Beyond Safety: Towards Non-Stigmatizing Mobile Emergency Watches That Empower Older Adults

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Abstract: The ageing population presents significant challenges for healthcare systems, creating a need for innovative digital health technologies (DHTs) to enhance autonomy, safety, and care outcomes for older adults. Mobile emergency watches offer a modern, non-stigmatizing alternative to traditional emergency buttons, combining mobility and functionality. This paper explores their potential to bring relief to older adults as well as overloaded healthcare systems by appealing to a broader audience and enabling more independent lifestyles than traditional emergency devices and addresses three core challenges: (1) balancing simplicity and reliability with advanced functionalities; (2) achieving equitable, personalised designs that balance non-stigmatizing aesthetics and functionality; and (3) navigating fragmented and evolving regulatory frameworks for DHTs. These challenges are analysed through the lens of a single case study, based on an expert interview and publicly available information on a mobile emergency watch startup. The paper discusses pathways to overcome these barriers, bridging gaps between innovation, user needs, and regulatory requirements.

1 INTRODUCTION

By 2050, nearly 1 in 4 people in Europe will be over the age of 65 (Eurostats, 2020). Germany, which is considered one of the five "super-aged" societies in the world, where nearly one-third of the total population will be over the age of 65 by 2050 (AARP, 2024a), is facing a crisis in older adult care, with demand far surpassing current capacity (Haß et al., 2024). The number of people in need of long-term care as defined by the Long-Term Care Insurance Act (§14 SGB XI, 2024), is expected to rise by 38% and total approximately 6.7 million people by 2050 (Federal Statistical Office, 2023).

These changing demographics create opportunities for digital health (and care) technologies (DHTs) that aim at improving health and care outcomes and enhance older adults' independence, autonomy, activity, and safety (Chung, Brakey, Reeder, Myers, & Demiris, 2023).

DHTs for older adults encompass a broad spectrum of technologies. Examples include assistive robots, AI voice assistants, smart scales, smart textiles, and other sensors that are used for various purposes such as health monitoring, fall detection, cognitive games, or promoting healthy lifestyle behaviours (Chen, Ding, & Wang, 2023). Some devices further promise to enable more effective communication among patients, family members, caregivers and healthcare providers by transmitting basic vital information or providing features that lead to better coordination of care and possibly improved health outcomes (Chen et al., 2023).

One particular type of DHTs are personal emergency response systems (PERS) which are also known as personal alarms or medical alert systems. These can be further differentiated into stationary or mobile systems, and into whether they are activated manually by users in case of an emergency or whether they automatically trigger alerts (Goyer, 2021)if sensing devices passively detect an emergency such as a fall (Casabona et al., 2023). PERS can further be programmed to either call an emergency response service centre or a personal caretaker or relative (Op den Buijs et al., 2018).

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Wearable emergency buttons connected to a home station and worn as a pendant, wristband, attached to a belt, or carried in a pocket have long been the standard in older adult care. However, their stationary design is increasingly out of step with the needs of an active, mobile, and independent ageing population (Chen et al., 2023)

Accordingly, popular consumer smartwatches, enhanced by custom apps and coupled with a 24/7 emergency response service subscription, are expected to be increasingly repurposed to serve as a modern alternative to the traditional emergency buttons (Orlov, 2022). As "mobile emergency watches," these devices work wherever mobile network coverage or Wi-Fi is available and set up. Their inconspicuous and customary design could encourage earlier and more consistent use, appealing to a broader demographic and ultimately aiming to empower older adults to maintain their active lifestyle, preserve their autonomy and mobility, and delay care dependencies.

Despite their potential, mobile emergency watches and similar digital health technologies face three core challenges that must be addressed to unlock their full potential in older adult care: (a) balancing simplicity with advanced functionality, (b) achieving equitable, non-stigmatizing, and personalised design, and (c) navigating fragmented regulatory frameworks.

This paper explores these challenges through the lens of a single case study based on an expert interview and additional publicly available information on the mobile emergency watch startup, discussing pathways to overcome these barriers and bridge the gaps between innovation, user needs, and regulatory requirements.

2 METHOD

This position paper aimed to capture insights and visions of Simon Prinz (hereafter referred to as interview partner SP) exploring the current state, challenges, and prospects of mobile emergency watches and DHTs for older adults.

SP is Head of Operations and Customer Success at Patronus, headquartered in Berlin, Germany. Patronus develops, sells, and operates mobile emergency watches which look like regular smartwatches as a *"less stigmatizing, mobile and modern version to the traditional red emergency buttons […] primarily for older adults"* (SP) by preserving their mobility, autonomy, and independence, enabling them to navigate life confidently and safely both within and beyond the confines of their homes (Schimroszik & Müller, 2022). SP was selected as an interview partner due to his expertise in both operational and customer success areas, providing firsthand insights into user behaviour, market trends, and regulatory challenges.

Following informed consent, a semi-structured expert interview was conducted via Zoom with SP, lasting approximately 50 minutes. The interview guide was structured along the following, overarching themes (cf. Appendix): *Implementation, Design Considerations, Future Developments.*

The automatically generated transcript of the interview was checked for completeness and correctness and pseudonymised by MN (18 DIN-A4 pages, single-spaced, 11pt font size). The transcript was then translated from German to English with DeepL and ChatGPT 4.0 and again checked for correctness and completeness by MN. A pragmatic thematic analysis approach was applied, focusing on identifying key insights relevant to the research scope rather than adhering to a formalized qualitative methodology. MN coded the translated interview thematically and distilled a first set of three main, central points. MN and SP then discussed and refined these propositions, before MN drafted the first version of the manuscript synthesizing and discussing the themes. To triangulate and further substantiate the interview data and the extracted central points, MN further collected additional information and quotes from public sources (e.g., newspaper articles, online customer reviews, legal texts). Both authors reviewed and refined the final version of the draft before submission.

Please note that SP participated in this interview in his personal capacity. His statements do not necessarily represent the official stance of Patronus but reflect his personal viewpoints and opinions.

3 DIGITAL OLDER ADULT CARE

3.1 "Don't Move Too Far Away from the Actual Focus": Balancing Simplicity vs. Innovation

First, there is a delicate balance between providing user-friendly core functionalities vs. integrating advanced features: DHTs in general and (emergency) smartwatches in particular seem to have untapped potential to evolve into multi-functional tools in older adult care supporting social, but also cognitive and physiological health. By integrating advanced, smart features like health monitoring and fall recognition (Bhattacharyya & Ghosal, 2023; Johnston, Worley, Grimmer-Somers, Sutherland, & Amos, 2010; Kennedy, 2023), cognitive stimulation training (Vinay et al., 2024) personalised lifestyle interventions (Kyytsönen, Vehko, Anttila, & Ikonen, 2023), or

GenAI-powered social interactions with voice assistants (Büchi, 2024), these devices could transition from reactive tools to proactive health companions (Yin et al., 2024).

Yet, the growing demand for additional smart features may introduce complexity that can overwhelm users, reduce battery life, and compromise the reliability of emergency functions. Eventually, striking the balance between simplicity and innovation will be critical for adoption and usability. "*We've intentionally kept the interface simple and robust by using a kiosk mode. This means users can't access standard apps, which helps avoid confusion and ensures the crucial emergency call features are always* reliably and *easily available at the click of a button. Features that proved too complex for older users or* are not essential *have been removed to keep the device intuitive."* (SP).

For the current generation of (still) less tech-savvy, not digital-native older adults, simplicity and reliability are likely crucial (Chung et al., 2023): their primary function as an emergency call tool must remain effective and intuitive first and foremost.

Second, older adults are a highly diverse group, with variations in gender, care needs (in Germany assessed in "care grades"), aesthetic preferences, and especially with regards to tech-savviness and (digital) health literacy and in terms of their cognitive and physical capabilities: *"[…] over 60% of our users are female. About 75% of our users have a care grade, with care grade 2 being the most common. Around 20% are at care grade 1, and another 20% are at care grade 3. Very few are in care grades 4 or 5, as these users are often in intensive care or assisted living facilities. […] We're also trying to reach people who aren't in care grades, like our parents, for instance, who might be in their 60s or 70s and still active but want to feel safer when, say, they go for a bike ride."* (SP)

Therefore, one-size-fits-all approaches are unlikely to meet diverse requirements, making personalization a critical aspect of digital older adult tech. At the same time, distinguishing genuine emergencies from false alarms remains a major challenge, as accidental presses, unintentional activations, or even the use of emergency buttons for social interaction can lead to system inefficiencies and unnecessary emergency responses. Indeed, in the case of Patronus as well as other PERS providers (Casabona et al., 2023), many users are quick to repurpose the watches for non-emergency functions, such as chatting, indicating a demand for broader use cases: "*About 20% of our users press the emergency button at least once a month, but only 5-10% of these are actual emergencies. The majority of button presses are accidental or for testing the device. […] There are a lot of people who use the button, […] on certain occasions like Christmas, because they don't have anyone else to call."* (SP)

Yet, false alarms may not only increase costs and response times but could also lead to alarm fatigue, reducing the likelihood of a rapid reaction by family caretakers in real emergency situations (Casabona et al., 2023).

According to SP, AI-based filtering mechanisms and adaptive interface designs that minimize accidental activations could become critical to ensuring emergency watches remain reliable and effective: *" For instance, AI could help filter emergency calls by identifying those that are genuine emergencies versus accidental presses. AI also has the potential for social engagement. For example, it could act as a conversational partner for users who feel lonely or isolated. On the analytical side, AI could process and evaluate usage data to identify trends, optimize demand balancing, and improve overall service delivery."* (SP)

3.2 "Don't Dog Tag Us": Towards Non-Stigmatizing, Equitable Digital Health Technology Designs for Older Adults

Beyond trading off essential core and advanced features, ensuring an equitable, non-stigmatizing, and personalized design remains another pressing challenge for mobile emergency watches as they must navigate competing demands: core functional requirements, such as long battery life, robust mobile network coverage, and GPS tracking (Yin et al., 2024) vs. aesthetic and unobtrusive aesthetics. Indeed, prior research found that frail older women were more resistant to using PERS despite a perceived risk of "long lies" (Porter & Ganong, 2002 as cited in Nyman & Victor, 2014). Long lies are situations where a fallen individual remains on the ground for extended periods, unable to summon help, leading to complications like dehydration, hypothermia, or rhabdomyolysis, and often resulting in long-term fear of falling, reduced mobility, and diminished quality of life (Kubitza, Schneider, & Reuschenbach, 2023). Nyman and Victor (2014) concluded that low use may be due to older people protecting their self-identity (Johnston, Grimmer-Somers, & Sutherland, 2010 as cited in Nyman & Victor, 2014), "in that using a personal call alarm may be perceived as a symbol of frailty and dependency".

According to SP, for many of Patronus' customers, *this is the primary feature why they opt for their device: "It's incredibly important. Many customers, or their families, choose our product specifically to avoid the stigma of traditional emergency buttons.*

We've heard stories of people who refused to wear the red buttons because they felt it marked them as frail or dependent. A more wearable and discreet device, like ours, helps users maintain a sense of normalcy and dignity. For example, customers can wear the watch while shopping without standing out as someone who needs constant monitoring" (SP)

Indeed, ageing is often, and in various ways, stigmatized (Nilsson, Andersson, Magnusson, & Hanson, 2024) which makes older adults reject products that visibly label them as in need of care (Orlov, 2022): *"My grandfather […] he never wanted one of these things, the classic device, because he didn't see himself as someone who now walks around with his red button like a recognizable dog tag, like someone who might need help because apparently he cannot watch out for himself anymore. [A colleague's] mother […] had a button like that back then, but never wanted to use it because […] she just didn't want to walk around like that. Then what had to happen happened: she fell somewhere, not wearing the emergency button, and was found in the bathroom three days later."* (SP)

Generally, there seem to be two pathways to reducing the stigma associated with emergency devices: While some companies have opted to develop dedicated age-inclusive devices for older adults that, for instance, resemble fashionable jewellery, hiding their emergency function, Patronus opted for re-purposing regular smartwatches into emergency mobile watches by equipping them with self-developed apps that allow direct phone connections to a caretaker of the person's choice and/or a professional 24/7 emergency call centre (Cavalry Ventures, 2022).

Indeed, since 2021 the level of wearable users among US older adults has risen from 17.5% (Chandrasekaran, Katthula, & Moustakas, 2021) to approx. 35% in 2024 (AARP, 2024b). Apparently, the introduction of the Apple watch and the dissemination of smartwatches in younger generations made the development of cool PERS wearables possible in the first place (Orlov, 2022).

Beyond age, equitable and inclusive design choices will need to extend to consider other features, and interfaces that cater to users' heterogeneous needs, abilities, and backgrounds. For instance, Figueroa, Luo, Aguilera, and Lyles (2021) stressed the need for feminist intersectionality in DHT design to tackle digital health's gender equities, especially for women with racial or ethnic minority backgrounds; and Nißen, Sou, and Kowatsch (2024) stressed the need for integrating female-specific data into human-computer interaction research. While the majority of Patronus' users are women, which is also in line with prior research (Casabona et al., 2023), specific adaptations for gendered needs in emergencies are currently limited with adjustments primarily focusing on aesthetics, such as smaller and unbulky watch sizes and feminine colours for the wristbands. However, feminist intersectionality in digital health extends beyond aesthetics. Research highlights how gendered social roles and systemic inequalities shape access to and engagement with digital health tools (Figueroa et al., 2021). In the context of mobile emergency watches, this could mean acknowledging that women, particularly those from racial or ethnic minority backgrounds, are more likely to be informal caregivers, bear higher caregiving burdens, and face digital exclusion. Indeed, according to SP, there could be significant potential to address social roles and gender dynamics in caregiving contexts as well as sex-specific health risks or conditions such as osteoporosis. Gender-sensitive design could enhance user engagement and health outcomes: "*We're aware of these concepts but haven't actively implemented them yet. Our primary focus has been creating an alternative to the traditional emergency button that is less stigmatizing and more appealing to older users. We recognize there's room for improvement, particularly in considering gender-specific needs. For example, women make up the majority of our users, and we've taken small accommodating steps like offering additional* wristband *options* and *testing beige and gold colour accents. But deeper considerations—like tailoring features to common health concerns among older women—are areas where we could grow."* (SP)

3.3 Regulatory Frameworks Lag Behind Innovation

Finally, beyond design considerations, regulatory frameworks present significant constraints and opportunities: Germany is a leader in leveraging digital technology to accommodate a healthier and more engaged older population (AARP, 2024a). As part of a broader effort to improve healthcare services to the population, Germany introduced the Digital Healthcare Act (German: Digitale-Versorgungs-Gesetz, DVG) in 2019. With the DVG, Germany was the first country in the world to introduce "digital health apps on prescription" (Gerke, Stern, & Minssen, 2020; Schmidt, Pawlitzki, Renard, Meuth, & Masanneck, 2024; Stern et al., 2022), a concept, commonly referred to as DiGA (short for German: "Digitale Gesundheitsanwendung", English: "digital health application"). By December 2024, there were 56 DiGAs listed, 36 of which were permanent and 20 of which were pilot projects (Federal Institute for Drugs and Medical Devices, 2024).

In 2021, as part of the Digital Health and Care Modernization Act (German: Digitale-Versorgungs-und-Pflege-Modernisierungs-Gesetz, DVPMG), Germany broadened the concept to also encompass "dig-

ital (long-term) care applications" (German: "Digitale Pflegeanwendung") or short "DiPAs". However, as of autumn 2024, no DiPA has been listed in the DiPA registry yet (Rybicki, 2024).

While the DVPMG was intended to establish a reimbursement pathway for digital tools in long-term care, but in practice, its implementation has been slow, leaving many innovative solutions—such as mobile emergency watches—without a clear regulatory framework for integration into the healthcare system. Indeed, Patronus has not (yet) filed an application for their mobile emergency watch to be listed as a DiPA, as regulatory requirements are difficult to fulfil and expensive (Hartung, 2024). However, personal emergency call devices are, generally speaking, part of the German Care Aid Directory (German: Pflegehilfsmittelverzeichnis), a list curated by the Federal Institute of Drugs and Medical Devices and reimbursed via people's statutory long-term care insurance: *"Technically, our device falls under the care aid directory, which outlines the devices eligible for reimbursement by health insurance. However, the directory was created decades ago, probably back in the 1950s or so, and only includes classic, stationary [emergency] devices with old-school [stigmatizing] wearables that do not function when you are a few meters too far from their base stations. […] We've been […] accepted as an equivalent, even though the directory still specifies certain criteria, like having a base station, which our device doesn't need, […] it is designed to be mobile. […] Our product essentially fits the same purpose, but this isn't universally recognized. Some insurers won't cover it, leaving users to pay out of pocket."* (SP)

Overall, the current regulatory landscape in Germany, where mobile emergency watches exist in a stopgap area, illustrates the need for modernization. Closing this regulatory gap will be essential to support innovation in care technologies: "*We hope to either change the existing category criteria or create a new category for mobile emergency devices in the next year."* (SP)

4 CONCLUSIONS

Ageing does not mean giving up on modernity—older adults want technology that is both functional and fashionable, too (Orlov, 2022). At the same time, tech-savviness and interest in digital health to maintain an active life are increasing in older adults (AARP, 2024b).

This paper highlights the potential of mobile emergency watches as a non-stigmatizing and more broadly appealing alternative to classic emergency buttons, designed to reach a wider range of users earlier in life. By preserving older adults' self-identity, freedom, and dignity, these devices are more likely to be adopted and worn consistently, contributing to better prevention of emergencies and delays in care dependency, which, in turn, has the potential to reduce the burden on the long-term care system.

To this end, three key challenges were critically discussed:

- **Balancing simplicity with advanced functionalities**: Older adults prioritize reliability, yet emerging features like fall detection, cognitive training, or AI-powered assistants may enhance long-term adoption and engagement. Ensuring that devices remain intuitive, accessible, and low-complexity while integrating meaningful smart features will be crucial.
- **Addressing aesthetic and functional design trade-offs**: Reducing stigma requires more than cosmetic changes. Mobile emergency watches should not only be discreet in appearance but also integrate gender-sensitive and inclusive features that reflect diverse user needs, caregiving roles, and digital health disparities.
- **Navigating outdated regulatory frameworks** – Mobile emergency watches remain in a regulatory grey area, caught between DiPA inaction and outdated classifications in the German Care Aid Directory. Until regulatory pathways evolve to support modern, mobile emergency solutions, users will face partial reimbursements or out-of-pocket costs, limiting broader accessibility.

While the single-case approach provides valuable insights, it limits the generalizability of findings. Broader studies across diverse user populations, PERS providers, and regulatory environments are needed to validate these conclusions and refine strategies for future development.

Nonetheless, the findings contribute to the growing discourse on how digital health technologies can meet the evolving needs of ageing societies, emphasizing the importance of innovation that is equitable, user-centred, and supported by clear regulatory frameworks.

REFERENCES

§14 SGB XI (2024). Definition: In need of care [Begriff der Pflegebedürftigkeit]. Retrieved on 16.12.2024 from https://www.sozialgesetzbuch-sgb.de/sgbxi/14.html

AARP (2024a). Germany. Retrieved on 10.12.2024 from https://www.aarpinternational.org/initiatives/aging-readiness-competitiveness-arc/germany

AARP (2024b). Insights from AARP's 2024 Tech Trends Report. Retrieved on 11.12.2024 from https://home.agetechcollaborative.org/blogs/mark-ogilbee/2024/08/01/insights-from-aarps-2024-tech-trends-report-part-2

Bhattacharyya, T., & Ghosal, P. (2023)**.** Healthier Aging: A Systematic Review of Different Fall Detection Techniques in Home and Outdoor Environments. In: Hussain, M. I. et al. (Eds.). *2023 4th International Conference on Computing and Communication Systems (I3CS)*, 1–6. doi:10.1109/I3CS58314.2023.10127548

Büchi, I. (2024). Alfred – get rid of loneliness and boredom [Alfred – hinweg mit Einsamkeit und Langeweile]. Retrieved on 16.12.2024 from https://www.margerite.ch/alfred-hinweg-mit-einsamkeit-und-langeweile/

Casabona, E., Campagna, S., Charrier, L., Viotti, D., Castello, A., Di Giulio, P., & Dimonte, V. (2023)**.** Evaluation of a Telemergency Service for Older People Living at Home: A Cross-Sectional Study. *Electronics*, *12*(23), 4786. doi:10.3390/electronics12234786

Cavalry Ventures (2022). *Cavalry x Patronus. Bringing healthcare for elderly people*. Retrieved on 30.11.2024 from https://medium.com/cavalry-chronicle/cavalry-x-patronus-5fecc4b86d22

Chandrasekaran, R., Katthula, V., & Moustakas, E. (2021)**.** Too old for technology? Use of wearable healthcare devices by older adults and their willingness to share health data with providers. *Health Informatics Journal*, *27*(4), 14604582211058073. doi:10.1177/14604582211058073

Chen, C., Ding, S., & Wang, J. (2023)**.** Digital health for aging populations. *Nature Medicine*, *29*(7), 1623–1630. doi:10.1038/s41591-023-02391-8

Chung, J., Brakey, H. R., Reeder, B., Myers, O., & Demiris, G. (2023)**.** Community-dwelling older adults' acceptance of smartwatches for health and location tracking. *International Journal of Older People Nursing*, *18*(1), e12490. doi:10.1111/opn.12490

Eurostats (2020). Ageing Europe - Statistics on population developments. Retrieved on 16.12.2024 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_population_developments

Federal Institute for Drugs and Medical Devices (2024). Directory of Digital Health Applications [DiGA-Verzeichnis]. Retrieved on 16.12.2024 from https://diga.bfarm.de/de/verzeichnis

Federal Statistical Office (2023, March 30). Long-term care projection: 1.8 million more people in need of long-term care expected until 2055. Retrieved on 10.12.2024 from https://www.destatis.de/EN/Press/2023/03/PE23_124_12.html

Figueroa, C. A., Luo, T., Aguilera, A., & Lyles, C. R. (2021)**.** The need for feminist intersectionality in digital health. *The Lancet Digital Health*, *3*(8), e526-e533. doi:10.1016/S2589-7500(21)00118-7

Gerke, S., Stern, A. D., & Minssen, T. (2020)**.** Germany's digital health reforms in the COVID-19 era: lessons and opportunities for other countries. *Npj Digital Medicine*, *3*, 94. doi:10.1038/s41746-020-0306-7

Goyer, A. (2021)**.** How to Choose a Medical Alert System. *AARP*. Retrieved on 16.12.2024 from https://www.aarp.org/caregiving/home-care/info-2017/medic-alert-systems-options.html

Hartung, T. (2024). *Approval of digital care applications a flop* [Zulassung von Digitalen Pflegeanwendungen ein Flop]. Retrieved on 11.12.2024 from https://www.carevor9.de/care-inside/zulassung-von-digitalen-pflegeanwendungen-ein-flop

Haß, L., Knippschild, S., Tönnies, T., Hoyer, A., Palm, R., Voß, S., & Brinks, R. (2024)**.** Projected number of people in need for long-term care in Germany until 2050. *Frontiers in Public Health*, *12*, 1456320. doi:10.3389/fpubh.2024.1456320

Johnston, K., Grimmer-Somers, K., & Sutherland, M. (2010)**.** Perspectives on use of personal alarms by older fallers. *International Journal of General Medicine*, *3*, 231–237. doi:10.2147/ijgm.s12603

Johnston, K., Worley, A., Grimmer-Somers, K., Sutherland, M., & Amos, L. (2010)**.** Personal Alarm Use to Call the Ambulance after a Fall in Older People: Characteristics of Clients and Falls. *Journal of Emergency Primary Health Care*, *8*(4).

Kennedy, R. (2023, March 21)**.** Personal Emergency Response Systems Are More Than Just About Fall Detection. *Managed Healthcare Executive*. Retrieved on 12.12.2024 from https://www.managedhealthcareexecutive.com/view/personal-emergency-response-systems-are-more-than-just-about-fall-detection

Kubitza, J., Schneider, I. T., & Reuschenbach, B. (2023)**.** Concept of the term long lie: a scoping review. *European Review of Aging and Physical Activity*, *20*(1), 16. doi:10.1186/s11556-023-00326-3

Kyytsönen, M., Vehko, T., Anttila, H., & Ikonen, J. (2023)**.** Factors associated with use of wearable technology to support activity, well-being, or a healthy lifestyle in the adult population and among older adults. *PLOS Digital Health*, *2*(5), e0000245. doi:10.1371/journal.pdig.0000245

Nilsson, M., Andersson, S., Magnusson, L., & Hanson, E. (2024)**.** Keeping the older population and their informal carers healthy and independent using digital technology: a discourse analysis of local policy. *Ageing and Society*, *44*(4), 812–842. doi:10.1017/S0144686X22000514

Nißen, M., Sou, D., & Kowatsch, T. (2024)**.** Digital Female Health: Advancing Women-Centric Human-Computer Interaction Research. *Mensch Und Computer 2024 - Workshopband, Gesellschaft Für Informatik E.V., September 1–4, 2024, Karlsruhe, Germany.* Advance online publication. doi:10.18420/MUC2024-MCI-WS14-199

Nyman, S. R., & Victor, C. R. (2014)**.** Use of personal call alarms among community-dwelling older people. *Ageing & Society*, *34*(1), 67–89. doi:10.1017/S0144686X12000803

Op den Buijs, J., Simons, M., Golas, S., Fischer, N., Felsted, J., Schertzer, L., Agboola, S., Kvedar, J., & Jethwani, K. (2018)**.** Predictive Modeling of 30-Day Emergency Hospital Transport of Patients Using a Personal Emergency Response System: Prognostic Retrospective Study. *JMIR Medical Informatics*, *6*(4), e49. doi:10.2196/medinform.9907

Orlov, L. M. (2022)**.** The Future of Wearables. In: Davis, M. et al. (Eds.). *Closing the Care Gap with Wearable Devices*, 17–40. New York: Productivity Press. doi:10.4324/9781003304036-4

Porter, E. J., & Ganong, L. H. (2002)**.** Considering the use of a personal emergency response system: an experience of frail, older women. *Care Management Journals : Journal of Case Management ; the Journal of Long Term Home Health Care*, *3*(4), 192–198. doi:10.1891/cmaj.3.4.192.57452

Rybicki, B. (2024). Digital Care Application – Lauterbach's Care Reform: Limits and Opportunities [Digitale Pflegeanwendung - Lauterbachs Pflegereform: Grenzen und Chancen]. Retrieved on 10.12.2024 from https://www.handelsblatt.com/technik/medizin/inside-digital-health/digitale-pflegeanwendung-lauterbachs-pflegereform-grenzen-und-chancen/100072551.html

Schimroszik, N., & Müller, A. (2022). *Saving Lives via Watch – Patronus Secures €27 Million to Modernize Home Emergency Systems* [Leben retten per Uhr – Patronus erhält 27 Millionen Euro für Modernisierung des Hausnotrufs]. Retrieved on 30.11.2024 from https://www.handelsblatt.com/technik/it-internet/altenbetreuung-leben-retten-per-uhr-patronus-erhaelt-27-millionen-euro-fuer-modernisierung-des-hausnotrufs/28721032.html

Schmidt, L., Pawlitzki, M., Renard, B. Y., Meuth, S. G., & Masanneck, L. (2024)**.** The three-year evolution of Germany's Digital Therapeutics reimbursement program and its path forward. *Npj Digital Medicine*, *7*(1), 139. doi:10.1038/s41746-024-01137-1

Stern, A. D., Brönneke, J., Debatin, J. F., Hagen, J., Matthies, H., Patel, S., Clay, I., Eskofier, B., Herr, A., Hoeller, K., Jaksa, A., Kramer, D. B., Kyhlstedt, M., Lofgren, K. T., Mahendraratnam, N., Muehlan, H., Reif, S., Riedemann, L., & Goldsack, J. C. (2022)**.** Advancing digital health applications: priorities for innovation in real-world evidence generation. *The Lancet Digital Health*, *4*(3), e200-e206. doi:10.1016/S2589-7500(21)00292-2

Vinay, R., Tommila, N. C., Schlögl, M., Klöppel, S., Biller-Andorno, N., & Kowatsch, T. (2024)**.** GRACE: Towards an Embodied Voice Assistant for Improving Quality of Life by Leveraging Elements of Cognitive Stimulation Therapy. In: Maedche, A. et al. (Eds.). *Proceedings of Mensch und Computer 2024, ACM Digital Library*, 560–565. doi:10.1145/3670653.3677521

Yin, R., Martinengo, L., Smith, H. E., Subramaniam, M., Griva, K., & Tudor Car, L. (2024)**.** The views and experiences of older adults regarding digital mental health interventions: a systematic review of qualitative studies. *The Lancet. Healthy Longevity*, *5*(11), 100638. doi:10.1016/j.lanhl.2024.08.007

APPENDIX

Interview Guide

The interview will be conducted as a semi-structured Interview. For this reason, the questions listed below are not conclusive, and further questions or more in-depth questions can be asked.

I Implementation

- What are/is the primary digital health technologies offered by Patronus?
- What is your main goal of offering your DHT (new revenue streams, cost-efficiency, improving older adult care, customer loyalty, …)?
- How does your watch address and excel in meeting the unique challenges of older adult care?
- What role do emerging technologies (e.g., AI, IoT) play for your device?
- What challenges have you encountered in scaling your watch?
- How does your business ecosystem look like?
- …

II Design considerations

- Have you implemented specific design considerations/concepts in the development of your technology for older adults (e.g., value-sensitive design, ethics by design, etc.)?
- What steps does Patronus take to ensure equitable access to care?
- Have you observed any sex or gender-specific barriers to accessing digital health solutions?
- To what extent are your solutions personalized to account for gender-related health needs?
- Are there conditions or health issues among older women that you feel are underserved by current digital health technologies?
- Do you generally see a market for sex- and gender-specific digital older adult care technologies?

III Future directions

- How do you see the role of Patronus Health evolving in the digital health space over the next 5-10 years, particularly regarding gender-inclusive innovations?
- What advice would you offer to researchers and practitioners aiming to design and implement inclusive digital health technologies?
- …