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Benefits and barriers of technologies supporting working carers—A scoping review

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Abstract

Combining work and care can be very challenging. If not adequately supported, carers' employment, well-being and relationships may be at risk. Technologies can be potential solutions. We carried out a scoping review to find out what is already known about technologies used by working carers. The search included academic and grey literature published between January 2000 and June 2020. Sixteen relevant publications were analysed and discussed in the context of the broader discourse on work-care reconciliation. Technologies discussed can be classified as: (a) web-based technologies; (b) technologies for direct communication; (c) monitoring technologies; and (d) task-sharing tools. Technologies can help to make work-care reconciliation more manageable and alleviate psychosocial and emotional stress. General barriers to using technology include limited digital skills, depending on others to use technologies, privacy and data protection, cost, limited technological capabilities, and limited awareness regarding available technologies. Barriers specific to some technologies include work disruptions, limited perceived usefulness, and lacking time and energy to use technologies. More research into technologies that can address the needs of working carers and how they are able to use them at work is needed.

KEYWORDS

barriers, benefits, employment, scoping review, technology, working carers

1 | BACKGROUND

Prior to the ongoing COVID-19 pandemic, around 16% of the European working-age population had provided unpaid care to a frail, sick or disabled family member, friend or neighbour (Eurofound, 2015)—a number which has since increased dramatically (Carers UK, 2020; Power, 2020; United Nations, 2020). This unpaid care work is of substantial economic value; for example, Buckner and Yeandle (2015) estimated that unpaid care saves the UK economy roughly the same

amount as total annual public spending on their National Health Service (~£132 billion). More than half of the European carer population currently combine unpaid care with paid work, meaning that about 15% of all people in paid work are so-called “working carers” (Carers UK, 2019; Eurofound, 2015). Even before the COVID-19 pandemic, this number was expected to increase as more people require care, fewer formal services are available or affordable due to public funding constraints, and more people are needed in the job market for longer to support an ageing society—especially women who provide

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care more often (Broese van Groenou & De Boer, 2016; Buckner & Yeandle, 2015; Round, 2017; Yeandle & Buckner, 2007). Juggling caring and work can have substantial impacts on carers' health, relationships, and employment (Carers UK & Age UK, 2016; Yeandle & Buckner, 2007). According to King and Pickard (2013), providing care for ten or more hours a week significantly increases the likelihood of a carer dropping out of the labour market. This negatively impacts on carers' long-term financial situation, the labour market in terms of loss of skilled or experienced labour, and the economy and the public purse (Carers UK, Efc, & DoH, 2013; Pickard et al., 2018). Work can offer a stable income, respite from providing care and social support (Bourke-Taylor et al., 2011; Bruns & Schrey, 2012; Calvano, 2013). Caring is often seen as an opportunity to reciprocate, support a loved one in need and gain a sense of purpose (Bourke et al., 2010; Eldh & Carlsson, 2011; Hamblin & Hoff, 2012). However, to avoid negative impacts on carers' well-being, they must receive the support they need to be able to fulfil both roles.

2 | CHALLENGES FACED BY WORKING CARERS

2.1 | Conceptual framework of working carers' challenges and solutions

We recently conducted a comprehensive review on carers' work-care reconciliation challenges and potential solutions for them (Spann et al., 2020). That review resulted in the development of a conceptual framework that connects challenges to their potential solutions and highlights that solutions can create additional challenges (see Figure 1). The framework is a useful tool for those supporting or developing support for working carers to better understand the complexity of work-care reconciliation, identify carers' needs and recognise potential shortcomings or barriers to solutions.

Challenges directly originating from combining work and care are conceptualised as Primary Challenges (C1). Primary Solutions (S1) refer to solutions or support aiming to address Primary Challenges. Secondary Challenges (C2), in turn, can arise from these solutions—most of them resulting from accessibility issues – while Secondary Solutions (S2) aim to address these Secondary Challenges.

2.2 | External challenges

External Primary Challenges usually arise when work and care demands are in direct conflict, forcing carers to prioritise one over the other. In our previous review (Spann et al., 2020), we classified these as C1A, high and/or competing demands; and C1C, distance. Fluctuating and unpredictable care needs, worrying about the cared-for person's safety and well-being when at work, and having to manage care from a distance, can lead to work interruptions, loss of productivity and absenteeism. Unpredictable work demands such as overtime or extra shifts can make it more difficult to manage caring.

What is known about this topic

- About 15% of all adults in paid work in Europe have unpaid caring responsibilities.
- If not properly supported, combining work and care can put carers' employment, relationships, and well-being at risk.
- Technology plays a part in most peoples' lives but is rarely considered as a solution to support working carers.

What the paper adds

- The majority of studies about technologies to support working carers focus specifically on web-based technologies, leaving other types of technologies underexplored.
- Technology can be beneficial for working carers; however, barriers to accessing and using technology need consideration.

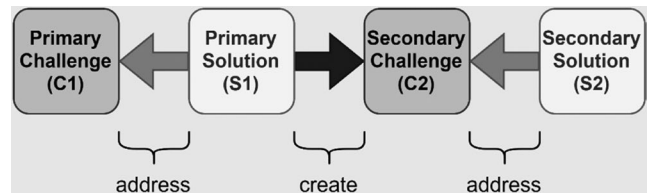


FIGURE 1 Conceptual framework of challenges and solutions of combining work and care (adapted from Spann et al., 2020)

S1 include receiving help with caring—both paid/formal and unpaid/informal—adjusting one's work situation (e.g., reducing work hours, requesting flexible work arrangements, looking for a more flexible job or becoming self-employed), taking leave from work, and using technology. All these solutions can create additional challenges (C2), including the time-intensive coordination of the care network, information about support and how to access it being hard to obtain, an unsupportive workplace, and formal care services being inadequate, unaffordable or not accessible.

Carers who delayed their entry into the job market or who must take leave from work for care-related reasons might find it difficult to return or find a new job (C1E) due to having a gap in their resume and finding their skills and knowledge insufficient or outdated. S1 include providing accessible opportunities for training and education, recognising caring skills on the job market, supporting carers to look for a new job or develop their business ideas and enabling carers on leave to stay in close contact with their workplace.

Many carers face financial pressure (C1F) resulting from care-related expenses or having to reduce work hours, take on more flexible but lower-paid work or having to take unpaid leave or even exit the job market. S1 include financial assistance like benefits, special insurance schemes or subsidised care services provided by the workplace or government (Bouget et al., 2016; Eurofound, 2015; Kröger & Yeandle, 2013; Yeandle & Buckner, 2017; Yeandle et al., 2017). C2

include carers not self-identifying, thus not seeking or making use of available financial support, or bureaucracy.

2.3 | Internal challenges

We found that internal Primary Challenges arise from the psychosocial-emotional experience of combining work and care (C1B) (Spann et al., 2020). They are often caused by interpersonal conflicts at the workplace, with the cared-for person or the care network, identity conflict, the distressing nature of caring, lacking confidence in their care skills and knowledge, perceiving themselves as unreliable at work, and carers' general evaluation of and perceived limited choice in their situation. These psychosocial and emotional stressors can lead to or exacerbate existing health concerns (C1D), especially if they persist over a long time and are inadequately addressed. S1 aims to strengthen carers' resilience by providing information and advice on caring, emotional support and psychoeducational programmes to help carers develop better coping and self-management skills and build up their confidence and self-efficacy. Finding time for self-care or seeking professional help for physical or mental health problems is also beneficial. C2 can result from carers not prioritising their well-being, having no time or energy to seek and engage with this kind of support, or services being inaccessible due to distance or conflicting business hours.

3 | REVIEW AIM

Our previous review demonstrated that technology plays a part in supporting working carers—although it is often merely a sidenote in a broader discussion about support for working carers and rarely explored in depth (Spann et al., 2020). The present review takes a closer look at the role technologies play. A growing body of research addresses technology for carers (Bergström & Hanson, 2017; Smith, 2008; Sriram et al., 2019; Wasilewski et al., 2017). However, little is yet known about whether and how carers use these technologies to reconcile work and care, and how work impacts carers'

experiences with technology. Andersson et al., (2017b) reviewed research using Information and Communication Technologies (ICTs) to support working carers. Their review, however, was restricted to carers of older family members and included articles that did not focus exclusively on working carers. Furthermore, technologies were restricted to ICTs, although a broad definition was used. Our review aimed to identify literature, both academic and grey, that explores the use of electronic and/or digital technologies of any kind to support working carers. Our focus is on identifying which technologies working carers used and on understanding their experiences with them, i.e., which benefits they derived and which barriers to accessing and using the technologies they encountered. Furthermore, we aim to situate our findings in the general discourse around work-care reconciliation. These broad questions necessitate a wide-ranging and exploratory yet systematic review approach, best accomplished by the scoping review methodology (Arksey & O'Malley, 2005; Colquhoun et al., 2014; Daudt et al., 2013). To understand technologies in the complex context of the challenges working carers face, we will relate our findings to the findings of our previous review (Spann et al., 2020), using our conceptual framework as an analytic aid.

4 | METHODOLOGY

Our research follows Arksey and O'Malley's (2005) scoping review approach, a method for evidence synthesis of diverse source material, including grey literature. It can be used to summarise and characterise an established or emerging field of research, thus highlighting gaps in existing evidence (Colquhoun et al., 2014). The main steps of the scoping review are displayed in table 1.

4.1 | Constructing and running the search (stages 1–3)

The operationalised major concepts used to construct the search and the corresponding eligibility criteria are displayed in Table 2. Search

TABLE 1 Summary of the scoping review framework (adapted from Davis et al., 2009)

| | |
|---------|---|
| Stage 1 | Identify the initial research questions and determine which aspects of the question are particularly important to facilitate the most appropriate search. |
| Stage 2 | Identify the relevant studies to comprehensively answer the central research question(s) and consider any time, date or budget constraints and range of sources. |
| Stage 3 | Select studies systematically but allow for flexibility with search terms and eligibility criteria which may be redefined as familiarity with the data progresses (iterative process). |
| Stage 4 | "Chart" the data , using a narrative descriptive-analytical framework method. Do not attempt to "weigh" the methodological quality of the evidence (broader approach than data extraction in a systematic review). |
| Stage 5 | Collate, summarise and report the results using a framework approach. |
| Stage 6 | Optional consultation with key stakeholders has the potential to add value, additional references and valuable insights. |

TABLE 2 Operationalised concepts and corresponding inclusion and exclusion criteria

| Concept | Explanation |
|----------------------|--|
| Working carer | A person in paid work who provides unpaid care ^a for a relative, friend or neighbour; care is understood as providing assistance with ADLs (activities of daily living) and IADLs (instrumental activities of daily living) as well as social or emotional support and monitoring the health and safety of the cared-for person; no restriction in terms of the condition of the person receiving care (e.g. carers of stroke survivors); |
| Included | Unpaid or "informal" carers: no formal training; no monetary reimbursement ^a ; carer is not employed by a care provider or hired by the person receiving care or their relatives; Carer is in paid employment or self-employed or had to give up work to care; no restrictions on work hours or workplace; Publication is focused on the challenges of combining work and care |
| Excluded | "Normal" childcare (bringing up a healthy child); short-term care (acute illness or accident) ^b ; voluntary work; domestic work; Publication does not focus on reconciling work and care |
| Technology | Technology is understood as any electronic and/or digital solution and can refer to both hardware and software; |
| Included | Any electronic and/or digital technologies used in the context of combining work and care |
| Excluded | Non-electronic and/or -digital technologies Technologies that are not used in the context of combining work and care |
| Also excluded | Non-English publications; incomplete references; film or book reviews; protocols; |

^aIn some countries, carers may receive a carers allowance or people receiving care may support them financially. These carers are still considered "unpaid" as they are not in the official employment of a care provider or the person they care for.

^bShort-term care may also lead to work disruptions. However, these disruptions are usually confined to a relatively short time with a foreseeable end and thus tend to have fewer long-term implications for carers' career, health, relationships and financial stability.

terms used to capture the "working carers" concept, consisting of terms used for "work" and "carer", were connected to search terms for the "technology" concept using the Boolean operator AND. The "technology" concept was intended to be as comprehensive as possible. We indexed all potentially relevant electronic and digital technologies and translated them into search terms. Potentially relevant technologies were identified from key publications and consultations with technology scholars. Publications (referring to both peer-reviewed and non-peer-reviewed literature) were eligible if they focused on working carers or had at least a distinct section or chapter on working carers, and if they mentioned any kind of technology in either the title or abstract. A pilot search in the Web of Science database found a very high number of publications using terms relating to "work" and "caring" in an irrelevant context. Therefore, after consultation with a librarian, we decided to limit the "working carers" concept to the titles to ensure that identified publications were more relevant to the research question.

The search was conducted in the MEDLINE (biomedical literature), CINAHL (nursing and allied disciplines), PsycInfo (psychology), Web of Science Core Collection (science, social science, arts and humanities), ASSIA (sociology), IEEE Xplore (technology) and Google Scholar (multidisciplinary) databases. As Google Scholar restricts the number of search terms that can be used in one search,

multiple searches had to be run to cover all technology search terms used in the other databases—for each of these searches, the first 100 results were extracted. The final search was conducted between May 30th and June 4th, 2018 and updated between June 8th and 15th 2020. It was limited to English and restricted to literature published after the year 2000, as the pilot search revealed no relevant literature before that. We also conducted an ancestry search of eligible publications and "standard Google" searches. Google searches are not generally part of the scoping review methodology. However, many organisations supporting carers and people needing care commission or conduct research which is often not indexed in the aforementioned databases. We aimed to capture this through the standard Google searches. We constructed three separate runs, using the most relevant search terms identified from the eligible publications. For each of those runs, the first 50 results were screened for relevance.

An example search string used in MEDLINE and the search terms used in the "standard Google" search are supplied as supporting information.

The search identified a total of 4,954 publications, which were imported into EndNote referencing software and screened for duplicates. Titles and abstracts of the remaining 3,440 publications were screened independently by AS and JV, thereby ensuring the

consistent application of the eligibility criteria (see Table 2). A Kappa of 0.82 was achieved, indicating a very high agreement (Landis & Koch, 1977). Any disagreements were resolved by SA. A total of 20 publications were identified from the academic databases, 11 of which were excluded after full-text review: two were conference abstracts whose corresponding full-text journal article was among the selected publications; one was a book chapter based on an included article; one was inaccessible, and the remaining seven were excluded because they did not fit the scope of the review or provided insufficient information on how technology was used. This left nine publications to be included in the final selection. One further publication was identified through the ancestry search and six through the Google searches. Figure 2 displays the flowchart of the search process.

4.2 | Data analysis/synthesis (stages 4&5)

Key aspects of the selected publications were charted using a data extraction sheet which was adapted throughout the process. General information (i.e. authors, date of publication, study location, study design), as well as more specific information including research aims, methods and results were mapped. NVivo Pro 11 software was used to enable thematic analysis (Braun & Clare, 2006). We first coded information about the kind of technology used and its intended purpose, and carers' perceived benefits of using the technology. We then related our findings to the broader context of the work-care reconciliation discourse to understand what Primary (C1) or Secondary (C2) work-care challenges these technologies provide solutions for. For that, we used the conceptual framework we developed (Spann et al., 2020) and described in the background section of this paper. Lastly, we analysed information on the perceived shortcomings of technologies or barriers to using them.

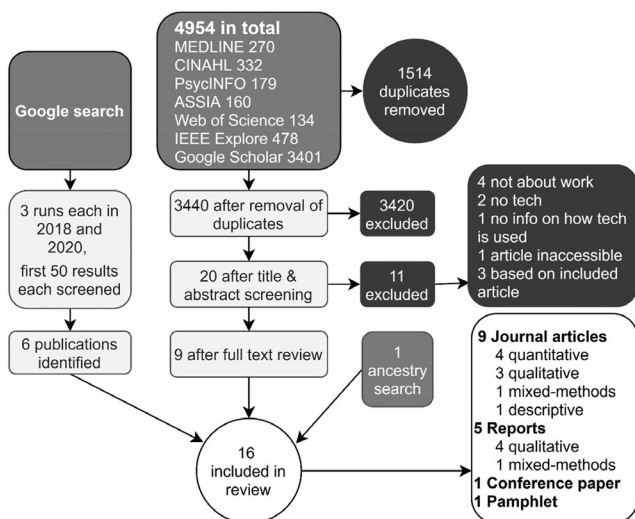


FIGURE 2 Flowchart of the search process

4.3 | Stakeholder consultations (stage 6)

Stakeholder consultations were conducted with members of carer support organisations and academics who specialise in studying carers in the Netherlands and the UK (n = 12) between October and December 2018. Ethical approval and consent from stakeholders were not required as they were approached solely to validate the findings of the review and provide feedback.

5 | FINDINGS

Nine of the included publications (56%) were peer-reviewed journal articles (JA) and seven (44%) non-peer-reviewed publications: five research reports (RR), one conference paper (CP) and one pamphlet (P) arguing for a technology-enabled future of care. Three journal articles were from Sweden, five from the USA, and one from the UK. All included reports originated from the UK, as did the pamphlet. The conference paper came from the USA. Five of the included publications focused exclusively on carers of older adults, three on carers of people with chronic conditions and/or people with cognitive impairment, and eight did not specify this. Table 3 lists the publications and their main attributes. Table 4 presents an overview of the findings which are now discussed in detail.

5.1 | Description of technologies

The following grouping of technologies was derived from the analysis: (a) *web-based technologies*, (b) *technologies for direct communication*, (c) *monitoring technologies*, and (d) *task-sharing tools*. *Web-based* and *monitoring technologies* were referenced the most, each referred to in 10 publications. Interestingly, most peer-reviewed publications were concerned with *web-based technologies* (Andersson et al., 2016, 2017a, 2019; Beauchamp et al., 2005; Klemm et al., 2014; Kuhn et al., 2008; Mahoney, 2004; Mahoney et al., 2008). *Monitoring technologies* and *technologies for direct communication* were mostly discussed in non-peer-reviewed, and only in four peer-reviewed publications (Andersson et al., 2019; Arksey, 2002; Mahoney, 2004; Mahoney et al., 2008) and *task-sharing tools* only in non-peer-reviewed sources (Carers UK, 2012b; Pickering & Thompson, 2017; Wilson et al., 2018).

5.2 | Perceived benefits of technologies

5.2.1 | Technologies can make work-care reconciliation more manageable (external challenges)

5.2.1.1 | Staying connected to the workplace

Web-based technologies and *technologies for direct communication* can facilitate carers working remotely (S1 to C1A and C1C), enabling them to provide care while still staying connected to their workplace

TABLE 3 Main attributes of included publications

| No | Reference | Pub. type | Country | Participants | Aim of Publication | Tech used/described |
|----|-------------------------|-------------------|---------|---|---|--|
| 1 | Andersson et al., 2016 | JA, Qual. | SWE | HCPs operating tech for working carers of older people | describe nursing and support staff's experiences of using ICT for information, e-learning and support of working carers of older people | Web-based "Anhörigstödportalen" & "Gapet"; Tech for direct communication: email & SMS; |
| 2 | Andersson et al., 2017a | JA Qual. | SWE | Carers of older people (full-time employed and seeking a job) | describe working carers' experiences of having access to web-based family care support network 'A good place' (AGP) provided by the municipality to support those caring for an older family member | Web-based "A Good Place (AGP)"; Tech for direct communication: email & SMS; |
| 3 | Andersson et al., 2019 | JA Quant. | SWE | Carers of older people (65+ years); self-employed or in paid employment/ work | describe the perceived value of different forms of support among Swedish working carers of older people, with a focus on ICT-mediated support | Web-based, Monitoring Tech, Tech for direct communication |
| 4 | Arksey, 2002 | JA Qual. | UK | Employed, self-employed or in full-time education | explore the extent to which the needs of employees with caring responsibilities are supported in the workplace | Tech for direct communication: Telephone |
| 5 | Beauchamp et al., 2005 | JA Quant. | USA | Carers of people with Dementia; employed at least part-time outside the home | evaluate the efficacy of a multimedia support programme delivered over the Internet to employed family carers of persons with dementia | Web-based "Caregiver's Friend: Dealing with Dementia" |
| 6 | Carers UK, 2012a | RR Mixed | UK | Employed, no further specification | exploring in more detail the evidence and opportunities afforded by telecare and telehealth technologies and the barriers to greater take-up from the carer's perspective | Monitoring tech: Telecare & Telehealth |
| 7 | Carers UK, 2012b | P - | UK | Not specified [chapter on technology & work] | survey the current landscape of technology for care and explore ways in which we can start to build a technology-enabled vision for the future of care | Web-based, Tech for direct communication; Monitoring tech; Task-sharing tools; |
| 8 | Carers UK et al., 2013 | RR expert groups | UK | Employed, no further specification | explore ways in which carers can be supported to combine work and care | Monitoring tech: medication reminders; fall detectors |
| 9 | Jarrold & Yeandle, 2009 | RR Qual. & review | UK | 50% in employment (special chapter on work & care) | carers' experiences of telecare | Monitoring tech: Telecare |
| 10 | Klemm et al., 2014 | JA Quant. | USA | Carers of people with chronic diseases (full or part-time employed) | evaluate psychosocial outcomes in employed family carers of people with chronic disease, who participate in non-/actively in online support, and whether psychosocial outcomes differ based on the format of online group support | Web-based: online support groups |

(Continues)

TABLE 3 (Continued)

| No | Reference | Pub. type | Country | Participants | Aim of Publication | Tech used/described |
|----|----------------------------|-----------------|---------|--|--|---|
| 11 | Kuhn et al., 2008 | JA Quant. | USA | Carers of older people with chronic diseases (employed in big corporations) | describe a pilot programme aimed at enhancing the self-efficacy and minimising the distress of employees who care for relatives with chronic medical conditions | Web-based "Powerful Tools for Caregivers Online (PTC online)" |
| 12 | Mahoney, 2004 | JA Descript. | USA | Carers of older people with chronic disease or cognitive impairment (Low-status occupational workers were specifically targeted) | development and testing of an innovative telecare system designed to support working caregivers concerned about vulnerable adults or older adults at home | Web-based "Worker Interactive Networking (WIN)"; Monitoring tech: wireless sensors "Nursense" |
| 13 | Mahoney et al., 2008 | JA Mixed | USA | Carers of older people (primarily "blue-collar" workers) | determine the feasibility of and receptivity to the first computerised workplace-based direct caregiver intervention and to assess the effects on businesses, working family caregivers and their elderly relatives | Web-based "Worker Interactive Networking (WIN)"; Monitoring tech: wireless sensors "Nursense"; Tech for direct communication: email |
| 14 | Pickering & Thompson, 2017 | RR Qual. | UK | Employed, no further specification | raise the profile of working carer, the difficulties they encounter and the impact this has; develop approaches to supporting working carers; promote the positive outcomes of support; provide solutions for culture change and promote positive attitudes of employers; co-produce 'Top Tips' to help employers retain working carers; | Monitoring tech: panic alarms, GPS technology, fall detectors; Task-sharing tools: "Rally Round"; Web-based; Tech for direct communication: telephone |
| 15 | Wilson et al., 2018 | RR Qual. | UK | Carers in semi-skilled; professional; skilled; and unskilled roles; | examine 'what works' in supporting carers to remain in or return to employment by testing a range of support interventions (technology among them) | Monitoring tech: Telecare; Task-sharing tools: "Jointly" & "Rally Round"; Tech for direct communication: phone or email; |
| 16 | Wingrave et al., 2012 | CP Descript. | USA | Carers of people with cognitive impairment | examine the design of a smart carer support system and how it is extended in a new system to support working carers | Monitoring tech: sensors, Artificial Intelligence; smartphone |

Abbreviations: CP, conference paper; Descript., Description; JA, journal article; P, pamphlet; Qual., Qualitative Research; Quant., Quantitative Research; RR, research report.

TABLE 4 Overview of findings

| Technologies used/described | Source | Purpose of technologies | Perceived benefits of technologies | Specific barriers | General barriers |
|--|---|---|---|--|--|
| Web-based technologies^a Training, information & resources; Peer networks; Care data storage; (mentioned: "A Good Place (AGP)", "Anhörigstödportalen", "Gapet", "Caregiver's Friend: Dealing with Dementia", "Powerful Tools for Caregivers online (PTC online)", "Worker Interactive Networking (WIN)") | P [1], P [2], P [3], P [5], N [7], P [10], P [11], P [12], P [13], N [14] | <i>For care:</i> peer and professional support; psychoeducation; information on caring and available support; store and share care-related information. <i>For work:</i> Stay connected to the workplace; flexible training; | <i>For external challenges</i> Staying connected to the workplace Accessible information Care management <i>For internal challenges</i> Save time and money Improve resilience & mental health Improve care relationship | Work disruptions No additional benefit perceived Having no time/energy to use technology | Limited digital skills Using technology depends on others Cost Privacy & data protection Limited technological capabilities Limited awareness of technologies |
| Technologies for direct communication Telephone, email, SMS, video-call technology | P [3], P [4], N [7], P [13], N [14], N [15] | communicate with the cared-for person, peers, HCPs, care network and workplace; arrange appointments; coordinate care | <i>For external challenges</i> Staying connected to the workplace Peace of mind Care management <i>For internal challenges</i> Save time and money Improve resilience & mental health Improve care relationship | Work disruptions | |
| Monitoring technologies Telecare (mentioned: personal alarms, fall detectors, medication reminders, various sensors, GPS technology), cameras and telehealth devices | P [3], N [6], N [7], N [8], N [9], P [12], P [13], N [14], N [15], N [16] | <i>Telecare and cameras:</i> ensure the cared-for person's safety at home; <i>Telehealth:</i> self-management of disease; | <i>For external challenges</i> Peace of mind Decrease the demand on the carer <i>For internal challenges</i> Improve care relationship | Work disruptions No additional benefit perceived | |
| Task-sharing tools (mentioned: "Jointly", "Rally Round") | N [7], N [14], N [15] | coordinate and share care tasks; store and share care-related information; communicate with care network; | <i>For external challenges</i> Care management | No additional benefit perceived | |

^aWeb-based refers to websites or -portals

^PPeer-reviewed; ^NNon-peer-reviewed.

and participating in meetings and online training. This can also help carers return to work after a longer care-related leave (S1 to C1E) (Carers UK, 2012b).

5.2.1.2 | *Peace of mind*

Monitoring technologies can give carers peace of mind that the cared-for person is safe and well when they cannot be physically present themselves (S1 to C1A and C1C) (Andersson et al., 2019; Carers UK, 2012a; Carers UK et al., 2013; Jarrold & Yeandle, 2009; Mahoney, 2004; Mahoney et al., 2008; Pickering & Thompson, 2017; Wilson et al., 2018; Wingrave et al., 2012). Andersson et al., (2019) found that the higher the work-care reconciliation conflict, the more carers value *monitoring technologies*. This was generally true for most kinds of support though, technological or otherwise. *Monitoring technologies* include cameras, telecare and telehealth. Telecare refers to technologies that help to keep an eye on the home and movements of the cared-for person. Some of these devices allow carers to view status reports of the collected data via web-portals (Mahoney, 2004; Mahoney et al., 2008) or on smartphones, using artificial intelligence to interpret the data (Wingrave et al., 2012). Telehealth devices allow carers to check on the health of the cared-for person from afar and alert healthcare professionals (HCPs) when measurements are unusual (Carers UK, 2012a). *Technologies for direct communication* enable carers to check in with the cared-for person and care network and respond to any potential crises or alarms raised by monitoring technologies (Arksey, 2002).

5.2.1.3 | *Decrease the demand on carers*

Monitoring technologies can decrease or eliminate the need for carers to continuously check in with the cared-for person (S1 to C1A and C1C). Additionally, they can increase the independence of cared-for people by providing reassurance that help is available if needed (Pickering & Thompson, 2017). Furthermore, telehealth can help slow down or halt disease progression and avoid adverse events (e.g., hospital admission), thus potentially preventing more demanding care in the future (Carers UK, 2012a, 2012b; Jarrold & Yeandle, 2009; Wilson et al., 2018).

5.2.1.4 | *Care management*

Task-sharing tools can make it easier for carers to coordinate their care network and share information (S2 to C2A) (Andersson et al., 2016; Carers UK, 2012a, 2012b; Pickering & Thompson, 2017). Carers value using *web-based technologies* to store personal and care-related information which makes it easier to share and coordinate with HCPs (Andersson et al., 2016, 2019). *Technologies for direct communication* enable carers to participate in medical appointments and care planning from a distance (S1 to C1A and C1C) (Andersson et al., 2019).

5.2.1.5 | *Accessible information*

Community or workplace operated *web-based technologies* can provide easily accessible information on available support (e.g., care services, financial support, worker's rights) and how to access it (S2 to C2A and C2F) (Andersson et al., 2017a; Carers UK, 2012b; Pickering

& Thompson, 2017). Andersson et al., (2019) found that carers particularly value information that can help them to have some rest and time for themselves, such as information on respite care.

5.2.2 | Technologies can help with psychosocial/emotional stress (Internal challenges)

5.2.2.1 | *Improve resilience and mental health*

Web-based technologies can provide information on caring in the form of peer-support groups and customisable care-related disease- or disability-specific educational resources (e.g., webinars, videos, podcasts, literature, and news items; S1 to C1B) (Andersson et al., 2016, 2017a; Beauchamp et al., 2005; Carers UK, 2012b; Kuhn et al., 2008; Mahoney, 2004; Mahoney et al., 2008; Pickering & Thompson, 2017; Wilson et al., 2018). Carers UK (2012b) suggested that employers can provide this kind of information via their company's intranet. Carers also receive advice on caring and emotional support from peers and professionals via *technologies for direct communication* (Andersson et al., 2016, 2017a, 2019; Carers UK, 2012b; Klemm et al., 2014; Mahoney et al., 2008; Pickering & Thompson, 2017; Wilson et al., 2018). Andersson et al., (2016) stated that this kind of support can help to improve carers' mental health and prevent potential physical, mental or emotional breakdown as carers can be reached earlier by HCPs (S1 to C1D). *Web-based* psychoeducational courses can reduce participants' depressive symptoms and stress levels and improve their overall quality of life (Beauchamp et al., 2005; Kuhn et al., 2008; Pickering & Thompson, 2017). Klemm et al., (2014) found that *web-based* support groups, both professionally facilitated and peer-directed, can equally help carers to achieve this, but only if they participate actively. For some carers, self-identification as a carer and public expression of emotions are problematic. Andersson et al., (2019) found that 25% of carers in their study preferred to be anonymous when meeting other carers. *Web-based technologies* allow them to preserve their anonymity, as well as their autonomy and take charge of their individual needs for support and information (Andersson et al., 2016, 2017a; Kuhn et al., 2008).

5.2.2.2 | *Save time and money*

A distinct benefit of especially *web-based technologies*, and *technologies for direct communication*, is that they are available at any time and place (Andersson et al., 2016, 2017a, 2019; Beauchamp et al., 2005; Kuhn et al., 2008; Pickering & Thompson, 2017). This helps carers save time as well as money as they do not have to spend it on travel and resources but can access support—generally for free—online (S2 to C2B and C2D; S1 to C1F) (Beauchamp et al., 2005). However, Andersson et al., (2019) found that carers value *web-based* social support slightly less than community peer groups which they attributed to limited digital skills and the impersonal nature of online interaction. *Web-based* resources, however, are valued because they can be revisited at any time (Kuhn et al., 2008). Personalising and individually tailoring information and educational content can also help carers save time (Andersson et al., 2016; Beauchamp et al., 2005; Carers UK, 2012b).

Carers appreciate websites that are either themed to ensure that they can access the information most relevant to their specific caring situation (e.g., specialised on dementia (Beauchamp et al., 2005) or chronic conditions (Klemm et al., 2014; Kuhn et al., 2008)) or receive access to closed specialised online peer-groups through their referring HCP (Andersson et al., 2016, 2017a).

5.2.2.3 | Improve care relationship

Monitoring technologies enable carers to check up on the cared-for person without having to call them all the time, reminding them of their dependence. These devices thus have the potential to improve the relationship between carer and cared-for person because conversations can revolve around more personal and meaningful topics (S1 to C1B) (Jarrod & Yeandle, 2009; Mahoney, 2004; Mahoney et al., 2008). Andersson et al., (2016) also highlighted that some people receiving care might feel guilty for or threatened by support services offered directly to carers. In this case, *web-based technologies* and *technologies for direct communication* may offer an unobtrusive way for carers to get the support they need without upsetting the cared-for person.

5.3 | Perceived barriers to uptake of technologies

Despite the demonstrated benefits of technologies for working carers, they are no panacea. There are various barriers to accessing or using technologies, some general, some specific to certain technologies.

5.3.1 | General barriers

5.3.1.1 | Limited digital skills

Carers' ability to use any kind of technology strongly depends on their confidence and digital skills (Andersson et al., 2016, 2017a, 2019; Mahoney, 2004; Pickering & Thompson, 2017; Wilson et al., 2018). Some carers, especially those with limited experience with digital technology, can be intimidated by the thought of having to use *web-based technologies* to access support or embarrassed by their lack of digital skills which can lead to avoidance (Andersson et al., 2016, 2017a). Digital literacy also poses a barrier for HCPs to use web portals and webchats to offer advice and support (Andersson et al., 2016). Digital skills do not appear to be such a big barrier for *monitoring technologies*. In the study conducted by Carers UK (2012a) only 5% of carers who were unhappy with devices reported them as being too complicated. Regardless, Wilson et al., (2018) have highlighted the importance of ongoing technical support.

5.3.1.2 | Using technology depends on others

Monitoring technologies often require active operation (e.g., wearing a device or activating it) by the person being monitored. Their ability to use technologies as intended determines whether they can fulfil their purpose. Inhibiting conditions mentioned were severely limited mobility or cognitive impairments which meant that people forgot to use

devices or were frightened by sensor technologies that changed their environment and routines (Carers UK, 2012a; Jarrod & Yeandle, 2009; Wilson et al., 2018). The cared-for person may also reject technologies out of fear, distrust or perceiving them as unnecessary, intrusive or dehumanising (Carers UK, 2012a; Jarrod & Yeandle, 2009; Wilson et al., 2018). In the study by Mahoney et al., (2008), carers' siblings opposed *monitoring technologies* for a parent, which the authors attributed to the acting out of historic sibling rivalries or conflicts. Moreover, an unsupportive workplace is a substantial barrier to carers' ability to use *technologies for direct communication*, *web-based* or *monitoring technologies* (Arksey, 2002; Mahoney, 2004; Mahoney et al., 2008). Mahoney et al., (2008) cited employers' concerns about data security, potential damage to IT equipment or increased demand on their IT support personnel, and potential loss of productivity through carers looking up information online or checking on monitoring technologies back home. Their research, however, demonstrated that these concerns were largely unfounded.

5.3.1.3 | Cost

The cost of technologies, especially *monitoring technologies* and connected services, can be a substantial barrier to their uptake (Carers UK, 2012a, 2012b; Jarrod & Yeandle, 2009; Mahoney et al., 2008) and can exacerbate financial pressure on carers.

5.3.1.4 | Privacy and data protection

Some carers are concerned about the protection of sensitive data that they share or store online via *web-based technologies* and are uncertain about what, and how much, personal information to reveal in online discussions with HCPs (Andersson et al., 2016, 2017a). Especially for *monitoring technologies*, privacy is an important issue. Cameras are often rejected by carers as too intrusive (Mahoney, 2004; Mahoney et al., 2008; Wingrave et al., 2012). In Mahoney's (2004) study, this concern was so strong that carers rejected *monitoring technologies* despite the assurance that no cameras would be used. Interestingly though, in a later study, the authors found that carers suggested cameras as an addition to the unobtrusive sensors installed as part of the study, albeit only in non-sensitive areas of the home (not bedrooms or bathrooms) (Mahoney et al., 2008). The authors reasoned that this might have been due to carers having established trust in the equipment and its operators. Jarrod and Yeandle (2009) similarly found that worries regarding the intrusiveness of *monitoring technologies* were allayed once people had been using them for a while. According to Mahoney (2004), ensuring maximum customisability and control of carers and cared-for people over the decision of which technology to use, how and when, is key to people using it.

5.3.1.5 | Limited technological capabilities

The limited capabilities of technologies were seen as problematic by Mahoney et al., (2008) and Wingrave et al., (2012), although rapid technological advancements in recent years may have taken care of most of these issues. In Mahoney et al.'s (2008) study, for example, the authors experienced difficulties with mobile network coverage

when implementing their intervention. Another issue identified was the management and interpretation of data collected by *monitoring technologies* (Mahoney, 2004; Mahoney et al., 2008; Wingrave et al., 2012). Technologies can record and generate an almost limitless amount and variety of data, including audio, video, motion and acceleration, pressure, and temperature; however, processing all these data can be difficult and expensive. Careful consideration should thus be given to the aspect(s) of the life of the cared-for person that requires monitoring, with suitable technologies selected accordingly. Wingrave et al., (2012) suggested using artificial intelligence to aid the interpretation of monitoring data. At present, an underdeveloped market and lacking sufficient consumer demand and investment hinder technologies from reaching their full potential to support working carers (Carers UK, 2012b; Mahoney et al., 2008). Also, some carers may be unable to use *web-based technologies* or profit from *monitoring technologies* if they have no internet access (Mahoney, 2004). Ultimately, technologies that do not operate reliably (e.g., often produce false alarms) can limit the trust of carers and cared-for people (Carers UK, 2012a, 2012b; Jarrold & Yeandle, 2009; Pickering & Thompson, 2017; Wingrave et al., 2012).

5.3.1.6 | Limited awareness of technologies

A major barrier is carers being unaware of technology's existence and how to access it, and limited understanding of the potential benefits it can offer (Andersson et al., 2016; Carers UK, 2012a, 2012b; Carers UK et al., 2013; Jarrold & Yeandle, 2009; Mahoney et al., 2008). Carers UK (2012a) found that 62% of British carers were unaware of available technology. Of carers who were aware of technology, 26% wanted to use it but did not know where to get it from. Andersson et al., (2016) assigned HCPs a vital role in raising carers' awareness of the existence and potential of technologies to support their roles. Employers, as trusted sources of information, can help to assuage carers' concerns regarding technologies and help them access them (Carers UK et al., 2013). Local government or social care services too can play a role in making carers aware of technologies and helping them to access them. This can, however, depend on their staff's knowledge and resources regarding technologies (Andersson et al., 2019; Carers UK, 2012a; Jarrold & Yeandle, 2009). Carers UK (2012a) has thus called for a culture change in which service providers and local government staff should automatically check for suitable technological support for carers when they get in contact and where carers themselves are encouraged to think about technology when they take up their caring role. Carers as users of technologies may thus create the demand required for the currently underdeveloped market to produce more suitable products (Carers UK, 2012b; Mahoney et al., 2008).

5.4 | Specific barriers

5.4.1 | Work disruptions

Technologies for direct communication and overseeing *monitoring technologies* can create additional demands on carers and potentially

cause work disruptions (Wingrave et al., 2012). *Monitoring technologies* must be suitable for the cared-for person, and who to connect them to, and who is best suited to respond are important considerations to avoid additional challenges for carers, particularly if they work a long way away (Carers UK, 2012a, 2012b; Wilson et al., 2018). Andersson et al., (2017a) found that carers generally did not use *web-based technologies* at work as they felt that they interfered with their jobs.

5.4.2 | Having no time or energy to use technology

Many carers may not find the time or energy to engage with *web-based technologies*, despite being aware of their potential benefits (Andersson et al., 2016, 2017a; Kuhn et al., 2008; Mahoney et al., 2008). In the study by Mahoney et al., (2008), this affected predominantly low-income carers from an ethnic-minority background.

5.4.3 | Perceiving no additional benefit

Some carers see no additional benefit to using technologies. *Web-based* resources, information or discussion forums can be seen as a waste of time if they are not relevant to the carer's situation (Andersson et al., 2017a). Some carers prefer face-to-face to online consultations with HCPs, in parts due to previous experiences of long response times to online queries or requests (Andersson et al., 2017a), HCPs facing challenges in maintaining a personal touch when managing high numbers of online interactions, and difficulties in explaining complex issues and emotions in a restrictive online format (Andersson et al., 2016). Webchats can also make carers feel pressured to interact with peers (Andersson et al., 2017a) or be difficult to sustain if not enough carers actively participate (Mahoney et al., 2008). *Monitoring technologies* may be seen as insufficient, especially if care needs are substantial (Jarrold & Yeandle, 2009; Wilson et al., 2018). As carers may feel that they can leave the cared-for person alone for longer periods, some carers worried that *monitoring technologies* could unintentionally increase the social isolation of the cared-for person (Wilson et al., 2018). Wilson et al., (2018) found that some carers did not perceive any additional benefit from using *task-sharing tools* and preferred to communicate directly with their care network or use mainstream social media like WhatsApp.

6 | DISCUSSION

This review provides an overview of the existing literature on technologies used by working carers. Not much is yet known about this subject despite a growing body of evidence on technology for carers (Bergström & Hanson, 2017; Smith, 2008; Sriram et al., 2019; Wasilewski et al., 2017). Andersson et al., (2017b) conducted a review on ICT-based solutions for working carers of older people that identified 14 articles. Their work focused on how ICTs can reduce

burden and improve working carers' well-being. For the present review, we have taken a more comprehensive approach with our inclusion criteria, not limiting the kind of technology to be included or the kind of care provided. Furthermore, we applied a more holistic outlook, using our conceptual framework from our earlier review (Spann et al., 2020) to relate our findings to the general work-care reconciliation discourse.

Our search only revealed 16 relevant publications within a 20-year period, six of which published more than ten years ago. This indicates that technologies as support for working carers have been identified long ago, but that a lot more research is needed to better understand which and how technologies can help to better reconcile work and care. Furthermore, the fact that seven of the included publications came from non-peer-reviewed publications highlights that a lot of important information within the informal care field is published in non-scientific literature. Despite most of the identified publications being very old, which is of particular concern in the rapidly progressing field of technology, there are still valuable conclusions to be drawn regarding how technologies can benefit working carers, which barriers must be considered when using them, and where further research is needed.

For this review we classified technologies as (a) *web-based technologies*; (b) *technologies for direct communication*; (c) *monitoring technologies*, and (d) *task-sharing tools*. However, as there are many gaps in the literature on which this classification is based, it might prove to be incomplete as technologies for working carers continue to be researched and better understood.

Apart from three studies which included *monitoring technologies* and two which included *technologies for direct communication*, one of those a very early study that mentions the importance of telephones, peer-reviewed articles focused on *web-based technologies*. These were used to enable professional and peer-support, store and share care-related information, and provide psychoeducational resources, information on caring and available support. It is unclear, however, if these resources and information were generally relevant for all carers or if the content was specific to working carers' challenges (e.g., how to manage workplace conflicts and ask for support for caring at work, strategies on how to balance work and care, etc.). This should be explored further, and future interventions should employ a co-design approach whereby working carers define their own information needs and priorities. In any case, it was established that working carers profited from these interventions, particularly as they were available independent of time and location. Further research on other technologies, notably *monitoring technologies* and *task-sharing tools* is much needed in the context of combining work and care.

Although it was not the express purpose of this review to evaluate the challenges-solutions framework developed in our earlier work (Spann et al., 2020), we found it useful to better understand the benefits and barriers of using technology in the broader work-care reconciliation discourse. Developers and distributors of technology for working carers should not only be aware of their advantages but should also consider potential shortcomings or unintended consequences. Data management, privacy and data security are important

matters to consider, as are carers' digital skills. The literature highlights that using technologies can often depend on others, including people receiving care. Cared-for people often had difficulty operating devices or did not want to use them, rendering technologies useless or even leading to conflict. Spann and Stewart (2018) identified several factors which influenced older people's decision to adopt technology, among them the impact of technologies on their sense of self and their self-efficacy. As *monitoring technologies* need to be useful, usable and acceptable—ideally even enjoyable—for carers as well as the person they care for, both sets of views and experiences need to be considered in the development and deployment of technologies. Often, carers did not see any additional benefit from using technologies, as was the case with *task-sharing tools* (Wilson et al., 2018). Empirical evidence regarding their usefulness for working carers is needed.

In the context of work-care reconciliation, technologies need to be usable at work. Line managers have been identified as the main gatekeepers for carers' access to resources and support at work (Carers UK, 2019; Spann et al., 2020). This finding has been echoed in this review with an unsupportive workplace presenting a major barrier to carers' ability to use technology at work. As highlighted by Mahoney et al., (2008), employers and line managers might have valid concerns regarding employees using technologies. However, as they have also demonstrated, these concerns might prove unfounded. Indeed, morale might even improve as employees feel better understood and supported by employers who enable them access to technologies. To allay any concerns employers might have regarding their carer employees' usage of technologies, it might be prudent to raise awareness and start a dialogue. The impact of job characteristics, i.e. the ability to take breaks when needed or leave the workplace, on workers' capacity to use technology and respond to care-related emergencies also need to be considered. More research is needed to understand which technologies are useful for working carers and how their work impacts their ability to use these technologies.

One additional area where more research is needed is telework or telecommuting, meaning carers using technologies to enable them to work from home while caring. Such technologies have not yet been discussed in detail. However, technologies are not necessarily the focus of interest when looking at telework. Hamblin and Hoff (2012) found that carers were frequently distracted when working and caring at home and Keck and Saraceno (2009) found that they often felt guilty when they had to prioritise work over keeping the cared-for person company (and vice versa). These findings were only side notes in their research though and warrant closer examination. Kossek et al., (2006) identified work-family boundary management and psychological appraisal as important factors regarding interpersonal conflict and mental health of teleworkers but their work did not focus on working carers. Future research should address this evidence gap. The COVID-19 pandemic has forced many people to work from home these past few months. It will be interesting to see how working carers have been impacted by this situation.

One subject identified by several of the publications included in this review is carers' limited awareness of technologies. Carers UK

(2013) found that while technology played a part in the lives of 98% of adults in the UK (e.g. for leisure, banking, shopping or communicating), only 30% of the general population used it to support health and care and 43% said that technology was the last thing they would consider as a potential source of help with caring. Limited awareness of technology prevents usage which in turn hinders further development and improvement of technologies that could be useful for working carers, because necessary user evaluations are missing, and developers and providers might not see the benefit of investing in them. Signposting carers to available technological support is urgently needed. This kind of support can be provided by HCPs, employers, carer support organisations or local authorities and other government departments.

7 | STRENGTHS AND LIMITATIONS

This review has several strengths. The scoping review methodology is uniquely suitable to synthesise evidence from both academic and grey literature. This was particularly useful as it allowed the inclusion of non-peer-reviewed sources exploring technologies used by working carers that had not been addressed by peer-reviewed publications. It was thus possible to get a fuller and more inclusive picture of technologies that might be useful to working carers and which could be investigated further. Situating our findings in the context of our earlier review (Spann et al., 2020) allowed for a better understanding of the benefits and barriers of technologies, contextualised in the broader work-care reconciliation discourse.

The review also has a few limitations. Considerable efforts have been made to ensure that all publications that addressed technologies for working carers would be captured in the review. These efforts included a vast array of technology-related search terms, a broad range of academic databases, an ancestry search of included publications and a Google search. However, the decision to limit the literature search to the English language, the “working carers” concept to the titles and the possibility that authors might have used terms to refer to technology that have not been captured in the search means that relevant additional publications might have been missed. It should be noted that all included publications originated from either the USA, UK, or Sweden. How both work and caring are organised in any given country strongly depends on the historical, cultural and political context (Bettio & Plantenga, 2004; Bouget et al., 2016; Eurofound, 2015; Kröger & Yeandle, 2013). Although technologies, insofar as they are available and accessible, can transcend political and cultural restrictions, it is unclear whether our findings are transferable to other countries.

8 | CONCLUSION

This review synthesised existing evidence relating to the technologies currently used by working carers. There is a dearth of research regarding technologies suitable to address the challenges faced by

working carers. Peer-reviewed publications are mostly concerned with *web-based technologies*. Other technologies such as *technologies for direct communication, monitoring technologies* and *task-sharing tools*, are mainly addressed in non-peer-reviewed publications which discuss many benefits and limitations. More robust research is needed to fully understand how working carers can benefit from these technologies.

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CONFLICTS OF INTEREST

All of the authors confirm that they have no competing interests.

AUTHORS' CONTRIBUTIONS

The lead author (AS) is a PhD student at the School of Health and Related Research at the University of Sheffield. AS took the lead in developing the review protocol. MH and LdW reviewed and approved the protocol. AS and JV screened and selected the relevant articles and resolved disagreements by discussion and seeking opinion from SA, MH, MS and LdW. AS extracted and analysed the data and drafted the manuscript. JV, MH, MS and LdW contributed significantly to the subsequent drafts and the final manuscript. All authors reviewed and approved the final manuscript.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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