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THE HEALTH SITUATION OF ELDERLY PEOPLE IN POLAND: THREE MODELS FOR ANALYSING THE NEEDS AND EXPECTATIONS OF POLISH SENIOR CITIZENS: NIA, DESIGN THINKING AND GROW IN THE CONTEXT OF THE POTENTIAL USE OF MEDICAL TECHNOLOGIES

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Abstract
The article discusses the possibilities for using cross-border models in the construction of telemedicine devices which use internet connections, and the possibility for placing data 'in the clouds'. There are such models as the *Identifying and Analysing Needs* model by Leslie Rae (NIA), the *Design Thinking* model and the *GROW* coaching model. The research was based on the rules of the emancipatory-critical paradigm and the triangulation method. The non-reactive research (the unobtrusive measures method) was applied in the first stage, and was based on the NIA and DT models. It was conducted based on the situation of senior citizens in Poland (against the background of the Covid-19 pandemic). In the second stage, research was carried out using a survey. The target of the survey was the elderly and their caregivers. In the third stage, in-depth interviews were conducted with senior citizens about their emotions, needs and fears/concerns. They were conducted in accordance with the GROW model coaching guidelines. The results of all the studies are presented on the basis of the Design Thinking model.
KEY WORDS: border methods and challenges, elderly people, telemedicine devices.

Anotacija
Straipsnyje aptariamos tarpnacionalinių tyrimo modelių taikymo galimybės, kuriant telemedicinos prietaisus, kuriuose naudojami interneto ryšiai ir yra galimybė patalpinti duomenis „į debesį" (Leslie'io Rae (NIA) poreikių nustatymo ir analizės, „Design Thinking" (DT) ir GROW koučingo modeliai). Tyrimas atliktas laikantis emancipacinės kritinės paradigmos taisyklių, taikant trianguliacijos metodą. Neaktyvūs tyrimai taikyti pirmajame etape ir pagrįsti NIA ir DT modeliais, atsižvelgiant į pagyvenusių žmonių padėtį Lenkijoje (pagrindas – COVID-19 pandemija). Antrajame etape tyrimai atlikti taikant apklausą. Tyrimo tikslas – pagyvenę žmonės ir jų globėjai. Trečiajame etape atlikti išsamūs interviu su senjorais, teiraujantis apie jų emocijas, poreikius ir baimes / rūpesčius. Jie atlikti remiantis GROW modelio koučingo gairėmis. Visų tyrimų rezultatai pateikti, remiantis „Design Thinking" modeliu.
PAGRINDINIAI ŽODŽIAI: tarpnacionaliniai metodai, iššūkiai, pagyvenę žmonės, telemedicinos prietaisai.

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Introduction

Telemedicine is a natural path for the evolution of health care in the digital world. It provides an opportunity for the effective exchange of real-time health

information (ATA, 2020), by creating a platform for interactive communication between the patient and the doctor, carer or practitioner. The mediation of a variety of pieces of telecommunication equipment in the health communication process (CMS, 2020; AHRQ, 2020) enables not only the remote treatment and control of the therapy process, but also the application of controlled preventative health care through the rapid exchange of up-to-date information about the client's health status. The provision of ICT-enabled health care, as defined by the World Health Organisation (WHO, 2020), is aimed at the diagnosis and treatment of illness and injury, prevention, research, examination and consulting, and improving patients' access to health services wherever they are. This is particularly valuable for people in so-called 'vulnerable' groups, e.g., those with disabilities and in ageing societies.

Joseph Engelberger, a robotics guru, promoted the idea of creating 'a multitasking robot caregiver for older people' as early as the digital revolution of the late 1990s. Travelling around the world, Engelberger encouraged research teams to work on the 'Elderly Care Giver', which would be a personal multi-tasking robot assisting an elderly person in everyday activities (Engelberger, 2000). However, it was not until 2005 that the first Japanese prototype of Engelberger's idea was developed (Robertson, 2007), i.e., the Wakamaru domestic robot that 'was released exclusively for Japanese households' (Van Aerschot, Parviainen, 2020, p. 248).

Unfortunately, in Poland and in many European Union (EU) countries of the former Eastern Bloc, telemedicine is still an undeveloped Blue Ocean on the map of products and services (Chan Kim, Mauborgne, 2015). Technology only became so reliable and affordable that it started to be widely used a few years ago. This coincided with rapid advances in the field of medical instrumentation, and they began to be equipped with archiving and data processing functions. The last six years have seen rapid development in the telemedicine industry, and the spread of its services. This was related to the development of technology and digital communications in everyday life, and, as it became 'anchored' in the public consciousness, technology also extended to other spheres of human existence, making telemedicine a universal service. Prior to the Covid-19 pandemic, it was estimated that the telemedicine market would reach over $130 billion by 2025 (Elliott, Yopes, 2019). However, the effects of the global pandemic required the implementation of telemedicine solutions in many fields (Van Nest, Ilyas, Rivlin, 2020). The epidemic situation meant that hospitals ceased to be perceived by society as safe places, becoming the source of an unknown foreign 'plague', and doctors, nurses and medical staff, in a broad sense, began to be perceived as carriers of the virus. They were feared by Poles, and stigmatised by the same potentially 'healthy' Poles (Jarynowski, 2020,

p. 31; Bielska, 2020).[1] State nursing homes, private nursing homes and hospices have become equally dangerous, becoming hotspots of Covid-19 infection.[2] The necessity for isolation and social distancing has also significantly limited access to traditional health care. It has highlighted the importance of quality homecare, understood not only as ensuring physiological needs and a sense of security, but also attempting the diagnosis and ongoing monitoring of chronic diseases and critical events, as well as promoting healthy behaviours (Mohiuddin, 2020, p. 19). Covid-19 has pushed (hence the author's note) the health care system out of its comfort zone, forced it to adapt to new conditions, and given a much-needed push to bring tele-health care into the medical mainstream (Portnoy, Waller, Elliott, 2020, p. 1489). These changes, although noticeable in the entire Polish population, are of particular importance for the elderly. Indeed, it is the elderly who are most likely to receive health care and require support in coping with their disabilities on a daily basis. In this article, using the Polish example, I will try to present three models of work subordinated to so-called 'cross-border' methods (i.e., methods which are used, regardless of the nationality of researchers, in order to investigate important social problems, methods such as non-reactive research [the unobtrusive measures method], surveys and in-depth interviews). While conducting research using these methods, I used the NIA, Design Thinking and GROW models, all of which enable the development of a comprehensive process of assessing the needs and expectations of older people, as well as designing solutions that are acceptable to them in the field of telemedical technologies.

In the research process, I was guided by the thesis that 'the scientific method, as applied to social sciences, includes a variety of research approaches, tools, and techniques, for collecting and analysing qualitative or quantitative data (...) The scientific method operates primarily at the empirical level of research' (Bhattacherjee, 2012, p. 14), e.g., how to make observations and interviews, and how to analyse these observations and these transcriptions of interviews. It was important to me that the model created includes a political, a learning, and a caring perspective (Bjerregaard, Maciulskyte, Acienė, Christensen, 2018).

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[1] There has been little research in this field so far in Poland. Single reports on the subject can only be found in specialist medical literature (e.g. ophthalmology) on patients' fear of visiting specialist doctors during the pandemic, supported by statistical data on the number of medical visits made during this period (Świerczyńska, Woś, 2020). In the field of pedagogy, a publication on the socio-cultural imaginaries of pandemics deserves attention (Bielska, 2020). In turn, media experts and social communicologists published the first articles on ways of presenting the pandemic in the media and influencing the recipients of these media (Marcinkiewicz et al., 2020). However, the English-language literature on social perceptions of the pandemic and fears related to hospitalisation for reasons other than Covid-19 is quite extensive (Zheng et al., 2020; Pellegrini et al., 2020; Bellucci 2020; Güell, Henahan, 2020; Kohen, 2020).

[2] According to the report of 29 June 2020 presented to the Senate Committees of Health and Family, Senior and Social Policy, coronavirus (during the first wave) was confirmed in 25 nursing homes out of 824 operating in Poland (Senate of the Republic of Poland, on-line).

1. Ageing and telemedical technologies as cross-border challenges: the research background

We are facing an increase in social challenges that take on the dimension of cross-border challenges as they relate to cross-border areas. One of the key challenges in EU countries is undoubtedly the ageing of societies. As this problem is becoming so common, the concept of shared knowledge, thinking beyond borders and 'collaboration in learning, research and development with an international neighbour' are gaining importance (Bjerregaard, Maciulskyte, Acienė, Christensen, 2018, p. 8).

Telemedicine technologies are also solutions that go beyond borders. The development and application of effective work methods, devices, services or procedures in the area of health communication and health care can have a cross-border dimension and become cross-border results, multiplied in different countries and environments. The term 'cross-border' may mean the transfer of knowledge between EU countries due to the shaping of a common health policy, e-health and telemedicine services. This term can also be equated with the possibility of open provision of services in EU countries due to the lack of limitations in the transfer of knowledge and skills and solutions between EU countries. It is particularly visible in the area of the 'flow' of solutions and good practices from Scandinavian countries that discovered the advantages of telemedicine technologies at the beginning of the century. High hopes are placed on the fact that technological development and digitisation will help to address issues related to ageing populations and the need for care (Van Aerschot, Parviainen, 2020, p. 247–256), by popularising solutions using technological devices.

So what models of analysis of expectations and needs, used in the context of innovative technologies, can we use in the research process, and multiply them within the framework of research methods known to us? In this text, we will look at the research methods used, and then the possibilities of applying three models: NIA (Needs – Identifying and Analysing), Design Thinking, and the GROW coaching model.

2. Materials and methods

The research process was carried out using the triangulation method, and included three stages. In the first stage of the process, non-reactive research (*unobtrusive measures*) was applied (Babbie, 2004; Webb, 1966). The situation of the elderly in Poland was analysed based on existing statistical data (CSO, Eurostat, OECD, WHO). The research exploration also included revealing the limitations of the he-

alth and social care system for older people based on the literature on the topic and statistical data, as well as analysing the solutions applied in Poland and the EU.

This stage was aimed, firstly, at describing the problems, needs and condition of Polish senior citizens as precisely as possible, and secondly, identifying potential health care weaknesses that do not respond to the real problems and needs of senior citizens.

A comparative analysis of telemedicine solutions which exist on the Polish market was also carried out, in terms of the functions offered, which enabled the potential support and coordination of the treatment process, as well as the psychosomatic protection of the elderly. A total of five European companies which specialise in the production of telemedicine devices were analysed. A comparative analysis of the functionality of, among others, virtual robots, integrated systems of passive monitoring and automatic notification, suspenders and telemedicine bands, were carried out. Based on the data obtained, the most technically valuable solutions, which can fulfil the unmet needs of senior citizens and can be relatively easily accepted (also in financial terms) and implemented by the elderly, were selected.

In conducting the research at this stage, the Design Thinking model and elements of the NIA model created (as TNIA) by Leslie Rae were used. *NIA as a cross-border model for the identification and analysis of needs (a political perspective)*

The first of the cross-border models is the NIA (Needs – Identification and Analysis) model. This is my original modification of the NIA model of recognition and analysis of training needs, created by Leslie Rae (Rae, 1997).[3] The basic assumption of NIA is the identification of needs and their analysis. The main questions to ask when starting with this method are: *What is the problem, or suspected problem or need? Can the problem be resolved by some approach?*

NIA confirms or denies the existence of the problem. It helps to pinpoint the exact nature and size of the problem or problems. It also allows us to discover other problems that we did not even suspect existed when starting our research analysis. NIA also determines the scale of the need: i.e., whether the problem concerns only a specific group of people, or is more general in nature, and if solving it requires a lot of effort. Moreover, the NIA model indicates the best solution, and allows the requirements and the discrepancy between these requirements and the skills of the people we test to be determined. It demonstrates the knowledge, skills and attitu-

[3] The TNIA (Training Needs – Identification and Analysis) model was developed by Leslie Rae, an independent UK training consultant, to identify and analyse the needs of training participants in the area of human resources. However, its modification works well, as has been verified by the author of this article (a trainer and coach with many years of experience), in development work with senior citizens, as it structures the areas of observation and analysis of different age groups and their needs.

des of the respondents, and, on the basis of them, helps build development goals for both the elderly and their carers.

The NIA model was used in the preparatory stage to conduct non-reactive research to organise the research procedure and the sequence of analyses. When verifying the existing data, the following research questions were asked:

1. What problem (identified or only perceived) are we dealing with in Polish society?
2. What problems do older people living in Poland encounter?
3. What are the problems of older people from a political perspective: health and social?
4. What are the possibilities for elderly people in Poland? What is within their reach?
5. What measures are available? What measures do the elderly use?
6. What needs of the elderly (identified or only perceived) are we dealing with?
7. Can the problem be resolved by telemedical technology or some other approach?

The assumption made was: If the need is identified as one that telemedical technologies will resolve, part of (...) NIA 'will be to identify the extent of the problem and the existing level of knowledge, skills and attitudes of the people involved' (Rae, 1997, p. 22).[4]

In the second stage, quantitative research was carried out with the use of a questionnaire on the usefulness of telemedicine devices, their applicability and key functionalities. The respondents were senior citizens and their guardians who are members of their families. A total of 63 people took part in the study: 42 women, and 21 men. Due to the incompleteness of the questionnaires (some respondents omitted individual questions), and the need for comparability of the results, 60 questionnaires were selected: 30 filled in by senior citizens alone or with the help of an interviewer ($n = 30$), and 30 filled in by their guardians ($n = 30$). Among the respondents finally selected, there were 40 women (66.67% of all respondents), and 20 men (33.33%). The mean age of elderly people who have problems with independent functioning, and the mean age of their caregivers in the study, are presented in the table below.

In both groups (both older people and their carers), people with a higher education (23 people in each group, 76.67%) and secondary education (six people each, 20%) predominated. In each group, one person (3.33%) had some form of vocational education. These people lived in cities of over 250,000 inhabitants (21 people, 35%), towns of up to 50,000 inhabitants (17 people, 28.3%), rural areas (11

[4] The use of NIA elements preceded the implementation of the Design Thinking model, which organised the entire research procedure.

people, 18.3%), towns of up to 100,000 inhabitants (nine people, 15%), and cities of up to 250,000 inhabitants (two people, 3.33%).

Table 1. Age distribution of respondents along with division into roles (elderly requiring care, caregiver)

Age category	Elderly person requiring care (n = 30)	Guardian (*n* = 30)
<29 years old	0	5 people (16.67%)
30–40 years	0	10 people (33.33%)
41–55 years	0	5 people (16.67%)
56–65 years	12 people (40%)	6 people (20%)
66–75 years	10 people (33.33%)	3 people (10.00%)
>76 years old	8 people (26.67%)	1 person (3.33%)

Source: The author.

GROW as a cross-border model for the identification of emotions, fears and acceptable technological solutions (a caring perspective)

In the third stage, remote in-depth interviews were conducted with senior citizens (n = 5) about their emotions, needs and fears. The interviews were based on the GROW coaching model.

The GROW model is commonly used in coaching practice to work on goals, and is one of the simplest tools that does not require an extensive knowledge of psychology or coaching. It gives the opportunity to adapt to the interlocutor and, most importantly, this model helps to 'move forward' and focus on the future, and, instead of the past, the path to achieve that is important for the coachee (in this case, a senior or his/her guardian).

The authorship of this model is attributed to, inter alia, Graham Alexander, Alan Fine, Timothy Galloway and Max Landsberg. However, its greatest 'populariser' was Sir John Whitmore, who described it in his books, and thus became the character most closely associated with this model of work (Whitmore, 2019; Wilson, 2020).

Carrying out the interview in accordance with the GROW model required it to be divided into four parts, integrally related to each other: Goal, Reality, Options and Way Forward (Will).

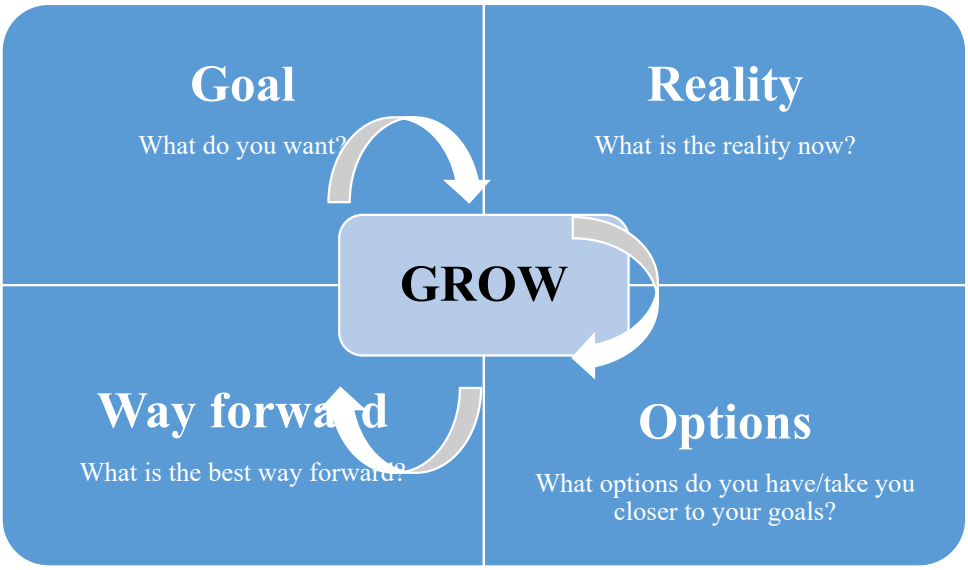

Figure 1. The GROW coaching model
Source: Whitmore (2019).

The first part (i.e. GOAL) required the interlocutor to answer several difficult questions relating to his/her vision of themselves and their future. These were, among others: *What do you (old person, caregiver) want? Over what time frame? What will that get you? Try to imagine that you have achieved it: How do you feel? What are the benefits? What is exciting about this goal (e.g., autonomy, ageing at home)? What's even more important than this goal (e.g., privacy, intimate space)? What do you want to achieve in four months/one year/three years?* The result of this stage was the definition of one's own short-term and long-term goals.

In the second part (i.e. REALITY), the participant in the conversation explored his/her current situation deeply. S/he then faced difficult questions such as: *How do you feel? How are things going right now? What existential and health problems do you face? What barriers do you face? What are your needs? What needs are the most important? Are these needs met? If so, how are they satisfied? What is the biggest concern? What resources are available? What is important to you? What values are most important to you?*

The third group of questions in the GROW model was related to the OPTIONS analysis. In this stage, the subject identified and evaluated possible options. Among the questions s/he heard were, among others: *What are some of the ways you could approach this issue? Would you like to brainstorm some options? Does it require*

changes in your habits? (Does the nursing home require the habits of the elderly?) How are the needs of the elderly met? Does the meeting of these needs violate senior citizens' autonomy? What can senior citizens use to feel what 'successful' ageing is all about? What solutions lie/are within your perceptual and financial possibilities? What are some of the advantages and disadvantages of each option?

The last group of questions concerned the level of will. WILL/WAY FORWARD/ WRAP UP is the stage when the person examined defines what s/he will be doing and by when. Among the questions that s/he was asked were: *Which option is your best choice? What's the first step? What functions of telemedicine devices are important to your wellbeing and sense of security? Which of them do you reject as jeopardising your autonomy and good mood? What else do you need to do?*

The respondents included three women (one from the 56 to 65 year-old category, one from the 66 to 75 category, and one over 76 years old) and two men (one from the 66 to 75 category, and one over 76 years old). The aim of the second and third stages was to design an optimised device for senior citizens which met their expectations and needs relating to the acquired disability.

DESIGN THINKING as a cross-border model of empathising, defining and creative problem solving (a learning perspective)

The research process was carried out in accordance with the definition and rules of the Design Thinking process (Brown, 2009; Brown, Wyatt, 2010), and proceeded according to the diagram below (Fig. 2). The article adopts the understanding of DT as defined by Thomas Lockwood (2009, xi), according to which Design Thinking is 'a human-centred innovation process that emphasises observation, collaboration, fast learning, visualisation of ideas, rapid concept prototyping and current (...) analysis which ultimately influences innovation and (...) strategy' (Lockwood, 2009, p. xi). It was also recognised, following Diane Nijs, that design thinking currently poses two main requirements for a social designer: the need to be sensitive to generational problems, and to know how to solve problems regardless of their level of complexity (Nijs, 2019, p. 65).

3. The five stages of the Design Thinking method: Empathise, Define, Ideate, Prototype, Test

The aim of the *empathise* stage is to learn about the needs of the group being studied, and to focus empathetically on the people being studied. In the case of the study conducted by the author, this means focusing on the oldest generations of Poles, finding out what health and existential problems they have, what is of particular importance for them in dealing with these problems, and assessing what may be overlooked or ignored by the developers of telemedicine devices and technolo-

gies in trying to help them solve these problems. Once the so-called 'knowledge gap' in this area has been filled, it is necessary to proceed to stage two (*define)*, in order to identify the key issues for the people surveyed. It is a kind of summary of the data obtained during the first stage, and determining the real needs of the respondents. In the case of the following study, these were health security problems, problems in maintaining autonomy and independence, and respect for their desire for self-determination. The third stage, *ideate*, is the stage of knowledge sharing, creative action and generating innovative solutions. At this stage, ideas are articulated and solutions are sought to address the key concerns of senior citizens classified in the previous stage. The results obtained should be within the perceptual and financial possibilities of senior citizens and their carers (this is required by the fulfilment of the *empathise* and *define* assumptions). The *prototype* stage involves a draft presentation of a prototype of an idea: a solution to a problem. The resulting prototype is consulted with senior citizens and their carers in terms of the feasibility of its implementation, costs, resources and feasibility. In the fifth stage, *test*, a viable solution is selected. The researcher shares the prototyped idea, in order to obtain, through a one-to-one interview with senior citizens, their opinions on the importance of these functionalities, their concerns, and hopes for the solution.

Fig. 2 shows a graphic diagram of the Design Thinking model, along with research questions and results assigned to individual stages of the DT, NIA and GROW models.

The author of the research was guided by the idea of value innovation (Chan Kim, Mauborgne, 2015), which allows the following: (1) by getting to know potential users, to eliminate any factors that the market has so far taken for granted, although in reality they do not represent any perceivable value for these users (e.g., options for using social media in telemedicine devices); (2) reducing some factors significantly below the standards in order to avoid the error of a too wide offer of possibilities (in line with B. Schwartz's principle that the greater the choice, the greater the decision paralysis in the recipient and the sense of loss caused by this and not another choice (2004); (3) increasing some factors far above the applicable standards, so that users do not have to compromise (e.g., the accuracy of heart rate measurement, device lifetime without recharging); (4) creating a new value not yet offered by device developers (e.g., using a telemedicine device as a new experience of old age, which enables independent functioning at home in a close, familiar environment with a sense of security created by a device monitoring vital functions).

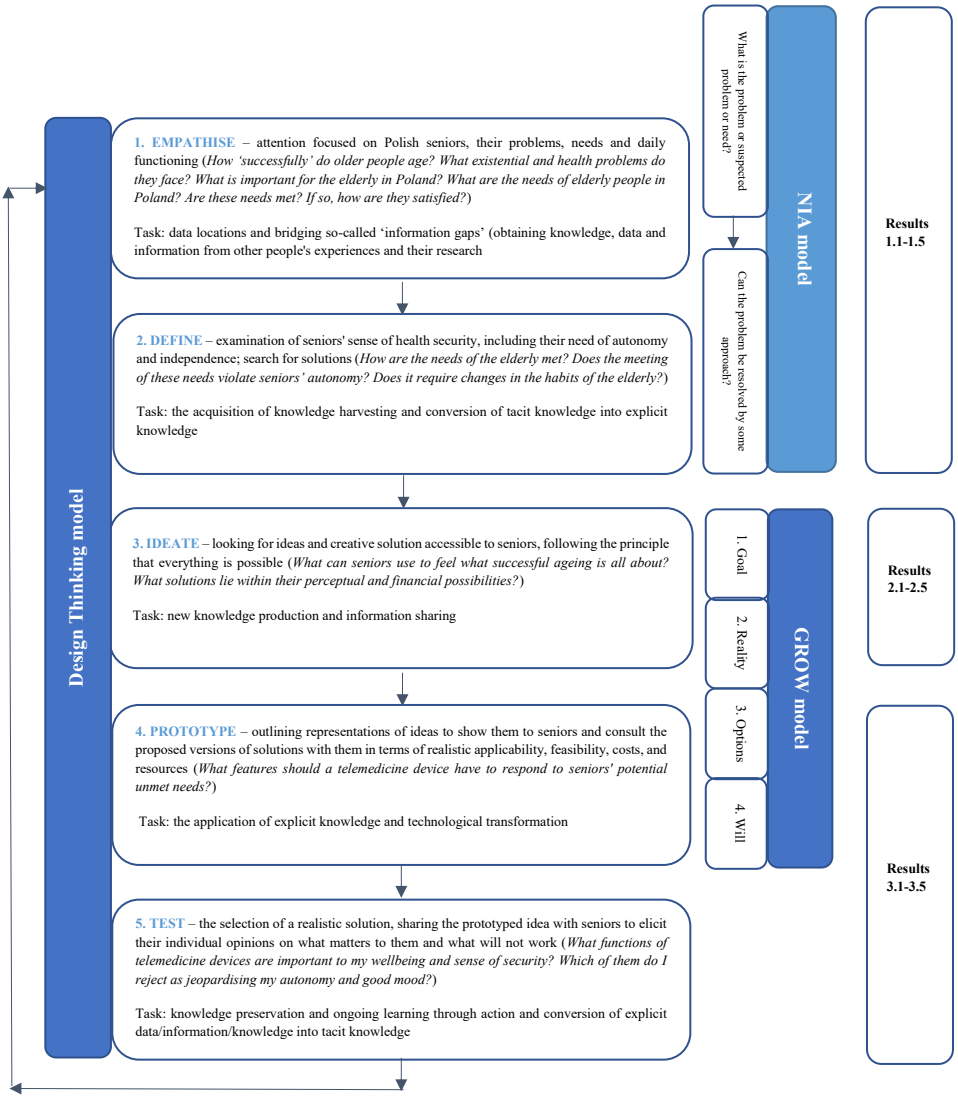

Figure 2. The use of models: NIA, Design Thinking and GROW in the analysis of the expectations and needs of senior citizens

Source: The author.

4. Results

According to statistical data from the Central Statistical Office of Poland, at the end of 2019, the population in Poland decreased to 38,383,000 inhabitants. This was a decrease of 28,000 (since the end of 2018). At the same time, a negative birth rate was recorded: in 2019 the number of births was 35,000 lower than the number of deaths. The demographic situation in 2020 was even less favourable, as it was influenced by the Covid-19 pandemic. The end of 2020 saw a decrease in the population of Poland to 38,265,000 inhabitants. This was a decrease of 118,000 compared to the end of 2019, and the number of births in 2020 was more than 122,000 lower than the number of deaths, the lowest value since the Second World War. According to data from the Central Statistical Office published at the end of 2020, the high number of deaths and low number of births, as well as the clearly lower number of marriages than in previous years, combined with the slowdown and prevention of immigration to Poland, exacerbated the unfavourable population situation in Poland which has been observed for several years. In the short term, there are no signs of changes to ensure stable demographic development. Fertility rates continue to decline, excluding the so-called 'replacement of generations'. At the same time, the percentage of people of retirement age increased, reaching a level of 22.3% of the total number of inhabitants of Poland. Senior citizens over 80 years of age accounted for 4.4% of Poland's population (CSO 2021, on-line). The old-age index increases every year, which, in the future, will be associated with problems for the social security system, due to the increase in the number and percentage of elderly people.[5]

Although the increase in life expectancy is a typical phenomenon in European countries, in Poland it is correlated with exceptionally low rates of so-called 'successful ageing' consisting of both subjective and objective factors. These are biomedical aspects (health and ADL, physical function, cognitive function) and psychosocial factors (psychologically well adapted, actively engaged in life) (Fernandez-Ballesteros, 2019).

According to Eurostat data, a 65-year-old male resident of Poland has an average of 16 years ahead of him, and a Polish woman has 20.5 years; but their estimated 'healthy life' is only 8.2 years (men) and 8.9 years (women) (OECD 2017, on-line). Health issues influence significantly the phenomenon of 'successful ageing': Poles have little chance of 'ageing well', and functioning at a satisfactory cognitive and physical level without serious diseases and significant disability (Eurostat,

[5] In 2019, the old age index was 118, now it is 121. This means that out of 100 children aged up to 14, there are 121 people aged 65 and over. The difference in size of these populations is 1.2 million, to the detriment of children.

2019).[6] The Polish coefficient of 'successful ageing' is one of the lowest in Europe, and is at a level of 1.6%. When we compare it to the highest rates, achieved by the Danes (21.1%) and Swedes (17%), and the European average (8.5%) (Hank, 2011), it becomes necessary to use knowledge from the fields of gerontology, andragogy and counselling to optimise measures aimed at senior citizens.

This is especially important now, as we realise that post-traditional societies have enormous freedom of choice, and can take advantage of an almost unlimited number of possibilities. This use, however, can be the cause of decision paralysis (Schwartz, 2004), reinforced not so much by a pandemic of disease, but by a pandemic of sizeable and often unrealistic expectations about how we should feel. In addition, if circumstances make us feel unwell, then our doctors should certainly be able to rectify the problem and make a decision for us, or at least to make it as easy as possible for us. This is particularly disturbing in a world where, according to Aldous Huxley, 'medical science has made such tremendous progress that there is hardly a healthy human left' (Muldoon, 2014, p. 797).

Denmark, Sweden and Finland are currently at the top of the successful ageing list (Eurostat, 2019), and the terms *e-Welfare* and *e-Health* have found a permanent place in their development policies and strategies (Hyppönen, Hämäläinen, Reponen, 2015; Zechner, 2019; Magnusson, Liveng, Christensen, 2013) and operating practices. It is possible thanks to, among other reasons, the high index for the digital economy and society in these countries (Fig. 3).

Technologies used in social and home care are booming. They include, among others, robots (automatic dispensers of drugs) correlated with telecare systems, virtual home care (no physical contact form for reminding individuals about meals, taking medication, verifying health status and physical rehabilitation via the internet), (profile similar to Polish social welfare centres) security devices installed free of charge by public institutions (watches with GPS tracking technology, security telephones, smoke detectors, heating system alarms or door alarms) and integrated passive monitoring and automatic notification systems based on motion sensors (e.g., Seniortek's Smart Flower Stand or Suvanto Home Service) (Van Aerschot, Parviainen, 2020, p. 247–256). Their goal is to increase the safety of older people and enable them to live longer in single-person households, while improving access to specialist services in the homecare procedure and reducing cost-intensity (Zechner, 2019; Russo, Eriksson, 2018; Magnusson, Liveng, Christensen, 2013; Jönsson, Ornstein, Christensen, Eriksson, 2019). The adaptation of Scandinavian solutions in Poland appears to be only a matter of time. Therefore, in the context of their inevitable expansion, the following article presents the results of the identifi-

[6] This is important when looking at the latest Eurostat data (Eurostat, 2019, p. 53), which shows that less than one-fifth of the elderly in Poland perceive their health as good or very good.

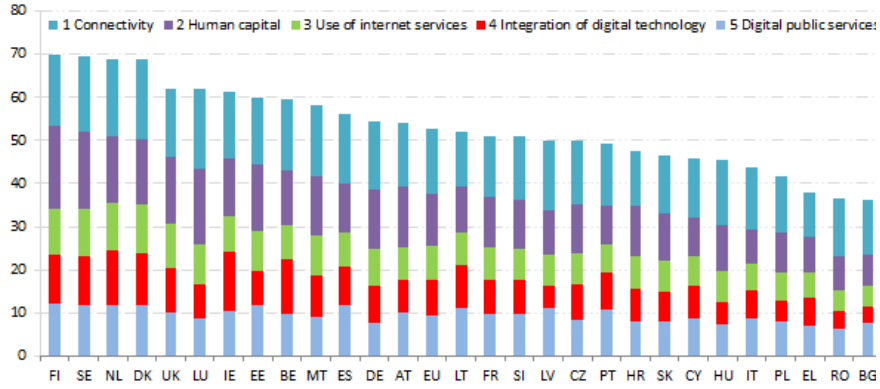

Fig. 3. The Digital Economy and Society Index in EU countries (2019): Finland (FI), Sweden (SE), Denmark (DK) and Poland (PL). Number 1 represents the index of network services, Number 2 human capital, Number 3 the use of internet services, Number 4 the integration of digital technology, Number 5 digital public services. English-language abbreviations below the index bars denote the names of individual countries (from left: Finland (FI), Sweden (SE), the Netherlands (NL), Denmark (DK), the United Kingdom (UK), Luxembourg (LU), Ireland (IE), Estonia (EE), Belgium (BE), Malta (MT), Spain (ES), Germany (DE), Austria (AT), Lithuania (LT), France (FR), Slovenia (SI), Latvia (LV), the Czech Republic (CZ), Portugal (PT), Croatia (HR), Slovakia (SK), Cyprus (CY), Hungary (HU), Italy (IT), Poland (PL), Greece (EL), Romania (RO), and Bulgaria (BG). The EU bar represents the average for the European Union. References: European Commission (2019). *Digital Economy and Society Index Report 2019: Human Capital: Digital Inclusion and Skills* (Brussels: European Commission, p. 2).

cation and analysis of senior citizens' expectations regarding telemedicine technologies using the NIA, Design Thinking and GROW models. They are as follows:

1. The basis of all activities in the NIA, Design Thinking and GROW models is empathising with the recipient and focusing on getting to know their needs in order to best define the existing problem (Fig. 2). Non-reactive studies conducted for this purpose allowed for the formulation of the following conclusions:
    1.1. The situation of elderly people in Poland is problematic and causes concern. The main problems faced by Polish senior citizens include: a lack of a sense of economic security and a lack of medical and care support for the elderly. Additionally, there is the situation of people who suffer from neurodegenerative diseases, including dementia and Alzheimer's disease.
    1.2. A significant threat to the implementation of the right of elderly people

to a dignified life are: long waiting times for specialised medical procedures, limited access to specialist doctors and gerontologists, a shorter length of stay in hospital, a decreasing number of hospitalisations of people over 75 years of age, liquidation of beds in geriatric wards and closing existing departments.

1.3. Care for Polish senior citizens is carried out mainly by families (in Poland, about 85% of carers of the elderly are the so-called 'natural guardians' i.e., family members and relatives). Senior citizens, their carers and representatives of social organisations who work for the elderly indicate the lack of a support system for dependent elderly people (especially those suffering from dementia) and their carers. Social support is provided by volunteers from non-governmental organisations, mainly religious, e.g. Caritas (Caritas Polska, on-line).

1.4. It is necessary to take systemic action aimed at eliminating the phenomenon of 'indirect discrimination', equated with taking seemingly neutral solutions or the failure to take any action, which results in limiting the right of older people to a long, independent life (RPO 2018: 9-10; United Nations. General Assembly, Resolution 2019, on-line). These actions should: (1) support a holistic approach to the needs of older people and their expectations regarding the support they receive; (2) aim to create a system of environmental support, adequate to the different (increasing with age) level of dependence of the elderly, in consultation with the elderly, especially in terms of potential threats and discriminatory practices; (3) combine multi-sectoral involvement (cooperation between the public, private, and non-governmental sectors) in the process of the professionalisation of social support by preparing a comprehensive offer; (4) use the latest technology to support basic communities (mainly families with elderly people) and informal carers for dependent senior citizens in line with the subsidiarity principle; (5) strive to ensure that older people with limited independence have the right to independence, to be active (to the extent possible) and to make decisions about their own lives.

1.5. Based on the existing statistical data, the most common diseases of Polish senior citizens were listed as: arterial hypertension, back and neck pain, osteoarthritis impeding movement, coronary artery disease, and diabetes. From the perspective of mobility and the sensory organs, and the possibility for self-care, these are: problems with vision, problems with hearing, problems with walking, problems with self-care, understood as the performance of daily activities that are the

basis of an adult's existence (CSO-EHIS 2015; CSO 2018, p. 12–14; Eurostat, 2019). Among Polish senior citizens, there are also often 'geriatric syndromes', i.e., disorders resulting from the coexistence of many diseases, and which require the help of another human being supported by telemedicine technologies, facilitating the functioning of senior citizens and their caregivers.

2. The third stage of Design Thinking includes the search for creative solutions (Ideate, Fig. 2). For this purpose, comparative studies were carried out on the functionality of telemedicine devices used in Poland and the Scandinavian countries, and compared with the expectations of senior citizens and their needs resulting from the assessment of health conditions (statistical data). The results of this stage are as follows:
   2.1. Among the telemedicine devices used in Poland, 'life bands' and remote senior care services dominate. In five Polish cities, telemedicine devices in the form of wristbands resembling watches have been implemented for nearly two years. These devices have a very limited range of functionality, and serve the elderly to a very limited extent. It is connected with lowering costs at the level of local self-government, where care for the elderly and the obligation to implement it within the scope of their duties plays a role. In no case was the introduction of the wristband preceded by an assessment of the actual demand for such devices. The functionality of the wristbands has not been studied in the context of the actual needs of senior citizens.
   2.2. The most common functionalities offered by the creators of telemedicine devices are: heart rate monitoring, alerts sent when an elderly person falls, and the function of calling for help via a button.
   2.3. The most popular telemedicine devices on the market offer the following functions: (1) two-way communication (the ability to make and receive phone calls), (2) a call button to a telecare supervisor or other defined person (the telecare function is an extra-pay function, with subscription usually paid on a monthly basis), (3) an SOS button calling a defined number (e.g., 112), and sending SMS alerts to defined phone numbers, (4) GPS/LBS location, (5) heart rate monitoring (providing information on deep and light sleep under the caregiver's supervision), (6) sleep monitoring (providing the carer with information about the client's deep and light sleep), (7) a pedometer and calorie counter.
   2.4. Sometimes the following functions can be found in telemedicine devices: (1) a virtual wall (marking a safe zone in which the wearer can move), (2) a movement sensor, (3) a fall sensor, (4) listening in the environment

(the guardian can, at any time, listen discreetly to the surroundings in which the senior resident is present when, for example, there is no voice contact with him/her), (5) reminders about cyclical activities (drinking water, taking medication, moving around), (6) an alarm (signalling that the band is not put on or taken off correctly). Telemedicine devices available on the market very rarely have the following functions: (1) a temperature sensor (monitoring the temperature level in the surrounding space), (2) voice notifications of the current time.

3. Prototyping, i.e., the fourth stage of the Design Thinking process (4. Prototype, Fig. 2), and the implementation of the GROW model, were associated with the question of senior citizens and their caregivers about solutions which, in their opinion, can work well in the real world (questionnaires and then individual interviews):
   3.1. Over two-thirds of the surveyed inhabitants of Poland (46 people, 76.67%) indicated in the survey that they had never heard of telemedicine devices for the elderly. None of the respondents used telemedicine devices, although 14 people had heard about them (23.33%). The same declarations appeared during individual interviews. '*I learned something new from this survey. Such a device is an interesting idea. I have heard about various solutions with robots, but I did not think that it is possible with us, right now. And these are such interesting functions, useful in everyday life, and you can almost get them right away. I will think about this solution*' (Ludwik, 74 years old)[7].
   3.2. For 85% of the respondents (51 respondents), the use of telemedicine devices by elderly people who have problems with independent functioning was a good idea. None of the respondents considered this a bad idea, 15% of respondents (nine people) did not have an opinion on this subject and gave the answer 'I don't know.' '*I don't need it. I am healthy. I can drive a car myself, make food and vacuum the house. But maybe other sick people need it. I don't know (...) They should judge for themselves*' (Tadeusz, 80 years old). Also, in individual interviews, the respondents emphasised that they found the idea good, although they did not necessarily want to use it right away. '*For now, this problem does not concern me, because, despite my health problems, I am intellectually fit. But I believe that such a device, for example, a simple wristband worn like a watch, could help many lonely people. On the other hand, during such a pandemic, my children are very worried about my well-being. I think such a device could help my daughter*

[7] In order to ensure the anonymity of respondents, their names were changed.

worry less about me and my pressure spikes in the future and, thanks to them, I will be able to live in my own home' (Jadwiga, 77 years old).

3.3. Elderly people and their caregivers, when asked about the three main functions of telemedicine devices that would facilitate care for the elderly, mentioned: (1) two-way internal communication (36 choices, 60% of responses), (2) reporting incidents (39 choices, 65% of responses), (3) a fall sensor (35 choices, 58.33% of responses). The usefulness of functions was related to: (4) reminders about cyclical activities (26 choices, 43.33% of answers), (5) GPS location of the senior (24 choices, 40% of answers), (6) a motion sensor (16 choices, 26.67% of answers), 7) alarm (12 choices, 20%), (8) listening to the environment (11 choices, 18.33%), (9) heart rate monitoring (ten choices, 16.67%). The need to equip telemedicine devices with the following functions was rated the lowest: (11) a pedometer and calorie counter (first choice, 1.67%), (12) a temperature sensor (three choices, 5%), (13) voice notifications about the current time (three choices, 5%), (14) a virtual wall (three choices, 5%) and sleep monitoring (five choices, 8.33%). One of the respondents said quite explicitly during the interview: '*I wouldn't want virtual walls. It would be a restriction on my freedom. What if I want to go for a short walk? I am not incapacitated, and that is how I would feel. It would be different if I already had dementia or Alzheimer's. Such a wall would then protect me. I would not like it, I am thinking about it now, if these devices allowed someone to eavesdrop on me in my home. I believe these functions should be activated with my permission or in an emergency, such as when I fall, hurt myself, and may not have the possibility to press a button and call for help. Then yes, because it is about my health. But I would not like anyone to overhear what I am talking about to my neighbour over tea, at home. I would lose my privacy then. The house would no longer be safe*' (Ewa, 63 years old).

3.4. When asked about the three main functions of telemedicine devices that may be most important for an elderly person who uses them, elderly people and their caregivers mentioned: (1) internal two-way communication (39 choices, 65% of responses), (2) reminders about cyclical activities (35 choices, 58.33% of responses) and (3) reporting incidents (34 choices, 56.66% of responses). The usefulness of the functions was mentioned less frequently: (4) a fall sensor (19 choices, 31.66% of responses), (5) heart rate monitoring (12 choices, 20% of responses), (6) an alarm (11 choices, 18.33% of responses), (7) a GPS

location sensor (ten choices, 16.66% of responses). The lowest rated necessity to equip telemedicine devices with the following functions: (8) a pedometer and calorie counter (first choice, 1.66% of responses), (9) a virtual wall (two choices, 3.33% of responses), (10) ambient listening (three choices, 5% of responses), (11) voice notifications about the current time (three choices, 5% of responses), (12) sleep monitoring (three choices, 5% of responses), (13) a temperature sensor (five choices, 8.33% of responses), (14) a motion sensor (six choices, 10% of answers). As one of the respondents pointed out: '*Listening to my surroundings reminds me of the times of the Polish People's Republic. Back then, you had to be careful what you said. For so many years, I have been free and independent. I still want to feel like that. I know I'm not eighteen, but I still feel young. I do not want anyone to connect to my house without my consent and overhear what I am doing. What if I snore and I don't want anyone to know? Everyone has their secrets. I would not want to live with the feeling that I am 'on the wire' at any time. It brings back very bad memories, and would turn the house into a prison. It would also make me feel very old and infirm if they have to eavesdrop on me to check if I am still breathing. And the calorie counter?* [smiles] *I won't be a model any more. I take care over what I eat because health is no longer the same. I guess that's enough?*' (Barbara, 70 years old).

3.5. When asked about the three redundant functions of the wristband, both senior citizens and carers of the elderly indicated: (1) a pedometer and calorie counter (52 choices, 86.66% of answers) and (2) voice notifications about the current time (36 choices, 60% of answers). The choice of the third option was problematic. The subjects ranged between (3a) sleep monitoring (18 choices, 30% of responses) and (3b) a temperature sensor (15 choices, 25% of responses and (3c) listening to the environment (15 choices, 25% of responses). The respondents also considered the possibility of eliminating the function of (4) a virtual wall (12 choices, 20% of answers) and (5) a motion sensor (11 choices, 18.33% of answers). Below were: (6) an alarm (seven choices, 11.66% of responses), (7a) heart rate monitoring and (7b) senior GPS location (six choices each, 10% of responses), (8) a fall sensor (three choices, 5% of responses), (9a) internal two-way communication and (9b) incident reporting (two choices each, 3.33% of responses). None of the respondents indicated reminders about cyclical activities as an unnecessary function of the telemedicine device.

The table below presents a list of the desired functionalities of telemedicine devices in the opinion of an elderly person (A) and an elderly caregiver (B), as well as three negated functionalities, the presence of which is not necessary to monitor the health of senior citizens (C). The sixth column indicates the functionalities with the largest and smallest sum of positive choices. The choices from the fifth column (C) were deducted from the sum of positive choices in the second (A) and third (B) columns. This operation resulted in negative points in the sixth column (D). The lowest-rated functionalities in column (D) are those least attractive to the respondents.

Table 2. List of functionalities of telemedicine devices in the opinion of the respondents

Functionality of telemedicine devices	**Most important for an OLDER PERSON (A)***	**Most important for the CARER OF THE OLDER PERSON (B)**	**KEY functionalities of telemedicine devices (A)+(B)**	**NECESSARY functionalities (C)**	**The sum of the choices obtained (D) = (A)+(B) – (C)****
Functionality 1: Two-way internal communication (the ability to make a phone call to a designated person to report a lack of supplies (food, medicine) or an event that requires intervention	39 choices (65%)	36 choices (60%)	**75 choices**	2 choices (3.33%)	**73 choices**
Functionality 2: Motion sensor (identifies whether the person wearing the armband is moving or staying still)	6 choices (10%)	16 choices (26.67%)	22 choices	11 choices (18.33%)	11 choices
Functionality 3: Temperature sensor (monitoring the temperature level of the surrounding space)	5 choices (8.33%)	3 choices (5%)	8 choices	15 choices (25%)	-7 choices

Functionality of telemedicine devices	**Most important for an OLDER PERSON (A)***	**Most important for the CARER OF THE OLDER PERSON (B)**	**KEY functionalities of telemedicine devices (A)+(B)**	**NECESSARY functionalities (C)**	**The sum of the choices obtained (D) = (A)+(B) – (C)****
Functionality 4: Incident reporting (an elderly person, by pressing a button, calls for help or reports an incident)	34 choices (56.67%)	39 choices (65%)	**73 choices**	2 choices (3.33%)	**71 choices**
Functionality 5: Fall sensor	19 choices (31.67%)	35 choices (58.33%)	**54 choices**	3 choices (5%)	**51 choices**
Functionality 6: Heart rate monitoring	12 choices (20%)	10 choices (16.67%)	22 choices	6 choices (10%)	16 choices
Functionality 7: Senior GPS location	10 choices (16.67%)	24 choices (40%)	34 choices	6 choices (10%)	28 choices
Functionality 8: Pedometer and calorie counter	1 choice (1.67%)	1 choice (1.67%)	2 choices	**52 choices (86.67%)**	-50 choices
Functionality 9: Listening to the environment (the caregiver can discreetly listen to the environment in which the senior is at any time, when, for example, there is no voice contact with him/her)	3 choices (5%)	11 choices (18.33%)	14 choices	15 choices (25%)	-1 choice
Functionality 10: Alarm (signalling that the band is incorrectly placed or removed)	11 choices (18.33%)	12 choices (20%)	23 choices	7 choices (11.67%)	16 choices
Functionality 11: Voice notifications about the current time	3 choices (5%)	3 choices (5%)	6 choices	**36 choices (60%)**	-30 choices
Functionality 12: Virtual wall (marking a safe zone in which the wearer can move)	2 choices (3.33%)	3 choices (5%)	5 choices	12 choices (20%)	-7 choices

Functionality of telemedicine devices	Most important for an OLDER PERSON (A)*	Most important for the CARER OF THE OLDER PERSON (B)	KEY functionalities of telemedicine devices (A)+(B)	NECESSARY functionalities (C)	The sum of the choices obtained (D) = (A)+(B) – (C)**
Functionality 13: Sleep monitoring (providing the caregiver with information about deep and light sleep)	3 choices (5%)	5 choices (8.33%)	8 choices	18 choices (30%)	-10 choices
Functionality 14: Reminders about cyclical activities (drinking water, taking medication)	35 choices (58.33%)	26 choices (43.33%)	**61 choices**	0 choices (0%)	**61 choices**

Source: The author.

* The highest number of possible choices for functionalities (A), (B) and (C) is 60, because the choices were made by the elderly and their carers.

** The highest figure that can be obtained is 120. However, this result is difficult to achieve with 14 functionalities.

The list of needs and the negation of the elderly and their caregivers in the sixth column of the table above show which functionalities of the prototype telemedicine device are the most expected functionalities that would facilitate the daily monitoring of the health condition of senior citizens. It also presents the least accepted or even rejected solutions.

The construction of a telemedicine device for senior citizens that is simple to build and use, which would be intended for testing (5. The test, Fig. 2), should first of all include functionalities such as (1) two-way internal communication (the possibility of making a phone call to a designated person to report a lack of supplies (food, medicine) or an event that requires intervention (73 choices), (2) reporting incidents (an elderly person, by pressing a button, calls for help or reports an incident) (71 choices), (3) a reminder for recurring activities (drinking water, taking medication) (61 choices), (4) a fall sensor (51 choices).

Final conclusions

Telemedicine devices are an opportunity to improve the quality of life of elderly people and support families caring for senior citizens. Although they are not known to the general public in Polish society, they are met with a high level

of acceptance, and are identified, by families, close relatives and caregivers, as an opportunity to support the process of care for the elderly.[8] Such devices may not only reduce the problems of the medical care system, struggling with staff shortages and long waiting times for medical visits and treatment (the problem of access to specialists in Poland is common), they can also protect the health and lives of older people, by increasing their control over their disease(s) and their own condition. Constant, round-the-clock monitoring of life processes and events can support long-term treatment effectively, and reduce (in the elderly) the sense of constant control by close or professional caregivers. According to the 'Health 2020' policy, telemedicine devices can (including in Poland) become an important element in the patient-oriented health care system (WHO, 2013, p. 3). It is crucial, however, that such a telemedicine device should contain several universal functionalities, and respond to the real expectations and needs of senior citizens. Too narrow a profiling of the group of recipients, their disease entities and dysfunctions may be ineffective in the case of multiple disabilities. One such basic functionality should be the possibility for internal two-way communication and 'reporting incidents' (the so-called 'quick response buttons'). They are especially important for maintaining the social affiliation of senior citizens and minimising the sense of social exclusion. The knowledge that they can count on the quick help of another person, who will react quickly to events requiring intervention, will strengthen their sense of security and satisfaction with life. This will influence their self-esteem, and build a sense of autonomy, and what that entails, of their own worth and self-determination.

A telemedicine device that meets the needs of elderly people and their caregivers, in terms of the functionalities offered, and one that encourages them to use it with its simple and attractive form, may create a completely new experience of ageing. The possibility of an independent existence in a close, familiar environment to the individual, and the knowledge that important vital functions are being systematically monitored should reduce the fear of one's helplessness, disability and suffering in silence. They can also provide senior citizens and their carers with a sense of security in epidemiological situations that get out of control and make it difficult for senior citizens to access health care facilities for a long time. Telemedicine devices can also support the elimination of the phenomenon of 'indirect discrimination', the aim of which is to increase the right of older people to live independently for as long as possible and to improve the quality of their daily functioning. Thus, they can influence the 'successful ageing' indicator in Poland, offe-

[8] The survey conducted aroused the interest of a quarter of the respondents so much that they asked the author for very detailed data on technologies and telemedicine devices available on foreign markets. In their opinion, such devices can significantly improve quality of functioning and the sense of security, both for senior citizens and for carers.

ring the user important value, autonomy, and a sense of independence (adequate to their health). However, for this to happen, they should be accepted by these senior citizens as tools to support their independent existence, and not as control devices that deprive them of the possibility of self-determination (Percival, Hanson, 2006).

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