Achieving person-centredness through technologies supporting integrated care for older people living at home: an integrative review

Abstract

Purpose

The purpose of this paper is to identify the range, type and outcomes of technological innovations aimed at supporting older people to maintain their independence within the context of integrated care at home. We also discuss key emergent themes relevant to the use of person-centred technology for older people in integrated care and propose recommendations for policy and practice.

Design

An integrative review methodology was used to identify and describe recent scientific publications in four stages: problem identification, literature search, data evaluation and data analysis.

Findings

Twelve studies were included in the review. Three studies described remote consultations, particularly telemedicine; five studies described tools to support self-management; three studies described the use of healthcare management tools, and one study described both remote consultation and self-care management. Emergent themes were: acceptability, accessibility and use of digital technologies; co-ordination and integration of services; the implementation of digital technologies; and safety and governance. Several recommendations are proposed relevant to integrated care teams, technology developers and researchers.

Originality

This review uniquely considers the extent to which novel digital technologies used in integrated care for older people are person-centred.

Keywords

Integrated Care; Older People; Digital Technologies; Person-centred Care; Community Care;

Article Classification

Literature review

Introduction

Over several years, there has been an increase in the use of health technologies to promote a more person-centred way of managing health. According to Snowdon et al (2014), there is increasing evidence that not only are individuals ready to manage their health and wellness, but are actively seeking out strategies and tools to take charge of their health and change

the way they access services. Digital technologies provide healthcare consumers with unprecedented access to health information through digital tools, online resources, and advanced technologies such as virtual patient forums, mobile health applications (apps), self-help programmes and monitoring and tracking devices. An analysis of the mobile health app market has revealed that consumers are increasingly using online technologies to self-manage their health and wellness, access health information, and connect with peer-to-peer health groups (Snowdon et al 2014). The authors claim that this is creating a consumer-based system, in which people select and engage online tools and resources to personalise their health and wellness that is custom-made to the needs, values, and goals of the individual. The global COVID-19 pandemic is having a massive impact on the pace of change in the use of digital technologies in healthcare, specifically concerning telemedicine and remote consultations (Whitelaw et al, 2020).

While there are various definitions of digital technologies for health or 'eHealth' (WHO 2018), The European Commission (2012) defines eHealth as *"the use of ICT in health products, services and processes combined with organisational change in healthcare systems and new skills in order to improve the health of citizens, efficiency and productivity in healthcare delivery, and the economic and social value of health".* This definition means that eHealth is more than just using innovative technologies: it also emphasises the need for organisational change and skill development with resulting improved outcomes for the individual and organisations. This emphasis is important, and calls for an understanding of how ICT can support person-centred care, looking beyond technologies themselves to explore what facilitates their successful implementation. Several frameworks have been proposed to aid our understanding of how technology can be directed towards people with health and social care needs, such as the eHealth Enhanced Chronic Care Model (Gee et al, 2015) although there is little published evidence that this has been applied in practice. A model which is more frequently cited and of note is Melchiorre et al's (2018). This divides health technology tools into four main types: remote consultation; self-management; healthcare management; and health data analytics. Melchiorre's model provides the framework for this review as it provides a broad, practical categorisation of digital tools which can then be critically examined for their use in the care and support of older people.

Technological advancement has also entered the arena of integrated care for older people. Integrated care has become the delivery model of choice to provide person-centred care to older people wishing to stay as independent as possible in their homes for as long as possible (Boult et al, 2009; Gress et al, 2009; Hopman et al 2016). By integrated, person-centred care, we mean health and social care professionals working collaboratively with people who use services to support them to develop the knowledge, skills and confidence to more effectively manage and make informed decisions about their health and care (Santana et al, 2017). We have chosen this broad definition of integrated care as it emphasises person-centredness, which is the focus of this review, and considers integrated care from a

number of stakeholder perspectives, as advocated by Valentijn (2016). Person-centred care adheres to principles of affording people dignity, compassion and respect, offering coordinated and personalised care, and supporting people to recognise and develop their own strengths and abilities to enable them to live an independent and fulfilling life (The Health Foundation, 2016). Most people receiving integrated care are older with multiple chronic health conditions and may have cognitive impairment. The challenge has become to find ways of supporting older people to meaningfully engage with technology in order for them to take full advantage of its potential, should they so wish.

This paper identifies the range and type of technological innovations aimed at supporting older people to maintain their independence within the context of integrated care at home. According to Melchiorre et al's (2018) framework, it categorises these technological innovations and reports their outcomes and limitations. Four key themes are discussed relating to the use of technology for older people which support person-centred, integrated care, at a micro or individual level, a meso or organisational level and at a macro or system level. These themes were inductively derived following analysis of the included papers.

Methodology and Methods

Design

An integrative review methodology was used according to Whittemore and Knafl (2005). We have followed the 4 stages: problem identification, literature search, data evaluation and data analysis. This methodology allows for the combination of diverse research designs using qualitative, quantitative and review methods to address a wide range of outcomes.

Problem identification

This review scopes the types of technologies that aim to support person-centred, integrated care for older people living at home, identify outcomes, and develop a set of technological innovation recommendations to support policy and practice.

Literature search

A literature search was undertaken between July and August 2020, using the databases: Pubmed, CINAHL , and PsychINFO. Keywords are shown in Table 1:

(Table 1 here)

Selection criteria applied in the search process were language of publication (English, Dutch, French and German, and published within the last five years (2015-2020). The search resulted in 267 papers, of which two duplicates were removed (Pubmed n=209; CINAHL n=57; PsychInfo n=1). Papers were included if they related to older people, described the use of digital technologies and integrated or person-centred care, and presented data on outcomes. An initial scope of the literature found that the terms integrated care and person-centred care where, at times, used interchangeably. Therefore, we decided to search for either of these terms rather than both together. Study protocols were excluded.

All study designs were included, such as qualitative, quantitative, mixed methodologies and review papers. Two authors (AD and JB) independently applied the inclusion and exclusion criteria to the titles and abstracts of the selected papers and resolved any disagreements through discussion; 238 papers were excluded at this stage. The complete manuscripts of the remaining 27 papers were each examined by one of the authors. Fifteen papers were excluded at this point either because age was not specified, or they did not report outcomes. The remaining twelve papers were included in this review (Figure 1) *(Figure 1 here - Prisma)*.

Data evaluation

Given the diverse nature of primary sources, the included studies' methodological quality of included studies was coded according to a 2-point criterion (high or low) relating to methodological rigour and relevance (Whittemore and Knafl, 2005). Each paper was evaluated by one of the authors. Papers were not excluded on the basis of quality; instead, this rating was used to evaluate the strength of the evidence at the point of data synthesis and discussion of findings.

Data analysis

According to a template based on Melchiorre et al's (2018) technology categories, data were extracted independently by the authors. Extraction included information about the study characteristics and outcomes to synthesise the articles' content. Data were further subjected to a thematic analysis at the micro, meso and macro levels to explore how person-centredness is manifest and operationalised in the context of integrated care and technology.

Results

The included studies were conducted in the US (n=4), Sweden (n=1), Germany (n=1), France (n=1), the UK (n=1), New Zealand (n=1) and Canada and New Zealand (n=1). A range of methodologies was used including a randomised controlled trial (n=1), surveys (n=2), qualitative methodologies only (n=2), a comparative multiple case study design (n=1), a mixed-methods study (n=1), pilot studies (n=2), a feasibility study (n=1) and systematic or narrative reviews (n=2). In terms of relevance and methodological rigour, seven studies were considered of high quality and five of low quality.

Typology of technologies

Of the four categories of technologies stipulated by Melchiorre et al (2018), four studies described the use of remote consultations, particularly telemedicine or telehealth (Bousquet et al, 2019; Gokalp et al, 2018; Hagglund et al, 2015 and Walker et al, 2017). Six studies described devices that support self-management (Dhillon, 2016; Gordon and Hornbrook, 2018; Hermann et al, 2020; Hashi, 2016; Lanzi et al, 2018 and Walker et al, 2017). Three studies described healthcare management tools, specifically electronic health

records (Klein et al, 2017; Steele Gray et al, 2018; Turvey et al, 2016). No studies described the use of technologies to support health data analysis decision-support systems or risk stratification tools. Table 2 sets out this typology and presents a summary of the findings. *Table 2: Summary of findings (here)*

Themes

Four themes relating to the person-centredness of technology for older people in integrated care were inductively derived from the analysis of the included papers. Inductive analysis is a process of coding the data without trying to fit it into a pre-existing coding frame or the researcher's analytic preconceptions. This form of thematic analysis is described as data-driven (Braun and Clarke, 2006). Themes identified were: acceptability, accessibility and use of digital technologies (micro-level); co-ordination and integration of services (meso-level); the implementation of digital technologies (macro-level;) and safety and governance (macro-level).

Acceptability, accessibility and use of digital technologies: the Micro level

Key to the success of any technology is the user's ability to tolerate it and adopt it and five of the studies shed light on this. Firstly, in Gokalp et al's (2018) study of telemonitoring, older people were trained to use the technology's vital signs and activity sensors and feedback on usability was sought. Although good compliance and satisfaction was reported, there were a number of difficulties relating to person-centredness. For example, some users found the technology intrusive and stigmatising, as they were reluctant to be labelled as 'frail'. For other participants, more practical problems were reported, for example, daily weighing was not undertaken due to safety concerns of standing on the scales, and chair sensors were reported as uncomfortable.

In a study of a social media health management system for older people, users positively rated usability and acceptability of the system (Dhillon et al, 2016). They reported to be interested in using the technology, were adequately competent, made a reasonable 'effort', and felt that the system has some value or utility for them. Those in the age range of 60 to 69 years considered themselves more competent and found the system more valuable than those in older age groups. Attitudes towards social networking functionalities were mixed; while users expressed the desire to make new friends online, some also had concerns about engaging with people who they did not know personally. Although users had a better understanding of their health due to the technology, they continued to rely on healthcare professionals for diagnosis and treatment.

Hermann et al (2020) applied grounded theory to identify factors that influenced digital technology acceptance for medication adherence among older people. These factors included views on using technology for healthcare in general; feelings towards being dependent on technology and erosion of their autonomy; their own experience with technology in their lives and healthcare; and general attitudes towards the wider place of

technology in society. As with the other studies described above, strategies to address barriers to acceptance were lacking.

Finally, Gordon and Hornbrook's (2018) research examined older people's ability to access and use technologies to obtain health information and advice. They found that over half reported that they could read health information online, half could watch online videos, a third could watch streamed programmes, a quarter could watch or listen to a webinar, and two-thirds had obtained health information from a website. The ability to perform these activities, however, decreased with advancing age. The ability to use a health-related app on a smartphone or tablet was much lower, particularly among older age groups. Despite this interaction with technology, it is interesting to note that, overall, more people preferred to receive printed newsletters mailed to their home than delivered via email, with this preference increasing with age. While this study sheds light on the breadth of access and usage among older people, it does not explain what facilitates this use or contributes to integrated care in the home setting.

Care co-ordination and integration: the Meso level

Studies here focused primarily on electronic shared care records and described improved care co-ordination and integration of services. Steele Gray et al (2018) described a partnership between health and social care services through shared access to electronic health records (EHRs) and informal connections between providers. The health and social care system was supported by using the technology to share patient data for better care co-ordination, and decision support was provided by accessing guidelines, clinical pathways and operation manuals. Integration between health and social care was less well supported in a study by Bousquet et al (2019), which found that many social care workers were not taken seriously when they informed health service providers about alerts triggered by a telemonitoring device.

Two studies conducted in the US go a step further in person-centredness, with service users owning their care record. Klein et al (2017) evaluated the use of a continuity of care document (CCD) or care plan via an electronic patient portal. Providers reported the most useful information in the CCD was around medications, laboratory results, conditions and allergies. Almost all providers claimed that they were better able to make treatment decisions about medications, and 50% reported that they did not order some laboratory tests or other procedures because of the information available. This finding is endorsed in a related study by Turvey et al (2016), who found that duplication of laboratory tests was significantly reduced when patients shared their care record with providers.

Implementation of digital technologies: the Macro level

The only study in our review that discussed the implementation of technology-mediated integrated care is that of Steele Gray et al (2018). This study presented a comparative

multiple-case study approach that implemented nine integrated community-based primary healthcare models in Canada and New Zealand. The study examined how technology was used to implement these integrated care models from managers' and healthcare providers' perspectives. Determinants of implementation were proposed including characteristics of individuals, organisational environment, external environment, and technology characteristics. Three types of barriers to adoption of technologies for integrated care were found: 1) data access: data protection considerations often acted against data access, which needs to be counteracted with procedures that strengthened both data security and access 2) limited functionality: in particular, lack of interoperability between systems from different providers and lack of fit with user workflows and 3) organisational and provider inertia: the technologies were used more like patient records rather than as care co-ordination systems and novel functionalities were less adopted.

Safety and Governance: the Macro Level

As previously highlighted, safety and governance in the use and deployment of technology are increasing in importance. From the twelve studies included in the review, three mentioned aspects of safety or governance issues that were taken into consideration in the development of their initiatives. However, details were on the whole relatively sparse. Bousquet et al (2019) included governance and safety issues in the training given to health workers on using a visual analogue assessment scale to monitor clients' health status and record data. The authors state that a reminder was given of the ethical rules, such as respecting the person's privacy and discretion. It was also emphasised that the employee should not attempt to make a medical diagnosis or replace the healthcare professional. The system was reported to comply with the EU General Data Protection Regulation (GDPR) for privacy, with information retrieved included in a single database in an authorised system hosting personal data with automated anonymisation.

In their social media health management system, Dhillon et al (2016) described a series of design principles concerned with 'privacy control' for users. It stated that user privacy must be maintained. Users must be able to fully control their health data (including sensitive data such as diagnosis, symptoms, and treatments), which must not be visible to others without a user's explicit permission.

Finally, in their review of how technologies have been adopted in practice in Canadian and New Zealand settings, Steele Gray et al (2018) asserted that strong legislative and regulatory policies were in place in both countries to protect personal information. Regulations and policies, including data privacy and access, were common themes in the operational data and guidelines examined. More details of these policies were, however, not forthcoming.

Discussion

This paper's primary aim was to examine the extent of person-centred digital technologies within the context of integrated care for older people by identifying the range, type, and outcomes of technological innovation. Our studies gave some interesting insights into, for example, the importance of assessing the user perspective and highlighting relevant sensitivities surrounding the use of technologies such as stigma, and progress with electronic records as a person-centred co-ordination vehicle. The four themes are now discussed concerning the broader literature and connected to a set of recommendations we propose for researchers, developers, and integrated care teams and systems, as summarised in Table 3. We then offer an overall critique of our findings and approach and conclude by highlighting what we consider to be the key challenges of person-centered technologies in this field looking forward.

Acceptability, accessibility and use

There is extensive literature relating to technology acceptance amongst older people (Gucin and Berk, 2015; Long, 2006; Peek et al., 2014). Theoretical models of acceptance, are based mainly on cognitive psychology approaches and include the Technology Acceptance Model (TAM) (Davis, 1989 cited by Long, 2006) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Ventatesh et al., 2003). Both models prioritise the usefulness of the technology in helping users achieve gains in performance and practical issues around the use of the technologies. From our review, the use of technology is mainly framed from the provider's perspective with constructs such as 'compliance' with the technology emphasised (Golkalp et al, 2018). There is limited evidence around the extent to which the use of technology is consistent with the older persons' needs, goals, and priorities as envisaged in person-centred care (Recommendation [R]1). There is some evidence that users fear becoming reliant on the technology and that their independence is eroded and stigma is created (Gokalp et al, 2018; Hermann et al, 2020). One notable exception is the study by Hashi et al (2016), who noted that promoting social engagement via the internet and supporting older people to use technology should be guided by what motivates older clients to learn and goals they want to achieve.

In terms of ease of use, user 'competence' and the extent to which users 'made an effort' to use the technology again frames the discussion around the provider's needs (Dhillon et al, 2016). Users themselves have described frustration (Lanzi et al, 2018), safety concerns and discomfort (Gokalp et al, 2018). Some of these concerns are echoed by Peek et al (2014), in a review of technology acceptance in older people living at home. These authors found concerns such as the lack of privacy and control, forgetting or losing the technology, triggering false alarms, obtrusiveness on everyday life and that it may be harmful, and that is it difficult to use (R2, R3). However, for some, there were benefits of using technology such as increased safety, increased independence, and reduced family caregivers burden. A review by Hirvonen et al (2020) similarly found that digital technologies facilitated the inclusion of older adults by providing support for decision-making, increasing awareness of

medical conditions and services and providing a greater sense of control over their health. It could be argued that key to the personalisation of technology and subsequent acceptability and use is users' involvement in its development (R4). Only one study in this review reported undertaking this activity (Dhillon et al 2016), a small feasibility study.

Our review also found that using technologies decreased with age (Dhillon et al, 2016; Gordon and Hornbrook, 2018). This phenomenon may be linked to increasing frailty and physical and cognitive limitations (Arief et al, 2013). Person-centred care, therefore, requires individual assessment of the suitability of technologies for each older person, rather than a 'one size fits all'. Internet connectivity is, of course, a vital pre-requisite for the use of many digital technologies. Most of the studies in our review were conducted in urban or semi-urban areas with good internet availability with users interested in the use of technology (R5). Perhaps, as a result, the majority of older users in the study by Gordon and Hornbrook (2018), regularly accessed online material relating to health conditions. Arief et al (2013) also found that most older people visited websites regularly and used email. However, these findings may not represent the older population more generally and should be interpreted cautiously.

Care Co-ordination and Integration

Our review has highlighted a limited application of digital technologies to enhance care co-ordination and integrated care. Studies evaluating digital technologies for older people, such as telemonitoring systems, are numerous (Bowes and McColgan, 2012; Hirani et al, 2014). However, they commonly involve a single healthcare provider, with few examples of how technology can be used to share information across health and social care organisations. Electronic Health Records (EHRs) were cited as an example of how digital technologies can enhance care co-ordination between providers organisations. Robust data on outcomes is relatively limited, focusing on avoiding duplication of medical tests (Klein et al 2017; Turvey et al 2016), and do not identify how EHRs can promote the collaborative working and complex decision-making processes in integrated care systems (R6). Personal Health Records (PHRs), in which service users have ownership of their care record, may support person-centred care in a more meaningful way but there is little evidence that they promote better co-ordination and integration. Coupled with this, resistance to digital technologies' adoption by healthcare workers has been highlighted (Oberg et al, 2018). Resistance is due to many factors, including staff not having either the time or skills to increase digitalisation and a lack of training and education (R7, R8).

An essential pre-requisite for digitally enhanced integrated care is interoperability between different providers' IT systems (R9). IT systems typically demand a high financial investment, and organisations may be reluctant to replace them, resulting in a patchwork of 'legacy' systems that are incompatible with data sharing (ADAM, 2020). This makes the objective of integrating operations across multiple organisations significantly more challenging. COCIR

(The European co-ordination committee of the radiological, electromedical and healthcare IT industry) has developed a digital health 'roadmap' to support integrated care (COCIR, 2017). This describes a process by which all stakeholders capture the necessary patient data, aggregate and synthesise it so that it is meaningful, and share it within multidisciplinary teams to enable care delivery based on agreed pathways. Such ambitions for data sharing are indeed a collective desire amongst those working in integrated care (de Bruin et al 2020). However, with regard to the COCIR roadmap, evidence of the its use and effectiveness is not visible, and as with other such roadmaps, it may remain aspirational for reasons described in the next section.

Implementation of digital technologies

Implementing innovative technologies has proven to be complex and time-consuming and alone will not ensure a person-centred approach to care. The only study to address implementation focused on the barriers from a service perspective (Steele Gray et al, 2018). Other authors highlighted regulatory, technological and economic barriers which limit the adoption of novel technologies in healthcare (Melchiorre et al, 2018). While a study by Desmedt et al (2017) on the use of technology tools in integrated care reported improved management processes, enhanced care integration and quality of care, barriers to implementation seemed to predominate. They included familiar issues such as inadequate funding, interoperability problems between systems, inadequate technical support and infrastructure, lack of skills amongst users and providers, a lack of a legislative framework and privacy issues.

However, the 'how to' approach from a professional delivery perspective is taken up by others, providing some much-needed guidance. A systematic review of eHealth implementation by Mair et al (2012) used Normalisation Process Theory (NPT) to identify salient implementation factors within themes of coherence, cognitive participation, and collective action. Such frameworks are useful, but person-centredness may become lost within a professionally driven agenda, and indeed an evaluation of this framework's effectiveness is yet to emerge. Mair et al (2012) observe that while healthcare providers are increasingly seeking to use eHealth systems, uptake and utilisation in practice have not always matched this desire, signalling the importance mentioned above of cultural and other areas of resistance.

Safety and Governance

While there was a relatively limited reference to safety and governance in our studies, the implementation 'perils' concerning privacy consequent to the cornerstone of effective and collaborative 'macro-level' integrated care working must be acknowledged (Nicholson et al 2018) (R10). With this in mind, commentators argue that organisations themselves can actively frustrate progress. Auschra (2018) discusses how existing regulations can impede inter-organisational collaboration, either forbidding or making the implementation process

complicated, costly and time-consuming for the partners involved. The legally required focus on bureaucratic procedures by organisations within the public sector can slow things down and ultimately hamper implementation and progress, particularly regarding patient data exchange.

When it comes to personal privacy concerns, Dhillon et al (2016) indicated their presence among users of social media, and these concerns clearly and increasingly prevail among all users of technology on a much wider scale. Solangi et al (2018) describe how we now have a connected global, immersive, and invisible networked computing environment built through the continued proliferation of smart sensors, cameras, software, databases, and massive data centres, termed 'the Internet of Things'. However, the authors warn that the potentially enormous benefits might lead to unseen security and privacy issues and vulnerabilities that will cause various malicious attacks such as ransomware and eavesdropping. Projecting this to the eHealth arena, authors as far back as 2006 have warned of the potential susceptibilities of the 'new age' of electronic patient records and sensor networks for monitoring (Meingast et al, 2006). These authors asked salient questions such as: Who owns the data? What type of data, and how much data, should be stored? Who can view a patient's medical record? and to whom should this information be disclosed without the patient's consent? Privacy aside, Skar and Sonderberg (2018) note that there are limited discussions about ethical aspects when implementing eHealth services. They call for more knowledge about ethical aspects when designing services to preserve patients' integrity, dignity and autonomy (R1).

For example, today, the increasing use of Amazon's Alexa in the health information arena, is stirring anxieties. The contract formed in 2019 between the NHS and Amazon for a health information licensing partnership has fuelled privacy and use concerns. While the NHS does make the same information freely available on its website, Amazon is a powerful US platform giant with a massive e-commerce business (Lomas, 2019). Some are concerned that this new partnership lacks information around data protection, patient confidentiality and safety (Downey, 2019). The instigation of the General Data Protection Regulation (GDPR) in 2018 intends to afford some protection. It is seen as the most rigid privacy and security law in the world with mandatory rules for how organisations and companies use personal data. It imposes obligations onto organisations anywhere, if they target or collect data related to people in the EU, with harsh fines against those who violate standards. However, while personal and health data are heavily protected under GDPR in the UK, Amazon Alexa do not comply with the same laws. While health information remains a lucrative commodity in many healthcare systems, the ability of services to create a safe and well-regulated technological medium to advance wellbeing could be hampered.

Moving the discussion to an overall critical commentary of our approach, it can be seen that there were a small number of studies reviewed that varied in quality and generalisability.

Most studies were pilot or feasibility studies, not always linked to a broader context and not easily transferable or scalable. No technologies described health data analysis, according to Melchiorre et al's (2018) framework. Furthermore, samples of older users were limited and seemingly drawn from those who were more technologically adept, explaining perhaps the positive evaluations in some cases (Gordon and Hornbrook, 2018). The findings also emphasised that older people should not be viewed as a homogenous group when considering technology development and the strategies needed for acceptance and use.

Given the rapid deployment of technology in health, integrated care does not appear to foster progress in this area, particularly regarding implementation (Steele Gray et al 2018). Co-ordination between health and social services continues to be a challenging issue (Bousquet et al 2019). Electronic health records seemed to be the only facet of integrated care co-ordination that was digitalised. Klein et al's (2017) continuity of care document has made some strides in user control. However, most electronic records were used as tools for healthcare providers with narrow access and applicability for users. While staff were trained in eHealth tools, this did not seem to be provided for patients or carers. In terms of innovation, only around one-third of the studies used tools which were specifically developed for that programme, with the authors concluding that the most advanced technologies had not been utilised.

Our reviewed studies' limited outcomes did appear to be in contrast to technologies that focus on non-integrated care, such as single pathologies such as stroke and heart disease, where interventions appear more effective (Radhafrishnan and Jacelon 2012; Esteban et al 2016). However, while they are clinically more straightforward to implement, such studies also acknowledge deficits regarding their lack of person-centredness in considering information needs (Triantafyllidis et al 2015; Davoody et al, 2016).

Despite the limitations of the review, the findings combined with a discussion of the wider literature enable us to put forward some recommendations for practice, targeted at integrated care teams, technology developers, integrated care systems and researchers (Table 3). These recommendations were arrived at by identifying and extracting the main points from the discussion from the perspective of a range of stakeholders and formulating these as recommendation statements.

Recommendations

(Table 3 here)

Conclusion

Most commentators agree that digital technologies are transforming the delivery of healthcare. However, there is evidence that the most novel technologies are falling short when it comes to person-centred care, and there are significant unresolved issues around

implementation. A fundamental challenge of current healthcare approaches is the development of unified technological care management and delivery systems. Healthcare is being driven towards community and home-based management, which could benefit from robust and safe digital systems. When it comes to integration, it is challenging to impose novel digital interventions upon a not optimally operational system, particularly concerning co-ordination. There is also an evident tension between balancing the development and roll-out of technological innovations and meeting the users' needs through meaningful involvement and evaluation.

References

ADAM (2020) "Integrated care systems – embracing the power of digital" Available at: https://www.useadam.co.uk/2020/05/12/integrated-care-systems-embracing-the-power-of-digital/, Accessed 14th December 2020

Arief, M; Nyguyen, H. and Saranto, K. (2013) "Barriers to and advantages of eHealth from the perspective of elderly people: a literature review", Finnish Journal of eHealth and e-welfare, Vol.5, No.2, pp. 50-56

Auschra, C. (2018) "Barriers to the integration of care in inter-organisational settings: a literature Review", International Journal of Integrated Care, Vol.18, No. 1, p.5. DOI: http://doi.org/10.5334/ijic.3068

Bowes, A. and McColgan, G. (2012). "Telecare for older people: Promoting independence, participation, and identity",Research on Ageing, Vol. 35, No.1, pp.32–49. Available at: https://doi.org/10.1177/0164027511427546. Accessed 20th December 2020

Boult, C., Green, A., Boult, L., Pacala,.J., Snyder, C., and Leff, B. (2009) "Successful models of comprehensive care for older adults with chronic conditions: evidence for the Institute of Medicine's "retooling for an aging America" report", Journal of the American Geriatric Society, Vol. 57, No. 12, pp. 2328-2337

Bousquet, J., Meissonnier, M., Michalet, V., Toupnot, A., Paccard, D., Nogues, M., Anto, J.M. Riso, J.P., Collomb, M., d'Abbotville, T. and Duranton, L. (2019) "A novel approach to integrated care using mobile technology within home services. The ADMR study", Maturitas, Vol. 129, pp.1-5, DOI: 10.1016/j.maturitas.2019.07.023

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology, Qualitative Research in Psychology, Vol. 3, No.2, pp. 77-101, DOI: 10.1191/1478088706qp063oa

Davoody, N., Koch, S., Krakau, I. and Hägglund, M. (2016) "Post-discharge stroke patients' information needs as input to proposing patient-centred eHealth services", BMC Medical Informatics and Decision Making, Vol 16 p. 66. DOI 10.1186/s12911-016-0307-2

de Bruin, S.R., Billings, J., Stoop, A., Lette, M., Ambugo E.A., Gadsby, E., Häusler, C., Oberman, K., Ahi, G-P., Reynolds, J., Ruppe, G., Tram, T., Wistow, G., Zonneveld, N., Nijpels, G., Baan, C. (2020) Different contexts, similar challenges, SUSTAIN's experiences with improving integrated care in Europe. International Journal of Integrated Care 2020: 20(2): 17, 1-5. DOI: https://doi.org/10.5334/ijic.5492

Desmedt, M., Pless, S., Dessers, E. and Vandijck, D. (2017) "Integrating and safeguarding care: the potential role of health information technologies", International Journal of Care Co-ordination, Vol. 20, No.3, pp. 112-118

Downey, A. (2019) "Amazon Alex partnership puts patient data 'at risk'", DigitalHealth. Available at: https://www.digitalhealth.net/2019/07/amazon-alexa-nhs-patient-data-safety/#:~:text=Personal%20and%20health%20data%20is,the%20same%20laws%2C%20Booth%20said.&text=Under%20GDPR%2C%20personal%20information%20can,It%20cannot%20be%20stored%20indefinitely. Accessed 8th December 2020

Dhillon, J.S., Wunsche, B.C, and Lutteroth, C. (2016) "Designing and evaluating a patient-centred health management system for senior", Journal of Telemedicine and Telecare, DOI:10.1177/1357633X15586082

European Committee of the Radiological, Electromedical and Healthcare IT industry (COCIR) (2017) "Digital health roadmap to support integrated care", Available at: https://www.cocir.org/uploads/media/17023_COC_Blueprint_24-04-17.pdf Accessed 14th December 2020

European Commission (2012) "eHealth Action Plan 2012-2020. Innovative healthcare for the 21st Century", COM(2012)736. Brussels: European Commission

Esteban, C., Moraza, J., Iriberri, M., Aguirre, U., Goiria, B., Quintana, J.M., Aburto, M. and Capelastegui, A. (2016) "Outcomes of a telemonitoring-based program (telEPOC) in frequently hospitalised COPD Patients", International Journal of COPD, Vol. 11, pp. 2919–2930

Gee, P; Greenwood, D; Paterniti, D; Ward, D and Millar, L (2015) The eHealth enhanced chronic care model: A theory derivation approach. *Journal of Medical Internet Research.* 17(4) e86

Gokalp, H., de Folter, J., Verma, V., Fursse, J., Jones, R. and Clarke, M. (2018) "Integrated telehealth and telecare for monitoring frail elderly people with chronic diseases", Telemedicine Journal and eHealth, Vo.24, No. 12, pp. 940-957. Doi: 10.1089/tmj.2017.0322

Gordon, M.P. and Hornbrook, M.C. (2018) “Older adults readiness to engage with eHealth patient education and self-care resources: a cross-sectional survey”, BMC Health Services Research, Vol.18, No.220. https://doi.org/10.1186/s12913-018-2986-0

Gress, G., Baan, C., Calnan, M., Dedeu, T., Groenewegen, P., Howson, H. and Vrijhoef, B. (2009) “Co-ordination and management of chronic conditions in Europe: the role of primary care - position paper of the European Forum for Primary Care”, Quality in Primary Care, Vol.17, No.1, pp.75-86

Gucin, N. and Berk, O. (2015) “Technology acceptance in healthcare: an integrative review of predictive factors and intervention programmes”, Procedia – Social and Behavioural Sciences, Vo.l 195, pp. 698-1704

Hagglund, E., Lynga, A., Frie, F., Ullman, B., Persson, H., Melin, M. and Hagerman, I. (2015) “Patient-centred home-based management of heart failure”, Scandinavian Cardiovascular Journal, Vol.49, No.4, pp. 193-199, DOI: 10.3109/14017431.2015.1035319

Hashi, I. (2016) “Case management promotion of social media for the elderly who love alone”, Professional Case Management, Vol. 21, No. 2, pp.82-87

The Health Foundation (2016) Person-centred care made simple: What everyone should know about person-centred care. Available at: https://www.health.org.uk/sites/default/files/PersonCentredCareMadeSimple.pdf. Accessed 2nd March 2021

Herman, M., Boehme, P., Hansen, A. Jansson, K., Rebacz, P. Ehlers, J.P., Mondritzki, T. and Truebel, H. (2020) “Digital competencies and attitudes toward digital adherence solution among elderly patients treated with novel anticoagulants: qualitative study” Journal of Medical Internet Research, Vol.21, No.1

Hirani, S. P., Beynon, M., Cartwright, M., Rixon, L., Doll, H., Henderson, C., ... and Newman, S. P. (2014) “The effect of telecare on the quality of life and psychological well-being of elderly recipients of social care over a 12-month period: The whole systems demonstrator cluster randomised trial”, Age and Ageing, Vol.43, No.3, pp. 334–341, Available at: https://doi. org/10.1093/ageing/aft185. Accessed 20th December 2020

Hirvonen, N., Enwald, H., Kansakoski, H., Eriksson-Backa., Nuguyen, H., Huhta, A. and Huvila, I. (2020) “Older adults views on eHealth services: a systematic review of scientific journal articles, International Journal of Medical Informatics. 135: 104031, Available at: doi: 10.1016/j.ijmedinf.2019.104031. Accessed December 20th 2020

Hopman, P., De Bruin, S., Forjaz, M., Rodriguez-Blazquez, C., Tonnara, G., Lemmens, L. Rijken, M. (2016) “Effectiveness of comprehensive care programs for patients with multiple

chronic conditions or frailty: a systematic literature review", Health Policy, Vol.120, No. 7, pp. 818-832

Klein, D.M., Pham, K., Samy, L., Bluth, A., Nazi, K.M., Witry, M., Klutts, J.S., Grant, K.M., Gundlapalli, A.D., Kochersberger, G., Pfeiffer, L., Romero, S., Vetter, B. and Turvey, C.L. (2017). "The veteran-initiated electronic care co-ordination:a multisite iniative to promote and evaluate consumer-mediated health information exchange", Telemedicine and eHealth, Vol.23, No.4, DOI: 10.1089/tmj.2016.0078

Lanzi, A., Wallace, S.A and Bourgeois, M.S. (2018) "External memory aid preferences of individuals with mild memory impairment", Seminars in speech and language, Vol. 39, No.3, pp.211-222

Long, L. (2006) "A critical review of technology acceptance literature", Available at: http://www.swdsi.org/swdsi2010/SW2010_Preceedings/papers/PA104.pdf Accessed 28/2/2018. Accessed 20th December 2020

Lomas, N. (2020) "Alexa where are the legal limits on what Amazon can do with my health data?" TechCrunch, Available at: https://techcrunch.com/2019/10/24/alexa-where-are-the-legal-limits-on-what-amazon-can-do-with-my-health-data/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAALpft3h81E6ZVgn94b3cStX_majnZGohX3Iv5hejh_0DMzcH2cQgUnmb5T-K6DRmssPxgrixRD2iuiCX4iEtj_11LGyUCshbpsmt-BnP43SHwZr6Yag1Pm7M0zoqLNdpkiTCOdhXouHHqPolWDJorL2UfFMJstv0a9VX_Qfc81kx, Accessed 8th December 2020

Mair, F., May, C., O'Donnell, C., Finch, T., Sullivan, F. and Murray, E. (2012) "Factors that promote or inhibit the implementation of eHealth systems: an explanatory systematic review" Bulletin of the World Health Organisation. Vol.90, pp.357-364

Maruthappu, M., Hasan, A. and Zeltner, T. (2015) "Enablers and Barriers in Implementing Integrated Care", Health Systems and Reform, Vol.1, No.4, pp. 250-256. DOI: 10.1080/23288604.2015.1077301

Meingast M, Roosta T, Sastry S. (2006) *Security and privacy issues with healthcare information technology.* Conf Proc IEEE Eng Med Biol Soc. 2006;2006:5453-8. doi: 10.1109/IEMBS.2006.260060. PMID: 17946702

Melchiorre, M., Papa, R., Rijken, M., van Ginneken, E., Hujala, A. and Barbabella, F. (2018) "eHealth in integrated care programmes for people with multimorbidity in Europe: Insights from the ICARE4EU project" Health Policy, Vol.122, pp. 53-63

Nicholson, C., Hepworth, J., Burridge, L., Marley, J. and Jackson, C. (2018) “Translating the elements of health governance for integrated care from theory to practice: a case study approach” International Journal of Integrated Care, Vol. 18, No.1, pp.11

Oberg, U., Orre, C.J., Isaksson, U., Schimmer, R., Larsson, M.D. and Hornsten, A. (2017) “Swedish primary healthcare nurses’ perceptions of using digital eHealth services in support of patient self-management” doi: 10.1111/scs.12534

Peek, S., Wouters, E., van Hoof, J., Luijkx, K., Boeije, H. and Vrihoef, H. (2014) “Factors influencing acceptance of technology for aging in place: A systematic review” International Journal of Medical Informatics, Vol. 83, pp.235-248

Radhakrishnan, K. and Jacelon, C. (2012) “Impact of telehealth on patient self-management of heart failure: a review of literature”, Journal of Cardiovascular Nursing, Vol. 27, No. 1, pp. 33–43

Santana, M.J., Manalili, K., Jolley, R.J., Zelinsky, S., Quan, H.. and Lu, M. (2017) “How to practice person-centred care: A conceptual framework” Wiley Online. Vol.2, No.2, Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/hex.12640. Accessed 20th December 2020

Skar, L., Soderberg, S. (2017) “The importance of ethical aspects when implementing eHealth services in healthcare: A discussion paper”, Journal of Advanced Nursing, https://doi.org/10.1111/jan.13493

Solangi, Z.A., Chandio, S., Aziz, M.S., Hamzah, M.S and Shah, A. (2018) “The future of data privacy and security concerns in the internet of things” IEEE International Conference on Innovative Research and Development (ICIRD) 11-12 May 2018,Bangkok Thailand. Available at:https://www.researchgate.net/profile/Zulfiqar_Solangi2/publication/325910112_The_future_of_data_privacy_and_security_concerns_in_Internet_of_Things/links/5bfd125a92851cbcdd749153/The-future-of-data-privacy-and-security-concerns-in-Internet-of-Things.pdf Accessed 8th December 2020

Snowdon, A., Schnarr, K. and Alessi, C. (2014) “It’s all about me: The personalisation of health systems” The World Health Innovation Network. Available at: https://scanhealth.ca/win/. Accessed: 17th September 2018

Steele Gray, C., Barnsley, J., Gagnon, D., Belzile, L., Kenealy, T., Shaw, J., Sheridan, N., Nil, P.W. and Wodchis, W.P. (2018) “Using information communication technology in models of integrated community-based primary healthcare: learning from the iCOACH case study”, Implemention Science, Vol.13, No.87

Triantafyllidis, A., Velardo, C., Chantler, T., Shaha, S.A,. Patonb, C., Khorshidi, K., Tarassenko, L. and Rahimi, K. on behalf of the SUPPORT-HF Investigators (2015) "A personalised mobile-based home monitoring system for heart failure: The SUPPORT-HF Study", International Journal of Medical Informatics, Vol 84, pp. 743-53

Turvey, C.L., Klein, D.M., Witry, M., Klutts, S., Hill, E.L. Alexander, B. and Nazi, K.M. (2016) Patient education for consumer-mediated HIE. A pilot randomised controlled trial of the department of veterans affairs blue button", Applied Clinical Informatics, Vol. 7, No.3, pp. 765-776, doi: 10.4338/ACI-2016-01-RA-0014

Valentijn, P.P (2016) "Rainbow of Chaos: A study into the Theory and Practice of Integrated Primary Care", International Journal of Integrated Care, Vol 16, No.2, p3
DOI: http://doi.org/10.5334/ijic.2465

Ventatesh, V., Morris, M., Davis, G. and Davis, F. (2003) "User acceptance of information technology: towards a Unified view", MIS Quarterly , Vol.27, No.3, pp. 425-448

Walker, C., Kopp, M., Binford, R.M. and Bowers, C.J. (2017) "Home telehealth interventions for older adults with diabetes", Home Healthcare Now, Vo.35, No.4

WHO (2018) "Definition of eHealth" Available at: http://www.who.int/ehealth/en/ Accessed 28th February 2018

Whitelaw, S., Mamas, M.A., Topol, E. and Van Spall, H. (2020) "Applications of digital technology in COVID-19 pandemic planning and response." Lancet Digital Health: 2: e35-40 https://doi.org/10.1016/ S2589-7500(20)30142-4

Whittemore, R. and Knafl, K. (2005) "The integrative review: updated methodology", Journal of Advanced Nursing, Vol. 52, No.5, pp. 546-554