

1 Nurses' experience of using video consultation in a 2 digital care setting and its impact on their 3 workflow and communication

4 SeyedehMaryam Razavi^a, Nasim Farrokhnia^b, Nadia Davoody^{a*}

5

6 ^aDepartment, of Learning, Informatics, Management, and Ethics, Karolinska Institutet
7 Stockholm, Sweden

8 ^bDepartment of Clinical Science and Education, Karolinska Institutet, Södersjukhuset,
9 Stockholm, Sweden

10

11 *Corresponding author:

12 Email: nadia.davoody@ki.se

13

14

15

16

17 **Abstract**

18 Sweden as many other countries uses video consultation to increase patients'
 19 access to primary healthcare services particularly during the COVID-19
 20 pandemic. Working in digital care settings and using new technologies, in this
 21 case video consultations, require learning new skills and adoption to new
 22 workflow. The aim of this study is to explore nurses' experience of using video
 23 consultation in a digital care setting and its impact on their workflow and
 24 communication. Fifteen semi-structured interviews were carried out with
 25 registered nurses recruited from a private digital healthcare provider. Interviews
 26 were recorded, transcribed, and analysed using an abductive approach. Nurses'
 27 workflow was modeled, and several categories and subcategories were identified:
 28 nurses' workflow (efficiency, flexibility, and information accessibility);
 29 communication (interaction with patients and interprofessional communication);
 30 user experience (change and development of the platform, challenges, and
 31 combining digital and physical care). Even though providing online care has its
 32 limitations, the nurses were positive towards using video consultations.

33 **Keywords:** Telehealth, Nursing, Video consultation, Socio-technical Model

34 **Introduction**

35 The complex nature of healthcare, an aging population suffering from multiple chronic
 36 diseases, and occurrence of the COVID-19 pandemic require new ways of providing
 37 care to patients and citizens. The traditional ways of providing care to all patients are
 38 not sufficient due to lack of resources [1]. Information and communication technology
 39 has been used widely in healthcare, and telemedicine has been seen as one of the

40 essential solutions to this matter [2]. E-health innovations enable patients and citizens to
41 among others obtain healthcare online, get involved in their own care, and track their
42 disease and treatment processes.

43 In recent years, receiving care through video consultations has been an
44 inseparable part in health care. Video consultations, digital care visits, video visits, and
45 video consultations are some of the terms for receiving care online [3-6]. Video
46 consultation is defined as a direct and synchronous conversation between healthcare
47 professionals and patients [7]. With video consultations in this study, we mean real-time
48 tele consultation/virtual visit that is initiated by a patient at a distance using information
49 and communication technology. New paragraph: use this style when you need to begin
50 a new paragraph.

51 **The use of video consultations in Sweden and globally**

52 Currently, the use of video consultations has increased significantly worldwide due to
53 the occurrence of the COVID-19. Various countries, including the United States, UK,
54 Japan, China, and several European countries such as Sweden, plan and develop
55 healthcare strategies based on digital services. In this model, video counseling services
56 are provided by private companies to patients to deliver primary care services [8].
57 With the onset of the COVID-19 pandemic outbreak in March 2020, the use of
58 telemedicine increased to reduce the risk of spreading the infection, especially in
59 countries such as the USA, UK, China, and Australia. In recent years, particularly
60 during the COVID-19 pandemic, several studies have been performed focusing on the
61 use of video consultations and telemedicine, its benefits, and challenges in health care
62 from healthcare professionals' and patients' perspective [9-19].

63 In Sweden, video consultations have been provided by private healthcare
64 providers to citizens and patients since 2016. [20] Patient satisfaction with digital care
65 provided by private healthcare providers such as KRY AB and MinDoktor have been
66 around 90 percent [21]. Currently, most of the video consultations are done by these
67 two private, for-profit companies established in 2014 and 2015. In Sweden, digital care
68 users have mostly been from large regions such as Stockholm region, Västra Götaland
69 county, and region of Scania and most common diagnoses have been infections, skin
70 conditions, intestinal conditions, and male's or female's specific health problems [21].

71 **Socio-technical model**

72 Designing health information systems and eHealth services for providing care online
73 requires having a socio-technical approach in mind as they affect the work processes of
74 care professionals and the way they provide care to the patients and citizens. The
75 success of a health information system is influenced by technical, social, organizational,
76 and socio-political factors that ultimately affect the patient's outcome in healthcare
77 systems. In this regard, one of the models employed for the comprehensive analysis of
78 health information systems is the social-technological model. Hardware and software
79 computing infrastructure, clinical content, human computer interface, people, workflow
80 and communication, internal organizational features, external rules and regulations and
81 measurement and monitoring are the 8 dimensions of the socio-technical conceptual
82 model [22]. Profound study and understanding of these eight dimensions will assist us
83 to ensure that every patient receives the right care at the right time [23]. Workflow and
84 communication as one of the dimensions of the socio-technical model acknowledge the
85 collaboration of the healthcare team to accomplish patient care.

86 Usually, new eHealth solutions do not comply with the actual “clinical”
 87 workflow. In such a case, modifying the workflow or changing the health information
 88 technologies need to be considered. Numerous studies have been done regarding the
 89 impact of technology on nurses’ workflow and Communication [24-33]. Research on
 90 the impact of technology on nurses’ workflows in the physical settings shows that
 91 technology has a positive impact on nurses' workflows. Having access to information at
 92 the point of care, improved collaboration, job performance and communication,
 93 improved patient safety and reduction of medication errors, and improved nurses’
 94 perception of the system’s role in their workflow have been some of the benefits of
 95 using technology in a physical setting. The studies have, in addition, addressed some
 96 challenges such as technical problems, difficulties in providing clinical assessments,
 97 clinicians' skepticism and criticism, disconnection with the IT team, and setting up and
 98 maintenance of the devices [33-37]. In digital settings, however, the impact of video
 99 consultations on nurses’ work process and communication has not been studied in
 100 detail. To support nurses in a digital care setting we need to obtain a deep understanding
 101 of their workflow and the impact of the new technology, in this case video consultation,
 102 on their workflow and communication.

103 **Aim**

104 The aim of this study is to explore the nurses’ experience of using video consultations in
 105 a digital care setting. In addition, the aim is to study the opportunities and limitations
 106 with video consultations and its impact on the nurses’ workflow and communication in
 107 Sweden. Studying these aspects will assist us to support nurses throughout their work
 108 processes and also improve the design and implementation of these services in future.

109 **Materials and methods**

110 Qualitative research methods were used, and data was gathered through semi-structured
111 interviews with registered nurses at KRY AB in Sweden. The socio-technical model
112 was used to develop the interview guide in this study and our focus has been on the
113 workflow and communication of nurses in a digital setting.

114 **Data collection**

115 Fifteen interviews were performed in this study. Each interview took about 30 minutes
116 and was conducted by telephonic or video calls. Recruitment of the participants was
117 done in the beginning of 2020. All interviews were audio recorded and transcribed
118 verbatim. Interviews were analyzed using an abductive approach [38]. Questions asked
119 of individuals were regarding their workflow and communication.

120 **Participant selection and setting**

121 In this study, we involved nurses working in one of the private digital care providers,
122 namely, KRY AB as they are one of the first digital care providers in Sweden. KRY AB
123 has in 2018 started their physical clinics to provide care even physically if needed.
124 These integrated digital and physical services are called Digi-physical services and are
125 aimed to close the gap between digital and physical care and facilitate care flow both for
126 patients and healthcare workers [39-41]. The inclusion criteria were specified as
127 follows: English speaking participants with at least six months experience of working in
128 physical and digital care settings. All the participants were registered nurses and had
129 experience of working in physical settings with a mean average of 17 years (range 2-
130 41). All participants have been working at least 6 months with the digital platform at

131 KRY AB. Two females and 13 males were interviewed in this study. Table 1 indicates
132 the characteristics of the participants.

133 **Table 1. Participant characteristics**

Age	Years of experience in physical setting	Years of experience in digital care setting
30-39	13 y	1 y
30-39	17 y	1y
40-49	20 y	1y
40-49	26 y	1y
60-69	35 y	1y
40-49	25 y	1y
40-49	17 y	1y
40-49	11 y	7 m
40-49	10 y	1 y, 6 m
40-49	24 y	1 y, 6 m
50-59	41 y	2 y
40-49	5y, 6 m	6 m
40-49	2 y	6 m
40-49	14 y	1 y
20-29	3 y	1 y

134 **Data analysis**

135 All three authors (MR, NF, and ND) were involved in creating a preliminary semi-
136 structured interview guide. The interview guide was divided into three different parts
137 focusing on the workflow, communication, and user experience of nurses in the digital

138 setting. The themes were used as key concepts to guide the coding process and the
139 codes under these themes come from analysis of the interview material. All interviews
140 were conducted by the first author (MR) and the preliminary data analysis was
141 performed by her. The preliminary codes were discussed with the co-authors (ND and
142 NF). All authors were involved in the discussion of final codes and categories in this
143 study.

144 Based on the interviews, the nurses' workflow was modeled by Camunda, a
145 desktop application for modeling BPMN (Business Process Modeling Notation) [42]
146 workflows.

147 **Results**

148 The results will be presented in two parts. The first part includes nurses' workflow
149 model followed by a presentation of the themes, categories, and sub-categories.

150 **Nurses' workflow model**

151 To have an overview of how nurses work in a digital setting, their work process
152 has been modeled in this study (figure 1). The process starts by the nurse logging in to
153 the communication platform (Slack) and KRY platform. The technical issues are
154 checked to ensure proper audio, video, and Internet performance. If any technical
155 problems occur, the nurse either tries to solve the problem by herself/himself or contact
156 the technical support at the company. The work process will continue as soon as the
157 problem is solved. In the next step, the nurse sees a list of patients with their names and
158 pictures on their user page. In this section, the nurse chooses a patient that popped up on
159 the screen.

160 In the next step, the nurse can study the patient's chief complaint. It is important
161 to note that when a patient books an appointment, the patient should answer triage

162 questions that indicate what the patient's main problem is. When the nurse reads the
 163 patient's responses to triage questions, he or she may need to know more about the
 164 patient's previous medical history. The nurse can either choose to read the patient's
 165 previous medical record on the KRY platform or read the patient's medical record from
 166 other platforms where the patient's information is located, for example, national patient
 167 overview (NPÖ). The national patient overview is a web-based tool that gives
 168 authorized healthcare professionals access to an overview of a patient's medical record
 169 at other healthcare providers [43]. The next step is calling the patient through the KRY
 170 platform. At this stage, if the patient does not respond, the nurse will continue calling
 171 her/him for another three minutes, and then sends a text message to the patient. In this
 172 message the patient is asked to book another appointment which will end the process. If
 173 the patient answers the call, a video meeting will be started by the nurse.

174 To be able to make a diagnosis, the nurse obtains necessary information from
 175 the patient by asking questions related to the patient's problem. If the nurse is unable to
 176 make a diagnosis, she/he can either put the patient on hold or end the call and contact
 177 the patient after consulting a doctor or nurse. After consultation with the on-call
 178 doctor/nurse, the nurse receives an answer related to diagnosis and should call the
 179 patient again. If the nurse doesn't need any help from the on-call doctor/nurse, she/he
 180 can provide a diagnosis directly and continue the process.

181 The nurse then gives advice and/or referral to a hospital, a primary care center,
 182 or a physician. Also, at this stage, the nurse can send a message containing the
 183 information that was provided during the meeting to the patient. The nurse writes then a
 184 report and documents all the information and interventions. The nurse approves and
 185 signs the report which ends the work process.

186 **Figure 1. Nurses' work process illustration**

187 All participants in this study were working both digitally and physically at
188 different healthcare centers. The results including themes, categories, and subcategories
189 will be presented below (Figure 2).

190 **Figure 2. An overview of identified themes, categories, and subcategories**

191 **Theme 1. Workflow**

192 **Efficiency**

193 Participants were interested in working with maximum productivity and minimum time
194 or energy wasting e.g., not spending time traveling to the workplace, meeting the
195 patients with short preparation time, and having enough information about the patient.

196 *No travelling time.* Most of the participants stated that it is positive to not spend the time
197 commuting between workplace and home.

198 *'I don't have to spend time traveling to work. Don't have to spend time traveling home. I*
199 *have a setting at home which is very comfortable, which is nice at covid-19 time.*

200 *Working from home.'* (Interview 1)

201 *Not preparing the examination rooms.* They also mentioned that not preparing the
202 examination room resulted in having more time for patients. They felt that they were
203 more concentrated in communication with the patient through video consultations than
204 the physical meetings.

205 *'It is a lot faster. There is less time spent looking for the patient, preparing the patient,*
206 *going into the room, sitting down, washing your hands, everything like that. You just*
207 *kind of start and it is all there.'* (Interview 1)

208 *Prior knowledge about the patient.* Most of the participants showed an interest in
209 having as much as possible information about a patient's medical history in advance.

210 This helped them to be prepared during the video consultation. They were also satisfied
211 with the information that they got before the visit via NPÖ.

212 *‘The flow with the patients is much better because before I give them a call, I can read*
213 *what they are seeking in the form. I can also check NPÖ to check some background*
214 *information if I do feel I need to. And then when I have all this stuff, I call them. I think*
215 *it is easier.’ (Interview 3)*

216 *‘You get the patient's personal number, and you can read the symptoms and you can see*
217 *the medical record and read about the medical history and then join the meeting...’*
218 (Interview 13)

219 Access to the patient's triage questions and the patient's health data make the nurses’
220 workflow and communication more effective.

221 *‘Before I give them a call, I can read what they are seeking in the form. Also, I can*
222 *check NPÖ to check some background information. I am much more effective because I*
223 *have all the facts before the patient calls, mostly I have a quite good picture of what is*
224 *waiting for me, because of that it is much more effective.’ (Interview 3)*

225 **Flexibility**

226 Most participants were positive towards having freedom to choose the time and place to
227 work. They also liked the way they could schedule their working days and being able to
228 choose freely to work in a physical or a digital setting.

229 *Working remotely.* Most of the participants were satisfied working from home.

230 *‘I am satisfied because I do love this way of working. I can work from home. I can sit on*
231 *the sofa if I only have this white background.’ (Interview 3)*

232 *‘You don't have to go to the healthcare center, you just need to talk to someone that tells*
233 *you what to do. I can do my job from my home.’ (Interview 5)*

234 However, some of the participants have mentioned that working from home was
235 challenging for them as it reduced their social interactions with other colleagues.
236 *'I like working from home. I have other work that I also do from home, so I don't have
237 to go to my workplace. Sometimes you get bored, because you need to talk to someone,
238 but we have a good chat channel [Slack] at KRY, we can talk to each other...'*

239 (Interview 6)

240 *Moving freely between physical and digital setting.* Participants stated that working with
241 video consultation allows them to work in the physical setting as well. Participants
242 stated that in this way they can practice their skills and be in touch with the patients
243 physically.

244 *'... For me also I can work in a physical setting too, but it is up to me. I can change
245 between physical and digital settings.'* (Interview 1)

246 *'And all the time with video consultation is hard and if you can combine it then it is
247 good. And also, it is good that patients can meet the nurse or doctor physically... I think
248 in a long time it will be boring with digital and when you are educated you want to do
249 some practice...'* (Interview 13)

250 *'I would say if I can choose both, I would choose both 50-50. I love the combination.
251 100% digitally will be too much. Sometimes I need to see the patient...'* (Interview15)

252 *Scheduling the working hours freely.* Nurses declared working in a digital setting gives
253 them more autonomy regarding planning their schedule. In physical settings, they need
254 to work 7 hours in predetermined shifts, while in this digital care setting, they can
255 decide about their working hours.

256 *'I can decide when I want to work or not. Or I don't need to work 7 hours in a row.
257 Working or going for one hour or two hours.'* (Interview 2)

258 **Information accessibility**

259 Majority of the participants expressed that using the platform is easy because they have
260 access to all the necessary information about the patients. They have access to the KRY
261 medical record as well as NPÖ.

262 *Easy access to necessary information is in the same place.* The participants were
263 satisfied that they have access to all the information in one place.

264 *'It is very easy to follow. Why is it easy to follow? You don't have many options. You get*
265 *your patient and patient's medical record, and you don't have to write any personal*
266 *number or other details. Everything is just there...It is easy to follow the previous*
267 *medical record. Easy to follow and easy to see what it is.'* (Interview 7)

268 *Access to clinical guidelines.* Participants felt that their diagnosis had a better quality as
269 they could check it with clinical guidelines while talking to the patients. Also, if nurses
270 are in doubt about their diagnosis, they can confirm their diagnosis without any
271 significant delay and simultaneously with a doctor's approval.

272 *'[In a video consultation, the diagnosis is] a lot easier. In the physical setting if you*
273 *need to check something, you need to talk to the patient and then go to your computer*
274 *and then talk to the patient which takes time and is not a very professional way. Now I*
275 *can check things up with quality standards that we do have, what is KRY policy on this*
276 *and then I check this up. Meanwhile I am talking to the patient, and they aren't even*
277 *aware that I'm checking it. It is more quality, but I would say it is effective in that way*
278 *in the digital care setting.'* (Interview 1)

279 **Theme 2. Communication**

280 **Interaction with patients and interprofessional communication**

281 Fast communication between colleagues is more feasible in the digital care setting due
282 to different communication services such as Slack.

283 *Nurse – patient communication.* Participants were satisfied that nothing disturbs them,
284 so they focus on their work.

285 *‘There is nothing disturbing me. I have this patient and only this patient, not a*

286 *colleague knocking on the door, so I can focus on what I do.’ (Interview 3)*

287 *‘Here the only thing that I do is to answer the patient. That is the only thing that I do...’*

288 *(Interview 6)*

289 *Easier communication through different channels.* Communication between colleagues
290 is more feasible in the digital care setting due to the different communication channels
291 such as Slacks. Several participants indicated that it is much easier to communicate as
292 all the nurses are using Slack, phone or email. Having access to all responses in Slack
293 has made this communication channel to a learning tool.

294 *‘Slack, it is a learning platform too.’ (Interview 5)*

295 *‘Slack, one thing is good, you can write something to anyone, and they can read it any*
296 *time they can. I don’t want to interrupt them. Slack is better than physical. In a physical*
297 *setting two people should be at the same place at the same time and it is hard to get a*
298 *time to suit both persons. In Slack you write a message and after 10 min you receive a*
299 *response.’ (Interview 15)*

300 However, some participants stated that communicating in a written form can be
301 problematic as it is more difficult to be understood, get a response in time or receive
302 several responses at the same time.

303 *‘Negative, it is always complicated when the conversation is in a written form because I*
 304 *hear my words in one way when I am writing them, when the receivers read it, it might*
 305 *sound different for them...’ (Interview 15)*

306 **Theme 3. User experience**

307 **Support from the organization**

308 The majority of the participants mentioned that they receive significant support from the
 309 organization regarding technical problems. They also mentioned that they have access
 310 to collegial support.

311 *Solving technical problems.* At the beginning of all working shifts, nurses need to check
 312 the technical features including sound and video. If they face any problems, they can
 313 contact the technical support via email, phone call or Slack. Participants expressed that
 314 they always receive support without any significant waiting time.

315 *‘There is a channel for this too. They always check the channel. If I write something*
 316 *there, especially a technical problem, they are very fast to fix the problem.’ (Interview*
 317 *1)*

318 *‘We send messages everywhere and we get quick responses from all of us. So, from*
 319 *someone who knows something. I usually write to them [IT people] in Slack.’ (Interview*
 320 *5)*

321 *Support from colleagues.* All participants have the possibility to ask their questions
 322 through a phone call to the assigned physicians/specialists. They can even send a
 323 message to all other doctors/nurses through Slack. In both cases, they will receive an
 324 answer without significant waiting time. Unlike the physical setting, nurses do not need
 325 to chase the doctor or wait a long time to get a response. According to the participants,
 326 the doctors set aside time for them in the digital care setting. This setting allows them to

327 communicate with other colleagues e.g., other nurses, physicians/specialists, and
 328 technical experts, easily, if needed.

329 *'If I need to know something in general, I can send a picture and write the description*
 330 *as a question and then I will have my answer. Sometimes I can ask a specific doctor. We*
 331 *have a nurses' group. Also, we can ask each other there. There we can also call but*
 332 *often we write to each other because it is quicker. [...] There is a big difference between*
 333 *physical care and digital care. In physical care you always have to chase the doctor*
 334 *and often don't have time for helping nurses. But [in the digital care setting] they*
 335 *always have time.'* (Interview 4)

336 *'If you want to ask something, you have quickly an answer from a doctor or another*
 337 *nurse.'* (Interview 2)

338 Some participants, however, were more positive towards receiving support from
 339 colleagues in a physical care setting.

340 *'Also I can mute myself and call a colleague if I don't get a direct response through*
 341 *Slack. I can put the patient on hold and call a colleague. In a physical setting you have*
 342 *someone inside you can just go and ask a colleague, you don't have to wait to respond,*
 343 *and you can find the person there and talk to him. It can be a bit negative for digitally.*
 344 *Sometimes in Slack you don't get a response.'* (Interview 14)

345 **Change and development of the platform**

346 The platform was developed regularly, and nurses needed to stay updated all the time.

347 *Active learning.* The majority of the participants stated that the digital care setting is
 348 changing rapidly and that these changes are positive and based on a need. They believed
 349 that rapid changes in the platform is practical, and that improvement of the platform
 350 does not change the basic structure of their work.

351 *'It is changing fast because they are trying to improve it. KRY always changes fast but*
 352 *it is good changing. If they see the change is not good, they put it back. They do not*
 353 *struggle with bad things. It is under construction all the time. It is happening all the*
 354 *time. But I like it.'* (Interview 4)

355 However, some of the participants mentioned that being updated about all the changes
 356 made in the platform is time consuming and they need to put effort to learn about these
 357 changes in their free time, without any reimbursement.

358 *'I feel in a perfect world they would give us 15 minutes or once a week a time to get*
 359 *through the updates. It is difficult to keep track of all the updated procedures and you*
 360 *should do it in your free time. It is not the way it should work in health care. You should*
 361 *get time to go through the updated information.'* (Interview 8)

362 *Lack of training.* Some of the respondents mentioned that the occurrence of all these
 363 changes makes it difficult for them to stay up to date when they are away from the
 364 digital care setting for a long time. They experienced that they need to have a training
 365 course to review all the changes to be able to start working again. In the physical care
 366 setting, according to some participants, the changes occur slowly, and it makes it
 367 possible for them to be away from their work without the need for training.

368 *'...in the KRY platform if you are away for 6 weeks everything has changed. A lot of it*
 369 *has changed anyway. Then you have to kind of restart your training. You can [be away*
 370 *for 6 weeks] in the physical setting because things rarely change that fast. When you*
 371 *come back after 6 weeks or whatever else, maybe they rolled a plastic container to*
 372 *another side of the room.'* (Interview 1)

373 *'Sometimes there are a lot of updates with no administration time to read them. If I*
 374 *want to read, I either need to do it in my spare time and I will not get paid for it or read*
 375 *between the patients' [visits]...' (Interview 15)*

376 **Challenges**

377 Lack of social interaction with other colleagues, being dependent on the Internet and
 378 technology, as well as patients' high expectations and misconceptions about video
 379 consultations were among the problems that participants mentioned.

380 *Social interaction with colleagues.* Some of the participants explained that they needed
 381 to communicate with patients and colleagues in a different way in the digital care
 382 setting than a physical setting.

383 *'You don't get the social contact from your fellow colleagues as you get when you are at*
 384 *work [in a physical setting].'* (Interview 5)

385 *Technical problems.* Participants asserted some challenges and limitations regarding
 386 working in the digital care setting. The infrastructure of the communication channel in
 387 the digital care setting relies on technology and the Internet. In case of a technical
 388 problem or any interruption of the Internet, communication with the patient will be
 389 disrupted or disconnected.

390 *'Since we are dependent on the internet and IT, it needs to work, some days it can be*
 391 *too much on the internet and it gets slower and sometimes it breaks down, but they [the*
 392 *technical team] are really quick. So, it is not a problem.'* (Interview 6)

393 *'Obviously one thing, and that can be technical issues because it is digital. If something*
 394 *technically goes wrong like connection or something in the portal, I cannot do anything*
 395 *about it and that can be annoying if I have a meeting with the patient. I have to trust the*
 396 *technical team to resolve it.'* (Interview 14)

397 *Patients' high expectations.* Some participants believed that in video consultations
 398 patients have unrealistic expectations and get disappointed when they do not receive
 399 care. Even though it is possible to provide care for several problems digitally, there are
 400 still some limitations which make it impossible to help all patients.

401 *‘Sometimes patients have no realistic expectation; they think we can make judgment of*
 402 *their back or knee or ear and then when we say we cannot help you with this they get a*
 403 *little bit disappointed. You cannot do all things but for many kinds of things digital is*
 404 *really good...’ (Interview 11)*

405 *‘You need to examine [the patient] physically and those things you can't do, and some*
 406 *patients don't understand that.’ (Interview 4)*

407 *Unfamiliarity with the culture of digital care.* Another problem that nurses face is the
 408 lack of sufficient knowledge of patients about how to communicate and behave in the
 409 video consultation meetings. The nurses stated that this could affect the quality of their
 410 services.

411 *‘Maybe sometimes people are calling from a car or dark room. It was loud and difficult*
 412 *to see, like a wound on a hand, otherwise you need to hear what they are saying.’*
 413 *(Interview 12)*

414 *‘... Sometimes they are sitting in a car, or a dark room and I have to say I need to see*
 415 *you. That is a problem sometimes. Or parents calling while their kids are sleeping, and*
 416 *they get angry if we ask them to wake up the child.’ (Interview 11)*

417 *Lack of physical contact with patient.* Due to the lack of physical contact with patients,
 418 participants need to use their experiences as well as different methods to obtain accurate
 419 information from the patients to be able to evaluate their needs.

420 *‘[In a video consultation] you are very much on your own. I use my personality to make*
 421 *the patient comfortable and calm. The thing you have to do is you have to be very clear*
 422 *with your questions, and repeat their answers, and make sure that information they are*
 423 *giving you is correct.’ (Interview 5)*

424 *‘You have to think of another way because then you can ask them “can you check your*
 425 *pulse?” Then I look at the breath. So, you have to think in another way sometimes, but*
 426 *you do learn that quite quickly.’ (Interview 3)*

427 Participants mentioned that they did not see any difference between what they could see
 428 in a face-to-face meeting and what they could see in a video consultation, and that they
 429 could make a good assessment of the patient even without touching them. The
 430 important thing is to make sure that the information they receive is precise with clear
 431 questions and answers. What participants can evaluate or do is limited to what they see
 432 and hear. If the disease requires further evaluation, such as a physical examination, the
 433 patient should be referred to a healthcare center. The participants believed that video
 434 consultation could complement physical meetings.

435 *‘There is not any difference between what I can see on the computer or what I can see*
 436 *in real life. If you have an irritation or something.’ (Interview 4)*

437 *‘You assess them more than you think you do. You assess them without touching them.*
 438 *The thing you need to do is you have to be very clear with your questions, and repeat*
 439 *their answers, and make sure that information they are giving you is correct. You assess*
 440 *them like they are in the health clinic. You look at them, how they walk, how they talk.’*
 441 *(Interview 5)*

442 **Combining digital and physical care**

443 *Competence development for care professionals.* The participants expressed that in
 444 today’s health care, providing care digitally is a necessity. A combination of physical
 445 and digital care was appreciated by the nurses in this study.

446 *‘I think you cannot hold the digital meeting away. You are on the point that you need to*
 447 *explore the digital meeting. You need to make a combination of physical care and*
 448 *digital care. We have our physical clinic in Malmö, Lund and Jönköping.’ (Interview 4)*

449 Some of the participants were concerned about their competence development in the
450 digital setting and expressed that it is difficult to practice the skills if they only work
451 digitally.

452 *‘... If you do digitally all the time it would be hard. I think in a long time it will be*
453 *boring with digital and when you are educated you want to do some practice. with*
454 *digital you cannot practice your skills.’ (Interview 13)*

455 *Benefits for patients.* The Participants believed that combining the digital and physical
456 care would be an optimal solution for providing care to patients.

457 *‘I would say the best for the patient and nurse is to have physical and digital. And all*
458 *the time with video consultation is hard and if you can combine it is good. And also, it is*
459 *good that patients can meet the nurse or the doctor physically...’ (Interview 13)*

460 Discussion

461 The results of this study show that despite the limitations in digital care settings, nurses
462 are satisfied with the use of video consultations. Flexibility, efficiency, and access to
463 information have been some of the benefits mentioned by the participants in this study.
464 This is also in line with previous studies in which care professionals such as physicians
465 are satisfied and positive towards using video consultations [44-46].

466 The aim of this study was to explore nurses’ experience of using video
467 consultation and its impact on their workflow and communication in Sweden and give
468 insight into its opportunities, challenges, and limitations.

469 Eight categories and several subcategories were identified (Table 1). The results
470 showed that the use of video consultations in a digital setting had a positive impact on
471 communication between nurses, patients, and the nurses’ workflow. This is aligned with
472 the results of the use of video consultations in a physical setting [30,31,33]. The results

also showed that having access to prior knowledge about the patient, not commuting to work and no physical preparation routines enhance the efficiency of the nurses' work process. The nurses needed mainly to focus on the patient and be fully prepared to contact him/her. Although nurses are satisfied with the opportunity to work from home, having autonomy about choosing their working hours, there are still some challenges that need to be considered. Some of these challenges include lack of social interaction with co-workers, being dependent on technology, fast changes of the platform, facing patients' unrealistic expectations about digital healthcare services, dealing with patients' unfamiliarity with the culture of digital care, and lack of physical contact with patients. These challenges have also been mentioned in some previous studies [10,44,45,46]. Furthermore, the nurses in this study as participants in some other studies felt that technical problems may affect their workflow [32,45]. Improvement of technical solutions has been seen as a necessity in a study focusing on the challenges of video consultations [13].

Findings of this study showed that nurse-patient communication during video consultation was relevantly comparable with the physical meetings. The participants mentioned that they could focus on patients during the video consultations and not get disrupted by other factors. Hence, the findings of this study do not confirm the results of the previous study on the nurse's perception regarding nurse-patient communication while providing care via telehealth [47]. That study revealed that telehealth facilitates nurses work process but impedes the communication process due to struggling to understand non-verbal signals [47]. In addition, patient expectations need to be balanced and digital consultations culture needs to be accepted and respected by the patients as high expectations and unfamiliarity with the digital setting may result in difficulties in provision of online care [13].

498 Nurses' communication with each other was faster and easier as they used
 499 different communication channels and had access to the conversation history. However,
 500 the results showed that communication and providing diagnosis were easier for
 501 experienced nurses as they could use their previous communication skills to establish a
 502 relationship with the patients and provide a diagnosis despite the limitations with digital
 503 care. This result also has been confirmed in a previous study [47]. Since the importance
 504 of communication has been mentioned in previous studies, having a training program in
 505 which experienced nurses could help junior nurses in communication with the patients
 506 and other team members in a digital care setting could be beneficial [47].
 507 The results in this study, showed that the patient got referred to a medical center if a
 508 physical examination was needed. The nurses mentioned that providing health care only
 509 digitally will not cover all aspects needed to treat a patient or all types of diseases.
 510 There is, therefore, a need of combining digital with physical care in cases in which
 511 only digital care is not the optimal way to provide health care.

512 The video consultations, due to covid-19 situation and the current restrictions,
 513 can increase cooperation with physical healthcare centers. However, video consultations
 514 cannot be a substitute for face-to-face visits but can complement them and reduce the
 515 need of face-to-face consultations in some situations e.g., during the COVID-19
 516 pandemic. This is in line with the results of a scoping review regarding clinicians'
 517 experience of using video consultations in primary care [48]. However, some patients
 518 prefer face-to-face consultation when it is possible [10].

519 In this study we provided further insight into the digital setting. There have been
 520 studies exploring care professionals' experience of using video consultations, however,
 521 there was a lack of studies focusing on nurses' workflow and communication in the
 522 digital care settings and our study contributes to this knowledge gap. However, more

523 studies are needed within this area as we in this study only interviewed nurses working
524 for one online private care provider. The results may differ from other healthcare
525 providers using different digital platforms. In addition, further studies can be conducted
526 not only in private sectors but also in public sectors and even considering other aspects
527 of the socio-technical model such as internal organizational features, external rules, and
528 regulations and their impact on nurses' workflow in a digital setting.

529 **Conclusion**

530 Even though providing online care has its limitations, the nurses were positive towards
531 using video consultations. The opportunities such as flexibility, efficiency in the nurses'
532 workflow and information accessibility have been perceived as strengths in digital
533 settings.

534 The occurrence of the COVID-19 pandemic during two previous years has caused an
535 increasing use of video consultations worldwide. This fundamental change requires
536 extensive research within this area from both patients, their next-of-kin and care
537 professionals' perspective. In addition, the COVID-19 pandemic brought the realization
538 that providing digital healthcare meetings to patients and citizens is a necessity in future
539 health care.

540 **Acknowledgment**

541 We would like to thank all the study participants for their time and valuable insights.

542 **References**

- 543 (1) Rheuban KS. The role of telemedicine in fostering health-care innovations to
544 address problems of access, specialty shortages and changing patient care needs. J
545 Telemed Telecare. 2006;12 Suppl 2(2_suppl):S45-50.
- 546 (2) Tavares AI. eHealth, ICT and its relationship with self-reported health outcomes in
547 the EU countries. Int J Med Inform. 2018;112:104-13.
- 548 (3) E De Weger, Macinnes D, Enser J, Francis SJ, Jones FW. Implementing video
549 conferencing in mental health practice. J Psychiatr Ment Health Nurs.
550 2013;20(5):448-54.
- 551 (4) Hensel JM, Yang R, Vigod SN, Desveaux LJC, Research P. Videoconferencing at
552 home for psychotherapy in the postpartum period: Identifying drivers of successful
553 engagement and important therapeutic conditions for meaningful use.
554 2021;21(3):535-44.
- 555 (5) Santoro SL, Donelan K, Haugen K, Oreskovic NM, Torres A, Skotko BG, editors.
556 Transition to virtual clinic: experience in a multidisciplinary clinic for Down
557 syndrome. American Journal of Medical Genetics Part C: Seminars in Medical
558 Genetics; 2021: Wiley Online Library.
- 559 (6) Dahl-Popolizio S, Carpenter H, Coronado M, Popolizio NJ, Swanson C. Telehealth
560 for the Provision of Occupational Therapy: Reflections on Experiences During the
561 COVID-19 Pandemic. Int J Telerehabil. 2020;12(2):77-92.
- 562 (7) Hashiguchi TCO. Bringing health care to the patient: An overview of the use of
563 telemedicine in OECD countries. 2020.
- 564 (8) Salisbury C, Quigley A, Hex N, Aznar C. Private Video Consultation Services and
565 the Future of Primary Care. J Med Internet Res. 2020;22(10):e19415.

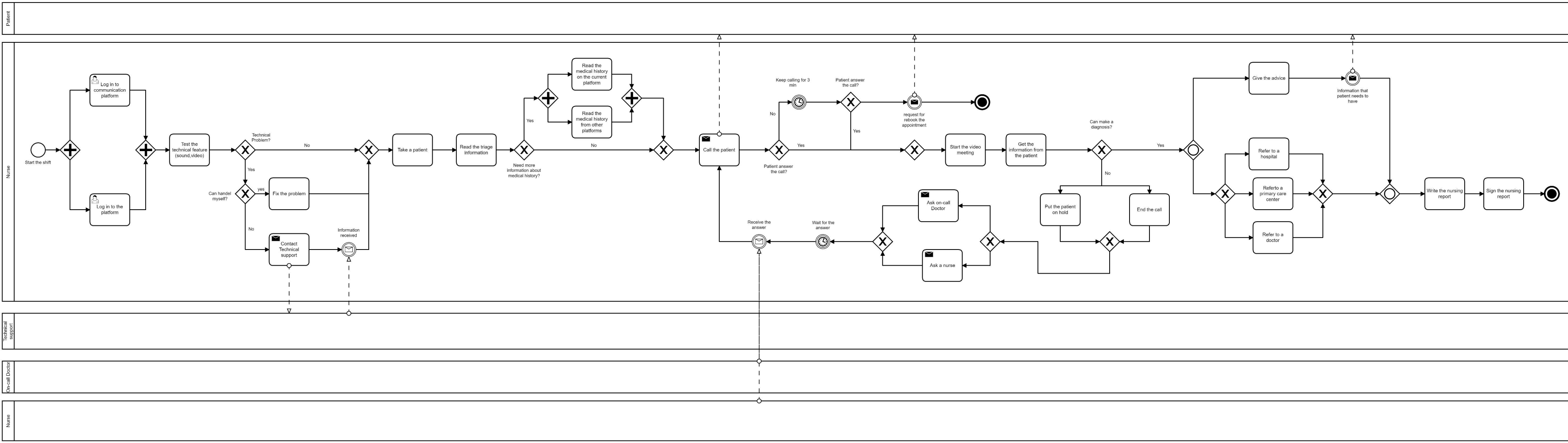
- 566 (9) Greenhalgh T, Vijayaraghavan S, Wherton J, Shaw S, Byrne E, Campbell-Richards
567 D, et al. Virtual online consultations: advantages and limitations (VOCAL) study.
568 BMJ Open. 2016;6(1):e009388.
- 569 (10) Thiyagarajan A, Grant C, Griffiths F, Atherton H. Exploring patients' and
570 clinicians' experiences of video consultations in primary care: a systematic scoping
571 review. BJGP Open. 2020;4(1).
- 572 (11) Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak:
573 a systematic review based on current evidence. BMC Public Health.
574 2020;20(1):1193.
- 575 (12) Jiménez-Rodríguez D, Santillán García A, Montoro Robles J, Rodríguez
576 Salvador MdM, Muñoz Ronda FJ, Arrogante O, et al. Increase in video
577 consultations during the COVID-19 pandemic: healthcare professionals' perceptions
578 about their implementation and adequate management. In. J. Environ. Res. public
579 health. 2020;17(14):5112.
- 580 (13) Donaghy E, Atherton H, Hammersley V, McNeilly H, Bikker A, Robbins L, et
581 al. Acceptability, benefits, and challenges of video consulting: a qualitative study in
582 primary care. Br J Gen Pract. 2019;69(686):e586-e94.
- 583 (14) Alhajri N, Simsekler MCE, Alfalasi B, Alhashmi M, AlGhatrif M, Balalaa N, et
584 al. Physicians' attitudes toward telemedicine consultations during the COVID-19
585 pandemic: cross-sectional study. JMIR medical informatics. 2021;9(6):e29251.
- 586 (15) Barney A, Buckelew S, Mesheriakova V, Raymond-Flesch M. The COVID-19
587 Pandemic and Rapid Implementation of Adolescent and Young Adult Telemedicine:
588 Challenges and Opportunities for Innovation. J Adolesc Health. 2020;67(2):164-71.

- 589 (16) Johansson AM, Lindberg I, Söderberg S. Healthcare personnel's experiences
590 using video consultation in primary healthcare in rural areas. Prim Health Care Res
591 Dev. 2017;18(1):73-83.
- 592 (17) Randhawa RS, Chandan JS, Thomas T, Singh S. An exploration of the attitudes
593 and views of general practitioners on the use of video consultations in a primary
594 healthcare setting: a qualitative pilot study. Prim Health Care Res Dev. 2019;20.
- 595 (18) Christensen NP, Danbjørg DB. Use of video consultations for patients with
596 hematological diseases from a patient perspective: qualitative study. J Particip Med.
597 2018;10(4):e11089.
- 598 (19) Greenhalgh T, Wherton J, Shaw S, Morrison CJB. Video consultations for
599 covid-19. British Medical Journal Publishing Group; 2020.
- 600 (20) Blix M, Levay CJ. Digitalization and Health Care. 2018;13-35.
- 601 (21) Ekman B, Thulesius H, Wilkens J, Lindgren A, Cronberg O, Arvidsson E.
602 Utilization of digital primary care in Sweden: Descriptive analysis of claims data on
603 demographics, socioeconomic, and diagnoses. Int J Med Inform. 2019;127:134-40.
- 604 (22) Sittig DF, Singh H. A new socio-technical model for studying health
605 information technology in complex adaptive healthcare systems. Cognitive
606 informatics for biomedicine: Springer; 2015. p. 59-80.
- 607 (23) Whitworth B, De Moor A. Handbook of research on socio-technical design and
608 social networking systems: IGI Global; 2009.
- 609 (24) Rodrigues RJ. Opportunities and challenges in the deployment of global e-
610 health. Int J Healthc Manag. 2003;5(3-5):335-58.
- 611 (25) Oh H, Rizo C, Enkin M, Jadad A. What is eHealth (3): a systematic review of
612 published definitions. J Med Internet Res. 2005;7(1):e110.
- 613 (26) Eysenbach G. 2001. What is e-health? J. Med. Internet Res. 3(2):e20.

- 614 (27) Ossebaard HC, Van Gemert-Pijnen L. eHealth and quality in health care:
615 implementation time. *Int J Qual Health Care*. 2016;28(3):415-9.
- 616 (28) Rouleau G, Gagnon MP, Cote J, Payne-Gagnon J, Hudson E, Dubois CA.
617 Impact of Information and Communication Technologies on Nursing Care: Results
618 of an Overview of Systematic Reviews. *J Med Internet Res*. 2017;19(4):e122.
- 619 (29) van Uden-Kraan CF, Drossaert CH, Taal E, Shaw BR, Seydel ER, van de Laar
620 MA. Empowering processes and outcomes of participation in online support groups
621 for patients with breast cancer, arthritis, or fibromyalgia. *Qual Health Res*.
622 2008;18(3):405-17.
- 623 (30) Kleinpell R, Barden C, Rincon T, McCarthy M, Zapatochny Rufo RJ. Assessing
624 the Impact of Telemedicine on Nursing Care in Intensive Care Units. *Am J Crit*
625 *Care*. 2016;25(1):e14-20.
- 626 (31) Funderskov KF, Boe Danbjørg D, Jess M, Munk L, Olsen Zwisler AD,
627 Dieperink KB. Telemedicine in specialised palliative care: Healthcare professionals'
628 and their perspectives on video consultations—A qualitative study. *J Clin Nurs*.
629 2019;28(21-22):3966-76.
- 630 (32) Dieperink KB. CN5 Video consultations with older patients in the oncology
631 nursing outpatient clinic. *Ann Oncol*. 2020;31:S1125.
- 632 (33) Dichmann Sorknaes A. Nurses' and patients' experiences of tele-consultations.
633 *Nursing Informatics 2016*: IOS Press; 2016. p. 885-6.
- 634 (34) Harvey J, Powell J. Harnessing mobile devices to support the delivery of
635 community-based clinical care: a participatory evaluation. *BMC Med Inform Decis*
636 *Mak*. 2019;19(1):134.
- 637 (35) Arnaert A, Delesie L. Effectiveness of video-telephone nursing care for the
638 homebound elderly. *Can J Nurs Res*. 2007;39(1):20-36.

- 639 (36) Jeon E, Park H. Nursing Intervention using smartphone technologies; a
640 systematic review and meta-analysis. Digital Healthcare Empowering Europeans.
641 2015:321-5.
- 642 (37) Alsweed F, Alshaikh A, Ahmed A, Yunus F, Househ M. Impact of
643 computerised provider order entry system on nursing workflow, patient safety, and
644 medication errors: perspectives from the front line. Int J Electron Healthc.
645 2014;7(4):287-300.
- 646 (38) Mirza NA, Akhtar-Danesh N, Noesgaard C, Martin L, Staples E. A concept
647 analysis of abductive reasoning. J Adv Nurs. 2014;70(9):1980-94.
- 648 (39) That is how it works. [accessed 2020 22 May]. Available from:
649 <https://www.kry.se/en/how-it-works/>.
- 650 (40) Bengtsson L. KRY launches 'Digi-physical' Healthcare in the South of Sweden.
651 [accessed 2020 22 May]. Available from: [https://www.prnewswire.com/news-](https://www.prnewswire.com/news-releases/kry-launches-digi-physical-healthcare-in-the-south-of-sweden-300959804.html)
652 [releases/kry-launches-digi-physical-healthcare-in-the-south-of-sweden-](https://www.prnewswire.com/news-releases/kry-launches-digi-physical-healthcare-in-the-south-of-sweden-300959804.html)
653 [300959804.html](https://www.prnewswire.com/news-releases/kry-launches-digi-physical-healthcare-in-the-south-of-sweden-300959804.html).
- 654 (41) Telemo Nilsson S, Rexha L. When the physical patient becomes digital: A study
655 of the innovation “digital health care center” on the Swedish market. 2016.
- 656 (42) Scheuerlein H, Rauchfuss F, Dittmar Y, Molle R, Lehmann T, Pienkos N, et al.
657 New methods for clinical pathways—business process modeling notation (BPMN)
658 and tangible business process modeling (t. BPM). 2012;397(5):755-61.
- 659 (43) Nationell patientöversikt. [accessed 2022 3 January]. Available from:
660 <https://www.inera.se/tjanster/alla-tjanster-a-o/npo---nationell-patientoversikt/>.
- 661 (44) Breton M, Deville-Stoetzel N, Gaboury I, Smithman MA, Kaczorowski J,
662 Lussier MT, et al. Telehealth in Primary Healthcare: A Portrait of its Rapid
663 Implementation during the COVID-19 Pandemic. Healthc Policy. 2021;17(1):73-90.

- 664 (45) Breton M, Sullivan EE, Deville-Stoetzel N, McKinstry D, DePuccio M, Sriharan
665 A, et al. Telehealth challenges during COVID-19 as reported by primary healthcare
666 physicians in Quebec and Massachusetts. BMC family practice. 2021;22(1):1-13.
- 667 (46) Stureson L, Groth K. Effects of the digital transformation: qualitative study on
668 the disturbances and limitations of using video visits in outpatient care. J Med
669 Internet Res. 2018;20(6):e9866..
- 670 (47) Barbosa IdA, Silva MJPD. Nursing care by telehealth: what is the influence of
671 distance on communication? Revista brasileira de enfermagem 2017;70:928-34..
- 672 (48) Sutherland AE, Stickland J, Wee B. Can video consultations replace face-to-face
673 interviews? Palliative medicine and the Covid-19 pandemic: rapid review. BMJ
674 supportive & palliative care. 2020;10(3):271-5.



Workflow	Efficiency	- time to diagnosis - use of resources of diagnostic methods - order knowledge in the system
	Flexibility	- working variability - working time pressure of patient and physician - adapting software to field
	Information accessibility	- being able to use knowledge from local and remote sites - data transfer and integration
Communication	Interaction with doctors and knowledge of medical communication	- being able to communicate - using group, doctor through others (doctor)
User experience	Support from the organization	- support from patients - support from doctors
	Change and development of the platform	- development - evaluation
	Challenges	- development of new support - technical problems - knowledge and data - cooperation with the local health system - use of physical context support
	Combining physical and digital resources	- developing new support for patient and doctor - analyzing patients