Nurses' view of benefits, enablers and constraints to the use of digital health tools with patients: A cross-sectional study

Olga Navarro Martínez[1] (iD), Jorge Igual García[2] (iD) and Vicente Traver Salcedo[3]

Abstract

Introduction: Digital literacy helps patients to be more informed in order to make decisions about their health. Patient empowerment in the digital realm is a duty for all healthcare professionals, but nurses are the most numerous professionals in all healthcare systems worldwide. In addition, they have an important role in health education and patient follow-up. Therefore, the use of digital tools, by nurses to empower and help patients know more about their health, is crucial.

Objective: This study was conducted to identify nurses' views on the benefits as well as constraints nurses encounter when using digital resources to empower and educate their patients. We sought to identify enablers that could help nurses use technology with their patients as a means to reinforce the care and advice they offer them.

Methods: An online ad hoc questionnaire was answered by 848 currently employed Spanish nurses on the benefits of using digital media with their patients, as well as on the constraints and enablers during implementation.

Results: The majority of the nurses considered that reliable digital information would reduce unnecessary consultations. In addition, they think that at least 50% of their patients could benefit from consulting information online. Among the constraints, nurses mainly pointed out the older age and low educational level of their patients. Younger nurses are the most likely nurses to see patient age as a problem. As for enablers, nurses pointed out the training offered to patients as well as digital tools being user-friendly for patients.

Conclusions: It is crucial to work while following a lifelong learning strategy, with training from university education as well as training from healthcare institutions to reduce the digital gap that affects patients' digital empowerment.

Keywords

Patients, nursing, digital health, empowerment, health literacy, telemedicine

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Introduction

In recent decades, the use of technology in the healthcare environment has taken off, with thousands of resources, tools and applications. The Internet offers nurses, doctors and other healthcare professionals multiple possibilities to create or retrieve resources that can contribute to patient empowerment. However, similarly, professionals must

[1]Department of Nursing, Catholic University of Valencia, Valencia, Spain
[2]Higher Technical School of Telecommunication Engineering, Universitat Politècnica de València, Valencia, Spain
[3]Instituto ITACA, Universitat Politècnica de València, Valencia, Spain

Corresponding author:
Olga Navarro Martínez, Department of Nursing, Catholic University of Valencia, Calle Espartero 7, Valencia, Spain.
Email olga.navarro@ucv.es

know and use the available tools. During the COVID-19 pandemic, it has become more apparent that other ways of reaching patients are needed to support self-care and patient empowerment.

However, these incredible advances have not been matched by the human element. Many healthcare professionals have not received any training in using information communication technologies (ICT) in the professional environment[1] and belong to the population known as digital immigrants.[2] Healthcare professionals also encounter many legislative, instrumental or even ethical limitations when applying ICT to their daily practice with their patients.[3] Undoubtedly, ICT is a vital resource, but it is necessary to know how to manage it properly for the benefit of healthcare professionals and patients.

According to the World Health Organization (WHO)[4] by 2030, one in six people will be aged 60 or over, and by 2050 this figure will have doubled. There are already more people over the age of 60 than children under the age of 5.

This fact also leads to increased disability, chronicity and dependency inherent to our current longevity. The high prevalence of chronic pathologies in the elderly leads health systems to suffer a significant care overload and a shortage of both material and human resources to cope with this new reality. Likewise, these new challenges oblige states to rethink new methods to finance, cover and alleviate these needs and shortcomings, focusing, whenever possible, on prevention and health promotion for healthy ageing to reduce disability and dependency.

To ensure that people aspire to healthy ageing, according to the WHO plan for the Decade of Healthy Ageing 2020–2030,[4] 'it requires lifelong learning, enabling older people… to retain the ability to make decisions and to maintain their identity and independence… This requires literacy, empowerment, and barrier-free spaces for participation, particularly in the digital domain'.

Nurses are the most numerous professionals in all healthcare systems worldwide and have an important role in patient education and follow-up. Their role in patient empowerment, also in the digital world, is therefore crucial.[5,6]

In this regard, the American Academy of Nursing states that: 'A nursing focus on health literacy as an essential component of all patient care will improve the delivery of person-centred care, patient safety, and patient, population and system outcomes'.[7]

This study identifies nurses' opinion about possible benefits as well as constraints when applying technology in order to empower patients. However, it also sheds some light on the enabling aspects that could boost this empowerment in the digital domain.

Methods

This cross-sectional study was carried out by means of using a survey among employed Spanish nurses to determine their opinion regarding constraints and enablers in implementing digital resources to empower their patients. The questionnaire was disseminated on the Internet on different social networks and mobile messaging services. The survey was active during December 2020 and being open for 13 days. We decided to close it after getting 850 responses.

Sample and recruitment of participants

To calculate the necessary sample, the total number of registered nurses in Spain was consulted, according to the National Institute of Statistics.[8] This number in the year 2020 was 325,018 nurses. We used the following formula[9] to calculate the necessary sample size to estimate a population proportion (p) of a large population with 99% confidence and a margin of error no larger than e $= \pm 5\%$ for the most uncertain case (the worst-case scenario) $p = 50\%$: $N = z^2*p*(1 - p)/e^2. Based on this formula choice, 665 responses were needed.

To achieve the proposed target number of participants, an online questionnaire was created and sent openly on social networks such as Instagram, Facebook, LinkedIn or Twitter, as well as on mobile instant messaging groups such as Telegram or WhatsApp, which are most commonly used by the population, to reach as many nurses as possible and reduce the risk of the study being biased.

The inclusion criteria for participation in the study were:

- Being a nurse
- Currently employed
- Signing the informed consent form before starting the survey
- Answering all questions in the survey

Failure to complete any of the survey questions or to meet any of the above criteria was considered a reason for exclusion.

This study was approved by the Research Ethics Committee of the Universitat Politécnica de València, Spain (P4_25_07_18).

Structure and details of the survey

This survey was designed in several phases of development and verification before it was launched for this study.

It was initially tested by a panel of experts. This group consisted of 13 researchers who helped define the response options for the questions and reduce the questionnaire from 26 to 24 questions.

The survey was then tested on a pilot group from December 2018 to February 2019, and 103 professionals (doctors and nurses) participated. This pilot test was done to guarantee that it worked (that people answered everything, that it did not become too long, etc.). Finally, we

made the decision to withdraw three of the items, which did not provide relevant information, leaving 21 questions in the final survey.

This final questionnaire was elaborated on Google Forms, to simplify the storage of the answers and their subsequent analysis. This type of questionnaire can be answered on any device with Internet access. The complete final questionnaire with 21 questions explores the opinion of Spanish nurses about using digital tools to promote patient empowerment. This survey was structured as follows:

- General data, with three questions about socio-demographic information on the participant's age, gender and place of work. This data was collected for comparative purposes only.
- Internet use, with eight questions regarding how professionals use the Internet in their work, how they use it, which networks or tools they usually use.
- Empowerment, with five questions on the definition of empowerment and the use of digital materials used with patients.
- Constraints and enablers, with four questions that sought to find out whether practitioners valued potential benefits, as well as those constraints that hindered their use and enablers that could favour their application.

In this research we have focused only on the last section of this survey (constraints and enablers, four questions). This is because we were particularly interested in finding out the constraints that hinder the integration of digital tools in nursing practice and the enablers that could help their implementation. The complete questionnaire can be found in Appendix 1.

Participation was voluntary and disinterested. No personal data that would allow the identification of the participant was collected. No emails were collected from participants to ensure confidentiality.

On the first page of the questionnaire, participants had access to the study information sheet where they were provided with an explanation of the purpose of the survey; the approval of the ethics committee, as well as their involvement; and the contact details for the people who were responsible for the survey. As with acceptance and consent to their participation, it was necessary for them to have previously read this document and signed it electronically by pressing the 'Accept' button. Any participant could leave the survey without completing it. In this case, data obtained from incomplete surveys was not retained. The estimated time needed to respond to the survey was under 5 min.

Appendix 2 includes the Checklist for Reporting of Survey Studies (CROSS),[10] which helped us structure the content of this article appropriately.

Statistical analysis

Statistical tests were applied to check if the results were statistically significant ($p < .05$). Most variables were categorical, and some were dichotomous. We used the chi-squared test as the test statistic with the corresponding degrees of freedom depending on the dimensions of the contingency table. Some variables, such as age, were considered ordered variables, grouped in different age ranges. We used the Kruskal–Wallis test (or Wilcoxon–Mann–Whitney test when there were only two groups) and correlation.[11] Some questions in the survey were 'check all that apply' (respondents selected as many of the response options as perceived to apply to them), for which we considered each answer as a dichotomous (yes/no) categorical variable. Statistical analysis was performed with SPSS software.

Results

The questionnaire was answered by 850 nurses in 13 days. After this period, we decided to close the survey. Two records were deleted due to inconsistent responses. Therefore, 848 responses were analysed. All the nurses who responded were of Spanish nationality. Sixty-three percent of the people who answered the survey were between 20 and 40 years old, and 37% were over 40. Only 135 of the 848 (16%) people were men. This aligns with the proportion of male professionals working as nurses in nursing in Spain.[8]

Although the survey included 21 questions, here we focused on the analysis of those that have something to do with the benefits of ICT use in health, the constraints in its application identified by professionals and the factors that can, on the contrary, enhance it, which corresponds to the last four questions as indicated above. Some of the study results have been previously published.[12]

Benefits and beneficiaries

Before asking participants about constraints and enablers, we included two questions about which patients could benefit from digital tools and whether they would be useful, for example, to reduce face-to-face visits, following the line initiated on this topic by Zanaboni.[13] We felt it was important to relate the potential usefulness as well as the outreach to patients to these conditioning factors of use. Therefore, firstly, a specific question about the potential benefit of using digital health with patients was asked. Question 1 was as follows:

Do you think quality information for the patient community via the Internet would reduce the number of visits to primary care and hospital consultations?

Participants selected their responses on a Likert scale from 1 for not agree at all to 5 for strongly agree. The values presented are the % responses of the participants (Table 1).

Most participants think that health information offered via digital media would have a positive effect; only 13.91% totally or partially disagree that reliable information on the Internet would reduce the number of visits.

All age groups think it is positive to use the Internet, but not all do so with the same strength. The youngest group, 20–30 years old, are the most likely to believe that using the Internet as an information channel will have a positive effect on reducing visits (assuming a continuous scale, mean value of 3.79 compared to the rest of the groups). Table 2 shows the mean value as well as the confidence interval for each age group in the Likert scale in this question.

There is a slight negative correlation between age and the belief that good information on the Internet would reduce visits, $r = -0–067$ ($p = .0192$), and the Kruskal–Wallis test shows the same association, although not significant ($p = .1074$).

There is no gender difference ($p = .1424$), although men are slightly more likely to have a more positive view of Internet use (CI 3.58–3.94 men vs. 3.56–3.71 women).

Participants were then asked how many patients could use digital media to learn more about their health.

Question 2 was as follows: What percentage of patients do you think it is feasible for, to use Internet tools to learn more about their health? This question was presented as a Likert scale with five options, where the possible answers ranged from $1 = 0\%$ of patients to $5 = 100\%$ of patients. The number of people who chose each option, as well as the % they represent from the total, can be seen in Table 3.

The mean value for this question is 2.90 on a Likert scale from 1 to 5 (confidence interval 2.83–2.96). Table 4 shows the mean value by age group.

The mean for the youngest group is lower, but the values are not different enough to reject the hypothesis that all age groups have the same distribution ($p = .2898$ for Kruskal–Wallis test). As we can see in Table 3, 66% of the participants consider that at least 50% of their patients could consult health information online.

Constraints limiting the use of digital resources

After asking about the number of patients who could use the Internet to learn more about their health and assessing whether it could be beneficial, for example, by reducing the number of visits to the emergency room, participants are asked about the constraints that limit patients' access to the Internet.

Question 3 was: What constraints do you think make it difficult for patients to use these digital tools? This question offered response options that had already been obtained after consultation with a panel of experts and verification with a pilot group of 103 participants. The participant was still allowed to choose 'Other causes' to indicate what he/she considered appropriate. The participant could choose from several response options. These options can be seen in Table 5.

Considering each option separately, the percentage of respondents selecting each of the possible causes is as follows: the advanced age of the patients, indicated by 77.12% of the participants (654 people); 66.39% (563 people) regarded the patients' low cultural level as the main constraint; 385 people (45.4%) indicated low support from the institutions as a cause; 41.5% (352 people) state that the lack of training in this area for professionals is a constraint; and only 5.42%, i.e. 46 participants, indicate other causes. Figure 1 shows the graphical representation of the data related to the constraints identified.

Only 0.5% of respondents considered that the reason was 'other', and only 5.42% included 'other' among the causes, which shows that the options presented as possible answers cover almost all reasons. Participants who selected the option 'Other' suggested constraints such as lack of time, too much information on the web, a lack of knowledge about resource reliability and a lack of protocols in healthcare centres.

We then determined whether the causes reported by the participants were equally distributed among age groups. The p-value for the Chi-squared and Wilcoxon–Mann–Whitney tests for the different options.

As we can see in Table 6, there are statistically significant differences for the lack of training by professionals and advanced age options. For the option *Lack of training by professionals*, not only is there a tendency to believe that it is a relevant problem as the respondent's age increases, but there is also a highly significant correlation. Older professionals consider the lack of training as a greater constraint than younger ones.

Table 1. Percentage of participants who selected the different options offered.

1 (not all agree)	2	3	4	5 (strongly agree)
3.30%	10.61%	27.12%	35.14%	23.82

Table 2. Mean value and confidence interval in question 1 by age group.

Nurse's age	20–30	31–40	41–50	+50
Mean value	3.79	3.56	3.56	3.61
Confidence intervals	3.68–3.90	3.41–3.71	3.39–3.72	3.43–3.78

Table 3. The number of people who indicated the different options and their % of the total.

Likert scale	1 0% of patients	2 25% of patients	3 50% of patients	4 75% of patients	5 100% of patients
Number of people and %	53 (6.25%)	235 (27.71%)	331 (39.09%)	200 (23.58%)	29 (3.41%)

Table 4. Mean values obtained by age group in question 2.

Nurse's age	20–30	31–40	41–50	51–60	+60
Mean value	2.80	2.95	2.94	2.94	3.11

For the option *Advanced age*, there are statistically significant differences, with this constraint being more relevant for younger nurses. Approximately 81.09% of those under 40 consider a patient's advanced age as a cause as opposed to 70.38% of those over 40 ($p = 3.39e\text{-}04$).

For the options *Institutional constraints* and *Low cultural level or lack of knowledge* in terms of *patients*, there are no differences related to age. For the option *Patients do not have Internet access or devices*, there is also no difference in WMW test $p = .7929$, although for Chi-squared test $p = .0527$.

We also studied the sex influence in the results. No significant differences were found in the options chosen as constraints between men and women as we can see in Table 7. A higher percentage of men, than women, considers that institutional constraints are a problem when it comes to being able to apply digital resources with patients. Moreover, there is also a higher percentage of men who think that the bottom line is professionals' training. Approximately 36.83% of women regard Internet access as a constraint, whereas only 28.36% of men think alike. When it comes to the patients' cultural level being a constraint, 64.18% of men agree as opposed to 66.81% of women. Approximately 77.87% of women regard the advanced age of a patient as a constraint, whereas only 73.13% of men thought the same.

Enablers for the use of digital resources

Once the constraints to using digital tools with patients had been identified, it was time to analyse possible facilitating factors. To this end, the following question was asked: *What factors do you think favour patients using these tools?* In this question, as in the previous one, set answer options were offered, as well as the option 'Other' with space for a free written answer. The participant could choose several response options. These options can be seen in Table 8.

Considering each option separately, the percentage of respondents who selected each of the possible causes is as follows: 658 people (77.59%) indicated that training

Table 5. Question and options offered to participants about constraints.

What constraints do you think make it difficult for patients to use these digital tools?
1. Institutional constraints. Health facilities and services do not facilitate access to health services.
2. Lack of training for professionals
3. Patients do not have access to the Internet or devices.
4. Low cultural level or lack of knowledge on the part of patients
5. Advanced age of the patients
6. Others

patients could help to increase the use of digital resources in healthcare, and 649 participants (76.53%) indicated that easing the use of digital resources could be of great help. Approximately 63.67%, i.e. 540 participants, indicated that patient guidance by professionals would be a beneficial factor in order to apply digital resources. Nearly 60% of the participants (59.9%, 508 people) indicated training for professionals as an enabler when using digital tools with patients. Institutional support as an enabler was selected by 56.48% (479 nurses).

Not a single respondent failed to select at least one of the proposals on the list, and only 0.94% of respondents ticked the 'Other' option in addition to some other answer. So again, the first thing to take note is that the list of options offered perfectly covers the range of possible measures to be taken to promote the use of these tools. The graphical representation of this data can be seen in Figure 2.

Some of the enabling factors indicated in the *Other* option were the use of advertising campaigns, the standardization of health portals to facilitate navigation, professionals' commitment and agility in responding to patients.

We then set out to determine whether the factors reported by the participants were equally distributed in each age group and whether there were differences between men and women.

Of all the factors noted, the *Patient training* factor is significantly more relevant for younger participants (this option was chosen by 80% of participants under 40 years old as opposed to 73.57% of those over 40 years old, $p = .0310$).

Statistically, significant differences are also observed in the response: *Professional training*. In this case, conversely, 64.65% of those over 40 years regard this factor as necessary compared to 57.12% of those under 40 years ($p = .0307$).
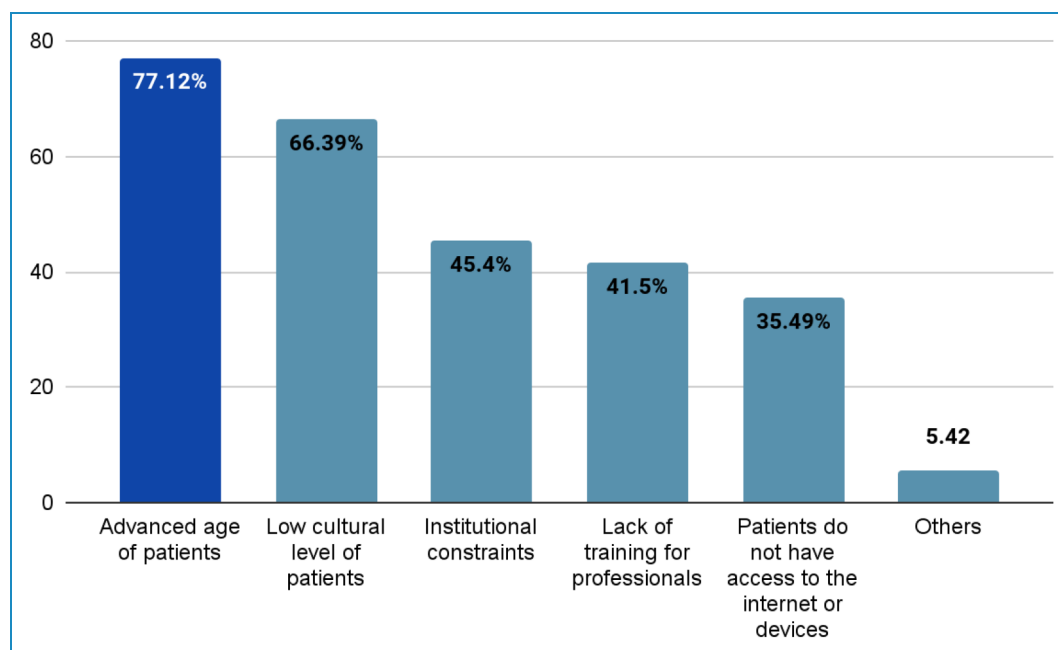
Figure 1. Constraints reported by professionals when applying digital tools with patients.

Table 6. Tests for different responses in question 3 for age groups.

Question 3 options	Institutional constraints	Low cultural level or lack of knowledge	Patients who do not have Internet access or devices	Lack of training by professionals	Advanced age
Chi-squared test	$p = .4124$	$p = .3830$	$p = .0527$	$p = .0374$	$p = .0053$
Wilcoxon–Mann–Whitney test	$p = .7809$	$p = .3131$	$p = .7929$	$p = .003$	$p = .0012$

Concerning the gender of the respondent, only the case of *Guidance by professionals* should be mentioned, where, although the difference is not statistically significant, there is a higher consideration of this factor among women, 64.99% compared to 56.72% of men. Table 9 shows all the correlations made for each factor according to the age and gender of the participant.

Discussion

Benefits and beneficiaries

Most of the questionnaire participants have highlighted recommending health resources on the web as something beneficial (86%) in order to reduce, for instance, the number of unnecessary visits to healthcare centres. Dendere et al. pointed out that websites with high-quality information for patients have proved to be beneficial by allowing us to discover medical errors. Moreover, they tend to improve patients following their treatment as well as better patient–professional communication.[14] Other authors, like Arbuckle, indicate the importance of good-quality information about health on the Internet in order to avoid errors and problems when it comes to following treatment and medical advice, above all, among younger patients.[15] Mallmann found that from a sample of over 500 breast cancer patients, 82% had the necessary technological resources, 56% looked up information about their health online and in addition 15% actually modified their treatment based on information found online.[16] According to a study carried out in Norway, resources such as booking an appointment online, renewing medical prescriptions online or access to video-consultation made patients save time and unnecessary journeys. In fact, in that same study, they highlighted that 'time-saving was the most evident benefit for patients'.[13] Other authors pointed out that carrying out educational schemes regarding health for patients with chronic pathologies online could improve their participation and follow-up[17].

Table 7. Tests for different options in question 3 for sex groups.

Question 3 options	Men	Women	p
Institutional constraints	52.24%	44.12%	.0832
Low cultural level or lack of knowledge of patient	64.18%	66.81%	.5546
Patients who do not have Internet access or devices	28.36%	36.83%	.0599
Lack of training by professionals	47.01%	40.40%	.1587
Advanced age	73.13%	77.87%	0.2310

Table 8. Question and options offered to participants concerning enabling factors.

What factors do you think favour using these tools by patients?
1. Institutional support
2. User-friendliness
3. Guidance by professionals
4. Training for patients
5. Training for professionals
6. Others

The pandemic situation due to COVID-19 has accentuated these benefits, having seen adequate information online as well as via teleassistance services as a way to cut costs, reduce complications, wasted journeys[18] and improve health attention for the population.[19,20]

When it comes to the number of patients that could benefit from this information and services online, the participants in our study highlighted that over 50% of the patients would benefit from them. According to a report by the Spanish Ministry of Health, in 2022, 50.5% of citizens would use teleconsultation compared to 35.8% who would not use it.[21] Similar results were obtained in a 2020 study based on the perceptions of general practitioners, and eConsulta could have replaced 63%–88% of conventional appointments.[22]

Some benefits indicated by Norwegian doctors would be having more time to assist patients properly, waiting rooms being less congested and more precise communication.[23] It is essential to point out that 167 million video consultations were carried out in Spain in 2021, according to data from the Health Ministry, being 21% carried out by nurses.[24]

Constraints limiting the use of digital resources

The main constraints identified by Spanish nurses that participated in the survey were the patients' ages (77%) as well as their low educational level (69%). These results add up

with those published by other authors who indicate that to the present day, the patients who benefit the most from the use of the Internet regarding health are women and young people, also being influenced by their level of studies.[13,25,26] However, diverse authors highlight that people with lower medical knowledge regard the use of applications, such as health education material, as easy to use.[27] Moreover, patients who are semi-illiterate with very little medical knowledge or little experience with smartphones might also benefit from the use of mobile applications to improve their self-care, even if they are over 60 years old.[28] In this sense, it is important to highlight that perhaps not all patients would benefit from it, due to their age or health, professionals think that technology could be useful for their family members or carers.[29] Or as Zanaboni pointed out, 'Despite these digital health services currently catering to competent health users, less competent users would still benefit indirectly if such services succeed in freeing up resources in primary care'.[16]

It can also be noted that technology can be employed in multiple ways, not only to access information or carry out video consultations, and therefore, it could be helpful for dependent patients and/or with special needs in the form of robots, device assistance, security systems, etc. Some of these resources have demonstrated that they improve patients' quality of life and their safety perception.[30,31]

Another prominent cause that was highlighted by the nurses, who participated in this investigation, is institutional constraint (45%), which could mean a lack of support on behalf of their institutions as well as a lack of resources. This constraint has been pointed out by several authors as a key factor when it comes to implementing technology in the workplace.[3,32,33]

Enabling factors

As for the nurses within our survey, the factors that could help us the most to implement technology in the healthcare field would be training for patients and everything being user-friendly, closed followed by guidance or orientation by professionals. In the results obtained, it is noteworthy that the youngest nurses consider patients as the party that requires most of the training, while the eldest nurses considered the problem was the lack of information on behalf of professionals. These could be due to a generational gap or a lack of training in technology during their nursing degree.[34] However, as we have already seen in previous studies we carried out, elder nurses usually use more technology with their patients than younger nurses.[12]

Almost 60% of the nurses who participated pointed out that more training for professionals could be an enabling factor. Other authors agree with this assumption, highlighting training as a necessary asset when fostering the use of technology in the healthcare field.[35,36]
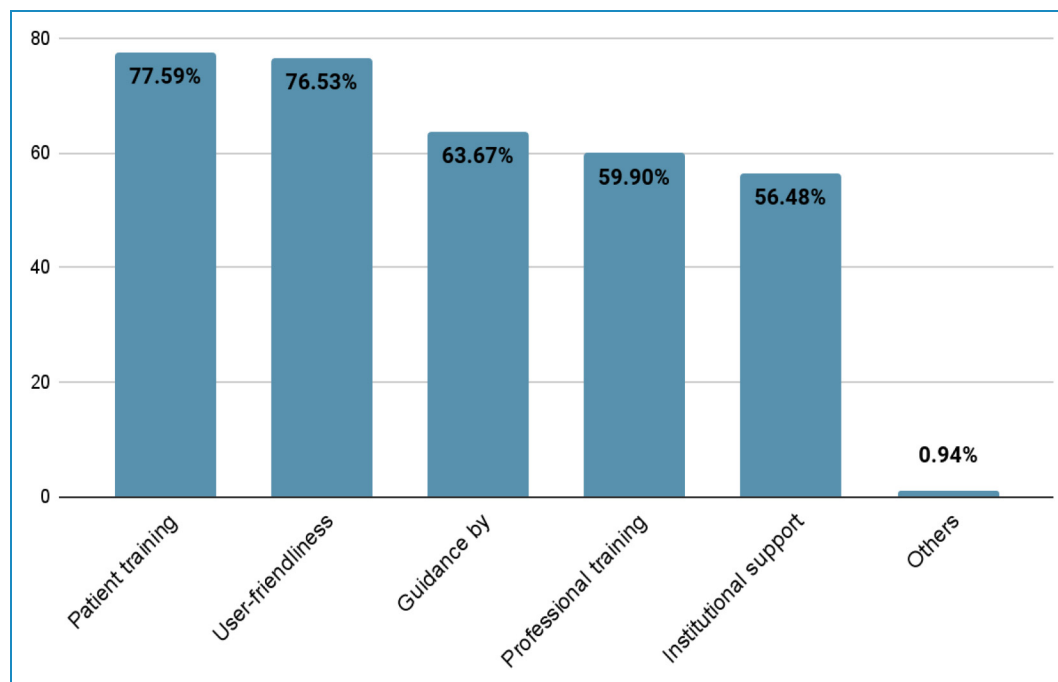
Figure 2. Enabling factors identified by professionals.

Table 9. Observed correlations between factors and age or gender of participants.

Enabling factors	p age (Chi-squared test)	p age (WMW test)	p gender
Institutional support	.6584	.5423	.3134
User-friendliness	.8955	.7454	.8955
Guidance by professionals	.9823	.8179	.0678
Patient training	.2217	.0488	.3693
Professional training	.1604	.0222	.1963

Finally, institutional support has also been highlighted, in this case, as an enabling factor, which has also been pointed out by other authors. Successful new technology implementation requires organizational and collegial support to promote continuous support.[3,37,38]

Acceptance or non-acceptance of technology could, according to the Unified Theory of the Acceptance and Use of Technology (UTAUT), be influenced by factors such as the age or gender of the individual.[39] However, in the case of health professionals, there are other factors such as the socio-occupational environment or their workflow.[40] These other factors were also mentioned by the participants in this survey.

Limitations. The main limitation that can be highlighted in this proposal is the creation of an ad hoc instrument. This instrument was subjected to peer review, and subsequently, a pilot was carried out in order to verify implementation problems, but no further statistical validation of the instrument was carried out.

The tool used to conduct this survey does not allow for the identification of responses based on the IP from which they originate, and therefore this could also be considered a limitation.

We also consider that offering questions with pre-established answer options to the participants can be a constraint, even though this fact is minimized as an open response was always offered in the option: Other.

All the nurses who participated in the survey were Spanish nurses. It would be of great interest to carry out this type of study in other countries in order to identify different constraints and facilitators according to the context in each region.

Responses were received electronically, which could imply a bias in receiving responses from people with higher technological competence. As indicated above, the survey link was sent on mobile phone groups widely used by the population. We expect that due to the large sample size, any bias has been minimized.

Conclusions

Despite a large number of nurses believing that information for patients on the Internet can help reduce unnecessary appointments, they also think that only half of the patients would benefit from it. These findings mainly add up with those obtained in previous research. However, it's noteworthy that in this study we have picked up on an important connection between nurses' perceptions and their age. Spanish nurses regard the advanced age of patients as the main factor when it comes to obstructing the use of technology. In fact, we have detected a significant connection between the age of the nurse and this belief. Regarding the second constraint, training or technological skills, we, again, observe a notable connection between the nurse's age and the perception about the need for training; in other words, the younger the nurse, the higher the belief that the patient requires training, whereas if a nurse is elder, they think the person in need of training is themselves. In conclusion, based on these findings, it would be crucial to work on this right from university training onwards as well as postgraduates being supported by healthcare institutions, as the elder nurses do also point out, in order to mitigate this generational and/or training gap.

ORCID iDs: Olga Navarro Martínez https://orcid.org/0000-0003-3563-4129
Jorge Igual García https://orcid.org/0000-0003-3408-4014

References

1. Mengestie ND, Yeneneh A, Baymot AB, et al. Health information technologies in a resource-limited setting: knowledge, attitude, and practice of health professionals. *Biomed Res Int* 2023; 2023: 1–7.
2. Prensky M. *Digital natives, digital immigrants*, Part 1. On the Horizon, MCB University Press, 2001, Vol. 9, No. 5, pp. 1–6. DOI: 10.1108/10748120110424816
3. Konttila J, Siira H, Kyngäs H, et al. Healthcare professionals' competence in digitalisation: a systematic review. *J Clin Nurs* 2019; 28: 745–761.
4. Organización Mundial de la Salud. Década de Envejecimiento Saludable 2020–2030, https://www.who.int/es/publications/m/item/decade-of-healthy-ageing-plan-of-action?sfvrsn=b4b75ebc_25 (2020, accessed 27 April 2022).
5. Organizacion Mundial de la Salud; Consejo Internacional de enfermeras. Situación de la enfermería en El Mundo 2020. *Salud Publica Mex* 2020; 24: 683–690.
6. Stewart DFAA, Tuipulotu DAA, Darazi DFAl, et al. *Enfermería: Una voz para liderar. Llevando al mundo hacia la salud.* Ginebra, https://2020.icnvoicetolead.com/wp-content/uploads/2020/03/IND_Toolkit_Spanish_FINAL.pdf (2020, accessed 25 August 2021).
7. Loan LA, Parnell TA, Stichler JF, et al. Call for action: nurses must play a critical role to enhance health literacy. *Nurs Outlook* 2018; 66: 97–100.
8. Instituto Nacional de Estadística. INEbase/Sociedad/Salud/Estadística de profesionales sanitarios colegiados/Últimos datos, https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176781&menu=ultiDatos&idp=1254735573175 (2021, accessed 8 March 2022).
9. Verma JP and Verma P. *Determining sample size and power in research studies*. Singapore: Springer Singapore, 2020. DOI: 10.1007/978-981-15-5204-5.
10. Sharma A, Minh Duc NT, Luu Lam Thang T, et al. A consensus-based checklist for reporting of survey studies (CROSS). *J Gen Intern Med* 2021; 36: 3179–3187.
11. King AP and Eckersley RJ. *Statistics for biomedical engineers and scientists: how to visualize and analyze data*. Elsevier Science & Technology Books, 2019, pp.1–249.
12. Navarro Martínez O, Igual García J and Traver Salcedo V. Estimating patient empowerment and nurses' use of digital strategies: esurvey study. *Int J Environ Res Public Health* 2021; 18: 9844.
13. Zanaboni P and Fagerlund AJ. Patients' use and experiences with e-consultation and other digital health services with their general practitioner in Norway: results from an online survey. *BMJ Open* 2020; 10: e034773.
14. Dendere R, Slade C, Burton-Jones A, et al. Patient portals facilitating engagement with inpatient electronic medical records: a systematic review. *J Med Internet Res* 2019; 21: e12779.

15. Arbuckle C, Tomaszewski D, Brown L, et al. Exploring the relationship of digital information sources and medication adherence. *Comput Biol Med* 2019; 109: 303–310.

16. Mallmann CA, Domröse CM, Schröder L, et al. Digital technical and informal resources of breast cancer patients from 2012 to 2020: questionnaire-based longitudinal trend study. *JMIR Cancer* 2021; 7: e20964.

17. Murray E, Ross J, Pal K, et al. A web-based self-management programme for people with type 2 diabetes: the HeLP-diabetes research programme including RCT. *Programme Grants Appl Res* 2018; 6: 1–242.

18. Benis A, Banker M, Pinkasovich D, et al. Reasons for utilizing telemedicine during and after the COVID-19 pandemic: an internet-based international study. *J Clin Med* 2021; 10: 5519.

19. Gong K, Xu Z, Cai Z, et al. Internet hospitals help prevent and control the epidemic of COVID-19 in China: multicenter user profiling study. *J Med Internet Res* 2020; 22: e18908.

20. Lee M and You M. Effects of COVID-19 emergency alert text messages on practicing preventive behaviors: cross-sectional web-based survey in South Korea. *J Med Internet Res* 2021; 23: e24165.

21. Secretaría General de Salud Digital Información e Innovación del SNS, Subdirección General de Información Sanitaria., Ministerio de España. RESUMEN BARÓMETRO SANITARIO 2022, https://www.sanidad.gob.es/estadEstudios/estadisticas/Barometro Sanitario/Barom_Sanit_2022/2022_Totales/Resumen_ejecutivo_ BS2022.pdf (2022, accessed 19 March 2023).

22. López Seguí F, Vidal-Alaball J, Sagarra Castro M, et al. General practitioners' perceptions of whether teleconsultations reduce the number of face-to-face visits in the Catalan public primary care system: retrospective cross-sectional study. *J Med Internet Res* 2020; 22: e14478.

23. Fagerlund AJ, Holm IM and Zanaboni P. General practitioners' perceptions towards the use of digital health services for citizens in primary care: a qualitative interview study. *BMJ Open* 2019; 9: e028251.

24. Ministerio de Sanidad España. *Informe Anual del Sistema Nacional de Salud 2020–2021*. Madrid, https://www. sanidad.gob.es/estadEstudios/estadisticas/sisInfSanSNS/ tablasEstadisticas/InfAnualSNS2020_21/INFORME_ ANUAL_2020_21.pdf (2022, accessed 19 March 2023).

25. Bidmon S and Terlutter R. Gender differences in searching for health information on the internet and the virtual patient-physician relationship in Germany: exploratory results on how men and women differ and why. *J Med Internet Res* 2015; 17: e156.

26. Wynn R, Oyeyemi SO, Budrionis A, et al. Electronic health use in a representative sample of 18,497 respondents in Norway (the seventh tromsø study – Part 1): population-based questionnaire study. *JMIR Med Inform* 2020; 8. DOI: 10. 2196/13106

27. Kim S and Jeon J. Factors influencing eHealth literacy among Korean nursing students: a cross-sectional study. *Nurs Health Sci* 2020; 22: 667–674.

28. Heiney SP, Donevant SB, Adams SA, et al. A smartphone app for self-management of heart failure in older African Americans: feasibility and usability study. *JMIR Cardio* 2020; 22. DOI: 10.2196/17142

29. Andrade AC, Corrado M and Bertolucci PHF. Health care professionals and use of digital technologies in patients with dementia and related disorders. *Alzheimer's Dementia* 2021; 17. DOI: 10.1002/alz.056667

30. Schüssler S, Zuschnegg J, Paletta L, et al. Effects of coach robot pepper versus tablet training on psychosocial and physical outcomes of persons with dementia: a mixed-methods study. *Alzheimer's & Dementia* 2021; 17. DOI: 10.1002/alz. 053453

31. Pais B, Buluschek P, DuPasquier G, et al. Evaluation of 1-year in-home monitoring technology by home-dwelling older adults, family caregivers, and nurses. *Front Public Health* 2020; 8. DOI: 10.3389/fpubh.2020.518957

32. Attenborough J, Abbott S, Brook J, et al. Everywhere and nowhere: work-based learning in healthcare education. *Nurse Educ Pract* 2019; 36: 132–138.

33. Liao S-C and Hsu S-Y. Evaluating a continuing medical education program: new world Kirkpatrick Model approach. *Int J Manage Econ Soc Sci* 2019; 8: 266–279.

34. Van Houwelingen CTM, Ettema RGA, Kort HSM, et al. Internet-generation nursing students' view of technology-based health care. *J Nurs Educ* 2017; 56: 717–724.

35. Gilmour J, Strong A, Chan H, et al. Primary health-care nurses and internet health information-seeking: access, barriers and quality checks. *Int J Nurs Pract* 2016; 22: 53–60.

36. Sadoughi F, Azadi T and Azadi T. Barriers to using electronic evidence-based literature in nursing practice: a systematised review. *Health Info Libr J* 2017; 34: 187–199.

37. Kalayou MH, Endehabtu BF and Tilahun B. The applicability of the modified technology acceptance model (TAM) on the sustainable adoption of eHealth systems in resource-limited settings. *J Multidiscip Healthc* 2020; 13: 1827–1837.

38. Walle AD, Ferede TA, Baykemagn ND, et al. Predicting healthcare professionals' acceptance towards electronic personal health record systems in a resource-limited setting: using modified technology acceptance model. *BMJ Health Care Inform* 2023; 30: e100707.

39. Venkatesh V, Thong JYL and Xu X. Unified theory of acceptance and use of technology: A synthesis and the road ahead, https://papers.ssrn.com/abstract=2800121 (2016, accessed 27 May 2023).

40. Ammenwerth E. Technology acceptance models in health informatics: TAM and UTAUT. *Stud Health Technol Inform* 2019; 263: 64–71.

Appendix

Appendix 1. The survey used in this research.

General data

1. Sex
a. Men
b. Woman
2. You work in:
   (a) Primary health
   (b) Hospital
   (c) Nursing home
   (d) School
   (e) Out-of-hospital emergencies
   (f) Other
3. Age
a. 20–30
b. 31–40
c. 41–50
d. 51–60
e. +60

Internet use

4. Do you have Internet access at your workplace?
a. Yes
b. No
5. How much time do you spend surfing the Internet daily?
a. –4 h
b. 4–6 h
c. 6–8 h
d. 8–10 h
e. +10 h
6. Do you belong to any professional social network? (you can tick several options)
a. LinkedIn
b. Professional groups in Facebook
c. Professional groups in WhatsApp
d. ResearchGate
e. Twitter
f. Telegram
g. Instagram
h. None
i. Other
7. Would you say you deal with technology?...
a. Badly
b. Fairly well
c. Well
d. Very well
8. Do you think the Internet can help you improve the quality of your daily work?
a. Yes
b. No
9. How? (open question)
10. Do you think social media can be useful for updating your knowledge?
a. Yes
b. No
11. Why? (open question)
12. Which do you consider most useful for updating your own knowledge?
a. Facebook
b. Twitter
c. YouTube
d. Instagram
e. Telegram
f. Other

Appendix 1. Continued.

Empowerment
13. With which adjective would you define a patient as empowered?
a. Informed
b. Active
c. Responsible
d. Autonomous
e. All of them
f. Other
14. What indicators do you use to measure the empowerment of your patients? (several options can be ticked)
a. None
b. Attitude towards changes or new information
c. Decision-making skills
d. Educational level
e. Other
15. What type of patients request further information in the consultation? (you can tick more than one option)
a. Men
b. Women
c. Young people
d. Patients over 60 years of age
e. Patients with chronic pathology
f. Others
16. How often do patients ask for additional information after your explanations?
a. Never
b. Infrequent
c. Fairly often
d. Always
17. What do you use to provide additional information to your patients? (you can tick more than one option)
   (a)   Printed material
   (b)   Videos or images
   (c)   Links
   (d)   Mobile applications
   (e)   Oral communication
   (f)Other
Constraints and enablers
18. Do you think that providing quality information to the community through the Internet would reduce the number of visits to primary and specialized care centres?
1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree
19. What percentage of patients is it feasible for them to use Internet tools to obtain more health information?
1: 0%
2: 25%
3: 50%
4: 75%
5: 100%
20. What constraints make it difficult for patients to use these digital tools? (multiple choices are possible in this question)
   (a)   Institutional constraints. Health centres and services do not facilitate access.
   (b)   Lack of training for professionals
   (c)   Patients do not have access to the Internet or devices.
   (d)Low cultural level or lack of knowledge on the part of patients
   (e)   Advanced age
   (f)Other
21. What factors do you think favour the use of these tools by patients? (several options can be ticked here)
   (a)   Institutional support
   (b)   Ease of use
   (c)   Professional support
   (d)   Patient training
   (e)   Professional training
   (f)Other

Appendix 2. Checklist for Reporting of Survey Studies (CROSS)

Section/topic	Item	Item description	Reported on page no.
Title and abstract			
Title and abstract	1a	State the word 'survey' along with a commonly used term in title or abstract to introduce the study's design.	In this case the type of study has been indicated in the title
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion and conclusions.	Page 1
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done and why this survey is needed.	Page 2
Purpose/aim	3	Identify specific purposes, aims, goals or objectives of the study.	Page 3
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g. cross-sectional or longitudinal).	Page 3
	5a	Describe the questionnaire (e.g. number of sections, number of questions, number and names of instruments used).	Page 4
Data collection methods	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure and reference links (if any).	The survey was used for exploratory purposes only. The items were not scored.
	5c	Provide information on pretesting of the questionnaire, if performed (in the article). Report the method of pretesting, number of times questionnaire was pretested, number and demographics of participants used for pretesting and the level of similarity of demographics between pretesting participants and sample population.	Page 4
	5d	Questionnaire if possible should be fully provided (in the article).	Included in Appendix 1
Sample characteristics	6a	Describe the study population (i.e. background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	Page 4
	6b	Describe the sampling techniques used (e.g. single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	Page 3
	6c	Provide information on sample size, along with details of sample size calculation.	Page 3
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	Page 3

Appendix 2. Continued.

Section/topic	Item	Item description	Reported on page no.
Survey administration	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the survey was conducted (e.g. outpatient room or by use of online tools, such as SurveyMonkey).	Page 3
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure and follow-up days.	Page 3
	7c	Provide information on the entry process: →For web-based surveys, provide approaches to prevent 'multiple participation' of participants.	With the tool used, this is not possible.
Study preparation	8	Describe any preparation process before conducting the survey (e.g. interviewers' training process, advertising the survey).	The survey was sent out via social media.
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board (IRB) approval, Helsinki declaration and good clinical practice (GCP) declaration (as appropriate).	Page 4
	9b	Provide information about survey anonymity and confidentiality, and describe what mechanisms were used to protect unauthorized access.	Page 5
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	Page 5
	10b	Report any modification of variables used in the analysis, along with reference (if available).	Not applicable
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e. missing completely at random (MCAR), missing at random (MAR) or missing not at random (MNAR)) and methods used to deal with missing data (e.g. multiple imputation).	Incomplete surveys, two in particular, were eliminated.
	10d	State how non-response error was addressed.	Incomplete answers were deleted.
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	Not applicable
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	Not applicable
	10g	Describe any sensitivity analysis conducted.	Not applicable
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	Page 6
	11b	Provide reasons for non-participation at each stage, if possible.	Not applicable

(continued)

Appendix 2. Continued.

Section/topic	Item	Item description	Reported on page no.
	11c	Report response rate, and present the definition of response rate or the formula used to calculate response rate.	Not applicable
	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g. view proportion, participation proportion, completion proportion).	Not applicable
Descriptive results	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	Page 6
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and *p*-values.	Results section
	13b	For multivariable analysis, provide information on the model building process, model-fit statistics and model assumptions (as appropriate).	Not applicable
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	Not applicable
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	Pages 16–17
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions, and suggest areas for future research.	Discussion section
Generalizability	16	Discuss the external validity of the results.	Discussion section
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation and analysis.	Not applicable
Conflict of interest	18	Declare any potential conflict of interest.	No conflict of interest
Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	Not applicable