



Care robots in Australia and New Zealand: developing an ethical research roadmap

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Abstract—We conducted a series of semi-structured interviews with key stakeholders and experts in care robotics across Australia and New Zealand, looking at adoption drivers and impact areas of care robots. Respondents projected that robots would be used as assistive technology in care homes and hospitals, and would expand their social integration and capabilities. Concerns raised included privacy, loss of social integration, and misapplication of technology. Based on these findings, we develop a roadmap of recommendations for researchers in the area of social and care robots within an ethics of care framework.

Index Terms—Care, robots, therapy, regulatory frameworks, ethics of care.

I. BACKGROUND

Significant changes in relation to care services are now underway in many countries [1]. Care recipients are increasing in numbers, becoming older, have greater levels of disability and chronic illness, and higher expectations about service quality [2]. Simultaneously, care service providers are finding it increasingly difficult to recruit an appropriate workforce [3]. Technological advances offer a potential solution to these twin pressures, particularly in robotics, but there exists considerable danger when technologies are inappropriately implemented [4].

Robots have played a role in care - especially aged care - for some years, and a robust literature is beginning to develop [5]–[9]. However, there remains a serious lack of attention within public policy and public management fields to the actual implementation of robots in care settings, along with many other aspects of technological change [10]. Nor do we see the corresponding capability developments and levels of expertise in the public service that will be necessary to flexibly govern this technology. This is concerning from an ethical perspective, as technological interventions and robots in particular raise many thorny ethical questions, especially around privacy, security, and discrimination [11], and their intersection with the existing understanding of care ethics is complex and multi-dimensional.

Here, we explore the roles that robots play and are projected to play in care delivery, drawing on interview data from stakeholders across government, academia, and technology providers. Our aim is to examine how robots are being used across different care settings in Australia and New Zealand,

TABLE I
INTERVIEWEE AFFILIATIONS

Organisation	Number
Academic expert/Expert commentator	12
Provider of care services	5
Government department/agency	13
Supplier of technology	5

the challenges that these disruptive technologies create, and to begin a discussion between researchers and policy makers on the collision of robotics with the ethics of care, to create road-maps for the implementation and regulation of these new technologies.

II. METHODOLOGY

Ethical approval from the UNSW Human Research Ethics Committee (HC171025) was pre-obtained. A qualitative approach to research was adopted, making use of semi-structured interviews [12], which are typically used to gain a detailed picture of a respondent’s beliefs or perceptions of a particular topic area [13].

A purposive approach was adopted to identify interviewees [14]. We sought to engage a range of experts from across Australia and New Zealand with roles in policy, provision of care services, academics and experts, and technology suppliers (Table I).

Data was analysed using a thematic approach [15]. In accordance with our ethical approval, any quotes in the following text are not ascribed to individuals and are simply labelled according to country and interview sequence (eg. AU01, NZ03).

III. FINDINGS

A. Adoption drivers

What inspired or initiated the uptake of a particular robotic technology?

Concern about the labour force supply was a major factor. Testing possible models of robotically-enhanced care was a driver for one provider: “we know that there’s not going to be enough people around to look after the number of older people

who will need support.” (NZ03). For many, robotic technologies are employed to enhance the services that individuals can access, and therefore the quality of their care experience. This includes regulating relationships between carers and those they are caring for. Caregivers are not always able to accurately perceive or assess an individual’s emotional state, so the robot acts as a co-mediator, transmitting this information through the use of artificial moral emotions [16]. “The real driver for us was, how can we preserve dignity in this relationship?” (AU08). Dignity is a core value of ethical care practices [17].

Robots are being used as a way of driving efficiencies and cutting costs, not only in staff wages, but also in injury reductions and maintenance tasks. Robots may also grow income - a number of care providers adopted robotic technology to demonstrate their innovative nature and differentiate their services from others, attracting a broader clientele. Several care providers acquired robotic technologies not through carefully planned acquisition schemes, but through serendipitous relationships, and the challenge for them became how to integrate this technology into their existing practice, given it was not acquired in response to a specific need.

B. Impacts

Although a range of robots is currently in use in care services in Australia and New Zealand, the field is relatively nascent and there has not been a strategic approach looking at effective roll-out and coverage. Adoption has primarily occurred at a local level, with varying degrees of access to information and funding. Our interviews identified six commercial robots currently used in the care sector, of which only three have any significant market penetration in Australia/New Zealand. Manufacturers of these niche products are reticent about sales figures; our best estimates, sourced from interviews, financial reports, and academic studies, are given in Table II.

TABLE II
INDIVIDUAL CARE ROBOT SALES IN AU/NZ, AS OF 2018

Product	Number
Nao (Softbank) [18]	311
Pepper (Softbank) [18]	25
PARO [19]	100

At present robots have only a limited number of applications in home and residential care settings, due to technological limitations. The greatest current area of application is facilitating social interaction. “... telepresence robots are crucial to our particularly Australian environment, because we have people in both nursing homes and also the community who don’t get to see other people.” (AU14).

Therapeutic robots are often used to engage and calm. Some technologies are also introduced to reduce the burden on staff in these settings, including tiresome social tasks, such as repeating information: “[robots] are non-judgmental, they are patient, [...] they don’t transmit their own emotion, they don’t come with baggage that changes the interaction” (AU13). This

was seen as a positive for both the staff and those they are caring for.

Developing a relationship with a robot was seen as a way to mitigate social isolation and loneliness. Robots were described as giving individuals a purpose, or facilitating relationships with other humans, “It’s not so much what this robot can do, but its agency resulted in conversations.” (AU15). Robots in aged care settings are also seen as a useful way to enhance intergenerational relationships.

C. Concerns and projections

Concern that robots might physically or psychologically harm individuals, through inadequate testing and unforeseen consequences, was pervasive. Issues of accountability were also raised. Interactions with robots were seen as potentially changing the ways that individuals behave with other humans. People might come to be overly reliant on robots, to the exclusion of humans in care processes, or left with robots as their only form of social interaction. Technology obsession was seen as another potential danger, particularly with children.

Technologies are often being bought not because they fit well with the model of care, but because it makes an organization technologically distinctive. Many described the current robotics situation in care services as supplier-driven. Of a bulk robot purchase by a state government: “they’re apparently sitting in a cupboard and have done for the past couple of years.” (AU14). Solutions are not necessarily well-embedded in existing service delivery. “providers [...] just look at it from a business standpoint” (AU01). The cost of robots was not always seen as justified. Cost also affects how the technologies are used. Many of those who acquired robots talked about having to find ways to protect them, fearful of accidental damage or mistreatment. Often companion robots are locked away until specifically requested.

A further issue was implementation. Having access to individuals with the skills and capacity to set up and program the robot could be a significant barrier. Some talked about the need for rapid upskilling in order to be able to undertake these roles. Others had to rapidly recruit staff with new skills, who did not understand the core business of the organization. Technological literacy does not just apply to staff, it also applies to those being cared for. If the recipients do not understand the uses and limitations of the robots, the technologies will not be effective. Additionally, the provision of a fast and functional internet service is of significant import for many modern devices. In many parts of the world (including Australia and New Zealand), connectivity outside of major cities is sparse [20].

Privacy concerns were paramount; many thought insufficient attention had been given to this issue. But several interviewees acknowledged the tradeoff between privacy and independence. “They’re happy to trade some elements of privacy for autonomy.” (AU09). On the design side, cultural fit was often raised. Even basic health metrics may not be consistent across different settings - “How much is an appropriate amount of sleep? How much is an appropriate amount of movement?”

These things sound like they might be medical decisions, but they're being coded in by someone using some standard that may not [match] our national health standard." (AU04). Not having a clear sense of how a robot fits within an existing care model was cited as a reason the technology would not be successful.

Imagined future areas of expansion for robots included practical assistance and automation in hospitals and aged care settings, and social and intimate robotics. However a number of interviewees suggested that robots could never replace humans, pointing out that much of care work is not routine and hence very difficult to automate. The overall view was that robots would not replace humans in care delivery systems, but instead become commonplace tools that will help augment human skill. These technologies would need to be developed in consultation with professionals. "[technology] also has to be integrated with what everyone else is doing, both the IT systems and the other people who are involved." (NZ05).

Respondents often expressed discomfort with the idea of robots touching people: "I wouldn't want people to get more isolated with the security of a robot companion that they choose not to engage with other human beings, probably, because that human touch is so important for our wellbeing." (NZ02). Robots should also not appear 'too human' - interviewees thought robots should not in any way attempt to replace or mimic humans too closely, as this could confuse or upset individuals.

Not all effects will be immediately obvious. "There's a lot of secondary and tertiary effects associated with this stuff. A lot of it is things that we don't foresee. It's like invasive species." (AU08).

IV. CONCLUSIONS

The current care robot landscape in Australia/New Zealand is dominated by a few products which have some-to-little proven health benefits, while subtler technological implementations that present equal ethical and regulatory challenges fly under the radar. Respondents envisaged a strong role for government in terms of stewarding these technologies. Yet public service agencies are yet to engage in the type of strategic thinking that will eventually be needed: "The technology is already outpacing our ability to regulate and legislate for it." (AU08). Additionally, we are only beginning to develop ethical frameworks around technology implementation [21], [22].

Adoption of robotic technologies is not necessarily being driven by positive impacts on social relations or carer workloads, but by the desire to be seen to be offering innovative service products, or because of serendipitous opportunities and networks. Small care providers do not have the resources to invest in understanding the range of technologies available and the evidence base for each. In a largely supplier-driven market, this poses a potential risk of care providers buying technologies they do not fully understand.

Economically, robots may improve efficiency and cut costs, but returns on investment will take time, and for industries

operating under tight financial margins, the steep initial investment may be out of reach. The danger of prioritizing economic value is that it may undermine ethical practices, particularly individual dignity [11].

Critically, interviewees argued that we need governance and regulatory structures that do not attempt to presuppose the problem. The way interviewees spoke about government intervention was consistent with ideas of responsive regulatory approaches, which emphasise a 'light touch', ensuring the environment is still conducive to technological innovation. This responsive framework must also be integrated with an ethical foundation that prioritizes privacy, autonomy, and equity.

V. DISCUSSION

As a practice, care is understood to be structured by both conscious decisions and habitual dispositions [23]. Actions are guided by a social construction of the experiences people have had of care, in either direction [24]. However, unchecked, the interactions are also likely to perpetuate inequalities and oppressive power relationships [25], [26].

A. Roadmap: Researchers and end-users

Responsive regulation requires a third party or network engaged in regulation (in addition to state and business) to avoid capture or corruption [27]. Care providers, the medical community, researchers, and end-users can create this third-party network, but this demands a well-integrated approach with high degrees of communication between nodes. Work will be needed to establish connections and ties between research groups, institutions, communities, and other third-sector parties, in order to develop evidence bases and test new technologies, but researchers can seek out existing NGO health and care networks to establish trust and reach a broad and representative end-user base.

The form factor of care robots has significant impact on psychological and physical safety, and in some cases there is a tight development loop between end-users and designers [28]–[30]. However individual responses to robots are highly dependent on both culture and personal preference [31], raising a question of maintaining both economy of scale and therapeutic effectiveness, which researchers and developers will have to grapple with.

While the upskilling of the workforce necessary to deal with new technology presents an opportunity for job creation, in the short term it acts as a significant barrier to the uptake and effective use of robots in care. Educators, researchers, and developers are well-positioned to tackle this problem from both ends - by providing tools to increase technological literacy and capability among the population in general and care workers in particular, and also by adapting their interfacing modalities to lay abilities [32], [33]. This increases accessibility and lays the groundwork for inclusive equitable technology.

B. Roadmap: Researchers and policy makers

Respondents saw government's role as that of a regulator - creating a strong evidence base, developing standards, protecting data and privacy, and protecting the workforce. All of

these are frameworks that require the involvement of technologists and researchers. The aforementioned linked network of actors across research, industry, communities, and government can serve to establish a responsive and accessible set of information and databases. Researchers must be proactive in developing global benchmarks and evaluative frameworks, to allow cross-comparison of robots created in different cultural contexts. A number of interviewees suggested the establishment of ‘quality assurance certifications’, which technologies could receive once they’ve been determined to meet various evidentiary, quality, and longevity standards.

Existing government programmes (e.g. in Australia, the Global Innovation Linkages grants, Linkage Projects, Industry Growth Centres Initiative) can be leveraged to support work in this area. Few formal structures exist to bring researchers and policy-makers together, but these relationships can be developed (by researchers) through participation in steering groups, hosting joint workshops to establish a shared language and knowledge base, agency embedding of PhD students, and the creation of open resource and reference hubs accessible to and explicitly designed for policy-makers.

C. Roadmap: Researchers and the social contract

As we have outlined, many of the concerns about use of robots stem from insecurity and lack of assurance of safety in relationships where one can be considered vulnerable. Privacy and security are considered paramount, so standards around data collection and privacy need to be established that allow for useful, integrated technology and research activities without violating the implicit expectations of end-users. Researchers need to consider not simply data collection, but the storage and - if necessary - disposal and erasure of sensitive information.

Our research indicated that in the current division of labour between carers and robots, carers were perceived to prefer to leave the robot to do the time-consuming social interaction. If robots are going to continue to be developed for this function and also develop social emotional competence through AI, we submit that there are opportunities and risks which should be considered. In studies of care, the literature identifies that the person who is charged with acting in the responsibility of another is often poorly recompensed and undervalued [34], [35]. Robots can disrupt traditional patterns of inequality in care, not just through access arrangements, but by considering how the AI learns to read vulnerability and need. Additionally, the move to augmenting care with the use of robot should be seen as a recognition of the value of care work, and not as a replacement. These patterns of undervaluing care can also be disrupted with careful planning. Finally, there is an opportunity to consider more elegant practices of providing direct feedback from the cared-for throughout the care phases - to those who are charged day-to-day caring, and to those who hold the ultimate responsibility for that care.

A preliminary development plan for care robots which will help minimize adverse impacts can be framed around the following questions:

- what is the robot being introduced to do?
- what is the target group for this technology?
- what should be delivered as a result of implementation?
- has a comprehensive evidence base been sufficiently established? is there the potential for longitudinal and cross-cultural evaluation?
- what are the anticipated costs, both of the technology itself and any necessary development for staff/users?
- what are the anticipated impacts on relationships in a care context?
- can any potential adverse impacts or misuses be foreseen or anticipated?

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