

Systematic Review

A scoping review of person-centred care strategies used in diagnostic Nuclear Medicine



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ABSTRACT

Introduction: Person-centred care (PCC) emphasises the need for the health care professional to prioritise individual patient needs, thereby fostering a collaborative and emphatic environment that empowers patients to actively participate in their own care. This article will explore the purpose of PCC in Nuclear Medicine (NM), while discussing strategies that may be used to implement PCC during diagnostic NM examinations performed on adult patients.

Methods: The scoping review was conducted in accordance with the Joanna Briggs Institute methodology. The search was performed on PubMed, Embase and Cinhal in June 2023 and included studies in English, Spanish, Portuguese and Italian. The research equation combined keywords and Medical Subject Heading terms (MeSH) related to person-centred care (PCC), for all types of nuclear medicine diagnostic examinations performed. Three independent review authors screened all abstracts and titles, and all eligible full-text publications were included in this scoping review.

Results: Fifty-three articles, published between 1993 and 2022, met the inclusion criteria for this scoping review. Seven articles were published in 2015 while 56.6 % of all included studies were performed in Europe. Most studies (n = 39/53) focused on the patients only, with the identified patient benefits being: improve patient experience (67.9 %), increase patient comfort (13.2 %), increase patient knowledge (5.7 %), reduction of patient anxiety (9.4 %) and reduction of waiting/scan time (3.8 %).

Conclusion: The scoping review identified a lack of research investigating the use of person-centred care strategies in NM. Future research will focus on using an international survey to explore this topic in nuclear medicine departments overseas.

Implications for practice: By applying PCC principles, the NM professional can improve the patient care pathway and increase patient satisfaction, leading to enhanced clinical outcomes.

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Introduction

Person-centred care (PCC) is a fundamental principle within the healthcare setting that highlights the active involvement of patients in their own care and decision-making processes involving

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both diagnostic and treatment pathways.¹ PCC encourages the health care professional to acknowledge that patients are unique individuals with diverse needs and backgrounds, requiring healthcare services to be tailored to meet their specific demands. This involves empathically considering information or facts available through the eyes of the patient, in order to create a compassionate culture.² However, this role change of the service users becoming the central decision makers in the health care setting, will require a shift from the traditional model in which the health care professional is the leader of the patient care pathway, towards a more person oriented PCC model. In such a model the health care professional will need to be integrated into the direct patient care processes, that are designed around patients' needs and preferences³. Person-centred care differs from patient-centred care in that it requires the health care professional to focus on the patient holistically and not only on the disease and symptoms of the client. Person-centred care takes into consideration all the aspects related to the well-being of the individual, such as beliefs and preferences.⁴ Therefore, PCC strategies should involve the use of mechanisms that can be used in clinical practice to assist all aspects of PCC.

This approach is especially important in the field of Nuclear Medicine (NM), where diagnostic and therapeutic procedures involving the use of diverse radioactive tracers can be used both to diagnose and treat a variety of medical conditions. This dual role places NM in a strategic position to promote PCC, creating a shift from a treatment-centred approach to a person-centred model of care. However, in order for the NM professional to embrace the concept of PCC, it is vital for that professional to understand that the success of any healthcare intervention does not only depend on the accuracy of the diagnostic tests or on the effectiveness of the treatment being given, but also on the experience of the patient. The NM professional needs to acknowledge that the alignment of the care pathway to the preferences and goals of the patient may be the key to a successful treatment regime, while ensuring that the patient and the healthcare team work together towards a common endpoint. Such an approach has long been promoted in research, with the Person-Centred Outcomes Research Institute (PCORI) being set up in 2010 in the United States.³ The focus of this institute was exclusively to steer the purpose of medical research towards promoting more evidence-based studies that were led by patients themselves and their caregivers, within a community-based methodology.³ The benefit of such research was found to have the potential to link the traditional medical needs, such as the requirement to understand the diagnostic accuracy of imaging modalities available, to the needs of the patients who are mostly concerned with their health status and quality of life. It is therefore imperative to direct research to PCC in all aspects of medicine, including diagnostic imaging, in order to promote a link between the focus of the health care professional and the needs of the patient. As suggested in recent publications,⁵ there are limited studies exploring the different perceptions of the stakeholders on PCC in radiography. Such research is even more lacking in specific fields of radiography, for instance diagnostic NM.

The article aims to explore the concept of person-centred care strategies within the field of diagnostic Nuclear Medicine, and its significance in improving patient outcomes and experiences. This was done with the aim of considering practical aspects that can be used in clinical NM to facilitate PCC. Furthermore, it will highlight the challenges and potential strategies for implementing PCC in NM, taking in consideration the unique technical aspects of this field of medical imaging. Nuclear medicine uses radioactive substances and radiopharmaceuticals for the diagnosis and treatment

of health conditions, thereby making this speciality different from other areas of medical imaging.⁶

Methodology

This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) methodology for scoping reviews.⁷ Scoping reviews synthesised in a structured way provide an excellent means to collate findings from various studies in order to answer research questions and identify gaps in the actual literature.⁸ Based on the JBI methodology the following steps were used when conducting this scoping review⁷:

1. Define and align the objectives and questions
2. Develop and align the inclusion criteria with the objective
3. Describe the planned approach to evidence searching and selection
4. Search for the evidence
5. Select the evidence
6. Extract the evidence
7. Chart the evidence
8. Summarise the evidence in relation to the objectives
9. Consult with information scientists, librarians, and/or experts (throughout)

Inclusion and exclusion criteria

This scoping review was performed to evidence the research and results available on the strategies used to ensure PCC in NM. A range of studies were included, investigating different designs applied in all NM diagnostic procedures performed on adult patients. Articles discussing PCC in paediatric patients and oncology patients were not included in this scoping review, since the authors felt that such patients required more specific person-centred care strategies, including also the viewpoints and feedback of guardians and care-givers.

To be consistent with the concept of PCC, this review included studies that considered the opinions of health care professionals working in NM, as well as studies that collected data on patient's opinions or preferences. However, studies performed to optimise protocols that did not consider patient preferences or feelings were excluded from this scoping review.

Additionally, this scoping review included quantitative, qualitative, and mixed methods studies. In contrast, systematic reviews, guidelines, and editorials were excluded, as in the case of systematic reviews no detailed data on the methodologies of the studies included was available for assessment, while guidelines and editorials did not fall within the scope of this review.

Search strategy

The search strategy ([Appendix A](#)) included both published and unpublished primary studies retrieved from three databases: PubMed, Embase and Cinhal, in June 2023. A combination of keywords and Medical Subject Headings terms (MeSH) related to PCC and NM were used.

No keywords or MeSH terms related to patients were included in the search strategy as they introduced noise to the results after a first attempt. The selection on these criteria was carried out manually. Studies published in English, Spanish, Portuguese or in Italian were all included since the group of authors involved native or fluent speakers in each of these four languages. No date

restrictions were applied to the search strategy in order to include all the publications that were relevant to this scoping review.

Study selection

All identified studies were uploaded into EndNote 20 and duplicates were removed by using Bramer's method.⁹ Previously, the references were imported into Rayyan, a free web-tool,¹⁰ in order to facilitate the selection of the studies. Titles and abstracts were screened in a first round by three independent reviewers for evaluation of their pertinence, according to the criteria described earlier. Full-text articles that could be included were then retrieved and reviewed by the same three reviewers in a second round of screening. Full-text studies not meeting the inclusion criteria were excluded from this review. Reasons for their exclusion are indicated in Fig. 1. Any disagreement between the reviewers was resolved through a process of discussion.

Data extraction and analysis

Data were retrieved using an extraction table, that had been decided upon by the three reviewers following a preliminary review of the articles. During the selection process, the three reviewers independently choose the categories. The reviewers then constructed the extraction grid through a consensus process. The extraction table was based on the following characteristics: authors, year, country, aim, population studied, type of methodology, tool used, type of nuclear medicine examination, variable measured, benefits for patients and key findings.

A descriptive analysis with a narrative summary was performed in order to present the results.

Results

Search strategy and article selection

After removing duplicates, 1363 results were identified through the use of the search strategy. Fifty-three studies met all criteria and were included. The main reasons for exclusion were *publication types* (n = 22) in situations where the article was a review or an opinion article, the *wrong context* being used (n = 13), and the *outcome* not being directly related to the benefits perceived by patients (n = 5) (Fig. 1).

Included studies

Out of the 53 studies, 41 focused exclusively on diagnostic NM examinations,^{11–51} while 12 compared NM examinations with other imaging examinations such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Ultrasound (US).^{52–63} Additionally, 32.1 % (n = 17/53) of the articles referred to several types of NM investigations^{12–15,18–20,25,32,36,45,48–50,54,61}, 26.4 % (n = 14/53) to Single Photon Emission Computed Tomography (SPECT) scintigraphy explorations^{11,26–29,34,37,41,51,53,55,56,60,61} and 37.7 % (n = 20/53) to Positron Emission Tomography combined with CT or MRI (PET/CT or PET/MRI) investigations.^{16,21–24,27,31,33,35,39,40,42,43,46,47,57–59,61,62}

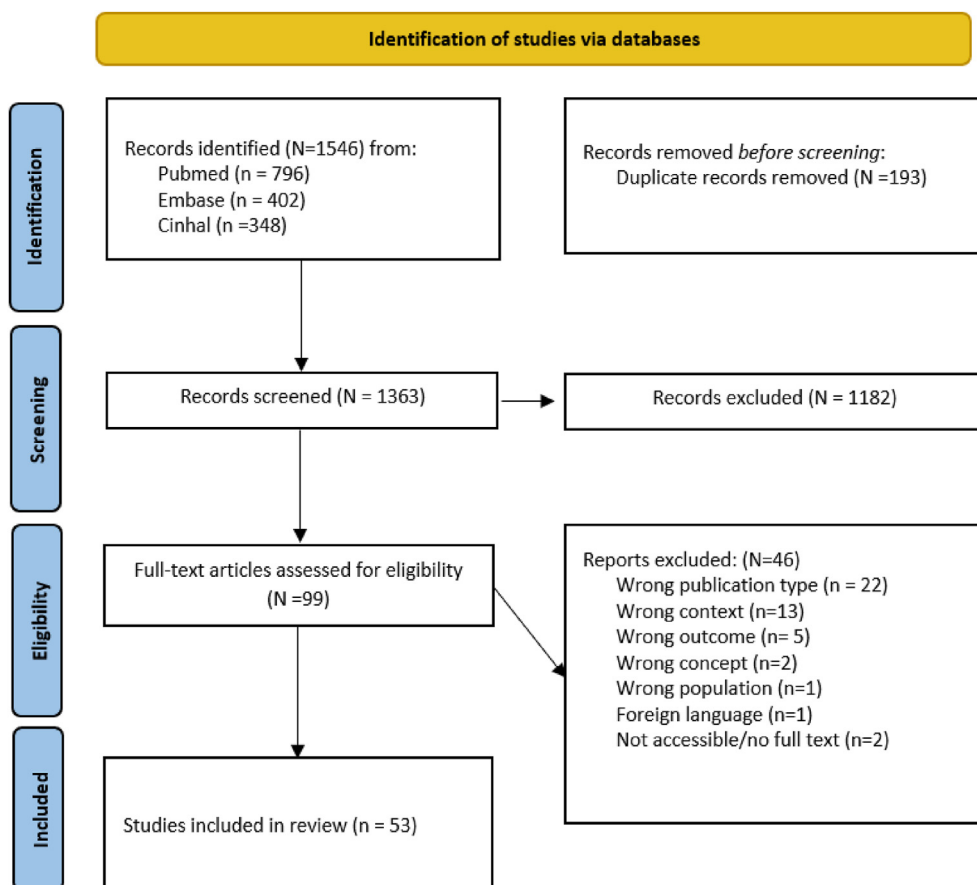


Figure 1. Search results, study selection and inclusion criteria.⁷

Year of publication

The 53 studies included were published between 1993 and 2022. The earliest publications that were retrieved were from 1993. However, it was noted that the topic of PCC has gained prominence in literature mostly within the last 10 years, acquiring relevance as a research subject within this period of time.

In the selected articles, more than 71.7 % (n = 38/53) were published after 2011 such as Kemp et al. (2019)⁵² or the more recent publication of Iliadis et al. (2022).⁵¹ As indicated in Fig. 2, 2015 was the boom year for such publications, with the highest number of relevant studies on this topic published during that year being 7.^{20–22,38,47,54,56}

Country where the research was performed

More than a third of researches were carried out in the United States of America (USA),^{11,23,28,30,31,34,37–39,44,45,50,52–54,58,60,63} including studies such as those by Rosenkrantz and Flagg (2015)⁵⁴ and Dako et al. (2017).²³ The rest of the studies, 56.6 % (n = 30/53) were performed in Europe,^{12–22,24–27,29,32,33,35,36,40–43,46–49,51,55–57,59,61,62} such as the study by De Man et al. (2002),²⁵ Bamford et al. (2016)²⁷ or Goense et al. (2018)⁵⁷ (Table 1).

Populations being investigated

The populations surveyed in these studies varied, with most articles focusing on patients only (n = 39/53), others considered both the patient and the professional perspectives (n = 11/53),^{11,14,20,25,27,28,30,34,37,43,44} while three studies reviewed only the views of the professionals.^{29,31,45} The professionals involved in the surveys of the reviewed studies, included NM technologists, physicians, nurses or administrative staff. Out of those studies (n = 14/53), where professionals were included, six involved NM technologists.^{20,29,30,34,43,45} Gender proportions or age categories, both for professionals and the patients, were difficult to map as they were not always reported within the reviewed articles. The population samples included in the studies ranged from 27 to 4007 individuals, depending on the type of methodology used which may have involved focus groups, questionnaires or individual interviews.

Table 1
Number of studies as per country of origin.

Country of Origin	Number of occurrences	Percentage (%)
USA	18	34.0
UK	11	20.8
Germany	4	7.5
Spain	4	7.5
Sweden	3	5.7
Belgium	2	3.8
China	2	3.8
Netherlands	2	3.8
Canada	1	1.9
Denmark	1	1.9
Egypt	1	1.9
Italy	1	1.9
Portugal	1	1.9
South Africa	1	1.9
Greece	1	1.9
Total	53	100

The tool used

Most of the reviewed studies used surveys as a tool (n = 50/53), including 44 questionnaires, 5 individual interviews^{18,26,44} including 2 by telephone calls^{31,50} and a single focus group method.¹¹ However, not all the studies made use of validated questionnaires. Two studies used data registrations^{29,60} while one research study implemented the use of videos.⁴³

Type of methodology

From the analysis carried out on the selected articles, it was evident that in 67.9 % of cases (n = 36/53) the methodology used involved prospective research, followed by cross-sectional studies (13.2 %; n = 7/53).

Additionally, out of the 53 analysed publications, 1 study did not clearly mention the type of methodology used⁴³ while a retrospective analysis was used in 2 articles,^{55,58} and in 7 publications other methodologies were adopted^{35,36,41,45,46,50,63} (Table 2).

Benefits for the patients

The 53 selected articles discussed different and varied approaches to PCC. Although the common objective of all the studies

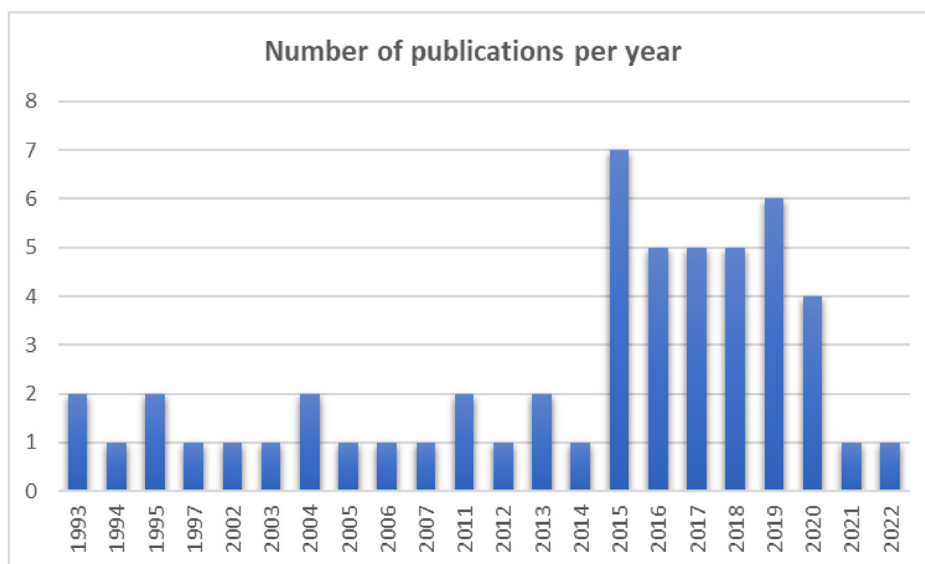


Figure 2. Number of publications per year.

Table 2
Number of publications as per t type of methodology.

Type of methodology	Number of publications	Percentage (%)
Prospective study	36	67.9 %
Cross-sectional study	7	13.2 %
Retrospective study	2	3.8 %
A cross-sectional descriptive study	1	1.9 %
Observational transversal	1	1.9 %
Pilot study	1	1.9 %
Pre-test/post-test quasi-experimental design	1	1.9 %
Prospective transversal	1	1.9 %
Randomized Controlled Trial	1	1.9 %
Randomized, double-blind, crossover comparison	1	1.9 %
N.A.	1	1.9 %
Total	53	

was the improvement of the service provided in NM centres, the procedures performed and the parameters being assessed varied amongst the various reviewed articles. For a better understanding and analysis of the results obtained, the articles were catalogued into five different categories, according to the main benefit identified for the patients. The following categories were identified: improve patient experience, increase patient comfort, increase patient knowledge, reduction of patient anxiety and reduction of waiting/scan time.

The results indicated that in 67.9 % of the articles (n = 36/53), the goal of the study was to ‘improve patient experience’ (Fig. 3). This meant that in these studies more than one variable or more than one benefit for the patient was studied and evaluated. In 13.2 % (n = 7/53) of the articles, the data collected showed that the mentioned benefits for the patients, such as patient comfort, were performed with the intention to reduce patient anxiety, with 9.4 % of the studies (n = 5/53) reaching this result. The last 9.4 % (n = 5/53) of all the reviewed publications were divided between the categories ‘increase patient knowledge’ (5.7 %; n = 3/53) and the ‘reduction of waiting/scan time’ (3.8 %; n = 2/53) (Fig. 3).

It was also interesting to note the distribution of the type of methodologies used in comparison to the characteristic that was intended to be evaluated. Due to the majority of the studies (67.9 %

implementing a prospective research methodology, the prospective method group showcased types of research falling in each category (Table 3), highlighting also which categories had the most or least publications.

Further grouping of the articles: Application of PCC strategies

The articles were further classified into four groups according to whether they were related to: (1) Measuring patient satisfaction or anxiety levels in relation to the service provided: 47.2 % (n = 25/53), (2) the implementation of specific PCC strategies: 18.9 % (n = 10/53), (3) the perception on the quality of care provided: 17 % (n = 9/53), and (4) the results of PCC strategies implemented: 13.2 % (n = 7/53). Two articles did not fall into any of these four groups and were placed into a separate group called *not applicable* (NA). Improving the patient’s experience in a NM department was mainly studied in relation to the perception of the quality and type of care being provided to the patients. Additionally, the results of strategies that were implemented, were related to the investigation of the patient’s comfort after performing an intervention related to the patient’s environment, such as the use of a positioning device or the introduction of music in the examination room (Table 4).

Discussion

The aim of this scoping review was to identify PCC strategies used in diagnostic examinations that are performed on adult patients, in NM.

As seen in Fig. 2, the person-centred care approach is not a recent topic of interest. In fact, it is possible to find publications in the 90s discussing this topic in general. However, it is only in the last 10 years that the topic has gained an important prominence and a high relevance within the radiography profession, and especially in NM. In the selected articles, more than 71 % (n = 38/53) were published after 2011. Additionally, between 2014 and 2015 there was an increase in the number of publications related to the PCC topic in NM. It is difficult to attribute this increase to a particular event or occurrence within this field of imaging. However, various publications linking the concept of PCC with radiology appeared in 2013, with one of the first publications being a book

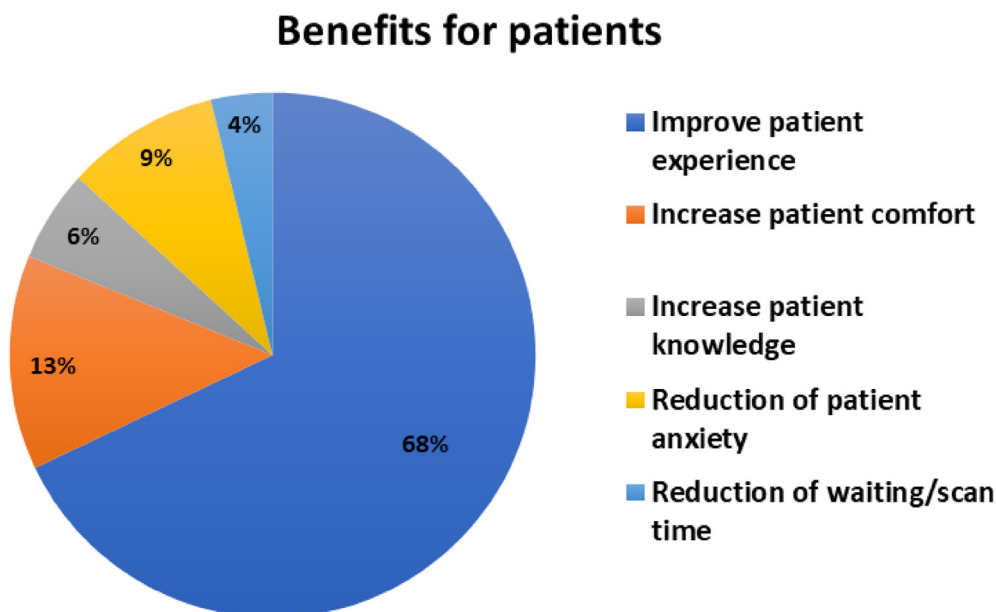


Figure 3. Benefits for the patients.

Table 3
Number of publications as per type of methodology and controlled characteristics.

Type of methodology	Improve patient experience	Increase patient comfort	Increase patient knowledge	Reduction of patient anxiety	Reduction of waiting/scan time	Total
Prospective study	24	4	1	5	2	36
Cross-sectional study	7					7
Retrospective study	1	1				2
A cross-sectional descriptive study	1					1
Observational transversal	1					1
Pilot study	1					1
Pre-test/post-test quasi-experimental design		1				1
Prospective transversal	1					1
Randomized Controlled Trial			1			1
Randomized, double-blind, crossover comparison		1				1
N.A.			1			1
Total	36	7	3	5	2	53

Table 4
The number of articles in each patient benefit category in relation to the PCC strategy groups.

	Measuring patient satisfaction or anxiety levels in relation to the service provided	Implementation of specific PCC strategies	Perception on the quality of care provided	Results of PCC strategies implemented	NA	Total
Improve patient experience	20	5	8	2	1	36
Increase patient comfort	2	1		3	1	7
Increase patient knowledge	2	1	1	2		5
Reduction of patient anxiety	1			1		3
Reduction of waiting/scan time		2				2
Total	25	9	9	8	2	53

titled “Patient Centred Care in Medical Imaging and Radiotherapy”⁶⁴ According to the authors, this publication was intended to fill the gap in the field of radiology, a field that “has focused for far too long on the technical aspects of an examination or treatment procedures” (ix). Following this, in 2015, professional societies such as the Radiology Society of North America (RSNA)⁶⁵ and the World Health Organization (WHO)⁶⁶ published strategies emphasising the need to change the model of care in the healthcare setting, and in imaging departments, in order to focus more on the patient globally.

In the last decade, many developments and improvements have been incorporated into models of care, such as changes in quality standards and organisational cultures, and an increased awareness of the diverse needs of various patient groups such as paediatrics, anxious/distressed, neurodiverse, hearing-impaired individuals, and migrants.⁶⁷

Furthermore, developments in technology have led to the NM radiographer/technologist* being at the forefront of improved patient communication and care.⁶⁸ In this regard, the European Federation of Radiographers Societies (EFRS) published a statement on the Importance of Patient Engagement and the Patient Voice within Radiographic Practice, in which they stated that: “The patient voice and patient engagement can add value to all aspects of radiography practice and service development. Understanding the patients’ perspectives and utilising patients’ own experiences across all areas of service development, education and research is vital to the radiography profession and informs radiographic practice. The EFRS recommends that our national societies and Educational Wing members continue to embrace the patient voice and seek to engage patients

* Radiographers are medical imaging and radiotherapy experts who are professionally accountable to the patients’ physical and psychosocial wellbeing, prior to, during and following examinations or therapy; take an active role in justification and optimisation of medical imaging and radio therapeutic procedures (EFRS, 2011).

in all aspects of the work “(p3).⁶⁹ Such a statement shows the value of PCC within the European context.

In fact, the results of this scoping review indicated that more than half of the studies were conducted in Europe (56.6 %; n = 30/53). The United Kingdom was found to be the country with the most PCC-related publications in the field of NM. Additionally, the authors of a study performed in 2021,⁷⁰ stated that “person-centred care was most adopted into discourse in the UK” (p274). However, different elements can influence the number of publications issued on a particular topic in a specific country, such as cultural approach, health care systems together with their associated costs and reimbursement schemes, resources used and funding allocated for the research. In relation to this, a research study performed in 2017⁷¹ mentioned that the private health care system in some countries, such as in the United States of America (USA), was both expensive and complicated. The authors commented that this was because economic inequalities in the USA increased health inequities. In contrast, various research funds are allocated in Europe for research, with the aim of supporting projects related to the improvement of person-centred care. One such funding opportunity is the Silver Deal package - Person-centred health and care in European regions (Horizon Europe Framework Programme (HORIZON)).⁷²

When exploring PCC, in NM or in any other field of radiography, it is of utmost importance that the benefits for patients are evaluated and identified. This review grouped studies that included more than one benefit for the patient into a specific category, under the heading: Improve patient experience, in order to highlight the importance of such research. Such a concept becomes even more essential when working in NM, providing the staff with the opportunity to apply the concept of personalised medicine within this field. This in turn leads to improvements in the quality of life of the patients while supporting the effective reduction of healthcare costs.⁷³ However, there is still a perceived lack of public and patient awareness and involvement in the area of NM. These limitations

increase the importance of studies focusing on an integral view while exploring the patient's experience, such as the ones included in this review.

The results of the current review further indicated that studies including patients ($n = 39/53$) lacked information on the sample characteristics. In some cases, the information on the age and gender of the participants was not consistently provided. In order to adopt a person-centred care practice, it is important to include patients from all backgrounds, regardless of gender, age, ethnicity, sexual orientation, religion, education, socio-economic status, immigration status, health status and any other relevant characteristics.

Therefore, in research centring around PCC it is essential to take into account and to acknowledge the needs, preferences and values of each participant.⁷⁴ Additionally, such factors should be incorporated into the assessment of care provided and into strategies for the improvement of the patient's journey. In the researches that included professionals ($n = 14/53$), 78.6% ($n = 11/14$) involved the implementation of strategies that can be used to improve the patient's experience. It is important to take note of such strategies and to try and include them in new departmental procedures and protocols in order to enhance their adoption into practice.⁷⁵ When focusing on the procedures discussed in the reviewed studies, the results revealed that most articles (24.5%; $n = 13/53$) explored the global service provided by NM departments. Regarding specific examinations, FDG-PET and Myocardial Perfusion Scintigraphy SPECT scans were the ones mostly investigated, each being mentioned in 9 and 11 studies respectively. This data aligned with the results of a previous meta-analysis study that highlighted the frequency of each of these 2 examinations within the clinical scenario.⁷⁶ The authors in the study concluded that the highest number of procedures and referrals (47.6%, $n = 13,530,000$) performed between 2006 and 2016 in the USA, involved cardiac and PET NM examinations. The necessity to focus on the most common procedures being performed in NM, is vital to explore PCC needs through an integral approach, involving the entire service being provided to the patients.

It is therefore also important to discuss aspects of patient education when considering the global aspect of the care being provided to the patients. The promotion of patient education in PCC strategies is not a new concept, as it was already mentioned in a study published in 1999.⁷⁷ In the article the authors had already specified that patient education was not merely telling patients what they may eat or what positions they must assume for particular procedures, instead it requires a much deeper level of knowledge transfer. Additionally, patient education strategies are especially important in NM, as apart from being good practices of patient care, an informed patient is more likely to cooperate during an examination. A factor which could be critical for the successful completion of a diagnostic procedure.⁴⁹ Together, with the discussed criteria, the essential role of the NM radiographer or technologist paves the way to the implementation of a PCC culture within a department.

Limitations

The limitations of this exploratory study involved primarily the quality of the articles included, which were not assessed according to the methodology of a scoping review, and the fact that the concept of PCC is a broad one that is difficult to fully cover in any research strategy adopted. Therefore, some articles pertinent to the topic being investigated may not have been included. Additionally, this scoping review only focused on diagnostic procedures performed in adults, which can also be seen as a limitation. However, the authors felt that it was justified to exclude specific patient

categories, such as paediatrics and oncology patients, since these categories demanded the investigation of explicit PCC strategies, which was outside the scope of this review.

Conclusion

The current scoping review verified the idea that there is a lack of research investigating the topic of PCC strategies in the NM field. Furthermore, the data included in this review seemed to indicate a predominance of studies published in the last 10 years, undertaken mostly in the USA, and focusing exclusively on the performance of the NM examinations. Methodologically, results of reviewed studies were mainly based on surveys using non validated questionnaires. Data further revealed that most articles explored the global service provided by NM departments, while the ones that focused on specific examinations highlighted the use of common procedures such as Myocardial Perfusion Imaging and PET/CT scans, performed with 18F-FDG. Overall, the main goal of the reviewed studies was to improve patient experience, yet the PCC strategies themselves were not always explored in detail.

Considering the lack of evidence on this topic proved by the results collected in this review, future studies should focus on gathering data on current PCC strategies being applied within the clinical scenario, in NM departments within Europe. Complementing this scoping review, the authors aim to implement an international survey to explore in detail the topic of PCC strategies being used in NM departments. Additional phases of this project will therefore take into consideration the opinions of the professionals working within this field, while taking into account also the needs of patients and the views of members of the general public.

Conflict of interest statement

None.

Acknowledgements

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Appendix A

01.06.203 Pubmed

("Nuclear Medicine" [MeSH Terms] OR "Radionuclide Imaging" [MeSH Terms] OR "Nuclear Medicine" [Title/Abstract] OR "pet" [Title/Abstract]) AND ("Patient-Centered Care" [MeSH Terms] OR "Patient Care Team" [MeSH Terms] OR "Patient Care Planning" [MeSH Terms] OR "Patient Participation" [MeSH Terms] OR "Professional-Patient Relations" [MeSH Terms] OR "Patient Satisfaction" [Mesh] OR "Patient-Centered Care" [Title/Abstract] OR "Personalized care" [tiab] OR "Integrated care" [tiab] OR "Individualized care" [tiab])

⇒ **796 results**

01.06.203 CINAHL

(MH "Nuclear Medicine" OR MH "Radionuclide Imaging+" OR MH "Nuclear Medicine Technicians" OR "Nuclear Medicine" OR TI "pet" OR AB "pet")
AND

(MH “Patient Centered Care” OR MH “Multidisciplinary Care Team” OR MH “Patient Care Plans” OR MH “Narrative Medicine” OR MH “Consumer Participation” OR MH “Professional-Patient Relations” OR MH “Patient Satisfaction+” OR MH “Health Care Delivery, Integrated” OR “Patient-Centered Care” OR “Personalized care” OR “Integrated care” OR “Individualized care”)

⇒ **348 results**

01.06.203 EMBASE

(‘nuclear medicine’:ti,ab, kw OR ‘pet’:ti,ab,kw) AND (‘collaborative care team’/de OR ‘patient care planning’/de OR ‘patient comfort’/de OR ‘patient decision making’/de OR ‘patient positioning’/de OR ‘patient scheduling’/de OR ‘patient participation’/exp OR ‘professional-patient relationship’/de OR ‘patient satisfaction’/exp OR ‘patient-centered care’:ti,ab, kw OR ‘personalized care’:ti,ab, kw OR ‘integrated care’:ti,ab, kw OR ‘individualized care’:ti,ab,kw) AND [2010–2022]/py AND (‘article’/it OR ‘review’/it).

⇒ **402 results**

References

- McFadden DS, O Neil DA, Flood MT, Guille MS, Oliveira MC, Barbosa MB, et al. Person-centred Care in the Radiography curriculum – the patient’s perception of undergoing Radiotherapy. *J Med Imag Radiat Sci* 2022;**53**:S27. 4, Supplement 1.
- Hancock A, Bleiker J. But what does it mean to us? Radiographic patients and carer perceptions of compassion. *Radiography* 2023;**29**:S74–80.
- Zygmunt ME, Lam DL, Nowitzki KM, Burton KR, Lenchik L, McArthur TA, et al. Opportunities for patient-centered outcomes research in radiology. *Acad Radiol* 2016;**23**(1):8–17.
- Santana MJ, Manalili K, Jolley RJ, Zelinsky S, Quan H, Lu M. How to practice person-centred care: a conceptual framework. *Health Expect* 2018 Apr;**21**(2): 429–40. <https://doi.org/10.1111/hex.12640>. Epub 2017 Nov 19. PMID: 29151269; PMCID: PMC5867327.
- Hyde E, Hardy M. Patient centred care in diagnostic radiography (Part 1): perceptions of service users and service deliverers. *Radiography* 2021;**27**(1): 8–13.
- International Atomic Energy Agency. *IAEA factsheet, human health – nuclear medicine for diagnosis and treatment*. IAEA Office of Public Information and Communication; 2017. <https://www.iaea.org/sites/default/files/nuclear-medicine-for-diagnosis-and-treatment.pdf>.
- Peters MDJ, Godfrey C, Mclnerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: scoping reviews (2020 version). In: Aromataris EMZ, editor. *JBI manual for evidence synthesis*. JBI; 2020.
- Arksey H, O’Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;**8**(1):19–32.
- Bramer WM, Giustini D, de Jonge GB, Holland L, Bekhuis T. De-duplication of database search results for systematic reviews in EndNote. *J Med Libr Assoc* 2016 Jul;**104**(3):240–3.
- Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. *Rayyan—a web and mobile app for systematic reviews*, 5; 2016. 210.
- Patel KK, Decker C, Pacheco CM, Fuss C, Boda I, Gosch KL, et al. Development and piloting of a patient-centred report design for stress myocardial perfusion imaging results. *JAMA Netw Open* 2021;**4**(8):e2121011.
- Harding LK, Harding NJ, Tulley NJ, Forbes E, Clarke SE. Improving information for nuclear medicine department outpatients. *Nucl Med Commun* 1994;**15**(5): 392–8.
- Schreuder N, Jacobs NA, Jager PL, Kosterink JGW, van Puijenbroek E.P. Patient-reported adverse events of radiopharmaceuticals: a prospective study of 1002 patients. *Drug Saf* 2021;**44**(2):211–22.
- Forbes F, Clarke SE, Buxton-Thomas M, Burwood R, Nunan T, Craig J. The development of regional nuclear medicine audit in south Thames. *Nucl Med Commun* 1997;**18**(8):693–7.
- De Man S, Vlerick P, Gemmel P, De Bondt P, Matthys D, Dierckx RA. Impact of waiting on the perception of service quality in nuclear medicine. *Nucl Med Commun* 2005;**26**(6):541–7.
- Brechtel K, Heners H, Mueller M, Aschoff P, Eschmann SM, Bares R, et al. Fixation devices for whole-body 18F-FDG PET/CT: patient perspectives and technical aspects. *Nucl Med Commun* 2007;**28**(2):141–7.
- Leckie J. The effects of informational intervention on state anxiety and satisfaction in patients undergoing bone scan. *Nucl Med Commun* 1994;**15**(11): 921–7.
- Harding LK, Griffith J, Harding VM, Tulley NJ, Notghi A, Thomson WH. Closing the audit loop: a patient satisfaction survey. *Nucl Med Commun* 1994;**15**(4): 275–8.
- Lledó R, Herver P, García A, Güell J, Setoain J, Asenjo MA. Information as a fundamental attribute among outpatients attending the nuclear medicine service of a university hospital. *Nucl Med Commun* 1995;**16**(2):76–83.
- Rodrigo-Rincon I, Goñi-Girones E, Serra-Arbeloa P, Martínez-Lozano M, Reyes-Pérez M. Discrepancies on quality perceived by the patients versus professionals on the quality of a nuclear medicine department. *Rev Española Med Nucl Imagen Mol* 2015;**34**(2):102–6.
- Shortman RI, Neriman D, Hoath J, Millner L, Endozo R, Azzopardi G, et al. A comparison of the psychological burden of PET/MRI and PET/CT scans and association to initial state anxiety and previous imaging experiences. *Br J Radiol* 2015;**88**(1052):20150121.
- Gücel B, Gatidis S, Enck P, Schäfer J, Bisdas S, Pfannenber C, et al. Patient comfort during positron emission tomography/magnetic resonance and positron emission tomography/computed tomography examinations: subjective assessments with visual analog scales. *Invest Radiol* 2015;**50**(10):726–32.
- Dako F, Wray R, Awan O, Subramaniam RM. Adapting a standardized, industry-proven tool to measure patients’ perceptions of quality at the point of care in a PET/CT center. *J Nucl Med Technol* 2017;**45**(4):285–9.
- Sun Y, Sun Y, Qin Y, Zhang Y, Yuan H, Yang Z. ‘Virtual experience’ as an intervention before a positron emission tomography/CT scan may ease patients’ anxiety and improve image quality. *J Med Imag Radiat Oncol* 2020;**64**(5): 641–8.
- De Man S, Gemmel P, Vlerick P, Van Rijk P, Dierckx R. Patients’ and personnel’s perceptions of service quality and patient satisfaction in nuclear medicine. *Eur J Nucl Med Mol Imag* 2002;**29**(9):1109–17.
- Nightingale JM, Murphy EJ, Blakeley C. ‘I thought it was just an x-ray’: a qualitative investigation of patient experiences in cardiac SPECT-CT imaging. *Nucl Med Commun* 2012 Mar;**33**(3):246–54.
- Bamford C, Olsen K, Davison C, Barnett N, Lloyd J, Williams D, et al. Is there a preference for PET or SPECT brain imaging in diagnosing dementia? The views of people with dementia, carers, and healthy controls. *Int Psychogeriatr* 2016;**28**(1):123–31.
- Hudgens S, Spalding J, Chaudhari P. Validation of a patient-reported outcome (PRO) measure and a clinician-reported outcome (CRO) measure to assess satisfaction with pharmacologic stress agents for single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI). *Clin Therapeut* 2016;**38**(5):1141–50.
- Greaves C, Gilmore J, Bernhardt L, Ross L. Reducing imaging waiting times: enhanced roles and service-redesign. *Int J Health Care Qual Assur* 2013;**26**(3): 195–202.
- Holliday RM, Jain MK, Accurso JM, Sharma A, Harrison SR, Aloszka DL, et al. Buffering the suffering of breast lymphoscintigraphy. *J Nucl Med Technol* 2020;**48**(1):51–3.
- Kaiser A, Davenport MS, Frey KA, Greenspan B, Brown RKJ. Management of diabetes mellitus before (18F-fluorodeoxyglucose PET/CT: a nationwide patient-centred assessment of approaches to examination preparation. *J Am Coll Radiol*; *JACR* 2019;**16**(6):804–9.
- García Vicente AM, Soriano Castrejón A, Martínez Delgado C, Poblete García VM, Ruiz Solís S, Cortés Romera M, et al. [Patient satisfaction as quality indicator in a nuclear medicine department]. *Rev Española Med Nucl* 2007;**26**(3):146–52.
- Andersson C, Johansson B, Wassberg C, Johansson S, Sundin A, Ahlström H. Assessment of whether patients’ knowledge, satisfaction, and experience regarding their 18F-fluoride PET/CT examination affects image quality. *J Nucl Med Technol* 2016;**44**(1):21–5.
- Hudgens S, Breeze J, Spalding J. Patient- and clinician-reported satisfaction with pharmacological stress agents for single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI). *J Med Econ* 2013;**16**(6):828–34.
- Andersson C, Pulido CT, Ahlström H, Johansson B. Randomized controlled trial examining effects of web-based information on patient satisfaction and image quality in 18F-fdg PET/CT examinations. *J Nucl Med Technol* 2019;**47**(1):39–46.
- Reyes-Pérez M, Rodrigo-Rincón MI, Martínez-Lozano ME, Goñi-Gironés E, Camarero-Salazar A, Serra-Arbeloa P, et al. [Assessment of the patient satisfaction with a nuclear medicine service]. *Rev Española Med Nucl Imagen Mol* 2012;**31**(4):192–201.
- Li J, Walker DR, Biesbrock G, Kristy RM, Yang H, Gao E, et al. Factors that impact a patient’s experience when undergoing single-photon emission computed tomography myocardial perfusion imaging (SPECT-MPI) in the US: a survey of patients, imaging center staff, and physicians. *J Nucl Cardiol: official publication of the American Society of Nuclear Cardiology* 2021;**28**(4):1507–18.
- Covington MF, Sherman S, Lewis D, Lei H, Krupinski E, Kuo PH. Patient survey on satisfaction and impact of 123I-ioflupane dopamine transporter imaging. *PLoS One* 2015;**10**(7):e0134457.
- Acuff SN, Bradley YC, Barlow P, Osborne DR. Reduction of patient anxiety in PET/CT imaging by improving communication between patient and technologist. *J Nucl Med Technol* 2014;**42**(3):211–7.
- Grilo AM, Vieira L, Carolino E, Costa M, Galaio S, Melo I, et al. Cancer patient experience in a nuclear medicine department: comparison between bone scintigraphy and 18 F-fdg PET/CT. *J Nucl Med Technol* 2020;**48**(3):254–62.

41. de Wet A, Da Rocha M, Bresser PL. The effect of music on discomfort during lumbar spine SPECT scintigraphy. *J Radiol Nurs* 2021;**40**(1):93–9.
42. Chen S, Hu P, Gu Y, Pang L, Zhang Z, Zhang Y, et al. Impact of patient comfort on diagnostic image quality during PET/MR exam: a quantitative survey study for clinical workflow management. *J Appl Clin Med Phys* 2019;**20**(7):184–92.
43. Shortman RI, Hoath J, Osadolor T, Inga P, Roper L, Bomanji J, et al. Development of PET/CT and PET/MRI patient-information videos in collaboration with patients previously treated for cancer. *J Nucl Med Technol* 2018;**46**(1):26–8.
44. Lingler JH, Roberts JS, Kim H, Morris JL, Hu L, Mattos M, et al. Amyloid positron emission tomography candidates may focus more on benefits than risks of results disclosure. *Alzheimer's Dementia: Diagnosis, Assessment and Disease Monitoring* 2018;**10**:413–20.
45. Mann A, Farrell MB, Williams J, Basso D. Nuclear medicine technologists' perception and current assessment of quality: a society of nuclear medicine and molecular imaging technologist section survey. *J Nucl Med Technol* 2017;**45**(2):67–74.
46. Schatka I, Weiberg D, Reichelt S, Owsianski-Hille N, Derlin T, Berding G, et al. A randomized, double-blind, crossover comparison of novel continuous bed motion versus traditional bed position whole-body PET/CT imaging. *Eur J Nucl Med Mol Imag* 2016;**43**(4):711–7.
47. Andersson C, Johansson B, Wassberg C, Johansson S, Ahlström H, Wikehult B. Patient experience of an 18F-FDG-PET/CT examination: need for improvements in patient care. *J Radiol Nurs* 2015;**34**(2):100–8.
48. Hamed MAG, Salem GM. Factors affecting patients' satisfaction in nuclear medicine department in Egypt. *Egyptian Journal of Radiology and Nuclear Medicine* 2014;**45**(1):219–24.
49. Da Silva S, Morrison S. The role of a nuclear medicine technologist in patient education: a survey analysis. *Can J Med Radiat Technol* 2004;**35**(3):11–9.
50. Sa K, Ke S. Quality improvements through direct patient pretest communication. *J Nucl Med Technol* 1995;**23**(2):91–2.
51. Iliadis C, Kourkouta L, Bountas D, Tsaloglidou A, Koukourikos K, Frantzana A, et al. The quality of health services provided to patients undergoing myocardial perfusion imaging by a nuclear medicine department. *Acta Inf Med* 2022 Mar;**30**(1):29–35.
52. Kemp J, McKenzie A, Burns J, Miller K. Immediate interpretation and results communication decreases patient anxiety: experience in a private practice community hospital. *AJR:Am J Roentgenol* 2020;**214**(6):1311–5.
53. Liang W, Lawrence WF, Burnett CB, Hwang Y, Freedman M, Trock BJ, et al. Acceptability of diagnostic tests for breast cancer. *Breast Cancer Res Treat* 2003;**79**(2):199–206.
54. Rosenkrantz AB, Flagg ER. Survey-based assessment of patients' understanding of their own imaging examinations. *J Am Coll Radiol: JACR* 2015;**12**(6):549–55.
55. Sparrow P, Plein S, Jones TR, Thorley PJ, Hale C, Sivanathan MU. Tolerance of MRI vs. SPECT myocardial perfusion studies—a patient survey. *J Magn Reson Imag: JMRI* 2004;**19**(4):410–6.
56. Feger S, Rief M, Zimmermann E, Richter F, Roehle R, Dewey M, et al. Patient satisfaction with coronary CT angiography, myocardial CT perfusion, myocardial perfusion MRI, SPECT myocardial perfusion imaging and conventional coronary angiography. *Eur Radiol* 2015;**25**(7):2115–24.
57. Goense L, Borggreve AS, Heethuis SE, van Lier AL, van Hillegersberg R, Mook S, et al. Patient perspectives on repeated MRI and PET/CT examinations during neoadjuvant treatment of esophageal cancer. *Br J Radiol* 2018;**91**(1086):20170710.
58. Gulak MA, Bornais C, Shin S, Murphy L, Smylie J, Pantarotto JR, et al. Implementing a one-day testing model improves timeliness of workup for patients with lung cancer. *Curr Oncol* 2019;**26**(5):e651–7.
59. Evans RE, Taylor SA, Beare S, Halligan S, Morton A, Oliver A, et al. Perceived patient burden and acceptability of whole-body MRI for staging lung and colorectal cancer; comparison with standard staging investigations. *Br J Radiol* 2018;**91**(1086):20170731.
60. Salimi PN, Niggel JB, Keating FK. How to achieve patient-centred testing: role of the protocol nurse. *J Nucl Cardiol: official publication of the American Society of Nuclear Cardiology* 2019;**26**(2):536–40.
61. Dyrberg E, Larsen EL, Hendel HW, Thomsen HS. Diagnostic bone imaging in patients with prostate cancer: patient experience and acceptance of NaF-PET/CT, choline-PET/CT, whole-body MRI, and bone SPECT/CT. *Acta Radiol* 2018;**59**(9):1119–25.
62. Albano D, Agnello F, Patti C, La Grutta L, Bruno A, Midiri M, et al. Whole-body magnetic resonance imaging and FDG-PET/CT for lymphoma staging: assessment of patient experience. *Egyptian Journal of Radiology and Nuclear Medicine* 2017;**48**(4):1043–7.
63. Domina JG, Bhatti ZS, Brown RKJ, Kazerooni EA, Kasotakis MJ, Khalatbari S. Patient perception of radiology and radiologists: a survey analysis of academic and community institutions. *Am J Roentgenol* 2016;**207**(4):811–9.
64. Ramlaul Aarthi VM. *Patient centered care in medical imaging and radiotherapy*. Elsevier Health Sciences; 2013.
65. Itri JN. Patient-centred radiology. *Radiographics* 2015 Oct;**35**(6):1835–46.
66. World Health Organization. *WHO global strategy on people-centred and integrated health services: interim report*. 2015. p. 48.
67. Cindy Brach, Hall Kendall K, Eleanor Fitall. *Cultural competence and patient safety*. Agency for Healthcare Research and Quality; Patient Safety Network; 2019.
68. Aarts S, Cornelis F, Zevenboom Y, Brokken P, Griend N, Spoorenberg M, et al. The opinions of radiographers, nuclear medicine technologists and radiation therapists regarding technology in health care: a qualitative study. *Journal of Medical Radiation Sciences* 2017;**64**:3–9.
69. England Andrew, Beardmore Charlotte, García Gorga Rodrigo, Malamateniou Christina, Portelli Jonathan L, Christensen Berit Møller. *EFRS statement on the importance of patient engagement and the patient voice within radiographic practice*. 2021.
70. Rosengren K, Brannefors P, Carlstrom E. Adoption of the concept of person-centred care into discourse in Europe: a systematic literature review. *J Health Organisat Manag* 2021;**35**(9):265–80.
71. Dickman SL, Himmelstein DU, Woolhandler S. Inequality and the health-care system in the USA. *Lancet* 2017;**389**(10077):1431–41.
72. *Horizon Europe health calls 2023 - the silver deal - person-centred health and care in European regions*. European Commission. https://hadea.ec.europa.eu/index_en.
73. Hacker M, Beyer T, Baum RP, Kalemis A, Lammertsma AA, Lewington V, et al. Nuclear medicine innovations help (drive) healthcare (benefits). *Eur J Nucl Med Mol Imag* 2015;**42**(2):173–5.
74. Saha S, Beach MC, Cooper LA. Patient centeredness, cultural competence and healthcare quality. *J Natl Med Assoc* 2008 Nov;**100**(11):1275–85.
75. Graham ID, Logan J. Innovations in knowledge transfer and continuity of care. *Can J Nurs Res* 2004 Jun;**36**(2):89–103.
76. Mettler FAJ, Mahesh M, Bhargavan-Chatfield M, Chambers CE, Elee JG, Frush DP, et al. Patient exposure from radiologic and nuclear medicine procedures in the United States: procedure volume and effective dose for the period 2006–2016. *Radiology* 2020 May;**295**(2):418–27.
77. Steves AM, Dowd SB. Patient education in nuclear medicine technology practice. *J Nucl Med Technol* 1999 Mar;**27**(1):4–13. quiz 17.