Research Aricle

A Concept Analysis of Person-Centered Care and Personalized Medicine/Health Care as a Basis for an Indivualized AI and Big Data Driven Nursing and Health Care

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Abstract

Background: Digitalization and artificial intelligence are playing an increasingly important role in healthcare. But so far, there is a lack of evidence as to whether the promises can be kept and whether patient-centredness and the personalization of healthcare can be implemented. Up to now, discussions have been dominated by personalized medicine and precision medicine. The impression arises that the biopsychosocial approach is not being integrated into the discussion about AI and big data analysis in healthcare.

Methodology: A concept analysis of personalized medicine and person-centered care according to Rogers (2000) is carried out. The basis is a structured literature review.

Results: Personalized medicine initially appears to have a purely biomedical approach, but evidence is emerging in the literature that further data about patients is necessary if tailor-made healthcare is to be enabled. Person-centered care is based on various scientific theoretical approaches, but aims to perceive and care for the patient in a biopsychosocial way.

Conclusion: The concept analysis makes it clear that the concepts of personalized medicine and person-centered care should be merged for AI development and big data analysis so that the relevant characteristics can be incorporated into this development and the data relevant to patients can be collected and evaluated using a bio-psycho-social approach.

Keywords: Personalized medicine; Precision medicine; Person-centered nursing; Person-centered health care; AI; Digitalization

Introduction

Digitalization in the healthcare sector, particularly in the form of artificial intelligence and big data, is an increasingly important topic. Wiljer et al [58] assume that a decisive point has now been reached in healthcare where AI and its algorithms can be used safely, including to improve the quality of healthcare. The extent to which AI is changing prevention, diagnosis, disease care and predictive healthcare is considered significant [58]. According to Couture et al. [12], AI in healthcare has the potential to improve population health due to the large-scale use of AI-based diagnostic tools, use of AI-based health apps, especially if they are developed specifically for defined populations and their health, or if AI is used for automated population health screening. The great promise of AI in healthcare and health services research is that, due to the reliance on big data,

it enables an understanding of what works for whom and when [36]. A scoping review by Sharma et al. [46] shows that most of the research on AI in health care covers very different clinical settings and focuses more on healthcare providers and less on patient or people in need of care. Furthermore, they predominantly examine clinical care provided by physicians rather than other healthcare professionals. Similarly, the AI tools examined so far support more human decision-making and and do not inquire about people's autonomy in the healthcare system. Furthermore, the authors point out that most studies examine very defined interventions in health care that have so far had little to do with the clinical reality or the patients' real lives, needs and preferences [46]. The scoping review shows that research on AI in healthcare is predominantly conceptual in nature, often

commentaries, opinion pieces and conceptual frameworks that address relevant questions but do not provide any empirical evidence. The evidence of empirical evidence of AI in healthcare is narrow and underdeveloped, limiting the potential for generalization of findings to healthcare practice and further development of methodological approaches. In a slightly similar way, von Gerich et al. [58] summarize their results of their scoping review. Accordingly, most developed and trialed AI technology was only "working as intend or showing potential". The clinical benefit of the new AI-based tools has not been validated in the studies. In addition, only four studies have examined the relationship between technological functionality and the end-user perspective. Many studies on AI in nursing and healthcare do not specify the target group or the intended benefits [58]. Gama et al. [16] question the qualita of data used for AI and big data since it depends on many factors and local conditions that have not yet been sufficiently researched, such as the availability of technologies, documentation systems, healthcare professionals, patients, family members and so on. However, there are also a number of requirements if AI is to be used in healthcare [57]. Firstly, this includes ensuring that people retain autonomy over all healthcare processes and their data. The right to informed decision-making and the protection of privacy and confidentiality should be preserved. This also includes protecting human well-being, personal safety and the public interest. Other requirements include transparency, comprehensibility and accountability for people in healthcare. Furthermore, inclusion and equity are essential criteria for an individual-centered AI. This indicates that no one should be excluded from the development of AI and big data analysis in healthcare. WHO [57] emphasizes that AI in health care must be independent of age, gender, income and other social determinants [57].

Background

Current literature discusses the potential of artificial intelligence in nursing, e.g. how it will change nursing care [38]. It is assumed that artificial intelligence can, among other things, improve and support the organization of patient processes and treatment plans and/or provide all relevant information that doctors and nurses need to make appropriate decisions and/or assist with repetitive or routine tasks in healthcare or medication management [35,50]. It is hypothesized that AI will take over routine tasks in the healthcare process, such as providing patient information to nurses and doctors, creating care plans, performing medication management, etc. [35]. Other authors assume that the integration of artificial intelligence into nursing care will change the nurse-patient interaction. There is discussion in the international literature that AI-based processes in nursing can support clinical decisions or even generate automatic warning systems and thus also systematically support the nursing workflow and enable personalized patient care [45,8]. These technologies need to be examined in more detail, in particular how they change nursing care processes qualitatively and quantitatively, how they change every day processes and whether and how the outcomes of nursing care are influenced [41]. In their consensus statement, Ronquillo et al. [40] elaborate on the positive potential of AI in nursing care as well as possible negative influences, e.g. that system-related biases can be reflected in the AI algorithms, including social and health inequalities. The question also arises as to how these AI-based systems improve patient safety and outcomes and to what extent they contribute to the prevention of nursing errors [45]. For example, there are opportunities for clinical pathways, disease progression or the prediction of deterioration or risks to

be taken over by AI, thus paving the way for nursing action [42]. Other potential uses are also seen in the fact that AI can combine diagnosis with scientific evidence and guidelines and lead to personalized treatment plans [31]. The qualitative survey by Rony et al. [41] shows that the nursing professions surveyed generally consider the implementation of AI to be very positive and supportive of nursing care. In principle, they anticipate that AI in nursing care will, for example, enable tailor-made healthcare, detect any deterioration in health and improve the well-being of patients through this personalized or person-centered AI-based support. In another paper Rony, Parvin & Ferdousi [42] claim, that AI will "revolutionize nursing practice and enhance patient care" since "real-time insights", more accurate diagnosis and personalized care plans will be possible.

However, some recent publications such as Rony et al. [41], Rony, Parvin & Ferdousi [42] and Ronquillo et al. [40] emphasize that nursing professions in particular, with their more holistic approach in health care have a special role to play in the process of developing and implementing AI in health care. The above outlined debate on the development of AI in healthcare has shown that, on the one hand, AI offers many promises for improving and transforming nursing and healthcare. On the other hand, however, it appears that the perspective of the people, the patients, as well as their needs, wishes and factors that shape their lives and which are relevant in the provision of high-quality and person-centered healthcare, are missing. Shang (2021) states that the topic of AI and nursing is still in its infancy. This can be recognised, among other things, by the still low degree of application of AI in practical nursing care as well as in research publications on AI and nursing, which remains very underrepresented. Buchanan et al [8] question how person-centred nursing care can be ensured with the development of AI and big data analysis. This includes not only ensuring that a nurse-patient interaction and relationship continues to take place and is established, but also that the relevant information of a person-centred AI development is included. There is some discussion in the literature that there is a risk in AI that systemic biases or social inequalities will be perpetuated, thus making AI less accurate [33]. So, after all, the algorithms or AI-based decisions, diagnoses, treatment suggestions and more, require person-cenetred information so that a bio-psycho-social health care can be made in the interests of the individual patient. A purely personalized medical AI will lack relevant information.

The impression is that the development and testing of AI in the health and nursing care of patients is currently directed from a predominantly one-dimensional and rather biomedical and monodisciplinary perspective. As early as 2018, Abdul-Hasn & Kenny [1] formulated that the developments in personalized medicine should go hand in hand with the huge genetic findings and databases with electronic documentation systems that have been determined to date. The two authors view the electronic patient record as a real-time, patient-centered digital documentation system that is managed responsibly by healthcare professionals. They are assuming that this combination could considerably improve the clinical healthcare of patients.

Aims

Although almost all publications on AI in healthcare state the potential for better and more accurate diagnosis, personalized and person-centered as well as tailor-made planning and implementation of healthcare, the literature lacks the conceptual foundations of how the approaches of individualized, person-centered and personalized nursing healthcare should be reali-

zed with AI. So far, the published literature has not specified the basis on which the required data should be derived for AI development if all the promises of AI in healthcare and nursing care are to be achieved.

In this light, the aim of this conceptual analysis is to clarify the meaning of the terms personalized medicine and person-centered nursing/healthcare so that they can be used as a basis for AI development and big data analysis in order to fill the gaps mentioned above. The aim is to provide the opportunity to define the relevant aspects of person-centered and personalized health care in such a way that the pertinent characteristics can be integrated into AI development and big data analysis. This concept analysis is intended to provide a basis for the question of how artificial intelligence and big data can be used to achieve person-centered and personalized nursing and health care that meets people's needs and requirements and can support the process of interprofessional and cross-sectoral healthcare.

Methods

Concept analysis is seen as a relevant basis for further research, since a precise description of a concept provides a theoretical basis for further research and practice. Nuopponen (2010:4) defines concept analysis as follows: "Concept analysis could be basically defined as an activity where concepts, their characteristics and relations to other concepts are clarified." A concept analysis analyses and presents the state of knowledge for a concept of interest. Guiding questions include: How is the concept defined, described? Is it used in defined areas? How is it used? What predictions, explanations do the concept enable? In which generalizations or descriptions/descriptions of patterns does the concept appear? If the theory/concept makes a difference in practice, what difference does it make in use?

Concept analysis is therefore useful to approach conceptual and terminological problems and thus understand them as part of "terminology work". Since the concepts of personalized medicine and person-centered care have evolved in understanding in recent years, but are also so fundamental to enabling AI and big data analysis in healthcare that is useful to people in need of healthcare, it makes sense to analyze both concepts with the help of a concept analysis as a basis for further AI development and research,

Concept analysis is therefore an analytical and synthesizing approach to define and describe relevant concepts [39]. There are various methodological approaches to concept analyses. In this thesis, the approach of Rodgers [39] is applied.

Following the methodology proposed by Rodgers (39), the following steps were carried out (Table 1).

- While conducting the core analysis, the following questions were addressed to the included publications [52].

- **Surrogate terms:** Do other words say the same thing as the chosen concept? Do other words have something in common with the concept?

- **Antecedents:** Which events or phenomena have been associated with the concept in the past?

- **Attributes:** What are the concept's characteristics?

- **Examples/Use of Concept:** Are concrete examples of the concept described in the data material?

- **Consequences:** What happens after or as a result of the concept?

This approach was supplemented by the additional items definition of the concept according to Walker & Avant [56]: What kind of definitions offer the authors on the concept?

The results of this core analysis can be seen in Table 2 &3.

Literature Search

Following the approach of Rodgers [52], the literature search is broad-based. This is also done against the background that the terms "personalized medicine", "personalized nursing" and "person-centered nursing" are very wide-ranging.

The literature search was conducted iteratively. Initially, general literature sources are sought in order to gain an overview of the current state of discussion on this topic. It can be seen that all terms are sometimes very generic in publications, but then again very specifically related to population groups, settings and diseases. Some already refer to digitalization and AI development, especially in relation to personalized medicine. Based on these findings, the decision was made to define the following inclusion and exclusion criteria

Inclusion criteria: Personalized medicine, precision medicine; personalized nursing, person-centered nursing, person-centered medicine in the title. The articles should deal with the concepts in general. The search is initially conducted for the last 5 years. If it becomes apparent that relevant publications date back a further 5 years, the search is carried out a further 5 years into the past. Furthermore, not only studies are included, but also commentaries, opinion papers and grey literature, i.e. also publications that were produced on behalf of e.g. ministries, health insurance companies or similar and were created as pdf or other publication options. Only publications in English are integrated.

Exclusion criteria: All contributions that deal with specific

Table 1: Steps concept analysis.

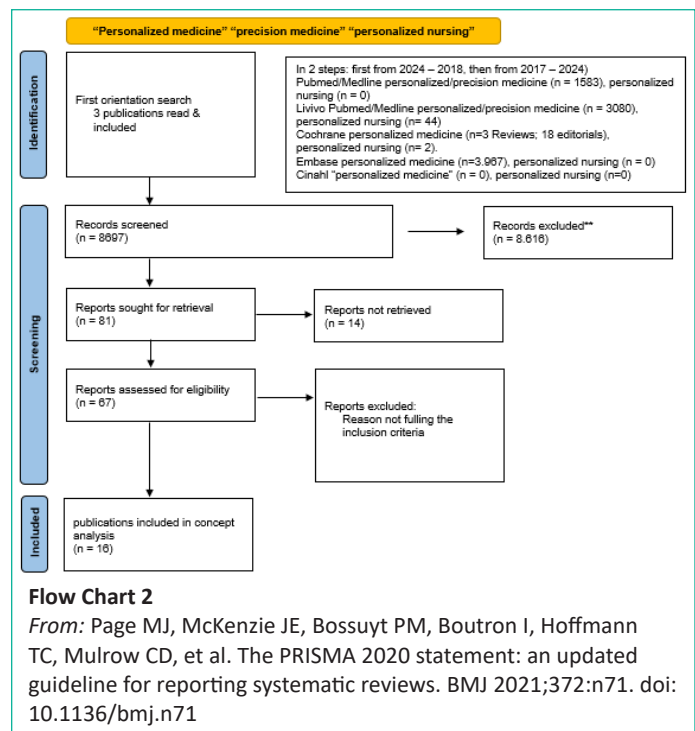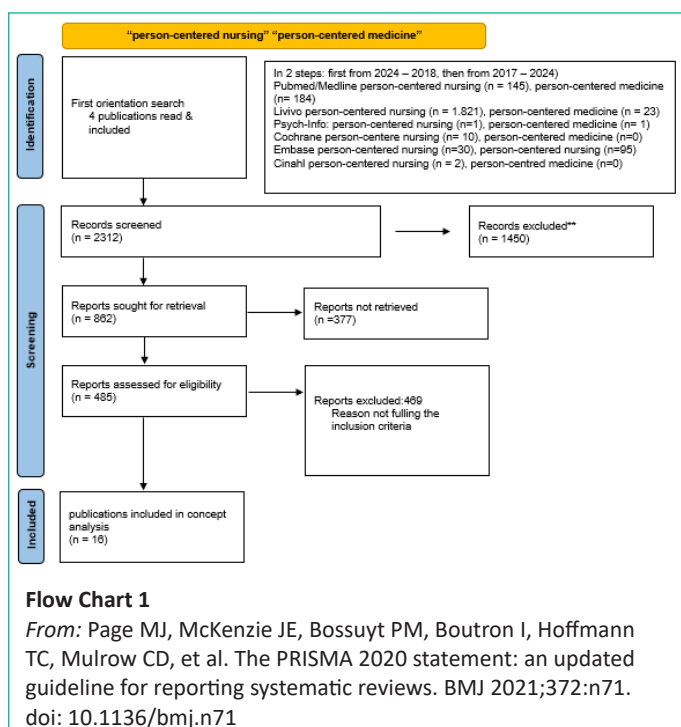| Steps	
The initial phase: Choice of concepts for analysis	Both selected concepts, such as personalized medicine and person-centered care, are important for the future design of AI-based healthcare and big data analysis
The context of the concept	Rodgers (39) explains that a concept is understood and enculturated differently depending on the discipline. For this reason, a comprehensive research is carried out in this concept analysis for both concepts in order to determine whether and how both concepts are defined in both disciplines (medicine and nursing science).
Collection of material for concept analysis	Rodgers (39) explains that a range of material can be used to analyze a concept (e.g. print media, interviews etc.). In the presented concept analysis, a literature review is carried out according to the procedure of a scoping review as described by Elm et al. (2019). This procedure also includes a range of different sources and is appropriate to the proposal by Rodgers (39).
The choice of texts	Following Rodgers' suggestions, not only are the databases selected to match the chosen concepts (PubMed/Medline, Livivo, CINAHL), but they are also supplemented with a manual search by referencing the literature of the included publications (snow-ball system) and also using google scholar as a supplement.
The core analysis phase	During the core analysis, the following questions (see below) were developed for each text and recorded in an analysis table (see table 2 & 3) and described in the results section of this paper.

population groups, settings, diseases in the context of the se-lected concepts. In addition, no articles older than 10 years will be included.

In accordance with the iterative procedure, the PubMed/Medline database is first searched after the first orientation research for each term, the title and abstract of the articles searched are screened to determine whether they are suitable for the concept analysis and transferred to the literature management program CITAVI. At the same time, an evaluation is carried out in accordance with the above-mentioned areas of analysis and entered into the tables. The search terms are then entered into the Livivo database and the articles are screened in the title and abstract to determine whether they fulfil the inclusion criteria and transferred to CITAVI. The same procedure is followed with Psycho-Info Cinahl and Embase. For each search, the included articles are analyzed according to the criteria listed in table 2 & 3. The advantage of this iterative search and analysis process is that any articles that already exist and have been analyzed are immediately recognized and no longer included. Furthermore, it is also possible to compare the analysis results, recognize overlaps or differences or any further developments in order to be able to assess that all relevant findings on both concepts have been included and data saturation can be determined. This is followed by a snowball procedure, i.e. if it becomes apparent within an analyzed article that a source is cited that has not yet appeared in the database search but appears to be relevant, it is manually searched for and researched and assessed as to whether it meets the inclusion criteria. Due to the aim and intention of this publication to perform a concept analysis, it is not necessary to apply a method to assess the quality of the included publications.

In the end, the concept analysis includes the publications that contain descriptions and definitions of the desired concepts, that make statements about how these concepts are used, that describe the elements, attributes and characteristics of the concepts.

The Following PRISMA Flow Charts Show the Iterative Process of the Literature Search

Prisma Flow Charts 1 & 2

Flow Chart 1

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Flow Chart 2

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Results

In this results section, the individual elements of the concept analysis are first presented separately for personalized medicine and then for person-centered nursing.

Personalized Medicine

Surrogate terms/Synonyms: Different synonyms are sometimes used for personalized medicine within the texts, such as precision health care, precision medicine, precision medicine, stratified medicine, individualized medicine, genomic medicine, pharmacogenomics, personalized treatment, integrated meidince, precision medicine, stratified medicine, genomics medicine and so on which are not necessarily explained in the many articles [34,32,18,17,15,51,2,3]. It can be seen that over the years the terminology has changed from personalized medicine to precision medicine. It is recognizable that this is intended to clarify that the therapy and treatment of patients should be tailored to individuals with the help of bio-genetic procedures.

Antecedents

While the understanding of personalized medicine was originally very biomedical and shaped by various genome projects in different countries [23,34,13,32,18,17,9,22,27,2] the few publications from the field of nursing sciences on personalized medicine are based more on a person-centered understanding of personalized healthcare [20,24,15,51]. The focus is more on the biopsychosocial understanding of a person. However, more recent publications on personalized medicine are also increasingly turning to the realization that data from clinical care and other data must also be taken into account for personalized healthcare if the patient is to receive individually appropriate medical care [2,17,22]. It is clearly recognized that genetic information alone is not enough. Rather, it is emphasized that the particular challenge will be to combine the different data appropriately. Abul-Husn & Kenny [1] discuss how, for example, the wealth of data available in electronic documentation systems (e.g. longitudinal, real patient data, standard clinical care data, demographic data, medical and healthcare data, structured and unstructured data, etc.) can be used by patients for personalized medicine.

Attributes

The outstanding characteristic of personalized medicine is, first of all, genetic analyses, the reference to very large databases with genetic information [23,34,13,32,17,18,9,22,27,2]. Further publications will then add other aspects that appear to be important for personalized medicine, such as phenotypes or knowledge of people's lifestyles, living environment or clinical data from electronic patient documentation systems [17,22,2,20,24,15,51].

Uses of Concept/Examples

As the literature analyzed for this concept analysis mainly deals with personalized medicine in general, the possible examples or uses of personalized medicine are not clearly presented. Some publications indicate that personalized medicine is still predominantly a research topic and has not yet made its way into clinical care [34,23,32,18]. The potential is generally seen in the individualized medical treatment of diseases. The possibility of prevention on the basis of genome analyses is also repeatedly seen, but this is not elaborated on in the underlying publications. The potential is generally seen in the individualized medical treatment of diseases [34,32,18,17,2,27,51]. The publications that address personalized medicine from a nursing science perspective list possible roles and responsibilities that nursing professions can take on in personalized medicine. These include, for example, counselling patients, coordinating healthcare or collecting all relevant information from patients, their environment, family backgrounds and more [20,24,27,15,51].

Consequences

The listed consequences of personalized medicine still seem to be in the realm of the possible, rather than actually achieved as personalized medicine [13,17,3]. It is hoped that patients may experience fewer side effects due to customized therapies, that healthcare outcomes will improve and that diseases or therapies will be better understood [13,22]. Another necessary consequence formulated in the literature is that data from traditional personalized medicine, such as genome analyses, should be combined with data from electronic patient records and other personal data such as lifestyles, health and illness behavior, environmental factors and more [32,17]. The need for interdisciplinary and multidisciplinary collaboration is also necessary in personalized medicine so that all relevant information about the patient can be obtained and included in the data analysis [23,29,9,15].

Definitions

In most definitions, reference is first made to the basic genetic disposition of individuals [23,34,13,9,22], with the aim of referring to tailor-made therapies for the particular individual, as it supports the decision-making process for the most suitable and effective treatment [32,17,18,2]. Further definitions add that personalized medicine is about meeting the healthcare needs of individuals. Other definitions state that personalized medicine focuses primarily on preventive medicine. More recent developments in the understanding of personalized medicine add the need to understand and integrate the social contact of patients, their preferences, behavior, etc [20,24,17,15,22,51].

Person-Centered Nursing – Health Care

Surrogate Terms/Synonyms

Various synonyms for the concept of "person-centred care" are used in the literature, such as patient-centered care, resident and family-centered care, patient-involvement, personalized care, relationship-centered care, person-directed care person-focused care [14,10,19,47,25,49,5,44]. However, all terms are not differentiated from each other in the publications, but are sometimes only mentioned as an alternative to the term "person-centered care".

Antecedents

The concept has obviously emerged from critical analyses of the term "patient-centered care" in order to detach from the understanding that people receiving healthcare are only passive beings who are merely recipients of disease diagnoses and therapy [14,48,49,5]. With the person-centered care approach, the aim is to shift away from the biomedical view of people as patients in the healthcare system and implement a biopsychosocial approach to individuals in healthcare [6,14,21,47,48,5]. Person-centered care is about the person who is interdependently linked with others and the environment [14,53]. It recognizes that health and illness are not only biomedically determined, but that many other factors can be significant [53]. Some of the publications refer to the scientific-theoretical foundations of personhood and individuality [30,10].

Attributes

The attributes or characteristics of person-centered healthcare are similar in almost all of the publications included. These characteristics are as follows: shared decision making, autonomy, taking patients' values and preferences into account, including patients' needs and requirements, care coordination, effective communication [7,19,53,47,26,5,44]. A key characteristic of person-centered care is that the patient is at the center of healthcare and the entire healthcare provision is based on the needs and requirements of the patient. Patients' values and standards are part of healthcare that always has dignity in its sights [6,14,10,48,49]. Furthermore, a core element is that the relationship between healthcare professionals and patients is understood as a partnership and that the patient's perspective is incorporated into healthcare and included in the documentation [30,6,10, 53,49,26]. Healthcare is organized across all settings and sectors, enabling improved communication across all levels of healthcare [47]. Patients are an active part of healthcare, which is also reflected in shared decision-making [30,19,26,5].

Consequences

The consequences of person-centered care are reported to be partnership-based healthcare, the patient as an active part of healthcare, improved communication and care coordination and outcomes and better patient satisfaction and less fragmented health care [7,6,10,19,47,43,44]. Patients' needs and requirements are better understood and if these are then incorporated into healthcare decisions, the quality of healthcare also improves [49,25].

Use of Concept/Examples

As described above in the description of the results on personalized medicine, there are no specific examples of its application, as the literature analyzed was primarily intended to deal with the concept of person-centered care in general, in accordance with the inclusion criteria. However, the literature reviewed indicates that the concept of person-centered care with the biopsychosocial approach can be used in all settings and sectors and for all patient and population groups [53,47].

Definitions

There are various definitions of person-centered care. What they have in common is, that this concept is a biopsychosocial approach that takes a respectful approach to the needs, preferences and values of patients and it contributes to empower patients. Person-centered care guarantees the right to respect for human rights by taking into account the dignity and rights of patients regardless of gender, age and state of health. Person-centered nursing care involves identifying the values and preferences as well as health and life goals of patients and people in need of care in healthcare. The goal of person-centered care is a meaningful life for patients [43,53,21,49,10,5,44]. It is believed that person-centered care is likely to have a nursing care is likely to have a statistically significant impact on improving patient care, so the integration of person-centered care is important for outcomes and quality [25].

Discussion

This conceptual analysis of these two concepts initially suggests that they appear to have a different focus. Personalized medicine has a predominantly biomedical approach [34,32,17,18], although more recent publications recognize that people are not just made up of genetic data. More recent publications on personalized medicine emphasize that clinical data on healthcare is just as necessary as knowledge of social circumstances, personal values, attitudes and should include a more biopsychosocial approach and focus more on the needs of patients [13,22]. It has even been suggested that personalized medicine could develop into "precision public health" [2].

At this point, the crossover or a developing interface to person-centered care becomes obvious. Person-centered care, on the other hand, is based on a completely different level of scientific theory. On the one hand, it becomes clear that the concept of person-centered care has been the result of a critical discussion of the term patient-centered care. The aim of person-centered care is to no longer see patients in healthcare as merely passive recipients of healthcare measures, but as an active part and as a person who is embedded in a life and has values and preferences and is influenced by lifestyles and living environments [6,14,53,49,48]. This also illustrates that person-centered care, unlike personalized medicine, is based on complex scientific theoretical foundations such as the concept of the individual, personhood or people as biopsychosocial entities [30].

Interestingly, publications from the field of nursing science that address personalized medicine also tend to be based on the theories of personhood, the individual or the person as a biopsychosocial being [20,15,51]. They seem to combine the initially biomedical approach of personalized medicine with the predominantly biopsychosocial approach of person-centered care. This approach is also the one that should be pursued for the further development of AI and big data in healthcare. If the initially predominantly biomedical approach of personalized medicine is pursued further and incorporated into AI development and big data analysis, there is a risk that a lot of data will be missing for customised therapy and healthcare. The current impression is, that the concept personalized medicine dominates the discussion in developing AI and anlysing the huge amount of data in health care. Already, Alyass, Turcotte & Mayre [4] identify a bottleneck problem in the development of personalized medicine and big data analysis. The challenge is not so much data generation, but data management, data analysis, data integration and interpretation. It would therefore already seem important to take a critical look at the understanding of personalised medicine and demonstrate that an at least person-centred approach should be integrated for AI development and big data analysis that is intended to benefit patients and perceive them as a whole person. In this case, the complexity of data storage, analysis and interpretation becomes even more complex, but should be considered from the very beginning in order to ensure that AI and big data analysis in healthcare meets the needs of patients and can improve decision-making with a bio-psycho-social approach and outcomes.

Burau`s et al [9] article reveals that hat the current discussions on personalized medicine tend to take place in the context of state or higher-ranking interests, i.e. in the context of interests of pharmaceutical companies, or other companies in healthcare industry, but the perspective, interests and benefits of citizens, who are also part of a state, are hardly ever discussed. At the moment, the concept analysis hints, that the interests of individuals as the fundamental part of personalized medicine are not discussed and integrated in the development of personalized medicine. In the context of increasing digitalization and AI development as well as big data analysis, this finding must be viewed critically, as it is questionable which data and information will then be included, whether people will still be part of the decision-making process at all and how the biopsychosocial approach is to be implemented in AI and big data analysis in healthcare. This critical point advocates conceprually bringing together personalized medicine with person-centered care to ensure that all relevant data and information is incorporated into AI development and big data analysis to improve healthcare and outcomes. It remains to be recognized that people are comprised of more than just genetic information and treatment success is dependent on many factors that are not only biomedically based. At the moment, the biomedical assumption of the effects of personalized medicine is still in the realm of "wishful thinking". So far, the assumption, that personalized medicine enables a more focused therapy is unproven. Although more genetic information is being identified, personalized medicine as it is currently understood has not yet been effectively implemented [23,29,28].

Smith et al. [46] clearly state that person-centered care was developed in response to the depersonalization of people in the healthcare system. This aspect must be strongly considered when it comes to the development of AI and big data in healthcare. If the focus is too much on personalized medicine in the traditional sense and in the biomedical approaches, there is a great risk that previous achievements in healthcare, such as person-centered healthcare, shared decision-making, patients' wishes and needs, their circumstances and much more will be disregarded. For this reason alone, it is highly relevant to analyze the characteristics of person-centered care and to ask which data and data sources can be used to integrate these into AI development and big data.

The attributes of personalized medicine initially appear to be genetic analyses and large databases. But subsequently, the ideas for personalized medicine open up around the need for data from clinical care and the individual living environment. This is precisely where the connection point of person-centered care can be found, which not only focuses on the patient, but also on joint decision-making, the values, needs, priorities, perceptions and bio-psycho-social circumstances of the patient. For an AI and big data analysis in healthcare that is not only

committed to a personalized medicine but also to being person-centered, it is important to integrate the characteristics of person-centered healthcare or to develop a joint concept that can be used for further AI development.

The common concept would therefore be that the findings of the genetic analyses and biomarkers are supplemented by the findings on values, norms, preferences, lifestyles, environmental and personal factors, responses to therapies, existing co-morbidities cognitive and emotional factors, presentation of symptoms, self-management and other factors are also added. Furthermore, the goals of combined AI-based personalized and person-centered healthcare must be defined. Cirillo & Valencia (2019) ask how knowledge is gained from the large amount of data in the healthcare sector. This question is highly relevant if AI and big data analysis in healthcare should be personalized and person-centered, taking into account the choices, wishes, needs and circumstances of patients in the healthcare system. This requires concrete knowledge about personal orientation and which data is required.

Overall, the literature on AI in healthcare indicates that these goals and an overall framework for AI in healthcare are lacking [46]. However, defining the objectives is highly relevant in order to be able to define the outcomes in the end, not to lose the focus on people, who should also be the center of attention in AI development and big data analysis, and to structure research accordingly and give possible personalized, person-centered directions.

Of course, the question remains whether it would not be sufficient to incorporate PROMs (patient related outcomes) as person-centered factors in AI development and big data analysis. But it is questionable whether the PROMs are sufficient for this and reflect the outcomes from the patient's perspective or their expectations or merely the assumptions of the healthcare professionals conducting the research [11]. There is evidence in the literature that the PROMs do not reflect patients' specific views of favorable outcomes, that they can't visualize more nuanced or at least supplementary outcomes and their measurements and they have little relevance for the clinical healthcare of patients [37,11].

It should also be noted that in the reality of healthcare, the aspects of person-centered care are sacrificed first due to time and personnel limitations [44]. Under difficult time and personnel conditions, healthcare professionals are less likely to provide person-centered care and are also less interested in doing so [44]. Against the background that AI and big data are increasingly influencing healthcare and at the same time the framework conditions are not getting any easier due to a shortage of qualified staff, increasing economization of the healthcare system, and so forth, it can therefore be concluded from the discussion above that a conceptual clarification of the important elements of person-centered and personalized healthcare appears to be highly significant. On this basis, it would then be possible to derive which information and data are required, how they can be analyzed and linked in a high-quality manner and which outcomes they should lead to in the interests of the individual. Further research is needed in the future to clarify these aspects so that AI development and big data analysis can be carried out in a person-centered and personalized manner.

Vincente et al. [54] describe in their vision for personalized medicine for the year 2030 that this will overcome intersectoral boundaries and combine clinical care, clinical research and the health professions, patients with personalized medicine. But this will definitely require further research, as it is questionable how the data from interprofessional clinical research and the perspectives of patients and healthcare professionals should be incorporated into the development of personalized medicine and which data is needed.

Conclusion and Implications

While personalized medicine is predominantly based on genome analyses and other biomedical tools, the question remains as to whether personalized care and healthcare should be more broadly based [23,29,28]. In the course of increasing digitalization and the use of digital data through AI and big data, it seems highly relevant to consider person-centeredness conceptually and in research in order to include the perspective, goals, values and expectations of patients and those in need of health care. In light of the fact that AI and big data are increasingly influencing healthcare and at the same time the framework conditions are not becoming any easier due to the shortage of specialists, increasing economization of the healthcare system, etc., the question should be asked as to precisely which aspects of person-centered and personalized healthcare need to be digitized and which need to be maintained in personal interaction. The envisioned concept should be to develop an understanding of hybrid healthcare that combines personalized and person-centered care in such a way that the bio-psychosocial approach to healthcare is also enabled by digitalization, AI and big data. This proposed approach seems so important because the existing digitalization of the healthcare system will go hand in hand with further digitalization, as new digital applications are constantly being added. In the medium and long term, a digital ecosystem will emerge that must be centered around people with healthcare needs and generate and analyse high-quality data. It is precisely against this background that it is so important to conceptualize the terms of person-centeredness and personalized medicine so effectively that all information relevant to people in need of is incorporated into digitized and AI-based healthcare.

Furthermore, PROMs only serve to analyze the impact of healthcare interventions. The review by Rivera et al. [37] even shows that PROMs have hardly any effect or influence in the reality of healthcare. Furthermore, if we consider the attributes of person-centered care and how the concept of personalized medicine has been expanded to include a biopsychosocial understanding or the development towards public health-oriented personalised medicine, it is apparent that AI-based healthcare and big data analysis require further information about people in order to make useful healthcare suggestions for patients. It is left to further research to deal with the results of this concept analysis, to develop a hybrid understanding of personalised-person-centered healthcare, which then shows the data collection tools, the required information and linkages of different data sources and more that need to be integrated.

Based on the attributes, possible consequences and definitions identified in this concept analysis, a reasonable approach could be to first define the goal of hybrid personalized-person-centered healthcare, to define or possibly develop the possible appropriate data collection instruments and data bases and to determine the outcomes that are to be achieved. This requires an interprofessional, interdisciplinary and participatory research approach that also involves patients.

References

1. Abul-Husn NS, Kenny EE. Personalized medicine and the power of electronic health records. Cell. 2019; 177: 58–69.

2. Aguilera-Cobos L, Garciá-Sanz P, Rosario-Lozano MP, Claros G, Blasco-Amaro J. An innovative framework to determine the implementation level of personalized medicine: A systematic review. Health Policy. 2021; 125: 122–129.

3. Ahmed L, Constantinidou A, Chatzittofis A. Patients' perspectives related to ethical issues and risks in precision medicine: a systematic review. Front Med. 2023; 10: 1215663.

4. Alyass A, Turcotte M, Meyre D. From big data analysis to personalized medicine for all: challenges and opportunities'. BMC medical genomics. 2015; 8: 33.

5. American Geriatrics Society Expert Panel on Person-Centered Care. Person-Centered Care: A Definition and Essential Elements. J Am Geriatr Soc. 2016; 64: 15– 18.

6. Araki M. Patient Centered Care and Professional Nursing Practices. Journal of Biomedical Research and Clinical Investigation. 2019; 1: 1004.

7. Berghout M, van Exel J, Leensvaart L, Cramm JM. Healthcare professionals' views on patient-centered care in hospitals, BMC health services research. 2015; 15:385.

8. Buchanan C, Howitt ML, Wilson R, Richard G. Predicted Influences of Artificial Intelligence on Nursing Education: Scoping Reviews. JMIR Nursing. 2021 4: e23933.

9. Burau V, Nissen N, Terkildsen MD, Væggemose U. Personalised medicine and the state: A political discourse analysis, Health policy. 2021; 125: 122–129.

10. Byrne AL, Baldwin A, Harvey C. Whose centre is it anyway? Defining person-centred care in nursing: An integrative review. PloS one. 2020; 15: e0229923.

11. Carfora L, Foley CM, Hagi-Diakou P, Lesty PJ, Sandstrom ML, Ramsey I, et al. Patients' experiences and perspectives of patient-reported outcome measures in clinical care: A systematic review and qualitative meta-synthesis. PloS one. 2022 17: e0267030.

12. Couture V, Roy MC, Dez E, Lagerle S, Bélisle-Pipon J-C. Ethical Implications of Artificial Intelligence in Population Health and the Public's Role in Its Governance: Perspectives From a Citizen and Expert Panel. Journal of Medical Internet Research. 2023; v25: e44357.

13. DiPaolo A, Sarkozy F, Fyll B, Siebert U. Personalized medicine in Europe: not yet personal enough? BMC Health Services Research. 2017; 17: 289.

14. Eklund H, Holmström IK, Kumlin T, Kaminsky E, Skoglund K, Hoglander J, et al. Same same or different?" A review of reviews of person-centered and patient-centered care. Patient Education and Counseling. 2019; 102: 3-11.

15. Fu MR, Kurnat-Thoma E, Starkweather A, Henderson WA, Cashion AK, Williams JK, et al. Precision health: A nursing perspective. International journal of nursing sciences. 2020; 7: 5–12.

16. Gama F, Tysbo D, Nygren J, Barlow J, Reed J, Svedberg P, et al. Review. Implementation Frameworks for Artificial Intelligence Translation Into Health Care Practice: Scoping Review. Journal of Medical Internet Research. 2022; 24: e32215.

17. Ginsburg BS, Phillips KA. Precision Medicine: From Science to Value. Health Aff. 2018; 37: 694–701.

18. Goetz LH, Schork NJ. Personalized medicine: motivation, challenges, and progress', Fertility and sterility. 2018; 109: 952–963.

19. Grover S, Fitzpatrick A, Azim FT, Ariza-Vega P, Bellwood P, Burns J, et al. Defining and implementing patient-centered care: An umbrella review. Patient education and counseling. 2022; 105: 1679–1688.

20. Han CH. A Concept Analysis of Personalized Health Care in Nursing', Nurs Forum. 2015; 1: 32-29.

21. Jensen AN, Andersen O, Gamst-Jensen H, Kristiansen M. Short Communication: Opportunities and Challenges for Early Person-Centered Care for Older Patients in Emergency Settings. Int J Environ Res Public Health. 2021; 18: 12526.

22. Johnson KB, Wie WQ, Weeraratne D, Frisse ME, Misulis K, Rhee K, et al. Precision Medicine, AI, and the Future of Personalized Health Care. Clin Transl Sci. 2021; 14: 86–93.

23. Joyner MJ, Paneth N. Seven Questions for Personalized Medicine. Jama. 2015; 314: 10:999-1000.

24. Jungyoun Han C. A Concept Analysis of Personalized Health Care in Nursing. Nursing Forum. 2016; 51: 32–39.

25. Kim S, Kim M. Nursing students` experience and perceptions of barriers to the implementation of person-centred care in clinical settings: A qualitative study. Nursing Open. 2023; 10: 1889–1899.

26. Lopes M, Sousa L, Fonseca C. Advances in Personalized Nursing Care. Journal of personalized medicine. 2023; 13: 12.

27. Lopes-Júnior LC. Personalized Nursing Care in Precision-Medicine Era. SAGE open nursing. 2021; 7: 23779608211064713.

28. Madden K, Bhandara I. Can Evidence-Base Medicine and Personalized Medicine coexist? C. Rivière, P.-A. Vendittoli (eds.), Personalized Hip and Knee Joint Replacement. 2020.

29. Mathur S, Sutton J. Personalized medicine could transform healthcare (Review). BIOMEDICAL REPORTS. 2017; 7: 3-5.

30. McCormack B, Borg M, Cardiff S, Dewing J, Jacobs G, Janes N, et al. Person-centredness – the 'state' of the art. Practice Development Journal. 2015; 5: 1.

31. McGrow K. Artificial Intelligence. Nursing. 2019; 49: 9.

32. Nimmesgern E, Benediktsson I, Norstedt I. Personalized Medicine in Europe. Clin Transl Sci. 2017; 10: 61–63.

33. Pailaha AD. The Impact and Issues of Artificial Intelligence in Nursing Science and Healthcare Settings. SAGE open nursing. 2023; 9: 23779608231196847.

34. Pavelic K, Martinovic T, Kraljevic Pavelic.Do we understand the personalized medicine paradigm? EMBO reports. 2015; 16: 133.

35. Pepito JA, Locsin R. Can nurses remain relevant in a technologically advanced future? International Journal of Nursing Sciences. 2019; 6: 106-110.

36. Renn BN, Schurr M, Zaslavsky O, Pratap A. Artificial Intelligence: An Interprofessional Perspective on Implications for Geriatric Mental Health Research and Care. Front. Psychiatry. 2021; 12: 734909.

37. Rivera Samantha Cruz, Kyte Derek G, Aiyegbusi Olalekan Lee, Slade Anita L, McMullan Christel, Calvert Melanie J. The impact of patient-reported outcome (PRO) data from clinical trials: a systematic review and critical analysis. In: Health and quality of life outcomes. 2019; 17: 156.

38. Robert N. How artificial intelligence is changing nursing. Nursing Management. 2019; 50: 31–39.

39. Rodgers BL, Knafl KA. Beyond analysis: further adventures in concept development. Rodgers BL, Knafl KA (eds). Beyond analysis: further adventures in concept development. Concept Development in Nursing: Foundation, Techniques, and Applications, 2nd edn. 2000.- B. Saunders Company, Philadelphia. 2000; 321–331.

40. Ronquillo CE, Peltonen LM, Pruinelli L, Chu CH, Bakken S, Beduschi A, et al. Artificial intelligence in nursing: Priorities and opportunities from an international invitational think-tank of the Nursing and Artificial Intelligence Leadership Collaborative. Journal of Advanced Nursing. 2021; 77: 3707-3717.

41. Rony KK, Kayesh I, Das Bela S, Akter F, Parvin MR. Artificial intelligence in future nursing care: Exploring perspectives of nursing professionals – A descriptive qualitativ study. Helion. 2024; 10: e25718.

42. Rony MKK, Parvin MR, Ferdousi S. Advancing nursing practice with artificial intelligence: Enhancing preparedness for the future. Nursing Open. 2024; 11: e2070.

43. Rossiter C., Levett-Jones T, Pich J. The impact of person-centred care on patient safety: An umbrella review of systematic reviews. International Journal of Nursing Studies. 2020; 109: 103658.

44. Sassen B. Nursing and Person-Centered Care. Inn Sassen, B. (ed). Improving Person-Centered Innovation of Nursing Care. Cham, Springer Nature Switzerland. 2023; 55–68.

45. Sensmeier J. Harnessing the power of artificial intelligence. Nursing Management. 2017; 48: 14–17.

46. Sharma M, Savage C, Nair M, Larrson I, Svedberg P, Nygren JM. Review. Artificial Intelligence Applications in Health Care Practice: Scoping Review.Journal of Medical Internet Research. 2022; 24: e40238.

47. Sillner AY, Madrigal C, Behrens L. Person-Centered Gerontological Nursing: An Overview Across Care Settings. Journal of gerontological nursing. 2021; 47: 7–12.

48. Smith JB, Willis EM, Hopkins-Walsh J. What does person-centred care mean, if you weren't considered a person anyway: An engagement with person-centred care and Black, queer, feminist, and posthuman approaches. Nursing philosophy: an international journal for healthcare professionals. 2022; 23: e12401.

49. Stjernswärd S, Glasdam S. The European Standard EN 17398:2020 on Patient Involvement in Health Care - a Fairclough-Inspired Critical Discourse Analysis. Policy, politics & nursing practice. 2022; 23: 130–141.

50. Stokes F, Palmer A. Artificial Intelligence and Robotics in Nursing: Ethics of Caring as a Guide to Dividing Tasks Between AI and Humans. Nursing Philosophy. 2020; 21: e12306

51. Suhonen R, Stolt M, Edvardsson D. Personalized Nursing and Health Care: Advancing Positive Patient Outcomes in Complex and Multilevel Care Environments. J Pers Med. 2022; 12: 1801.

52. Tofthagen R, Fagerstrom LM. Rodgers' evolutionary concept analysis – a valid method for developing knowledge in nursing science. Scandinavian Journal of Caring Sciences. 2010; 24:21–31.

53. Tomaselli G, Buttigieg SC, Rosano A, Cassar M, Grima G. Person-Centered Care From a Relational Ethics Perspective for the Delivery of High Quality and Safe Healthcare: A Scoping Review. Frontiers in public health, 2020; 8 :44.

54. Vicente, AM, Ballensiefen W, Jönsson JI. How personalised medicine will transform healthcare by 2030: the ICPerMed vision. Journal of translational medicine, 2020; 18: 180.

55. Von Gerich H, Moen H, Block J, Chu CH, DeForest H, Hobensack M, et al. Artificial Intelligence -based technologies in nursing: A scoping literature review of the evidence. International Journal of Nursing Studies 2022; 127: 104153.

56. Walker LO, Avant KC. Strategies for theory construction in nursing. Persona. 2019.

57. WHO. Ethics and governance of artificial intelligence for health: WHO guidance Executive summary. Geneva.

58. Wiljer D, Salhia M, Dolatabadi E, Dhalla A, Gillan C, Al-Mouaswas D, et al. Accelerating the Appropriate Adoption of Artificial Intelligence in Health Care: Protocol for a Multistepped Approach. JMIR Res Protoc. 2021; 10: e30940.