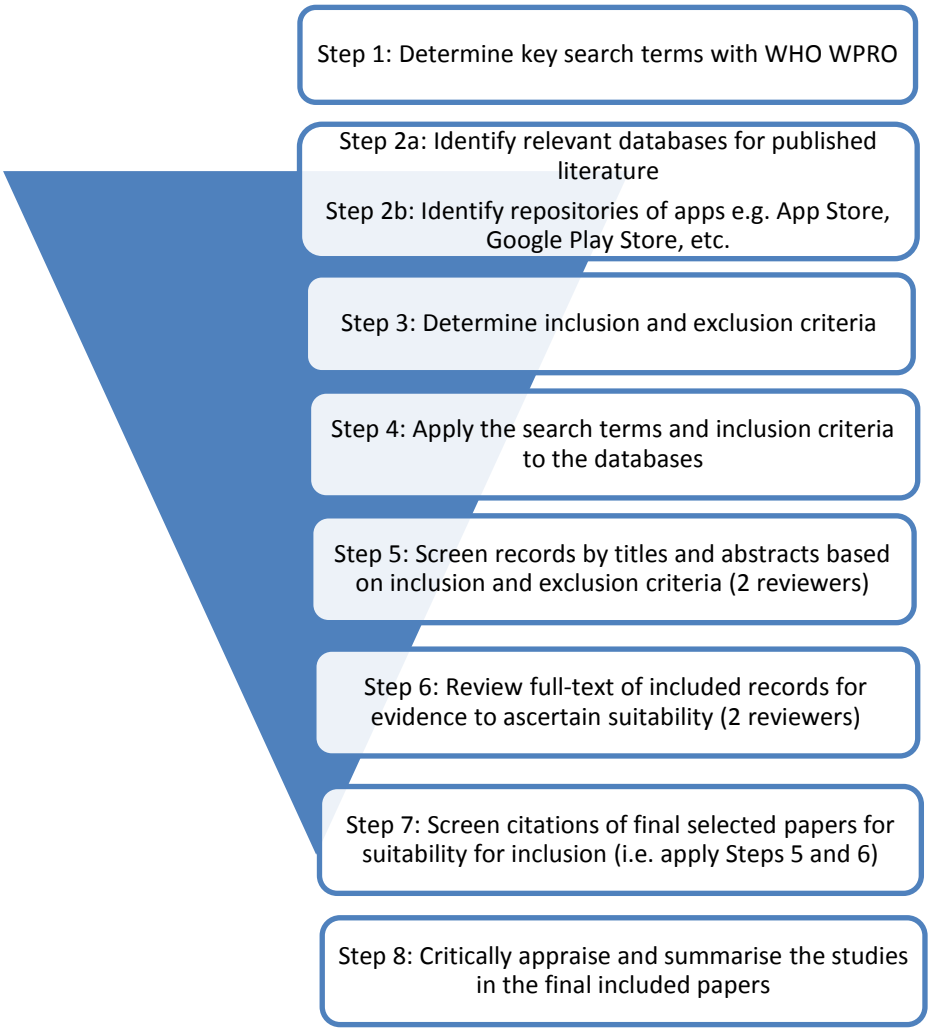
Note: *The target population is from middle age onwards (aged > 45 years) to enable an understanding of mHealth related to healthy ageing. However, some studies include all adults aged > 18 years; these should be included if the study population is predominantly > 45 years*

Methodology

The systematic review was carried out in various steps as per the PRISMA guidelines(22).

Figure 2 summarises the methods adopted for this review and is described below. The scope and stages involved in this systematic review (Figure 3) were discussed and agreed with the sponsor. The literature review was registered with Prospero, an international prospective register of systematic reviews, and can be accessed at: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=82383

Figure 2 Stepwise description of the review process



Inclusion criteria

- Literature which describe the use of mHealth interventions in people aged 45 years and older
- Literature published from 2007 onwards

Exclusion criterion

- Non-English literature

Search strategy

We searched the following electronic bibliographic databases: MEDLINE, EMBASE, Global Health, PsycINFO, Scopus, ScienceDirect, CINAHL and the Cochrane Library. The search strategy included terms relating to or describing mobile health interventions for adults. A combination of the terms *mobile health, healthy ageing and aged care* were used along with terms from the RE-AIM framework including *reach*, *effectiveness*, *adoption*, *implementation* and *maintenance*.

The search was restricted to records published in the English language from 2007 onwards. Where possible, the search was limited to people aged 45 years and older. In ScienceDirect, the broad Science categories were limited to the ones most applicable to this systematic review. The first search of the databases was conducted on 19th October 2017. Following the initial search results, further searches were conducted and the search strategy refined until a consensus was reached by the review team. The fifth and final search of the databases was conducted on 3rd November 2017.

Search terms

Various search keywords which broadly fell into following groups were used as part of the search strategy.

a) mHealth OR mobile health
b) Healthy ageing
c) Aged care

The final search strategy along with the search keywords is provided in Attachment 2.

Quality appraisal

- The above databases were finalised in consultation with a research librarian at UNSW Sydney.
- Consensus meetings were held on a weekly basis to discuss the review process.
- At least 2 members of the review team screened and selected records for inclusion based on titles and abstracts (Step 5).
- Depending on their expertise, two independent reviewers critically appraised the full text of each included study. In the event of disagreement, a consensus was achieved through discussion with at least one other reviewer.

Data extraction and management

- A detailed template incorporating the various parameters of the study was prepared and a unified scoring system used to extract the data (See Figure 1 and Attachment 1).
- Two reviewers independently reviewed each included paper. Disagreements were discussed to achieve consensus, often during a full review team meeting.
- Study biases were assessed and included for reporting.

Data synthesis

- The relevance of the studies was the first filter to include literature for the review.
- The RE-AIM framework(20, 21) was used to assess the extent of success of the implementation and uptake of the mHealth interventions.
- The assessment of access was done via a patient-centred model(23) that considers both health service and patient perspectives.

Search strategy for Android apps

Rationale: As part of this review we also searched the Google Play store to understand the number of Android-based health related apps available to the general public. We chose to understand the Android market for reasons we have stated in the Introduction. The smartphone market, including the health information technology market, is shifting from Apple iOS towards the Android operating system, with current estimates that the ratio of *iOS:Android* smartphone is almost 20:80(3).

Method: The Google play store in each country was searched using the same keywords from the search term groups - mHealth, healthy ageing and aged care – used in the literature search strategy. The Google play store application programming interfaces were used to carry out this search.

The mHealth apps from each country were further grouped based on the healthy ageing category indicated by their title and by the WHO region. We did not appraise the individual apps as this was out of the scope of this review.

Caveat: It is important to note that an app may be available in multiple countries and as part of multiple groups. The search results presented later in the findings section need to be interpreted in this context.

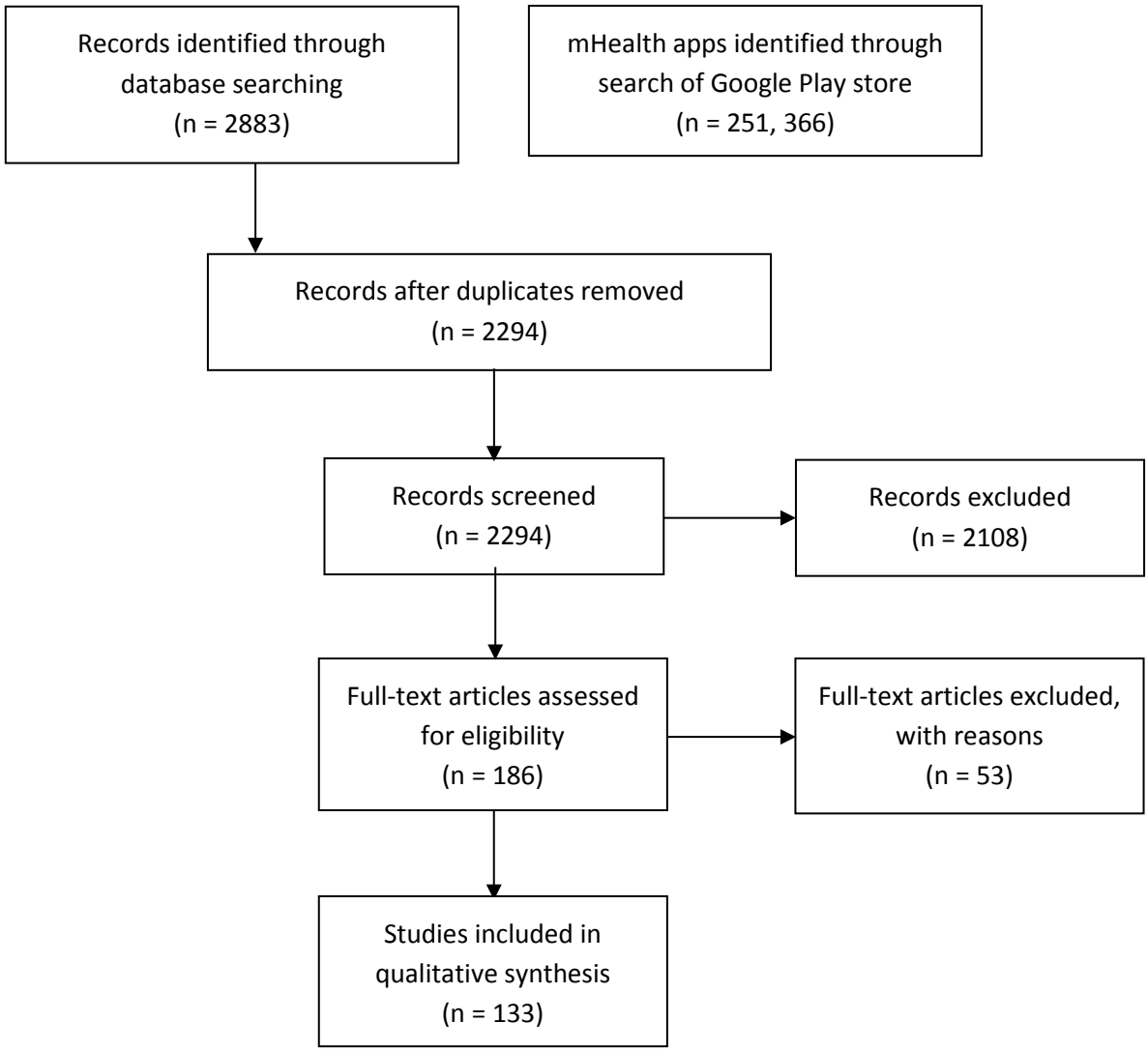
Findings

Search process and yield

The search results are summarized and presented as a PRISMA flow diagram (Figure 3).

The final search of the 8 chosen databases yielded 2883 papers. Removal of duplicates left 2294 papers. Assessment of the title and abstracts by at least two independent reviewers excluded 2108 papers. This left 186 papers for further assessment of eligibility. Of these 186, 53 were excluded and 133 were included for assessment of full-text and data extraction.

Figure 3 PRISMA Flow Diagram of search strategy



Distribution of included papers in the healthy ageing and health system strengthening frameworks to support age friendly services

The included studies were classified under the following themes of healthy ageing:

- Management of health
- Healthier eating
- Active living
- Tobacco-free living
- Reducing harmful alcohol and drug use
- Mental health
- Violence and injury
- Prevention of falls
- Sexual health
- Age-friendly environments

These studies were also classified under the following elements of use of mHealth to strengthen health systems to support age-friendly health services, at the 4 levels of care, including: self-care, care by multi-professional teams, care by healthcare organisations and within the health system in the social context. The framework includes:

1. Self-management applications such as education and patient information tools and decision aids
2. Sensors & point of care (POC) diagnostics such as fitness trackers, wearables, anaemia detection devices, etc.
3. Applications used by health care providers such as communication tools, information sharing, medication management, electronic health records and clinical decision support systems;
4. Applications used by health organisations to strengthen health systems(24) such as:
    a. Information exchange,
    b. Data collection and reporting systems especially in Maternal & Child Health in LMIC rather than in aged care,
    c. Patient/disease registries,
    d. Events monitoring especially in LMIC, and
    e. Human resources management (HRM), financial management and supply chain management systems

Table 1 summarises the numbers of included papers, classified by the combined framework and which review question was addressed.

Table 2 further describes the distribution of papers by the framework and by year of publication.

Table 3 summarises the number of apps available in the open market by geographic regions of the WHO.

Table 4 summarises the papers by how they address the RE-AIM framework.

Table 5 summarises the papers that were considered to contribute some evidence to the impact of mHealth.

The tables will be discussed under each review question.

Table 1 Included papers classified by the WHO themes of healthy ageing and age-friendly services framework addressing the review questions

	Papers on mHealth supporting the healthy ageing themes										Papers on mHealth supporting the delivery of age-friendly services				
Review question	Heath Management	Healthier eating	Active living	Tobacco-free living	Reducing harmful drug & alcohol use	Mental health	Violence and injury	Prevention of falls	Sexual health	Age-friendly environments	Self-management applications	Applications to support care by health teams	Applications to support care by organisations	Sensors & POC diagnostic applications	Health system strengthening applications including managerial systems
1. How is mHealth being used to promote healthy ageing and support the delivery of age-friendly healthcare services?	65	13	28	3	1	11		1		1	58	48	3	31	
2. What are the effective models for implementing mHealth initiatives?	58	9	20	3		11					51	43	2	21	
3. What are the lessons learnt so far from mHealth initiatives?	66	14	27	4	1	13		1		2	66	51	4	27	
4. What is the evidence to support the impact of mHealth?	32	9	14	2		2					34	27	2	12	

Table 2 Included papers classified by framework and by year of publication

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
mHealth initiatives for enhancing healthy ageing											
1. Management of health		1				3	5	11	21	23	13
2. Healthier eating						1	1	1	5	3	4
3. Active living						1	4	9	9	9	6
4. Tobacco-free living								2		1	
5. Reducing harmful alcohol and drug use											1
6. Mental health								1	3	8	5
7. Violence and injury											
8. Prevention of falls							1				
9. Sexual health											
10. Age-friendly environments							1	1			
mHealth initiatives for strengthening age-friendly health services											
1. Self-management applications						4	3	9	18	24	14
2. Applications to support care by health teams		1					4	9	19	16	9
3. Applications to support care by health organisations									2		2
4. Sensors and point-of-care diagnostic applications						1	4	9	8	9	9
5. Health systems strengthening applications including managerial systems											

Table 3 Included apps from Google Play classified by the WHO geographical regions

Healthy ageing themes	Number of mHealth apps associated with healthy ageing					
1. Management of health	3871	6026	5488	4965	2495	6468
2. Healthier eating	3871	5978	5439	4985	2490	6517
3. Active living	3912	5774	5321	4984	2491	6307
4. Tobacco-free living	2462	4133	3542	1320	**800**	2189
5. Reducing harmful alcohol and drug use	1915	3127	2714	1021	**580**	1701
6. Violence and injury	4018	6125	5390	4180	2450	6615
7. Mental health	3822	5782	5635	4802	2450	6615
8. Prevention of falls	4018	6272	5292	4900	2352	6517
9. Sexual health	4263	3481	**588**	4851	2450	6517
10. Age-friendly environments	4018	1312	11270	4802	2352	5341
WHO region	**Americas**	**Europe**	**Africa**	**Eastern Mediterranean**	**South-East Asia**	**Western Pacific**

Review question 1: How is mHealth being used by all stakeholders to promote healthy ageing and support the delivery of age-friendly health and long-term care services?

We examined the pattern of use in terms of how, by whom, when and for what in healthy ageing and aged-friendly health services. These include the functionalities:

- information sharing, especially in between face-to-face sessions;
- education and training, including "gamification";
- healthy ageing behaviour, including values and activities where indicated;
- self-management, including daily mood rating, prompts and reminders;
- disease and medication management;
- care delivery;
- organisational and managerial strategies, including data collection, monitoring and display; and
- social approaches, including values-driven activities and synching to personal calendars.

The data extracted shows that there were enough papers to address the review questions, especially from 2012 onwards. This is especially so for the themes of healthy ageing, except for violence and injury and sexual health where no papers were found. There were very few papers on falls prevention, harmful use of drugs and alcohol, and the age-friendly environment.

Table 1 shows that most papers describing mHealth apps development and evaluation addressed management of health (65 papers), followed by active living (28 papers), healthy eating (13 papers) and mental health (11 papers). The health problems managed were mainly chronic disease (diabetes, cardio vascular/ischaemic/coronary artery disease (CVD/IHD/CAD), Hypertension, heart failure, prostate, urinary, back pain, cancer). There were mHealth papers on apps to assist self-management, management by health teams and about sensors and point-of-care diagnostic applications.

Table 2 shows the evolution of the mHealth domains. Papers on mHealth apps showed an increasing trend from 2012, especially for health management, healthy eating and physical activity and in 2014 for mental health (Table 2). There appears to be a peak in 2015-2016, which may be a manifestation of the hype cycle. For instance, there were a few smoking cessation papers, but we did not find any published beyond 2016.

Table 3 illustrates the global digitalisation through the "Internet of Things", with all of the WHO regions having potential access to apps in all aspects of healthy ageing through the Android world. This is significant as Android phones and apps are much cheaper than the Apple iOS apps and tools. We identified other issues to do with the reliability, quality and security of mHealth, but that is not directly relevant to this review. The large numbers (251, 366) of apps found was due to the search methodology as the same apps may be available in a number of countries.

The relatively lower number of apps on sexual health and the use of tobacco, alcohol and drugs parallel the number of papers in the main literature review (Tables 1, 2 and 4). Sexual heath apps were particularly low in the African region. Tobacco, alcohol and drugs apps were particularly low in the South East Asian region. The Western Pacific region appears to be no different from the rest of the other regions. However, it is important to note that digitalisation breaks down international boundaries and barriers to access to mHealth apps.

Some positive examples from the literature review include:

- A cluster randomised controlled trial of a medication adherence and lifestyle

modification app for cardiovascular disease in Tibet, China and India showed improved clinical outcomes and quality of care in China and India (25).

- Testing of a tablet-based intervention for patients recovering from surgery for gastric cancer resulted in better post-operative self-care compared to a retrospective control group who received usual care (26).
- A longitudinal study of a mobile phone-based intervention for identifying hypertension in a cohort of Chinese patients found that participating in the study enhanced their health beliefs (27).
- The use of mobile health has shown positive effects towards enhancing lifestyle and wellbeing in older people globally. Piloting of a smartphone-based tool to stimulate physical activity in Dutch general practices in patients with either COPD (chronic obstructive pulmonary disease) or diabetes had a positive impact on the participants' level of physical activity (28).
- A more recent pilot of a pedometer app for smartphones in Mexican oncology clinics was successful in detecting chemotherapy-induced toxicity by monitoring patients' daily step count (29). A pilot randomised controlled trial of a mobile phone intervention to assist mindfulness for curbing depression in a rural German population showed improved clinical outcomes over the four-month follow-up period (30).
- The use of a mHealth application among older American adults indicated enhanced cognitive function and self-rated wellbeing among the participants (31). The use of a mobile device to promote healthy eating and physical activity in another American population showed significant weight loss among the participants (32). These studies imply that mHealth applications can be a useful aid for management of chronic health conditions.

In contrast to the above studies, a randomised trial of incorporating a mobile phone intervention into existing diabetes programmes in three LMICs did not show a change in diabetes control in the two-year follow-up period (33). This is not surprising given the evolving and dynamic nature of mHealth applications (34).

The application of mHealth also has implications for provision of healthcare:

- Implementation of a phone application for cardiovascular risk assessment among community health workers in South Africa led to reduction in training and screening time as well as calculation errors (35).
- Evaluation of the impact of giving tablets to healthcare providers in an American healthcare organisation revealed that more than half the providers felt comfortable using the device. The intervention led to an increase in overall productivity, improved patient-provider communication and process of care (36).

In summary:

There is a large range of uses where mHealth technologies have been applied. Many of the apps provided feedback, reminders or prompts in self-care as an adjunct to complement existing clinical services. This is usually in the context of outreach services in disease specific specialties such as diabetes, CVD, COPD, cancer and mental health. This is as close as mHealth gets to the concept of multidisciplinary teams providing integrated age-friendly care.

There were little or no papers on apps used in the violence & injury, sexual health and age-friendly environment categories. The lack of recent work on smoking cessation was surprising, but the increasing emphasis on mental health is encouraging.

There was little on mHealth as a new service delivery model or model of care or to support care

by health organisations, including stepped up care, or to support managerial systems. A reason for this is the context as the functionalities provided by mHealth apps will be prioritised differently in different countries under different resource constraints. In many Low and Middle Income Countries (LMICs), the prevailing context of mHealth is Maternal and Child Health (MCH) rather than Aged Care. This is reflected in the model for mHealth in strengthening health systems developed by Labrique et al, which is based on MCH in LMICs (24). There is therefore an emphasis on MCH data collection and reporting systems of some managerial systems such as supply chain management or linking community health workers with the hospital system in LMICs. This is not completely applicable to adult and aged care.

However, the evidence base is growing and as it grows, we expect the policies and strategies governing these applications will also follow.

Review question 2: What are the effective models for implementing mHealth?

We assessed the implementation using the RE-AIM and access frameworks (20, 21) at the following levels of health care (Table 4):

- self-care,
- clinical care by a multi-professional team,
- by a health care organisation, and
- by the health system and in the social context.

Little was reported on models of successful implementation or evaluation of theory-based models. Those reported were mainly assessments of readiness using the Technology Adoption Model (17), with little explicit description of the translation into the design, development and testing as well as the evaluation phases. There were studies that tested the accuracy of algorithms for specific sensor technologies.

Launchers with a larger number of features were found to have, on average, more usability problems. Reducing the number of features is not necessarily a feasible way to increase usability. More research-based development is needed, which should better consider recommendations for the age-friendly design of user interfaces (UIs) on smartphones (11-13). Nevertheless, the design and development aspect of mHealth interventions appear to be mature and is well-illustrated in many studies.

Many of the studies conducted feasibility testing and/or usability testing or a pilot study followed by, usually, small trials and post-intervention feedback. The FITT (Fit between Individuals, Task, and Technology (37)) and Health-ITUEM (Health IT Usability Evaluation Model (38)) has been used to understand the usability and learnability of mobile devices and applications. Usability is assessed on three dimensions: 1) task-technology fit; 2) individual-technology fit; and 3) individual-task fit. The 9 concepts of the Health-ITUEM includes: *Error prevention, Completeness, Memorability, Information needs, Flexibility/Customizability, Learnability, Performance speed, Competency, Other outcomes*. To develop a finer granularity of analysis, the nine concepts can be broken into positive, negative, and neutral codes. The resultant 27 codes were used to code text data for usability analysis. These studies demonstrated the positive usability of smartphones in solving health challenges with some differences in performance among devices.

Self-Regulation Theory (SRT) was a theoretical framework to explain the use of text messages to promote adherence. According to SRT, text messages provide patients with support to cope with and adapt to their health care experiences and conditions, act as prompts and reminders, reduce forgetfulness, clarify misinformation and support and encourage adherence to medications and other treatments. It is based on assumptions of patients, their roles in self-care and shared care and acceptance of their roles by health care providers (HCPs). The eventual outcomes to be achieved are to maintain usual activities of the patients and help patients to be emotionally comfortable (39).

The Health Belief Model (HBM) or Self-Determination Theory (SDT) was also used to guide the development of the content of the text messages in some studies e.g. how to present information on how the participants' medication works (40). Also used is the Patient Activation Measure (PAM), a 13-item instrument, is an interval-level, unidimensional Guttman-like measure that contains items measuring self-assessed knowledge about chronic conditions, beliefs about illness and medical care, and self-efficacy for self-care. The PAM focused on physical conditions and measures activation as a broad construct (41). The Health Care Climate Questionnaire (HCCQ) assesses patients' perceptions of the ability of the health-care professionals in supporting their autonomy (versus "controllingness") and in motivating their

initiative in care management. The HCCQ consists of 15 items on a seven-point Likert scale ranging from “strongly disagree” to “strongly agree” (42).

There was also implicit use of the 12 'theoretical domains' from 33 theories to explain behaviour change:

- knowledge,
- skills,
- social/professional role and identity,
- beliefs about capabilities,
- beliefs about consequences,
- motivation and goals,
- memory, attention and decision processes,
- environmental context and resources,
- social influences,
- emotion regulation,
- behavioural regulation, and
- nature of the behaviour (43).

Smoking cessation apps were examining the psychopathology and treatment models underlying Acceptance and Commitment Therapy (ACT), which is linked to the nature of human language and cognition (44). ACT is consciously based on basic behavioural principles. The evidence available suggests that ACT works through different processes than active treatment comparisons such as the traditional Cognitive-Behaviour Therapy (CBT) (45).

There was some evidence to suggest that when there is more direct contact between the research team and participant through technologies such as video-over-internet protocols (VOIP), retention rates are greater and less subject to bias (46) suggesting a hybrid approach may provide an optimal response (47). Continuing user engagement with self-guided mobile-Web interventions can be improved with support by professional caregivers or integrated within a health promotion program (48).

A study of an mHealth app for obesity suggested that, despite a mobile delivery method e.g. phone or tablet, a majority (58%) often use a non-mobile device (desktop computers) to access podcasts mostly at their home or work, and 62% were mainly non-mobile (e.g., sitting at work) when listening (49). This raises the questions as to the nature of the effect of the mHealth app. Is it a facilitator or the effector of the changes? Implementation needs to consider this fidelity issue.

A small trial demonstrated that direct-to-consumer mHealth apps aligned with behaviour change theories can augment brief psychoeducation interventions (50). However, this was not a definitive trial and not powered to detect moderators and mediators of this tool.

Interrogative plus social context messages are more effective in the context of cancer screening. mHealth is not a uni-directional intervention and there is a continuous interaction cycle happening with a program team (51). The high completion of the interactive surveys (75%) demonstrated a general willingness in the community to respond to mobile technology and mHealth tools. The automatic alerts sent to patients as reminders were also possible explanations for the high survey response.

Many of the papers did not appear to explicitly examine the effect of launchers to enhance the usability for the elderly. This appeared to be part of the consistent theme from this review – the technology did not appear to have sufficiently matured beyond feasibility studies. A comparison of a set of commercialised smartphone launchers with an adapted user interface (UI) and

assistive technologies (ATs) for older adults by means of heuristic evaluation showed that launchers generally integrate only basic features such as calls, texting or contacts and only one assistive technology such as an SOS service. The overall usability varied across different launchers. They often were inadequate in meeting older adults' needs and abilities. In particular, usability problems linked to content and perception were discovered that limit the older adults' capability for error recovery as well as visual, auditory, and haptic access to the information provided by the UI (11-13).

Co-design and development appeared to be gaining momentum. At the team and organisational level, medical staff members and dietitian enrolled to co-develop a mHealth app to provide a feasible solution to the challenge of post-operative management of cancer patients (26).

Another good example for co-development is the Integrated Illness Management and Recovery (I-IMR) was based on the stress vulnerability model, which asserted that biological vulnerability and stress are impacted by factors that people have control over, such as coping skills. This model uses an adaptive systems engineering framework and user-centered design to guide the multi-stage iterative design and testing of a smartphone intervention (I-IMR) to self-monitor their behaviour (52).

In summary:

This section illustrates examples of some of the conceptual frameworks and theories that underpin the development, implementation and evaluation of mHealth projects. This includes an examination of the reach, efficacy/effectiveness, adoption, implementation and maintenance of the mHealth apps and tools.

Table 4. Included papers that addressed implementation of mHealth within the RE-AIM construct

Aspects of implementation	Reach	Efficacy / Effectiveness	Adoption	Implementation	Maintenance
mHealth strengthening healthy ageing					
1. Management of health	9	54	2	26	1
2. Healthier eating	2	8		1	
3. Active living	4	21		9	
4. Tobacco-free living	3	3		4	
5. Reducing harmful alcohol and drug use	1			1	
6. Mental health	3	12		10	
7. Violence and injury					
8. Prevention of falls					
9. Sexual health					
10. Age-friendly environments					
mHealth strengthening age-friendly health services					
1. Self-management applications	12	46	2	22	1
2. Applications to support care by health teams including EHRs and EDS	9	42	1	20	
3. Applications to support care by health organisations	1	3		5	
4. Sensors and Point of Care (POC) diagnostics applications	5	21	1	5	
5. Health system strengthening applications					

Review question 3: What are the lessons learnt from implementing mHealth initiatives?

The review brought to light several key lessons learnt from implementing mHealth initiatives. These are highlighted below.

Constraints and barriers in implementing mHealth initiatives: Many studies report constraints and barriers at almost every step in the process of design, development, testing, implementation and evaluation of a mHealth app. These barriers relate to the technology, the context and the participants (53).

Expectations around mHealth apps: Adherence to medication regime, or any protocol for that matter, is a multidimensional problem and cannot solely be solved by an app. It is important to "Avoid the hype" to manage expectations. This was exemplified by Apple's promise "there is an app for that" when they introduced the Medication Plan its App Store in 2008 (54).

Challenging current practices and assumptions: Implementing mHealth may challenge existing assumptions and practices, creating a change management barrier. For example *SIRRACT: An International Randomized Clinical Trial of Activity Feedback During Inpatient Stroke Rehabilitation Enabled by Wireless Sensing* (55) found that based on sensing data, walking time amongst patients actually decreased by 30% over the course of their rehabilitation admission. Their conventional rehab intervention wasn't operating as they assumed it to be. Sensors and other objective measures of outcome indicators provide the ability to check the effectiveness of conventional treatments and rehabilitation for ageing people.

Practical considerations were ignored: Particular difficulties with engaging participants include high risk patients and patients from low income groups. Some lessons to facilitate participant engagement include the ability to save and share messages, having the support of providers and family, a feeling of support through participation in the program, the program being initiated close to the time of a CV event, personalised messages, opportunity for initial face-to-face contact with a provider, and program and content was perceived to be from a credible source. Diet and physical activity messages were most valued. Four messages/week was ideal. Program duration should be at least for six months or longer (56).

In a pilot study of an accelerometer-equipped smartphone to monitor older adults with cancer receiving chemotherapy in Mexico, the main reasons for not recording steps were being on a geographic area without GSM coverage, not wanting to carry the smartphone, "feeling too bad" to carry the smartphone, technical problems with the application, forgetting to charge the smartphone, and forgetting to carry the smartphone (29).

Post- intervention measures are important: Video consultations preceded by uploading relevant measurements can lead to clinically and statistically significant improvements in glycaemic control among patients who have not responded to standard regimens. However, continuing effort and attention are essential as the effect does not persist when intervention ends. Furthermore, future studies should focus on differentiation as the most vulnerable patients are at greater risk of non-adherence (57).

A pilot randomized controlled trial in Kenya (WelTelKenya) showed that an interactive mobile phone text-messaging intervention can improve adherence and viral load suppression in five participant groups: youth (14–24 years), mature (50 years), English as a second language, remote (3 hours travel time to clinic), and non-suppressed. The intervention was a useful way to communicate with health care providers, thus increasing the ability to access services, report side effects, and attend appointments (58).

Text interventions are feasible in patients with cancer prescribed oral anticancer agents (OAs) for symptom management and medication adherence and may be effective in helping patients engage in behaviour change and improve self-care (59).

A theory-based intervention, called HEART, aimed to encourage adults with ischemic heart disease (IHD) to undertake regular physical activity and improve fitness through an automated system of text messages and a supporting Web site. To participate, patients need access to the Internet, which will limit participation (60). The mobile usability and feasibility of Bite Counter, a watch-like device that detects when a user consumes food or beverages, was tested in a behavioural weight loss study, Participants found the Bite Counter easy to use and that use was associated with weight loss (32).

Limited evidence on the cost-effectiveness of mHealth apps: There were limited evidence available on the cost-effectiveness of mHealth apps. The simplified cardiovascular management model tested in the SimCard study in multiple countries demonstrated some cost-effectiveness. It has the potential to be scaled up in more regions in China, India, and other countries to benefit a large number of disadvantaged populations (25).

Integrating mHealth with social media had larger benefits: We also found that integrating mHealth tools with social media applications such as Twitter had larger and compounding benefits. The type of device used for podcast listening did not affect participant engagement but there was a trend toward greater weight loss among mobile phone users. Twitter postings were associated with greater engagement and weight loss. Mobile app users posting more to Twitter lost more weight (49).

In summary:

The included studies suggest that mHealth apps for the care of chronic diseases are feasible, usable and reliable. However, it should be noted that many of the included studies were not adequately powered or did not showed significant differences between control (usual care) and intervention groups. This might be due to the diversity and lack of quality in study designs (e.g., inaccurate or incompletely reported sample size calculations).

Future research needs innovative experimental study designs to complement the traditional RCTs as well as a holistic approach that focuses on multilevel determinants (clinical, behavioral, and care coordination) to promote self-care and proactive collaborations between health care professionals and patients to manage chronic disease care. The use of observational electronic health record data is a promising area to enhance prevailing research methodologies (61-63).

A participatory design approach is needed in which target users are involved in the development of cost-effective and personalized interventions. Too often technology is being developed within the scope of the existing structures of the health care system. Including patients and carers as part of the design team stimulates and enables designers to think differently, unconventionally, or from a new perspective, leading to apps that are better tailored to patients' and carers' needs (64).

Review question 4: Is there enough evidence to support the impact of mHealth?

The included studies covered the use of mHealth apps in a range of healthy ageing themes ranging from:

- mHealth to complement a diabetes prevention program (33, 65, 66)
- different patient reminders for pneumococcal vaccination in eligible adults (67)
- cardiovascular management (25)
- obesity and weight loss (49) (68)
- comparing impact of Fitbit tracker and website with pedometer on moderate to vigorous physical activity amongst post-menopausal women (69)

Cardiovascular Management: The simplified cardiovascular management model tested in the SimCard study in multiple countries demonstrated some cost-effectiveness. It has the potential to be scaled up in more regions in China, India, and other countries to benefit a large number of disadvantaged populations (25).

Diabetes Management: The Diabetes Prevention Intervention Using a Mobile App complemented the 6-sessions Diabetes Prevention Program with home-based program delivered by a mobile phone App and pedometer, with daily text messages and a video clip. The control group received a pedometer without step goals and standard medical care. The recruitment was stringent with 20% not completing screening. 61 out of 103 invited were recruited after screening and randomised (30 intervention, 31 control). Outcome measures were self-reported diet, weight, a calorie and physical activity diary, and pedometer readings. Weight loss and pedometer readings were greater in the study group. There was reduction in hip circumference, BP, and intake of sat fat and sugar sweetened drinks. However, there was no effect of lipid or glucose levels. There was good adherence over 5 months. Small sample size with relatively high incomes and larger proportion of females limits generalisability. Social desirability bias of self-reported measures is highly likely and limits the integrity of the study (66).

The study on the effect of text message support on diabetes self-management in developing countries did not show a benefit of adding the mHealth intervention to existing care and self-management programmes (33). The absence of an effect might be explained by the variety of patients and disease-related characteristics, the non-homogeneous implementation of the intervention, and/or the influences that the routine programme might have had on the outcomes. The readiness of the individual and community may not have been optimal (18) as may be the informatics capability maturity of the local health facilities and system(19) (33).

An app was effective in decreasing hypoglycemic events by immediately alerting patients about the need to manage their hypoglycaemia, particularly if it was severe hypoglycaemia (blood glucose <74 mmol/l with hypoglycemic symptoms and <2.78 mmol/l, requiring the assistance of another party, respectively (65). The beneficial results seem to come from the increased physical activity and a healthy dietary pattern induced by the tailored feedback instantly generated by the clinical decision support system (CDSS) rule engine in the clinical information system. While this can be seen as a digital divide issue based on age or socioeconomic status (70), the 85% participation rate in the study indicate that older patients can adopt a new and advanced technology, refuting a common stereotype that this age group is inflexible.

Obesity and weight loss: This quality problem is consistent across all the clinical trials conducted on “mHealth apps to support the management of health theme in healthy ageing” as reported in the included papers. However, access and equity are important issues to address as tailored

text messaging is a promising approach to weight control among underserved, urban African American adults. This is significant because African Americans, and African American women in particular, have among the highest rates of obesity in the US (68).

Patients with a variety of chronic conditions will complete interactive voice response (IVR) self-care support calls regularly. Risk factors for missed IVR calls overlap with those for missed appointments. Despite the favourable findings, IVR cannot fully address the barriers to health service engagement among some of high-risk patients. Involvement of informal caregivers may significantly increase engagement (71, 72).

Population based trials were more robust. Reminders through mobile phones can work at a primary care level in a LMIC in a real-world setting (73).

Elderly vaccination programs: A randomised controlled trial on the effect of various types of reminders communicated to eligible patients identified in the clinic electronic health records on the uptake of pneumococcal vaccine in adults (67) found that SMS and email reminders are effective for patient uptake of vaccination, and can be reinforced by subsequent phone calls. Pneumococcal vaccination rates increased significantly in the phone-call reminder group. However, there were logistic problems such as a shortage of vaccine availability following first reminder, which could have lowered the vaccination rate. Personalising the messages may increase the rates. A hybrid approach of old and new technologies is indicated (67).

mHealth apps in the acute care of aged patients were also more promising, especially if there was a link between the app and the EHR and clinical information system (65). It is possible to integrate home based measurements collected through the mHealth app into EHR and use the decision support tools in the EHR to personalise guidance for self-management (74).

The type of device used for podcast listening did not affect participant engagement but there was a trend toward greater weight loss among mobile phone users. Twitter postings were associated with greater engagement and weight loss. Mobile app users posting more to Twitter lost more weight (49).

Wireless automated data transfer technology is another potential and driver for mHealth. SmartLoss provides the ability to deliver intensive behavioural weight loss interventions, consistent with treatment guidelines, remotely. The platform provides remote monitoring of progress and the delivery of personalized treatment recommendations and lesson material via the multimedia capabilities of smartphones (75). SmartLoss promoted clinically meaningful weight loss over 12 weeks compared with an attention-matched control group and user-satisfaction was favourable. This small feasibility and pilot study provides an insight into the wireless automated data transfer technology.

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
63. Hagoel, L., Neter, E., Stein, N., & Rennert, G. (2016). Harnessing the question-behavior effect to enhance colorectal cancer screening in an mHealth experiment. American Journal of Public Health. 106(11), 1998-2004. doi:10.2105/AJPH.2016.303364	H	Phone message not read; a personalised signature may be more effective; the mechanisms underlying QBE were not examined; population-level interventions seldom influence heterogeneous audiences significantly.	Cancer	Primary	60.4	interrogative + social context compared to non-interrogative questions and no intervention	No	Question based behaviour effect (QBE) modest in colorectal cancer screening, but the absolute number of potential screenees may translate into a clinically significant health promotion change		
157. Tian, M., Ajay, V. S., Dunzhu, D., Hameed, S. S., Li, X., Liu, Z., . . . Yan, L. L. (2015). A cluster-randomized, controlled trial of a simplified multifaceted management program for individuals at high cardiovascular risk (SimCard Trial) in Rural Tibet, China, and Haryana, India. Circulation. 132(9), 815-824. doi:10.1161/CIRCULATIONAHA.115.015373	M/H	may not be generalizable to healthcare settings without existing or available CHWs	CVD	Community	59.7	Summarized as a 2+2 model, consisting of 2 therapeutic lifestyle modifications (smoking cessation and salt reduction) and the appropriate prescription of 2 medications (BP–lowering agents and aspirin).		Significant increase in % high-risk individuals taking aspirin (17.1%, P<0.001) across both countries but higher in China. Significant reduction in mean SBP (–2.7 mm Hg, P=0.04).	Sample not adequate and data not complete enough for subset analyses;	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
88. Lim, S., Kang, S. M., Kim, K. M., Moon, J. H., Choi, S. H., Hwang, H., . . . Jang, H. C. (2016). Multifactorial intervention in diabetes care using real-time monitoring and tailored feedback in type 2 diabetes. Acta Diabetologica. 53(2), 189-198. doi:10.1007/s00592-015-0754-8	M/H	Only if can use SMS or have Internet access. Short (6-month) follow-up period might not be long enough to evaluate the long-term effect of this system.	Diabetes	Primary	64.3	Physical activity-monitoring device and dietary feedback WITH integration into a EHR-CDSS package	Individualized multidisciplinary u-healthcare service combined with exercise monitoring and dietary feedback	Improved HbA1c, fasting & 2HPP BG, BMI, waist girth, lipids, BP, LFTs, & microalbuminuria.	11.6 % u-healthcare group reduced their dose of oral antidiabetic drug or insulin (no change in antidiabetic medication in the SMBG group)	
5. Akhu-Zaheya, L. M., & Shiyab, W. e. Y. (2017). The effect of short message system (SMS) reminder on adherence to a healthy diet, medication, and cessation of smoking among adult patients with cardiovascular diseases. International Journal of Medical Informatics. 98, 65-75. doi:https://doi.org/10.1016/j.ijmedinf.2016.12.003	M	Text messages found to be boring and repetitive by some, esp in placebo group. Change in patients' health status not monitored. A process evaluation of intervention needed to examine acceptability and feasibility. Longer follow-up period is needed to	CVD	Primary	55	Automated messages about medication, diet and smoking cessation were sent to mobile phones of patients in the experimental group from a database that was created by a commercial software company	Routine care, which included arranged cardiac clinic physician visits, diagnostic procedures, lab tests and prescription of usual medication	Significant change in 8-item Morisky Medication Adherence Scale (MMAS-8) p=0.001	No significant change in Readiness to Quit Smoking Ladder (p=0.327), Significant change in Mediterranean Diet Adherence Screener (MEDAS) (p= 0.000)	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
		assess maintenance of improved medication adherence.								
11. Anzaldo-Campos, M. C., Contreras, S., Vargas-Ojeda, A., Menchaca-Díaz, R., Fortmann, A., & Philis-Tsimikas, A. (2016). Dulce wireless Tijuana: A randomized control trial evaluating the impact of project Dulce and short-term mobile technology on glycemic control in a family medicine clinic in Northern Mexico. Diabetes Technology and Therapeutics. 18(4), 240-251. doi:10.1089/dia.2015.0283	M	Incomplete data due to patient and employment mobility; varying intensity of intervention; small margin for attrition	Diabetes	Primary	51	Project Dulce–only (PD); Project Dulce technology enhanced with mobile tools (PD-TE); or IMSS standard of care/control group (CG).		HbA1c reducted and knowledge improved		
20. Bobrow, K., Farmer, A. J., Springer, D., Shanyinde, M., Yu, L. M., Brennan, T., . . . Levitt, N. (2016). Mobile Phone Text Messages to Support Treatment Adherence in Adults with High Blood Pressure (SMS-Text Adherence Support [StAR]): A Single-Blind, Randomized Trial. Circulation. 133(6), 592-600. doi:10.1161/CIRCULATIONAHA.115.017530	M	Well-designed study with ITT analyses. General population could not detect change in SBP,	Hypertension	Primary	54.3	information-only SMS text messages (n=457); interactive SMS text messages (n=458); or usual care (n=457).	Interactive adherence support and information-only group could respond to selected messages that generated an automated series of responses, focused on techniques of goals & planning, repetition & substitution, social support, and natural consequences.	No evidence that an interactive intervention increased this small reduction in systolic blood pressure control compared with usual care at 12 months.	There was no evidence of differences in intervention effectiveness between men and women, younger and older patients, and patients with and without comorbid conditions.	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
							Translated, and tested in English, isiXhosa, and Afrikaan.			
42. DeVito Dabbs, A., Song, M. K., Myers, B. A., Li, R., Hawkins, R. P., Pilewski, J. M., . . . Dew, M. A. (2016). A Randomized Controlled Trial of a Mobile Health Intervention to Promote Self-Management After Lung Transplantation. American Journal of Transplantation. 16(7), 2172-2180. doi:10.1111/ajt.13701	M	Small trial in one centre. Adequately powered (80%). Very specifc group of lung transplant patients with no attrition	Diabetes	Tertiary	62	Smartphone with custom Pocket PATH programs to record daily health indicators, view graphical display of trends, and receive automated feedback messages to notify health co-ordinators.	A toll-free, tech-help line was available.	1. Self-monitoring more frequently, 2. More likely to show adherence 3. Report Clinical Health indicators more frequently	Self care perception and rehospitalizatio n comparable in both groups	
55. Ghadieh, A. S., Hamadeh, G. N., Mahmassani, D. M., & Lakkis, N. A. (2015). The effect of various types of patients' reminders on the uptake of pneumococcal vaccine in adults: A randomized controlled trial. Vaccine. 33(43), 5868-5872. doi:10.1016/j.vaccine.2015.07.050	M	Beneficiaries of organisation Insurance Plan only; Shortage of vaccine following first reminder;; messages were not personalised; no ability to make appointments for patients.	Vaccinati on	Primary	40+	Reminders for patients to get the PPSV23 vaccine: Subgroups 1a and 1b - standardised phone call reminder by nurse, subgroups 2a and 2b - SMS-text reminder, subgroups 3a and 3b - e-mail reminder;	Subgroups 1b, 2b and 3b also received additional information about seriousness of pneumococcal disease Delivered via phone (nurse), SMS and e-mail	Vaccination rate increased to 14.9%: short phone calls group (16.5%); sms-text group (7.2%); e-mail group (5.7%).	Rates were independent of age, associated education message and predisposing condition	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
61. Greaney, M. L., Puleo, E., Sprunck-Harrild, K., Bennett, G. G., Cunningham, M. A., Gillman, M. W., . . . Emmons, K. M. (2012). Electronic reminders for cancer prevention: Factors associated with preference for automated voice reminders or text messages. Prev Med. 55(2), 151-154. doi:https://doi.org/10.1016/j.ypmed.2012.05.014	M	Health & English literacy; Part of a RCT;	Cancer	Primary	50.8	SMS or automated voice response calls	part of ongoing trial providing multiple risk behaviour intervention	Less than one third chose SMS compared to AVR	Participants selecting SMS remiders were younger, more comfortable with computer and/or sent or received SMS more often	
65. Hansen, C. R., Perrild, H., Koefoed, B. G., & Zander, M. (2017). Video consultations as add-on to standard care among patients with type 2 diabetes not responding to standard regimens: A randomized controlled trial. European Journal of Endocrinology. 176(6), 727-736. doi:10.1530/EJE-16-0811	M	Multiple measures but short duration with 16% drop outs. Low adherence in poor control group at baseline	Diabetes	Primary	58	Video consultation preceded by uploads of measurements		Lower HbA1 in intervention group but ITT analysis at 6 months showed no difference.		
74. Irvine, A., Russell, H., Manocchia, M., Mino, D. E., Glassen, T. C., Morgan, R., . . . Ary, D. V. (2015). Mobile-Web app to self-manage low back pain: Randomized controlled trial. Journal of Medical Internet Research. 17(1), 1-21. doi:http://dx.doi.org/10.2196/jmir.3130	M	Good study but short duration. Social desirability bias of self-reports. Participants employed, educated, with a middle-class income.	Back pain	Community	NA	FitBack: a multi-visit reminder program; provides NLBP education and behavioral strategies.;	weekly email reminder prompts for 8 weeks plus emails to do assessments	Intervention group performed better on current back pain, behavioral, and worksite outcomes at 4-month follow-up	Patient activation, constructs of the Theory of Planned Behavior, and attitudes toward pain	
78. Karhula, T., Vuorinen, A. L., Rääpysjärvi, K., Pakanen, M., Itkonen, P., Tepponen, M., . . .	M	Stratified RCT; Low HbA1c	Diabetes and Hypertens	Primary	69	Phone with a PHR app and bluetooth	Health coaches and patients can see	Only significant difference in waist	No differences in any other outcome	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
Saranummi, N. (2015). Telemonitoring and mobile phone-based health coaching among Finnish diabetic and heart disease patients: Randomized controlled trial. Journal of Medical Internet Research. 17(6), e153. doi:10.2196/jmir.4059		threshold for inclusion; Patients called every 4 weeks; more missing values for smoking and alcohol use; Assistive technology principles applied.	ion			connected devices for manual/automatic reporting of BP, Weight, BGL & steps using a binary SMS text message. Measurements sent weekly to the PHR.	measurements in PHR and use them during health coaching phone calls. Self-management guide (hardcopy) was also provided to increase patient knowledge.	circumference in T2DM group; more likely due to multiple testing rather than a true difference.	variables - HRQL (SF-36), HbA1c, blood pressure, weight, and lipid levels)	
81. Kumar, S., Shewade, H. D., Vasudevan, K., Durairaju, K., Santhi, V. S., Sunderamurthy, B., . . . Panigrahi, K. C. (2015). Effect of mobile reminders on screening yield during opportunistic screening for type 2 diabetes mellitus in a primary health care setting: A randomized trial. Preventive Medicine Reports. 2, 640-644. doi:https://doi.org/10.1016/j.pmedr.2015.08.008	M	Real world setting; Unequal number of intervention and control groups; 70% followed up.	Diabetes	Primary	46.5	Diabetics and pre-diabetics at a PHC clinic received a mobile reminder to attend clinic for definitive tests.		85.7% of outpatients in intervention arm returned for definitive test compared to 53.3% in control arm		
90. Lin, M., Mahmooth, Z., Dedhia, N., Frutchey, R., Mercado, C. E., Epstein, D. H., . . . Cheskin, L. J. (2015). Tailored, Interactive Text Messages for Enhancing Weight Loss Among African American Adults: The TRIMM Randomized Controlled Trial. The American Journal of Medicine. 128(8), 896-904. doi:https://doi.org/10.1016/j.amjmed.2015.03.013	M	African-American cohort through a church. Need SMS capability; 32% attrition at 3 months. Important context	Healthy eating	Primary	40+	Patients with BMI>27 randomised to: Standard care (one-on-one counselling sessions with dietitian & physician) or standard care plus 3-4 daily tailored text		Significant decrease in weight in TRIMM group at 3 and 6 months (3.7 kg). The mean between-group difference in weight change from baseline was 2.5 kg at 3 months and 3.4	Engagement with TRIMM (% days participants responded to messages) declined over the study duration from a mean of 66% in month 1 to 37% in month	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
						messages for 6 months.		kg at 6 months	6. The mean response rate over the 6 months was 47.6%.	
93. Maddison, R., Pfaeffli, L., Whittaker, R., Stewart, R., Kerr, A., Jiang, Y., . . . Rawstorn, J. (2015). A mobile phone intervention increases physical activity in people with cardiovascular disease: Results from the HEART randomized controlled trial. European Journal of Preventive Cardiology. 22(6), 701-709. doi:10.1177/2047487314535076	M	Intervention may not have had enough increasing intensity in physical activity, cost-benefit analysis only considered costs of intervention	CVD	Primary	60	Text messages and videos, delivered by mobile phone		No differences in physical activity, but increased self-efficacy and self-reported physcial health (SF36)	Cost analyis - costs of implementing and delivering the intervention only	
96. Martin, C. K., Miller, A. C., Thomas, D. M., Champagne, C. M., Han, H., & Church, T. (2015). Efficacy of SmartLossSM, a smartphone-based weight loss intervention: Results from a randomized controlled trial. Obesity. 23(5), 935-942. doi:10.1002/oby.21063	M	Well-designed study. Duration only 12 weeks, sample size small, no formal evaluation of scalability and cost-effective analysis	Healthy eating	Primary	44.4	SmartLoss participants were prescribed a 1,200 to 1,400 kcal/d diet and provided with a smartphone, body weight scale, and accelerometer that wirelessly transmitted measurements to a website.	Participants in the Health Education control group (n=20) received health information via text messages or e-mails delivered to the smartphone during the study.	Greater weight loss (%initial weight) in SmartLoss group ($p<0.001$), especially at weeks 4, 8, and 12.	Significant improvements compared to Health Education on waist circumferences at all time points ($P<0.05$). Smart Loss participants had significantly larger reductions in systolic blood pressure compared with the Health Education	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
									group, P<0.05	
110. Muller, C. J., Robinson, R. F., Smith, J. J., Jernigan, M. A., Hiratsuka, V., Dillard, D. A., & Buchwald, D. (2017). Text message reminders increased colorectal cancer screening in a randomized trial with Alaska Native and American Indian people. Cancer. 123(8), 1382-1389. doi:10.1002/cncr.30499	M	No individual data understand findings; Contamination in a single health care system; used eHR to screen and monitor participants; a research project.	Cancer	Primary	40+	3 reminder text messages sent 1 month apart.	Use of focus groups to collaboratively create the study protocol and the text messaging content ensured local relevance and cultural acceptability of communication strategy.	Increased CRC screening for AN/AI aged 50-75 years and aged 40 to 49 years (p=0.55), especially for women (0.09).	Services were offered without requiring out=of-pocket payments.	Excellent collaboration between clinical staff and research team promoted cultural respect
127. Piette, J. D., Marinec, N., Janda, K., Morgan, E., Schantz, K., Yujra, A. C., . . . Aikens, J. E. (2016). Structured Caregiver Feedback Enhances Engagement and Impact of Mobile Health Support: A Randomized Trial in a Lower-Middle-Income Country. Telemed J E Health. 22(4), 261-268. doi:10.1089/tmj.2015.0099	M	Small short (4mths) study; Female (62%), 60+ years (62%), and indigenous (29.2%); Self-reported outcomes	Manage health	Primary	60+	Weekly IVR calls including self-care education and questions either alone (standard m-health) or with automated feedback about health and selfcare needs sent to their Care Partner after each call	Informal caregivers (Care Partners, defined as a relative or friend living outside the patient's home)	mHealth+CP patients completed significantly more IVR calls than standard mHealth patients (62.0% versus 44.9%;	mHealth+ CP patients more likely to report excellent health via IVR and less likely to report days in bed due to illness. No variation due to age.	
129. Piette, J. D., Rosland, A. M., Marinec, N. S., Striplin, D., Bernstein, S. J., & Silveira, M. J. (2013). Engagement with automated patient monitoring and self-management support calls: Experience with a thousand chronically ill patients. Medical Care. 51(3), 216-223. doi:10.1097/MLR.0b013e318277ebf8	M	77% white and 70% male; 83% completion	Heart failure, depression	Primary	60.9	Weekly IVR calls including self-care education and questions either alone (standard m-health) or with automated feedback about	Involvement of Informal Caregivers (Care Partners, defined as a relative or friend living outside the	Patients with a variety of chronic conditions will complete IVR self-care support calls regularly. Risk factors for missed IVR calls		

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						health and selfcare needs sent to their Care Partner after each call	patient's home)	overlap with those for missed appointment. Involvement of informal caregivers may significantly increase engagement		
130. Piette, J. D., Striplin, D., Marinec, N., Chen, J., & Aikens, J. E. (2015). A Randomized Trial of Mobile Health Support for Heart Failure Patients and Their Informal Caregivers. Medical Care. 53(8), 692-699. doi:10.1097/MLR.0000000000000378	M	VA patients may have more support for HF management than patients in less-resourced contexts. Patient participants were almost exclusively men. Intervention targeted at CarePartners outside the patient's household.	Heart failure	Community	67.9	Weekly IVR calls including self-care education and questions either alone (standard m-health) or with automated feedback about health and selfcare needs sent to their Care Partner after each call	Informal caregivers (Care Partners, defined as a relative or friend living outside the patient's home)	mHealth+CP patients reported lower levels of caregiving strain at both 6 and 12 months	There was increased CarePartners' involvement in self-care assistance, while time spent for the small number of CarePartners (who were spending the most time at enrolment) was decreased.	
137. Redfern, J., Santo, K., Coorey, G., Thakkar, J., Hackett, M., Thiagalingam, A., & Chow, C. K. (2016). Factors influencing engagement, perceived usefulness and behavioral mechanisms associated with a text message support program. PLoS ONE. 11(10). doi:10.1371/journal.pone.0163929	M	Mixed methods evaluation of a text message support program	Health Behaviour	Primary	58	Regular semi personalised text messages providing behaviour change advice, motivation, and information that aimed to	4 messages/week (messages sent four or five randomly selected week days and arrived at random times	Factors increasing engagement: ability to save and share messages, having the support of providers and family, a feeling	Diet and physical activity messages were most valued. Four messages/wk was ideal	

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						improve general heart health, diet, physical activity and encourage smoking cessation	during working hours)	of support through participation in the program, the program being initiated close to the time of a CV event, personalied messages, opportunity for initial face-to-face contact with a provider, and program and content was perceived to be from a credible source.	Program duration should be at least for six months or longer.	
158. Toy, B. C., Myung, D. J., He, L., Pan, C. K., Chang, R. T., Polkinhorne, A., . . . Blumenkranz, M. S. (2016). Smartphone-based dilated fundus photography and near visual acuity testing as inexpensive screening tools to detect referral warranted diabetic eye disease. Retina. 36(5), 1000-1008. doi:10.1097/IAE.0000000000000955	M	Burden of disease affecting Latino patients	Diabetes	Primary	60.5	Smartphone used to estimate near visual acuity and capture anterior and dilated posterior segment photographs, which underwent masked, standardized review		Smartphone-based telemedicine system demonstrated sensitivity and specificity to detect referral-warranted diabetic eye disease with good correlation between clinical Snellen and smartphone visual acuity measurements.		
160. Turner-McGrievy, G. M., & Tate, D. F. (2014). Are we sure that Mobile Health is really		Mostly white women in a	Healthy eating	?	42.7	1) Theory-based podcast		POD participants in the TBP group		

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
mobile? An examination of mobile device use during two remotely-delivered weight loss interventions. International Journal of Medical Informatics. 83(5), 313-319. doi:https://doi.org/10.1016/j.ijmedinf.2014.01.002		narrow age range 2) mHealth advances since 2011, with greater usability. 3) Present analysis does not include groups randomized to these methods.				(TBP) of the Pounds Off Digitally (POD) study 2) TBP + mobile group (self-monitoring app and Twitter app for social support) of the mobile Pounds Off Digitally (mPOD) study.		lost significantly more weight than control podcast group ($p < 0.001$). mPOD participants, showed no significant difference in % weight loss at 6 months between TBP or TBP + mobile.		
164. Van Der Weegen, S., Verwey, R., Spreeuwenberg, M., Tange, H., Van Der Weijden, T., & De Witte, L. (2015). It's LiFe! Mobile and web-based monitoring and feedback tool embedded in primary care increases physical activity: A cluster randomized controlled trial. Journal of Medical Internet Research. 17(7). doi:10.2196/jmir.4579	M	Mean baseline PA was above recommended level. Only 10% of practices and 37% of patients approached agreed to participate, suggesting selection bias. Cycling, swimming, strength training, and upper body movements not measured because they could not be	Active living	Primary	57.8	The complete It's LiFe! intervention consists a self-management support program and a monitoring and feedback tool.	four individual consultations with the PN; in the first week, after 2 weeks, after 2-3 months, and after 4-6 months	Group 1 who received the tool and the SSP showed 8 minutes more moderate and vigorous physical activity ($\geqslant$3 METS) than participants in the SSP, and 12 minutes more PA than the care as usual group.	general self-efficacy (general self-efficacy scale), exercise self-efficacy (exercise self-efficacy scale], and quality of life	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
		captured with the PAM. Short follow-up (3 mths).								
167. Van Olmen, J., Van Pelt, M., Malombo, B., Ku, G. M., Kanda, D., Heang, H., . . . Schellevis, F. (2017). Process evaluation of a mobile health intervention for people with diabetes in low income countries – the implementation of the TEXT4DSM study. Journal of Telemedicine and Telecare. 23(1), 96-105. doi:10.1177/1357633X15617885	M	Limitations was related to study design, data collection and data analysis. To maintain context, message content will differ among contries with impact on information quality.	Diabetes	Primary	55+	Diabetes Self-Management Support (DSMS) by SMS containing information on healthy behaviours and disease management;	A nurse in DRC, a peer educator in Cambodia, a community health worker or education nurse in the Philippines through automated software. Messages were sent manually in Philippines	Mean monthly messages delivered to recipients' phones: 67.7% of the planned number in DRC, 92.3% in Cambodia and 83.9% in the Philippines. Problems with 1/3 of phones, including breakage, loss and cancelled subscriptions. Number reached at least once was 70.0% in DRC; 60.7% in Cambodia; and 2% in the Philippines. Those reached each time was 56.9% in DRC 9.9% in Cambodia, none in the Philippines	: Implementation of the intervention meets constraints at every step in the process. Barriers relate to the technology, the context and the participants.	
8. Anguera, J. A., Jordan, J. T., Castaneda, D., Gazzaley, A., & Areán, P. A. (2016). Conducting a fully mobile and randomised clinical trial for	L	Feasibility study, high attrition	Mental health	Commu nity	32 yrs	3 apps to assess and treat depression. $	An online custom dashboard of	Access, engagement and expense	Cost: $314,264 over 2 years	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
depression: Access, engagement and expense. BMJ Innovations. 2(1), 14-21. doi:10.1136/bmjinnov-2015-000098 (Methodology paper)						incentives.	their study progress.			
24. Bricker, J. B., Mull, K. E., Kientz, J. A., Vilardaga, R., Mercer, L. D., Akioka, K. J., & Heffner, J. L. (2014). Randomized, controlled pilot trial of a smartphone app for smoking cessation using acceptance and commitment therapy. Drug and Alcohol Dependence. 143, 87-94. doi:https://doi.org/10.1016/j.drugalcdep.2014.07.006	L	Small, short duration uncontrolled study. Low program completion	Tobacco free	Primary	41.5	A programmed software to participants' mobile phones.	NA	High user receptivity, modest quit rates, and high smoking reduction rates.		
27. Burke, L. E., Styn, M. A., Sereika, S. M., Conroy, M. B., Ye, L., Glanz, K., . . . Ewing, L. J. (2012). Using mHealth Technology to Enhance Self-Monitoring for Weight Loss: A Randomized Trial. American Journal of Preventive Medicine. 43(1), 20-26. doi:https://doi.org/10.1016/j.amepre.2012.03.016	L	Small study of slef-monitoring and distal feedback	Healthy eating	Hospital	46.8	Self-monitoring diet using a PDA alone (PDA) or with daily tailored feedback (PDAFB) compared to a conventional paper diary	Meetings held weekly for Months 1–4; biweekly for Months 5–12, and monthly for Months 13–18.	Small weight loss at 24 months;	Greater adherence to dietary self-monitoring over time.	
28. Burke, L. E., Zheng, Y., Ma, Q., Mancino, J., Loar, I., Music, E., . . . Sereika, S. M. (2017). The SMARTER pilot study: Testing feasibility of real-time feedback for dietary self-monitoring. Preventive Medicine Reports. 6, 278-285. doi:https://doi.org/10.1016/j.pmedr.2017.03.017	L	Small study with less male participation	Healthy eating	Community	44.8	Self-monitoring using the Lose It! smartphone app	NA	Adherence and retention	blood pressure and self-efficacy for weight loss	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
29. Cadmus-Bertram, L. A., Marcus, B. H., Patterson, R. E., Parker, B. A., & Morey, B. L. (2015). Randomized Trial of a Fitbit-Based Physical Activity Intervention for Women. American Journal of Preventive Medicine. 49(3), 414-418. doi:https://doi.org/10.1016/j.amepre.2015.01.020	L	Small short duration study of postmenopausal women	Active living	Community	58	Use of Fitbit tracker and website versus pedometer use		Increased moderate to vigorous physical activity amongst post-menopausal women	The Fitbit was well accepted in this sample of women	
41. Depp, C. A., Ceglowski, J., Wang, V. C., Yaghouti, F., Mausbach, B. T., Thompson, W. K., & Granholm, E. L. (2015). Augmenting psychoeducation with a mobile intervention for bipolar disorder: A randomized controlled trial. Journal of Affective Disorders. 174, 23-30. doi:https://doi.org/10.1016/j.jad.2014.10.053	L	Excluded drug use and severe mental health problems; 65% compliance Not powered to detect moderators and mediators	Mental health	Primary	47.5	Personalized Real-Time Intervention for Stabilizing Mood (PRISM).		MADRS Total Score	YMRS and IIS Total Scores.	
49. Fukuoka, Y., Gay, C. L., Joiner, K. L., & Vittinghoff, E. (2015). A Novel Diabetes Prevention Intervention Using a Mobile App. American Journal of Preventive Medicine. 49(2), 223-237. doi:10.1016/j.amepre.2015.01.003	L	Higher income and more females; Small and short duration study	Diabetes	Community	55	Six diabetes prevention sessions with home based program delivered by mobile phone app (daily text and videos), pedometer, and weight, calorie and physical activity diary.	This intervention was added to a reduced face to face DPP.	6.2 kg weight loss compared to 0.3kg gain in control group.	Increase steps by 2551 (cf. decrease of 734 per day in control group). Reduced hip circumference, BP, intake of sat fat and sugar sweetened drinks.	
71. Hoffman, V., Söderström, L., & Samuelsson, E. (2017). Self-management of stress urinary	L	Small cohort study with well-educated	Urinary	Community	44.2	Tät® mobile app		Improved ICIQ-UI SF and ICIQ-LUTSqol from	Patient Global Impression of Improvement	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
incontinence via a mobile app: two-year follow-up of a randomized controlled trial. Acta Obstetricia et Gynecologica Scandinavica. 96(10), 1180-1187. doi:10.1111/aogs.13192		group. No control group						baseline to two years	(PGII)	
77. Kardas, P., Lewandowski, K., & Bromuri, S. (2016). Type 2 Diabetes Patients Benefit from the COMODITY12 mHealth System: Results of a Randomised Trial. Journal of Medical Systems. 40(12). doi:10.1007/s10916-016-0619-x	L	Short study of feasibility and usability with incusion criterion being diabetics able to use the technology!! Title misleading!	Diabetes	Primary	59	COMMODITY 12 system: smart phone with bluetooth sensors (glucometer, ECG, heart rhythm, respiratory movements, triaxial accelerometer, patient adherence monitor)		Good scores (4/5 likert scores) on usability instruments.	Minor improvementob served in 4 out 5 dimensions of HQOL (self-care, usual activities, pain/discomfort and anxiety/depression)	
80. Kim, J. H., Kwon, S. S., Shim, S. R., Sun, H. Y., Ko, Y. M., Chun, D. I., . . . Song, Y. S. (2014). Validation and reliability of a smartphone application for the international prostate symptom score questionnaire: A randomized repeated measures crossover study. Journal of Medical Internet Research. 16(2). doi:10.2196/jmir.3042	L	Self-reported data; Possible selection bias, no open questions, no assessment of quality of repsonses; no test of reliability over time.	Prostate (LUTS)	Primary	58	Smartphone application of a questionnaire		IPSS scores		
103. Mertens, A., Brandl, C., Miron-Shatz, T., Schlick, C., Neumann, T., Kribben, A., . . . Becker, S. (2016). A mobile application improves therapy-adherence rates in elderly patients	L/M	60+ yr with a minimum visual acuity of -0.75; Small short	CAD	Rehab	73.8	Medication Plan via Apple iPad with data logging		iPad-delivered intervention improved subjective and objective	Majority of participants would like to use the medication app	Manage expectations and avoid the hype

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
undergoing rehabilitation A crossover design study comparing documentation via iPad with paper-based control. Medicine (United States). 95(36). doi:10.1097/MD.0000000000004446		study – 28 days in each crossover phase.						medication adherence from baseline and compared to paper diary.	and would not need further assistance with the app.	
108. Moore, S. L., Fischer, H. H., Steele, A. W., Joshua Durfee, M., Ginosar, D., Rice-Peterson, C., . . . Davidson, A. J. (2014). A mobile health infrastructure to support underserved patients with chronic disease. Healthcare-the Journal of Delivery Science and Innovation. 2(1), 63-68. doi:https://doi.org/10.1016/j.hjdsi.2013.12.016	L	Small short (9mths) study; Access to SMS; Mainly female (65%) & Latino (65%):	Diabetes	Primary	40.6	Automated, bidirectional text messaging (outreach messages) for appointment reminders and collection of patient-reported blood sugar measurements.	Feasibility of integrating mHealth infrastructure with clinical information systems, using patient relationship management software	Patients sent over 6500 messages with response rates of 53.7% (bloodsugar), 48.8% (step counts), and 31.9% (blood pressure).	% responses correctly formatted by patients	
134. Pludwinski, S., Ahmad, F., Wayne, N., & Ritvo, P. (2016). Participant experiences in a smartphone-based health coaching intervention for type 2 diabetes: A qualitative inquiry. Journal of Telemedicine and Telecare. 22(3), 172-178. doi:10.1177/1357633X15595178	L	Qualitative evaluation of a RCT	Diabetes	Primary	55+	Smartphone based health coacing intervention containing education, peer support and coaching frequently by adherence level	provision of a smartphone and self-monitoring software to optimise patient's own time through 2-4 contacts monthly and one phone call/3 months	Interventions with T2DM assisted by smartphone software and health coaches actively engage individuals in improved hemoglobin A1c (HbA1c) control.	(a) smartphone use in relation to health behavior change; (b) how client/ health coach relationships were assisted by smartphone (c) perceptions of the overall intervention; (d) difficulties with self-management of T2DM	
136. Quinn, C. C., Clough, S. S., Minor, J. M.,	L	Very small	Diabetes	Primary	55+	WellDoc System:	Feedback every 2 weeks for	HbA1c values declined	Improvement in knowledge	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
Lender, D., Okafor, M. C., & Gruber-Baldini, A. (2008). WellDoc™ mobile diabetes management randomized controlled trial: Change in clinical and behavioral outcomes and patient and physician satisfaction. Diabetes Technology and Therapeutics. 10(3), 160-168. doi:10.1089/dia.2008.0283		study				Diabetes management software system, real-time feedback on patients blood glucose levels, patient medication adherence, treatment algorithms	patients and 4 weeks for healthcare providers	significantly in intervention group	of food choices, confidence and provider feedback	
140. Ross, K. M., & Wing, R. R. (2016). Impact of newer self-monitoring technology and brief phone-based intervention on weight loss: A randomized pilot study. Obesity. 24(8), 1653-1659. doi:10.1002/oby.21536	L	Small short study	Healthy eating	Community	51	1) Self monitoring - a calorie reference book, a pedometer to monitor daily step counts, and a body weight scale (ST); 2) Fitbit Aria (TECH) 3) Fitbit plus phone-based interventionist contact over the 6-month intervention (TECH+PHONE)		Newer self-monitoring technology; plus brief phone-based intervention can improve adherence to self-monitoring and lead to greater weight loss than traditional self-monitoring tools.		
145. Sepah, S. C., Jiang, L., & Peters, A. L. (2015). Long-term outcomes of a web-based diabetes prevention program: 2-Year results of a single-arm longitudinal study. Journal of Medical Internet Research. 17(4), e92.	L	Non Randomized uncontrolled single arm design with a self selected	Diabetes	Community	43.6	'Prevent' Internet based lifestyle intervention includes small group support,		Mean reduction in weight (lbs) and HbA1c (%) were similar in groups pre and post intervention	Digital therapeutics can produce a sustained behaviour change and aid	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
doi:10.2196/jmir.4052		sample, fewer males, Attrition				personalized health coaching, weekly diabetes prevention program curriculum and digital tracking tools.		without any statistical significance	for healthy ageing	
148. Silveira, P., Van De Langenberg, R., Van Het Reve, E., Daniel, F., Casati, F., & De Bruin, E. D. (2013). Tablet-based strength-balance training to motivate and improve adherence to exercise in independently living older people: A phase II preclinical exploratory trial. Journal of Medical Internet Research. 15(8). doi:10.2196/jmir.2579	L	1) small convenience sample; 2) different recruitment methods without initial randomisation & blinding may have introduced a selection bias that questions the validity of adherence & attrition findings.	Falls prevention	RACF	75	ActiveLifestyle runs on a tablet and assists, monitors, and motivates older people to follow personalized training plans autonomously at home.	1) an individual group using the individual version of ActiveLifestyle; (2) a social group using the social version of the app, (3) a control group using exercises with printed information without additional motivation.	Adherence across training plans differed significantly between groups; Attrition 41% (due to lack motivation); Both tablet training groups showed far lower values (21% and 8% for individual and social groups, respectively).	Social motivation strategies seemed to be more effective to stimulate the participants to comply with the training plan and remain on the intervention	
152. Spoelstra, S. L., Given, C. W., Sikorskii, A., Coursaris, C. K., Majumder, A., DeKoekkoek, T., . . . Given, B. A. (2015). Feasibility of a Text Messaging Intervention to Promote Self-Management for Patients Prescribed Oral Anticancer Agents. Oncology Nursing Forum. 42(6), 647-657. doi:10.1188/15.ONF.647-657		Small sample Self-report is limited recall & social desirability biases;	Cancer	Community	58.5	Text messages to promote self-management among patients prescribed oral anticancer agents (OAs)	The intervention group received daily texts for adherence and weekly for symptoms for 21–28 days.	30/37 satisfied with intervention reported they reas the texts all the time	Text group reported fewer symptoms. Medical record & prescription data (n = 26) showed higher adherence in the text group.	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
153. Spring, B., Duncan, J. M., Janke, E. A., Kozak, A. T., McFadden, H. G., Demott, A., . . . Hedeker, D. (2013). Integrating technology into standard weight loss treatment a randomized controlled trial. JAMA Internal Medicine. 173(2), 105-111. doi:10.1001/jamainternmed.2013.1221	L	Small sample from a specific outpatient clinic limits generalisabiity.	Healthy eating	Primary	57.7	Personal digital assistance through mobile technology to self monitor diet & physical activity PLUS discussion of nutrition, physical activity, and behavior change		Weight loss at 6 and 12 months	The addition of a personal digital assistant and telephone coaching can enhance short-term weight loss in combination with an existing system of care.	
154. Sun, N., Rau, P.-L. P., Li, Y., Owen, T., & Thimbleby, H. (2016). Design and evaluation of a mobile phone-based health intervention for patients with hypertensive condition. Computers in Human Behavior. 63, 98-105. doi:https://doi.org/10.1016/j.chb.2016.05.001	L	The sample size was small and the evaluation lasted for only 6 weeks. Patients who believe in TCM may ascribe hypertension to daily activities.	Hypertensn	Community	59.2	An electronic BP monitor and a mobile phone a health app, BP Tagger which helps users to store BP data and to generate BP reports and provide a self-reflective feature		Average score "self-reflective behaviour" increased from 5.56 to 6.00 in first 2 weeks (effect size 0.189), and then to 6.42 in the next 2 weeks (effect size 0.410).	.	Need to anticipate the cultural context, especially of TCM
156. Thorsteinsen, K., Vittersø, J., & Svendsen, G. B. (2014). Increasing physical activity efficiently: An experimental pilot study of a website and mobile phone intervention. International Journal of Telemedicine and Applications. doi:10.1155/2014/746232	L	Small short study	Active living	Community	55.3	Intervention included an activity planner, progress monitoring and gamification components; used SMS text as a secondary delivery channel and		Lifestyle group performed consistently more physical activity, at a higher intensity, than the control group.	Including gaming elements and SMS-text in an interactive, computer-tailored physical activity intervention is useful.	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
						feedback to improve engagement in the content.				
166. Van Olmen, J., Kegels, G., Korachais, C., de Man, J., Van Acker, K., Kalobu, J. C., . . . Schellevis, F. (2017). The effect of text message support on diabetes self-management in developing countries – A randomised trial. Journal of Clinical & Translational Endocrinology. 7, 33-41. doi:https://doi.org/10.1016/j.jcte.2016.12.005	L/M	Representativeness is good for this multi-country study; High attrition rates;	Diabetes	Primary care in DR Congo (Kin-réseau), Philippines (FiLDCare), Cambodia (MoPoTsyo)	58	Intervention group received DSMS through automated Short Message Services (SMS) through Frontline. Internet-based. messages sent 5 times/week in Kin-réseau, 6 times/week in MoPoTsyo, and 2 times/week in FiLDCare. The messages were developed by a country team (project manager, assistant programme manager, educator, general doctor with extra diabetes training	Community-based peer educator	Control (HbA1c < 7.0%) was achieved by 33.9% of intervention group and 31.1% of control group (p = 0.39). In Kin-réseau, the percent increase was significant (p = 0.04) In MoPoTsyo, the %controlled diabetes decreased. In FiLDCare, %controlled diabetes increased in the intervention but decreases in the control group.	The intervention did not appear to have an effect on the intermediate outcome indicators, including patient knowledge, perceptions, and the utilisation of care. All showed a drop in attendance to meetings with the educator in MoPoTsyo and FiLDCare. In MoPoTsyo, the number of subjects that self-monitored glucose levels significantly decreased in both groups.	
169. Verwey, R., van der Weegen, S., Spreeuwenberg, M., Tange, H., van der Weijden, T., & de Witte, L. (2014). A pilot study of a tool to	L	Small sample size - pilot study	Active living	Primary	60	Accelerometer and a smartphone (Galaxy Ace,	Patients visited the practice three times: in the first week,	Adherence regarding the use of the tool was high (on average	Mean activity significantly increased by 10.6 min per	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
stimulate physical activity in patients with COPD or type 2 diabetes in primary care. Journal of Telemedicine and Telecare. 20(1), 29-34. doi:10.1177/1357633X13519057						Samsung) with data subs and equipped with the web app.	after two weeks, and after 8–12 weeks. The consultations (20 min) could be extra or an extension of a routine consultation (10 min).	80%). Most patients (12 out of 17) were positive about the intervention. The intervention appears to be feasible in primary care.	day, from 28.7 (SD 21.1) min per day in the first two weeks compared to 39.3 (SD 24.2) in the last two (P=0.02).	
170. Vidoni, E. D., Watts, A. S., Burns, J. M., Greer, C. S., Graves, R. S., Van Sciver, A., . . . Bieberle, N. A. (2016). Feasibility of a Memory Clinic-Based Physical Activity Prescription Program. Journal of Alzheimer's Disease. 53(1), 161-170. doi:10.3233/JAD-160158 (Promoting Activity through Clinical Education and Reinforcement, PACER)	L	Feasibility trial with limited efficacy testing; Cross over design not appropriate as the second arm was delayed; Small sample size and large attrition; Study was biased to the clinician's prescription as intended; Subjective ratings subject to reporting biases	Active living	Primary	72.3	Exercise booklet and accelerometers to count steps. Study coaches made calls every three weeks to assess adverse events only.	Personal study coach made bi-weekly phone calls to encourage exercise, problem-solve barriers to exercise, and provide technical supp	Participants and study partners were comfortable with the setup and use of the Internet-connected accelerometer	Significant positive changes in physical activity can occur among mild cognitively impared individuals	
173. Wayne, N., Perez, D. F., Kaplan, D. M., & Ritvo, P. (2015). Health coaching reduces hba1c	L/M	Not representative	Diabetes	Primary	53.2	Intervention: Samsung	Can communicate	No significant between-group	Changes in psychometric	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
in type 2 diabetic patients from a lower-socioeconomic status community: A randomized controlled trial. Journal of Medical Internet Research. 17(10). doi:10.2196/jmir.4871		as only recruited from two GP clinics				Galaxy Ace II mobile phone, with a data-only carrier plan, a user account with the Connected Wellness Platform (CWP) which supported participants in health-related goal setting and progress monitoring. Participants track key metrics, blood glucose levels, exercise frequency/duration/intensity, food intake (via photo journaling) and mood.	with health coach at any time in the 24-hour cycle via secure messaging, scheduled phone contact, and/or during in-person meetings.	differences in HbA1c from baseline to 6 months when analyzed with intention-to-treat (P=0.48) and per-protocol (P=0.83) principles	assessments at baseline and 6 months were analyzed using the Satisfaction with Life Scale, the Hospital Anxiety and Depression Scale, the Positive and Negative Affect Schedule, and the Short Form Health Survey-12 (SF-12).	
174. Wayne, N., & Ritvo, P. (2014). Smartphone-enabled health coach intervention for people with diabetes from a modest socioeconomic strata community: Single-Arm longitudinal feasibility study. Journal of Medical Internet Research. 16(6). doi:10.2196/jmir.3180	L	small sample size, short duration, self-reporting bias, no control group	Diabetes	Primary	55.6	After baseline data collection, health coach communicated with participants about eating, physical activity patterns, and overall health	Wellness plans collaboratively created in multiple interactions focused on exercise instruction and reviews of electronic monitoring	a mean reduction of 0.43% (SD 0.63) (P<0.05) with minimal change in medication.		

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
						goals.	entries, with diet and medication guidelines set by primary care physicians and dieticians.			
177. Wijsman, C. A., Westendorp, R. G. J., Verhagen, E. A. L. M., Catt, M., Slagboom, P. E., De Craen, A. J. M., . . . Mooijaart, S. P. (2013). Effects of a web-based intervention on physical activity and metabolism in older adults: Randomized controlled trial. Journal of Medical Internet Research. 15(11). doi:10.2196/jmir.2843	L/M	Attention bias could have been introduced; Netherlands is a high income country with high internet usage among elderly. Translating to other settings will be challenging.	Active living	Community	64.7	DirectLife, a commercial Web-based program directed at increasing daily physical activity, using the stages of change and I-change health behavior change models. It considers the individual's current activity level and provides a personal goal.	DirectLife consists of three elements: an accelerometer-based activity monitor, a personal website, and a personal e-coach, who provides regular updates of the individual's physical activity status by email and gives advice to increase physical activities.	After 13 weeks, daily physical activity as measured by an ankle/wrist-worn tri-axial accelerometer increased by 46% (SE 7%, P<.001) in the intervention group, compared to 12 % (SE 3%, P<.001) in the control group.	Mean change of −1.49 kg in intervention group compared to −0.82 kg in the control group (Pdifference=.046). Likewise, waist circumference and fat %age also decreased more in the intervention vs control group.	
180. Wu, J.-M., Yu, H.-J., Ho, T.-W., Su, X.-Y., Lin, M.-T., & Lai, F. (2015). Tablet PC-enabled application intervention for patients with gastric cancer undergoing gastrectomy. Computer Methods and Programs in Biomedicine. 119(2), 101-109. doi:https://doi.org/10.1016/j.cmpb.2015.03.004	L/M	Small pilot study; App not regulated by medical authorities in Taiwan; Bias in retrospective	Cancer	Tertiary	61	A tablet PC application developed to serve the functions of nutritional monitoring, medical information		App group had a lower body weight loss percentage and more outpatient clinic (OPC) visits relative to the control group during the 6-	BMI, No of outpatient clinic visits, readmission, emergency room visits	

Papers addressing Question 4	Evidence (Low/Med /High)	Strengths & Limitations	Healthy ageing theme	Care setting	Mean Age (yrs)	Intervention	Co-interventions	Primary Outcomes	Secondary outcomes	Harms
		study. Very speicialised field				management, drainage follow-up and wound care. 20 consecutive gastrectomy patients at the National Taiwan University Hospital received perioperative care via the application		month follow up,		

Synthesis and discussion

This scoping review of the published literature and ageed/age care apps in the Android domain found a large range of uses where mHealth technologies have been applied in aged care.

Healthy ageing

The lack of recent papers on smoking cessation was surprising, but the increasing emphasis on mental health is encouraging. The emphasis on disease management and healthy lifestyle contrasts with the lack of apps to address sexual health, violence and injury, drug and alcohol abuse, and age-friendly environments. Nevertheless, this health focus (as opposed to a more social focus) fits with prevailing biomedical values and attitudes rather than the comprehensive biopsychosocial approach to health and health care.

There were only a few robust studies that looked at patient outcomes (Table 5). There is evidence to support non-clinical outcomes like intention to continue-to-use and positive trends in user participation, uptake and engagement. These findings support the belief that older people, as well as their caregivers, are able and willing to adopt mHealth technology to address their communication, information and decision support needs as they age and use health services. However, the literature also suggests that they do not want mHealth apps to impact too much on the personal relationship and interactions they have with their health care providers. Moreover, it is uncertain how well the positive intention to use might translate into successful implementations with positive clinical outcomes.

A range of impacts of mHealth – positive, neutral and negative - on the management of health, lifestyle enhancement, active living and other themes of healthy ageing was found. This is not surprising given that most of the trials are small and of short duration. More importantly, the evolving and dynamic nature of the mHealth domain makes variations and heterogeneity an expected and predictable constraint. However, the generally positive sentiments and engagement with mHealth suggest that these apps can be useful complements to current service delivery models leading to improved models of care for the diagnosis and management of chronic non-communicable health problems and their exacerbations.

Aged friendly services

The application of mHealth to the provision of age-friendly healthcare is less direct. mHealth apps to make decision aids, such as for cardiovascular risk assessment, can reduce screening time and calculation errors among non-medically trained health care providers such as community health workers. Introduction of a tablet to healthcare providers in an American healthcare organisation was well adopted and is believed to have led to an increase in overall productivity, improved patient-provider communication and process of care. Similar assessments of the use of tablets by patients and their physicians in other organisations showed mixed outcomes. While patients perceived the use of the tablets during patient-provider consultations negatively, the use of the tablets in the waiting room resulted in enhanced patient satisfaction and uptake of information provided by their physicians. The context is central to any evaluation of mHealth, with perhaps patient-centredness being a core principle for the use of mHealth.

Little was found that evaluated mHealth as a new service delivery model or model of care for the provision of age-friendly care and services. The most common health service context was hospital outreach services provided by disease specific specialties such as diabetes,

cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD), cancer and mental health. The evidence is sparse on how mHealth can support care by health organisations, including stepped up care, or to support managerial systems. This is likely due to countries having different health and social priorities under different resource constraints. In many Low and Middle-Income Countries (LMICs), the prevailing context of mHealth was and continues to be Maternal and Child Health (MCH) rather than Aged Care. As such the model for mHealth in strengthening health systems developed by Labrique, et al, was based on MCH not aged care or non-communicable disease in LMICs (24). The effect is that the search would not find papers outside the ageing and aged care domain.

Design development and testing

Many of the papers reported on accuracy and feasibility testing rather than implementation and evaluation to examine impact on patient and provider outcomes. In this context, the large number of apps available in the market and the relatively small number of papers reporting on the testing, let alone evaluation, of mHealth apps is an issue that need to be addressed for safety and quality reasons.

The mHealth apps vary in levels of complexity from standalone information sources in a range of media to communication tools mainly through the asynchronous use of text messages to provide motivational support to facilitating behaviour change, alerts and reminders to encourage adherence to self-management plans to complement existing clinical services. More complex apps capture patient information and measurements which may be linked and integrated with personal health information in electronic health records (EHRs) and clinical decision support systems (CDSS) to provide more complex and personalised guidance in matters such as medication guidance.

The need for more research-based development of mHealth launchers was expressed as the prevailing focus was on assistive technologies. Issues such as larger number of features being associated with more usability problems indicated an underlying complexity to be addressed. Co-design and co-development of mHealth apps, engaging the teams & organisation, clinicians & managers, and patients & carers dietitian will logically develop more usable and relevant mHealth apps to improve patient empowerment and the safety and quality of care (26). This requires an understanding of mHealth readiness(18) and informatics capability maturity of individuals, oranisations and communities (19, 76). An adaptive systems engineering framework and user-centered design is essential to guide the multi-stage iterative design and testing of a smartphone intervention to self-monitor their behaviour (52).

Innovation in research and evaluation of mHealth

The heterogeneity in study designs, implementation processes and measurements precluded meta-analysis of pooled results of these usually small studies of short duration. This emphasises the imperative for a common methodology and terminology for research and evaluation.

Patient engagement

When patients were engaged for longer periods of time, the processes and impacts of mHealth apps on the quadruple aims of cost-effectiveness of care in terms of patient health outcomes and satisfaction, provider well-being and the health of populations can be evaluated. Patient engagement can occur in the iterative co-design and co-development of mHealth apps as well as in the implementation and evaluation of the" tested app". This applies to other actors such as the clinicians and other health professionals. In this context, even pilot and feasibility studies need to be well-designed, adequately powered and

sufficiently resourced to recruit and retain participants as well as to innovate with new methodologies being pioneered in clinical research informatics and the use of observational data in health information systems and EHRs.

Ethics and governance

As this review and contemporary environment indicates, the fast pace of technological improvement and the rapid development and adoption of mHealth apps presents crucial challenges for clinicians, users and policy makers. There is a need to ensure the safety of mHealth apps and establish their cost-effectiveness and their impacts on patients, carers, clinicians and other health care providers. For instance, can mHealth tools improve the role of patients, carers and clinicians in shared health decision-making? The impact of mHealth tools on the clinician-patient relationship and interactions needs to be explored, together with the skills required for both groups to benefit from the use of apps within and adjunct to the face-to-face consultation.

Conclusion

Conclusive evidence for the cost-effectiveness of mHealth, in terms of patient outcomes, is lacking. Feasibility and usability studies confirm positive attitudes to mHealth tools with high intention-to-use and positive trends in user participation, uptake and engagement. Pilot studies on adoption and implementation should address safety and reliability testing, accuracy of underlying algorithms and validity and reliability of decision support rules. Heterogeneity in study design, implementation and measurements must be addressed and standardised to enable meta-analysis to further understand the impact of mHealth on clinical and patient outcomes.

Innovation in research and evaluation methodology is important to translate feasibility studies into definitive clinical trials focused on outcomes. Mobile technology and electronic health records have important roles in broadening the reach and representativeness of RCTs, while substantially reducing the time to determine intervention effectiveness and reducing study costs (77). Future research needs experimental study designs and a holistic approach that addresses multilevel determinants (clinical, behavioural, and care coordination) of shared care, self-care and proactive collaborations between health care professionals and patients (64).

This review of apps and publications, in the context of the contemporary environment, highlights the fast pace of technological change and the rapid development, adoption and demise of mHealth apps presents crucial challenges for clinicians, users and policy makers. The gaps in sexual health, violence and injury, drug and alcohol abuse, and age-friendly environments highlighted need to be addressed. This may involve a paradigm change from the biomedical model to a more holistic biopsychosocial one.

Good implementation is important and must consider sociotechnical requirements of all the actors to optimise the use of mHealth in achieving the quadruple aims cost-effective beneficial outcomes for the patient and the community, patient satisfaction and provider well-being. This reiterates the need for good collaborative partnerships among all the actors in this design, development, testing, implementation and evaluation of mHealth apps.

A participatory design approach is needed in which target users are involved in the co-development of cost-effective and personalized mHealth apps that are sufficiently mature before implementation. Including patients, carers and clinical users as part of the design team stimulates and enables designers to think differently, unconventionally, or from a new perspective, leading to applications that are better tailored to patients' needs(64).

Healthcare organizations need to consider the risk of fragmenting clinical practice within the organization as a result of too many apps being developed or used. What mechanisms are required for the integration of mHealth tools and information into the wider electronic health records (EHRs) and health information system (HIS)? What are the required standard operating procedures and governance framework for their use and linkage to the EHR or HIS either directly or through an Internet of Things infrastructure? (78)

Robust governance frameworks are essential to anticipate and/or act on intended and unintended clinical outcomes and consequences of mHealth apps in healthy ageing and to support age friendly health services (79).

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Attachments

Attachment 1: Data extraction template with data

Attachment 2: Strategy for search of databases

			Publication details			
No.	Article no.	Co-reviewer	Title of article	Year of publication	Journal name	Study type (eg: RCT)
1	2	Teng	Daily mood ratings via text message as a proxy for clinic based depression assessment	2015	Journal of Affective Disorders	Single-group interventional study
2	3	Teng	survey evaluating Text4Mood: mobile health program to	2016	BMC Pyschiatry	online, mixed-method survey evaluating a mobile
3	4	Teng	Improvements in illn	2015	Primary Care Diabetes	Observational open label trial
4	5	Mark	message system (SMS) reminder on	2017	International Journal of Medical Informatics	Randomised controlled trial
5	6	Padma	Classifying obstructive sleep	2014	Journal of Biomedical Informatics	Preliminary findings from
6	7	Padma	Preliminary Outcomes of a Web and Smartphone–Based	2016	Journal of Medical Systems	preliminary outcomes of a smartphone-based mHealth platform
7	8	Teng	mobile and randomised clinical trial for depression:	2016	BMJ Innovations	Randomised clinical trial
8	9	Teng	Outpatient blood pressure monitoring using	2015	Journal of the American Society of Hypertension	Randomised controlled 3-arm trial
9	10	Mark	mobile-based tailored intervention to enhance	2014	Journal of Medical Internet Research	Initial results of a cluster randomised controlled trial
10	11	Padma	Tijuana: A randomized control trial evaluating the	2016	Diabetes Technology & Therapeutics	Open label randomised controlled trial
11	12	Teng	Intervention for Inner City Patients with Poorly	2012	Diabetes Technology & Therapeutics	Pilot trial of a mHealth program

12	13	Teng	Peer-Group Lifestyle Intervention	2016	The Journal of Nervous and Mental Disease	effectiveness of a lifestyle intervention incorporating
13	14	Mark	Features and usability assessment of a patient-centered	2016	Applied Nursing Research	Development and preliminary usability of a mHealth application
14	16	Mahfuz	The Effect of a Mobile Health Decision Support System on	2014	The Journal for Nurse Practitioners	Randomised controlled trial
15	19	Mark	preliminary efficacy of remotely delivering cognitive training to people	2017	Schizophrenia Research: Cognition	Reanalysis of data from a randomised controlled trial
16	20	Teng	Messages to Support Treatment Adherence in Adults with High Blood Pressure	2016	Circulation	Pragmatic, single-blind, 3-arm randomised controlled trial
17	21	Ben	smartphone-based intervention to reduce sedentary	2014	PLOS ONE	Within-subjects experimental trial
18	24	Mahfuz	controlled pilot trial of a smartphone app for smoking cessation using	2014	Drug and Alcohol Dependence	Randomised controlled pilot trial
19	25	Padma	usability evaluation of the mHealth Tool for Lung Cancer (mHealth TLC): A	2015	Patient Education and Counseling	Feasibility and usability of a mHealth tool
20	26	Teng	adult experience of a web-based, tablet-delivered heart failure self-care program using	2017	Geriatric Nursing	Qualitative evaluation of a mHealth intervention
21	27	Jitendra	Technology to Enhance Self-Monitoring for Weight Loss: A	2012	American Journal of Preventive Medicine	Randomised 3-arm behavioural clinical trial
22	28	Jitendra	The SMARTER pilot study: Testing feasibility of real-time feedback for	2017	Preventive Medicine Reports	Pilot randomised clinical trial

23	29	Ben	Randomized Trial of a Fitbit-Based Physical Activity Intervention for Women	2015	American Journal of Preventive Medicine	Randomised controlled trial
24	30	Mark	tablet-based instruction of breathing technique in	2016	International Journal of Medical Informatics	Randomised controlled trial
25	31	Jitendra	technology-based embedded assessment in the	2014	Disability and Rehabilitation Assistive Technology	implementation and evaluation of a location tracking
26	32	Teng	Developing a Mobile Health Intervention to Link Diabetes	2015	Journal of Ambulatory Care Management	Pilot randomised controlled trial
27	34	Mahfuz	Engagement and abstinence among users of a smoking	2016	Addictive Behaviors	Evaluation of a mobile phone-based smoking cessation
28	35	Mahfuz	Improvement in Asthma Control Using a Minimally	2016	Journal of Allergy and Clinical Immunology in Practice	Usability and effectiveness of a smartphone
29	37	Mark	App for Self-Management and Education of Cardiac Diseases in	2016	Journal of Medical Systems	Usage and utility of a mHealth app
30	39	Teng	Postoperative monitoring with a mobile application after ambulatory lumbar discectomy:	2016	European Spine Journal	Feasibility of a mHealth app
31	41	Jitendra	psychoeducation with a mobile intervention for bipolar disorder: A	2015	Journal of Affective Disorders	Randomised controlled trial
32	42	Padma	Controlled Trial of a Mobile Health Intervention to Promote Self-	2016	American Journal of Transplantation	Randomised controlled trial
33	44	Teng	mobile-phone-based home	2014	Telemedicine and Telecare	smartphone mHealth app
34	45	Ben	international randomized clinical trial of activity	2015	Neurorehabilitation and Neural Repair	International randomised controlled trial

35	49	Mark	A Novel Diabetes Prevention Intervention Using a Mobile App	2015	American Journal of Preventive Medicine	Randomised controlled trial
36	50	Ben	levels and steps of people with stroke	2012	Journal of Neurologic Physiotherapy	SmartShoe system in stroke patients
37	51	Teng	criterion-related validity with a smartphone used in	2014	Biomedical Engineering Online	validation of an iPhone accelerometer
38	52	Mark	Mobile Romberg test assessment	2014	BMC Research Notes	Cross-sectional survey of patients'
39	54	Padma	The impact of tailored text messages on health beliefs and	2016	Research in Social and Administrative Pharmacy	Pilot randomised controlled trial
40	55	Jitendra	The effect of various types of patients' reminders on the uptake of	2015	Vaccine	Randomised controlled trial
41	56	Ben	effects of home-based smartphone-delivered automated	2016	Parkinsonism and Related Disorders	Pilot randomised controlled trial
42	57	Mahfuz	Treatment seeking as a mechanism of	2017	Journal of Substance Abuse Treatment	Secondary data analysis of a RCT of
43	60	Teng	Function of Healthcare Professional in eHealth and	2016	Journal of Diabetes Research	Cross-sectional survey of patients' perceptions regarding mHealth
44	61	Padma	reminders for cancer prevention: Factors associated with preference for	2012	Preventive Medicine	Cluster randomised controlled trial
45	62	Mark	Technology for Atrial Fibrillation Management Integrating Decision	2017	The American Journal of Medicine	Pilot randomised controlled trial
46	63	Padma	Harnessing the question-behavior effect to enhance	2016	American Journal of Public Health	Assessment of effectiveness of text reminders to
47	64	Teng	Supporting the self-management of hypertension:	2016	Journal of Human Hypertension	Qualitative evaluation of patient experience

48	65	Mark	as add-on to standard care among patients with type 2	2017	European Journal of Endocrinology	Randomised controlled trial
49	67	Jitendra	Devices to Promote Medication Adherence in	2012	The Journal for Nurse Practitioners	medication adherence through use of handheld
50	68	Mahfuz	Preliminary Findings Describing Participant Experience With	2016	Journal of the Association of Nurses in AIDS care	Preliminary findings of a randomised controlled trial
51	69	Padma	A personalized, multi-platform nutrition, exercise,	2017	Internet Interventions	Pilot testing of a multi-platform lifestyle coaching
52	71	Jitendra	of stress urinary incontinence via a mobile app: two-year follow-up of a	2017	Acta Obstetricia et Gynecologica Scandinavica	Two-year follow-up of a randomised controlled trial
53	74	Teng	Mobile-Web app to self-manage low back pain: Randomized controlled trial	2015	Journal of Medical Internet Research	Randomised controlled trial
54	75	Mark	A New mHealth application to support treatment of sleep apnoea patients	2017	Journal of Telemedicine and Telecare	Feasibility and acceptability of a mHealth app
55	77	Padma	Patients Benefit from the COMODITY12 mHealth System:	2016	Journal of Medical Systems	Randomised controlled trial
56	78	Teng	mobile phone-based health coaching among Finnish diabetic and heart disease	2015	Journal of Medical Internet Research	Randomised controlled trial
57	80	Mark	reliability of a smartphone	2014	Journal of Medical Internet Research	repeated measures crossover trial
58	81	Padma	Effect of mobile reminders on screening yield during	2015	Preventive Medicine Reports	Randomised controlled trial

59	82	Padma	evaluation of an audiology app for iPhone/iPad mobile devices	2015	Acto Oto-Laryngologica	Development and evaluation of an iPhone/iPad mHealth app
60	83	Teng	Self-Reported Health Outcomes of a Patient-Designed Do-it-Yourself Mobile Technology	2017	Diabetes Technology & Therapeutics	Cross-sectional online survey of
61	84	Mark	treatment adherence for blood pressure lowering via mobile phone SMS-	2015	BMC Family Practice	evaluation of participants' experience of a RCT of SMS-based mHealth
62	88	Teng	intervention in diabetes care using real-time monitoring and tailored feedback in	2016	Acta Diabetologica	Randomised controlled trial
63	89	Ben	Patient handling activity recognition through pressure-map manifold learning using a	2017	Smart Health	Description and pilot testing of a smart footwear device
64	90	Padma	Tailored, Interactive Text Messages for Enhancing Weight	2015	The American Journal of Medicine	Randomised controlled trial
65	91	Mark	based lifestyle intervention for reducing overall	2015	of Environmental Research and Public Health	evaluation of a mobile phone-based lifestyle intervention
66	93	Ben	intervention increases physical activity in people with cardiovascular	2015	European Journal of Preventive Cardiology	Randomised controlled trial
67	96	Padma	SmartLossSM, a smartphone-based weight loss intervention: Results from a randomized	2015	Obesity	Testing of a smartphone-based weight loss intervention
68	97	Teng	Cardiovascular screening in low-income settings using a novel 4-lead smartphone-based	2017	International Journal of Cardiology	Validation of a portable ECG device

69	98	Mark	Feasibility of a lifestyle intervention for overweight/obese	2015	Gynecologic Oncology	Feasibility of a lifestyle intervention delivered through web and mobile-
70	100	Padma	evaluation of theory-informed technology to augment a wellness motivation	2014	Translational Behavioral Medicine	Design and evaluation of a mobile app to promote physical activity
71	101	Teng	PULSE-SMART: Pulse-based arrhythmia	2016	Journal of Cardiovascular Electrophysiology	Testing of an enhanced smartphone app for
72	102	Jitendra	Mobile personal health system for ambulatory blood pressure monitoring	2013	Computational and Mathematical Methods in Medicine	Preliminary findings from implementation of a mobile personal health monitor application
73	103	Jitendra	A mobile application improves therapy-adherence rates in elderly patients	2016	Medicine	Crossover usability trial
74	104	Teng	A spanish pillbox app for elderly patients taking multiple	2014	Journal of Medical Internet Research	Randomised controlled trial
75	107	Mahfuz	Acceptability of Ecological Momentary Assessment of Daily	2017	American Journal of Geriatric Psychiatry	feasibility, acceptability and initial validity of smartphone-based
76	108	Jitendra	infrastructure to support underserved patients with chronic disease	2014	Healthcare	Feasibility of integrating mHealth infrastructure with clinical information systems
77	109	Mahfuz	Text Messaging for Exercise Promotion in Older Adults From an Upper-	2016	Journal of Medical Internet Research	Randomised controlled trial
78	110	Teng	Text message reminders increased colorectal cancer screening in	2017	Cancer	Randomised controlled trial

79	111	Teng	Effects of a Whatsapp-delivered physical activity intervention to enhance health-related physical	2017	The Journal of Sports Medicine and Physical Fitness	3-arm pilot randomised controlled trial
80	115	Teng	Developing a behavioral model for mobile phone-	2013	Patient Education and Counseling	Qualitative evaluation of a text message-based
81	116	Teng	Randomized Controlled Pilot	2016	Journal of Medical Systems	Randomised controlled pilot trial
82	117	Mahfuz	medication adherence and blood pressure control in recent	2015	Journal of the Neurological Sciences	feasibility and preliminary out comes of a mHealth system
83	120	Mahfuz	Increasing physical activity in stroke survivors using STARFISH, an interactive mobile	2016	Topics in Stroke Rehabilitation	Evaluation of potential effectiveness of a mobile app
84	121	Mahfuz	Mobile App for Managing Urinary Incontinence	2015	The Journal of Urology	evaluation of a mobile app for management of
85	122	Mahfuz	Smartphone Application Incorporating Personalized Health-	2014	AIDS Patient Care and STDs	Randomised clinical trial
86	124	Mahfuz	Acceptability of a mobile health exercise-based	2015	Journal of Cardiopulmonary Rehabilitation and	Randomised controlled trial
87	125	Padma	activity in a cardiac rehabilitation population using a smartphone-based	2013	Journal of Medical Internet Research	mobile phone physical activity questionnaire and comparison with
88	127	Jitendra	Structured Caregiver Feedback Enhances Engagement and Impact of Mobile	2016	Telemedicine and eHealth	Randomised controlled trial
89	129	Jitendra	Engagement with automated patient monitoring and self-	2013	Medical Care	Patient experience of a IVR self-management
90	130	Jitendra	of Mobile Health Support for Heart Failure Patients and Their Informal	2015	Medical Care	Randomised comparative effectiveness trial

91	131	Mahfuz	intervention supporting heart failure patients and their informal caregivers: A randomized	2015	Journal of Medical Internet Research	Randomised comparative effectiveness trial
92	133	Mahfuz	Development and initial evaluation of a mobile application to help	2017	International Journal of Medical Informatics	User acceptance, perceptions and usage of a mobile app
93	134	Mahfuz	experiences in a smartphone-based health coaching intervention for	2016	Journal of Telemedicine and Telecare	Qualitative evaluation of a RCT
94	135	Padma	motivational mobile phone short message service on aspirin adherence after coronary	2013	International Journal of Cardiology	Pilot randomised controlled trial
95	136	Padma	WellDoc™ mobile diabetes management randomized controlled trial:	2008	Diabetes Technology & Therapeutics	Randomised controlled trial
96	137	Mahfuz	Factors influencing engagement, perceived usefulness and	2016	PLOS ONE	Parallel design, single-blind randomised controlled trial
97	138	Mahfuz	smartphone-based intervention to promote cancer prevention	2017	International Journal of Medical Informatics	Pilot testing and evaluation of a smartphone app
98	140	Jitendra	self-monitoring technology and brief phone-based	2016	Obesity	Randomised pilot study
99	141	Padma	mHealth intervention to improve the	2016	Lancet Diabetes Endocrinology	Randomised controlled trial
100	142	Mahfuz	remote mood and activity monitoring in bipolar disorder:	2017	European Psychiatry	Qualitative evaluation of an intervention
101	144	Mahfuz	tablet computing on provider productivity, communications, and the process of	2016	International Journal of Medical Informatics	Survey evaluating practitioner perceptions of mobile tablet computers

102	145	Padma	Long-term outcomes of a web-based diabetes prevention	2015	Journal of Medical Internet Research	Outcomes of a longitudinal pilot study
103	147	Mahfuz	using a mHealth device and correlations with psychopathology in patients with	2016	Pyschiatry Research	Quantitative evaluation of a mHealth application
104	148	Jitendra	strength-balance training to motivate and improve adherence to	2013	Journal of Medical Internet Research	Phase II preclinical exploratory trial
105	149	Mahfuz	Investigating the Use of a Mobile Phone Short Message Service	2014	Journal of the Association of Nurses in AIDS care	Qualitative evaluation of a pilot study
106	150	Jitendra	A pilot study of an accelerometer-equipped	2017	Journal of Geriatric Oncology	Pilot feasibility study
107	152	Padma	Feasibility of a Text Messaging Intervention to	2015	Oncology Nursing Forum	Randomised controlled trial
108	153	Mahfuz	Integrating technology into	2013	JAMA Internal Medicine	Randomised controlled trial
109	154	Jitendra	Design and evaluation of a mobile phone-	2016	Computers in Human Behavior	Exploratory longitudinal study
110	155	Mahfuz	Evaluating the use of mobile phone technology to	2014	International Journal of Medical Informatics	Development and evaluation of a mobile application
111	156	Jitendra	Increasing physical activity efficiently: An experimental	2014	International Journal of Telemedicine and Applications	Pilot testing of an online physical activity intervention
112	157	Padma	randomized, controlled trial of a simplified multifaceted management	2015	Circulation	Cluster randomised controlled trial
113	158	Padma	dilated fundus photography and near visual acuity	2016	Retina	Usability of a smartphone-based telemedicine system
114	159	Mahfuz	Byte by bite: Use of a mobile Bite Counter and weekly behavioral	2017	Smart Health	Examination of usability and feasibility of a mobile app

115	160	Jitendra	Mobile Health is really mobile? An examination of mobile device use	2014	International Journal of Medical Informatics	Examination of two randomised controlled trials
116	161	Mahfuz	Effects of exercise intervention in breast cancer patients: is mobile health (mHealth)	2017	Breast Cancer Research and Treatment	Quasi-randomised multicenter trial
117	164	Jitendra	It's LiFe! Mobile and web-based monitoring and feedback tool	2015	Journal of Medical Internet Research	Cluster randomised controlled trial
118	165	Mahfuz	Usability testing of a monitoring and feedback tool to	2014	Patient Preference and Adherence	Usability testing of a tool to stimulate physical activity
119	166	Padma	The effect of text message support on diabetes self-management in	2017	Journal of Clinical & Translational Endocrinology	Randomised controlled trial in three countries
120	167	Mahfuz	Process evaluation of a mobile health intervention for people with	2017	Journal of Telemedicine and Telecare	Process evaluation of a mHealth intervention
121	169	Padma	tool to stimulate physical activity in patients with COPD or type 2 diabetes in primary care	2014	Journal of Telemedicine and Telecare	Pilot testing and evaluation of a tool to stimulate physical activity
122	170	Mahfuz	Feasibility of a Memory Clinic-Based Physical Activity Prescription Program	2016	Journal of Alzheimer's Disease	Randomised crossover trial
123	171	Jitendra	multimedia food recording tool, food log: Smartphone-based self-management for	2015	Journal of Diabetes Science and Technology	Testing of a revised version of a smartphone application
124	173	Padma	reduces hba1c in type 2 diabetic patients from a lower-	2015	Journal of Medical Internet Research	Evaluation of a health coach intervention
125	174	Mahfuz	Smartphone-enabled health coach intervention for people with	2014	Journal of Medical Internet Research	Development and testing of a smartphone application

126	**175**	Jitendra	of gait quality during daily life provide insight into	2013	Neurorehabilitation and Neural Repair	Evaluation of a body-based accelerometer
127	**176**	Mahfuz	Adapting a Psychosocial Intervention for Smartphone	2017	American Journal of Geriatric Psychiatry	Development and evaluation of a smartphone application
128	**177**	Padma	based intervention on physical activity and metabolism in older adults:	2013	Journal of Medical Internet Research	Randomised, waitlist-controlled trial
129	**178**	Jitendra	Using a mobile health application to support self-	2014	British Journal of General Practice	Embedded qualitative study
130	**179**	Mahfuz	mobile phone intervention to assist mindfulness	2016	Mental Health & Prevention	Pilot randomised controlled trial
131	**180**	Padma	Tablet PC-enabled application intervention for patients with	2015	Computer Methods and Programs in Biomedicine	Single-arm pilot study
132	**183**	Padma	Adoption and use of a mobile health application in older adults for cognitive	2016	Transforming Healthcare with the Internet of Things	Longitudinal evaluation of a new tablet application
133	**186**	Padma	Extended, continuous	2017	Journal of Neuroscience	Development and real-world feasibility

Details of study methods					Healthy A
Overall duration of study	**Number of groups/sites**	**Informed consent obtained (Y/N)**	**Power calculation**	**Type of intervention**	**Disease group**
Not mentioned	1	Y	Not done	Text messages enquiring regarding mood	Depression
6 months	1	N	Not done	text messages (Text4Mood program)	Depression and anxiety
6 months	2 groups, 16 sites (OP clinics)	Y	Not reported	mHealth services, including	diabetes & hypertension
Not mentioned	3	Y	0.8	text messages about	CVD
Not mentioned	2	Not mentioned	Not done	Smartphone-based portable	Obstructive sleep apnoea (OSA)
6 months	1	Y	0.8	mobile phone app for patients and their providers to	Hypertension +/ dyslipidemia +/ heart failure +/HIV infection
	3	Y			
15 days	3	Y	Not done	i) EMR-only group, ii) EMR + reminder group	HTN
21 months	2	Y	0.8	based intervention to promote physical activity delivered	CVD
30 months	3	Y	0.975	an integrated, multidisciplinary care program for	T2DM
3 weeks	1	Y	Not done	A text message–capable mobile phone	Diabetes

24 weeks	1	N/A	N	A peergroup lifestyle intervention enhanced with	Mental health
NA	1	N	N	An App connected by blue tooth to a monitoring	CHF
	3	N	Not mentioned	mHealth decision support system (DSS)	N/A
36 months	2	Y	N	Delivery of cognitive training by iPad or by computer	Schizophrenia
12 months	3	Y	Y		Hypertension
4 weeks	1	Y		App to prompt movement periodically	ovewrweight or obese
2 months	2	Y	0.8	EG: Smartphone delivered acceptance and commitment	N/A
9 days	1	N/A	NA	One hour interview	Health professionals dealing with Lung cancer
					Heart failure
24 months	3	Y	Y	self-monitoring diet using a PDA alone	weight loss
12 weeks	3	Y	N	SM using the Lose It! smartphone app	weight loss

16 weeks	2	Y		impact of Fitbit tracker and website with pedometer on moderate to	Overwight or obese
28 months	2	Y	Y	application that instructs COPD patients in respiratory	COPD
6 weeks	1	Y	N/A	sensor-based location indoor and outdoor	Neuromuscular disorders
6 months	1	Y	N	diabetes connect web application with secure messaging (tablets)	Diabetes
24 months	No group	Not mentioned	Not mentioned	A pre-programmed library of	N/A
4 months	1	Y	Not mentioned	A smartphone based app containing self-	Asthma
9 months	1	Y	N/A	provides information, patient held health and	CVD
15 days	1	Y	N	Mobile app for postoperative monitoring after outpatient lumbar	Spine
6 months	2	Y	N	Real-TimeIntervention forStabilizingMood(PRISM).	Bipolar disorder
			Yes	group-Pocket PATH-Smartphone with custom Pocket	Cohort of Lung Transplant recipients
6 months	1	Y	Not done	Mobile app based on dyspnoea	AeCOPD
dependent on rehabilitation length of stay	2	Y		Single blinded RCT	Stroke rehabilitation

4 months	1	Y	Y	prevention sessions with home based program delivered by	Nil
sectional (one off)	3	Y		- testing acuracy of neural	People with mild to moderate stroke
NA	1	N/A	N/A	NA	NA
NA	1	Y	NA	Useof a mobile phone	Elderly (9 Frail and 9 non Frail
90 days	2	Y	N	Daily text messages for 90 days	Diabetics with HbA1c>8%
4 months	6	N	0.8	Different types of reminders inviting patients to get the	DM/CHF/Asthma/COPD/CAD (Conditions with increased risk of pneumonia)
10 weeks	2	Y		provides reminders for corrective actions for gait,	People with Parkinsons
8 months	2	N	Not mentioned	Provided a smart phone based	Alcoholic disorder
NA	1	Y	N	NA	NA
6 months	2	Y	Incomplete	SMS or automated voice response calls	Healthy adults
4 months	2	Y	Y	providing medical record, clinical decision support, self	Atrial Fibrillation
6 months	5	Y	Yes	Comparison among a question mode	Healthy adults
8 weeks	N/A	Y	N/A	mobile app on HT self Mx	HTN

8 months	3	Y	Y	Video consultations as add on to standard care.	T2DM
12 weeks	1	Not mentioned	N	adherence was assessed by the On Time RxTM	(unspecified) chronic illness
16 weeks	2	Y	Not done	Short messaging service intervention containing	HIV & neurocognitive behaviour due to HIV
12 months	1	Y	NA	Web based multi platform, nutrition	Obese adults
24 months	2	Y	Not done	Tät® mobile app	Urinary incontinence
	3	Y			
6 weeks	1	Y	N	Self monitoring of CPAP treatment using a mobile App	Obstructive Sleep Apnea patients
6 Weeks	2	Y	Y	system composed of smart phone, wirelessly	diagnosed >6 months prior to the study, currently in maintenance phase
12 months	3 for each disease	Y	0.8	Mobile phone with a PHR app and bluetooth connected measurement devices for	DM and HTN
12 months	1	Y	Y	application of a questionnaire	Benign prostate hypertrophy
11 days	2	Y	Yes	Eligible outpatients either received (intervention	Healthy adults

Five Months	Single group	Yes	NA	Multi-center prospective non-randomized validation study.	Patients attending otolaryngology clinics
3 months	1	N/A	N	NA	DM
24 months	1	Y	N/A	improve blood pressure medication adherence semil tailored to	Hypertension
6 months	2	Y	Primary endpoint: % patients achieving HbA1c<7 % without	Physical activity-monitoring device and dietary feedback Integrated into a CDSS package	DM
N/A	1	Y		Non intervention - 8 participants undertook 8 routine on-ward activities and	Not focused on disease group, applications likely to focus on rehabilitation or
12 months	2	Y	Yes	Participants were randomized to standard care	BMI>27
18 months	8	Y	Y	prescritpion, written handbook.	Healthy workers
24 weeks	2	Y	Not mentioned	Text messages and videos, delivered by mobile phone	Ischaemic heart disease outpatients
12 Weeks	2	Y	NA	participants were prescribed a 1,200 to 1,400 kcal/d diet and were provided with a	Overweight/ obese people
	1	N/A	NA	NA	CVD

1 month	1	Y	N	Mobilie APP for logging food intake and volitional	Overweight or obese patients with Stage 1 or 2 Endometrial cancer
10 days	2	NA	NA	Pilot implementation and evaluation	Older adults with fall risk and low physical activity
		Y		NA	CVD
		Y			
	1	Y	Not done	Medication Plan via Apple iPad	Coronary heart disease
3 months	2	Y	No	Personalization of prescriptions and medical advice, showing	
				smartphone-based ecological momentary assessment	
9 months	ts were recruited from WestsideComm unity Health	Y	N/A	automated,bidirectionaltextmessaging (outreach messages).	Diabetes
24 weeks	2	Y	0.8	SMS text messeging about knowledge on exercise	N/A
					Cancer

10 weeks	3	Y	N/A	Whatsapp-based physical activity intervention	No specific disease targeted
	N/A	Y	N/A	Text message based self mx program	DM
3 months with data collection at	2 groups	Y	N	Patient-centered, tablet-based self	DM and Hypertension
3 months	2		Not mentioned	mHealth program involving a GSM enabled	Post-stroke patients wth uncontrolled hypertension
6 weeks	2		0.84	a smartphone based app containing behaviour change activity	Stroke survivors
Not mentioned	N/A	N	N/A	a Mobile App for Managing Urinary	Urinary Incontinence symptoms
	2				HIV infection
24 weeks	2 arms			HEART intervention was designed to	ischemic heart disease (IHD)
1 week	1	Y	N/A	based Physical Activity Questionnaire and Pedometer	CVD, Hypertension, Diabetes, AF, High Cholesterol, Angina, Heart Attack etc.
4 months	4	Y	Not done	weekly IVR calls with automated feedback from care partners	Patients with diabetes and/or hypertension
23 months	N/A	Y	N/A	IVR chronic disease self-management	heart failure, depression, diabetes, Cancer
12 Months	2	Y	Not done	IVR chronic disease self-management support	Heart failure

	2	Y	0.8	mHealth support for caregivers of HF patients over and above the impact of a standard	Heart disease (Heart failure)
Not mentioned	1	Y	Not mentioned	An Anroid app containing information about	N/A
6 months	2	Y	Not mentioned	smartphone based health coacing intervention	Type 2 diabetes
1 month	2	Y	Not mentioned	Motivational SMS	Patients who had undergone coronary stenting
3 months	2	Y	N	Cell phone based diabetes management software system, real-time	Patients with Diabetes
6 months	2	Y	Not mentioned	Text messaging program	Coronary heart disease
4 weeks	1	Y	Not mentioned	smart phone based intervention contatining	N/A
6 months	1	Y	0.8	monitoring - a calorie reference book, a	Weight Loss
12 months	2	Y	Y	Intervention	Prehypertensives 120-139 mmHg
		Y	Not mentioned		
18 months		N	N/A		

Two years	One group but analysed into two groups	Y	NA	Prevent' Internet based personalized health coaching	Healthy adults Mean age 43.6
		Y			Schizophrenia
N/A	Horgen, Switzerland	Y	N/A	Tablet-Based Strength-Balance Training	Elderly
N/A	1	Y	Not mentioned	Self-monitoring	Cancer
10 Weeks	2	Y	NA	proof of concept of a mobile health (mHealth)	Oral cancer patients
12 months	2	N	Not mentioned	SMS and telephonic	Obese
N/A	Tsinghua Elderly University and a nearby	Not mentioned	Not mentioned	Self-monitoring and self-reflection	hypertensive or pre-hypertensive condition
		Y	Not done	mobile phone based CVD risk assessment	Cardiovascular disease
N/A	Norway	Y	No	Self-monitoring	None specifically
27 months	2	Yes	Yes	Healthcare Workers were aided by the smartphone-based electronic	high cardio-vascular risk
8 months	2	Yes	NA	telemedicine app. The visual acuity	undergoing ophthalmic screening for
4 weeks	1	Y	Not done	mobile Bite Counter (a watch-like device that detects	N/A

36 months	3	Not mentioned	No	basedpodcast (TBP) 2) the TBP + mobile group (a	Weight Loss
					Cancer
Not mentioned	Twenty four family practices. Netherlands	Y	Based on a power of 80%, an alpha of .05 (two-	monitoring and feedback tool	chronic obstructive pulmonary disease or type 2 diabetes
	N/A	N	Not mentioned	A monitoring and feedback tool consisting	
2 years	3	Y	Y	Mobile phone for self-management of Diabetes	Diabetes
12 months	3	Y	Not done	Diabetes Self-Management Support (DSMS) by SMS	N/A
3 months	1	NA	NA	Pre and post intervention study	Diabetes or COPD
16 weeks	2	Y	Not done	Promoting Activity through Clinical Education and Reinforcement,	Alzheimers
Not mentioned	Not mentioned	Y	Not mentioned	Self management	T2DM
6 months	2	Yes	yes	with or without mobile phone monitoring support. health	Diabetics with HbA1c>7.3%
24 weeks	1	Y	Not mentioned	smartphone based health coach intervention for	Diabetes

6 months	2	Not mentioned	Not mentioned	Self monitoring using accelerometer	Elderly
adaptive systems engineering framework5	1	Y	Not mentioned	smartphone interventions (I-IMR) that allow participants o do	mental illness
3 months	Two groups	Yes	Yes	Philips DirectLife, which was directed at increasing	inactive adults aged 60-70 years without diabetes
6 months	patients from various community NHS	Y	Not mentioned	Self management	COPD
	2	Y	Not mentioned	An SMS-assistedMindfulness-	people with depression
6 weeks	2	Y	Pilot study	A tablet PC application developed to serve the	Patients who have undergone surgery for gastric cancer
6 months	1	N/A	Pilot study	Evaluation study	Healthy adults
5 months	1	Y	N/A	Functional monitoring of	Alzheimers disease and related

ageing setting/context		Population details				
Care setting (Primary, secondary, tertiary)	**wider health promotion and disease prevention program, specify the other**	**Mean Age**	**Sex**	**Total sample size**	**Number of patients per group**	**Issues with access to or equity of intervention or services within the population**
Primary	N/A	52.6	M & F	33	N/A	42% of participating patients did not know how to use text
Primary and secondary	N/A	46-65 (31.3%) >65 (7%)	M & F 83% F	4111	N/A	None
OPD	a)monitor pts sx/self-mx problems	Mean age 66.7±9.8 (All > 60	97% male	422 eligible, 301 (72%)	108 in 3-mth, 193 in 6-mth program	equitable access
Primary	N/A	54.94	M & F 54.4% M	180	60	their phone lines disconnected
Primary	N/A	Varying ages, not	93% M	15	8 and 7	Most participants
Primary and secondary	N/A	56	M & F 78.6% M	62	N/A	with Android or iOS smartphones could
Primary care	N/A	60	M & F	123	47 in 1st group, 33 in the 2nd and 43 in the	None
Tertiary care (cardiac rehabilitation centre)	N/A	59	M & F (78% male)	69	29 in intervention and 40 in control group	None
Primary care	N/A	51	M & F (67% F)	301	group (CG), 99 in Project Dulce intervention	with active health insurance could
ED at the Los Angeles County Hospital		45 years	60% were male	Twenty-three patients with		80% of Spanish-speaking patients have and use

Primary	Yes	49	56% female	32 patients with BMI>30;	1 group only	people living with severe mental health problems and
Patients admited to hospital with diagnosis of CHF	No	58.2	M & F 60% M	25	N/A	NA
N/A	N/A		M & F; mostly female	363	Cohort1=93; cohort 2= 132; cohort 3=138	N/A
Outpatient clinic, mental health centres and community	Nil	45	81% M	47	Computer 21; iPad 26	Reduced access in remote communties
Primary care	no			1372	information-only SMS text messages (n=457), interactive SMS text messages	The clinic is within walking distance of both communities. All primary healthcare
setting, recruitment through		47	83% female	30	30 (repeated measures with same group)	online, so may not be representative
Primary	N/A	41.5	M & F Male: 47% (smart	196	98	Not completing baseline survey and confirmation call
Tertiary	group providing rehab. Services for Lung cancer	20-50	Seven females and one male	8	NA	professionals with a higher level of knowledge and
Hospital?	NA	46.8 years	women (84.8%)	210	paper diary group 68 assigned to PDA group	
community		44.85 ± 12.75	female (87.18%)	39	13	

Not in care settings		58 intervention/61 control	100% Female	49	25/24 control	Web based interface relied on consumer access and digital literacy
Medical wards of Tertiary Hospital	Nil	71.5	83.1% M	71	36 interv; 35 control	N/A
Primary care	N/A	65	M & F 60% F	5	5	N/A
Primary and secondary	Yes		CHW mostly female	72 patients with type 2 diabetes;	Active CHWs: completed some college or college graduate, 39.66	Targeted low SES groups
Primary	N/A	48	M & F Male 75%	1470	N/A	Not receiving the intervention due to the
Primary	N/A	50	M & F	60	N/A	N/A
Secondary care (cardiologists)	N	58	M & F	32	NA	Some rural access issues
Secondary	No	42 (23-77)	F/M = 18/42	60		
Primary care		47.5% (12.8)	58.5% Female	82	41	
Tertiary	Yes, Part of the University of Pittsburgh Medical Centre	62	Males-55%	201	Pocket PATH-99, Usual care-102	received transplantation at UPMC, recruitment
Secondary	M-COPD enhanced care service was	65	F/M = 1/1	8 (10 initially, but 2	NA	N
Tertiary		62	40% female	125	feedback intervention, 58 standard	

Community	Added to reduced face to face program	55	33% M	61	30 Int 31 control	NA
Not in care setting		62.1	50% female	12	sitting, walking groups)	
NA	NA	68 years				
University	No	83	Not reported	18	9 Frail 9 non Frail	NA
Tertiary	No	46	M & F	48	24	Diabetics with HbA1c>8%, use a mobile or text messages,
Primary care	N/A	> 40	M & F	1380	230	Participants had to be beneficiaries of the American
Not in care setting		Not reported in paper	Not reported	38	20 intervention, 18 control	participants had used a smartphone prior to
Primary	N/A	38.3	M & F 39.3%	349	I: n=156 C: n=155	
NA	N/A	58.3	M & F 69% M	93	NA	None
Primary care		50.8	59.3% females	598	SMS= 167, AVR= 431	Only those who were able to read/write English
Tertiary hospital	N/A	67	58% M	205	113 Intervention; 96 Usual care	No
Primary care	Yes, part of the national Israeli Colorectal	60.44	51.1% females	50000	10000	Study included only those who are eligible for
Primary care	Yes, regular follow-up visit with physician	F 58yrs (46–72); M 62.5 yrs	Females (n = 23) Males (n	49/51 interviewed	51 patients actively used the system for	

Outpatient clinic of 3 Tertiary hospitalt	N/A	58	M & F 64% M	165	Interv 83 Control 82	Nil
primary care		58.6	Female 83.8%	35	35	
Primary	N/A	51.8	M & F (M=9, F=2)	21	I: n=11 C: n=10	Physical condition which might limit moderate
NA	NA	49.64	89% Females	77	Single cohort	NA
	NCT01848938	s 44.2 yr (10.3) non-responder	F	123	App group = 61 control = 62	
	Neither supported by professional caregivers nor integrated within a health			597 adults were recruited, screened, consented and	(1) treatment group (n=199), which used the FitBack intervention, (2) alternative care	Low eHealth literacy
Sleep unit of Tertiary Hospital	Nil	56	47% M	60	NA	NA
Primary	NA	Interventio n- 59.9, Control- 59.0	on-Females- 43%, Control-	60	30	was based on the ability to use the cell phone and the sensors
Primary	Health coaches and patients can see patients' measurements in the PHR and	Heart patients was 69.1 (SD 9.1) years, and diabetes	The majority of patients were men in	517	267 heart patients and 250 diabetes patients started in the trial, of which 246 and	
Primary care	No	58	100 M	1581	Interv 790 Control 791	No
Primary care	Yes, Outpatients attending a PHC	Inteventio n- 46.5, Control- 44.6	Interventi on-Females- 44.4%,	268	Intervention=23 3, Control=135	None

Tertiary	No	43.9	Females-55%	110	NA	NA
Online community	NA	41 years	74.8% females	1268 members of CGM in the Cloud communit y.	1157 had diabetes in the household with 62.6%(n = 724) using Nightscout	For children, the most common viewers were the mother, the father, the child himself or
Large primary care practice	NA	36-78 years	35% M	37	Not reported	dispensed for 28 days from clinics (pre packaged from regional chronic
Outpatient clinic, Seoul National University Bundang Hospital (SNUBH) from December	Yes: individualized multidisciplinary u-healthcare service combined with	U-healthcare group 64.3 (5.2), SMBG 65.8 (4.7) years	Male/female: U-healthcare 40/10 and SBGM	100 patients (121 screened and 21 excluded:	50 each in the u-healthcare and SMBG groups	
Not identified		Not reported	Not reported	8 participants	N/A	
NA	NA	Intervention- Age 40+-85.2%,	Intervention-Females-	124	Intervention=63, Control=61	African Americans, Aged 21+ years with a
Workplace	Nil	61	58% M	589	99 Interv and 147 control	NA
Secondary (outpatient cardiac rehab)		60	M & F 81% M	153	75 intervention, 78 control	
Tertiary	NA	44.4	Females-82.5%	40	20	
Secondary - ommunity hospital	No	39±11 years	69/117 males	117	NA	Yes = Africa & LMIC

Hospital	N	58	F	50	NA	No
NA	NA	evaluation-Mean-74.6 Follow up Mean age-84	Initial evaluation-Females-45%	23	Initial evaluation-9, Follow-up- 14	NA
Secondary						
		58.9	M & F 61.9% F	21		
Cardiac rehab sports groups		73.8 yr (7.5)	M & F	24	24	
72 of 99 pats (73%) took more than 5 Meds/day; 36 of			45% female	99	48 controls, 51 experimental group	Control group received oral and written information
Primary care	chronic disease management in safetynet patients .i.e people with no	40.6% in age group 50-59	M & F	135	135	Safetynet patients .i.e people with no or little insurance
Primary	N/A	63.64	M & F	43	I: n= 22 C: n=21	4 patients had injuries which was not related to the
Primary		40-45 yrs: Control 404/Intervention	The HR estimates were higher for	2386 AN/AIs aged 40 to 75 years	Identified 808 eligible participants in wave 1, and	Yes. Cross cultural issues

Primary care	N/A	63.78	M & F 75% F	32	20 in training group, 15 in mobile group and 13 in control group	None
Primary care		three-quarters were	female (67%)	18 African-American patients	56 patients identified, 45 patients were	
Home		69 years	68% females	61 after attrition	n=32, control	N
tertiary	N/A		M & F	24	mHealth group=8, Eight patients were randomly	N/A
Primary	N/A	56	M & F 12 women	23	I: n=15 C: n=8	
			Female	878		N/A
Primary	N/A	46	M & F 26 men	28	I: n=17 C: n=11	
				171	I: n=85 C: n=86	
Tertiary- Cardiac rehabilitation centre	No	NA	Males - 87%	30	NA	Zealand Eurpoeans, so more likely to be educated and
Primary care	N/A	62.5% of patients above 60	M & F	72	27 (standard mhealth)+45(m health + CP)	29.2% indigenous
Primary care		60.9	M & F	1173	N/A	N/A
Primary care		67.9	M & F	369	Standard mHealth (n=180) mHealth+CP (n	N/A

	N/A	67.8 years	M & F	331	I: n=165, C: n=166	N/A
N/A	N/A	Not mentioned	M & F	3977	1st trial: 26 2nd trial: 3951	N/A
Primary	N/A	Male=63.5 Female=55 .8	M & F, F=9	11	N/A	N/A
Tertiary care	N/A	64	M & F 76.5% M	521	250 in intervention and 249 in control group	None
Primary	No	Intervention Age 55-64 n=5, Control n=7	Males Intervention n=4, Control n=5	26	13	No
Primary	N/A	58	M & F; 83% male	710	I: n=352 C: n=358	
N/A	N/A	Participants age between 18-35;	M & F	32	N/A	N/A
Research centre	N/A	51.1 years	M & F	80	2) TECH (n 5 27) 3) TECH1PHONE	N/A
Primary care	N	43	Intervention 47% Control-	637	Intervention-316 Control-321	No
				21	N/A	
		Not mentioned	M & F	42		all of the participants were provided a mobile tablet computer to

Individual	No	43.6	Males n (%)=38 (17.3)	220	Starters (4+ lesssons) = 187, Completers (9+ lessons) = 155	Participants recruited by a non-randomized uncontrolled,
			M & F	61		
recruited by convenience sampling from 2 institutions for		75	M & F	44	3 groups	Elderly
		46	M & F 80% F	25	N/A	N/A
Tertiary		73	M & F	40	40	N/A
Community care centre	NA	58.5	Females-60%	80	40	Patients were eligible if they were aged 21
Primary	N/A	57.7 years	M & F	69 adults	35	N/A
Elderly community		59.2	M & F	19	19	Elderly
		CHWs=33 years; communit	34% male, 66%			
Research centre		55.3	M & F	21	The Lifestyle group consisted of 12	Not mentioned
Community based study	To improve cardiac health status	59.7	Interventi on-65.4%, Control-66.8%	2086	Intervention-1095, Control-991	Residents of participating villages in China and India
Tertiary	NA	60.5	Females-58%	50	NA	a disproportionat e burden of
		54.1	Male=1, Female=11	12		

Not mentioned		42.75	M & F	174	participants were randomized to theTBP	Not mentioned
		50.3		356		
Primary care	monitoring and feedback tool embedded in the Self-	57.8	M & F	199 patients	Group 1 (n=65), Tool & SSP Group 2 (n=66), SSP	
Primary	Part of the wider TEXT4DSM study	58	Females Interventi on- 71%	781	Intervention-401, Control-380	Diabetic population
N/A	N/A	DRC=62; Cambodia = 55; Philippines	M & F	1470	TEXT4DSM group=505 Cambodia= 484 Philippines=	N/A
General Practice-Primary	NA	60	Females-45%	20	20	complex co-existing medical conditions, insufficient mastery of the
Primary	N/A	Cognitively impared group= 72.3; normal	M & F	30	2 cohorts; group with cognitive impairment due to	N/A
Not mentioned		58.6	M & F	5	Not mentioned	Not mentioned
Primary	NA	53.2	Females-72%	97	Intervention-48 Control-49	served were from a lower-income neighborhood
Primary	N/A	55.6	M & F	21	N/A	N/A

community-living		78.36	M & F	71	32 (falls) and 39(non-falls)	
secondary	N/A	55.3	Male=5, female=5	10	N/A	N/A
NA	NA	Interventio n-64.7 and Control- 64.9	on- Female- 39.5%, Control-	235	Intervention- 119 and Control- 116	age between 60 and 70 years, (2) no history of diabetes or use
respiratory community nursing service,		67	M & F	19	19	
secondary	N/A	43.38	M & F	41	I: n=21, C:n=20	N/A
Tertiary	NA	61	M & F 60% M	40	20	
N/A	N/A	79-88 years old	Females- 60%	15	15	Seniors between 79-88 years
Primary care	Participants were part of	45 and older	M & F	12	12	Only those with a caregiver were

	Intervention and comparator details				
Demographic profile and location of study groups	**Intervention description**	**Intervention duration**	**Intervention frequency**	**Intervention provided by**	**Co-interventions (if any)**
Patients from a public-sector mental health clinic in California, 94% of the patients	Automated text messages measuring mood on a scale of 1 to 9, and enquiring	2 weeks	Daily	Automated messages from a website	Group cognitive behavioural therapy
depression and anxiety seeking psychological or	text messages, written by CBTs and counsellors	180 days	Daily	Preprogrammed online software	N/A
16 DVA outpatient clinics in Michigan Illinois In	a)monitor pts sx/self-mx problems	3 and 6 months	weekly: Each week IVR system makes	Ann Arbor VA Healthcare System	Guidance on self-mx support for caregivers via
cardiac outpatient clinics of a	messages about medication, diet	3 months	Daily	Automated software	which included arranged cardiac
Patients from a medical sleeping	Measurement of subjects' oxygen	One-off test	N/A	The researchers	N/A
two clinics, a primary care and hospital, in Barcelona, Spain	medication management platform, which can be accessed	6 months	Daily	reminders were automated, and there was bi-directional	N/A
Patients were recruited from a primary care clinic	All patients were given a BP cuff and shown how	15 days	Daily	The reminder messages were sent by custom-built	N/A
recruited from the Skibotn Rehabilitation Centre in northern	access to an online interface with information about CVD and	3 months	Every 2 weeks	reminders and tailoring of the intervention were automated through	N/A
2 DM were recruited from a medical family unit	(PD) comprised multidisciplinary care by trained	10 months	month and twice a week during 2nd	physicians, nurses and peer educators; messages of the TE	N/A
(1) + 18 years old, (2) had diabetes, (3) had a text message-capable	Trial to Examine Text-based mHealth for Emergency	subjects received three text messages daily (9 a.m.	daily	fully automated, Web-based program developed by ERC	

97% white; 9% currently married; 16% living with family; 16%	intervention designed to facilitate peer support for	24-weeks			
Hospital, 36% high school or less, 40% "white", 36 African American, 20%	Mobile APP linked to questionnaire and, vital signs to	Not stated	Continuous	Not stated	Also provided to health care workers
14 years of education	training delivered by either desktop computer or iPad	delivered via 60 minutes per day 5 days a week		self administered	Exercise
Adults (>21yrs) attending the outpatient chronic disease services in a single, large, public sector clinic	Participants allocated to the interactive adherence support received the same	12 months	Personalized SMS text messages were sent to information-only message	Participants allocated to the interactive adherence support received the same messages as the	All SMS text messages were delivered automatically via an opensource Web-based
USA	smartphone prompts to be active after	4 weeks	three weeks (first week was baseline	outcomes measures (i.e. physical activtiy)	
Not mentioned	It is a self-paced intervention programme and its content was	Intervention duration	N/A	N/A	N/A
professionals working in a tertiary care hospital	based stigma reduction intervention game- Narrative	9 days	daily	mHealth tool for Lung cancer	NA
65 year old married, college; Very motivated patients educated male; 2/3 familiar with the	NA	NA	NA	NA	NA
white (78.1%)	PDA	24 months	held weekly for Months 1–4, biweekly for Months 5–12,	PDA with Dietmate Pro© software	feedback
White (84.62%)		12 weeks	1-4 daily	Lose It! app for dietary SM	none

USA, post-menopausal women	Compared Fitbit tracker and website use, with pedometer use	16 weeks	Continuous	Web app and tracking band	Coventry, Aberdeen, and London—Refined (CALO-RE) framework
43.7% elementary school	video delivered via mobile hone for patient education	3 stages lasting 30 minutes	Practice for 20-30 minitues three times a day	Doctors and nurses in hospital ward	Nil
recruited from those who participated in a	system was installed in participants'	3 to 6 weeks	Tracking was done daily	Tracking through Wi-Fi and GPS	N/A
Participants (n = 70) were African American with physician diagnosed type 2	We developed the Web application using an iterative user-centered design	NA	NA	NA	NA
Not mentioned	Daily messaging programme was scheduled	8 weeks	daily	Automated software	N/A
Older adults with asthma; clinic patients who had	The smartphone app was designed by	4 months		automated	N/A
Spanish provine of Valladolid.	that provides information, patient held health and	2 months	Not reported	self administered	Nil
	The Mobile app recovery indicators included a visual analogue scale	We analyzed the alarms according to their types and reasons as well	Overall satisfactionwas 3.5/4; usability 3.5/4; usefulness of		
African-American 8.5% Asian 2.4% Latino/jispanic		10 weeks	twice a day for 10 weeks	internet-enabled smart phone (Samsung Fascinate)	none
USA- Uni. Pittsburgh Medical Centre	custom Pocket PATH programs to record daily health indicators,	12 months	2, 6 and 12 months	Univ.Pittsburgh Medical Centre	NA
Ex-smokers	Physicians reviewed the patients' data				
16 rehab centres in 11 countries	augmented rehabilitation feedback based	depending on rehab stay, intervention	feedback sessions delivered 3	sensor data and alogithm outputs provided by study	

San Francisco and Berkley California. 48% ethnic minority	person program based on Diabetes Prevention program. Mobile	5 months	daily	F2F by trained non medical research staff.	See intervention
USA	study - testing accuracy of				
Weight 82kg; Height 171cm; BMI 27.8 kg/m2; ETGUG Trial 1 (12.00c);			NA		
Mean BMI 23.1	Smart phone (iphone4)	5 minutes	once	Not reported	Nil
Subjects taking treatment with the Michigan health system	Tailored text messages about DM	90 days	Daily	NA	None
Participants were recruited from a family medicine centre in Beirut,	Subgroups 1a and 1b - standardised phone call	4 weeks	Weekly	Nurse via phone, SMS and e-mail	None
Belgium and Israel	provides prompts on gair based on sensor data. Control and	6 weeks, 4 weeks follow up	Constant (app prompts)	Smartphone and two inertial sensors	Gait advice (given to both intervention and control groups)
Persons with alcohol use	the participants were provided a	8 months	Not mentioned	automated software	N/A
disease duration c 11 years.	NA	NA	NA	NA	NA
USA	SMS vs AVR every other week	6 MONTHS	fortnightly	Healthy Directions 2 RCT staff	an ongoing trial called HD2, where they were provided multiple risk
China	which contained personal health record, clinical decision support	3 months	Continuous	self administered	Nil
Israel- High Income Country	Question based behaviour effect (QBE) explored	6 Months	Single message sent at the beginning of	Staff of the National Israeli Colorectal Cancer	NA
4 different primary health-care centers in southern Sweden	3 components: (i) a mobile phone platform for self-	daily self-reports for 8 weeks		21st Century Mobile: technology is based on data	

Denmark. Higher education 18%, Non western background 23%	videoconferences with health care centre nurse via a tablet	8 months	Monthly	Health centre nurse	Nil
White 70.3% Black 27% Native American		12 weeks	not mentioned	handheld device	
People with HIV and neurocognitive behaviour due to HIV of HIV	Automated messages about the improvement of moderate	16 weeks	3 times daily	Automated software	N/A
Middle aged female caucasian patients from Columbia,	The Precision Nutrition Coaching	12 months	Each participant received two	Multi-pronged intervention- Precision Nutrition	
education (>3 yr) Responders 37 (80.4) Non-responders 14		two years	three times a day	mobile app	
No significant differences among the 3 groups	A self-tailored cognitive-behavioral approach, based on (1) expert panel and	The FitBack group also received weekly email reminder prompts for 8	The FitBack intervention is designed to encourage users to adopt appropriate		No
Barcelona	completed daily and weekly questions on App about use of CPAP , physical activity and diet.	6 weeks	Daily	Self administered	Nil
Polan	operability and whole trial feasibility, including	6 Weeks		NA	NA
BMI was higher in the diabetes group, but BMI distribution was similar between treatment arms	a structured mobile phone-based health coaching program supported by a	12 months	Health coaches called patients every 4 to 6 weeks and patients were encouraged to		
Tertiary hospital in South Korea.	questionnaire completed by	NA	NA	self administered	No
Puducherry state of India	Eligible outpatients either received (intervention	11 days	everyday for 3 working days	PHC doctors/investigators	None

Spain	underwent two hearing evaluations, a standard	5 Months	NA	AudCal iOS device	NA
Non-Hispanic whites (92.1%); most were caregivers or parents/guardians of individual with	Mobile applications were most popular, followed by wearables and	Because Nightscout enables 24-h access to sensor glucose data for			
Capetown. Poorly educated, high unemployment	from library focusing on behaviour change: goals and planning,	12 months	Not reported	Automated	Nil
No significant differences in biochemical parameters, including fasting glucose or HbA1c	Specially designed glucometer and activity monitor that automatically	6 ,pnyhs			
USA	N/A				
Baltimore, USA-High Income country	Participants received an automated, 6-	12 months	Weekly goals with messages delivered 3-4	TRIMM study staff	Engagement with the text message
education or above. Work units affiliated with	printed liestyleprescripti on to reduce CVD	12 months	risk (ranging from phone calls twice a	Research team	Nil
New Zealand				Mobile phone	
Pennington Biomedical Research Center, Baton Rouge, Louisiana, USA	provides the ability to deliver intensive behavioral weight loss interventions,	12 weeks	Weekly	SmartLoss study staff	NA
mean SBP 119 ± 21/78; 5 (4%) presented a history of coronary artery disease	NA				

Akron NE Ohio, US, 88% "white:	Participants were then instructed to use the AP to log daily food	4 weeks	Daily	Not reported	Nil
USA	informed app was designed to augment an intervention promoting	7-10 days	Daily	Study staff	NA
	PULSE-SMART conducted pulse analysis using 3				
Level of education Secondary school = 10 Qualifications for university = 8		not specified	not specified	Apple iPad	
Exp group: 22/51 (43%) had computer; 19/51 (37%) had home					
Participants (with HIV) were recruited from ongoing studies at the	All participants were provided with an Android Operating				
female (65%) and Latino(65%), with substantial participation	messaging for appointmentreminders and to prompt for and collect patient-	9 months	N/A	Automated using patient relationship management software	N/A
Participants were recruited from local resident associations and	At baseline each of the participants was provided a	12 weeks	daily	automated text messages using an online tool specifically	N/A
Unscreened AN/AIs in a tribal health care system in Anchorage, Alaska	3 text messages sent 1 month apart.				

Mallorca, Spain	Two training sessions every week 48 hours apart in the training and mobile group -	10 weeks	Twice a week	A study coordinator sent the messages and training information to participants	N/A
25% lived alone, >50% primary school only	Patient-centered, tablet-based self-monitoring	3 months	monthly		
Post stroke patient, encountared at a tertiary medical centre	smartphone enabled medication adherence and	3 months			N/A
a sample of stroke survivours was recruited from local stroke support groups	a smartphone based app containing behavioural change	6 weeks	Daily	automated text messages using an online app specifically made for tis study	N/A
women with Urinary Incontinence					
Participants were recruited from the Auckland City Hospital	an augmented version of the application which, in	3 months		automated software	N/A
were recruited from 2 large metropolitan	The intervention delivered a theory-based,	6 months			N/A
New Zealand	were provided a smartphone and a pedometer. 1st visit- Complete a	7 days	Daily	Mobile based questionnarire survey	
predominantly female (62%) and above 60 years (62%), with substantial	weekly IVR calls including self-management questions and self-care	4 months	weekly	Calls originated from the IVR platform established at the Universidad	None
77% white and 70% male	weekly IVR calls including self-management	The median number of weeks	weekly	IVR systems were programmed to automatically	None
99% male and 77% white	including self-management questions and self-care	12 months	weekly	programmed to automatically attempt to contact patients	None

Patients were recruited from VA Cleveland Medical Center outpatient clinics between June 2009	The mHealth+CP intervention was based on self-regulation theory, which emphasizes	12 months	weekly; Up to nine call attempts per week were made at times	automated software	N/A
Study 1: Subjects were recruited from a face-to-face workshop	It is a mobile phone based app; evaluation of this app was	1st trial: 8 weeks 2nd trial: 17 months	Not mentioned		N/A
Patients with type 2 diabetes who took participation in a RCT based	smartphone based self-monitoring software that	Not mentioned	2-4 contacts monthly and one phone call/3 months	The smartphone software used was provided by NexJ Systems, Inc.	N/A
who had undergone coronary stenting and been discharged from	Personalised SMS reminding patients of Aspirin intake	1 month	Daily	Computer-generated SMS	N/A
Maryland USA	Cell phone based diabetes management software system, real-time	3 months	Every 2 weeks for patients and 4 weeks for healthcare providers	Phone calls, Internet, Bluetooth	
patients with CHD from a tertiary hospital - a cardiac rehabilitation	Messages contained behaviour change	6 months	4 messages/week (messages sent four or five	automated messages using TEXT ME message management	N/A
		4 weeks (28 consecutive days)	one messages/day		N/A
participants were an average of (6SD) 51.1611.7 years old	Technology and Brief Phone-Based	6 months	based group Fourteen structured	Self and phone-based interventionist	None
three different countries-Argentina, Peru and	motivational counselling calls and weekly	12 months	Monthly calls and weekly text	Phone calls and SMS	
Patients with bipolar disorder took part in the	Under AMoSS study particiants monitor their	Not mentioned	10 times daily	Automated software	N/A
42 care providers workingat Palmetto Health, a single health care organization with	N/A	N/A	N/A	N/A	N/A

220 participants from across the USA	Internet based lifestyle intervention includes small	24 months	6, 12 and 24 month assessment timepoints	Internet based DPP	
Hospitalized patients with a DSM-IV diagnosis of schizophrenia in the Bugok National					
75 years (SD 6), predominantly female (64%), held a trade or	technology (IT)-based system for active and healthy aging	12 weeks	Once (daily-life)	Self monitoring	None
HIV-infected clients at an HIV clinic - Oak tree clnic in Vancouver, British	intervention involved a weekly SMS based on	6 months	weekly sms	Automated software	N/A
Forty patients (median age 73; 57% [N=23]	a smartphone with a pedometer	median follow-up was 21 days (range 2–28)	Once (daily-life)	Self monitoring	None
Michigan USA	The intervention group received daily texts for	10 Weeks	daily texts for adherence and weekly for	Study staff	None
overweight and obese adults at a	Personal digital assistance	12 moths	daily (1-2 weeks), weekly	dieticians, psychologists, or	N/A
Participants' ages ranged from 49 to 70 years old, with	The intervention was consisted an electric BP	4 weeks (excluding 2 weeks of	1	Self monitoring	None
CHWs with no previous experience in	The CHWs were issued basic features phones			mobile based application	N/A
11 men and 10 women—who ranged in age	The intervention design included an activity	3-months	Once (daily-life)	Seflf monitoring	None
China and India	key elements of the intervention were summarized as a 2+2 model,	Daily	1 Year	Community health workers	NA
California, USA	used to estimate near visual acuity and	8 Months	Monthly	Ophthalmologist	None
	Upon meeting study criteria, participants were e-mailed a		weekly face-to-face sessions and twice weekly audio		

Mostly middle-aged white female	the Pounds Off Digitally (POD)study, was a 3-month	3-months and 6-months	Once (daily-life)	Self management	None
	a pedometer and a newly developed smartphone application to				N/A
Above 55 mostly and above 90% of dutch origin	The complete It's LiFe! intervention consisted of the	6 months	four individual consultations with the PN; in the first	Practice nurse	None
DR Congo, Philippines, Cambodia	Patients in the intervention group received DSMS through	24 Months	the average number of SMS messages sent to	Open source software and web-based	NA
Participants were from the Democratic Republic of Congo	SMS contained information on healthy behaviours		several tmes a week	a nurse in DRC, a peer educator in Cambodia, a	N/A
Netherlands	provided with the accelerometer and a smartphone	12 weeks	visited the practice three times: in the first week, after	Nurse	None
participants with cognitive impairment at routine patient visits to the	Participants were provided with the the exercise booklet at baseline and	8 weeks	bi-weekly	Each participant was assigned one study coach who made bi-weekly phone calls	N/A
Mostly male	study, they received a smartphone (Samsung Galaxy Note 1, Seoul,	1 week	Once (daily-life)	Research staff	
primary health clinics in Toronto, Canada	group was provided with a Samsung Galaxy Ace II mobile	6 MONTHS	Daily review of participant logs	Health coaches	None
Participants were recruited from the Black Creek Community Health	After completion of baseline formalities of the participants,	24 week	Daily	Health coach	N/A

65% female and mostly above 75	triaxial accelerometer on their lower	3 days	Once (daily-life)	Research staff	
Middle aged and older adults with serious mental illness, participants	IMR is based on the stress vulnerability model,22			a masterslevel clinician and a nurse in a community mental	N/A
Netherlands	intervention group received a commercially available Web-	3 Months	Daily review of participant logs	Web-based physical activity program	None
Mostly male and above 65	This mHealth intervention focused	6 months	Once (daily-life)	Research nurse	
individuals with depression after discharge from	a manualizedgroup introduction to	4 months	weekly	automated	N/A
Taiwan	Twenty consecutive gastrectomy patients at the	6 MONTHS	Weekly	Study staff	
France	Stim'Art Application is a mobile application that	6 months	Daily usage pattern of the game	App	NA
Nebraska, USA	Functional monitoring to	5 months	Daily	By an automated GPS software	This was a part of an ongoing

	Details of outcomes				
Comparator groups (e.g. control/placebo or other groups based on a factorial design)	**Primary outcome and changes observed**	**Secondary outcome and changes observed**	**Negative outcomes or harmful effects**	**Individual level**	**Method to identify target population**
None	Significant relationship between daily mood scores and 1-week	No variation in correlation between daily mood ratings, weekly and 2-	None	N/A	Patients undergoing CBT for depression in a public sector clinic
None	N/A	N/A	None	N/A	advertisements, social media and word-of-mouth
3 months versus 6 months	Time associated with significantimprov	As intervention progressed there were significant		Good from qualitative feedback at exit	Through DVA OPD clinics
which received only routine care	change in 8-item Morisky	change in Readiness to	None	participants in the 3 groups	recruited from cardiac
None	Apnoea/hypoapnoea index (AHI)	N/A	None	8 subjects were diagnosed with	Subjects were recruited in
None	medication - no significant difference in PDC (proportion	satisfaction with the Medplan platform assessed through	None	Patients were managed across primary and secondary care	recruited from a primary care clinic and a hospital
					done via traditional ads in city buses,
EMR-only BP measurement in the first group	Self-measurement of BP twice a day	None	None	All patients were managed by physicians from	Patients were recruited from a primary care clinic
version of the intervention was delivered to the control group	using the International Physical Activity Questionnaire	using the PC-EX (perceived competence for regular exercise)	None	had been to the same cardiac rehabilitation centre for a 4-	were referred to the 4-week cardiac rehabilitation
group received standard care as prescribed by	(significant improvement after 10 months	low-density lipoprotein cholesterol (LDL-	None	never been prescribed Insulin before the	participants were identified by direct patient
	Subjects reported eating fruits/vegetables daily (56.5% pre-	healthy behaviors, diabetes self-efficacy, and			1-week enrollment period: 83 ED patients with

	Weight loss was significantly associated with perceived peer	76% used the private Facebook group			
Nil	Usability assessment.	Task completion and self confidence of health workers	Nil reported	Not reported	Approached on admission
	management of obesity and overweight and pediatric				
Nil	Attrition and adherence to training.	Nil	Nil	Unknown	hospital outpatients, community mental health
All trial staff were masked to treatment allocation. The information-only adherence	Primary outcome data were available for 1256 participants (92%). Odds	Primary outcome data were available for 1256 participants (92%).	Analyses were intention to treat. There was no		
None - within trial variation of intervention	mins activity after 30 mins sedentary				
National Cancer Institute's application for smoking	Among the user of smart quit app, quit rates were 13% which	N/A	N/A	In total 196 participants included in the study	through teir employer or facebook advertisement
NA	found to be believable, regardless of major technical	Reward system, Comprehension, acquisition of information		Individual level	
NA	Theme 1: Benefits information sharing with others, usability and learnability	improvement requested related to lifestyle (adding a diet/nutritional tracking feature)	Navigation glitches Exit button would not work, On-screen		
paper diary	percentage weight change from baseline to 24 months	adherence to self-monitoring of diet			took place at the University of Pittsburgh School of Nursing,
none	Adherence and retention were primary outcomes in this	Secondary outcomes included blood pressure and self-			Participantswere recruited fromthe community using the University

Coventional pedometer	increased moderate to vigorous physical activity (minutes, bouts	tracker use (95% of days) and acceptability of website (96%) and tradker			
Taught breathing retaining at bedside	intervention and control groups showed improvement in	improved in the intervention compared to conrol group	Nil		Approached on admission
None	N/A	N/A	None	Very few participants	identified from a large-scale survey of people with
NA	Secure messaging system connected the CHWs to the	The stand-alone nature of the system could benefit community	CHW preferred having a guide to help		
N/A	Significant changes were found in	N/A	N/A	In total 1470 participants included in the	Users enrolled online or by text message
N/A	control over asthma		N/A		
Nil	reported ease of taking medication and 8% in overall	Nil	Nil	Not reported	Cardiologists chose
	(n = 8/60) were very satisfied, (n = 50/60) satisfied and (n = 2/60) not				
paper and pencil condition	primary outcome of MADRS Total Score,	and secondary outcomes of YMRS and IIS Total Scores.			out patients diagnosed with either Bipolar Disorder I or II
Usual care group	monitoring percentages- Intervention group	perception and 2. Rehospitalization comparable in	None	Individual level	Lung transplant recipients of UPMC
	Significantly lower hospital admissions with				
received the same feedback sessions and	walking time, declined by 30% (negative	Timed 15-meter walk	significant differences in walking		Rehab admitted patients

Pedometer only without step goals and standard medical care.	6.2kg weight loss comp;ared to 0.3kg gain in control group.	2551 compared to decrease of 734 per day in control group. Reducation in	Nil reported	assessed. 54 did not complete screening. 103 invited but 22 did not show up at	Primary care clinics and posting studyflyers
Nil	Feasbility. Ability to detect	Nil	Nil	NA	NA
Control group- Usual care and a monthly 'check-in' text message	Change from baseline in medication adherence	Changes in health beliefs and attitudes- No significant	NA	Yes	Electronic database
Subgroups 1b, 2b and 3b received reminders without	Pneumococcal vaccination rates following the reminder period	N/A	None	Participants were either smokers or had different chronic	Electronic medical records of patients attending the
received gait advice (no smartphone app feedback)	(MiniBESTest) and maintained quality of life (SF-36 physical		No evidence of harm	Yes	Rehab services
Control group received only	reduction of frrequency of	Abstinence from alcohol use	N/A	In total 349 participants	Participants were recruited from
NA	T2DM patients perception and assessment of the healthcare professionals'	High level of T2DM patients engagement is predictive of patient			
	Less than one third chose SMS compared to AVR	None	None	Yes	Participants who received reminders for the larger RCT
Usual care	knowledge, drug aherence, quality life (EQ5D)	Patients in usual care group expressed greater	Nil	Not reported	Not reported
Standard care	Fecal Occult Blood Testing was higher	None	None	No Population level study	Nation wide survey, participants
	For patients self-managing their hypertension,	system perceived as easy and relevant for			

Usual care	intervention group by 0. 69% vs .18% in control group.	BP, BP, Lipids, creatine, glocuse. No change in SF36	Nil	165 agreed to participate out of 859 eligible who were approached.	recruited from University hosptial by Endocrinologist
no comparator	Adherence rate 89.64%	not mentioned			were identified as having difficulty with adherence
Same to the experimental group but were not provided any	increased physical activity and improved neurocognitive	N/A	N/A	IN total 21 participants were included in the study	Participants were recruited by the programme recruiter
No	Significant reduction in weight (between	Significant reduction in diastolic BP (3.77	NA	Yes	Recruited from a primary care practice
control	Consultation on Incontinence Modular Questionnaire	Patient Global Impression of Improvement			follow up investigation of a clinical trial (NCT01848938).
No significant differences in sociodemographic profiles	FitBack group showed greater improvement compared to the control group in every	FitBack group showed greater improvement compared to both control and alternative care	How self-guided mobile-Web interventions will be		Through 4 companies (trucking, manufacturing, technology, and a corporate
Nil	Feasibility and acceptability. CPAP compliance ws high.	Nil	Nil reported	NA	Recruited from hospital sleep clinic.
Standard care	operability and whole trial feasibility, including	system modestly improved glycaemic and blood pressure	NA	Yes	diagnosed with DM2 being treated in primary care
Stratified randomization design: Heart disease and diabetes patients were randomized	Only significant difference in waist circumference in T2DM group, however it is	Diabetes patients may be more likely than HD patients to benefit from this kind of	41 patients withdrew due to unfamiliarity with mobile		Randomly selected patients from the EHR system were invited in two trances to
Paper questionnaire	scores between groupsNil	Nil	Nil repoted	NA	patients attending clinic
Standard care	85.7% of outpatients in intervention arm returned for	Number of patientswhowere diagnosed with diabetes in	NA	Yes	Outpatients coming to OPD

NA	randomly generated audiometries, the	NA	NA	Individual level	NA
	Nightscout user reported checking their BG with a meter less often (P < 0.001); bolusing	Nightscout enables 24-h access to sensor glucose data for multiple family members	Half of users report using unapproved features		Heard of CGM in the Cloud through Facebook (59.4%), followed by friends (16.2%)
Usual care	Nparticipant experiences	NA	Nil	Text messages acceptable.	Purposive sampling
The same physical activity device without u-healthcare system was given to the SMBG	in the u-healthcare group, significant improvements in HbA1c, fasting	Effective in decreasing hypoglycemic events by immediately alerting patients			
	86.6% accuracy in categorising activities (walking, sitting, standing, rolling			N/A	
An initial clinical assessment consisting	Weight in the TRIMM group decreased 2.6 kg	Engagement with the TRIMM intervention was	No adverse events were	Yes	Through a church
report on annual medical examination	risk: The reduction in 10-year CVD risk at	systolic blood pressure (–5.55 vs. 6.89 mmHg; p	Nil reported	Not reported	Annual medical examination for work unit.
Usual cardiac rehab care	Self reported activity, general health (SF36) and self efficacy	costs of implementing and delivering the			
the Health Education control group (n=20) received health information via	group experienced significantly greater weight loss (percent of initial weight)	Satisfaction questionnaire showed smartLoss participants favorably rated	NA	Yes	Not Provided

Nil	pre- and post-interventionweight (105.0±21.8 kg versus	Nil reported	Nil reported		Cancer registry dta used to identify eligible patients
No	participants assessed the app as valid, usable, acceptable, and able to sense	NA	NA	Individual level	community-based health promotion programs and a county fair
	Excellent sensitivity (0.970),	Good accuracy for PAC (0.955) and PVC		Patients with frequent PACs or PVCs were	After obtaining informed consent, baseline
no control	subjective adherence w/o supporting system 50.02 (SD=3.44)	Objective adherence (medication intake) - figure 4 initial 98%			Cardiac patients were recruited via local cardiac-rehab sports groups (phase III
	better MMAS-4 scores (P<.001); fewer missed doses of	ALICE Significantly reduce medication		Designing apps for elderly with multimorbidity and	
					Participants were recruited for this study using recent results on a
N/A	responserate to text messageprompts for home measurements	percent of responses correctly formatted by patients	None		Diabetes registry
didn't receive any text message	frequency of exercise	exercise self-efficacy, PA-related energy expenditure,	N/A	Equal number of participants in the 2 groups	Older age people were recruited from local residents
	Screening status was ascertained from EHRs 3 months and 6	Increased CRC screening for AN/AI aged 50-75 years (HR,			The authors randomized to the intervention or usual-care

The control group maintained their usual physical activity throughout the	CVD risk factors (BP and post-training HR decreased significantly in training group	International Physical Activity Questionnaire (no significant change)	None	There were more participants in the training group	Advertisements in mass media, face-to-face information, distribution of posters and
	Brief and short improved BP; HbA1c, FBG	Knowledge of diabetes improved			
Uncontrolled hypertension group, did not receive any	medication adherence and blood pressure	Not mentioned	N/A		Patients were contacted through their preferred mode
stroke survivors but didn't receive text messages; received only usual care	physical activity	sedentary time, heart rate, blood pressure, BMI, Fatigue, , Ten-Meter Walk	N/A	Participants were distributed in a 2:1 ratio to intervention or control group	With the help of local stroke support group, target population were recruited
individuals were provided with a standard version of	Adherence to Anti retro-viral treatment	perceived understanding of HIV infection, treatment	N/A	The sample size was male dominated	According to the inclusion criteria purposive sampling was
	behaviour of the participants with IHD regarding				
NA	correlation of Mobile based PAL and paper based activity				
weekly IVR calls together with a care partner	patients' IVR call engagement and call completion	patients' likelihood of reporting excellent health and days	None		Most participants were initially identified as part of a 2013 survey of 1,144 patients
Involvement of Informal Caregivers	completion rates, trends in completion, and	haracteristics associated with persistent	None		patients were initially identified from
	reported measures of caregiving strain and depressive	helping with self-care, accompanying patients to	none		patients were initially identified from electronic medical records

received only mHealth intervention	change in HF-specific quality of life between baseline and 12 months		N/A		Potentially eligible patients identified from electronic medical records were sent an invitation
N/A			N/A	N/A	Purposive sampling
Received health coahing without using any software	individual's health behaviour, communicate		N/A	N/A	
Control group received standard care	aspirin adherence (significant increase) and controlled	Not mentioned	None	Patients were equally randomised into the two groups	Not mentioned
Control group-Usual care	Change in HbA1c				
the control group received usual care without the text	cardiovascular risk	user/participant engagement with the programme,	N/A	Almost equal number of participants were included in the	
N/A	participants' ability og usability, feasibility,	Not mentioned	N/A		Individuals were recruited via e-mail and Facebook. The
vs Fitbit vs Fitibit+Phone based	differences in weight change from	adherence to self-monitoring by group			recruited through advertisements in local newspapers,
Control group-Usual care	systolic and diastolic blood pressure	intake of high sugar and fat foods			
N/A	Behaviour change	Not mentioned	N/A	A sub-set of 21 patients participated in a	Recruitment into AMoSS was via outpatient
N/A	Patient's perception of the provider, interaction and communication	Patient's satisfaction about the care provided	N/A		

Groups compared by those had 4+ lessons (Starters	Mean reduction in weight (lbs) and HbA1c (%) were similar in	None	None		
	physical activity of patients with schizophrenia	feasibility of using mHealth device	N/A		A total of 79 patients with chronic schizophrenia in the inpatient unit,
composed of (1) an individual group that followed training	Adherence and Attrition	effectiveness of the motivation instruments built into the			recruited by convenience sampling from 2 institutions for
N/A	medication adherence and retention in treatment	Not mentioned	N/A	N/A	porposive sampling
N/A	Feasibility(intervention would be feasible if ≥75%	Acceptability (For our acceptability			Consecutive patients seen at the various
Standard care	Fewer symptoms were found in the	57% (83 of 145) of eligible participants	NA	Individual level	two community cancer centers in the midwestern
Standard care group	weight loss at 6 months	weight loss at 12 months	N/A		Participants completed a
N/A	change in self-reflective behavior	change in lifestyle modification			From elderly communities
N/A	CVD screening		N/A		The CHWs underwent training in the
The Lifestyle group consisted of 12	change in physical activity behavior after	None			Healthy adults (= 21) recruited through ads in ^{n}
Standard care with free medications only in India	antihypertensive medication use-the proportion increased	was a significant net increase in the proportion of high-risk individuals taking	None	Individual level	Household visit
NA	distance spectacle-corrected visual	NA	NA	Individual level	visited the Diabetic Ophthalmology
	weight loss	eating behaviour, self-efficacy around weight loss and	N/A	Adherence to dietary self-monitoring	Participants were recruited through workplace listservs and

participants were randomized to theTBP condition (37 to a control	body weight assessment	3-monthquestionnaires			Not mentioned
received an exercise brochure	Physical function and QOL				
Control group - care as usual (group 3)	The primary outcome measure was the average	Secondary outcome measures were general			invited 250 family practices in the South of Netherlands by
Standard care with mobile phones	After 2 years, an HbA1c < 7.0% (53 mmol/mol), which was	In Kin-réseau, the percent increase in subjects with	all participants showed a drop in	Individual level	Patients visiting the participating centres
			N/A		
No	(12 out of 17) were positive about the intervention. They felt	significantly increased by 10.6 min per day, from 28.7 (SD 21.1) min per	NA	individual level	Those who visit the GP clinic
Patients with normal cognition who weared accelerometer to assess the	implementation, and safety regardless of arm assignment		N/A		Participant of the cognitive imparement group were identified from a
None	input of meal photos				Part of a previous RCT
with HC support but without access to a mobile phone or	outcome was the difference between intervention	between HbA1c mean levels within groups were also	NA	individual level	Patients who visit the GP clinics
N/A	glycosylated hemoglobin (HbA1c)		N/A		Recruitment was through health care provider referral and

Falls and Non-falls	Patient falls	Measures of overall gait			Not mentioned
N/A			N/A	N/A	
group was placed on a 3-month waiting list, after which they	3-month follow-up, daily physical activity was	effect of the intervention on weight loss was seen with a mean	NA	Individual level	Advertisement in newspapers and press notifications
None	None	None			Patients meeting the eligibility criteria
didn't receive any text message	depressive symptomsand perseverative		N/A		after attending a mindfulness group
Standard care patients reviewed through	Change in % of body weight loss	BMI, No of outpatient clinic visits, readmission,		Yes	National Taiwan University Hospital in Taipei
NA	On average, each user has played half an hour (29.16	Perceived well being-All seniors had improvement in	NA	Yes	Not mentioned
None	Measurement of daily activity	Lifespace data - 79% of GPS	None	Participants were all from the	Participants in the intervention

Reach				
Inclusion criteria	**Exclusion criteria**	**Participation rate**	**Representativeness**	**Individual level**
Not specified	Not specified	51.2% (9-98%)	Spanish-speaking and low-income background, not representative of a larger population	Relationship between daily mood scores and 1-week average mood
N/A	N/A	21.70%	were mental health patients, carers as well as healthcare providers	N/A
ICD-9 diagnosis T2DM; 1+ outpatient VA	cognitive impairment, severe mental illness or living in a supervised	422 eligible, 301 (72%) participated	VA population only: not reelvant to women or children	Efficacious with methodolgical
CVDs (either hypertension or	such as Diabetes Mellitus (DM), Renal	88.88%	participants had hypertension, 49.4%	medication adherence,
Not specified	Not specified	No details about how	Those with OSA had mild, moderate and	Subjects' oxygen
heart failure and/or hypertension and/or	smartphone, using a device that was not Android or iOS (e.g. Blackberry or Windows	67.74%	Patients had HTN, dyslipidemia, HTN+dyslipidemia or HIV	patients found the app design acceptable
At least one abnormal BP measurement	Not mentioned	73.17%	Patients were not evenly randomised into the 3 groups	Success of BP recordings was 47.8% in
18 years, history of cardiovascular disease,	Not mentioned	27%	Participants had a broad range of co-morbidities	physical activity at 3 month follow-up in the
age, diagnosis of type 2 diabetes, HbA1c ‡8%	medical/psychiatric conditions and those unable to attend the	87%	Participants were all from the same family medicine clinic	HbA1c levels in PD and PD-TE groups
18 years and above, had diabetes, had a text message	Overt psychosis, inability to provide informed consent, pregnancy	At the end of the 3-week trial, 20 of the 23 (87.0%)		

Aged >21 years; had a chart diagnosis of schizophrenia	Med contraindication to weight loss; pregnant or planning to become pregnant within the next			
admitted with a diagnosis of CHFwere	Nil	Unknown	Low	Usuability assessment
The minimum patient ages for inclusion were obesity, age 2;				
clinically stable at the time of testing (no hospitalization	neurological disorder.	Not reported	Moderate	36.6%, completed average 3.06 hours per
(1) be age 18 or older, (2) smokeat least five cigarettes	Not mentioned	85%	Not mentioned	Participants' receptivity on acceptance and
Connected to Lung cancer through experience	NA	100%	Healthcare professionals	found to be believable, users not hindered by
adults, alert and oriented, documented New York Heart Association class II–III HF in the	children, chronic cognitive impairment documented in the electronic health record, dialysis patients, discharge disposition to a			
eligible if they were aged 59 years with a BMI between 27	requiring medical supervision of diet or exercise, physical limitations	51.47% (210/408)	white (78.1%)	
Individuals were eligible if they were ≥18 years of age with a	Exclusion criteria included pregnancy; conditions requiring medical	66.1% (39/59)	White (84.62%)	

COPD with pulmonary function test data	unconscious or had severely impaired cognitive function, (2)had communication	32%	Patients admitted with COPD	beathing self efficacy in intervention compared to
disabilities who were 45 years and older	Not mentioned	100%	Patients had different neuromuscular conditions	N/A
African American, 19 years and older, with poorly controlled type	individuals with end-stage medical conditions with limited life expectancy (<6 months), no access to a			CHWs utilized secure messaging to relay patient questions
Having a device that able to receive	in case of not providing any quit date or set a quit date >2weeks after	Not mentioned	N/A	Participants' frequency of reporting
		Not mentioned	N/A	
Sampling stratified by urban rural and gender.	Not reported	Not reported	Low	NA
All patients who had failed to respond to conservative treatment for a	patients who required urgent surgery due to cauda equina syndrome or progressive neurological deficit.			
older, 2) outpatients and currently prescribed	substance use disorder in the prior 3months, 2)were psychiatrically hospitalized in the prior	Condition, mean compliance was 65%	African-American 8.5% Asian 2.4% Latino/jispanic 14.6% More than one ethnicity	
years, underwent transplantation (January	transplant or were unable to perform their personal care were	75%	Only those who underwent a transplant at UPMC, so this would impair generalizability	level self-reporting characteristics were assessed
Patientswith at least two admissions for	severe end-organ failure (including respiratory, cardiac, liver and renal			
Admitted stroke rehab patients	Residual prior stroke effets, apahsia, minimal stroke paresis	97%	Good representativeness	walking time; 15 metre walking speed

(BMIZ23 for Asian-Pacific Islanders)8; age>35 years; risk for diabetes	of diabetes or other disease associated with disordered glucose metabolism (e.g., suboptimally treated	60%	Good	Weight loss, increased teps.
				(accelerometer and
	history of pain in the last twelve months, or a history of surgery, malignancy, or			
Older people purposively	Not reported	Not reported	Poor	NA
Diabetics with HbA1c>8%, use a mobile or text messages,	Heart attack/stroke/CHF, non-English speaking	90%	Only diabetics with HbA1c>8% and with pharmacy benefits	Individual level
Unvaccinated active patients (who had at least one visit to	Lack of access to at least one of the reminder methods (mobile number or e-mail) or	100%	All participants were from the same medical centre	Patients who received reminders and the
10 min continuously; had a score of 24 or higher on		38/40		significant canges in only two outcome measures and
Participants with 18+ age whho	Participants were excluded due to having	91.8% approached	N/A	Participants' use of post
Italian, affected by type 2 diabetes, aged over 18 years, and of both	Dementia, cognitive impairment, active psychiatric disorders, blindness, deafness, or lack Italian language			
part of the HD2 trial, not undergone cancer therapy		Cluster RCT	of the HD2 trial which was designed to study physical activity, fruit and vegetable intake,	Individual level
aged >18 years with atrial fibrillation diagnosed with	years, those with valvular atrial fibrillation (eg, prosthetic), and those unable to provide	Not reported	Not clear	and drug adherence and satisfaction
women and men aged 50 to 74 years, with	Non-HMO members, not able to give a consent	96%	Representive of the age groups from 50-74	Population level
>30 years, taking meds for hypertension,				

inhabitants of the City of Copenhagen with T2D and a	terminal disease with an expected lifespan of <6 months or need of an interpreter.	19.20%	?	No significant effect on H bA1c at 6m
the alarm sounds and read the screen on	not mentioned	77.14%		
person with age of 18 years and or old, having the capacity of	physical conditions that might limit moderate physical activity	89%	N/A	participants with cognitively impared due
men and women aged 18–65 years of	females who were pregnant or wanting to become pregnant over	40% completed the study	Not representative of women of this age group	Yes
not specified	not specified	100%	Responders 37 (80.4) Non-responders 14 (93.3)"	
(1) 18-65 years USA resident, (2) employed at least half time (which is typical for employees to		Low attrition and low data loss		Yes
patients with OSA visiting Sleep Unit who had some knowledge of smartphone use.	Nil Reported	Unknown	Unknown	NA
diabetes type 2 diagnosed ≥6 months prior to the study,	inter allia, the need to rely on the other persons with drug taking.	94%	phone and the sensors, elderly population who would be able to use these sensors by	Yes
Diabetes dx at least 3 months, HbA1c above 6.5% within 1 year; Heart disease (IHD				
attending clinic with LUTS	history of cancer of any organ, neurologic	Unknown	Unknown	IPSS Score
All outpatients (>30 years) attending routine OPD	Known patient with diabetes mellitus; pregnancy; alcoholics attending OPD who	70% followed up for definitive test	Yes participants who came to OPD	Yes

Age > 18 years, inactive otorrhea,	18 years, active otorrhea, > 75 dB loss in standard audiometry (any	Not provided	Patients from otolaryngologyclinics in Spain, further details are not provided.	Individual
			Not representative of poor or LMIC	NA
Inclusion in trial.	Not reported	NA	Similar to trial population	NA
Aged 60+, DM with HbA1c 7.0–10.5%.	Patients who were unable to use text messages or to access the internet for any reason were excluded	85%	Reflects the digital divide	Beneficial results seem to come from the increased physical activity and a
				N/A
African American adults aged 21>years,	self-reported substance abuse, uncontrolled	84 participants (67.7%) completed the	Small sample of church going African Americans with BMI>27, not	Individual level
years and willing to participate in the program.	No known CVD, a history of mental abnormalities, having difficulty in	Not reported	High of work units	10 year CVD risk
overweight and obese adults (BMI 25-35 kg/m2) age 18 to 65 years	dieting; 62 kg weight change in the past 60 days assessed by selfreport; inability to engage in moderate intensity	95%	Small sample size	Individual

aged 18 to 75 years with histologically confirmed Stage	non-English speaking, inability to read the consent form, lack of	33%	Unknown	BMI, nutrition, physical activity,
60 from rural and urban communities. The principal investigator,	Not Available	NA	Small sample size	Individual level
must be at least 60 yr with a minimum visual acuity of -0.75	previously owned a smart phone	100%	"Level of education Secondary school = 10 Qualifications for university = 8 University degree = 6	
Spanish for elderly patients taking multiple medications		23 pats and 7 health prof participated qualitative	No, sample too small	Y/N
HIV seropositive; age at enrollment 50 years or older;	psychotic disorders (e.g., schizophrenia); neurological disease (e.g., head			
2) English or Spanish as first language 3) Access to text message	N/A	N/A	(65%) and Latino(65%), with substantial participation among whites (25%)and	
English-speakingn community, aged between	Not mentioned	Not mentioned	N/A	frequency of doing exercise
1) AN/AI heritage documented in EHR; 2)				

1) owned one of three types of Internet-capable mobile devices: iPhone®, BlackBerry®, or	If having medical conditions or other physical problem that needs special medical attention	66.67%	Mostly female participants	Improved BP, HR and hand grip strength
adults with T2DM, on oral hypoglycemic	had been hospitalized in the prior 2 months			
18+ years, T2DM and/or hypertension for	unstable or lifethreatening conditions; no cognitive			
Not mentioned		Not mentioned	N/A	
person had to have had a single unilateral stroke, could walk	Not mentioned	Not mentioned	N/A	Physical activity of the stroke survivours increased
participants, diagnosed with IHD and who				
Individuals were eligible to participate if they had been on	Not mentioned	Not mentioned	N/A	patients' adherence to anti retroviral therapy
patients with IHD and who could perform		Seventy-five intervention participants	N/A	
with diabetes and/or hypertension	Refused consent, Unable to reach	around 30% (74/247) - JJ calculated	predominantly female (62%) and above 60 years (62%), with substantial indigenous (29.2%)	
Englishspeaking patients with heart failure,	ineligible if they had diagnoses of cognitive impairment,	HF- 57% Depression - 95%	77% white and 70% male	
patients had to have a HF diagnosis and ejection	if they had diagnostic codes indicating dementia, bipolar disorder, or	Approx 25%	99% male and 77% white	

CarePartners had to live outside the patient's home, speak English, have access			N/A	
	Not mentioned	Not mentioned	N/A	Partcipants showed positive attitudes
Patients with type 2 diabetes	Not mentioned	Not mentioned	N/A	Participants' ability (who using smarphone
had undergone coronary stenting for ACS with good in-hospital aspirin	Not mentioned	96%	N/A	Improved self-reported aspirin adherence
				HbA1c values declined significantly among intervention
Patients had to have significantly lower LDL	Not mentioned	87%	N/A	Participants' willingness to use the app for changing
aged between 18-35 years, owned a mobile pone and had	Not mentioned	Not mentioned	N/A	Patients' abililty to perceive the impact of the
included age between 18 and 70 years, body	excluded if they reported any of the following: physical limitations that	27% (80/293)	were an average of (6SD) 51.1611.7 years old and	
				did not affect change in systolic and
Not mentioned	lack of capacity to consent and those who had been a	Not mentioned	N/A	
providers with strong familiarity with existing HER system and	Not mentioned			

				Program Starters Weight loss Reduced
1) hospitalized patient with chronic schizophrenia; 2) involved in	1) Patients restricted from outdoor activity; 2) patients with severe medical condition that limits physical activity; 3)	80% (approx)	N/A	
were older adults aged 65 years or older; living	cognitive impairment, progressive neurological disease, stroke, severe	N/A	Participants were 75 years (SD 6), predominantly female (64%),	
at least 14 years of age, HIV diagnosed, currently on or	Not mentioned	Not mentioned	N/A	
Inclusion criteria for the current study were: 1)	Patients who used walking aidswere excluded	97% (40/41)	Forty patients (median age 73; 57% [N=23] female)	
Patients were eligible if they were aged 21	Those with cognitive impairment that limited the ability to understand	85%	Participants with cancer in Michigan area	Individual
a body mass index between	Recent psychiatric hospitalization,	80%	N/A	
hypertensive or pre-hypertensive condition	None	Not mentioned	Not mentioned	
Aged between 35 and 75 years, no history of		Not mentioned	N/A	
Not mentioned	Not mentioned	67% (21/31)	Not mentioned	
were ≥40 years of age with a self-reported history of (1) coronary heart	CVD-related complications that cannot be managed in a primary care setting; (2) having a	87%	Participants belonged to the village therefore representative	Individual
with a diagnosis of diabetes	NA	100%	Pilot study- Sample size not adequate for generalizability	Individual
participants must have been overweight or obese, between	unstable medical condition, uncontrolled thyroid condition, eating disorder, or a psychiatric	Not mentioned	N/A	

Not mentioned	Not mentioned	Not mentioned	Mostly middle-aged white female	
Patients confirmly diagnosed with breast cancer, age between 20	history of treatment for accompanying severe disease (e.g., other malignancy) within one month; severe			
between 40 and 70 years old with DM2 or COPD,	presence of coexisting medical conditions with a low survival rate, severe	36.8% (540 patients a general invitation letter	Above 55 mostly and above 90% of dutch origin	
people with COPD or type 2 diabetes, aged				
diabetes. Subjects were eligible for study participation,	NA	54%	Representativeness is good for this multi-country study	Individual level
years, five of whom had type 2 diabetes with a body-mass index>25 kg/m2	co-existing medical conditions, insufficient mastery of the Dutch language, or without an Internet	85%	Pilot study- Sample size not adequate for generalizability	Individual
1) age 60–85; 2) cognitive impairment due to Alzheimer's disease and not	individuals with normal cognition was also recruited as an active control cohort from a registry of		N/A	Participants and their study partners were comfortable
1) Able to exercise 2) Diagnosed with T2DM at least 5 years ago	cpomplications 2) serum cretatnine <1.5mg/DL 3) Proliferative retinopathy	Not mentioned	Mostly male 4/5	
eligible for participation if diagnosed with T2DM, if	NA	75%	Not representative as only recruited from two GP clinics	Individual level
patients over 18 years old, diagnosed with type 2	Participants were excluded if their baseline HbA1c was greater	Not mentioned	N/A	

were not previously clinically		Not mentioned	Not mentioned	
aged 49 + years with medical illnesses (defined as		Not mentioned	N/A	
age between 60 and 70 years, (2) no history of diabetes or use	Not Available	91.20%	Representative of the age group in Netherlands	Individual level
A diagnosis of chronic obstructive	Not mentioned	82.6%(19/23)	Mostly male and above 65	
age between 18-75 years, had symptoms of	Patients were excluded if they showed psychotic or manic symptomsor	Not mentioned	N/A	
an age >20 years, gastric cancer diagnosis,and	experienced difficultieswith accessing the app		This is a pilot study with very little sample size, so representativeness is a challenge	Individual level
Not mentioned	Not mentioned	100%	Sample size not adequate for generalisability	Individual
Medicare enrolled or	Not mentioned	100%	Participants were enrolled only from 1 of	N/A

	Efficacy/Effectiveness				
Measures/results for at least 1 follow-up	**Intent-to-treat analysis used (Y/N)**	**Impact on QOL (quality of life)**	**Percentage of attrition**	**Organisational level (setting and staff)**	**Description of intervention location**
After 1 week and 2 weeks	N	N/A	Not specified	N/A since the intervention delivery was not through personnel	Intervention was delivered through automated text messages.
N/A	N/A	Most respondents felt that the	N/A	intervention delivery was not through personnel	Intervention was delivered through
Weekly measuremen ts	Yes with linear regression	Partly with MCS and PAID	261 (87%) patients completed	DVA outpatient clinics	US VA health system
After 3 months	N	Not measured	11.11%	intervention delivery was not	delivered through a
N/A	N/A	N/A	N/A	N/A since the application was run	N/A since this was a diagnostic
months (control phase) and 6 months	N	using EQ-5D, no significant change post-intervention	32.26%	providers were satisfied with the app and found it user-friendly	N/A since intervention was delivered electronically
					intervention was delivered electronically
After 2 weeks	N/A	N/A	26.83%	A research assistant explained the respective interface	N/A since intervention was delivered
After 1 month and 3 months	N	Not measured	73%	content was created by the staff of the rehabilitation and	N/A since intervention was delivered electronically
After 4 months and 10 months	Y	No significant change post-intervention	13%	nurses from the centre, as well as community peer	education sessions took place at the
					This is a culturally sensitive, low-cost, bilingual

			7 out of 32		Health coaches, etc
Moderate self confidence	No	Nil	NA	NA	Hospital
NA	No	Not reported	36.60%	NA	NA
Only 1 follow up after 2 months	N/A	Not measured	16%	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
NA	NA				
absolute weight change from baseline to	Y	NA	14.29		took place at the University of Pittsburgh School of Nursing,
At 12 weeks, the outcome weights were on	Y		25.64% (10/39)		SM data were downloaded hourly between 9 AM and 10 PM

1,2 and 3 months	No	No difference of QoL	23%	Hospital	Tertiary Hospital in Taiwan
averages of time spent indoors and	N/A	N/A	0	N/A	Participants' homes and outdoors
NA	NA	NA	NA	NA	NA
After 42 days of quit date, participants	N/A	N/A	Not mentioned	N/A since the intervention delivery was not	Intervention was delivered through a
	N	N/A	Not mentioned	N/A since the intervention delivery was not	Intervention was delivered through a
4 weeks	No	No	Not reported	Hospital	NA
table 2 of manuscript??	Y	not mentioned	randomized, 82 analyzed, 22 lost-to-followup or		not specified
monitoring, adherence to the regimen,	Y	including re-hospitalization and mortality rares	None	UPMC Tertiary care hospital and trained staff	
sifgnificant difference between	No	N/A	N/A	Stroke rehab, rehab therapists	Multi-site international - 16 rehab clinics

Weight, steps, diet, hip circumferenc e, BP, Lipids,	Y	NA	adherence to mobile activity diary decreased from 90% in	NA	NA
				N/A	
NA	NA	NA	NA	NA	NA
No significant difference observed	N	N/A	10%		
After 4 weeks	N	N/A	0	Process evaluation not done	Intervention delivered through phone/email
(MiniBESTest) significant at 6 weeks, physical	Y	using SF-36 but only changes in physical health scale		N/A	
At 4, 8 and a2 month of	N	N	Not mentioned	N/A since the intervention	Intervention was delivered
chosen SMS. Participants selecting SMS	NA	NA	NA	NA	NA
3 months	No	Improved QoL (EuroQual	in intervention group by 3 months	Not reported	Not reported
Fecal Occult Blood Testing was	Y	NA	4%	Not reported	NA

NA	Y	SF36 no change	16% at 6 months	Not reported	Not reported
89.64% adherence rate	N	N	23%		not mentioned
	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
Significant reduction in weight	N	NA	60%	NA	NA
mean decrease 3.1 (95CI 2.0 - 4.2)	N	score Responders 34.2 (6.4) Non-	24.6% (15/61)		not mentioned
Measures at O, 2 and 4 months	Yes	Significant improvement	Fitback 8%; other groups 2.5%		
NA	NA	NA	Not reported	NA	NA
telehealth system dimensions reached	NA	improvements were observed in four out of the five	4%	NA	NA
Reliability of scores	No	NA	0.40%	NA	NA
85.7% of outpatients in intervention	Yes	NA	31.30%	NA	NA

randomly generated audiometries, the	NA	NA	NA	Individual level	Not Mentioned
NA	NA	Yes	NA		
NA	No	No	Not reported	Primary care clinic	Primary care clinic
Yes	No	No	15%		
Weight in the standard-care group	Yes	NA	20%	NA	NA
1 year	Y	Not reported	27.50%	Not reported	Hospital and Workplace
SmartLoss group experienced significantly greater weight loss	Yes	Yes	5%	NA	NA

1 month	N	No change in FACT G scoe	30%	NA	NA
theory-based motivational messages Usability	NA	NA	NA	Individual level	Community based
"subjective adherence w/o supporting system 50.02	N	N	0		not mentioned
N	N	N		N	N
over 6500 responsemes sages with response rates of	N	N/A	N/A		home based
after 12 weeks and 24 weeks	Y	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed

After 10 weeks	N	N/A	33%	A process evaluation was not done	Intervention was delivered through Whatsapp to the mobile group and on a sports
			4 lost to follow up in control and		
at 3 month	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
after 3 and 6 weeks	N	Increased physical activity may increrase one's self-efficacy	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed software to
at baseline, 1 month and 3 month	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
at 24 weeks	N	N/A		N/A	N/A
Participants were followed up for a total of 1,225	No	No	N/A		home based
83% completion	No	No	approx 5 % overall		home based
patients reported lower levels of	N	None			home based

				N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed software to participants'
Not mentioned	N	Not measured	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
	Not mentioned		Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
After 1 month	Not mentioned	N/A	4%	N/A	Intervention was delivered by computer-generated SMS
	NA	Improvement in knowledge of food choices, confidence and	14%		
Not mentioned	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
after 4 weeks	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
demonstrated a significant	No	N/A	8% (7/80)		home based
	Y	reduction in the intake of high sugar and	14%		
after 12 weeks	N/A	N/A	Not mentioned	N/A since the intervention delivery was not	Intervention was delivered through a
				N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed software to

	N		30%		
	N		20% (approx)	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed software to
across training plans differed significantly	No	N/A	group showed 41% attrition (primarily		home based
N/A	N	N/A	25%	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
Out of the 40 patients who completed	No	N/A	0%		home based
Of the 37 patients in the	NA	NA	15%	Individual level	Michigan USA
at 3, 6, 9 and 12 months	N	N/A	Not mentioned	N/A since the intervention	Intervention was delivered
The average score of users'	No	N/A	0%		home based
N/A	N	N/A	Not mentioned	N/A since the intervention delivery was not	Intervention was delivered through a
After the onset of the intervention	No	N/A	9% (2/21)		home based
reported antihypertensive medication use-the	Yes	NA	13%	Community level	India and China
distance spectacle-corrected	NA	NA	NA	Individual level	USA
	N	N/A	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed

participants in the TBP group lostsignifican	No	None	Not mentioned		home based
physical activity-at 6 weeks and 12 weeks;	N	physical, role, emotional, and cognitive functioning scores were			
Directly after the intervention, participants	No	Physical Component Score and Mental	12.66%		Family practice and home-based
After 2 years, an HbA1c < 7.0% (53	Yes	Assessed. The intervention did not appear to have an	46%	Individual level	The studies took place within the 'Kin-réseau' programme in DR
			11.9% in DRC, 14.5% in Cambodia and 64.6% in		
patients (12 out of 17) were positive about the	NA	NA	15%	Individual level	General Practices in the Netherlands
at 8 weeks	N	significant positive changes in physical activity can be	Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed software to
current 1-week study, input of meal photos was higher	No	No	Not mentioned		home based
outcome was the difference between	Yes	NA	25%	Individual level	Primary care clinics
24 week	N		Not mentioned	N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed

performance-based measures of	No	No	Not mentioned		lab and home based
				N/A since the intervention delivery was not through personnel.	Intervention was delivered through a programmed
and 3-month follow-up, daily physical	Y	nA	9%	Individual level	NA
patients' transition from being	No	No	21%(4/9)		lab and home based
after 1 week	N	Not mentioned	Not mentioned	N/A since the intervention delivery was not	Intervention was delivered through a
Significant results - App group had alower body	No	NA	NA	Organisational level- Medical staff members and dietitian enrolled to	Tertiary care facility in Taiwan
On average, each user has played half an hour	NA	NA	NA	Individual level	Not Mentioned
At least one 15 minute	N/A	N/A	0	N/A	N/A

	Adoption				
Description of staff who delivered intervention	**Method to identify staff who delivered intervention (target delivery agent)**	**Level of expertise of delivery agent**	**Inclusion/exclusion criteria of delivery agent or setting**	**Adoption rate of delivery agent or setting**	**Organisational level**
N/A	N/A	N/A	N/A	Process evaluation of the intervention was not	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	The intervention was delivered as intended.
Should do the RE-AIM assessment using another publication: J.E. Aikens, et al, Diabetes self-management support using mHealth and enhanced informal caregiving, J. Diabetes Complicat. 28 (2014) 171–176					Not reported here
N/A	N/A	N/A	N/A	evaluation of the	was delivered as intended.
N/A	N/A	N/A	N/A	Process evaluation	N/A
N/A	N/A	N/A	N/A	N/A	The intervention was delivered as intended.
					The intervention was delivered as intended.
A research assistant who worked closely	Not mentioned	The research assistant worked closely	N/A	N/A	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	The intervention was delivered as intended.
were responsible for prescribing	N/A	completed a 16-hour training based	N/A	N/A	The intervention was delivered as intended.

	NA	Good	NA	NA	NA
Hosital staff	Not reported	Not reported	Not reported	NA	NA
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
NA	NA	NA	NA	NA	NA
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
					Implemented at the organization level
not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	
research staff	not mentioned	not mentioned	not mentioned	not mentioned	

Doctors and nurses	Not reported	High	Not reported	NA	NA
regularly interacted with the	N/A	N/A	N/A	N/A	N/A
NA	NA	NA	NA	NA	NA
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
Cardiologists	NA	High	NA	NA	Not reported
was a master's trained family therapist and was trained by	not mentiones	master's trained family therapist	not mentioned	not metnioned	
NA	NA	NA	NA	NA	NA
Rehab therapists	Unclear	Unclear	Not addressed	Not addressed	but individual clinic level intervention, not focused on unit

Research staff	NA	NA	NA	NA	NA
					N/A
NA	NA	NA	NA	NA	NA
Nurses at the clinic made the phone and email	N/A	N/A	N/A	N/A	Intervention was delivered as intended
					N/A
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as
NA	NA	NA	NA	NA	NA
Not reported	Not repored	Not reported	Not reported	Not reported	Not reported
NA	**NA**	NA	NA	NA	Yes

Not reported	Not	Not reported	Not reported	Not reported	Not reported
not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
NA	NA	NA	NA	NA	No
not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	
Not reported	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	No

NA	NA	NA	NA	NA	Individual level
	Social media is a critical tool for dissemination of knowledge, tools, and				
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
Not reported	Not reported	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA

Not reported	NA	Not reported	NA	NA	NA
NA	NA	NA	N	NA	Individual level
not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	
N	N	N	N	N	N
N/A	N/A	N/A	N/A	N/A	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.

A study coordinator who was familiar with the intervention	Not mentioned	Not mentioned	Not mentioned	N/A	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	N/A	

N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	N/A
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.

N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was delivered as intended.
N/A	N/A	N/A	N/A	N/A	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
N/A	N/A	N/A	N/A	N/A	
Study staff	NA	NA	NA	NA	Individual level
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
N/A	N/A	N/A	N/A	N/A	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
N/A	N/A	N/A	N/A	N/A	
Community Healthcare workers	medical students in Tibet University and Community	Trained community healthcare workers	NA	NA	Community-Individual level
Ophthalmologist	Santa Clara Valley Medical Center	Tertiary education	NA	NA	Individual level
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A

N/A	N/A	N/A	N/A	N/A	
Practice nurse	Not mentioned	For mastering the execution of the intervention,	Not mentioned	Not mentioned	
			N/A for this study.		
community-based peer educator	Staff of the respective centres	NA	NA	NA	Individual level
Nursing staff	NA	NA	NA	NA	Individual level
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
Research staff	N/A	N/A	N/A	N/A	
Healthcoach	degrees in kinesiology and health science and/or	bachelor's degrees in kinesiology and health science	NA	NA	Individual level
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A

Research staff	none	none	none	none	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
Web based	NA	NA	NA	NA	Individual level
not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	
N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A
Medical Staff employed in the university hospital	NA	Qualified medical professionals			Yes
NA	NA	NA	NA	NA	NA
N/A since this was GPS	N/A	N/A	N/A	N/A	The intervention was delivered as

Implementation			Maintenance		
Fidelity of the intervention (%)	**Measures of cost of implementation**	**Individual and organisation level**	**Assessed outcomes ≥ 6 months post intervention**	**Indicators of program level maintenance**	**Measures of cost of maintenance**
100	Not mentioned	Process evaluation not done.	Only 2-week follow-up	No information provided.	Not provided
100	3 cents per message per participant	Program subscribers found that the	Only 6-week follow-up	No information provided.	Not provided
<40% patients chose to participate with	intervention relatively inexpensive to implement &	Quadratic analyses confirmed a	Compared 3 and 6 months	Part of service provision	Not reported
100	Not mentioned	evaluation not done.	Only 3-month follow-up	No information provided.	Not provided
N/A	Low cost compared to polysomnography	Process evaluation not	N/A	N/A	N/A
reported problems receiving the reminders	Not mentioned	patients wanted to continue using the app	Only 3 months' follow-up post-intervention	No information provided.	Not provided
	Not mentioned				$314,264 over 2 years
1 patient in the 2nd group did not receive any	Not mentioned	Process evaluation not done.	Only 15 day follow-up	No information provided.	Not provided
100%	Not mentioned	evaluation was done in terms of patients' perceived	Only 3 months' follow-up post-intervention	No information provided.	Not provided
100%	To be reported in the future	evaluation done, not yet reported.	At 10 months	No information provided.	Not provided
		90% would like to continue program; 100% would			

NA	NA	NA	NA	NA	NA
NA	Nil	NA	Nil	Nil	Nil
100%	Not mentioned	Process evaluation not done.		N/A	Not provided
Not reported	Not reported	NA	NA	NA	NA
					Although not reported here, the authors believe that the costs of delivering
100%	Not mentioned	Process evaluation not done.	Only 1 follow-up after 2 months	No information provided.	Not provided
not mentioned	They were compensated $50 per assessment excluding baseline.		not mentioned	not mentioned	not mentioned
not mentioned	not mentioned		not mentioned	not mentioned	not mentioned

N	N	N/A	N/A	N/A	N/A
80	are needed to install the system in the patient's home	participants felt the tracking	Only 6-week monitoring	N/A	Not mentioned
NA	NA	NA	NA	NA	NA
	Not mentioned	Process evaluation not done.	N/A	No information provided.	No information provided.
	Not mentioned	Process evaluation not done.	N/A	No information provided.	No information provided.
Not reported	Nil	Not reported	Nil	Nil	Nil
not mentioned	compensated $25 for each completed assessment (maximum $100), but		intervention feedback was done 12 weeks after	not mentioned	not mentioned
NA	NA	Individual	Primary and Secondary outcomes		
Not addressed	Not addressed	N/A	N/A	N/A	N/A

No repoted	Not reported	Nor reported	5 months	NA	NA
		N/A			
NA	NA	NA	NA	NA	NA
100	No cost to clinic; USD16 out-of-pocket cost to patient for the vaccine	N/A	Only 4 month follow-up	N/A	N/A
			N/A		
	N/A	Process evaluation not	N/A	No information provided.	No information provided.
NA	NA	NA	NA	NA	NA
Not reported	Not reported	Not reported	Not known	Not known	Not reported
96%	NA	NA	NA	NA	NA

Not reported	Nil	Not reported	Not reported	Not reported	Not reported
not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
	N/A	Process evaluation not done.	N/A	No information provided.	No information provided.
	NA	NA	NA	NA	NA
not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
Not reported	Not reported	NA	Nil	Nil	Nil
NA	NA	NA	NA	NA	NA
Not reported	Not reported	NA	No	Nil	NIl
NA	NA	NA	NA	NA	NA

All proposed interventions were implemented	Not performed	Individual	NA	NA	NA
	Cheap and easy to install, with good support from CGM community	The story of Nightscout and its potential impact on outcomes suggest that			
Not reported	Not reported	NA	NA	NA	NA
			No		
NA	NA	Individual	NA	NA	NA
Not reported	Nil	Not repored	Yes	Not reported	Not reported
	Cost-effective				
NA	NA	NA	NA	NA	NA

Not reported	Nil	NA	NA	NA	Nil
All proposed interventions were implemented	Not performed	Individual	NA	NA	NA
not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
N	N	N	N	N	N
No	No		No, just a focus group with small patients	No	No
100%	Not mentioned	Process evaluation not done.	N/A	No information provided.	No information provided.

100%	not mentioned	Process evaluation not done.	No	None	Not mentioned
	N/A	Process evaluation not done.	N/A	No information provided.	No information provided.
100%	Not mentioned	Process evaluation not done.	N/A	No information provided.	No information provided.
	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
	Not mentioned	N/A	N/A	N/A	N/A
No	No		No	No	No
No	No		No		No
No	No		No		No

	N/A	Process evaluation not done.	N/A	No information provided.	No information provided.
	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
100%	Not specified but noted to be inexpensive	in the intervention group reported satisfaction with the SMS-	Only 1-month follow-up	N/A	N/A
96%	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
No	No		No	No	No
Not mentioned	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A

	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
No	No		N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A		N/A	N/A	N/A
All proposed interventions were	Not performed	Individual	NA	NA	NA
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A		No	No	No
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A		No	No	No
All proposed interventions were implemented	Not performed	Individual	NA	NA	NA
interventions were implemented	Not performed	Individual	NA	NA	NA
N/A	N/A	N/A	N/A	N/A	N/A

N/A	N/A		No	No	No
Not mentioned	Not mentioned		Not mentioned	Not mentioned	Not mentioned
All proposed interventions were implemented	Not performed	Individual		NA	NA
all proposed interventions were implemented	Not performed	Individual	NA	NA	NA
N/A	N/A	N/A	N/A	N/A	N/A
Not mentioned	Not mentioned		Not mentioned	Not mentioned	Not mentioned
all proposed interventions were implemented	Not performed	Individual	NA	NA	NA
N/A	N/A	N/A	N/A	N/A	N/A

Not mentioned	Not mentioned		Not mentioned	Not mentioned	Not mentioned
N/A	N/A	N/A	N/A	N/A	N/A
NA	Not performed	Individual	NA	NA	NA
Not mentioned	Not mentioned		Not mentioned	Not mentioned	Not mentioned
N/A	N/A	N/A	N/A	N/A	N/A
All proposed interventions were implemented	Not performed	NA	NA	NA	NA
NA	NA	NA	At 6 months	None	N/A
100	Not specified but inexpensive due to	Process evaluation not	Only 5 month follow-up	Not mentioned	Not specified but inexpensive

Does the study answer the review question(s)					
Question 1 ***How is mHealth being used for healthy ageing?*** **(Y/N)**	**Question 2** ***Effective implementation model*** **(Y/N)**	**Question 3** ***Lessons learnt from implementation*** **(Y/N)**	**Question 4** ***Good evidence?*** **(Y/N)**	**Limitations and challenges**	**Lessons learnt**
Y	**N**	**Y**	**N**	Narrow range of depressive symptoms, low-income minority	Daily assessment of mood ratings may provide accurate indication of longitudinal
Y	**Y**	**Y**	**N**	generic and not tailored according to	replacement of email and web-based counselling
Y	**Y**	**Y**	**N**	Did not assess long-term control of	Develop mHealth apps and services that automatically
Y	**Y**	**Y**	**Y**	messages were found to be	improve medication
Y	**Y**	**Y**	**N**	The current application is	Smartphones have the potential to
Y	**Y**	**Y**	**N**	to iOS and Android interfaces, small sample	automatically collects and sends data to developers is needed, the app
N	**Y**	**Y**	**Y**		mobile RCTs are quick and cost-effective, but
Y	**Y**	**Y**	**N**	Clinical outcomes were not	Bi-directional text messaging as well as text message
Y	**N**	**Y**	**N**	randomised equally into both groups, small sample	intervention has potential to improve physical activity following
Y	**Y**	**Y**	**Y**	patient data could not be collated due to	peer education and multidisciplinary care enhanced by
Y	**N**	**Y**	**N**	Limitations: small sample size, uncontrolled	TEXT-MED was designed for resource-poor patients; should

Y	N	N	N		
N	N	N	N	Patients only used for 2 hours.	Nil
Y	Y	Y	N	program director emphasis on the NP (nursing	mHealth DSS was efficacious for the management of obesity and
N	N	Y	N	Not RCT, small sample	High attrition. Ipad is feasible with comparable retention rates
N	Y	Y	Y		
Y	N	Y	N		shorter, more regular periods of physical activity
N	Y	Y	Y	The small size was very small that limited the precision of the	The application smart quit 2.0 had high user receptivity, modest
Y	Y	Y	N	small sample, testing a prototype	can be achieved among those with minimal game experience and
Y	N	Y	N		These older adults viewed the mHealth technology positively suggesting that it
Y	N	Y	Y		
Y	N	Y	Y		

Y	N	N	Y	recruitement mechanisms are unlcear (university clinic) and may	
N	Y	Y	N	training. Lack of blinding. Confounded by other activities	May be usefl supppleme nt to patient edcuation.
Y	N	Y	N	of the tracking system is subject to	challenges in implementation of the UbiTrack
Y	N	Y	N	The intervention was brief at 6 months. The ongoing	Our application of a UCD in the development of the Web application resulted in a tool
Y	N	Y	N	Self-reporting bias, the information on	Combination of smoking cessation medication with
N	Y	Y	N	underrepresent ation of minorities,	smartphone apps are an effective means to improve
Y	N	N	N	Not reported	Nil
Y	Y	Y	N	Questions were based primarily on a survey of the patient's immediate	Patients generally have a positive attitude towards mobile health apps [19], including for
Y	Y	Y	Y	definitive trial and was not powered to detect	phone intervention is feasible, acceptable, and may enhance the
Y	Y	Y	Y	from one transplant centre, health indicators	
Y	N	N	N	Small study of a prototype application	Wireless sensors to measure symptoms automatically
Y	Y	N	N	ceased when no difference found between	highlight unanticipated service issues. For

Y	Y	Y	Y	5 months. Relaively high rincomes and large proportion of	Need to look at longer term maintenance
Y	N	N	N		sensor data and neiral networks
Y	N	N	N		The inertial sensor mounted in the iPhone 4® is sufficiently reliable
Y	N	N	N	Small purposive sample. Needs	Nil
Y	Y	Y	N	Subjects drawn from health system's electronic	SMS can be effective but more robust studies are needed
Y	Y	Y	Y	Shortage of vaccine availability following first	SMS and email reminders are effective in patient uptake of
Y	Y	Y	N	significant differences between groups, findings	feedback for gait wasn't significanty different across most outcome
Y	N	Y	N	Self-reporting bias, not	Advancing knowledge of
Y	Y	Y	N		
Y	Y	Y	Y	criteria as English only, majority were well educated	preferred mode, but SMS preferred by more tech savvy and young
Y	Y	N	N	measure clinical outcomes such as stroke or bleed.	Nil
Y	Y	Y	Y	Lean mode of the intervention,	Interrogative plus social context messages are more
Y	Y	Y	N	Small qualitativer study, but done	

Y	Y	Y	Y	Many patiens were vulnerable. 16% drop out.	Low adherence in group with poor glycaemic control at baseline.
Y	Y	Y	N	majority was femalestudy participants	not significantly related to adherence.
N	N	Y	N	The sample size was very small so that the findings cannot	iSTEP intervention is feasible to administer which can make high
N	Y	Y	N	Observational, no control group therefore	Further research needed
Y	Y	Y	Y	low numbers, no control at 2 year follow-up,	clinical data are improvements achieved from baseline to two
Y	N	Y	Y	USA trucking industry only	
Y	N	N	N	Nil reported	Nil
Y	Y	Y	Y	criteria of ability to use the sensors, alerts and	end users, assessment of their needs and expectations on the
Y	Y	Y	Y	The low inclusion criteria in terms HbA1c for diabetic patients posed	Real-time social support may help people to stay engaged and feel supported, important to
Y	N	N	Y	selection bias, self report, no	No
Y	Y	Y	Y	Short follow-up period of three days, baseline health seeking	Mobile reminders can work at a primary care level in a LMIC

Y	Y	Y	N	calibration was not possible. use of consecutive	become a useful tool for professionals in their daily clinical
Y	Y	Y	N	The opt-in process ensures that the sample of individuals acquired cannot be	Wearables in particularwere quite popular, interestingly not only for the caregivers but also
Y	N	Y	N	allocation so could not focus on reasons for particular trial outcomes.	multiple stressors related to their personal, family, socio-economic circumstances and
Y	N	Y	Y	6-month follow-up period might not be long enough to evaluate the long-term	85% participation rate indicatse older patients can adopt a new and advanced technology; and
Y	N	N	N	Non-intervention study, mostly about describing the	
Y	Y	Y	Y	duration of the intervention was only 6	tailored text messaging is a promising approach
Y	Y	Y	N	text messages. Also given prescription	NA
Y	N	Y	Y	may not have had enough increasing intensity in	physical activity, but increased self-efficacy and self-reported physcial
Y	Y	Y	Y	12 weeks, sample size small, no formal evaluation of scalability and	promoted clinically meaningful weight loss over 12 weeks compared with an attention-matched control group and
Y	N	N	N		

Y	Y	N	N	Small non random sample. No control.	older patients used the app.
Y	Y	Y	N	the initial and follow-up evaluation may not be	data suggested that evaluation participants found the app feedback helped them
Y	N	N	N		
Y	Y	Y	N		
Y	Y	Y	Y	medication intake needed to be confirmed via iPad, length of study was	The interventions improved all the related types of adherence, though
Y	Y	Y	N	Too little, too short,	Designing apps for elderly. Elderly has more femalse but this cohort has less.
Y	Y	Y	N		
Y	Y	Y	Y	patients for longer period would allow evaluation and impact on	integrate home based measurements into EMR and use for self-management
N	Y	Y	N	lack of statistical power and small sample	Text messaging mHealth application can reach those most in
Y	Y	Y	Y	Lack detailed individual-level data for evaluating	Use of focus groups to collaboratively create the study protocol and the

Y	N	Y	N	Small sample size, uneven randomisation of participants, lack of generalisability	Structured exercise interventions can control sarcopenia and CVD risk factors in the elderly
Y	Y	Y	N	Limited sampling, Brief limited	these technologies can be used to not only send
Y	N	Y	N	Small sample, short duration, no subgroups	study minimized the involvement of health care
N	Y	Y	N	Not mentioned	
N	Y	Y	N	Participants were relatively young & recruited from local support	the intervention using the STARFISH app can increase step/day, walking time and reduced
N	Y	Y	N	1) this was not a controlled study, it	
N	Y	Y	N	Participants might have underestimated the	the augmented application as a tool to help people with
N	Y	Y	N	1) To receive this intervention	text-messaging intervention to increase physical
Y	Y	Y	N		
Y	Y	Y	Y	1) reliance on self-reported outcomes could have biased the results.	1) providing feedback to an informal caregiver substantially increased patients'
Y	Y	Y	Y	1) limited the multivariate analyses of	1) Despite the favorable findings, IVR cannot fully
Y	Y	Y	Y	conducted among VA patients who may have had	increased CarePartners' involvement in self-care

N	**Y**	**Y**	**N**	1) Possibility of patients being biased about their medicaction adherence	health systems using mHealth approaches should consider creative ways to engage
N	**N**	**Y**	**N**	the sample size was very small in the first study, raw data	Users perceived the app as user-friendly and helpful to obtain health
N	**Y**	**Y**	**Y**		smartphone-based behavior monitoring software helped
N	**Y**	**Y**	**N**	intervention was not developed around a theoretical	SMS reminders are effective in improving aspirin adherence following coronary
Y	**Y**	**Y**	**Y**	Pilot study with its own limitations	WellDoc System is an effective tool for real-time support, education and data
Y	**Y**	**Y**	**Y**	the sample was recruited from a tertiary hospital that	patients with CHD were engaged with and positive about a text message
Y	**Y**	**Y**	**N**	small sample size and study design limits its generalizability,	Happy is usable and might help users change their behaviour
Y	**N**	**Y**	**Y**	was limited 2) participants were followed	demonstrate that newer self-monitoring
Y	**Y**	**Y**	**N**	adjusted for multiple comparisons	mHealth is a promising technology for LMIC
N	**Y**	**Y**	**N**		Mood and activity monitoring is well tolerated by
N	**Y**	**Y**	**N**	1) The findings of the study were not generalizable to allproviders and	Use of mobile tablet in medical practice can draw a positive impact upon overall

Y	Y	Y	Y	Non Randomized uncontrolled single arm	Digital therapeutics can produce a sustained behaviour change
N	Y	Y	N	1) All the patients were recruited from the close ward, results might	1) physical activity showed a significant association with positive symptoms
Y	N	Y	Y	sample size. 2) different recruitment methods and	strategies seemed to be more effective to stimulate the
Y	Y	Y	N	1) selection bias; 2) generalisability and	the use of the WelTel SMS support intervention as a
Y	N	Y	N		The reasons for not recording stepswere being on
Y	Y	Y	Y	Measuring adherence by self-report is	Text interventions are feasible in patients with
Y	Y	Y	Y	recruited sample from a	The addition of a personal digital
Y	Y	Y	Y	1) The sample size was small) and the	1) Patients who believe in traditional Chinese
Y	N	N	N	this application was not as easy toexplain the	the mobile phone application (non-blood based CVD
Y	N	Y	Y	1) small number of participants	1) including gaming elements and SMS-text in an
Y	Y	Y	Y	be generalizable to healthcare settings without existing or	cardiovascular management program's effectiveness in increasing the
Y	Y	Y	Y	size and clinic based population	smartphone based telemedicine to screen for referral-
Y	N	Y	N	short duration, single-arm design, two vs. three days of	participants found the Bite Counter easy to use and that use was

Y	N	Y	Y	was conductedin mostly white women in a	alsoentered the study with their own mobile device, meaning theydid
N	Y	Y	N	lack of assessment of adherence to each intervention	mHealth with pedometer might not have substantial superiority for most
Y	Y	Y	Y	the mean baseline physical activity was	Ideally, a 12-month follow-up is recommended [48]. Due to
N	N	Y	N		
Y	Y	Y	Y	High rates of Loss to Follow-Up	study did not show a benefit of adding the mHealth
N	Y	N	Y	Limitations was related to study design, data collection and	
Y	Y	Y	Y	Small sample size and a pilot study	stimulated patients to become more physically active and supported
N	Y	N	Y	1) it was designed as a feasibility trial with limited efficacy	mHealth technologies such as internetconnected accelerometers can
Y	N	Y	N	a small 1-week study,	study, participants often thought that small portions did not contain enough calories to
Y	Y	Y	Y	Reliability on HbA1c	between-group difference in improved glucoregulation,
Y	Y	Y	Y	small sample size, short duration, self-reporting bias,	electronically assisted health coaching may emerge as a viable

Y	N	Y	N	generating questions for follow-up	not observe robust group differences between the
Y	Y	Y	N	lack of monitoring about the using hour of mobile	User-centered design enabled us to target the unique needs of
Y	Y	Y	Y	could have been introduced in the study	using Web-assisted interventions for increasing physical
Y	N	Y	N	The patient sample was recruited within	1) The findings of this study show that patients perceived
Y	Y	Y	N	selection bias, small sample size,	people with severe mental illness are willing and able to
Y	Y	Y	Y	App was not regulated by medical authorities in	Provides a feasible solution to the challenge of post-operative
Y	Y	Y	N	Small sample size	a better game adoption by the elderly as well as an improved
Y	N	Y	N	Small sample size, incomplete	Obtaining highly textured,

Comments								
Future research is needed to inform if daily mood ratings can guide treatment								
the survey and data analysis was conducted								
May be more effective to offer individualized IVR								
evaluation of the intervention is								
This study describes								
adverse events and other chronic conditions should be added to the								
A process evaluation is needed to								
participants should be better addressed accounting for								
care programs should be provided to patients								
Potential of simple, scalable, unidirectional text messaging to								

Not trial. Descriptive study with very small sample.								
against RE-AIM framework as not developed in a								
To make a significant comparable inference, study								
shoulld we exclude? Since this was a feasibility study of the								

a clinical setting, hard to place within RE-AIM as it ws developed and trialled outside								
Good quality								
Mobile health technology (mHealth) has the potential to link the community								
Need to consider the group of minorities,								
Poor quality study with high risk of bias								
Aware of ease of use and care safety of eHealth home monitoring, with well proven								
using this technology in regular smartphones is								
Regression analysis demonstrated a significant increase								
conceptualisation of the study - they have used patient								

Good study but short duration.								
The evidence clearly points to the suitability of the iPhone for the								
Small descriptive study.								
Small sample								
RCT should be conducted								
Patient Health Engagement Scale (PHE-S), Patient Activation Measure (PAM)								
cannot be generalized as it is a part of another RCT, therefore								
Nil								
Authors investigated whether a question								

Good study. Short duration follow up.								
Sample size should be large and need a strong monitoring system								
Web-based multi-platform weight management is								
This is a pilot study which needs to be validated in a larger study								
Hawthorne effect for positive changes in both study groups. Control group patients may have								
No								
first randomized trial in a real-world primary care setting of a developing								

mobile device-based hearing handicap calculator available								
Are ill-considered responses or behaviour more likely online? When describing the month and								
Good qual study								
Approach may have relevance for gait monitoring, step counting, and sedentary								
Tailored text messages								
NA								
Cost-benefit analysis was limited in this case								
short duration study, but provides an insight into the wireless automated data transfer								

Small study without control.								
Small sample and short duration study, but provides an insight into usability of the App.								
Elderly patients with no previous experience with ICTs are capable of								
Need to make the sample size larger, need to strengthen the monitoring								
Study sample derived from a clinic-based population for	The findings of the current							

African-American patients with type 2 diabetes								
No inclusion criteria was mentioned, the study did not								
age group of the participants need to consider on the basis of mean age when the								
HF randomized results are also presented in below								

Very small sample size								
into the individual aspects of mHealth are needed								

Further investigation at a scale is needed								
There was no mention abouy power calculation which is needed								
Use of cell phones is increasing dramatically, and								
cardiovascular management model tested in the SimCard study has the potential								
needed to assess the sensitivity and specificity of this								

The intervention tool appears to be a feasible in primary care level								
primary care can improve the glucose management of								
a study design of RCT with a representative sample can give a								

high income country with high internet usage among elderly.								
Participants' ability to receive the intervention								
This is a pilot study which needs to be validated in a larger study								
Use of tablets and the constitution of serious games for seniors in close								
Further testing of this intervention								

Article no.	Co-reviewer	Title of article	Year of publication	Journal name	Study type (eg: RCT)	Overall duration of study	Number of groups/ sites	Informed consent obtained (Y/N)
5	Mark	The effect of short message system (SMS)	2017	International Journal of Medical Informatic	Randomised controlled trial	Not mentioned	3	Y
8	Teng	g a fully mobile and	2016	BMJ Innovations	ed clinical trial		3	Y
11	Padma	wireless Tijuana: A	2016	Technology & Therapeut	label randomised	30 months	3	Y
20	Teng	Phone Text Messages to Support	2016	Circulation	, single-blind, 3-arm randomised	12 months	3	Y
24	Mahfuz	ed, controlled pilot trial of a	2014	Drug and Alcohol Dependence	Randomised controlled pilot trial	2 months	2	Y
27	Jitendra	mHealth Technology to Enhance	2012	Journal of Preventive	ed 3-arm behavioural clinical trial	24 months	3	Y
28	Jitendra	The SMARTER pilot study:	2017	Preventive Medicine Reports	Pilot randomised clinical	12 weeks	3	Y
29	Ben	ed Trial of a Fitbit-Based Physical Activity	2015	Journal of Preventive Medicine	Randomised controlled trial	16 weeks	2	Y
41	Jitendra	ng psychoeducation with a	2015	Journal of Affective Disorders	Randomised controlled trial	6 months	2	Y
42	Padma	Randomized Controlled Trial of	2016	Journal of Transplantation	Randomised controlled trial			

49	Mark	Diabetes Prevention Intervention Using	2015	Journal of Preventive Medicine	Randomised controlled trial	4 months	1	Y
55	Jitendra	The effect of various types of	2015	Vaccine	Randomised controlled trial	4 months	6	N
61	Padma	reminders for cancer	2012	Preventive Medicine	randomised controlled trial	6 months	2	Y
63	Padma	Harnessing the question-	2016	American Journal of Public	Assessment of effectiven	6 months	5	Y
65	Mark	consultations as add-on to standard	2017	Journal of Endocrinology	Randomised controlled trial	8 months	3	Y
71	Jitendra	management of stress urinary	2017	Obstetricia et Gynecologica	follow-up of a randomised	24 months	2	Y
74	Teng	Web app to self-manage low back pain:	2015	Journal of Medical Internet Research	Randomised controlled trial		3	Y
77	Padma	Diabetes Patients Benefit from the	2016	Journal of Medical Systems	Randomised controlled trial	6 Weeks	2	Y
78	Teng	oring and mobile phone-based health	2015	Journal of Medical Internet Research	Randomised controlled trial	12 months	3 for each disease	Y
80	Mark	and reliability	2014	of Medical	ed repeated	12 months	1	Y
81	Padma	Effect of mobile reminders on	2015	Preventive Medicine Reports	Randomised controlled trial	11 days	2	Y
88	Teng	orial intervention in diabetes care	2016	Acta Diabetologica	Randomised controlled trial	6 months	2	Y

90	Padma	Tailored, Interactive Text	2015	The American Journal	Randomised controlled	12 months	2	Y
93	Ben	phone intervention increases	2015	Journal of Preventive	Randomised controlled trial	24 weeks	2	Y
96	Padma	of SmartLossSM, a smartphone-based weight	2015	Obesity	a smartphone-based weight loss interventi	12 Weeks	2	Y
103	Jitendra	A mobile application improves therapy-	2016	Medicine	Crossover usability trial		1	Y
108	Jitendra	health infrastructure to support underserv	2014	Healthcare	of integrating mHealth infrastruc	9 months	rticipants were recruited d from	Y
110	Teng	Text message reminders	2017	Cancer	Randomised controlled trial			
127	Jitendra	Structured Caregiver Feedback Enhances	2016	Telemedicine and eHealth	Randomised controlled trial	4 months	4	Y
129	Jitendra	Engagement with automate	2013	Medical Care	Patient experience of a IVR	23 months	N/A	Y
130	Jitendra	Randomized Trial of Mobile Health	2015	Medical Care	ed comparative effectiven	12 Months	2	Y
134	Mahfuz	t experiences in a smartpho	2016	of Telemedicine and Telecare	Qualitative evaluation of a RCT	6 months	2	Y
136	Padma	WellDoc™ mobile diabetes management	2008	Diabetes Technology & Therapeutics	Randomised controlled trial	3 months	2	Y

137	Mahfuz	Factors influencing engagem	2016	PLOS ONE	Parallel design, single-blind	6 months	2	Y
140	Jitendra	newer self-monitorin	2016	Obesity	Randomised pilot study	6 months	1	Y
145	Padma	Long-term outcomes of a web-	2015	Journal of Medical Internet	Outcomes of a longitudinal pilot	Two years	One group but analyse	Y
148	Jitendra	based strength-balance training	2013	of Medical Internet Research	preclinical exploratory trial	N/A	Horgen, Switzerland	Y
152	Padma	Feasibility of a Text Messagin	2015	Oncology Nursing Forum	Randomised controlled	10 Weeks	2	Y
153	Mahfuz	Integrating	2013	JAMA Internal	Randomised	12 months	2	N
154	Jitendra	Design and evaluatio	2016	Computers in Human	Exploratory longitudin	N/A	Tsinghua Elderly	Not mentioned
156	Jitendra	Increasing physical activity	2014	International Journal	Pilot testing of an online	N/A	Norway	Y
157	Padma	randomized, controlled trial of a simplified	2015	Circulation	Cluster randomised controlled trial	27 months	2	Yes
158	Padma	ne-based dilated fundus	2016	Retina	of a smartphone-based	8 months	2	Yes
160	Jitendra	sure that Mobile Health is really	2014	nal Journal of Medical	on of two randomised controlled	36 months	3	Not mentioned
164	Jitendra	It's LiFe! Mobile and web-based	2015	Journal of Medical Internet	Cluster randomised controlled	Not mentioned	Twenty four family practice	Y
166	Padma	The effect of text message	2017	Journal of Clinical & Translatio	Randomised controlled trial in	2 years	3	Y
167	Mahfuz	Process evaluation of a mobile	2017	Journal of Telemedicine and	Process evaluation of a mHealth	12 months	3	Y

169	Padma	study of a tool to stimulate physical activity in	2014	Journal of Telemedicine and Telecare	testing and evaluation of a tool to	3 months	1	NA
170	Mahfuz	of a Memory Clinic-Based Physical	2016	Journal of Alzheimer's Disease	Randomised crossover trial	16 weeks	2	Y
173	Padma	coaching reduces hba1c in type 2	2015	of Medical Internet Research	n of a health coach interventi	6 months	2	Yes
174	Mahfuz	Smartphone-enabled health	2014	Journal of Medical Internet	Development and testing of a	24 weeks	1	Y
177	Padma	a web-based intervention on	2013	of Medical Internet Research	ed, waitlist-controlled trial	3 months	Two groups	Yes
180	Padma	Tablet PC-enabled application	2015	Computer Methods and Programs	Single-arm pilot study	6 weeks	2	Y

Power calculated	Type of interventi on	Disease group	Care setting (Primary, secondar y, tertiary)	Wider health promotio n program? Specify	Mean Age	Sex	Total sample size	Number of patients per group
0.8	Routine care + text messages about medicatio	CVD	Primary	N/A	54.94	M & F 54.4% M	180	60
0.975	Dulce - an integrate	T2DM	Primary care	N/A	51	M & F (67% F)	301	control group (CG), 99
Y		Hypertens ion	Primary care	no	54.3 years (SD, 11.5 years)		1372	informati on-only SMS text messages (n=457), interactiv
0.8	Smartpho ne delivered acceptanc	N/A	Primary	N/A	41.5	M & F Male: 47% (smart	196	98
Y	monitorin g diet using a PDA alone	weight loss	Hospital?	NA	46.8 years	women (84.8%)	210	assigned to paper diary group
N	SM using the Lose It! smartpho	weight loss	communit y		44.85 ± 12.75	female (87.18%)	39	13
	g impact of Fitbit tracker and website	Overweigh t or obese	Communi ty		58 interventi on/61 control	100% Female	49	25/24 control
N	ed Real-Time Interventi on for	Bipolar disorder	Primary care		47.5% (12.8)	58.5% Female	82	41
Yes	on group-Pocket PATH-Smartpho	Lung Transplan t recipients	Tertiary	of the University of Pittsburgh	62	Males-55%	201	Pocket PATH-99, Usual care-102

Y	Diabetes preventio n sessions with	Nil	Communi ty	Added to reduced face to face program	55	33% M	61	30 Int 31 control
0.8	Different types of reminders inviting	DM/CHF/ Asthma/C OPD/CAD (Conditio	Primary care	N/A	> 40	M & F	1380	230
Incomplet e	automate d voice response calls	Healthy adults	Primary care		50.8	59.3% females	598	SMS= 167, AVR= 431
Yes	Comparis on among a	Healthy adults	Primary care	Yes, part of the national	60.44	51.1% females	50000	10000
Y	consultati ons as add on to standard	T2DM	Outpatien t clinic of 3 Tertiary hospitalt	N/A	58	M & F 64% M	165	Interv 83 Control 82
Not done	Tät® mobile app	Urinary incontine nce		NCT01848 938	s 44.2 yr (10.3) non-responder	F	123	group = 61 control = 62
				Neither supported by professio nal caregivers			597 adults were recruited, screened, consente	(1) treatment group (n=199), which used the
Y	ITY12 system composed of smart	Type 2 diagnosed >6 months	Primary	NA	Interventi on- 59.9, Control- 59.0	on- Females- 43%, Control-	60	30
0.8	Mobile phone with a PHR app and bluetooth	DM and HTN	Primary	Health coaches and patients can see patients'	Heart patients was 69.1 (SD 9.1) years, and	The majority of patients were men in	517	267 heart patients and 250 diabetes patients started in
Y	ne applicatio	prostate hypertrop	Primary care	No	58	100 M	1581	790 Control
Yes	Eligible outpatien ts either received	Healthy adults	Primary care	Yes, Outpatien ts attending	Inteventio n- 46.5, Control- 44.6	Interventi on- Females- 44.4%,	268	Interventi on=233, Control=1 35
Primary endpoint: % patients achieving HbA1c<7 % without	Physical activity-monitorin g device and dietary	DM	Outpatien t clinic, Seoul National University Bundang	Yes: individuali zed multidisci plinary u-healthcar	U-healthcar e group 64.3 (5.2), SMBG	Male/fem ale: U-healthcar e 40/10 and SBGM	100 patients (121 screened and 21 excluded;	50 each in the u-healthcar e and SMBG groups

Yes	Participants were randomiz	BMI>27	NA	NA	Intervention- Age 40+-	Intervention- Females-	124	Intervention=63, Control=6
Not mentioned	messages and videos, delivered	heart disease outpatients	y (outpatient cardiac rehab)		60	M & F 81% M	153	75 intervention, 78 control
NA	participants were prescribed a 1,200	Overweight/ obese people	Tertiary	NA	44.4	Females- 82.5%	40	20
Not done	Medication Plan via Apple iPad	Coronary heart disease	Cardiac rehab sports groups		73.8 yr (7.5)	M & F	24	24
N/A	d,bidirectionaltextmessaging (outreach messages)	Diabetes	Primary care	chronic disease management in safetynet	40.6% in age group 50-59	M & F	135	135
		Cancer	Primary		40-45 yrs: Control 404/Inter	The HR estimates were higher for	2386 AN/AIs aged 40 to 75	Identified 808 eligible participan
Not done	weekly IVR calls with automated	Patients with diabetes and/or hypertens	Primary care	N/A	62.5% of patients above 60	M & F	72	27 (standard mhealth)+ 45(mhealth + CP)
N/A	IVR chronic disease	heart failure, depressio	Primary care		60.9	M & F	1173	N/A
Not done	chronic disease self-managem	Heart failure	Primary care		67.9	M & F	369	Standard mHealth (n=180) mHealth+
Not mentioned	smartphone based health coacing	Type 2 diabetes	Primary	N/A	Male=63.5 Female=55.8	M & F, F=9	11	N/A
N	Cell phone based diabetes managem	Patients with Diabetes	Primary	No	Intervention Age 55-64 n=5, Control	Males Intervention n=4, Control n=5	26	13

Not mentioned	Text messagin g program	Coronary heart disease	Primary	N/A	58	M & F; 83% male	710	I: n=352 C: n=358
0.8	monitorin g - a calorie	Weight Loss	Research centre	N/A	51.1 years	M & F	80	26) 2) TECH (n 5 27)
NA	Prevent' Internet based personaliz	Healthy adults Mean age 43.6	Individual	No	43.6	Males n (%)=38 (17.3)	220	Starters (4+ lesssons) = 187,
N/A	Based Strength-Balance Training	Elderly	ts were recruited by convenien		75	M & F	44	3 groups
NA	proof of concept of a	Oral cancer patients	Communi ty care centre	NA	58.5	Females-60%	80	40
Not mentioned	SMS and telephoni	Obese	Primary	N/A	57.7 years	M & F	69 adults	35
Not mentioned	Self-monitorin g and self-	hypertens ive or pre-hypertens	Elderly communit y		59.2	M & F	19	19
No	Self-monitorin g	None specificall y	Research centre		55.3	M & F	21	The Lifestyle group
Yes	ty Healthcar e Workers were	high cardio-vascular risk	Communi ty based study	To improve cardiac health status	59.7	Interventi on-65.4%, Control-66.8%	2086	Interventi on-1095, Control-991
NA	Scope telemedic ine app.	ts undergoin g	Tertiary	NA	60.5	Females-58%	50	NA
No	basedpod cast (TBP) 2) the	Weight Loss	Not mentione d		42.75	M & F	174	41 participan ts were randomiz
Based on a power of 80%, an	monitorin g and feedback tool	chronic obstructiv e pulmonar	Primary care	monitorin g and feedback tool	57.8	M & F	199 patients	Group 1 (n=65), Tool & SSP
Y	Mobile phone for self-managem	Diabetes	Primary	Part of the wider TEXT4DS M study	58	Females Interventi on- 71%	781	Interventi on-401, Control-380
Not done	Diabetes Self-Managem ent	N/A	N/A	N/A	DRC=62; Cambodia = 55; Philippine	M & F	1470	TEXT4DS M group=50 5

NA	Pre and post interventi on study	Diabetes or COPD	General Practice-Primary	NA	60	Females-45%	20	20
Not done	Promotin g Activity through Clinical Education	Alzheimer s	Primary	N/A	Cognitivel y impared group= 72.3;	M & F	30	2 cohorts; group with cognitive
yes	coaching with or without mobile	Diabetics with HbA1c>7. 3%	Primary	NA	53.2	Females-72%	97	Interventi on-48 Control-49
Not mentioned	smartpho ne based health coach	Diabetes	Primary	N/A	55.6	M & F	21	N/A
Yes	program Philips DirectLife, which	adults aged 60-70 years	NA	NA	on-64.7 and Control-64.9	on-Female-39.5%, Control-	235	on-119 and Control-116
Pilot study	A tablet PC applicatio n	Patients who have undergon e surgery	Tertiary	NA	61	M & F 60% M	40	20

Access to or equity of intervention or services?	Demographic profile and location of study	Intervention description	Intervention duration	Intervention frequency	Intervention provided by	Co-interventions (if any)	Comparator groups (e.g. control/placebo/other	Primary outcome and changes observed
8 patients had their phone lines disconnec	Patients from cardiac outpatient clinics of a	Automated messages about medication, diet	3 months	Daily	Automated software	Routine care, which included arranged cardiac	Control group which received only routine	Significant change in 8-item Morisky Medication
patients with active	with Type 2 DM were	Dulce (PD) comprise	10 months	during 1st month	provided by physicians	N/A	control group received	level (significant
Clinic within walking distance of both communit	Adults (>21yrs) attending the outpatient chronic	Participants allocated to the interactive	12 months	Personalized SMS text messages were sent to	Participants allocated to the interactive	All SMS text messages were delivered automatic	All trial staff were masked to treatment	Odds ratios for participants with BP <140/90
Not completing baseline	Not mentioned	It is a self-paced intervention		Weekly for 8 weeks	N/A	N/A	National Cancer Institute's	Quit rates were 13%
	white (78.1%)	PDA	24 months	were held weekly for	PDA with Dietmate Pro© software	feedback	paper diary	e weight change from baseline
	White (84.62%)		12 weeks	1-4 daily	Lose It! app for dietary SM	none	none	Adherence and retention were
based interface relied on consumer access	USA, post-menopausal women	d Fitbit tracker and website use, with	16 weeks	Continuous	Web app and tracking band	based on Coventry, Aberdeen, and London—	Covential pedometer	increased moderate to vigorous
	69.5% African-American 8.5%		10 weeks	twice a day for 10 weeks	enabled smart phone (Samsung	none	paper and pencil condition	outcome of MADRS Total
ts who received transplantation at	USA- Uni. Pittsburgh Medical Centre	ne with custom Pocket PATH	12 months	2, 6 and 12 months	Univ.Pittsburgh Medical Centre	NA	Usual care group	monitoring percentages-

NA	Francisco and Berkley California. 48%	in person Diabetes Prevention program.	5 months	daily	trained non medical research staff.	See intervention	r only without step goals and standard	weight loss compared to 0.3kg gain in
Participants had to be beneficiar	Participants were recruited from a	Subgroups 1a and 1b - standardis	4 weeks	Weekly	Nurse via phone, SMS and e-mail	None	Subgroups 1b, 2b and 3b received	Pneumoccal vaccination rates
those who were able to	USA	AVR every other week	6 MONTHS	fortnightly	Healthy Directions 2 RCT staff	a part of an ongoing trial		one third chose SMS compared
Study included only	Israel-High Income	Question based behaviour	6 Months	Single message sent at	Staff of the National	NA	Standard care	Fecal Occult Blood
Nil	en, Denmark. Higher education	videoconferences with health	8 months	Monthly	Health centre nurse	Nil	Usual care	HbA1 in intervention group by 0. 69%
	education (>3 yr) Responde		two years	three times a day	mobile app		control	nal Consultation on Incontine
Low eHealth literacy	No significant differences among the 3	A self-tailored cognitive-behavioral approach	The FitBack group also received weekly	The FitBack intervention is designed to		No	No significant differences in sociodem	FitBack group showed greater improvement
criteria was based on the	Polan	operability and whole trial	6 Weeks		NA	NA	Standard care	operability and whole trial
	BMI was higher in the diabetes group, but BMI	a structured mobile phone-based health	12 months	Health coaches called patients every 4 to 6			Stratified randomization design: Heart disease	Only significant difference in waist circumfer
No	hospital in South	phone questionn	NA	NA	administered	No	questionnaire	ce of scores
None	Puducherry state of India	Eligible outpatients either received	11 days	everyday for 3 working days	PHC doctors/investigators	None	Standard care	85.7% of outpatients in interventi
	No significant differences in biochemic	Specially designed glucometer and activity monitor	6 ,pnyhs				The same physical activity device without	In the u-healthcare group, significant improvem

African Americans, Aged	Baltimore, USA-High	Participants received	12 months	Weekly goals with	TRIMM study staff	Engagement with the text	An initial clinical assessme	Weight in the TRIMM
	New Zealand				Mobile phone		Usual cardiac rehab care	reported activity, general health
	n Biomedical Research Center, Baton	provides the ability to deliver intensive behaviora	12 weeks	Weekly	SmartLoss study staff	NA	ts in the Health Education control group (n=20)	SmartLoss group experienced significantly greater
	Level of education Secondary school		not specified	not specified	Apple iPad		no control	subjective adherence w/o
patients .i.e people with no or little	antly female (65%) and Latino(65	automated text messaging for appointm	9 months	N/A	d using patient relationship managem	N/A	N/A	responserate to text messageprompts
Yes. Cross cultural issues	Unscreened AN/AIs in a tribal	3 text messages sent 1 month						Screening status was ascertaine
29.2% indigenous	predominantly female (62%) and	weekly IVR calls including self-managem	4 months	weekly	Calls originated from the IVR platform	None	weekly IVR calls together with a care	patients' IVR call engagement and call
N/A	77% white and 70%	weekly IVR calls including	The median number	weekly	IVR systems were	None	Involvement of Informal	completion rates,
N/A	99% male and 77% white	IVR calls including self-managem	12 months	weekly	systems were programmed to	None		er reported measures
N/A	Patients with type 2 diabetes	smartphone based self-monitorin	Not mentioned	2-4 contacts monthly and one	The smartphone software	N/A	Received health coahing without	individual's health behaviour,
No	Maryland USA	Cell phone based diabetes managem	3 months	Every 2 weeks for patients and 4 weeks for	Phone calls, Internet, Bluetooth		Control group-Usual care	Change in HbA1c

	patients with CHD from a tertiary	Messages contained behaviour	6 months	4 messages /week (messages	automated messages using	N/A	the control group received	cardiovascular risk
N/A	baseline, participants were	Monitoring Technolog	6 months	phone based group	phone-based interventi	None	monitoring vs Fitbit vs	ng differences in
Participants recruited by a non-	220 participants from across	Internet based lifestyle interventi	24 months	6, 12 and 24 month assessment	Internet based DPP		Groups compared by those had 4+	Mean reduction in weight (lbs) and
Elderly	ts were 75 years (SD 6), predomin	information technology (IT)-	12 weeks	Once (daily-life)	Self monitoring	None	were composed of (1) an individual	Adherence and Attrition
Patients were eligible if	Michigan USA	The intervention group	10 Weeks	daily texts for adherenc	Study staff	None	Standard care	Fewer symptoms were
N/A	overweight and	Personal digital	12 moths	daily (1-2 weeks),	dieticians,	N/A	Standard care	weight loss at 6
Elderly	Participants' ages ranged	The intervention	4 weeks (excluding 2 weeks	1	Self monitoring	None	N/A	change in self-reflective
Not mentioned	11 men and 10 women—	The intervention design	3-months	Once (daily-life)	Seflf monitoring	None	The Lifestyle group	change in physical activity
of participating villages in China	China and India	key elements of the intervention were	Daily	1 Year	Community health workers	NA	care with free medications only in India	reported antihypertensive medication
setting has a dispropor	California, USA	ne was used to estimate	8 Months	Monthly	Ophthalmologist	None	NA	mean distance spectacle-
Not mentioned	middle-aged white female	study, the Pounds Off	3-months and 6-months	Once (daily-life)	Self management	None	41 participants were randomiz	body weight assessment
	Above 55 mostly and above	The complete It's LiFe! interventi	6 months	four individual consultations with	Practice nurse	None	Control group - care as usual	The primary outcome measure
Diabetic population	DR Congo, Philippines,	Patients in the intervention group	24 Months	the average number of SMS	Open source software and web-	NA	Standard care with mobile phones	After 2 years, an HbA1c < 7.0% (53
N/A	Participants were from the Democrat	SMS contained informati		several tmes a week	a nurse in DRC, a peer	N/A		

with complex co-existing medical	Netherlands	were provided with the accelero meter	12 weeks	patients visited the practice three	Nurse	None	No	patients (12 out of 17) were positive
N/A	participants with cognitive impairment	Participants were provided with the the	8 weeks	bi-weekly	Each participant was assigned one	N/A	Patients with normal cognition who	implementation, and safety regardless
ns served were from a lower-	health clinics in Toronto, Canada	intervention group was provided	6 MONTHS	Daily review of participant logs	Health coaches	None	care with HC support but	primary outcome was the difference
N/A	Participants were recruited from the	After completion of baseline	24 week	Daily	Health coach	N/A	N/A	glycosylated hemoglobin
age between 60 and 70 years,	Netherlands	in the intervention group received	3 Months	Daily review of participant logs	based physical activity program	None	control group was placed on	baseline and 3-month follow-
	Taiwan	Twenty consecutive gastrecto	6 MONTHS	Weekly	Study staff		Standard care patients reviewed	Change in % of body weight

Secondary outcome and changes observed	Negative outcomes or harmful effects	Individual level	Method to identify target population	Inclusion criteria	Exclusion criteria	Participation rate	Representativeness	Individual level
No significant change in Readiness to Quit	None	Equal number of participants in the 3 groups	Participants were recruited from cardiac outpatient was done via traditiona	Outpatient with CVDs (either hypertension or	Other co-morbidities such as Diabetes Mellitus	88.88%	At baseline, 63.8% participants had hypertens	Patients' medication adherence, adherenc
cholesterol, low-density	None	patients had never	participants were identified	years of age, diagnosis	medical/psychiatric condition	87%	ts were all from the same	HbA1c levels in PD and
Primary outcome data were available for 1256	Analyses were intention to treat. There was no							
N/A	N/A	In total 196 participants	through employer or facebook	(1) be age 18 or older, (2) smokeat	Not mentioned	85%	Not mentioned	Participants' receptivity on
adherence to self-monitoring of diet			intervention took place at the	s were eligible if they were	y, conditions requiring	51.47% (210/408)	white (78.1%)	
Secondary outcomes included			Participantswere recruited fromthe	Individuals were eligible if they	Exclusion criteria included pregnanc	66.1% (39/59)	White (84.62%)	
levels of tracker use (95% of days) and								
y outcomes of YMRS and IIS			ts diagnosed with either	18 and older, 2) outpatients and	criteria for any substance use	PRISM Condition, mean complianc	69.5% African-American 8.5%	
care perception and 2. Rehospita	None	Individual level	transplant recipients of UPMC	than 18 years, underwent	received a previous transplant	75%	those who underwent a	level self-reporting characteristics

steps by 2551 compared to decrease	Nil reported	orginally assessed. 54 did not complete	care clinics and posting studyflyer	age>35 years; risk for diabetes (diabetes	reported diagnosis of diabetes or other	60%	Higher income and more females	Weight loss, increased teps.
N/A	None	Participants were either smokers	Electronic medical records of	Unvaccinated active patients	Lack of access to at least one of	100%	All participants were from the	Patients who received reminders
None	None	Yes	ts who received reminders for the	speaking, part of the HD2 trial, not		Cluster RCT	ts were a part of the HD2 trial	Individual level
None	None	No Population level	Nation wide survey,	women and men aged 50	Non-HMO members,	96%	Representive of the age	Population level
changes in BP, BP, Lipids, creatine,	Nil	agreed to participate out of 859	patients recruited from University	speaking inhabitants of the City of	criteria were terminal disease	19.20%	?	significant effect on H bA1c at 6m
Global Impression of Improvem			investigation of a clinical trial	not specified	not specified	100%	y education (>3 yr) Responde	
FitBack group showed greater improvement	How self-guided mobile-Web interventions will		Through 4 companies (trucking, manufact	(1) 18-65 years USA resident, (2) employed		Low attrition and low data loss		Yes
system modestly improved glycaemic	NA	Yes	ts diagnosed with DM2	18–65 years, diabetes type 2	allia, the need to rely on the	94%	use cell phone and the sensors,	Yes
Diabetes patients may be more likely than HD	41 patients withdrew due to unfamiliarity with		Randomly selected patients from the EHR system	Diabetes dx at least 3 months, HbA1c above				
Nil	Nil repoted	NA	attending clinic	attending clinic	who had a history	Unknown	Unknown	IPSS Score
Number of patientswhowere	NA	Yes	Outpatients coming to OPD	All outpatients (>30 years)	Known patient with diabetes	70% followed up for definitive	Yes participants who came to	Yes
Effective in decreasing hypoglycemic				Aged 60+, DM with HbA1c 7.0–10.5 %	Patients who were unable to use text messages	85%	Reflects the digital divide	Beneficial results seem to come from the increased

Engagement with the	No adverse events	Yes	Through a church	African American adults	self-reported substance	84 participants	Small sample of church	Individual level
analyis - costs of implementing and								
Satisfaction questionnaire showed	NA	Yes	Not Provided	ht and obese adults (BMI 25-35 kg/m2) age 18 to	dieting; 62 kg weight change in the past 60 days	95%	Small sample size	Individual
Objective adherence (medication			Cardiac patients were recruited via local	must be at least 60 yr with a minimum	previously owned a smart phone	100%	"Level of education Secondary school	
of responses correctly formatted by	None		Diabetes registry	18 2) English or Spanish as first	N/A	N/A	antly female (65%) and Latino(65	
Increased CRC screening for AN/AI			The authors randomized to the	1) AN/AI heritage documented in				
patients' likelihood of reporting excellent	None		Most participants were initially identified	with diabetes and/or hypertension	Refused consent, Unable to reach	around 30% (74/247) - JJ calculated	predominantly female (62%) and	
haracteristics associate	None		patients were initially	Englishspeaking patients	ineligible if they had	HF- 57% Depression -95%	77% white and 70%	
spent helping with self-care,	none		were initially identified from	eligible, patients had to have a HF	were excluded if they had	Approx 25%	99% male and 77% white	
	N/A	N/A		Patients with type 2 diabetes	Not mentioned	Not mentioned	N/A	Participants' ability (who using
								HbA1c values declined significantly among

user/participant engagement with	N/A	Almost equal number of		had to have significantly lower	Not mentioned	87%	N/A	Participants' willingness to use
adherence to self-monitorin			ts were recruited through	criteria included age	ts were excluded if they	27% (80/293)	baseline, participants were	
None	None							Program Starters Weight loss
Speed, effectiveness of the motivatio			ts were recruited by convenien	ts were older adults aged 65	illness, cognitive impairment,	N/A	ts were 75 years (SD 6), predomin	
57% (83 of 145) of eligible	NA	Individual level	two community cancer	Patients were eligible if	Those with cognitive	85%	Participants with cancer in	Individual
weight loss at 12	N/A		Participants	a body mass	Recent psychiatri	80%	N/A	
change in lifestyle modificati			From elderly communit	hypertensive or pre-hypertens	None	Not mentioned	Not mentioned	
None			Healthy adults (= 21)	Not mentioned	Not mentioned	67% (21/31)	Not mentioned	
was a significant net increase in the	None	Individual level	Household visit	s who were ≥40 years of age with a self-	CVD-related complications that cannot	87%	ts belonged to the village therefore	Individual
NA	NA	Individual level	s who visited the	patients with a	NA	100%	study-Sample size not	Individual
3-monthquestionnaires			Not mentioned	Not mentioned	Not mentioned	Not mentioned	middle-aged white female	
Secondary outcome measures			invited 250 family practices	between 40 and 70 years old with	presence of coexisting medical	36.8% (540 patients a general	Above 55 mostly and above	
In Kin-réseau, the percent	all participants showed a	Individual level	Patients visiting the participati	diabetes. Subjects were eligible	NA	54%	Representativeness is good for this	Individual level
	N/A							

activity significantly increased by	NA	individual level	Those who visit the GP clinic	over 40 years, five of whom had type 2	with complex co-existing medical	85%	study-Sample size not adequate for	Individual
	N/A		Participant of the cognitive impairement group	1) age 60–85; 2) cognitive impairment due to	individuals with normal cognition was also		N/A	Participants and their study partners
es between HbA1c mean	NA	individual level	Patients who visit the GP clinics	were eligible for participati	NA	75%	representative as only recruited	Individual level
	N/A		Recruitment was through health	patients over 18 years old, diagnosed	Participants were excluded if their	Not mentioned	N/A	
significant effect of the interventi	NA	Individual level	ment in newspapers and press	age between 60 and 70 years,	Not Available	91.20%	ative of the age group in Netherlan	Individual level
BMI, No of outpatient clinic		Yes	National Taiwan University Hospital	an age >20 years, gastric	experienced difficulties with		This is a pilot study with very	Individual level

Measures /results for at least 1 follow-up	Intent-to-treat analysis used (Y/N)	Impact on QOL (quality of life)	Percentage of attrition	Organisational level (setting and staff)	Description of intervention location	Staff who delivered intervention	Target delivery agent	Level of expertise of delivery agent
After 3 months	N	Not measured	11.11%	N/A since the intervention delivery was not	Intervention was delivered through a programmed	N/A	N/A	N/A
					intervention was delivered			
months and 10 months	Y	significant change post-	13%	and nurses from the	education sessions took	prescribed and changed	N/A	completed 16-hour training
Only 1 follow up after 2 months	N/A	Not measured	16%	N/A since the intervention	Intervention was delivered through a	N/A for this study.	N/A for this study.	N/A for this study.
(SD) absolute weight change	Y	NA	14.29		intervention took place at the	not mentioned	not mentioned	not mentioned
At 12 weeks, the outcome	Y		25.64% (10/39)		SM data were downloaded hourly	research staff	not mentioned	not mentioned
table 2 of manuscript??	Y	not mentioned	(104 randomized, 82 analyzed,		not specified	therapist was a master's trained	not mentiones	master's trained family therapist
monitoring, adherence to the	Y	Assessed including re-hospitaliz	None	Tertiary care hospital and		NA	NA	NA

steps, diet, hip circumference, BP, Lipids,	Y	NA	adherence to mobile activity diary	NA	NA	Research staff	NA	NA
After 4 weeks	N	N/A	0	Process evaluation not done	Intervention delivered through	Nurses at the clinic made the phone	N/A	N/A
chosen SMS. Participants	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Occult Blood	Y	NA	4%	Not reported	NA	NA	**NA**	NA
NA	Y	SF36 no change	16% at 6 months	Not reported	Not reported	Not reported	Not	Not reported
SF - mean decrease 3.1 (95CI 2.0 - 4.2)	N	LUTSqol score Responders 34.2	24.6% (15/61)		not mentioned	not mentioned	not mentioned	not mentioned
Measures at O, 2 and 4 months	Yes	Significant improvement	Fitback 8%; other groups 2.5%					
telehealth system dimensions	NA	Minor improvements were	4%	NA	NA	NA	NA	NA
Reliability of scores	No	NA	0.40%	NA	NA	NA	NA	NA
85.7% of outpatients in interventi	Yes	NA	31.30%	NA	NA	NA	NA	NA
Yes	No	No	15%					

Weight in the standard-	Yes	NA	20%	NA	NA	NA	NA	NA
SmartLoss group experienced significantly greater	Yes	Yes	5%	NA	NA	NA	NA	NA
"subjective adherence w/o	N	N	0		not mentioned	not mentioned	not mentioned	not mentioned
sent over 6500 response messages with	N	N/A	N/A		home based	N/A	N/A	N/A
Participants were followed up for a total of	No	No	N/A		home based	N/A	N/A	N/A
83% completion	No	No	approx 5 % overall		home based	N/A	N/A	N/A
CP patients reported lower	N	None			home based	N/A	N/A	N/A
	Not mentioned		Not mentioned	N/A since the intervention	Intervention was delivered through a	N/A for this study.	N/A for this study.	N/A for this study.
	NA	Improvement in knowledge of food choices,	14%					

Not mentioned	N	N/A	Not mentioned	N/A since the intervention	Intervention was delivered through a	N/A for this study.	N/A for this study.	N/A for this study.
demonstrated a significant	No	N/A	8% (7/80)		home based	N/A	N/A	N/A
	N		30%					
e across training plans differed	No	N/A	control group showed 41%		home based	N/A	N/A	N/A
Of the 37 patients in the	NA	NA	15%	Individual level	Michigan USA	Study staff	NA	NA
at 3, 6, 9 and 12	N	N/A	Not mentione	N/A since the	Intervention was	N/A for this study.	N/A for this study.	N/A for this study.
The average score of	No	N/A	0%		home based	N/A	N/A	N/A
After the onset of the	No	N/A	9% (2/21)		home based	N/A	N/A	N/A
reported antihypertensive medication	Yes	NA	13%	Community level	India and China	Community Healthcare workers	medical students in Tibet University and	Trained community healthcare workers
mean distance spectacle-	NA	NA	NA	Individual level	USA	Ophthalmologist	the Santa Clara Valley	Tertiary education
participants in the TBP group	No	None	Not mentioned		home based	N/A	N/A	N/A
Directly after the intervention,	No	Physical Component Score and	12.66%		Family practice and home-	Practice nurse	Not mentioned	For mastering the execution
After 2 years, an HbA1c < 7.0% (53	Yes	Assessed. The intervention did	46%	Individual level	The studies took place	community-based peer educator	Staff of the respective centres	NA
			11.9% in DRC, 14.5% in Cambodia					

patients (12 out of 17) were positive	NA	NA	15%	Individual level	General Practices in the Netherlands	Nursing staff	NA	NA
at 8 weeks	N	significant positive changes in physical	Not mentioned	N/A since the intervention delivery	Intervention was delivered through a program	N/A for this study.	N/A for this study.	N/A for this study.
primary outcome was the difference	Yes	NA	25%	Individual level	Primary care clinics	Healthcoach	degrees in kinesiology and	degrees in kinesiology and
24 week	N		Not mentioned	N/A since the intervention	Intervention was delivered through a	N/A for this study.	N/A for this study.	N/A for this study.
baseline and 3-month follow-	Y	nA	9%	Individual level	NA	Web based	NA	NA
Significant results - App group	No	NA	NA	Organisational level- Medical staff	Tertiary care facility in Taiwan	Medical Staff employed in the	NA	Qualified medical professionals

Inclusion/ exclusion criteria of delivery agent or	Adoption rate of delivery agent or setting	Organisational level	Fidelity of the intervention (%)	Measures of cost of implementation	Individual and organisation level	Assessed outcome ≥ 6 months post interventi	Indicators of program level maintenance	Measures of cost of maintenance
N/A	Process evaluation of the intervention was not done.	The intervention was delivered as intended.	100	Not mentioned	Process evaluation not done.	Only 3-month follow-up	No information provided.	Not provided
		The intervention was		Not mentioned				$314,264 over 2 years
N/A	N/A	The intervention was	100%	reported in the future	evaluation done, not yet	At 10 months	Not provided.	Not provided
								Although not reported here, the authors believe
N/A for this study.	N/A for this study.	The intervention was delivered	100%	Not mentioned	Process evaluation not done.	Only 1 follow-up after 2 months	No information provided.	Not provided
not mentioned	not mentioned		not mentioned	were compensated $50 per		not mentioned	not mentioned	not mentioned
not mentioned	not mentioned		not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
not mentioned	not metnioned		not mentioned	ts were compensated $25 for each		intervention feedback was done	not mentioned	not mentioned
NA	NA	NA	NA	NA	Individual	and Secondary outcomes		

NA	NA	NA	No repoted	Not reported	Not reported	5 months	NA	NA
N/A	N/A	Intervention was delivered as	100	No cost to clinic; USD16 out-of-	N/A	Only 4 month follow-up	N/A	N/A
NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	Yes	96%	NA	NA	NA	NA	NA
Not reported	Not reported	Not reported	Not reported	Nil	Not reported	Not reported	Not reported	Not reported
not mentioned	not mentioned		not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	Not reported	Not reported	NA	No	Nil	NIl
NA	NA	No	NA	NA	NA	NA	NA	NA
						No		

NA	NA	NA	NA	NA	Individual	NA	NA	NA
				Cost-effective				
NA	NA	NA	NA	NA	NA	NA	NA	NA
not mentioned	not mentioned		not mentioned	not mentioned		not mentioned	not mentioned	not mentioned
N/A	N/A		No	No		focus group with small patients	No	No
N/A	N/A		No	No		No	No	No
N/A	N/A		No	No		No		No
N/A	N/A		No	No		No		No
N/A for this study.	N/A for this study.	The intervention was delivered		Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A

N/A for this study.	N/A for this study.	The intervention was delivered	96%	Not mentioned	Process evaluation not done.	N/A	No information provided.	N/A
N/A	N/A		No	No		No	No	No
N/A	N/A		No	No		N/A	N/A	N/A
NA	NA	Individual level	All proposed interventi	Not performed	Individual	NA	NA	NA
N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A		N/A	N/A		No	No	No
N/A	N/A		N/A	N/A		No	No	No
NA	NA	Community-Individual level	proposed interventions were implemented	Not performed	Individual	NA	NA	NA
NA	NA	Individual level	proposed interventions were	Not performed	Individual	NA	NA	NA
N/A	N/A		N/A	N/A		No	No	No
Not mentioned	Not mentioned		Not mentioned	Not mentioned		Not mentioned	Not mentioned	Not mentioned
NA	NA	Individual level	All proposed interventions were	Not performed	Individual		NA	NA

NA	NA	Individual level	proposed interventions were implemented	Not performed	Individual	NA	NA	NA
N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NA	NA	Individual level	proposed interventions were implemen	Not performed	Individual	NA	NA	NA
N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NA	NA	Individual level	NA	Not performed	Individual	NA	NA	NA
		Yes	All proposed interventions were	Not performed	NA	NA	NA	NA

Q1 *mHealth use* (Y/N)	Q2 *Effective implementation* (Y/N)	Q3 *Lessons learnt* (Y/N)	Q4 *Good evidence?* (Y/N)	Limitations and challenges	Lessons learnt	Comments		
Y	Y	Y	Y	Daily text messages were found to be boring and	SMS reminders improve medication adherence	A process evaluation of the intervention is needed to inform		
			Y L3		nt of mobile RCTs are			
Y	Y	Y	Y L2	patient data could not be	y-based, peer education	integrated care programs		
N	Y	Y	Y	An interactive intervention does not increase a				
N	Y	Y	Y L3	The small size was very small that	The application smart quit 2.0	To make a significant comparable inference,		
Y	N	Y	Y L3					
Y	N	Y	Y L4			shoulld we exclude? Since this was a		
Y	N	N	Y	recruitement mechanisms are unlcear		integrated into a clinical setting, hard to place		
Y	Y	Y	Y L4	not a definitive trial and was not	d mobile-phone intervention is			
Y	Y	Y	Y L4	located from one transplant centre,		research in using this technology in regular		

Y	Y	Y	Y L3	over 5 months. Relatively high incomes	look at longer term maintenance	Good study but short duration.		
Y	Y	Y	Y L3	Shortage of vaccine availability following	SMS and email reminders are			
Y	Y	Y	Y	criteria as English only, majority	preferred mode, but SMS preferred	findings cannot be generalized as it is a part		
Y	Y	Y	Y	Lean mode of the	Interrogative plus social	Authors investigated whether a		
Y	Y	Y	Y	patiens were vulnerable. 16%	adherence in group with poor glycaemic	Good study. Short duration follow up.		
Y	Y	Y	Y	numbers, no control at 2 year follow-up,	important clinical data are improvem			
Y	N	Y	Y	USA trucking industry only				
Y	Y	Y	Y	criteria of ability to use the sensors,	definition for end users, assessmen	pilot study which needs to be validated in		
Y	Y	Y	Y	The low inclusion criteria in terms HbA1c for diabetic	Real-time social support may help people to stay	HAWthorne effect for positive changes in both study groups		
Y	N	N	Y	selection bias, self	No	No		
Y	Y	Y	Y	Short follow-up period of three	Mobile reminders can work at a	first randomized trial in a real-world		
Y	N	Y	Y	6-month follow-up period might not be long enough to	85% particiapti on rate indicatse older patients			

Y	**Y**	**Y**	**Y**	duration of the interventio	tailored text messaging	Tailored text messages		
Y	N	Y	Y	n may not have had enough increasing	differences in physical activity,	Cost-benefit analysis was limited in this case		
Y	**Y**	**Y**	**Y**	only 12 weeks, sample size small, no formal evaluation	promoted clinically meaningful weight loss over 12 weeks	sample and short duration study, but provides an insight into		
Y	**Y**	**Y**	**Y**	medicatio n intake needed to be confirmed	The interventions improved all the			
Y	**Y**	**Y**	**Y**	more patients for longer period would	Possible to integrate home based			
Yes	**Yes**	**Yes**	**Yes**	Lack detailed individual-level data	Use of focus groups to collaborati	Study sample derived from a clinic-	cultural tailoring is needed for text	The findings of the current
Y	**Y**	**Y**	**Y**	1) reliance on self-reported outcomes could	1) providing feedback to an informal			
Yes	**Yes**	**Yes**	**Yes**	1) limited the multivariat	1) Despite the favorable	HF randomized results are		
Yes	**Yes**	**Yes**	**Yes**	study was conducted among VA patients	interventio n increased CarePartn			
N	**Y**	**Y**	**Y**		smartphon e-based behavior monitorin			
Partially Yes	**Y**	**Y**	**Y**	Pilot study with its own limitations	WellDoc System is an effective tool for	Very small sample size		

Y	**Y**	**Y**	**Y**	the sample was recruited	patients with CHD were engaged			
Yes	**No**	**Yes**	**Yes**	size was limited 2)	demonstrate that newer			
Partially Yes	**Y**	**Y**	**Y**	Non Randomized uncontroll	Digital therapeutics can produce a	Further investigation at a scale is needed		
Yes	**No**	**Yes**	**Yes**	sample size. 2) different recruitmen	motivation strategies seemed to be			
Y	Y	Y	Y	Measuring adherence by self-	Text interventions are	Use of cell phones is increasing		
Y	**Y**	**Y**	**Y**	recruited sample	The addition			
Yes	**Yes**	**Yes**	**Yes**	1) The sample size was	1) Patients who			
Yes	**No**	**Yes**	**Yes**	1) small number of participant	1) including gaming			
Y	Y	Y	Y	not be generalizable to healthcare settings	cardiovascular management program's	simplified cardiovascular management model		
Y	Y	Y	Y	sample size and clinic	utility of smartphone based	studies are needed to assess the		
Yes	**No**	**Yes**	**Yes**	study was conductedin mostly white	s alsoentered the study with			
Yes	**Yes**	**Yes**	**Yes**	the mean baseline physical activity	Ideally, a 12-month follow-up is			
Y	Y	Y	Y	High rates of Loss to Follow-Up	study did not show a benefit of adding			
N	**Y**	**N**	**Y**	Limitations was related to study				

Y	Y	Y	Y	Small sample size and a pilot study	intervention stimulated patients to	intervention tool appears to be a feasible in primary		
N	**Y**	**N**	**Y**	1) it was designed as a feasibility	mHealth technologies such as internetconnected			
Y	Y	Y	Y	Reliability on HbA1c	significant between-group difference	coaching in primary care can improve the		
Y	**Y**	**Y**	**Y**	small sample size, short duration,	electronically assisted health	a study design of RCT with a representati		
Y	Y	Y	Y	bias could have been introduced in the	potential of using Web-assisted	is a high income country with high		
Y	**Y**	**Y**	**Y**	App was not regulated by	Provides a feasible solution to the	This is a pilot study which needs to be		

Article no.	Co-reviewer	Title of article	Year of publication	Journal name	Study type (eg: RCT)	Study duration	No. groups /sites	Informed consent (Y/N)	Power calculated	Type of intervention	Disease group	Care setting (Prim, Sec, Tert)
3	Teng	Cross-sectional survey	2016	BMC Pyschiatry	Cross-sectional, online,	6 months	1	N	Not done	Daily supportive text messag	Depression and anxiety	Primary and secondary
4	Teng	Improve	2015	Primary Care Diabete	Observational open	6 months	2 groups, 16	Y	Not reported	mHealth services	diabetes & hyperte	OPD
5	Mark	The effect of	2017	International Journal	Randomised control	Not mentioned	3	Y	0.8	Routine care + text	CVD	Primary
6	Padma	ng obstruc	2014	of Biomedi	nary finding	mentioned	2	mentioned	Not done	hone-based	ive sleep	Primary
7	Padma	Feasibility and Preliminary Outcom	2016	Journal of Medical Systems	Feasibility and preliminary outco	6 months	1	Y	0.8	interactive mobile phone app for	Hypertension +/ dyslipidemia +/ heart	Primary and secondary
8	Teng	Conducting a fully mobile	2016	BMJ Innovations	Randomised clinical trial		3	Y				
9	Teng	ent blood pressur	2015	of the American	mised controlled 3-	15 days	3	Y	Not done	only group, ii) EMR	HTN	Primary care
9	Teng	Outpatient blood	2015	Journal of the Americ	Randomised contro	15 days	3	Y	Not done	i) EMR-only group,	HTN	Primary care
11	Padma	wireless Tijuana	2016	es Technology &	label randomised	30 months	3	Y	0.975	Dulce - an integra	T2DM	Primary care
15	Padma	Smartphone application	2015	Rheumatology Interna	Patient perceptions	5 Months	1	Consent	NA	Descriptive Cross section	Rheumatoid Arthritis	Tertiary
16	Mahfuz	The Effect of a Mobile	2014	The Journal for Nurse	Randomised controlled		3	N	Not mentioned	mHealth decision	N/A	N/A
20	Teng	Phone Text Messages to	2016	Circulation	atic, single-blind, 3-arm rando	12 months	3	Y	Y		Hypertension	Primary care
24	Mahfuz	mized, controlled pilot	2014	and Alcohol Depen	mised controlled pilot	2 months	2	Y	0.8	EG: Smartphone deliver	N/A	Primary

25	Padma	pment and usability	2015	Education and Counse	ility and usability of	9 days	1	N/A	NA	One hour interview	professionals dealing with	Tertiary
35	Mahfuz	Improvement in	2016	Journal of Allergy	Usability and	4 months	1	Y	Not mentioned	A smartphone	Asthma	Primary
39	Teng	Postoperative monitoring	2016	European Spine Journal	Feasibility of a mHealth app	15 days	1	Y	N	Mobile app for postoperative	Spine	Secondary
41	Jitendra	nting psychoeducation	2015	of Affective Disord	mised controlled trial	6 months	2	Y	N	alized Real-TimeIntervent	Bipolar disorder	Primary care
42	Padma	Randomized Controlled	2016	an Journal of Transpl	mised controlled trial				Yes	ntion group-Pocket PATH-	of Lung Transplant recipien	Tertiary
45	Ben	T: An international	2015	ehabilitation and	ational randomised	, dependent on	2	Y		Single blinded RCT	Stroke rehabilitation	Tertiary
49	Mark	Novel Diabetes Prevention	2015	an Journal of Preventive	Randomised controlled trial	4 months	1	Y	Y	Diabetes prevention session	Nil	Community
54	Padma	The impact of tailore	2016	Research in Social and	Pilot randomised contro	90 days	2	Y	N	Daily text messages for	Diabetics with HbA1c> 8%	Tertiary
55	Jitendra	The effect of various	2015	Vaccine	Randomised controlled	4 months	6	N	0.8	Different types of	DM/CHF/Asthma/COPD/CAD	Primary care
60	Teng	Motivating Function of	2016	of Diabetes Resear	sectional survey of	NA	1	Y	N	NA	NA	NA
61	Padma	nic reminders for cancer	2012	Preventive Medicine	r randomised contro	6 months	2	Y	Incomplete	or automated voice	Healthy adults	Primary care
62	Mark	Health Technology	2017	American Journal of	randomised controlled	4 months	2	Y	Y	App providing medica	Atrial Fibrillation	Tertiary hospital

63	Padma	Harnessing the	2016	American Journal	Assessment of	6 months	5	Y	Yes	Comparison among	Healthy adults	Primary care
64	Teng	Supporting the	2016	Journal of Human	Qualitative evalua	8 weeks	N/A	Y	N/A	mobile app on HT	HTN	Primary care
65	Mark	consultations as add-on to	2017	an Journal of Endocr	mised controlled trial	8 months	3	Y	Y	consultations as add on to	T2DM	ient clinic of 3 Tertiar
71	Jitendra	management of stress	2017	Obstetricia et Gynecologica	year follow-up of a	24 months	2	Y	Not done	Tät® mobile app	Urinary incontinence	
77	Padma	Diabetes Patients	2016	of Medical System	mised controlled trial	6 Weeks	2	Y	Y	ODITY12 system	cs Type 2 diagnosed >6	Primary
78	Teng	onitoring and mobile phone-	2015	of Medical Internet	Randomised controlled trial	12 months	3 for each disease	Y	0.8	Mobile phone with a PHR app	DM and HTN	Primary
81	Padma	Effect of mobile	2015	Preventive Medicine	Randomised controlled	11 days	2	Y	Yes	Eligible outpatients	Healthy adults	Primary care
82	Padma	pment and evaluation of	2015	Acto Oto-Laryngologica	opment and evalua	Five Months	Single group	Yes	NA	center prospective non-	attending otolary	Tertiary
83	Teng	World Use and Self-Report	2017	es Technology & Therapeutics	sectional online survey	3 months	1	N/A	N	NA	DM	Online community
90	Padma	Tailored, Interac	2015	The American	Randomised contro	12 months	2	Y	Yes	Participants were	BMI>27	NA
91	Mark	phone-based	2015	tional Journal of	testing and evalua	18 months	8	Y	Y	risk prescription,	Healthy workers	Workplace
96	Padma	y of SmartLossSM, a smartphone-	2015	Obesity	g of a smartphone-based weigh	12 Weeks	2	Y	NA	oss participants were prescribed a	Overweight/ obese people	Tertiary

98	Mark	Feasibility of a lifestyle	2015	Gynecologic Oncology	Feasibility of a lifestyl	1 month	1	Y	N	Mobile APP for logging	Overweight or obese patients	Hospital
100	Padma	and evaluation of theory-inform	2014	tional Behavioral Medicine	and evaluation of a mobil	10 days	2	NA	NA	implementation and evaluat	adults with fall risk and low	NA
103	Jitendra	A mobile application	2016	Medicine	Crossover usability trial		1	Y	Not done	Medication Plan via Apple	Coronary heart disease	Cardiac rehab sports groups
104	Teng	A spanish pillbox	2014	Journal of Medical	Randomised controlled	3 months	2	Y	No	Personalization of prescri		72 of 99 pats (73%)
108	Jitendra	mobile health infrastructure	2014	Health care	ility of integrating mHeal	9 months	participants were recruited	Y	N/A	ated,bidirectionaltextmessaging	Diabetes	Primary care
110	Teng	Text message remind	2017	Cancer	Randomised controlled						Cancer	Primary
115	Teng	Developing a behavi	2013	Patient Educati	Qualitative evalua		N/A	Y	N/A	Text message	DM	Primary care
120	Mahfuz	Increasing physical activity	2016	Topics in Stroke Rehabilitation	Evaluation of potential	6 weeks	2		0.84	a smartphone based app	Stroke survivors	Primary
122	Mahfuz	of a Smartphone Applica	2014	Patient Care and STDs	Randomised clinical trial		2				HIV infection	Primary
127	Jitendra	Structured Caregiver Feedba	2016	Telemedicine and eHealth	Randomised controlled trial	4 months	4	Y	Not done	weekly IVR calls with autom	Patients with diabetes and/or	Primary care
129	Jitendra	Engagement with	2013	Medical Care	Patient experi	23 months	N/A	Y	N/A	IVR chronic disease	heart failure, depress	Primary care

130	Jitendra	Randomized Trial of	2015	Medical Care	mised comparative	12 Months	2	Y	Not done	chronic disease self-manag	Heart failure	Primary care
131	Mahfuz	mobile health intervention suppor	2015	of Medical Internet Resear	mised comparative effectivenes		2	Y	0.8	mHealth support for caregivers of	Heart disease (Heart failure)	
134	Mahfuz	pant experiences in a	2016	of Telemedicine and	ative evaluation of a	6 months	2	Y	Not mentioned	smartphone based health	Type 2 diabetes	Primary
136	Padma	WellDoc™ mobile diabet	2008	Diabetes Technology & Therap	Randomised controlled trial	3 months	2	Y	N	Cell phone based diabetes	Patients with Diabetes	Primary
137	Mahfuz	Factors influencing	2016	PLOS ONE	Parallel design,	6 months	2	Y	Not mentioned	Text messaging progra	Coronary heart disease	Primary
138	Mahfuz	study of a smartphone-	2017	tional Journal of Medica	testing and evaluation	4 weeks	1	Y	Not mentioned	smart phone based interve	N/A	N/A
141	Padma	veness of an mHealt	2016	Diabetes Endocr	mised controlled	12 months	2	Y	Y	Intervention	ertensives 120-139	Primary care
142	Mahfuz	nces of remote	2017	an Psychiatry	ative evaluation			Y	Not mentioned			
145	Padma	Long-term outcomes of	2015	Journal of Medical	Outcomes of a longit	Two years	One group but analys	Y	NA	Prevent' Internet	Healthy adults Mean age	Individual
149	Mahfuz	Qualitative Study Investi	2014	of the Association of Nurses	ative evaluation of a							
152	Padma	Feasibility of a Text	2015	Oncology Nursin	Randomised contro	10 Weeks	2	Y	NA	proof of concep	Oral cancer patients	Community care
153	Mahfuz	Integrating	2013	JAMA Interna	Randomised	12 months	2	N	Not mentio	SMS and	Obese	Primary
154	Jitendra	Design and evaluat	2016	Computers in Human	Exploratory longit	N/A	Tsinghua Elderly	Not mentioned	Not mentioned	Self-monitoring	hypertensive or pre-	Elderly community

157	Padma	cluster-randomized, control	2015	Circulation	r randomised controlled	27 months	2	Yes	Yes	unity Healthcare Workers	high cardio-vascular risk	Community based study
158	Padma	hone-based dilated	2016	Retina	ty of a smart	8 months	2	Yes	NA	Scope telemedicine	ants undergoing	Tertiary
164	Jitendra	It's LiFe! Mobile and	2015	Journal of Medical	Cluster randomised	Not mentioned	Twenty four family practic	Y	Based on a power of	monitoring and feedba	chronic obstructive pulmon	Primary care
166	Padma	The effect of text messag	2017	Journal of Clinical &	Randomised controlled	2 years	3	Y	Y	Mobile phone for	Diabetes	Primary
167	Mahfuz	Process evaluation of	2017	Journal of Telemedicine	Process evaluation	12 months	3	Y	Not done	Diabetes Self-Management	N/A	N/A
169	Padma	study of a tool to stimulate	2014	of Telemedicine and Telecar	testing and evaluation of a	3 months	1	NA	NA	and post intervention study	Diabetes or COPD	l Practice-Primary
170	Mahfuz	ity of a Memory Clinic-Based	2016	of Alzheimer's Disease	Randomised crossover trial	16 weeks	2	Y	Not done	Promoting Activity throug	Alzheimers	Primary
173	Padma	coaching reduces	2015	of Medical Interne	tion of a health	6 months	2	Yes	yes	coaching with or	Diabetics with HbA1c> 7.3%	Primary
174	Mahfuz	Smartphone-enabled	2014	Journal of Medical	Development and	24 weeks	1	Y	Not mentioned	smartphone based health	Diabetes	Primary
177	Padma	of a web-based interve	2013	of Medical Interne	mised, waitlist-	3 months	Two groups	Yes	Yes	t program Philips	adults aged 60-70 years	NA
179	Mahfuz	activity in a mobile	2016	Health &	randomised contro		2	Y	Not mentioned	An SMS-assiste	people with depress	secondary
180	Padma	Tablet PC-enabled	2015	Computer Methods and	Single-arm pilot study	6 weeks	2	Y	Pilot study	A tablet PC applica	Patients who have underg	Tertiary

Wider health promotion program? Specify	Mean Age	Sex	Total sample size	No. patients per group	Access or equity issues?	Demographic profile & location	Intervention description	Intervention duration	Intervention frequency	Intervention provided by	Co-interventions (if any)	Comparator groups (e.g. control/placebo/other
N/A	46-65 (31.3%) >65 (7%)	M & F 83% F	4111	N/A	None	Patients with depression and	Daily supportive text messag	180 days	Daily	Preprogrammed online	N/A	None
a)monitor pts' sx/self-	Mean age 66.7±9.	97% male	422 eligible, 301	108 in 3-mth, 193 in	equitable access	16 DVA outpatient	a)monitor pts' sx/self-	3 and 6 months	weekly: Each week	Ann Arbor VA	Guidance on self-mx	3 months versus
N/A	54.94	54.4% M	180	60	patients had	from cardiac	ted messag	3 months	Daily	ted softwar	care, which	group which
N/A	ages, not	93% M	15	8 and 7	participants	from a medical	ement of	One-off test	N/A	researchers	N/A	None
N/A	56	M & F 78.6% M	62	N/A	Only patients with Android or iOS	Patients were from two clinics,	Medplan is a medication manage	6 months	Daily	The messages and reminders	N/A	None
N/A	60	M & F	123	1st group, 33 in	None	were recruited from	patients were given a	15 days	Daily	reminder messag	N/A	only BP measurement
N/A	60	M & F	123	47 in 1st group,	None	Patients were recruit	All patients were	15 days	Daily	The reminder	N/A	EMR-only BP
N/A	51	M & F (67% F)	301	control group (CG),	patients with active	s with Type 2 DM	Dulce (PD) compri	10 months	during 1st month	was provided by	N/A	control group receive
NA	57	Females-91%	100	NA	Patients diagnosed	Porto, Portugal	Interviews	5 Months	NA	Study staff	NA	No
N/A		M & F; mostly female	363	Cohort 1=93; cohort 2=	N/A							
no			1372	information-only SMS text messag	The clinic is within walking	Adults (>21yrs) attending the outpati	Participants allocated to the interac	12 months	Personalized SMS text messag	Participants allocated to the interac	All SMS text messages were	All trial staff were masked to
N/A	41.5	M & F Male: 47% (smart	196	98	Not completing baselin	Not mentioned	It is a self-paced interve	Intervention duration	N/A	N/A	N/A	National Cancer Institut

wider group providing rehab.	20-50	females and one male	8	NA	health professionals with a	professionals working in a	logy based stigma reducti	9 days	daily	h tool for Lung cancer	NA	NA
N/A	50	M & F	60	N/A	N/A	Older adults with	The smartphone	4 months		automated	N/A	N/A
No	42 (23-77)	F/M = 18/42	60				The Mobile app recovery	We analyzed the alarms accordi	Overall satisfactionwas			
	47.5% (12.8)	58.5% Female	82	41		69.5% African-Americ		10 weeks	twice a day for 10 weeks	t-enabled smart	none	and pencil condition
Part of the University of	62	Males-55%	201	PATH-99, Usual care-	pants who received	Uni. Pittsburgh Medica	hone with custom	12 months	2, 6 and 12 months	ttsburgh Medical	NA	Usual care group
	62	40% female	125	augmented feedba		rehab centres in 11	red use of augme	depending on	rehab feedback	therapists, sensor		group received the
to reduced face to face program	55	33% M	61	30 Int 31 control	NA	Francisco and Berkley Califor	session in person progra	5 months	daily	trained non medical researc	See intervention	eter only without step goals
No	46	M & F	48	24	Diabetics with HbA1c	Subjects taking treatm	Tailored text messages	90 days	Daily	NA	None	Control group-Usual care
N/A	> 40	M & F	1380	230	Participants had to be	Participants were recruit	Subgroups 1a and 1b -	4 weeks	Weekly	Nurse via phone, SMS	None	Subgroups 1b, 2b and 3b
N/A	58.3	M & F 69% M	93	NA	None	disease duration c 11 years	NA	NA	NA	NA	NA	NA
	50.8	59.3% females	598	SMS= 167, AVR= 431	those who were able	USA	vs AVR every other week	6 MONTHS	fortnightly	Healthy Directions 2	was a part of an ongoin	
N/A	67	58% M	205	Intervention; 96 Usual	No	China	App which contained	3 months	Continuous	self administered	Nil	Usual care

Yes, part of the	60.44	51.1% females	50000	10000	Study included only	Israel-High Income	Question based	6 Months	Single message sent	Staff of the Nation	NA	Standard care
Yes, regular follow-	F 58yrs (46–72	Females (n = 23)	49/51 interviewed	51 patients		4 different	3 components:	daily self-reports		21st Century		
N/A	58	M & F 64% M	165	Interv 83 Control 82	Nil	hagen, Denmark. Higher	y videoconferences	8 months	Monthly	Health centre nurse	Nil	Usual care
NCT01848938	ders 44.2 yr (10.3)	F	123	group = 61 control = 62		sity education (>3 yr)		two years	three times a day	mobile app		control
NA	ntion-59.9, Control - 59.0	ntion-Females-43%,	60	30	on criteria was based	Polan	operability and	6 Weeks		NA	NA	Standard care
Health coaches and patients can see patients'	Heart patients was 69.1 (SD 9.1)	The majority of patients were men in	517	267 heart patients and 250 diabet		BMI was higher in the diabetes	a structured mobile phone	12 months	Health coaches called patients			Stratified randomization design:
Yes, Outpatients attendin	Intevention-46.5, Control	Intervention-Females-	268	Intervention= 233, Control	None	Puducherry state of	Eligible outpatients	11 days	everyday for 3 workin	PHC doctors/investigator	None	Standard care
No	43.9	Females-55%	110	NA	NA	Spain	pants underwent two	5 Months	NA	AudCaliOS device	NA	NA
NA	41 years	74.8% females	1268 members of CGM in the Cloud	1157 had diabetes in the household	For children, the most common	Non-Hispanic whites (92.1%),	Mobile applications were most	Because Nightscout enables 24 h				
NA	Intervention-Age	Intervention-Female	124	Intervention= 63,	African Americ	Baltimore, USA-	Participants receive	12 months	Weekly goals with	TRIMM study staff	Engagement with	An initial clinical
Nil	61	58% M	589	Interv and 147	NA	College educati	ual printed	12 months	d to CVD risk	Research team	Nil	medical report
NA	44.4	Females-82.5%	40	20		gton Biomedical Research Center,	oss provides the ability to deliver	12 weeks	Weekly	SmartLoss study staff	NA	pants in the Health Education control

N	58	F	50	NA	No	Akron NE Ohio, US,	Participants were then	4 weeks	Daily	Not reported	Nil	Nil
NA	evaluation-Mean-74.6 Follow	Initial evaluation-Females-45%	23	Initial evaluation-9, Follow-up- 14	NA	USA	theory-informed app was design	7-10 days	Daily	Study staff	NA	No
	73.8 yr (7.5)	M & F	24	24		Level of education		not specified	not specified	Apple iPad		no control
		45% female	99	48 controls, 51 experi	Control group received oral	Exp group: 22/51 (43%)						
chronic disease management in safetyne	40.6% in age group 50-59	M & F	135	135	net patients .i.e people with	minantly female (65%) and	automated text messaging for	9 months	N/A	ated using patient relatio	N/A	N/A
	40-45 yrs: Control	The HR estimates	2386 AN/AIs aged 40 to	Identified 808 eligible	Yes. Cross cultural issues	Unscreened AN/AIs in a	3 text messages sent 1					
	three-quarters	female (67%)	18 African-	56 patients		61% had comple						
N/A	56	M & F 12 women	23	I: n=15 C: n=8		a sample of stroke survivo	a smartphone based app	6 weeks	Daily	automated text messages	N/A	stroke survivors but didn't receive
N/A	46	M & F 26 men	28	I: n=17 C: n=11		Participants were recruit	an augmented version	3 months		automated software	N/A	individuals were provid
N/A	62.5% of patients above	M & F	72	27 (standard mhealth)+45(	29.2% indigenous	predominantly female (62%)	weekly IVR calls including self-	4 months	weekly	Calls originated from the	None	weekly IVR calls together
	60.9	M & F	1173	N/A	N/A	77% white and	weekly IVR calls	The median	weekly	IVR systems were	None	Involvement of

	67.9	M & F	369	groups - Standard	N/A	male and 77% white	IVR calls including self-	12 months	weekly	systems were programmed	None	
N/A	67.8 years	M & F	331	I: n=165, C: n=166	N/A	Patients were recruited from VA	The mHealth+CP intervention was	12 months	weekly; Up to nine call attempts per	automated software	N/A	received only mHealth intervention
N/A	Male=63.5 Female=55.8	M & F, F=9	11	N/A	N/A	Patients with type 2 diabet	smartphone based self-	Not mentioned	2-4 contacts monthl	The smartphone softwa	N/A	Received health coahin
No	Intervention Age 55-64 n=5,	Males Intervention n=4, Control	26	13	No	Maryland USA	Cell phone based diabetes	3 months	Every 2 weeks for patient	Phone calls, Internet, Blueto		Control group-Usual care
N/A	58	M & F; 83% male	710	I: n=352 C: n=358		patients with CHD from a	Messages contained	6 months	4 messages/week	automated messages	N/A	the control group receive
N/A	Participants age betwe	M & F	32	N/A	N/A			4 weeks (28 consec	one messages/day		N/A	N/A
N	43	Intervention 47%	637	ntion-316 Control	No	pants from three	y motivational	12 months	y calls and weekly	calls and SMS		group-Usual care
			21	N/A		Patients with bipolar	Under AMoSS study	Not mentioned	10 times daily	Automated softwa	N/A	N/A
No	43.6	Males n (%)=38 (17.3)	220	Starters (4+ lessons) =	Participants recruited by	220 participants from	Internet based lifestyl	24 months	6, 12 and 24 month assess	Internet based DPP		Groups compared by
	46	M & F 80% F	25	N/A	N/A	HIV-infected clients	intervention involved a	6 months	weekly sms	Automated software	N/A	N/A
NA	58.5	Females-60%	80	40	Patients were eligible	Michigan USA	The intervention	10 Weeks	daily texts for	Study staff	None	Standard care
N/A	57.7 years	M & F	69 adults	35	N/A	overweight	Personal	12 moths	daily (1-2	dieticians,	N/A	Standard
	59.2	M & F	19	19	Elderly	Participants' ages	The intervention	4 weeks (exclud	1	Self monitoring	None	N/A

To improve cardiac health status	59.7	s Intervention-65.4%, Control	2086	Intervention-1095, Control-991	nts of participating villages in	China and India	key elements of the interve	Daily	1 Year	Community health workers	NA	rd care with free medica
NA	60.5	Females-58%	50	NA	setting has a dispro	California, USA	hone was used	8 Months	Monthly	Ophthalmologist	None	NA
monitoring and feedback tool	57.8	M & F	199 patients	Group 1 (n=65), Tool &		Above 55 mostly and	The complete It's LiFe!	6 months	four individual consult	Practice nurse	None	Control group - care as
Part of the wider TEXT4DS	58	Females Intervention-	781	Intervention-401, Control	Diabetic population	DR Congo, Philippi	Patients in the interve	24 Months	the average numbe	Open source software and	NA	Standard care with
N/A	DRC=62; Cambodia =	M & F	1470	TEXT4DSM group=505	N/A	Participants were from	SMS contained inform		several tmes a week	a nurse in DRC, a	N/A	
NA	60	Females-45%	20	20	s with complex co-existing	Netherlands	s were provided with the	12 weeks	patients visited the practic	Nurse	None	No
N/A	Cognitively impared group=	M & F	30	2 cohorts; group with	N/A	participants with cognitive	Participants were provided	8 weeks	bi-weekly	Each participant was assigne	N/A	Patients with normal cogniti
NA	53.2	Females-72%	97	ntion-48 Control-49	tions served were from a	y health clinics in	intervention group was	6 MONTHS	review of participant	Health coaches	None	rd care with HC
N/A	55.6	M & F	21	N/A	N/A	Participants were recruit	After completion of baselin	24 week	Daily	Health coach	N/A	N/A
NA	ntion-64.7 and Control	ntion-Female-39.5%,	235	ntion-119 and Control	age betwe en 60 and 70	Netherlands	s in the intervention	3 Months	review of participant	based physical activity	None	control group was placed
N/A	43.38	M & F	41	I: n=21, C:n=20	N/A	individuals with	a manualizedgro	4 months	weekly	automated	N/A	didn't receive any
NA	61	M & F 60% M	40	20		Taiwan	Twenty consecutive	6 MONTHS	Weekly	Study staff		Standard care patient

Primary outcome & changes observed	2ndry outcome and changes observed	Negative outcomes or harm	Individual level	Method to identify target population	Inclusion criteria	Exclusion criteria	Participation rate	Representativeness	Individual level	Measures/results for >1 follow-up	Intent-to-treat analysis use (Y/N)
N/A	N/A	None	N/A	Through news, advertisements,	N/A	N/A	21.70%	Survey respondents were	N/A	N/A	N/A
Time associated with	As intervention		Good from qualitati	Through DVA OPD	ICD-9 diagnosis	cognitive impair	422 eligible, 301	VA population	Efficacious with	Weekly measurements	Yes with linear
change in 8-item	No significant change	None	Equal number of	Participants were	Outpatient with	Other co-morbidi	88.88%	At baseline, 63.8%	Patients' medicat	After 3 months	N
ypoapnoea index	N/A	None	subjects were	s were recruite	specified	specified	details about	with OSA	s' oxygen	N/A	N/A
Adherence to medication - no significant	Usability of and satisfaction with the	None	Patients were managed across	Participants were recruited from	Treatment for heart failure and/or	Not having a smartphone,	67.74%	Patients had HTN, dyslipidemia,	90.5% patients found the app design	After 3 months (control phase) and 6	N
				Recruitment was done							
measurement of BP twice a	None	None	patients were manage	were recruited from	one abnormal BP	Not mentioned	73.17%	were not evenly	of BP recordings	After 2 weeks	N/A
Self-measurement of	None	None	All patients were	Patients were recruit	At least one	Not mentioned	73.17%	Patients were not	Success of BP recordi	After 2 weeks	N/A
level (significant	cholesterol, low-density	None	patients had never	al participants	years of age, diagno	medical/psychiatric	87%	pants were all	ed HbA1c levels	months and 10	Y
Disease related, Treatment related,	NA	NA	Individual level	patients diagnosed	Patients diagnosed	Patients were exclud	100%	Participants with RA	Individual	Of the 98 patients that	NA
management of obesity					The minimum patient						
Primary outcome data were available for 1256	Primary outcome data were available for	Analyses were intention to treat									
Among the user of smart quit app,	N/A	N/A	In total 196 partici	through teir employer or	(1) be age 18 or older,	Not mentioned	85%	Not mentioned	Participants' receptivity on	Only 1 follow up after 2	N/A

game was found to be	system, Comprehension, acquisiti		Individual level		ted to Lung cancer throug	NA	100%	Health care professionals	was found to be believa	NA	NA
control over asthma		N/A					Not mentioned	N/A			N
(n = 8/60) were very satisfied,					All patients who had failed	patients who required urgent					
outcome of MADRS Total	secondary outcomes of			pants were out patient	aged 18 and older, 2)	criteria for any substa	PRISM Condition, mean	69.5% African-Americ		table 2 of manuscript??	Y
monitoring percentages-	care perception and 2.	None	Individual level	transplant recipients of	than 18 years, under	received a previous	75%	those who underwent a	ual level self-reporti	monitoring, adherence to	Y
daily walking time,	15-meter walk	significant differe		admitted patient	ed stroke rehab	al prior stroke	97%	representativeness	g time; 15	sifgnificant differe	No
weight loss comp;ared to 0.3kg	steps by 2551 compared to decrease	Nil reported	orginally assessed. 54 did	y care clinics and posting	25 (BMIZ23 for Asian-Pacific	reported diagnosis of diabet	60%	Good	Weight loss, increased teps.	, steps, diet, hip circum	Y
Change from baseline in	Changes in health beliefs	NA	Yes	Electronic database	Diabetics with HbA1c	Heart attack/ stroke/ CHF,	90%	Only diabetics with	Individual level	No significant differe	N
Pneumococcal vaccination rates	N/A	None	Participants were either	Electronic medical	Unvaccinated active patient	Lack of access to at	100%	All participants were	Patients who received	After 4 weeks	N
T2DM patients' perception and assessme	High level of T2DM patients engagem				Italian, affected by type 2 diabet	Dementia, cognitive impair					
than one third chose SMS	None	None	Yes	pants who received	speaking, part of		Cluster RCT	pants were a part of the	Individual level	had chosen SMS. Partici	NA
, knowledge, drug aherence	friendly. Patients in usual care	Nil	Not reported	Not reported	patients aged >18 years	uals aged <18 years,	Not reported	Not clear	dge and drug adhere	3 months	No

Fecal Occult Blood	None	None	No Population	Nationwide survey,	women and men	Non-HMO memb	96%	Representive of the	Population level	Fecal Occult Blood	Y
For patients self-	system perceived as				>30 years, taking						
HbA1 in intervention group by 0.	changes in BP, BP, Lipids,	Nil	agreed to participate	patients recruited	speaking inhabitants of	on criteria were termin	19.20%	?	significant effect on H	NA	Y
onal Consultation on Incontine	Global Impression of Improve			up investigation of a	not specified	not specified	100%	rsity education (>3 yr)		UI SF - mean decrease 3.1	N
operability and whole trial	system modestly improve	NA	Yes	ients diagnosed with	18–65 years, diabetes	allia, the need to rely	94%	to use cell phone and	Yes	telehealth system	NA
Only significant difference in waist	Diabetes patients may be more likely than HP	41 patients withdrew due to		Randomly selected patients from	Diabetes dx at least 3 months						
85.7% of outpatients in interventi	Number of patients whower	NA	Yes	Outpatients coming to	All outpatients (>30	Known patient with	70% followed up for	Yes participants who	Yes	85.7% of outpatients in	Yes
randomly generated	NA	NA	Individual level	NA	18 years, inactive	under 18 years, active	Not provided	s from otolaryngologyclinics	Individual	40 randomly genera	NA
Nightscout user reported checking their BG with a	Nightscout enables 24-h access to	Half of users report using unappr oved		Heard of CGM in the Cloud throug				Not representative of poor or	NA	NA	NA
Weight in the TRIMM	Engagement with the	No adverse	Yes	Through a church	African Americ	self-reported	84 participants	Small sample of	Individual level	Weight in the standa	Yes
in CVD risk: The reduction	in systolic blood	Nil reported	Not reported	medical	45–75 years and	No known CVD, a	Not reported	of work units	year CVD risk	1 year	Y
SmartLoss group experienced significantly	s Satisfaction questionnaire showed	NA	Yes	Not Provided	eight and obese adults (BMI 25-35	dieting; 62 kg weight change in the past	95%	Small sample size	Individual	SmartLoss group experienced signific	Yes

pre- and post-interventionweight	Nil reported	Nil reported		Cancer registry dta used	aged 18 to 75 years	non-English speaki	33%	Unknown	BMI, nutrition, physica	1 month	N
n participants assessed the app	NA	NA	Individual level	existing community-based	over age 60 from rural and	Not Available	NA	Small sample size	Individual level	y of theory-based motivational	NA
subjective adherence w/o	Objective adherence (medicat			Cardiac patients were recruit	must be at least 60 yr with a	previously owned a smart	100%	"Level of education		"subjective adherence w/o	N
better MMAS-4 scores (P<.001);	ALICE Significantly reduce		Designing apps for		Spanish for elderly patient		23 pats and 7 health	No, sample too small	Y/N	N	N
response rate to text message prompts	of responses correctly	None		Diabetes registry	Above 18 2) English or	N/A	N/A	minantly female (65%) and		s sent over 6500 responsemess	N
Screening status was ascertain	Increased CRC screening for			The authors rando	1) AN/AI heritage						
					adults with T2DM,	had been hospita					
physical activity	sedentary time, heart rate, blood	N/A	Participants were distributed	With the help of local	person had to have had a	Not mentioned	Not mentioned	N/A	Physical activity of the stroke	after 3 and 6 weeks	N
Adherence to Anti retro-viral	perceived understanding	N/A	The sample size was	According to the inclusi	Individuals were eligible	Not mentioned	Not mentioned	N/A	patients' adherence to	at baseline, 1 month	N
patients' IVR call engagement and call	patients' likelihood of reportin	None		Most participants were initially	with diabetes and/or hypert	Refused consent, Unable	around 30% (74/247) - JJ calcula	predominantly female (62%)		Participants were followed up	No
completion rates,	characteristics associate	None		patients were initially	English speaking	ineligible if they	HF-57% Depres	77% white and		83% completion	No

ner reported measures	spent helping with self-care,	none		s were initially identifi	eligible, patients had	s were excluded if they	Approx 25%	male and 77% white		h+CP patients report	N
change in HF-specific quality of life between		N/A		Potentially eligible patients	CarePartners had to live outside the			N/A			
individual's health behaviour,		N/A	N/A		Patients with type 2 diabet	Not mentioned	Not mentioned	N/A	Participants' ability (who		Not mentioned
Change in HbA1c									HbA1c values declined signific		NA
cardiovascular risk	user/participant engagement with	N/A	Almost equal number of		had to have significantly	Not mentioned	87%	N/A	Participants' willingness	Not mentioned	N
participants' ability og usability,	Not mentioned	N/A		Individuals were recruit	aged betwen 18-35	Not mentioned	Not mentioned	N/A	Patients' abililty to	after 4 weeks	N
in systolic and	weight, intake of high								ntion did not		Y
Behaviour change	Not mentioned	N/A	A sub-set of 21	Recruitment into	Not mentioned	lack of capacity to	Not mentioned	N/A		after 12 weeks	N/A
Mean reduction in weight	None	None							Program Starter		N
medication adherence and	Not mentioned	N/A	N/A	porposive sampling	at least 14 years	Not mentioned	Not mentioned	N/A		N/A	N
Fewer symptoms were	57% (83 of 145) of	NA	Individual level	two community	Patients were eligible	Those with cogniti	85%	Particiants with	Individual	Of the 37 patient	NA
weight loss at 6	weight loss at	N/A		Participants	a body mass	Recent	80%	N/A		at 3, 6, 9 and	N
change in self-reflective	change in lifestyle			From elderly comm	hypertensive or pre-	None	Not mentioned	Not mentioned		The average	No

reported antihypertensive medication	was a significant net increase in the	None	Individual level	House hold visit	uals who were ≥40 years	having CVD-related compli	87%	pants belonged to the village	Individual	-reported antihyperten	Yes
mean distance spectacle	NA	NA	Individual level	uals who visited	patients with a	NA	100%	study-Sample size	Individual	mean distance	NA
The primary outcome measure	Secondary outcome			invited 250 family practic	between 40 and 70 years	presence of coexisting	36.8% (540 patients a	Above 55 mostly and		Directly after the interve	No
After 2 years, an HbA1c < 7.0% (53	In Kin-réseau, the percent	all participants showe	Individual level	Patients visiting the	diabetes. Subjects were	NA	54%	Representativeness is	Individual level	After 2 years, an HbA1c	Yes
		N/A									
patients (12 out of 17) were positive	activity significantly increased by	NA	individual level	Those who visit the GP clinic	over 40 years, five of	s with complex co-existing	85%	study-Sample size not adequa	Individual	patients (12 out of 17) were	NA
implementation, and safety regardles		N/A		Participant of the cognitive	1) age 60–85; 2) cognitive	individuals with normal cogniti		N/A	Participants and their study	at 8 weeks	N
primary outcome was the differenc	es between HbA1c mean	NA	individual level	s who visit the GP clinics	s were eligible for partici	NA	75%	representative as only	Individual level	primary outcome	Yes
glycosylated hemoglobin		N/A		Recruitment was throug	patients over 18 years	Participants were exclud	Not mentioned	N/A		24 week	N
baseline and 3-month follow-	significant effect of the	NA	Individual level	sement in newspapers	age between 60 and 70	Not Available	91.20%	entative of the age	Individual level	baseline and 3-month	Y
depressive symptom		N/A		after attending a	age between 18-	Patients were exclud	Not mentioned	N/A		after 1 week	N
Change in % of body weight	BMI, No of outpatient clinic		Yes	National Taiwan	an age >20 years, gastric	experienced difficultieswit		This is a pilot study with	Individual level	Significant results - App	No

Impact on QOL (quality of life)	Percentage of attrition	Organisational level (setting and staff)	Description of intervention location	Staff who delivered intervention	Target delivery agent	Level of expertise of delivery agent	Inclusion/exclusion criteria of delivery agent	Adoption rate of delivery agent or setting	Organisational level	Fidelity of the intervention (%)	Measures of cost of implementation	Individual and organisation level
Most respondents	N/A	N/A since the interve	Intervention was	N/A	N/A	N/A	N/A	N/A	The intervention	100	3 cents per message per	Program subscrib
Partly with MCS	261 (87%) patients	DVA outpatient	US VA health system	Should do the RE-AIM assessment using another publication: J.E. Aikens, et al, Diabetes self-management support using					Not reported here	<40% patients chose	Intervention relativel	Quadratic analyse
measured	11.11%	since the	ntion was	N/A	N/A	N/A	N/A	evaluation of	intervention	100	mentioned	evaluation not
N/A	N/A	since the	since this	N/A	N/A	N/A	N/A	evaluation of	N/A	N/A	cost compar	evaluation not
Measured using EQ-5D, no	32.26%	The healthcare providers were	N/A since intervention was	N/A	N/A	N/A	N/A	N/A	The intervention was delivere	50% of patients reported	Not mentioned	88.1% of patients wanted
			since intervention						The intervention		Not mentioned	
N/A	26.83%	research assistan	since intervention	research assistan	Not mentioned	research assistan	N/A	N/A	The intervention	patient in the 2nd	Not mentioned	evaluation not done.
N/A	26.83%	A research	N/A since interve	A research	Not mentioned	The research	N/A	N/A	The intervention	1 patient in the	Not mentioned	Process evaluat
significant change	13%	ans and nurses	education	physicians were	N/A	ans completed a	N/A	N/A	The intervention	100%	reported in the	s evaluation
NA	NA	Individual level	Portugal	NA	NA	NA	NA	NA	NA	NA	NA	NA
				N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was	100%	Not mentioned	Process evaluation
Not measured	16%	N/A since the interve	Intervention was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was	100%	Not mentioned	Process evaluation

									mente d at the organiz			
N/A	Not mentio ned	N/A since the	Interve ntion was	N/A for this	N/A for this	N/A for this	N/A for this	N/A for this	The interve ntion		Not mentio ned	Proces s evaluat
not mentio ned	(104 rando mized, 82		not specifi ed	therapi st was a master	not mentio nes	's trained family therapi	not mentio ned	not metnio ned		not mentio ned	pants were compe nsated	
Assess ed includi ng re-	None	Tertiar y care hospita l and		NA	NA	NA	NA	NA	NA	NA	NA	Individ ual
N/A	N/A	rehab, rehab therapi	site interna tional -	Rehab therapi sts	Uncle ar	Uncle ar	Not addres sed	Not addres sed	unit level, but	Not addres sed	Not addres sed	N/A
NA	adhere nce to mobile activity	NA	NA	Resear ch staff	NA	NA	NA	NA	NA	No repote d	Not report ed	Nor report ed
N/A	10%											
N/A	0	Proces s evaluat ion	Interve ntion deliver ed	Nurses at the clinic made	N/A	N/A	N/A	N/A	Interve ntion was deliver	100	No cost to clinic; USD16	N/A
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ed QoL (EuroQ ual	attritio n in interve ntion	Not report ed	Not report ed	Not report ed	Not repore d	Not report ed	Not report ed	Not report ed	Not report ed	Not report ed	Not report ed	Not report ed

NA	4%	Not reported	NA	NA	**NA**	NA	NA	NA	Yes	96%	NA	NA
SF36 no change	16% at 6 months	Not reported	Not reported	Not reported	Not	Not reported	Not reported	Not reported	Not reported	Not reported	Nil	Not reported
LUTSqol score Respon	24.6% (15/61)		not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	not mentioned		not mentioned	not mentioned	
Minor improvements were	4%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	31.30%	NA	NA	NA	NA	NA	NA	NA	No	NA	NA	NA
NA	NA	Individual level	Not Mentioned	NA	NA	NA	NA	NA	Individual level	proposed interventions	Not performed	Individual
Yes	NA				Social media is a critical tool for						Cheap and easy to install, with	The story of Nightscout and its
NA	20%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Individual
Not reported	27.50%	Not reported	al and Workplace	Not reported	Not reported	NA	NA	NA	NA	Not reported	Nil	Not repored
Yes	5%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

No change in FACT	30%	NA	NA	Not reported	NA	Not reported	NA	NA	NA	Not reported	Nil	NA
NA	NA	Individual level	Community based	NA	NA	NA	N	NA	Individual level	proposed interventions were	Not performed	Individual
N	0		not mentioned	not mentioned	not mentioned	not mentioned	not mentioned	not mentioned		not mentioned	not mentioned	
N		N	N	N	N	N	N	N	N	N	N	N
N/A	N/A		home based	N/A	N/A	N/A	N/A	N/A		No	No	
Increased physical activity	Not mentioned	N/A since the intervention	Intervention was delivered	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was deliver	100%	Not mentioned	Process evaluation not
N/A	Not mentioned	N/A since the interve	Intervention was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The intervention was		Not mentioned	Process evaluation
No	N/A		home based	N/A	N/A	N/A	N/A	N/A		No	No	
No	approx 5 % overall		home based	N/A	N/A	N/A	N/A	N/A		No	No	

None			home based	N/A	N/A	N/A	N/A	N/A		No	No	
		N/A since the interve ntion deliver	Interve ntion was deliver ed throug	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The interve ntion was deliver ed as		N/A	Proces s evaluat ion not done.
	Not mentio ned	N/A since the interve	Interve ntion was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The interve ntion was		Not mentio ned	Proces s evaluat ion
Improv ement in knowle dge of	14%											
N/A	Not mentio ned	N/A since the interve	Interve ntion was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The interve ntion was	96%	Not mentio ned	Proces s evaluat ion
N/A	Not mentio ned	N/A since the interve	Interve ntion was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	The interve ntion was		Not mentio ned	Proces s evaluat ion
ant reducti on in	14%											
N/A	Not mentio ned	N/A since the	Interve ntion was	N/A for this	N/A for this	N/A for this	N/A for this	N/A for this	The interve ntion	Not mentio ned	Not mentio ned	Proces s evaluat
	30%											
N/A	25%	N/A since the interve	Interve ntion was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A
NA	15%	Individ ual level	Michig an USA	Study staff	NA	NA	NA	NA	Individ ual level	All propos ed	Not perfor med	Individ ual
N/A	Not mentio	N/A since	Interve ntion	N/A for	N/A for	N/A for	N/A for	N/A for	N/A	N/A	N/A	N/A
N/A	0%		home based	N/A	N/A	N/A	N/A	N/A		N/A	N/A	

NA	13%	Community level	India and China	unity Health care workers	d medical students in	d community healthcare	NA	NA	Community-Individual level	proposed interventions were	Not performed	Individual
NA	NA	Individual level	USA	Ophthalmologist	of the Santa Clara	y education	NA	NA	Individual level	proposed interve	Not performed	Individual
Physical Component	12.66%		Family practice and home-	Practice nurse	Not mentioned	For mastering the executi	Not mentioned	Not mentioned		Not mentioned	Not mentioned	
Assessed. The interve	46%	Individual level	The studies took place	community-based peer	Staff of the respective	NA	NA	NA	Individual level	All proposed interve	Not performed	Individual
	11.9% in DRC, 14.5%											
NA	15%	Individual level	l Practices in the Nether	Nursing staff	NA	NA	NA	NA	Individual level	proposed interventions were	Not performed	Individual
significant positive change	Not mentioned	N/A since the intervention	Intervention was delivered	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A
NA	25%	Individual level	Primary care clinics	Health coach	or's degrees in kinesio	or's degrees in kinesio	NA	NA	Individual level	proposed interventions	Not performed	Individual
	Not mentioned	N/A since the interve	Intervention was deliver	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A for this study.	N/A	N/A	N/A	N/A
nA	9%	Individual level	NA	Web based	NA	NA	NA	NA	Individual level	NA	Not performed	Individual
Not mentioned	Not mentioned	N/A since the	Intervention was	N/A for this	N/A for this	N/A for this	N/A for this	N/A for this	N/A	N/A	N/A	N/A
NA	NA	Organisational level-Medica	Tertiary care facility in	Medical Staff employed in	NA	Qualified medical			Yes	All proposed interve	Not performed	NA

Assessed outcome ≥ 6 months post interve	Indicators of program level maintenance	Measures of cost of maintenance	Q1 *mHealth use* (Y/N)	Q2 *Effective implementation* (Y/N)	Q3 *Lessons learnt* (Y/N)	Q4 *Good evidence?* (Y/N)	Limitations and challenges	Lessons learnt	Comments		
Only 6-week follow-	No information provid	Not provided	**Y**	**Y**	**Y**	**N**	Messages were generic and not tailored	Potential for replacement of	Administration of the survey and data		
Compared 3 and 6	Part of service provisio	Not reported	y	y	y	N	Did not assess long-term	Develop mHealth apps and	May be more effective to		
Only 3 month follow-	No information	Not provided	**Y**	**Y**	**Y**	**Y**	Daily text messages were found	SMS reminders	A process evaluation of the		
N/A	N/A	N/A	**Y**	**Y**	**Y**	**N**	application is limited to	nes have the	describes implementat		
Only 3 months' follow-up post-interve	No information provided.	Not provided	**Y**	**Y**	**Y**	**N**	App was limited to iOS and Android interfaces,	A system that automatically collects	Monitoring of adverse events and other chronic		
		$314,264 over 2 years				**Y**		Recruitment of mobile RCTs are			
day follow-up	information provide	Not provided	**Y**	**Y**	**Y**	**N**	outcomes were not investigated	directional text messagin	evaluation is needed to understand		
Only 15 day follow-	No information	Not provided	**Y**	**Y**	**Y**	**N**	Clinical outcomes were not	Bi-directional text	A process evaluation is needed		
At 10 months	information provid	Not provided	**Y**	**Y**	**Y**	**Y**	patient data could not be	ity-based, peer	integrated care programs		
NA	NA	NA	Y	Y	Y	?	Cross sectional study, Patients	usefulness of a smartphone	more research is required ranging		
	N/A	Not provided	**Y**	**Y**	**Y**	**N**	program director emphasis on the NP	mHealth DSS was efficacious for			
		Although not reported here, the	**N**	**Y**	**Y**	**Y**					
Only 1 follow-up after 2	No information provid	Not provided	**N**	**Y**	**Y**	**Y**	The small size was very small that	The application smart	To make a significant comparable		

			Y	**Y**	**Y**	**N**	small sample, testing a prototype	usability can be achieved among			
N/A	No information	No information	**N**	**Y**	**Y**	**N**	underrepresentation of	smartphone apps are	Need to consider the group		
			Y	**Y**	**Y**	**N**	Questions were based primarily on a	Patients generally have a positive attitude	Aware of ease of use and care safety of eHealth		
intervention feedback was	not mentioned	not mentioned	**Y**	**Y**	**Y**	**Y**	not a definitive trial and was not	ed mobile-phone interven			
y and Secondary outco			**Y**	**Y**	**Y**	**Y**	located from one transplant centre,		research in using this technology in regular		
N/A	N/A	N/A	Y	Y	N	**N**	ceased when no difference	may highlight	be conceptualisation of		
5 months	NA	NA	**Y**	**Y**	**Y**	**Y**	over 5 months. Relaively high rincomes	look at longer term maintenance	Good study but short duration.		
			Y	**Y**	**Y**	**N**	Subjects drawn from health	SMS can be effective but	Small sample		
Only 4 month follow-up	N/A	N/A	**Y**	**Y**	**Y**	**Y**	Shortage of vaccine availability following	SMS and email reminde			
			Y	**Y**	**Y**	**N**			Patient Health Engagement Scale (PHE-S)		
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	criteria as English only, majority	the preferred mode, but SMS	findings cannot be generalized as it is a		
Not known	Not known	Not reported	**Y**	**Y**	**N**	**N**	measure clinical outcomes such as	Nil	Nil		

NA	NA	NA	**Y**	**Y**	**Y**	**Y**	Lean mode of the	Interrog ative plus	Authors investigate d whether		
			Y	**Y**	**Y**	**N**	Small qualitative r study,				
Not report ed	Not report ed	Not report ed	**Y**	**Y**	**Y**	**Y**	patiens were vulnerable. 16%	adheren ce in group with	study. Short duration follow up.		
not mentio ned	not mentio ned	not mentio ned	**Y**	**Y**	**Y**	**Y**	numbers, no control at 2 year follow-up,	importa nt clinical data are			
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	criteria of ability to use the sensors,	definitio n for end users,	pilot study which needs to be		
			Y	**Y**	**Y**	**Y**	The low inclusion criteria in terms HbA1c for diabetic	Real-time social support may help	HAWthorne effect for positive changes in both study groups		
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	Short follow-up period of three	Mobile reminde rs can work at	first randomize d trial in a real-world		
NA	NA	NA	Y	Y	Y	Y	standardiz ed calibration was not	could become a useful tool for	the first mobile device-based		
			Y	**Y**	**Y**	**N**	The opt-in process ensures that the sample of individuals	Wearabl es in particula rwere quite popular	Are ill-considered responses or behaviour more likely	The majorit y of users (69.2%) used	
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	duration of the interventio	tailored text messagi	Tailored text messages		
Yes	Not report ed	Not report ed	**Y**	**Y**	**Y**	**N**	and text messages. Also	NA	NA		
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	only 12 weeks, sample size small, no formal evaluation	ss promote d clinically meaning ful	sample and short duration study, but provides an insight		

NA	NA	Nil	**Y**	**Y**	**N**	**N**	Small non random sample. No	older patients used the app.	Small study without control.		
NA	NA	NA	Y	Y	Y	Y	s in the initial and follow-up evaluation may not	narrative data suggested that	sample and short duration study, but provides		
not mentioned	not mentioned	not mentioned	**Y**	**Y**	**Y**	**Y**	medication intake needed to be confirmed	The interventions improved all the			
N	N	N	Y	Y	Y	N	Too little, too short,	Designing apps for elderly.	Elderly patients with no previous		
just a focus group with small	No	No	**Y**	**Y**	**Y**	**Y**	more patients for longer period would	Possible to integrate home based			
			Yes	**Yes**	**Yes**	**Yes**	Lack detailed individual-level data	Use of focus groups to	Study sample derived from a	cultural tailoring is	The findings of the
			Yes	**Yes**	**Yes**	**No**	Limited sampling, Brief	these technologies can	African-American patients		
N/A	No information provided.	No information provided.	**N**	**Y**	**Y**	**N**	Participants were relatively young & recruited	the intervention using the	age group of the participants need to consider		
N/A	No information provid	N/A	**N**	**Y**	**Y**	**N**	Participants might have underesti	the augmented applicati			
No	No	No	**Y**	**Y**	**Y**	**Y**	1) reliance on self-reported outcomes could	1) providing feedback to an			
No		No	**Yes**	**Yes**	**Yes**	**Yes**	1) limited the multivariat	1) Despite the	HF randomized results		

No		No	**Yes**	**Yes**	**Yes**	**Yes**	study was conducted among VA patients	intervention increased			
N/A	No information provided.	No information provided.	N	Y	Y	N	1) Possibility of patients being biased	health systems using mHealth approaches			
N/A	No information provid	N/A	**N**	**Y**	**Y**	**Y**		smartphone-based behavior			
			Partially Yes	**Y**	**Y**	**Y**	Pilot study with its own limitations	WellDoc System is an effective tool for	Very small sample size		
N/A	No information provid	N/A	**Y**	**Y**	**Y**	**Y**	the sample was recruited	patients with CHD were			
N/A	No information provid	N/A	**Y**	**Y**	**Y**	**N**	small sample size and study	Happy is usable and might			
			Y	**Y**	**Y**	**?**	not adjusted for	is a promising	research into the individual		
N/A	No information	N/A	**N**	**Y**	**Y**	**N**		Mood and activity			
			Partially Yes	**Y**	**Y**	**Y**	Non Randomized uncontroll	Digital therapeutics can	Further investigation at a scale is needed		
N/A	N/A	N/A	**Y**	**Y**	**Y**	**Y**	1) selection bias; 2) generalisa	the use of the WelTel SMS	There was no mention abouy		
NA	NA	NA	Y	Y	Y	Y	Measuring adherence by self-	Text interventions	Use of cell phones is increasing		
N/A	N/A	N/A	**Y**	**Y**	**Y**	**Y**	recruited sample	The addition			
No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	1) The sample size was	1) Patients who			

NA	NA	NA	Y	Y	Y	Y	not be generalizable to healthcare settings	d cardiovascular management	simplified cardiovascular management model		
NA	NA	NA	Y	Y	Y	Y	sample size and clinic	utility of smartph	studies are needed to assess the		
Not mentioned	Not mentioned	Not mentioned	**Yes**	**Yes**	**Yes**	**Yes**	the mean baseline physical activity	Ideally, a 12-month follow-			
	NA	NA	Y	Y	Y	Y	High rates of Loss to Follow-Up	study did not show a benefit			
			N	**Y**	**N**	**Y**	Limitations was related to study				
NA	NA	NA	Y	Y	Y	Y	Small sample size and a pilot study	intervention stimulated patients	intervention tool appears to be a feasible in		
N/A	N/A	N/A	**N**	**Y**	**N**	**Y**	1) it was designed as a feasibility	mHealth technologies such as internetc			
NA	NA	NA	Y	Y	Y	Y	Reliability on HbA1c	significant between-group	coaching in primary care can improve		
N/A	N/A	N/A	**Y**	**Y**	**Y**	**Y**	small sample size, short duration,	electronically assisted health	a study design of RCT with a representat		
NA	NA	NA	Y	Y	Y	Y	bias could have been introduced in the	potential of using Web-assisted	s is a high income country with high		
N/A	N/A	N/A	**Y**	**Y**	**Y**	**N**	selection bias, small sample	people with severe	Participants' ability to receive the		
NA	NA	NA	**Y**	**Y**	**Y**	**Y**	App was not regulated by	Provides a feasible	This is a pilot study which needs to		

RE-AIM dimension	Indicator
Reach	
	Individual level
	Method to identify target population
	Inclusion criteria
	Exclusion criteria
	Participation rate
	Representativeness
Efficacy/effectiveness	
	Individual level
	Measures/results for at least 1 follow-up
	Intent-to-treat analysis utilized
	Quality-of-life (QOL) or potential negative outcomes
	Percent attrition
Adoption	
	Organizational level (setting and staff)
	Description of intervention location
	Description of staff who delivered intervention
	Method to identify staff who delivered intervention (target delivery agent)

	Level of expertise of delivery agent
	Inclusion/exclusion criteria of delivery agent or setting
	Adoption rate of delivery agent or setting
Implementation	
	Organizational level
	Intervention duration and frequency
	Extent protocol delivered as intended (%)
	Measures of cost of implementation
Maintenance	
	Individual and organization level
	Assessed outcomes ≥ 6 months post intervention
	Indicators of program level maintenance
	Measures of cost of maintenance

RE-AIM internal and external validity indicators.

Description
The number, proportion, and representativeness of participants.
Describe the process by which the target population was identified for participation in the intervention.
Explicit statement of characteristics of the target population that were used to determine if a potential participant was eligible to participate.
Explicit statement of characteristics that would prevent a potential participant from being eligible to participate.
Sample size divided by the target population denominator.
Explicit statement of characteristics of the study participants in comparison to the target population.
The measure of the primary outcome, quality of life, and on avoiding unintended negative consequences.
The study variable(s) are measured at a time point after baseline.
Analyzing participants in trials in the groups to which they were randomized, regardless of whether they received or adhered to the allocated intervention.
QOL: Includes a measure of quality of life with some latitude for coding articles that refer to well-being or satisfaction with life.
Negative outcomes: To evaluate unanticipated consequences and results that may be a product of the intervention and may have caused unintended harm.
The proportion that was lost to follow-up or dropped out of the intervention.
The number, proportion, and characteristics of adopting organizations and staff.
The explicit statement of characteristics of the location of the intervention.
The explicit statement of characteristics of the staff who delivered the intervention.
Describe the process by which the staff was identified for participation in the study.

Training or educational background in of those delivering the intervention.

The explicit statement of characteristics of the setting/agent that were used to determine if a potential setting/agent is eligible to participate.

The number of participating delivery settings or agents divided by the number of eligible and approached delivery settings or agents.

The degree to which the intervention is delivered as intended.

Duration: length the intervention over days, weeks, and months as well as the length of each intervention contact.

Frequency: number of contacts with participants

Description of fidelity to the intervention protocol.

The ongoing cost (eg, money, time) of delivery across all levels of the intervention.

The measure of behavior at the individual level and sustainability of the intervention at an organizational level.

Description of follow-up outcome measures of individuals available at some duration after intervention termination.

Description of program continuation after completion of the research study.

The ongoing cost of maintaining delivery across all levels of the intervention.

adapted from - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3806547/

Importance

Helps investigators develop an approach to determining who may be suitable for the intervention. Examples ir

Inclusion criteria should be as inclusive as possible to improve the external validity of findings [40].
Exclusion criteria should be considered carefully to prevent potential harm to prospective participants, but
should also avoid excluding individuals based on criteria that could be related to SES (eg, ability to travel to intervention site), comorbidities,
or other factors that could influence an externally valid depiction of intervention effects [40].

Provides information on the acceptability of the study and interventions from the perspective of the target po

Identifies disparities in participation and informs the degree to which the study results are generalizable to the

To evaluate whether the intervention outcomes were statistically significant or changed (positively/negatively

Reduces bias from omitting individuals who were lost to follow-up and improves generalizability [63].

Provide a metric to compare across interventions with different behavioral targets and provides a better sense

Allows for the weight of the harms and benefits of an intervention [26].

High attrition lowers statistical power and treatment-correlated attrition of participants from conditions threa

Provides an understanding of resources needed for future researchers [26].

Provides information on the characteristics may be needed to deliver an intervention and assist with retentior

Helps investigators develop an approach to identify and engage staff that may be suitable for intervention deli

Allows for the assessment of generalizability of those delivering an intervention to typical practice settings del

Inclusion criteria should be as inclusive as possible to improve the external validity of findings. Exclusion criteri

Provides information on the acceptability of the study and interventions from the perspective of the setting ar

Useful for replication and comparison of resources needed to resources available in a practice setting [26].
This provides insight into the feasibility of delivering all components of an intervention at the pre-determined

This is helpful for future researchers to be able to determine if conducting a specific intervention has economi

Provides information on the maintenance of intervention outcomes over time [26].

Provides information on whether the intervention can be integrated into an existing system/organization [26].

Sustainability costs provides information for practice settings to determine the resources needed for long-terr

nclude using an electronic medical record query or mass media approaches [20].

pulation [26].

e target population [26].

) [26].

e of the impact that the intervention on the participants' perceptions of health [26].

tens internal validity [42].

n of participants [35].

ivery [35].

ivery [35].

ia should not systematically remove potential settings or staff that typical in the practice domain [20]

ıd staff that will ultimately be responsible for intervention delivery [26].

date and time [26].

cally feasible delivery [35].

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n intervention delivery [28].

Review of mHealth for healthy ageing and aged care services – Database search strategy

No.	Database	Search syntax (3rd November 2017)	Results
1	**MEDLINE**	mHealth or "mobile health" "healthy ageing".mp. "aged care".mp. reach effectiveness adoption implementation.mp. maintenance RE-AIM.mp. limit 9 to (english language and yr="2007 - 2017") limit 10 to ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")	**89**
2	**EMBASE**	mHealth or "mobile health" "healthy ageing".mp. "aged care".mp. reach effectiveness adoption implementation.mp. maintenance RE-AIM.mp. limit 9 to (english language and yr="2007 - 2017") limit 10 to ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")	**374**
3	**Global Health**	mHealth or "mobile health" "healthy ageing".mp. "aged care".mp. reach effectiveness adoption implementation.mp. maintenance RE-AIM.mp. limit 9 to (english language and yr="2007 - 2017") limit 10 to ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")	**137**
4	**PsycINFO**	mHealth or "mobile health" "healthy ageing".mp. "aged care".mp. reach effectiveness adoption implementation.mp. maintenance RE-AIM.mp. limit 9 to (english language and yr="2007 - 2017") limit 10 to ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")	**150**

5	**Scopus**	(ALL ("mobile health" OR mhealth) AND ALL ("healthy ageing" OR "aged care" OR re-aim OR reach OR effectiveness OR adoption OR implementation OR maintenance) AND PUBYEAR > 2006 AND PUBYEAR < 2018) AND (LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012) OR LIMIT-TO (PUBYEAR , 2011) OR LIMIT-TO (PUBYEAR , 2010) OR LIMIT-TO (PUBYEAR , 2009) OR LIMIT-TO (PUBYEAR , 2008) OR LIMIT-TO (PUBYEAR , 2007)) AND (LIMIT-TO (LANGUAGE , "English ")) AND (LIMIT-TO (EXACTKEYWORD , "Middle age ") OR LIMIT-TO (EXACTKEYWORD , "Middle aged ") OR LIMIT-TO (EXACTKEYWORD , " All aged ") OR LIMIT-TO (EXACTKEYWORD , " Aged ") OR EXCLUDE (EXACTKEYWORD , "Young Adult ") OR EXCLUDE (EXACTKEYWORD , " Adolescent ") OR EXCLUDE (EXACTKEYWORD , " Child "))	**415**
6	**ScienceDirect**	"mobile health" OR mHealth "healthy ageing" OR "aged care" OR RE-AIM OR reach OR effectiveness OR adoption OR implementation OR maintenance Limit: 2007 to Present Sciences: Medicine and Dentistry, Neuroscience, Nursing and Health Professions, Pharmacology, Toxicology and Pharmaceutical Science, Psychology, Sports and Recreation	**1630**
7	**CINAHL**	"mobile health" OR mHealth "healthy ageing" OR "aged care" OR RE-AIM OR reach OR effectiveness OR adoption OR implementation OR maintenance Filters: Date published: 20070101-20171231, English, middle aged: 45-64 years, aged: 65+ years, aged, 80 & over	**30**
8	**Cochrane Library**	"mobile health" or mHealth "healthy ageing" OR "aged care" OR RE-AIM OR reach OR effectiveness OR adoption OR implementation OR maintenance Filter: Publication year from 2007 to 2017	**58**
Total number of records identified from search of the above 8 databases			**2883**