Original Research

Patient preferences for use of virtual consultations in an orthopaedic rehabilitation setting: Results from a discrete choice experiment

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Abstract

Objective: Virtual Consultations may reduce the need for face-to-face outpatient appointments, thereby potentially reducing the cost and time involved in delivering health care. This study reports a discrete choice experiment (DCE) that identifies factors that influence patient preferences for virtual consultations in an orthopaedic rehabilitation setting.

Methods: Previous research from the CONNECT (Care in Orthopaedics, burdeN of treatmeNt and the Effect of Communication Technology) Project and best practice guidance informed the development of our DCE. An efficient fractional factorial design with 16 choice scenarios was created that identified all main effects and partial two-way interactions. The design was divided into two blocks of eight scenarios each, to reduce the impact of cognitive fatigue. Data analysis were conducted using binary logit regression models.

Results: Sixty-one paired response sets (122 subjects) were available for analysis. DCE factors (whether the therapist is known to the patient, duration of appointment, time of day) and demographic factors (patient qualifications, access to equipment, difficulty with activities, multiple health issues, travel costs) were significant predictors of preference. We estimate that a patient is less than 1% likely to prefer a virtual consultation if the patient has a degree, is without access to the equipment and software to undertake a virtual consultation, does not have difficulties with day-to-day activities, is undergoing rehabilitation for one problem area, has to pay less than £5 to travel, is having a consultation with a therapist not known to them, in 1 weeks' time, lasting 60 minutes, at 2 pm. We have developed a simple conceptual model to explain how these factors interact to inform preference, including patients' access to resources, context for the consultation and the requirements of the consultation.

Conclusions: This conceptual model provides the framework to focus attention towards factors that might influence patient preference for virtual consultations. Our model can inform the development of future technologies, trials, and qualitative work to further explore the mechanisms that influence preference.

Keywords

Virtual consultation, discrete choice experiment, orthopaedics

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Introduction

Virtual Consultations (VC) may reduce the number of face-to-face (F2F) outpatient appointments over the next 10 years.[1] VC has been shown to be acceptable to patients,[2] but F2F care is still seen as the gold standard[3] and is generally preferred by patients.[4] The COVID-19 pandemic has shone a spotlight on the potential for VC to enable continuation of care, seeing telemedicine used 'like never before'[5] and there are examples of its rapid implementation.[6–8] VC can reduce the cost to providers of delivering health care and mean patients do not have to spend time and money travelling to F2F consultations.

Our previous study of the acceptability of VC for patients with shoulder instability[9] found that half of included patients preferred VC over F2F for their rehabilitation sessions. Preferences, however, were not static over time and were often dependent on what patients wanted from the consultation and the stage of the problem and treatment the patient was at. The CONNECT (Care in Orthopaedics, burdeN of treatmeNt and the Effect of Communication Technology) Project is a four-phase investigation into patient preferences for virtual consultations in an orthopaedic rehabilitation setting.[10] The overall design of the CONNECT Project can be seen in Figure 1.

Previous CONNECT Project research indicates that the use of VC changes what is required of patients to participate with their care (Phase 1).[11] VC use required different processes (such as logging in and setting up software), different skills (communicating over a screen and self-assessing), different logistical requirements (not physically attending the consultation), time requirements (integrating the consultation in their lives), a different setting (creating space for virtual and physical rehabilitation), additional hardware and software and changes to interactions (due to an altered patient-clinician relationship).

We have also shown that use of VC impacts on patients' experiences of receiving care and identified factors that influence preference (Phase 2).[12] These factors include the situation of care (the clinical status, treatment requirements and the availability of health care to the patient), expectations of care (the patient's desire for physical contact, their psychological status and the impact of this across different care formats, their experience of previous care and the patient's perceived requirements), demands of care (the requirements of care, the competing life demands and the patients consequences of choice) and capacity to allocate resources to care (such as financial, material and informational resources, support available through their social network and sources of health care capacity). Large-scale quantitative studies have investigated preferences for VC at a population level,[13] at key stakeholder level[14] and with patients.[15] To our knowledge, no studies have investigated factors influencing patient preference for - or against - VC in an orthopaedic rehabilitation setting.

In the present study, preference is defined as a 'total subjective comparative evaluation',[16] which is a cognitive task whereby patients consider the alternatives and their consequences to determine the alternative which yields the most utility to them. It is assumed that a patient will subsequently *choose* the option that will provide the most utility.[16]

This paper reports Phase 3 of the CONNECT Project, a discrete choice experiment (DCE) designed to investigate the factors influencing preference for VC among patients attending orthopaedic rehabilitation. The purpose was to identify factors that significantly influence patient preference for or against VC in an orthopaedic rehabilitation setting. A secondary objective was to develop a conceptual model providing explanations for these observed mechanisms. This paper will inform Phase 4 of the CONNECT Project, which will design a model of care based on the preferences of patients.

The research question for this DCE is 'what are the factors that influence preferences for or against VC among patients attending orthopaedic rehabilitation?'

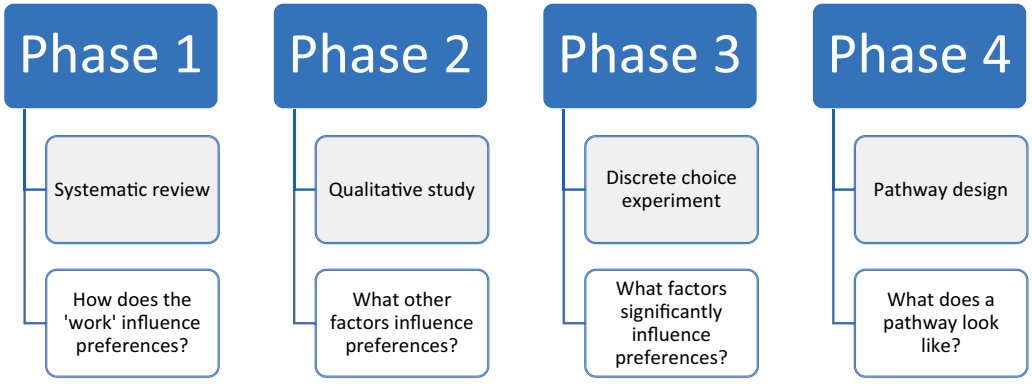

Figure 1. Flow diagram of methods for the CONNECT project.

Secondary questions investigate the relative importance of these factors, whether there are interactions amongst factors that influence individual preference and whether heterogeneity exists within the factors that influence preference.

Methods

The research intended to recruit participants from an NHS specialist orthopaedic hospital with sites in North and Central London and an NHS specialist hospital in Oxfordshire, UK.

Previous research from the CONNECT Project informed DCE development. The semi-structured interview guide to explore preferences in Phase 2[12] (Online Supplement 1) was informed by Phase 1.[11] Twenty-two patients and 22 clinicians (13 physiotherapists, 9 occupational therapists) were interviewed during Phase 2.[12] From these interviews we identified factors that influenced preference. In addition, we explicitly asked participants to identify the factors they felt would be important to test in a DCE. These were compiled and split into two categories: pathway factors (features of the consultation) and patient demographic factors (features of the patient). This DCE was intended to be pragmatic and inform changes to clinical practice. Priority was therefore given to those pathway factors most amenable to manipulation in practice within the choice experiment. The final selection of pathway factors was supported by the Management Team of the host NHS organization. One example of an attribute that was included is the 'time of day' of the appointment, which can be set throughout the day. For the purposes of this DCE, we decided to set times that provided a spectrum across the day. Another example is the duration of the appointment, derived from clinical experience and covering the spectrum of long (60 minute) and short (15 minute) appointments. One attribute that was excluded was a proxy for 'willingness to pay', which was the willingness to compromise outcomes by having a virtual appointment, as it was felt that it would be unethical to pose such a question to patients who were about to undergo rehabilitation.

All demographic variables that were identified as important were included in the questionnaire to provide insight into the factors that influence preferences for patients. The participant information sheet and discussions at the recruitment stage made it clear to patients that completion of the DCE would not affect their care and that virtual appointments were not actually available for use. Factors of interest, mapped to the factors identified in Phase 2, can be seen in Table 1.

The final wording of the DCE questions and survey design were developed with support of the CONNECT Project Patient and Public Involvement Steering Group (PPISG) during a scheduled meeting in March 2019 (2 members of the public, 3 patients, 3 hospital staff) and then with an additional PPISG patient member in August 2019, prior to the initial pilot.

Instrument

The DCE was designed in light of best practice.[17] The initial discussion and pre-pilot suggested that the most realistic format would be one where hypothetical scenarios are presented to patients, who then opt to have them as either VC or F2F consultations. Given our attributes (i.e. $2 \times 3^2 \times 4$ with a full factorial of 72 combinations), an efficient fractional factorial design with 16 choice scenarios was created using the NGENE software that identified all main effects and partial two-way interactions. D-efficiency of the optimal design (where the higher the percentage is, the higher the statistical efficiency)[18] was 84%, implying that the relative efficiency of our design compared to the full factorial was good. To reduce the impact of cognitive fatigue on patients the design was split into two blocks so that each participant was required to answer only eight scenarios in addition to demographics. The final DCE design is demonstrated in Table 2. Three pilots were undertaken to refine the questionnaire, to ensure comprehension and to develop the analytical model. A full vector of demographic variables was collected within the DCE (the 'Block 1' version of the questionnaire can be viewed in the Online Supplement 1).

The participant information sheet informed patients that they would choose whether they would prefer F2F or VC in each of the eight hypothetical scenarios, then provide information about themselves in the following questions. In summary, Part 1 consisted of the choice experiment, Part 2 consisted of demographic questions, Part 3 consisted of questions related to VC and access to resources and competing demands, Part 4 consisted of questions related to clinical care and Part 5 consisted of questions about travelling to the clinic.

Participants

Sample size depends on the number of choice tasks, the number of alternatives and level of effects needed. Using Johnson and Orme's formula,[19] a total sample size of 125 participants was deemed to be efficient. Planned recruitment therefore was 100 patients, meeting the inclusion criteria, per block, per site, to allow for comparisons between sites.

This study sought to recruit patients over the age of 18 with experience of an orthopaedic/musculoskeletal condition attending recruitment centres for occupational therapy or physiotherapy. Patients needed to

Table 1. Phase 2 factors mapped with Phase 3 DCE factors of interest.

Theme Phase 2	Factor	Description	DCE factors of interest
Patient Factors	Demographic factors	Routinely available data accessible to health care staff	Age Gender Ethnicity Main language
Situation of care	Clinical status	The health issue the patient experiences, its stability, reversibility, and its impact on the patient in conjunction with other issue.	The health issue the patient has Symptoms the patient has Level of mobility Previous surgery
	Treatment requirements	The treatment and management of the patient's health issue. The restrictions imposed on the patient.	Symptoms the patient has Level of mobility Previous surgery
	Care pathway	The availability of health care to the patient	Number of previous sessions Frequency of previous sessions
Expectations of care	Desire for contact	Whether the patient/health care professional believes the F2F is more of a capable method of care delivery than VC.	Previous experience of rehabilitation
	Psychological status	The psychological status of the patient and the impact of this on care across different delivery formats.	Relationship with current therapist
	Previous care	Experience of previous care	Previous experience of rehabilitation
	Perceived requirements	The negotiated requirements of the session	The health issue the patient has Symptoms the patient has
Demands on the patient	Care requirements	The requirements of care	Type of rehabilitation
	Social demands	The competing life demands that can interfere with health care	Other commitments
	Consequences of choice	The impact of choice	Length of time to travel Type of rehabilitation
Capacity to allocate resources to care	Financial	The ability to free up financial resources	Patient's academic qualifications (socioeconomic proxy) Cost of travel
	Infrastructure	Access to material and informational resources	Transport to clinic Ability to use phone/video call Access to equipment Willingness to download additional software
	Social capacity	Support available through social network	Requirement of a chaperone to travel
	Health care system	Sources of health care capacity	Transport to clinic Patient and hospital's main language

understand and speak English or a language covered by the hospital's interpreter service, and provide informed written consent to enter the study. Patients without the capacity to consent were ineligible, as were patients suffering from disorders other than orthopaedic as the primary cause (e.g. respiratory, neurological or oncology disorders).

The study was advertised using a pop-up banner in each respective department. Patients were encouraged to discuss the study with their treating health care professional or approach the researcher directly. Patients were provided with a participant information sheet and were eligible to join the study after providing written consent. Patients were given the option of completing the DCE in a paper format (using a print-out of the questionnaire, with a clipboard and pen provided. The researcher could act as a scribe for anyone who had difficulty) or electronic format (online, via SurveyMonkey, where patients could scan a QR code and complete on their own device or using a Hospital tablet computer). Paper copies were transferred to electronic form at a later date.

Table 2. Final DCE design.

Choice Set	Therapist	When	Duration	Time of day	Block
1	Old	1 Week	15 mins	2pm	Block 2
2	Old	1 Week	30 mins	8am	Block 2
3	Old	1 Week	60 mins	2pm	Block 2
4	Old	4 Weeks	15 mins	8am	Block 1
5	Old	4 Weeks	60 mins	6pm	Block 1
6	Old	12 Weeks	15 mins	12pm	Block 1
7	Old	12 Weeks	30 mins	12pm	Block 2
8	Old	12 Weeks	60 mins	6pm	Block 2
9	New	1 Week	15 mins	6pm	Block 1
10	New	1 Week	30 mins	2pm	Block 1
11	New	1 Week	60 mins	12pm	Block 1
12	New	4 Weeks	15 mins	12pm	Block 2
13	New	4 Weeks	30 mins	8am	Block 1
14	New	4 Weeks	60 mins	8am	Block 2
15	New	12 Weeks	15 mins	6pm	Block 2
16	New	12 Weeks	30 mins	2pm	Block 1

Data analysis

Data analysis was conducted in R v3.5.1 (R Core Team 2013). Initial reporting of data provided descriptive statistics for demographic variables and observed choices (virtual versus F2F) by choice set. Binomial logistic regressions were undertaken with attribute levels entered as covariates to explain individual choices for VC or F2F consultations. The following process was followed:

1. Binomial logistic regression investigating DCE attributes' main effects.
2. Adding selected interactions to specification
3. Adding full vector of demographic variables to specification.
4. Adding only significant demographic variables in specification.
5. Using the estimated coefficient from our preferred model specification, we calculate predicted probabilities of specific hypothetical scenarios of interest.

Ethical considerations

Ethical approval for the qualitative interviews informing the DCE design was sought for Phase 2 (approval received on 4 December 2018 from the South Central-Oxford C Research Ethics Committee (IRAS ID: 255,172 REC Reference 18/SC/0663) and ethical approval for DCE delivery was sought for Phase 3 (approval received on 18 October 2019 from the London-Hampstead Research Ethics Committee (IRAS ID: 248,064 REC Reference 19/LO/1586). All participants were approached within the recruiting therapies' departments and provided informed written consent prior to completion of the DCE.

Table 3. Recruitment numbers to final DCE.

Site	Block 1	Block 2
A	128	61
B	88	0
C	3	0

Results

Recruitment commenced in January 2020. Forty-nine patients completed the first pilot, 17 the second pilot and 16 the third pilot before the DCE was finalized. Sites A and B in London were required to cease recruitment due to COVID-19 by Friday 13th March 2020 - potential patients were thereafter required to undertake virtual consultations, as reported elsewhere.[6] The study was closed at Site C in Oxfordshire at the same time. Final recruitment numbers are demonstrated in Table 3.

As full DCEs were required (paired questionnaires from 'Block 1' and 'Block 2') only 61 questionnaires (122 patients) were used for analysis at site A. The first 61 questionnaires were selected. This therefore led to 976 choice sets. No analysis could be conducted for sites B and C as no 'Block 2' data were collected.

As the number of recruited participants were less than planned, and the relative oversampling of Block 1 compared to Block 2, we undertook three additional, previously unplanned, checks of validity:

1. Test for scale differences between the two blocks

- Neither the baseline nor the preferred model suggested scale issues.

2. A random sample of 61 participants was chosen and matched to Block 2

- Mean coefficients were close to our presented coefficients with similarities being close to the statistically significant coefficients, with no differences relating to sign and significance. This is evidence for a lack of bias due to consecutive sampling of block 1 data.

3. A comparison of the estimation of results between Site A and B for Block 1 data alone to test for validity between sites.

- The signs and significance of results were deemed to be consistent across sites A and B.

The average age of included patients was 51.56 years (range 18–90 years). Seventy-nine patients were female, 42 were male, 1 nonbinary. 256 choice sets (26%) were in favour of VC compared to 720 (74%) in favour of F2F consultations.

DCE outputs

The full vector of demographic variables is available to view in Online Supplement 2. Full DCE output for all variables is available in Online Supplement 3. Table 4 demonstrates the outputs from the DCE with the retained significant factors, along with the attribute main effects:

The factors included within the DCE demonstrate the odds of each respective factor in relation to their reference level. If the coefficient value is a positive

Table 4. DCE estimation of pathway factors and demographic variables influence on preference.

Variable *(reference levels in parenthesis)* Level in the model	Estimate (z value)	Standard error	P value	Odds ratio
Intercept	–0.162 (–0.451)	0.36046	0.652	
Therapist *(Old)*				
New	–0.311 (–1.685)	0.18476	0.092	0.73
Time to appointment *(4 Weeks)*				
1 Week	–0.021 (–0.082)	0.26603	0.935	0.98
12 Weeks	0.305 (1.047)	0.29177	0.295	1.36
Duration of appointment *(15 minutes)*				
30 mins	–0.887 (–3.800)	0.23337	<0.000	0.41
60 mins	–1.661 (–7.331)	0.22651	<0.001	0.19
Time of day of appointment *(12 noon)*				
8:00 am	1.096 (3.755)	0.29193	<0.001	2.99
2:00 pm	0.271 (0.950)	0.28555	0.342	1.31
6:00 pm	0.886 (3.353)	0.26414	<0.001	2.42
Highest level of academic qualification *(Degree)*				
No degree	0.430 (2.284)	0.18835	0.022	1.54
Access to equipment and software to phone or video call your therapist? *(Yes)*				
Do not have access to equipment	–3.530 (–5.867)	0.60166	<0.001	0.03
Difficulty with day-to-day activities *(Yes)*				
No	–0.960 (–4.975)	0.19290	<0.001	0.38
Do you have other conditions that restrict your mobility? *(Yes)*				
No	0.954 (4.728)	0.20177	<0.001	2.60
How much did your return journey to the clinic cost? *(Less than £5)*				
More than £5	0.524 (3.130)	0.16734	0.002	1.69

Table 5. Predicted probability of outcome for pathway factors.

Scenario 1	Scenario 2
• Appointment with a therapist not known to the patient • Appointment in 12 weeks' time • Appointment to last 15 minutes • Appointment at 8am Value = 0.594	• Appointment with a therapist known to the patient • Appointment in 1 week's time • Appointment to last 60 minutes • Appointment at 2 pm Value 0.074

Table 6. Predicted probability of outcome for pathway factors and demographics.

Scenario 3	Scenario 4
The appointment is: • with a therapist known to the patient • in 12 weeks' time • to last 15 minutes • at 8am Demographic factors *The patient:* • does not have a degree • has access to the equipment and software to undertake a virtual consultation • has difficulties with day-to-day activities • is undergoing rehabilitation for multiple health issues • has to pay more than £5 for their return journey Value = 0.8996	*The appointment is:* • with a therapist not known to the patient • in 1 week's time • to last 60 minutes • at 2 pm Demographic factors *The patient:* • has a degree • does not have access to the equipment and software to undertake a virtual consultation • does not have difficulties with day-to-day activities • is undergoing rehabilitation for one health issue • has to pay less than £5 for their return journey Value = 0.0005

number, virtual consultations are preferred for that factor level in comparison to the reference level (for example, for time of day, if an appointment was offered at 8:00am the positive coefficient (1.096) indicates that VC would be preferred relative to the response for an appointment at 12:00 noon). In contrast, where the coefficient value is negative F2F consultations are preferred.

The results reported in Table 4 indicate that patients' preferences were strongly influenced by two of the attributes included in the experiment (duration and time of day of appointment) but showed less influence for the other two attributes. Patients preferred F2F when the appointment was with a new therapist or in the very near future (1 week), preferring VC when the appointment date was more distant (12 weeks) - although these effects were not statistically significant. There was a consistent, statistically significant ($p < 0.001$), pattern in favour of F2F with increasing duration of appointments (30 and 60 minutes compared with the reference level of 15 minutes). Patients offered early (8am) or late (6 pm) appointments were more likely to choose VC, compared with midday (12 pm) – with odds of 2.99 and 2.4 times respectively.

Among the respondent and demographic variables included in the model two were significantly associated ($p < 0.001$) with preference toward F2F consultation. These were patients who did not have access to equipment to make video calls (odds ratio = 0.03) and those who had difficulty with day-to-day activities (odds ratio = 0.38). Three variables significantly associated with preference toward VC were the presence of multiple musculoskeletal problems that restrict mobility (odds ratio = 2.60, $p < 0.001$), having paid more than £5.00 to attend the appointment (odds ratio = 1.69, $p = 0.002$) and not having a degree (odds ratio = 1.54 $p = 0.022$).

Predicting probability of outcome

Using the 'predict' function in R we found a 59% probability a patient would choose VC in scenario 1 and a 7% probability a patient would choose VC in scenario 2, based only on the study attributes. We chose these scenarios to include those combinations that were most (Scenario 1) and least (Scenario 2) favourable to choosing VC (Table 5).

Incorporating demographics into the scenario shows there is an 89% probability a patient would choose VC in scenario 3 and a less than 1% probability a patient would choose VC in scenario 4 based on these data. Again, these scenarios combinations that are more favourable (Scenario 3) and less favourable (Scenario 4) to choosing VC (Table 6).

Discussion

We developed a choice experiment from our qualitative study of preference for VC. The experiment was developed and conducted before the UK's COVID-19 lockdown - where remote working was not ubiquitous – and patients may have been expected to have expectations of, and strong preferences in favour of, F2F consultation. This may be reflected in the fact the predicted probability of choosing VC, using combinations of consultation characteristics most favourable to VC, is around 60%. Inclusion of patient, demographic and other factors, such as difficulty with day-to-day activities or cost of travel, can further influence preference in favour of VC.

The data we have been able to analyse are from a single site and may not be generalizable. However, the findings from the DCE provide a starting point to consider insights into factors that might influence preferences in other settings. We undertook an analytical process whereby factors were thematically organized into constructs. This enabled characterization of constructs in a manner not specific to any one health care setting, which should be transportable to other areas of health care.

Figure 2 presents our proposed set of constructs that influence preference for VC: these are *patients' access to resources*, *context for the consultation* and *requirements of the consultation*. Patients' access to resources refers to socioeconomic and equipment factors (access to, and willingness to engage with, technology). Context for the consultation includes pathway-related factors (such as the length and timing of the appointment) and symptom-related factors (such as patient symptoms and the effect of travel on these). Requirements of the consultation cover both the objectives of the consultation, and interaction factors (whether the patient feels the interactions required to fulfill the objectives of a consultation can be achieved). The model indicates how these factors, and their interaction, influence preferences.

Patients' access to resources and context for the consultation interact (labelled (a) in Figure 2) to the extent that socioeconomic status determines patients' ability to engage with care. Patients' ability to access and engage with the technology will provide the starting point to undertake a virtual consultation, which may reduce the physical burden of travel and consequences on symptoms for the patient. The financial consequences of travel (cost, implications of taking time out of other activities, such as employment) will differ depending on each patient's circumstances and may be affected by the time of day of the appointment (e.g. travel during rush hour is likely to take longer and cost more, travel during the middle of the day may impose less on other activities). The financial burden imposed on patients may be *worth* it if the appointment is longer.

Interactions between patients access to resources and requirements of the consultation (labelled (b) in Figure 2) occur as patients' ability to access and use the equipment determines whether the consultation objectives can be fulfilled. Trade-offs may take place between the ability to meet the requirements of the consultation and the socioeconomic consequences of choice. These financial implications will be dependent on the patient's structural position.

Interactions between the context for the consultation and requirements of the consultation (labelled (c) in Figure 2) derive from the fact that consultation objectives are dynamic and are informed by the clinical context and suitability of the pathway. Consultation objectives may determine the suitability of each form of consultation delivery. These may be mediated by the

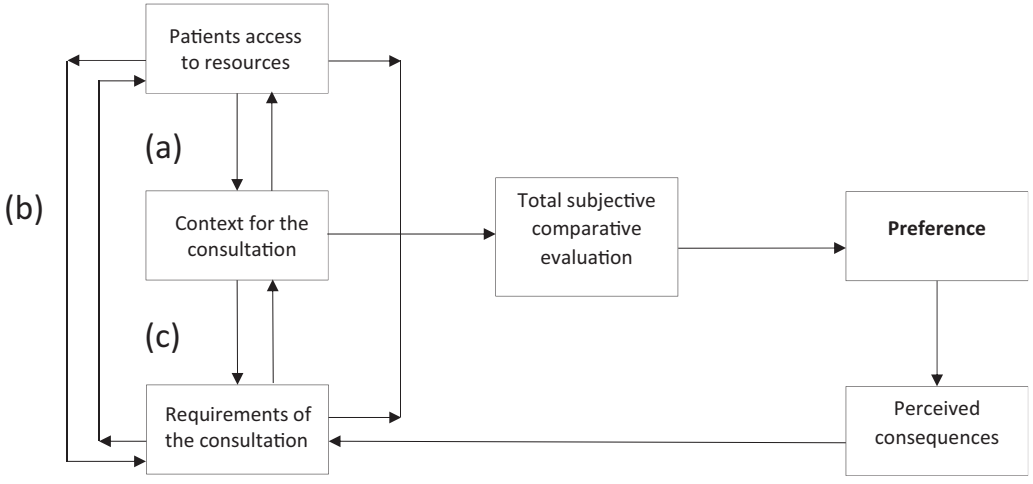

Figure 2. Interactions between factors that influence preferences for videoconferencing consultations.

clinical context of the patient and the ability of the patient and clinician to work together to meet the requirements of the consultation.

Each of these factors influence preference as individuals consider the option that yields them maximum utility. Preferences inform choice in favour of VC or F2F. The choice of a particular consultation format has consequences[11] that impact on the factors we have identified.

Financial burden of time and travel has been found to be a particular strain for patients with multimorbidity, especially those with deprived socioeconomic status.[20] Our previous work[12] found that some patients reported having to take unpaid leave to attend appointments, whilst others were fearful of losing their jobs. Kalleberg[21] highlighted how economic vulnerability extends to the level and stability of compensation, earnings and leave options, while Cochrane and McKeown[22] found that 25% of females and 42% of males did not receive paid time off work.

Patients with a degree qualification preferred F2F over VC care. A report[23] concluded that both women and men with a degree are likely to have higher lifetime earnings than women and men without a degree (£252,000 more and £168,000 more respectively). The *type* of job an individual has may be dependent on employment status and those with lower education (up to A-Level in the United Kingdom) are over-represented in 'zero hours' contracts[24] and therefore unable to take paid leave for medical appointments. Socioeconomic factors may constrain choice.

Short appointment times are challenging.[25] Within our DCE we offered a mixture of appointment lengths: 15 minutes, 30 minutes and one hour. Patients in this choice experiment preferred to travel to undergo F2F appointments for longer sessions whereas VC was preferred for shorter sessions. This may be in part due to patients' expectations of receiving hands-on treatment, which may take longer than a purely conversational style appointment.

Time of day of the appointment was a significant factor in our DCE. Patients appreciate flexibility of treatment pathways.[25] Travelling for a F2F was favoured during the middle of the day (12 noon or 2 pm) compared to 8am or 6 pm in our study. Travel times may be longer during 'rush hour' which could increase discomfort for those suffering with pain as they are pushed beyond their travel limits, which they might 'pay' for at a later time.[26] Furthermore, patients in our study who had trouble with day-to-day tasks or multiple problems preferred virtual consultations. This may be, in part, due to the challenges of travel.

VC may pose challenges by altering how patients and clinicians interact and may impact on the flow of the consultation.[27] Potter[28] identified patient perspectives on the interpersonal skills that makes a good physiotherapist (body language, demonstration of empathy, making eye contact and speaking directly to the patient), some of which may be affected by VC. Furthermore, skills such as listening, encouragement, confidence, being empathetic and friendly, and nonverbal communication[29] might be impeded using VC. The DCE indicated that patients preferred a F2F appointment when seeing clinicians not known to them, although this finding was not statistically significant ($p = 0.1$). Some patients may require hands-on care, this will also inform patient preference for or against VC.

Limitations

There are four main limitations in this study. First, the initial factors were developed abductively[30] during two previous studies, and other factors may have been identified in our earlier work through use of other means of analysis. A limited number of care pathway factors were amenable to manipulation in our choice experiment and we therefore chose to focus on pathway factors that could be influenced. Had we investigated alternative demographic variables the outputs of the DCE may have provided additional insights into the weight and strength of their influence on preference.

Second, the pragmatic nature of this study may have affected the sample. We recruited patients as they attended rehabilitation appointments at their respective NHS hospitals, but it was not always possible to recruit patients due to competing demands on the research team, and thus some patients might have been missed. Although we included the first 61 participants from Block 1 in site B, our retrospective random sampling of Block 1 data demonstrated a lack of recruitment bias from these repeated estimations. Sampling, considering an equal proportion of age, gender, and ethnicity, may have gleaned more data specifically relating to these factors. Although we have drawn conclusions relating to finances and socioeconomic status within this study, level of education was used as a crude socioeconomic proxy.[31] Further questions into household income and type of job may have gleaned more information. However, we agreed during the piloting stage that asking patients multiple questions about their socioeconomic status may have made some patients uncomfortable.

Third, there was the impact of COVID-19 on our sample. The design of the study required that 125 patients were recruited. However, it was cut short due to COVID-19, as the host site stopped routine F2F contacts. Data collection was abandoned after 61 patients from each block were recruited at only one site (122 patients in total). Further data collection

upon re-opening of outpatient clinics was not appropriate due to the potential contamination of viewpoints from patients who had been required to use VC during the pandemic. Our small eventual sample size could affect generalizability of findings and hence we suggest caution in extrapolating these. Within our study, several demographic factors were not statistically significant, including patient age, gender, ethnicity, whether they speak English as a first language and the type of transport taken to get to the appointment. More participants may have yielded different results.

The impact of COVID-19 has led to rapid uptake[6] and interest in VC in practice. This research provides a baseline of pre COVID-19 preferences prior to the pandemic. It may be that the constructs offered, particularly structural factors - such as willingness to engage with technology - will be different because of the pandemic. Repetition of this study may illuminate the influence of COVID-19 on preferences. An understanding of preferences by health care clinicians, managers and policy makers will assist in supporting the design of patient centred care pathways.

Fourth, we have offered theory as to how these factors may influence preference. Further qualitative research investigating underlying reasons behind preferences may provide a stronger basis for theorization. The results of this work provide a framework for further investigation into clinical prediction models. Further mixed methods research will assist with the development of tools to support decision making at a clinical level.

Conclusions

We have successfully designed and conducted a DCE that investigated the trade-offs between pathway factors for patients attending orthopaedic rehabilitation appointments at a tertiary orthopaedic NHS hospital. In addition, we have investigated a vector of demographic variables to understand how these patient demographics influence preferences. A number of factors have been identified, including patients' access to resources, the context for the consultation and the requirements of the consultation. These factors have informed the development of an analytical model that can be used to predict the probability of a patient preferring either F2F or virtual consultations. We used a simplified conceptual model to explain how these factors interact to inform preference.

This simplified model has been reduced to its most basic form to allow for transportability to other settings. This conceptual model provides the framework to focus attention towards factors that might influence preference. In addition, the model can inform the development of future technologies, trials, and qualitative work to further explore the mechanisms that influence preference.

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Ethics approval

Ethical approval for the qualitative interviews informing the DCE design was sought for Phase 2 (approval received on 4 December 2018 from the South Central-Oxford C Research Ethics Committee (IRAS ID: 255,172 REC Reference 18/SC/0663) and ethical approval for DCE delivery was sought for Phase 3 (approval received on 18 October 2019 from the London-Hampstead Research Ethics Committee (IRAS ID: 248,064 REC Reference 19/LO/1586). All participants were approached within the recruiting therapies' departments and provided informed written consent prior to completion of the DCE.

Declaration of conflicting interests

The author(s) declare that there is no conflict of interest.

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Supplemental material

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