Implementation of digital technology for connected resilient communities, enhancing access to public services

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Abstract. Digital technology has been presented as part of the solution to revolutionise public services, such as social care with its rising costs and demand. Here we present the outcome of an ongoing trial of CareTeam, a digital platform used during the redesign of the commission of domiciliary care for Portsmouth City Council, UK. CareTeam comprises a mobile app and sensors developed to support independent living, enabling communication and coordination of the wider care network. Qualitative interviews with care workers and commissioners were conducted to understand the impact on the commissioning and administration of care for clients and care workers/management. Responses indicate that technology can enhance care provision through increased transparency and collaboration. CareTeam provided (a) assurances to formal and informal carers that the care was actually being delivered and (b) improved adherence and adaptability to the care schedule delivering a more cost effective and robust service. While previous research has shown digital technologies perceived as being in competition with traditional service provision, CareTeam was found to support human interactions. Results show that connected services can be deployed to support assisted living through providing person centric, efficient and cost-effective support in the budget-restrained social services reality.

1. Introduction
In 2017/18 UK local authorities (LAs) spent over £18 billion on adult social care, which faces growing pressures including an ageing population, LA budget restrictions, large costs and low charges for care [1]. Projections indicate that by 2030/31 there will, under the existing budget, be a funding gap of ~£18bn [2]. Additionally, in 2016, approximately 2.2 million adults in the UK received informal and unpaid care, on average 3,500 hours per adult, valued at ~£59.5 billion to the economy [3]. The availability and type of social care provision varies significantly across countries with many facing similar issues to the UK [4]. Dementia, one of the main causes of care dependence for older adults (OAs) required a globally estimated 82 billion hours of informal care in 2015. Equivalent to more than 40 million full time workers, which is expected to rise to 65 million by 2030 [5]. This shows the persisting challenges in social care, with major implications on the health and wellbeing of those receiving and providing care. With its current state requiring change and enhanced capacity to reduce the burden on formal and informal care networks, assisting those unable to afford private care.
Digital technology has been proposed as part of the solution to aid social care provision [6]. However, the perceptions and reactions of care workers to technology have not been thoroughly researched [7]. An oversight when one considers that they not only care for those using the digital technology but are users and facilitators themselves, able to provide knowledge and confidence. Work is needed to investigate interactions with care practices and routines, understanding whether technology is intrusive and isolating [8] or whether it enhances rather than replaces human contact and personally tailored care.

The Adult Support Digital Platform (ASDP), termed CareTeam, is a collaborative research project between NQuiringMinds, the University of Southampton and Portsmouth and Southampton City Council [6]. It is a digital platform that comprises a mobile app and set of sensors, developed to support independent living by enabling monitoring, communication and coordination for a wider care network.

This paper presents the results of a six-month trial (January to June 2019) of the CareTeam platform with Portsmouth City Council (PCC), UK as part of a redesign of their domiciliary care. The platform was used to digitally monitor care visits with a cohort of 20 clients (adults who receive care at home and their informal care network) across the city. Clients had a range of needs, care plans and billing methods with a total of over 2,100 care calls conducted during the six-month period. The main objective of this research is to understand the impact of the implementation of digital technology for the commissioning and administration of care for clients and care workers/management. In the following sections, we document the research design or method, results and discussion reviewing the practical implications of the use of digital technology in social care with final conclusions and plans for future research.

2. Research design
Before the commencement of the trial all active PCC participants (care workers/management) participated in both group and individual training sessions where the platform was explained, demonstrated and practiced. Training was followed by a researcher and member of care management accompanying each care worker on their initial appointment to view and assist implementation of the app in practice. When sensors were installed in participants’ homes, a short questionnaire took place to establish household and building characteristics and to estimate expected activity. All ethical approvals for use of the platform and interviews were obtained including data sharing and security requirements.

At the conclusion of the trial (June 2019) semi-structured, guided interviews were conducted with all 9 active members of the trial (6 care workers, and 3 care managers; social worker, care coordinator and intervention lead). The care workers ranged in experience from 6 months to over 10 years with most having spent 2-3 years in the field, and backgrounds ranging from an economist, to a nurse and retail manager. Interviews were conducted in face-to-face meetings in a neutral setting, in order to reduce potential positive bias, by a team of two interviewers with a length of 60-90 minutes. The interviews comprised of 19 questions (excluding warm-up questions) with conversations allowed to naturally divert dependent upon the interviewee’s comments. Questions were grouped in 6 categories as follows: 1) past experiences of technology, 2) experience of technology during the intervention, 3) integration of assistive technology in day-to-day care practices, 4) capacity to integrate others in the network, 5) training process and visions for the future, 6) ethical, privacy and safety considerations. With responses classified and presented into three groups; (i) clients (ii) care workers and (iii) care management.

3. Results
3.1. Clients: “Provides peace of mind and is a life-line in being able to concentrate on my job”
Based on the interviews, the key benefit from the platform was the added reassurance from having direct, real-time access to care reports and times. Allowing individuals to remain, and in one case, return, to work dedicating a set time/times of the day to checking the app. Additionally, the platform enabled increased collaboration between formal and informal carers, exchanging feedback, notes and instructions (such as last-minute cancellations or changes in the clients condition) helping better utilize the informal care network and produce a multifaceted approach to care. This collaboration was the leading surprise benefit for care workers and management who had previously not considered the informal network as a valuable resource. However, the information sharing not only allowed the care
management to better understand and gauge a clients needs but also allowed them to adapt the care schedule to the informal carers’ needs and schedules allowing them time off when required.

Responses indicated that the clients found the platforms transparent, connected approach a major positive. Citing the enhanced understanding and acceptance of the process/mechanism as a result. Of being able to view the same data as the formal carers. Previous work has shown a tension between carers and those receiving care in the level of enthusiasm for technology (particularly that which sense motion) with the latter opposed to being monitored [8]. There was however no such opposition to the monitoring and timing of care reports from any of the users, which were able to provide similar levels of reassurance and confidence to the informal network without any added stress/anxiety from overt observations.

3.2. Care workers: “We feel part of the modern age”

Care workers, despite being enthusiastic toward the prospect of using technology, were found to be initially reluctant in using the platform. However, after becoming confident users of the platform, all interviewees appreciated the technology and did not wish to return to business as usual (handwritten notes and times recorded in the clients home), emphasizing the importance of trust and familiarity when considering the utilization of technology [9]. The key benefits discussed were the increased efficiency and ease of timing and recording care calls. Legibility was also an additional benefit with four of the six care workers stating that they had previously stopped reviewing care records due to illegibility, but during the intervention had made a habit of reading their clients previous reports either the night before or on the morning of their commissioned calls. Care workers are used to modifying routines and protocols in order to meet their clients’ needs [6] and so in turn should likely be adaptable to new technology. Interestingly however, only one carer regularly read reports in-between calls, with the rest remaining rigid to their set schedules, compartmentalizing the process.

The platform was found to allow further adaptation and compartmentalisation of the care process with carers no longer needing to write reports in a client’s home. Recording tasks have been found to take away from one’s primary duty to provide care [10] yet the reporting process as shown with the client responses are a vital part of social care provision. This separation of responsibilities reduced potential conflicts in carers duties allowing them to focus on their responsibility to administer care.

Being mobile based was found to reduce the learning curve when compared to PC based e-learning. Indicating that IT literacy is likely to be too vague a term and instead one should consider platform specific experience and knowledge in order to maximise adoption of technological solutions. Added to this, all carers had used technology in previous professions but had limited to no contact since working in care. Using digital technology was found to have positively impacted their self-esteem, generating wellbeing and pride in their work.

3.3. Care management: “CareTeam lead to a more capacious, cohesive and continuous system”

CareTeam was found to have a profound impact on the care commissioning and billing procedures. A review of 3,782 randomly selected PCC-commissioned care calls (10% of the PCC cohort) completed by a multitude of private care providers during November 2018 found that 74% of traditional system care calls were over commissioned. This rounding up of carers’ recorded times (which were often rounded up to the nearest 5/10-minute interval) resulted in 30% of the commissioned 174,120 minutes being undelivered. Therefore, the projected savings could amount to over £2.7 million per year solely from technology providing precise and accurate billing.

The digitalisation of reports also provided management with enhanced quality and quantity of information allowing them to identify issues, such as care induced dependencies and deterioration in health. In the traditional system social workers would need to frequent a client’s home in order to review the care plan, however with the digital platform they could actively review and adapt care packages in near real time. This adaptability resulted in adjustments to the care schedule taking place on average 90 days sooner than the traditional system’s 114 days from initiation of commissioned care. With 28% of ongoing adjustments increasing the length of the care coupled with a 72% decrease. Agreeing with literature on how enhanced flexibility and adaptability are of paramount importance for technological solutions [11] as it can create a more capacious system allowing for wider adoption of services.

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4. Conclusions
The results showed positive acceptance of the CareTeam app as a work tool for day-to-day care enabling transformation and changes to meet the needs of modern social care challenges. With the evidence provided resulting in PCC approving a full redesign of domiciliary care to be enacted in mid-2020.

There are potential complications that need to be researched further in future work, firstly the contracting of care workers is traditionally on a “zero-hours” contract where the concept of live charging could dramatically reduce a carers income and provide little to no incentive for them to provide the desired level of care. In order to provide a more capacious system workers would need to be on full-time contract that allow them to adapt to care needs of the client without having to lose out on personal income. Additionally, the use of technology can create new dependencies, one has to consider connectivity and robustness of any technological approach, paper-based information may only be available in one place but it is almost always available [7].

In essence, our research shows that appropriately designed technologies can be deployed to support assisted living through providing person centric, efficient and cost-effective support in the current budget-restrained social services reality. Such technology addresses many of the UN SDGs, especially SDGs 1 (No Poverty) and 3 (Good Health and Wellbeing). Technology is not the sole solution but represents a shift in networks of relations and responsibilities, where it was found to facilitate a combined communal capacious system that can increase the availability of social care, thus assisting in the challenge of ‘No Poverty’ by helping those most vulnerable in society receive care. Secondly, technology can impact on the goal of ‘Good Health and Wellbeing’ by reducing the stresses and complications on informal and formal workers, enhancing the wellbeing, and as a result, health of a large proportion of the population.

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