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Prototypes occupy an important place in the development of new products and are a well-established form of investigation in today's design practices. This paper focuses on helping future designers in the development process of Smart Bandages (SBs) prototyping for treatment and monitoring of diabetic chronic wounds (DCWs). Adopting a perspective of design as an intermediary between different stakeholders and embracing an interdisciplinary approach, this investigation demonstrates the complexity of innovation aspects in medical contexts and the need for new insights and conceptual frameworks to support medical practice.

The study introduces the concept of "*AI logic of care*" to advance an approach that combines Annemarie Mol's "logic of care" and AI tools prospects. The investigation brings into discussion George Canguilhem's work and supports a medical rationality that encourages experimentation, but also advises carefulness and modesty in the decision-making process. Long-term observation, experience and experimentation are key concepts encountered also in Mol's "logic of care" perspective. In both cases, it is about innovation; it is about the relationship between technology and care. As an emerging, inclusive, and interdisciplinary approach to prototyping, the "AI logic of care", which acknowledges the lack of a "care-centred design" in the research related to smart bandages, disentangles the complexity of innovation processes in medicine and the incorporation of AI in healthcare as a tool to strengthen the professional-patient relationship as opposed to the existing telemedicine format of the primary contact. The intention, as well as the hope, is to reconnect the

fragmented research context of smart bandage prototyping for the treatment and control of chronic wounds. As one of the major medical issues that involve constant monitorisation, DCWs are the centre of interest to several stakeholders. From patients, caregivers, and medical services providers involved in their monitoring and treatment to engineers, material scientists, and designers involved in the products used to treat them.

Smart Bandages are the starting point of reflection on the nature of prototyping and the place of care in the current design processes for medical products. Moreover, by assessing the logic of AI care in the development of these devices, the present article can offer insights into how user-centred design practices are run nowadays, as well as how they could be done in the near future.

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## Introduction

This article aims to introduce and discuss a new prototyping framework, the "*AI logic of care*", for the development of smart bandages (SBs) for monitoring and treatment of diabetic chronic wounds (DCW). Our investigation takes smart bandages as a case study for innovation in medicine in an effort to answer the lack of focus on the user-centred design perspective in the development of these types of devices. A smart bandage is a bioactive wound dressing that treats the wound bed and monitors the changes in wound parameters like biomarkers through the use of a biosensor that interacts with a wearable system on a chip or SoC to send them to a database (Zhang et al., 2021; Tandon et al., 2020; Brown, Ashley and Koh, 2018; McLister et al., 2016; Abrigo, Mcarthur and Kingshott, 2014; Mehmood et al., 2014). Smart bandages are expected to be a crucial development in wound care research due to their prospective healing characteristics (Abrigo, Mcarthur and Kingshott, 2014).

The smart bandage field is interdisciplinary in nature (Figure 1), involving research on diabetes, chronic wounds, active materials for wound treatment, bandage manufacturing technologies, market research, and the needs of users and care professionals. Nonetheless, after a thorough review of smart bandage (SB) prototyping processes found in the literature, we observed a lack of focus on the users' needs (in the sense of User Centred Design (UCD) perspective) in the development of this type of device. In general, the guidelines for these approaches are to evaluate interactions with devices, to have in mind the user skills, as well as their knowledge-based behaviour, decision-making biases, and a minimum number of device design iterations (Menold et al.,2017; Harte et al., 2014; Dow et al., 2011, Liu and Khooshabeh, 2003). This tendency can be seen both on the side of industrial practice, as well as in academic medical device design research in cases like connected health devices for older adults (Harte et al., 2014; Pols, 2012).

Therefore, this article aims to introduce the "*AI logic of care*", a framework that takes into consideration today's medical care constraints and speculates about possible future constraints derived from the incorporations of AI-driven tools. The study explores the potential use of these AI tools in healthcare, including their potential impact on employment and patient care. The paper also presents an overview of some potential challenges and concerns associated with the general use of AI in healthcare systems, such as data privacy, reliability, and safety, to mention a few.
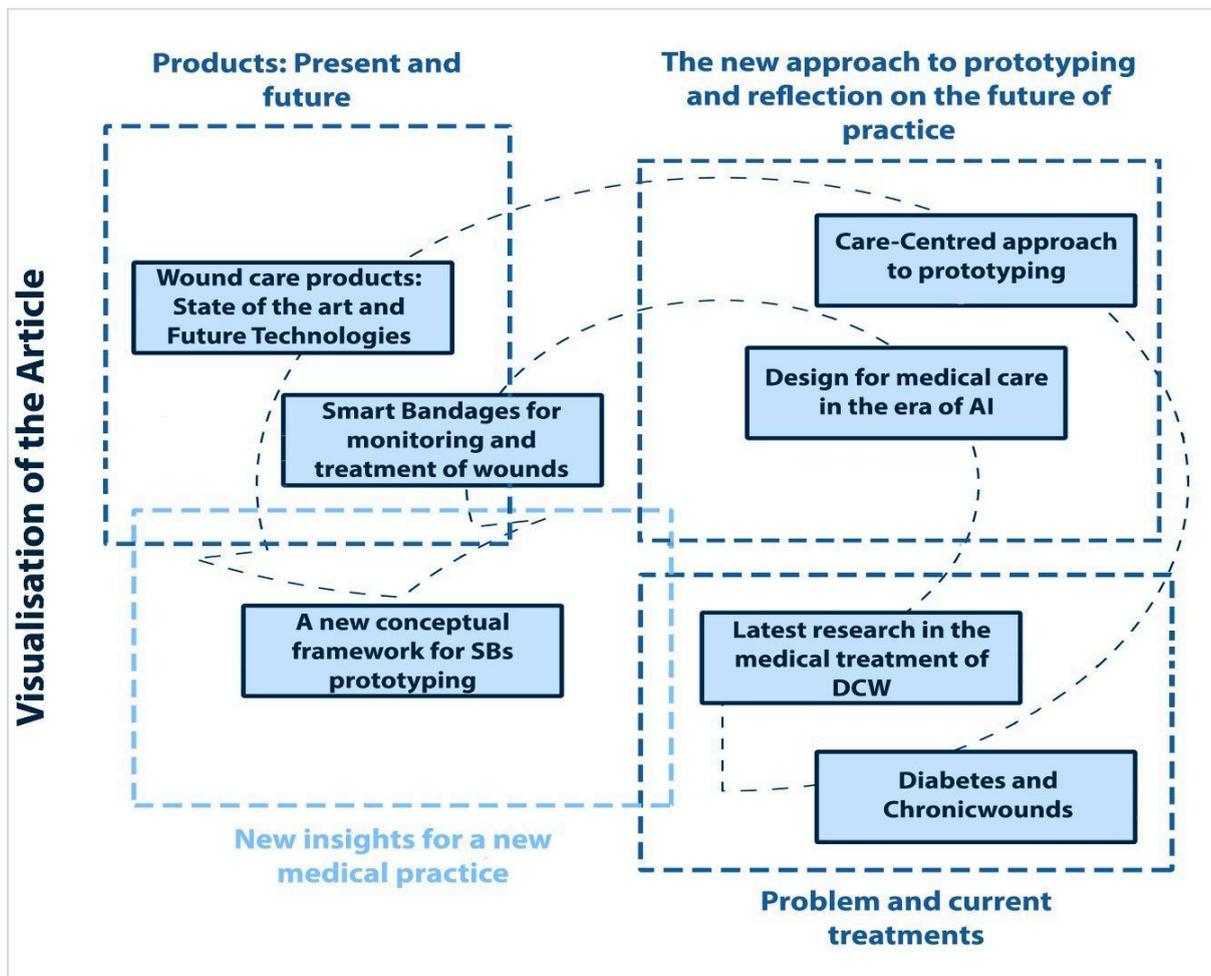
Figure 1. Visualisation of the approach, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R.(2023) "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.
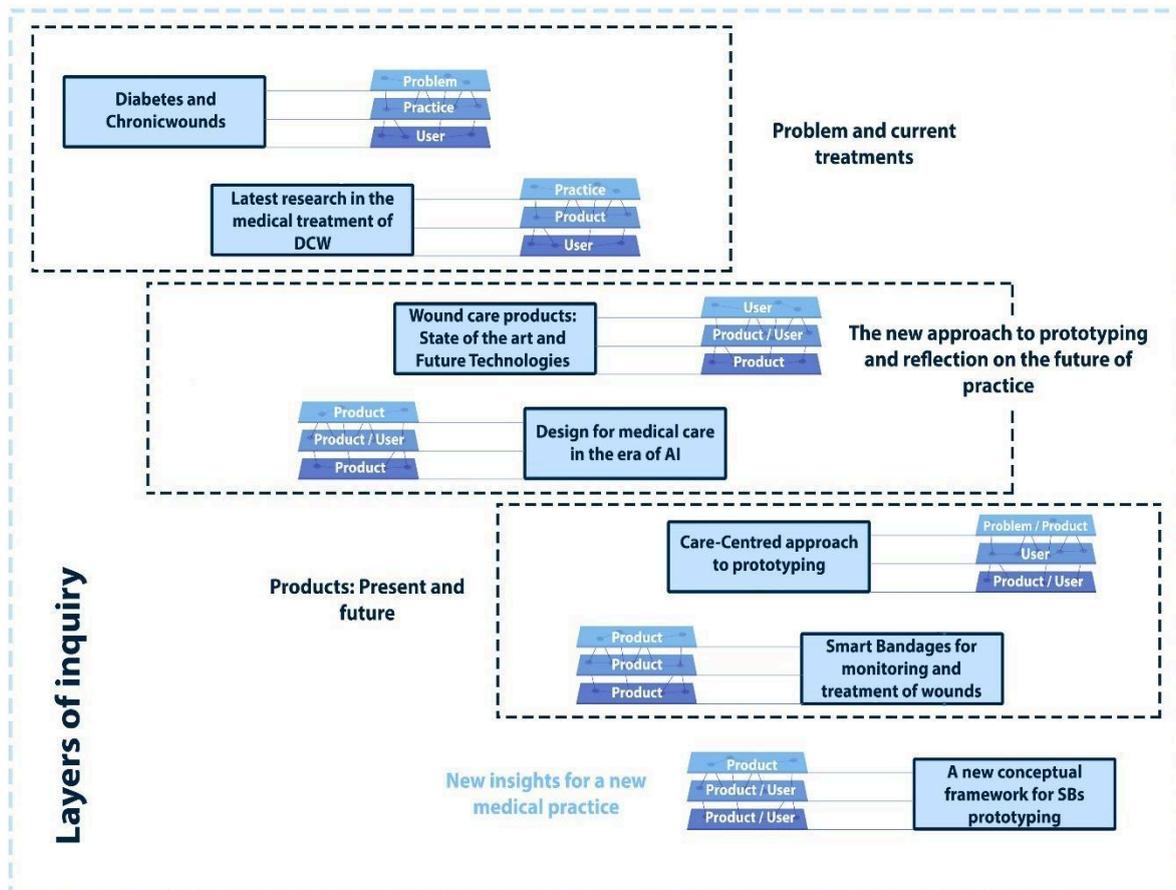
Figure 2. Visualisation of the layers of inquiry, figure by J. Ignacio De La Torre Zapata, 2023.

## Design for medical care in the era of AI: What is it?

AI systems, as defined by UNESCO, are systems that process information in a way that resembles intelligent behaviour. However, our investigation refers to AI systems in healthcare as systems that use computer programs to perform tasks and filter data in multiple areas of healthcare. (UNESCO, 2021; Mudgal et al., 2022).

This article anticipates a range of difficulties derived from the wide incorporation of AI tools into the healthcare system that will have an impact on a number of collectives. For example, it has been theorised that in the case of workers, employment numbers will be directly affected, with predictions of a sharp decline in staff numbers (Mudgal et al., 2022; Wani et al., 2022). Moreover, on the patient side, the incorporation of AI tools

could create more cases of isolation due to the fact that there will be less need for carers and family members to support those in need, possibly contributing to more behavioural issues on the patient side (Mudgal et al., 2022; Sharkey and Sharkey, 2012).

Therefore, two options for the system can be extracted from this speculative future: A system that keeps the number of workers aiming to help the healthcare professional gain time to adapt and more information related to the caring process and patient support based on the empowerment of both sides driven by AI tools establishing a transversal relationship between both collectives. On the other hand, a system that aims to diminish the number of healthcare workers and, in return, exponentially increase the turnover of patients by automating the primary contact (nonetheless, this system does not take into account if the patient problem is actually resolved, it is only focused on the number of "transactions"). A priory in the latest case, the hypothesis is that the primary contact between the system and the patient will be completely automatised and, as a result, the staff cost and patient waiting time are reduced. In summary, an advanced version of the current NHS 111 call (or chatbot) automatise service, where the level of urgency is filtered by the patients' answers.

The problem that we see with the second scenario is that these types of systems are already labelled as one of the most inefficient systems in healthcare (Parviainen and Rantala, 2022; Carter et al., 2018). Furthermore, having in mind the mentioned factors, the following questions have emerged: Why amplify this system if they are being currently labelled as inefficient? Why automate the contact at the beginning and not after the first contact with the healthcare professional? In this context, as a partial answer to these questions, we understand that designers and other stakeholders involved in the creation of a new framework for prototyping should take these possible situations into account while developing such frameworks focused on care in order to avoid possible pushback from the collectives affected. In addition, by adopting a logic of care as the basis for a new framework, the priority should be on finding the balance between the inclusion of these new tools and the quality of the care service, which, in Mol's perspective (Mol, 2008), implies the time and the involvement of these two collectives in the process of adaptation.

Building on these bases, the "*AI logic of care*" is a framework for prototyping that is adapted to the development of SBs for the treatment of DCWs in a healthcare system

that adopts a holistic perspective. This framework takes into account that the AI tools will oversee a long list of tasks, helping the healthcare professional predict the number of patients, helping in patient diagnosis, or helping process the data collected by wearable devices like smart bandages and other key devices. Nevertheless, in this new *AI logic of care*, the professional is a crucial group for this investigation's design approach (Pols, 2012). This group of professionals is the one that uses the tools to increase their capabilities, not the one which can be easily substituted by automatise tools. The views of this paper are against the substitution of the healthcare professional, especially in the first stages of the care process, which takes place in the clinical setting, the place where this research sees tools like SBs to be first implemented. Furthermore, it is worth mentioning that, currently, AI tools are not as efficient, nor empathetic enough to substitute human beings in some of the complex processes of caring, and this will probably be the case in the near future as well (Mudgal et al., 2022; Wani et al., 2022).

As the article mentioned above, AI tools can assist healthcare professionals in expanding their evidence-based knowledge, which could accelerate the diagnostics and/or treatment decision-making, allowing them more time to provide a better quality of direct patient care in all stages of the care process (Mudgal et al., 2022). Moreover, at the same time, due to the task weight share and increment in productivity, AI tools could help reduce burnout in professional carers that is caused by the increasing number of tasks per person in today's healthcare systems (Wani et al., 2022; Lee and Yoon, 2021; Secinaro et al., 2021; Zhang et al., 2017). From our perspective, new frameworks should be designed for a future in which healthcare and medicine resemble more of a picture where patients will have a closer relationship with a healthcare professional, as it is predicated by Mol's work. A framework for a setting where this relationship is supported and "enhanced" by AI-driven tools instead of a healthcare setting in which these AI systems could become a potential source of digital authoritarianism.

Nonetheless, while this article addressed some important challenges in the use of AI tools in healthcare, others that are outside of the scope of this research are just as important, including data privacy, reliability and safety of the AI systems, accountability of technology use, potential loss of support from the system, multidimensional data

acquisition, challenges in generalisation to population,  organisational and managerial challenges, and/or malicious use of this systems to mention a few (Mudgal et al., 2022; Wani et al., 2022; Lee and Yoon, 2021; Secinaro et al., 2021; Zhang et al., 2017; Escalante et al., 2012; Sharkey and Sharkey, 2012).

## AI logic of care

### A new framework for prototyping

This paper introduces the "*AI logic of care*" to advance an approach to prototyping that combines both Annemarie Mol's "logic of care" and the AI promises of ubiquitous, more powerful, and reliable tools. We are aware of the challenges posed by both; thus, to support this new perspective, the study also brings into discussion George Canguilhem's work in "The Normal and the Pathological" (Canguilhem, 1966). Against a technophobic perspective, Canguilhem praises medical rationality, one that encourages experimentation but also advises carefulness and modesty in the decision-making process. Long-term observation, experience, and experimentation are key concepts also encountered in Mol's "logic of care" perspective. In both cases, it is about innovation, but also it is about the relationship between technology and care. In the context of the new AI logic of care framework, smart bandages for monitoring and treatment of diabetic chronic wounds are the starting point to reflect on the nature of prototyping and the place of care in the design processes for future medical products.

As Mol testimonies in her book "The Logic of Care. Health and the Problem of Patient Choice", the "treatment of diabetes" cannot be separated from the "life with diabetes", and therefore, there is little space "for choice" from the part of the patient. She uses diabetes as a case study to exemplify the difference between the "logic of care" and the "logic of choice" to demonstrate the need for the adoption of the logic of good care in the organisation of the medical system. This, of course, is also directly related to the funding models of medical activities. The "logic of care" is one that does not rely only on the measurement of a few parameters, but considers a day-to-day monitorisation of the patient over a longer period of time. The "logic of good care" opposes the managerial "logic of choice", allowing "potentially helpful technologies" to be allocated and fine-tuned by carefully attending to the experiences of patients (Mol, 2008).

The two "logics" differ in the way they define the patients, as either customers (the logic of choice), or citizens (the logic of care), and the way in which the health care process is taking place. If the "logic of choice" was praised starting in the 1980s, as being non-paternalistic and paying attention to the "patients want" and voices, the "logic of care" implies the possibility of healing and what might be good for patients. In both cases, what is at stake, is not only the act of medical care but the perspective we adopt about the whole medical system, from patients to professionals, from products of medical treatments to medical infrastructures.

The logic of care "allows" potentially helpful technologies and innovation to be part of the caring process. Nevertheless, this concept was created in the latest stages of the first decade of the 2000s; thus, the author was referring to technologies and innovative models before the "AI revolution". When we speak of innovation in technology and care today, wearables, artificial intelligence (AI), and related innovations are becoming the focus in industry and culture, sometimes being praised, other times being feared (e.g., Apple Watch, Abbott FreeStyle Libre 2 sensor, Chat GPT, DALL-E, IBM Watson, or da Vinci surgical system), none of which were available in 2008. Nonetheless, in 2023, AI, the Internet of Things (IoT), and Robotics are already helping hospitals around the world (e.g., Moorefield´s Eye Hospital London, Mayo Clinic London, or the Paris Public University Hospital) to gain more insights through precision, speed, and reduced treatment time. These activities and services are closely related to this research, and they are crucial problems in today's healthcare systems around the world.

The "*AI logic of care*" is a new framework, a methodology of prototyping applied to the development of SBs that integrates the concept of "logic of care". It is a framework based on a care-centric approach in which the design process includes the needs of the healthcare professional (and, by extension, the patient), the technologists (engineer, designer, material scientist, etc.), and the prospects of the new AI-driven healthcare system. It is a structure that builds on Mol's work; however, it advances the understanding of technological innovation by taking into account today's technologies. In this context, it is possible to speculate that these new AI-driven systems will help healthcare professionals manage data from multiple sources and provide advances in biomedical research, diagnosis, prognosis, treatment, and prevention. In theory, in the foreseeable future, such AI health systems could entitle patients to manage their health

through apps connected to wearables, like smart bandages for chronic wounds, while maintaining the professional involved, informed, and ready to intervene in real-time. Nevertheless, based on the data acquired by this research, there are certain requirements that these new wearable smart devices should comply with to fit in the prospective new healthcare systems. With the intention of making the devices fulfil these requirements, this investigation proposes the "*AI logic of care*" framework.

In order to create and organise this new framework, we mapped the aspects related to the treatment of diabetic chronic wounds, the products used in today's medical practice, as well as the new products in development for the treatment of this pathology. During this stage of the investigation, a gap was discovered, analysed, and discussed. The vast majority of the literature related to this future medical devices' development for the treatment of chronic wounds are research projects that only address the technological innovation capable of managing the molecular and biological levels of chronic wounds. The range of solutions is based on different dressing and sensing technologies with the overall intention of creating a closed-loop medical treatment process where data sharing from the wound is key for medical care success.

Nevertheless, in all cases, there is no consideration related to the healthcare professional who will use/handle the device in the clinical setting, nor consideration related to the patient who will use it. Even though these devices are in an experimental phase and cannot be used on patients yet, they are intended to be used on/in humans, by humans; thus, this is where the involvement of healthcare professionals (and later patients) could be integral in the development of such devices.

In the pursuit of creating a care-centric approach to prototyping, and in addition to the already mentioned concept of permanent experimentation in medicine pointed out by George Canguilhem, the article also benefits by incorporating another term that could help guide the development process of SBs, the term is "uncontrolled field study" (Pols, 2012). Jeannette Pols used this term in her noteworthy book *Care at a Distance (On the Closeness of Technology)*. The concept is used as opposed to the randomised controlled trial (RCT) and is defined as a flexible form of research that describes actual, innovative care as a practice of taming and unleashing new devices.
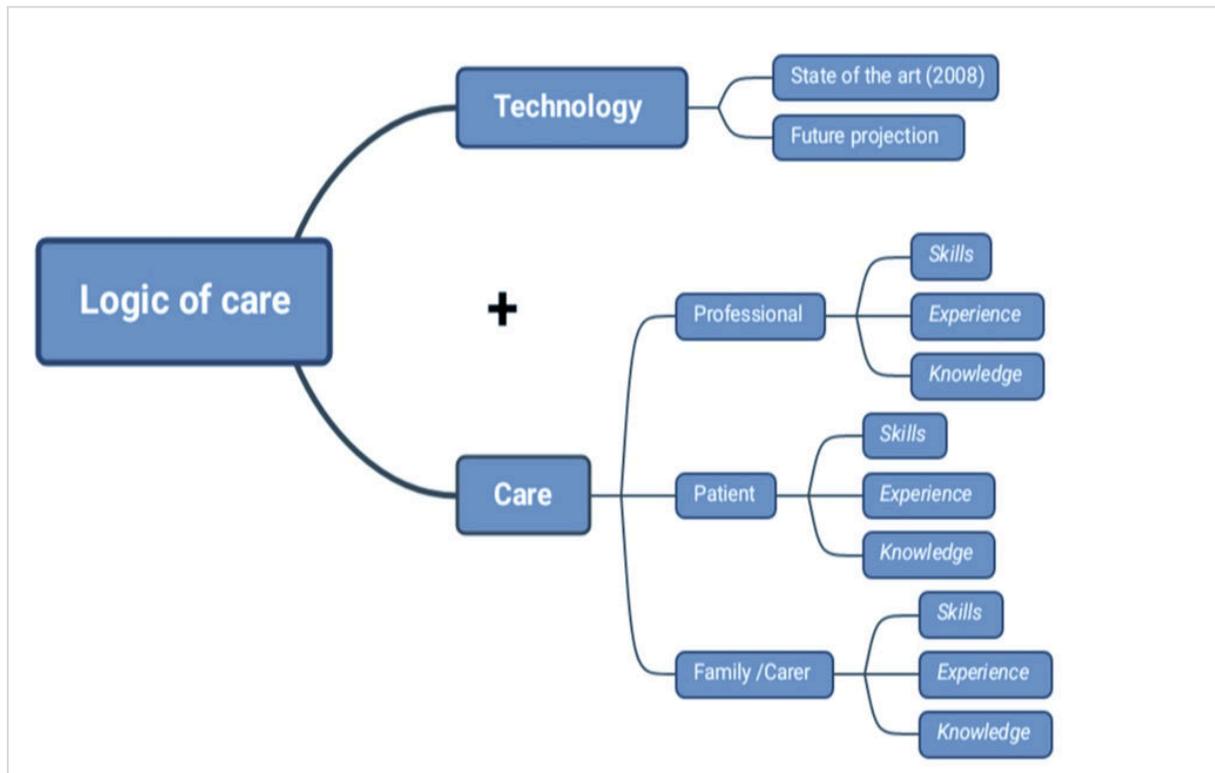
Figure 3. The "Logic of care" schematic, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R.(2023) "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.
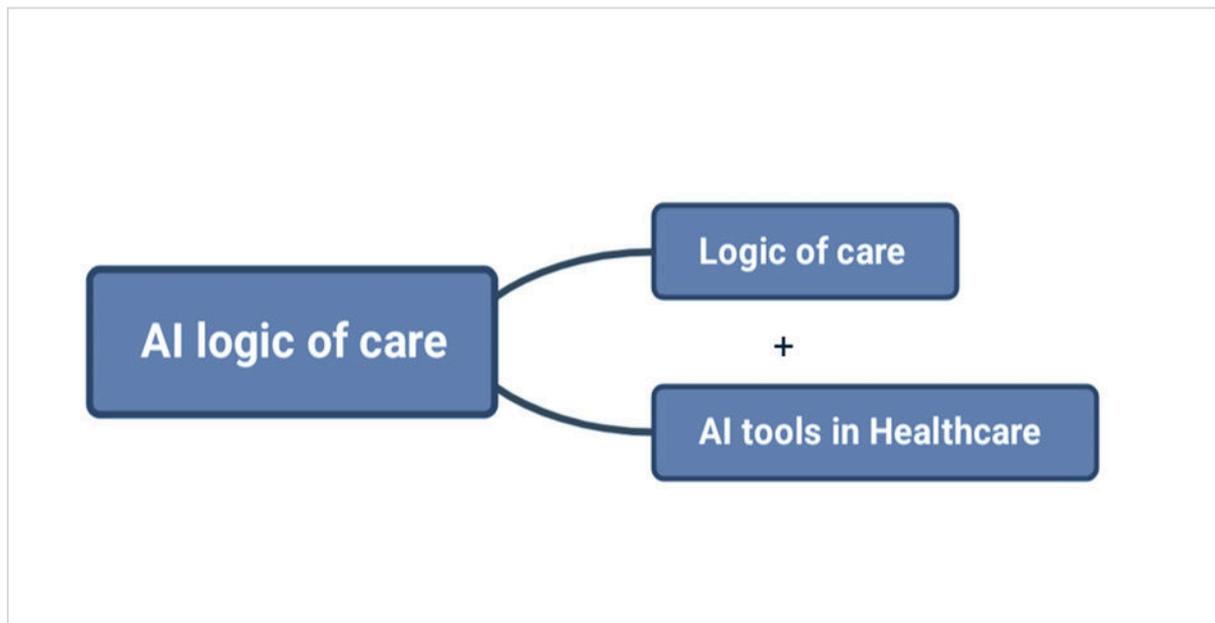
Figure 4. "AI logic of care" simple schematic, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R.(2023) "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.

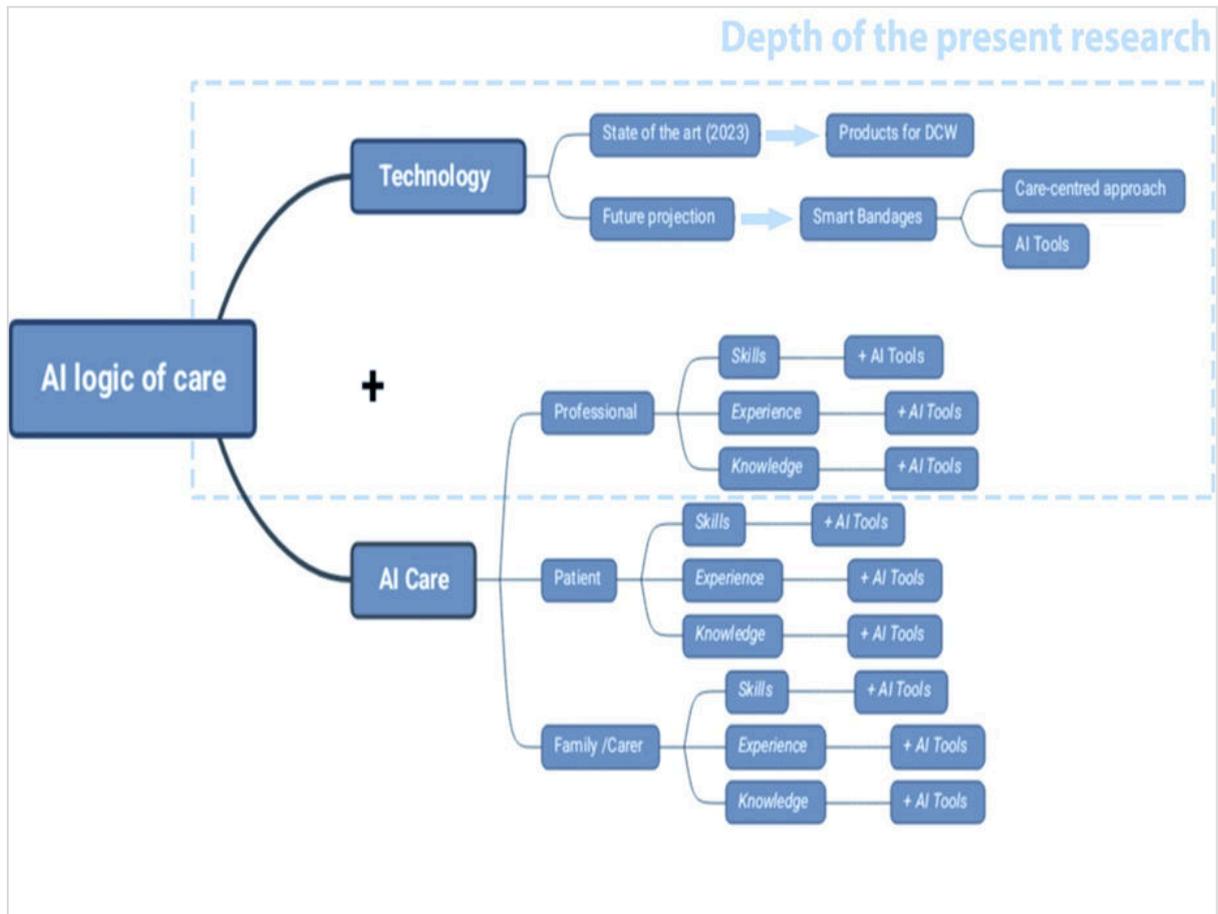Figure 5. "AI logic of care" complex diagram schematic, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R. (2023). "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds'', in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.

In her investigation, Pols highlighted that the quantitative nature of RCTs does not take into account the practical knowledge gained through the experience of the users. Instead of incorporating this tacit knowledge into the development process of a device, RCTs ignore it, since these research designs need predefined fixed outcome variables. As a result, this research method (RCTs) used in an isolated way hinders the creation of innovative practices (Pols, 2012).

As the premise of a new AI-driven healthcare system has already been accepted by this investigation, this type of study could help answer the question of how to incorporate future empathy-like and context-awareness skills into the tools used in the new medical practice to support the practitioners' skills, experiences, and knowledge. As far as the authors of this article understand, these aspects have not yet been systematically addressed. This situation opens new opportunities to further specialise in user-centric research perspectives that could improve, for example, the planned interventions for the healing of DCWs (Grothier and Pardoe, 2013).

In line with Pols's research, this research understands the healthcare professionals operating these future devices (and caring for the patients that will wear them) as important stakeholders. The present framework is focused on three methods (see Table 1): preliminary design sessions, in-depth interviews, cognitive walkthroughs, and workshops, although other methods can be borrowed in the future from the fields of ergonomics and human factors, for example. The goal is to collect crucial information about the ways in which current products are used, the most common problems with these products, how future products can be adapted to professional needs, current treatment protocols, etc. The intention should not be only that the device complies with the technical purposes but also to adapt the device to make it better fit the users' needs.

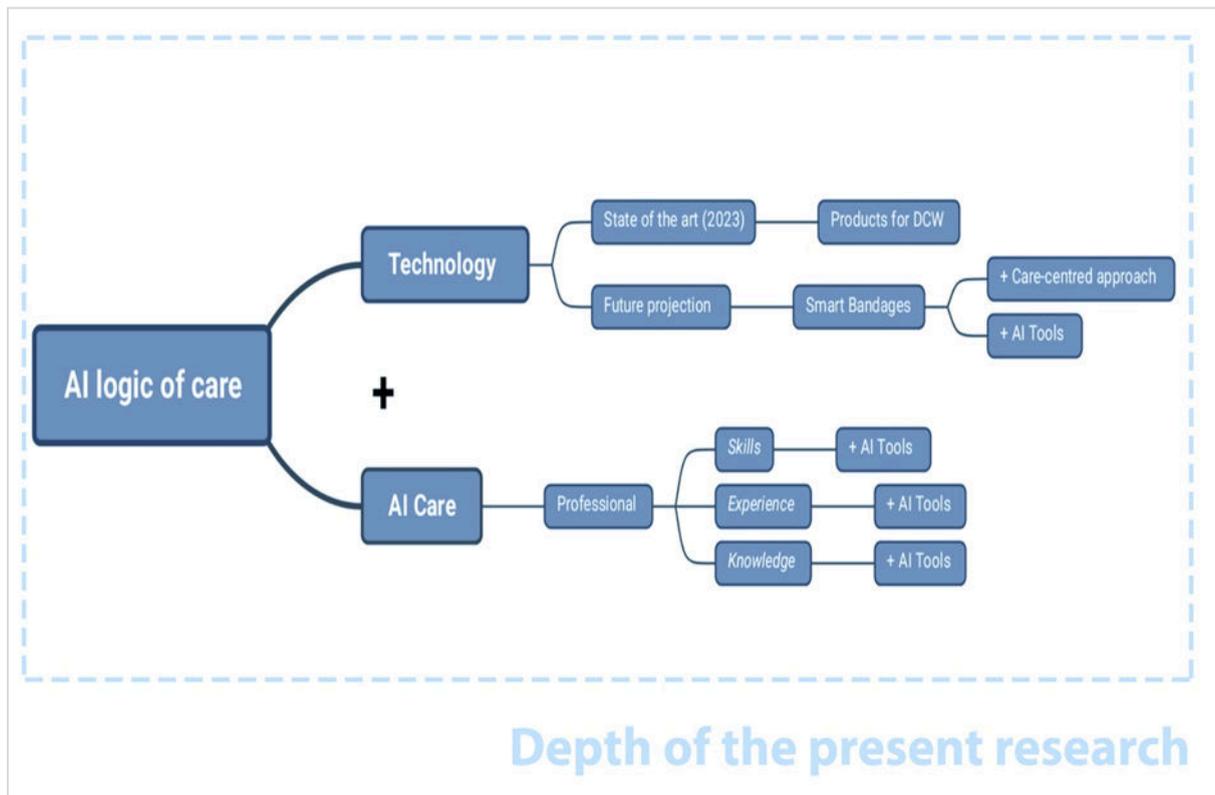Figure 6. "AI logic of care" Depth of the present research detail schematic, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R. (2023). "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.

Table 1. "AI logic of care" methods proposition, table reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R.(2023) "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.

| Methods | Reasoning | Objectives | Connections |
|---|---|---|---|
| **Preliminary Design sessions** | The reason behind this activity is the need to evaluate what healthcare professionals know about the current and future products for the treatment of DCW, to find out if the current products for the treatment of DCW used in the clinical setting are appropriate, and what tools/products they need to improve the treatment of DCW. | The workshop design session will stimulate dialogue between the three experts, by creating a multidisciplinary conversation the expectation is to create balanced content covering SBs/AI tools and the balance between technology/user needs. Furthermore, the conversation will be of use to understand and improve the group awareness of AI tools in the future of healthcare as well as in the future use of the proposed device.<br><br>The intention is to create a workshop to inform the user (healthcare professional) about these future technologies increasing their awareness | As per the designer connection, this activity will have an impact on the development of the designer as a "director and translator" of the project. The designer will oversee the conversation flow as is the member who can understand and translate the information transversally.<br><br>The connection with the technological experts (engineers and material scientists) is in the intention of this project of increasing the awareness of this collective of the need in the prototyping phase for the incorporation of a care-centred (in this case for |

| Methods | Reasoning | Objectives | Connections |
|---|---|---|---|
| | | and, possibly, extracting valuable information to retrofit the design process for SBs. By creating a multidisciplinary conversation, the assumption is that this will increase the tacit and technical knowledge of the intended workshop and will open more possibilities for conversation to extract information from the target audience. | support of the healthcare professional) approach to the technical one.<br><br>The connection to the Healthcare professional is that of the workshop target group. |
| **In-Depth Interviews** | The reason to propose this activity is the virtually absolute lack of healthcare professionals' input in the development process of smart bandages found in the literature. This is the gap that has prompted this research to present the need for a care-centred approach where the user (healthcare professional) must be involved in the design process of such devices, at least, from the prototyping phase. | To gain an in-depth understanding of the knowledge, experience, and opinions of professionals involved in the monitoring and treatment of diabetic chronic wounds.  More precisely, about their knowledge in terms of treatment protocols, the basis for treatment choice (evidence vs experience), knowledge and opinions about current treatment products, knowledge and opinions about future treatment products, and their level of | The designer's connection with this activity will have an impact on the development of the designer as a "director and translator" of the project. The designer will conduct the interviews with the aim of understanding and gathering crucial information to later translate the information to the technological experts. It is worth mentioning that this process will contribute to the overall acquisition of knowledge of the healthcare practices |

| Methods | Reasoning | Objectives | Connections |
|---------|-----------|------------|-------------|
|  |  | awareness of the implementation of AI tools in healthcare. | by the designer which will affect the quality of the result for the cognitive walkthrough activity.<br><br>The connection with the technological experts (engineers and material scientists) is in the intention of this project of increasing the awareness of this collective of the need in the prototyping phase for the incorporation of a care-centred (in this case for support of the healthcare professional) approach to the technical one.<br><br>As per the connection with the healthcare professional, this activity focuses on making them co-creators, thus, active participants of the care-centred design approach to smart bandage prototyping for monitoring and treatment of diabetic chronic wounds. |

| Methods | Reasoning | Objectives | Connections |
|---|---|---|---|
| **Cognitive Walkthroughs** | The reason behind this activity is that, as has been stated before, and based on the results of the SLR in the academic field of SBs performed by this research, there is, almost, an absolute lack of healthcare professionals' input in the development process of such a device. Therefore, in order to further understand the caring process of DCWs in a clinical setting the research believes that cognitive walkthroughs are one of the best-suited processes that can be adapted for this case from the Human Factors field to improve the final product (SBs). | The objective of this activity is to analyse the specifics and the sequence of steps or actions required by a user (healthcare professional) to accomplish the tasks of monitoring and treatment of diabetic chronic wounds to have those actions in mind while developing a new device to support such activities. The designers involved in the development process of the device (SBs) will walk through these steps with the healthcare professional as a team, asking questions at each step to gather data during the process to iterate and redesign the device to address the issues identified.<br><br>The intention is to perform a heuristic evaluation with a holistic view to identify problems not identified if the group in charge of the device development is only composed of the | The designer connection within this activity will have an impact on the development of the designer as a "transversal translator" in the project. The designer and the user (healthcare professional) will work as a team to gather data during the process performed in the clinical setting with the intention of iterating and redesigning the device to later address the issues identified (care-centred design approach) in coalition with the technological experts.<br><br>The connection with the technological experts (engineers and material scientists) is in the intention of this project of increasing the awareness of this collective of the need in the prototyping phase for the incorporation of a care-centred (in this case for |

| Methods | Reasoning | Objectives | Connections |
|---|---|---|---|
|  |  | designer and technologists. The method is rooted in the understanding that the healthcare professional or user will prefer to learn how to employ the device by using it to accomplish tasks, rather than, for example, following the manual. | support of the healthcare professional) approach to the technical one.<br><br>As per the connection with the healthcare professional, this activity focuses on making them co-creators, thus, active participants of the care-centred design approach to smart bandage prototyping for monitoring and treatment of diabetic chronic wounds. |
| **Workshops** | The reason behind this activity is to act against the lack of knowledge and understanding of the healthcare professional about the current and future products for the treatment of DCW found in the literature. Moreover, the interest in this activity extends to find out and later enhance the knowledge about the current and future use of AI tools in healthcare and the | The objective of this workshop is to educate the user (healthcare professional) about these future technologies increase their awareness and, possibly, extract valuable information to retrofit the design process for SBs. The aim is to increase the tacit and technical knowledge of the intended user and, therefore, to open more possibilities for conversation to | The designer connection within this activity will have an impact on the development of the designer as a "director and transversal translator" in the project. The designer will educate the user (healthcare professional), in the main concepts agreed in coalition with the technological experts, as well as will gather data during the process to |

| Methods | Reasoning | Objectives | Connections |
|---|---|---|---|
| | possible connection with the device in development (SBs). This last point is intended for the healthcare professional involved in the prototyping process. | extract information from the ultimate long-term project's target audience (patients). | later use this valuable information to retrofit the design process for SBs.<br><br>The connection with the technological experts (engineers and material scientists) with this activity is the collaboration in the process of increasing the awareness of the healthcare collective about the technologies related to the project (SBs and AI tools). This is done by participating in the planning of the activity with the designer.<br><br>The connection to the Healthcare professional is that of the workshop target group. |
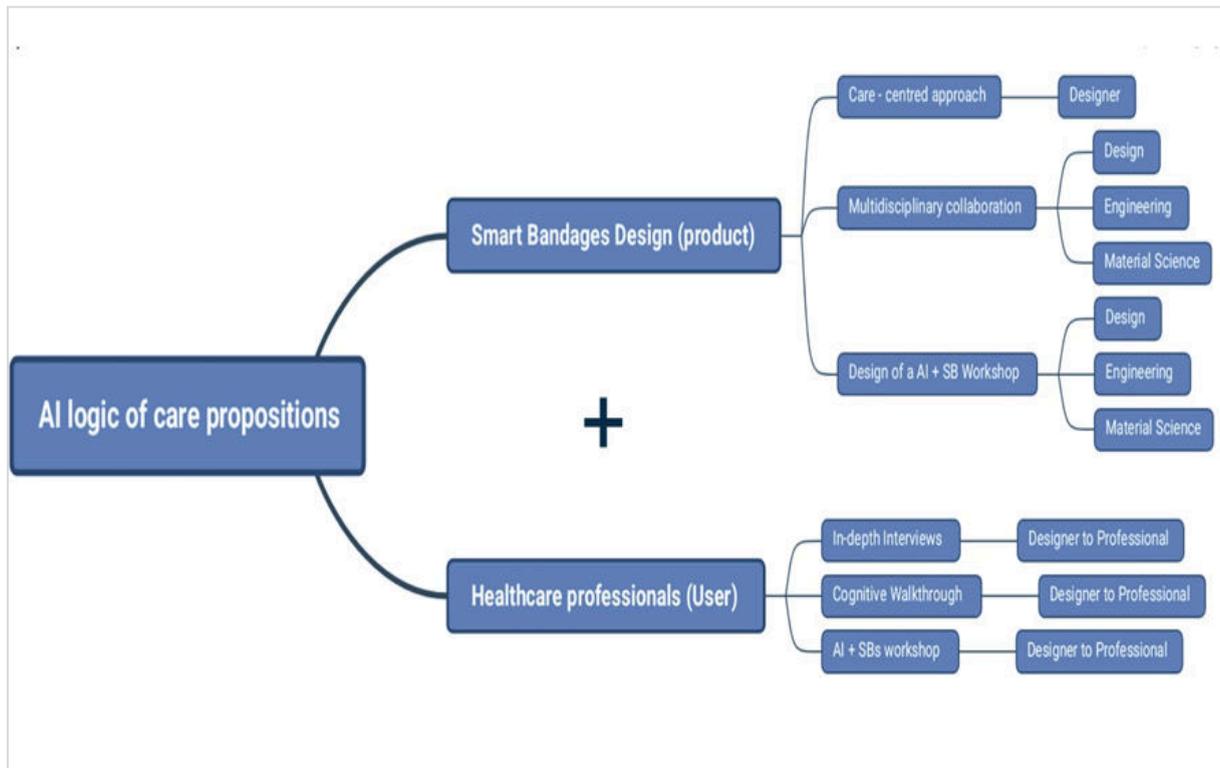
Figure 7. "AI logic of care" propositions schematic, figure reprinted from Zapata, I.d., Heinzel, T., and Bernabei, R.(2023) "AI Logic of Care: premises for upgrading the smart bandages for diabetic chronic wounds", in De Sainz Molestina, D., Galluzzo, L., Rizzo, F., Spallazzo, D. (eds.), *IASDR 2023: Life-Changing Design*, 9-13 October, Milan, Italy. https://doi.org/10.21606/iasdr.2023.283.

## Conclusion

Based on a previous review of the latest research in the medical treatment of chronic wounds and related issues, an analysis of the prototyping processes and theories, a mapping of existing treatment products for chronic wounds on the market, a review of the latest research connected to smart bandages, and the prospects of an AI-driven medicine service. Our paper proposes the "AI logic of care" framework as an emerging, inclusive, and interdisciplinary approach to the prototyping of smart bandages.

As a novelty when compared with Mol's logic of care, this new framework acknowledges the lack of a "care-centred design" in research related to smart bandages and the complexity of innovation processes in medicine in the era of AI. Furthermore, this

framework takes into account the needs and experiences of healthcare professionals, technologists, and patients in the design process. We argue that this approach can help bridge the gap between research and practice by providing designers with a structured method for prototyping in a new context of future medical practice. This is in contrast to other approaches to smart bandage prototyping that may focus solely on technological innovation or may not take into account the needs and experiences of all stakeholders involved in the use of the device.

In the near future, AI systems will have clear advantages (and disadvantages as well) in real-world applications, including applications in healthcare systems and the tools used in them (Mudgal et al., 2022; Khadija, Zahra and Naceur, 2021; Lee and Yoon, 2021; Khandalavala et al., 2020;  Rong et al., 2020; Mendes-Soares et al., 2019; Porter et al., 2019; Topol, 2019; Uddin, Wang and Woodbury-Smith, 2019; Rabhi, Mrabet and Fnaiech, 2018; Yala et al., 2019; Hosny et al., 2018; Moore, Hamilton and Llewellyn, 2018; Hudec and Smutny, 2017;  Zhang et al., 2017; Crawford, 2016; Williams et al., 2015; Escalante et al., 2012). In this situation, we understand that the user-centred design aspects will become more important in the prototyping for devices like SBs. This is justified due to the fact that AI tools are not advanced enough to have empathy-like and context-awareness skills of a person. Thus, this opens new opportunities for specialisation in care-centric research in medical devices. By incorporating the needs and experiences of these stakeholders in the design process and the implications of the use of AI in the field in a speculative future, a new care-centric design paradigm has been developed.

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