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Shared Decision-Making: Investigating the Potential of an Interactive, Web-Based Information Tool to Support Treatment Choice of People with Advanced Pancreatic Cancer

(Web-Based Tool to Support Treatment Choice in Advanced Cancer)

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Amendment History

Amendment No.	Protocol Version No.	Date issued	Author(s) of changes	Details of Changes made

Study synopsis

Study title	**Shared decision-making: investigating the potential of an interactive, web-based information tool to support treatment choice of people with advanced pancreatic cancer**
Sponsor Reference No.	
Study design	**Multiphase mixed methods design**
Study participants	Oncologists, clinical nurse specialists, people diagnosed with advanced pancreatic cancer, and their relatives who provide care and support for them
Sample size	120
Follow-up duration	**Not applicable**
Planned study period	**August 2018 – December 2019**
Primary objectives	To investigate the potential of a web-based, interactive, information tool in facilitating shared decision-making for the choice of treatment for people with advanced pancreatic cancer (APC)
Secondary objectives	(i) To assess the quality of life, efficacy, and safety of chemotherapy treatments of APC through systematic review and network meta-analysis (NMA) of randomized controlled trials (RCTs). (ii) To explore the expectations and preferences of clinicians, people with APC, and their relatives, when making decisions about treatment, through focus groups and semi-structured interviews for clinicians, and people with APC (including their relatives), respectively. (iii) To identify the features necessary for the design of a web-based information tool to facilitate SDM between clinicians and people with APC about choice of treatment. (iv) To evaluate the effectiveness of the developed information tool in SDM, through a pilot test with clinicians (doctors and nurse specialists), people with APC, and their relatives.

Primary endpoint	Effectiveness of Shared decision-making
Interventions	**Not applicable**

Abbreviations

AE	Adverse Event
BSC	Best Supportive Care
BU	Bournemouth University
BUCRU PPI	Bournemouth University Clinical Research Unit Patient and Public Involvement
CI	Chief Investigator
DCS	Decisional Conflict Scale
EU	European Union
HRQoL	Health Related Quality of Life
MRC	Medical Research Council
NHS	National Health Service
NMA	Network Meta-analysis
PC	Pancreatic Cancer
PCUK	Pancreatic Cancer United Kingdom
PIS	Participant Information Sheet
R&KEO	Research & Knowledge Exchange Office
RCT	Randomised Controlled Trial
REC	Research Ethics Committee
SDM	Shared Decision Making
SUCRA	Surface Under the Cumulative Rank Area
SUS	System Usability Scale

Key Words
Pancreatic cancer, web-based information tool, patient decision aid, mixed methods, systematic review, network meta-analysis, interviews, focus group

1 Introduction

1.1 Background

Pancreatic cancer (PC) is a disease with very low 5-year survival rates. Some estimates set this at less than 5% (Vincent et al. 2011; Balaban et al. 2016). In the European Union (EU), over 85,000 deaths were projected in 2017, which is a rise of around 8.0% from 2012 (Malvezzi et al. 2017). PC can be broadly classified as locally resectable, borderline resectable, locally advanced, and metastatic (Vincent et al. 2011). Treatments include surgery, chemotherapy, radiation therapy, and palliative care (Kamisawa et al. 2016). Surgery offers curative treatment, but 80% of patients are diagnosed in the advanced stage (locally advanced or metastatic) and are ineligible (Ducreux et al. 2015; Taieb et al. 2017). However, systemic therapy (such as chemotherapy) is a palliative option for people with advanced pancreatic cancer (APC) (Balaban et al. 2016). “Best supportive care” (BSC), or “supportive care”, is another option which involves symptom management and improving quality of life (Hui et al. 2013).

Shared decision-making (SDM) is a process where clinicians and patients make decisions together using the best available evidence (Elwyn et al. 2010). SDM is recognised as a policy priority and ethical imperative by the National Health Service (NHS) and several healthcare regulators in the United Kingdom (UK), respectively (Coulter et al. 2017). The concept of equipoise is a scenario where there is more than one legitimate choice of treatment for a medical condition (Edwards et al. 2000; Elwyn et al. 2000). It offers an opportunity to apply SDM in discussing the choice of treatment for people with APC because there is no clear preference of treatment options in terms of benefits and risks for APC (Balaban et al. 2016). Moreover, a systematic review by Gravel et al. (2006) indicated, among other things, that SDM facilitated positive impact on the clinical process and patient outcomes. Encouraging SDM in APC treatment could yield similar results, including the reduction in selecting aggressive treatments that have little or no corresponding economic or personal benefits (Oshima Lee and Emanuel 2013; Veroff et al. 2013).

Several tools have been developed to enhance SDM in relation to other medical conditions (Agoritsas et al. 2015; Elwyn et al. 2016). Some of these tools are for ovarian cancer (Vogel et al. 2013), stage IV lung cancer (Leighl et al. 2008), and colorectal cancer (Leighl et al. 2011). CONNECT ™ is a computer-based tool that was developed for the general improvement of the doctor-patient communication process (Meropol et al. 2013). Additionally, a systematic review conducted by Austin et al. (2015) showed that decision tools can improve patients’ knowledge and awareness of the treatment options available to them. However, there is very little in literature about the use of evidence-based digital tools in discussing the expected outcomes of treatment for people with APC. Although predictive tools have been developed for PC (Ansari et al. 2013; Smith and Mezhir 2014; Walczak and Velanovich 2017), there is currently no web-based information tool that can provide clinical evidence on the treatment choices available to people with APC.

However, there is an online decision aid developed for patients with APC in Canada (Gresham 2013). It has some useful features which can help its users make decisions about their treatment, including information about APC. However, its automation in comparing treatment options is basic, its depth of information necessary for decision-making, and its flexibility could be improved. Its target audience are the patients only. It also assumes that users typically have only 3 options to choose from.

It is necessary that patients are fully aware of the benefits and risks associated with any treatment that is being proposed to them. Also, to ensure that clinicians provide the best available evidence-based information in an easily understandable format for the patients, the purpose of this study is to develop an interactive, web-based

information tool to assist in the process of shared decision-making between clinicians, and patients and their relatives (or caregivers).

1.2 Research rationale

1.2.1 The need for an evidence-based information tool for APC treatment options

There is currently no web-based, SDM tool for APC that presents information on available treatment options in a visual, and concise way to patients so that they and their clinicians can make informed choices. Acceptability and reliability are two important factors to be considered when developing such tools (Coulter et al. 2017).

1.2.2 The support for the policy priority for patient-centred care in the UK

In the United Kingdom, shared decision-making is viewed as a priority in patient care (Coulter et al. 2017). However, effective SDM is enhanced through well-informed participants, and that is an objective of the proposed information tool.

1.2.3 Enhancing clinicians' communicative skills

Geessink et al. (2017) identified communicative skills in healthcare professionals as a requisite for successful SDM. The proposed information tool is hoped to enhance clinicians' capacity to communicate available treatment options with their patients by presenting pertinent facts in a concise and user-friendly manner for them.

1.2.4 Improving medical cost-effectiveness

This tool could also potentially challenge the "more-is-better" attitude (assumption that expensive treatment equals better healthcare) held by the public (Levinson et al. 2015). Evaluation of some patient decision aids showed improved cost-effectiveness in some medical conditions (O'Connor et al. 2004). Introducing the information tool to APC treatment could potentially yield similar results.

2 Objectives

2.1 Primary objective

To investigate the potential of a web-based, interactive, information tool in facilitating shared decision-making in the choice of treatment for people with advanced pancreatic cancer

2.2 Second objectives

(i) To assess the quality of life, efficacy, and safety of chemotherapy treatments of APC through systematic review and network meta-analysis (NMA) of randomized controlled trials (RCTs).

(ii) To explore the expectations and preferences of clinicians, people with APC, and their relatives, when making decisions about treatment, through focus groups and semi-structured interviews for clinicians, and people with APC (including their relatives), respectively.

(iii) To identify the features necessary for the design of a web-based information tool to facilitate SDM between clinicians and people with APC about choice of treatment.

(iv) To evaluate the effectiveness of the developed information tool in SDM, through a pilot test with clinicians (doctors and nurse specialists), people with APC, and their relatives.

3 Study design

A multiphase mixed methods research design has been adopted for this study. It involves a series of either sequential or concurrent discrete phases (Creswell 2010, p.100). This design was chosen because of the nature of the research questions that are both qualitative and quantitative, and because multiphase mixed methods is suitable for evaluation of intervention programs (Creswell 2014). This project involves evaluation of an information tool.

Error! Reference source not found. is an overview of the research design. Phases 1 and 2 will occur concurrently and will generate information required for the tool development in phase 3. Finally, Phase 4 will test the developed tool. The next section (Research methods) describes these phases in detail.

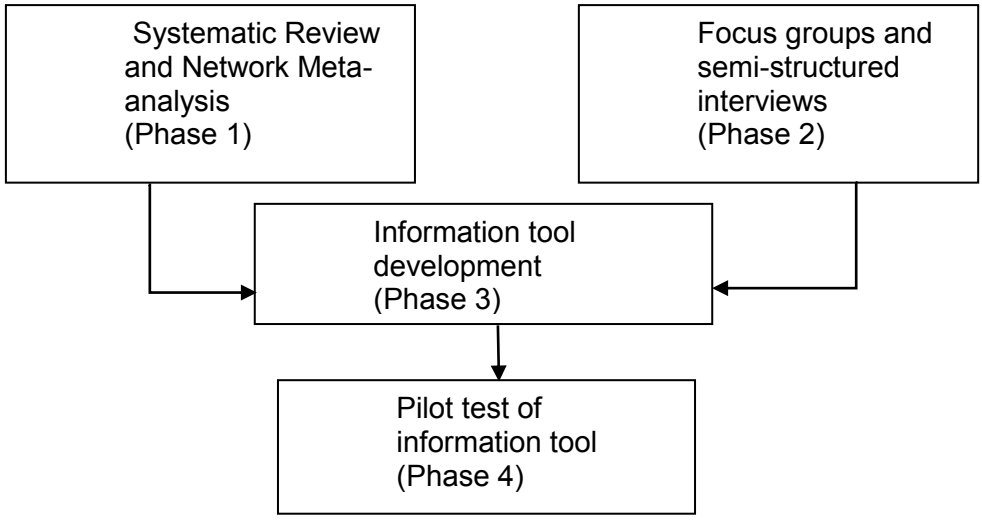

Figure 1: Study Design Diagram

3.1 Research methods

3.1.1 Phase 1: Systematic review and network meta-analysis

A systematic review and network meta-analysis (SR & NMA) of clinical trials in APC treatment shall be performed. The aim is to assess the comparative efficacy and safety of the different chemotherapy treatments for APC from reported randomised controlled trials. This will provide a basis for the design of the information tool. Network meta-analysis is chosen because it has the capacity to make comparison between treatments in different studies when they have a common-comparator treatment (Jones et al. 2011; Catala-Lopez et al. 2014). Traditional meta-analysis summarizes treatment effects for similar studies that compare the same kind of regimens, however network meta-analysis is designed to summarize and compare effects of different studies. For example, if study 1 compares treatment A vs. B, and study 2 compares treatment B vs. C, there is a common comparator, treatment B, between studies 1 and 2. Using network meta-analysis, it is statistically possible to compare the effects of treatment C vs. A, even if they were never compared in an actual study (Zoccai 2014, p.27), provided that these studies exhibit the transitivity assumption, that is, they are similar in all respects (Salanti et al. 2014). The outcome of this network meta-analysis shall be a probability ranking of different available treatment options based on a chosen endpoint (study outcome), and surface under the cumulative area (SUCRA) statistic (Salanti et al. 2011). The endpoints chosen for this network meta-analysis are: overall survival, progression-free survival, disease

control rate, toxicity (neutropenia, leukopenia, thrombocytopenia, nausea, fatigue), and health-related quality of life (HRQoL).
The eligibility criteria of included studies for the SR & NMA are:

i. First-line chemotherapy treatment. These are treatments used as the primary or initial treatment
ii. Phase III randomised controlled trials. These are trials designed for actual participants from the target population to determine drug effect
iii. Locally advanced or metastatic PC
iv. Full-text articles
v. English version of reported trials
vi. Studies considering Best Supportive Care (BSC) will be included. These kinds of studies typically compare a regimen against symptom management.
vii. Studies published from 1997 onwards; this criteria was chosen because of a landmark study (Burris et al. 1997) that established a chemotherapy treatment standard for APC.

Databases to be searched include PubMed, MEDLINE, EMBASE, CENTRAL, Web of Science, and Scopus. Manual search of article references will also be done.

3.1.2 Phase 2a: Focus groups/interviews with clinicians

Focus groups (or semi-structured interviews) will be conducted for clinicians (doctors and clinical nurse specialists) involved in cancer treatment. The focus groups (or personal interviews if more convenient for the participants) will be done to explore the experiences of the participants in discussing treatment options with patients before commencement of treatment. The potential use of an information tool for SDM will be explored during the discussions. It is anticipated that an observer who is a member of the supervisory team (or somebody nominated by them) will assist the postgraduate researcher during the conduct of the focus groups.
The venue for the focus groups (or semi-structured interviews) will be at the hospitals. The maximum duration is 1 hour.

3.1.3 Phase 2b: Interviews with patients and relatives

Patients and their relatives shall be interviewed separately to elicit their experiences about the consultations they had with clinicians, their mode of information access regarding pancreatic cancer, and what they felt could have helped them in making choices. Preferences about quality-of-life issues, information needs, and attitudes about the use of a web-based tool shall be explored.
The venue for each interview will be at the hospital, or by phone, or via Skype (or any appropriate teleconferencing application). For patients and relatives, there is an option of conducting the interview at the residence of the participants (or other convenient locations).
All focus groups and interviews will be audio-recorded (with permission of participants) for transcription purposes.

3.1.4 Phase 3: Information tool development

A web-based information tool shall be designed using an appropriate technology. Shiny package for R1, or Java Enterprise Edition 2 are being considered for this phase. A human-centred approach (Giacomin 2014) will be adopted in reasoning about the information tool development. It involves communicating with the intended users and understanding their needs, experiences and incorporating feedback into the development process.

[1] https://shiny.rstudio.com/
[2] http://www.oracle.com/technetwork/java/javaee/overview/index.html

The information tool shall incorporate data from the SR & NMA, and from the qualitative data analysis from phase 2. Its essential functionalities will include the ability to display the available treatment options to users based on selected outcomes, while comparing the benefits and risks of each option.
The web-based tool will be hosted on BU web development server.

3.1.5 Phase 4: Evaluation of developed information tool

The resulting web-based information tool will be tested for its functionality, usability, and effectiveness in SDM. Target users are clinicians, patients and relatives of patients. Users will be asked to perform certain tasks with the developed tool. These tasks will be based on the expected functionalities of the proposed information tool. Phase 2 will elicit some of the requirements and functionalities of the proposed information tool.
Phase 4 is designed to be accomplished in two stages:
Stage 1 will assess the information tool's usability. It will be for participants who were involved in the study during the focus group or semi-structured interviews (phase 2). Participants will be asked to complete predefined tasks using the information tool. Participants will then provide feedback to inform the tool modification. There will be options to accomplish the tasks from the residence of participants through web links to the information tool and an online feedback form. Feedback is in the form of a questionnaire and open-ended questions.
Data from stage 1 is primarily for refining the information tool's functionality and usability in preparation for stage 2.
The average duration for stage 1 test is 30 minutes.
Stage 2 will evaluate the effectiveness of the proposed information tool in the SDM process. It is targeted at real-life consultations between clinicians and patients who are starting consultations about their treatment. These patients and relatives will be recruited for this stage. Evaluation at this stage involves the effectiveness of the decision-making process and decision quality (Sepucha et al. 2013) of the information tool.
Effectiveness of the decision-making process is the extent to which the information tool helps the participants in the SDM process. However, decision quality or quality of choice measures the extent to which patients are fully informed and receive the treatments consistent with their preferences (Sepucha et al. 2013).
A variety of instruments have been proposed for measuring the effectiveness of SDM process (Scholl et al. 2011) and the effectiveness of decision aids (Sepucha et al. 2013). The Decision Conflict Scale (DCS) (O'Connor 1995) will be adopted for this purpose because it has been validated in many studies, it has more than one version to suit different participants (Légaré et al. 2012), and it is freely available.
After each consultation involving SDM with the information tool, all participating parties (clinician, patient, relative) will fill out the appropriate DCS form. The form is to be completed and returned within 4 weeks after consultation. This is to enable the participants to give a reliable evaluation of their experience during the consultation. The instruments can be returned at the hospital, by email, or post (stamped addressed envelopes will be provided).
Electronic versions of the DCS will be developed and interested participants can choose to provide feedback through this option.
The duration for filling the DCS form is approximately 10 minutes.
To assess the decision quality associated with the information tool, Sepucha et al. (2013) noted that more than half of the tools reported in the literature were original products designed to meet the requirements of each study. Consequently, the development of a customised instrument to assess the quality of the decision associated with the proposed information tool may be explored. As in the case of breast cancer decision quality measurement (Sepucha et al. 2007; Lee et al. 2010), the major contents of the decision quality instrument for APC treatment will be

disease-specific knowledge and value items or goals of the treatment for people with APC.
The content of the proposed instrument will require about 10 minutes to complete.

3.2 Study Primary and secondary outcome measures

The second phase of the study is a qualitative study that includes interviews and focus groups. Factors that influence the decision-making process during choice of PC treatment, and information needs of these groups of people will be explored.
For the test/evaluation phase of the study, the primary outcome measures are the decisional conflict and system usability score. These will be measured with the DCS and (adaptions of) the System Usability Scale (SUS) (Brooke 1996), respectively.

3.3 Definition of end of study

There are two recruitment stages for this research study. For the first stage, end of study is when the participants have completed and returned the usability evaluation forms for the web-based information tool.
For the second stage, end of study is when participants have successfully completed and returned the SDM evaluation forms.

3.4 Data collection

Data will be extracted from relevant literature for phase 1 of this research with the use of excel sheets specially designed for this purpose. This will enable synthesis of information regarding the comparative benefits, harms and uncertainties surrounding treatment options for APC.
Data collection for participants will be through recordings during interviews, and focus groups, and through completion of survey (paper-based or online). The interview and focus groups recordings will be used to identify themes that will broaden the knowledge on information needs, expectations and challenges of treatment choices for people with APC.
Web analytic tools like Google Analytics [3] will be included in the information tool to collect data on User Behaviour Flow.
The researcher will be responsible for data collection, transcription and analysis.

3.5 Source data

Data sources are from the relevant literature (phase 1), and from participants responses during interviews, focus groups (phase2), and completed forms from phase 3 and phase 4. For monitoring and audit purposes, the recordings will kept for the duration of the permitted duration allowed by data protection act to facilitate comparison with corresponding transcriptions of interviews and focus groups.

4 Participant selection

Participants shall be clinicians, patients with APC, and their relatives. They are defined in section 4.1.

4.1 Definition of participant groups

Clinician: a trained medical professional who has had experience in discussing outcomes or treatment choices with patients about PC. A clinician can either be an oncologist or a clinical nurse specialist.
Patient: an adult who has been diagnosed with APC and who has discussed treatment choices or prognostic outcomes with a clinician.

[3] https://www.google.com/analytics/analytics/#?modal_active=none

Relative: an adult who is involved in providing support for the patient during the period of treatment. They will normally be nominated by the patient.

4.2 Recruitment

Potential clinicians and patients will be recruited from NHS Trust sites in England, and through a charity, Pancreatic Cancer UK (PCUK). PCUK have been approached regarding their support for the research.

4.2.1 NHS recruitment

A member of the site's clinical care team will identify potential participants for the study either through medical records or during hospital appointments, and seek their permission to be contacted by the recruiter (researcher or onsite research nurse) regarding the research. This initial identification will include collection of the Participant Information Sheet (PIS) by the potential participants. There will be a minimum of 24 hours to expect a reply to the invitation.

The recruiter will contact interested persons (either during subsequent appointments, or by phone, or email, or through other agreed communication channels) and explain the study in more detail. If there are questions, these will be answered by the recruiter.

The potential participant will then be invited to sign the informed consent form to indicate acceptance of inclusion in the study.

For focus groups or face-to-face semi-structured interviews, the informed consent form can be signed the same day as the interview (prior to data collection). For interviews by phone or Skype (or other teleconferencing software), informed consent forms will be signed and returned by post, or email.

Relatives of patients will be invited through the patients who have agreed to join the study. The patients will be asked to give a copy of the PIS to their nominated relative with an invitation to take part in the study. The recruiter will then contact the relatives who have shown interest in the study. The most appropriate means and period of contact will be agreed by the recruiter and the patient who made the nomination. The recruiter will receive informed consent from the relatives if they accept to take part in the study.

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The recruitment of clinicians will be either by presentations during periodic meetings, or through other suitable channels at the Trust sites.

4.2.2 PCUK recruitment

For recruitment through PCUK, the project (including the PIS) will be advertised through PCUK online notice boards, and interested persons will be invited to contact the researcher through the BU Clinical Research Unit Patient and Public Involvement (BUCRU PPI). If the potential participants meet the inclusion criteria, written informed consent will be obtained (via post or email or through face to face contact, whichever is convenient).

4.2.3 Recruitment style

Recruitment will be by stratified sampling which is a subset of purposive sampling (Robinson 2014). Stratified sampling is a technique based on defining categories or groups of interest, splitting the sample according to these categories, and including suitable participants into these categories (Robinson 2014). The theoretical foundation for these categories (clinicians, patients, relatives) is explained in the shared model of decision making (Charles et al. 1999).

4.2.4 Stages of recruitment

Figure 2 and Figure 3 describe the envisaged flow of activity for the two main stages of recruitment of participants described in section 3.3.

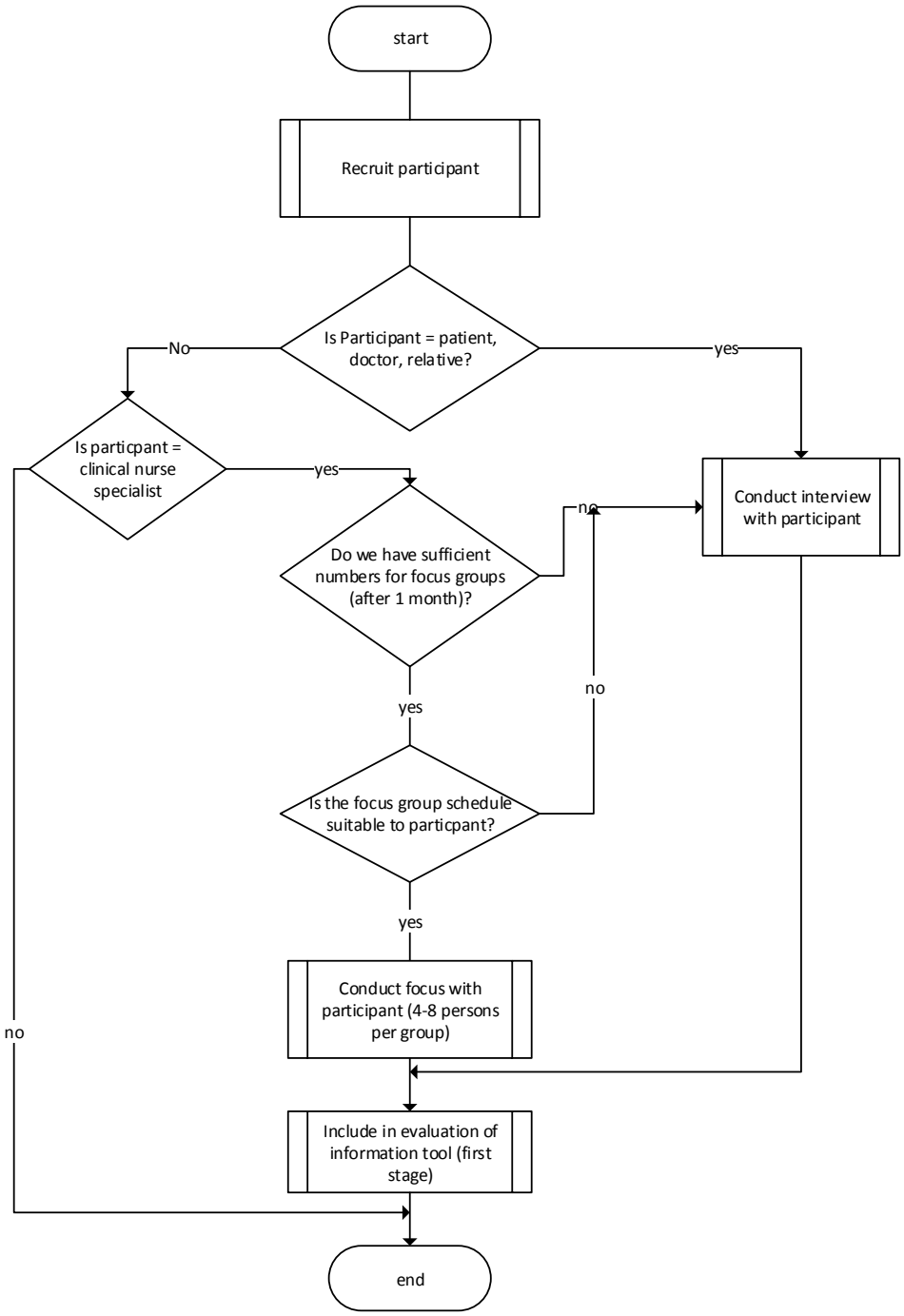

Figure 2: First Stage Recruitment

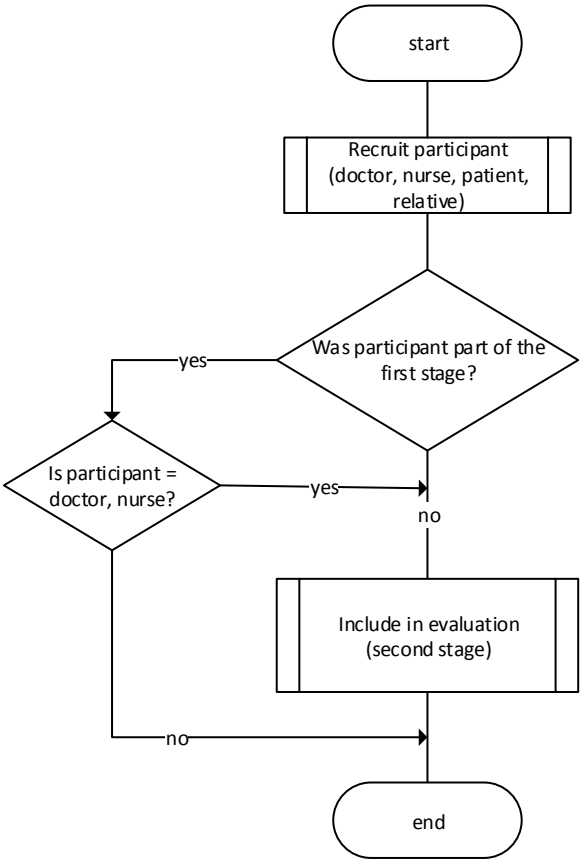

Figure 3: Second Stage Recruitment

4.3 Pre-registration or randomisation evaluations

There are no additional screening procedures involved after potential participants have been identified by a member of the clinical team. There are no randomisation evaluation for this research study.

4.4 Inclusion Criteria and exclusion criteria

Table 1 outlines the inclusion and exclusion criteria for participants of this research.

Table 1: Participant inclusion and exclusion criteria

	Participant	Inclusion criteria	Exclusion criteria
1.	Clinician (doctors, clinical nurse specialists)	Clinicians must have had experience of a minimum of one consultation with a patient with cancer leading to the administration of chemotherapy	Clinicians who have no prior experience in consultation with candidates for chemotherapy
2.	Patient	Diagnosed with advanced PC, able to speak and understand written English, 18 years or older	Patients with operable PC, Non-English speakers, Patients too weak to speak or give written informed consent, Patients lacking mental capacity to consent

	Participant	Inclusion criteria	Exclusion criteria
3.	Relative (or carer)	must be involved in, or aware of, the decision of the patients in choice of treatment, should be responsible for the provision of support to the patient, Must 18 years or older, Must be able to speak and understand written English	Relative who is not involved in the decision-making process leading to treatment selection for the patient, Relative lacking mental capacity to consent

4.5 Withdrawal criteria

If a participant loses the capacity to consent through severe ill health or other reasons, they will be withdrawn from the study. This will be verified by the referring oncologist, or other persons acting on behalf of the participants. Before the commencement of each phase of the study, the capacity of participants to consent will be assessed by verbally reminding them of the purpose of the research and their responsibility, including their ability to leave the study at any time.
If a participant indicates interest to voluntarily withdraw, they will be withdrawn from the study.

5 Treatment or therapy plan

5.1 Description of Treatment or Therapy

The intervention is a web-based interactive information tool that will be designed to provide the relevant information required to guide users in shared-decision-making about treatment options available for APC.
The intervention is not invasive and it will not affect care of participants.

5.2 Treatment Arms

This is a single arm study.

6 Assessment and follow-up

6.1 Duration of Treatment or Therapy

There are no treatments involved this study.

6.2 Duration of Follow-up

Not applicable for this study.

6.3 Subject compliance or Criteria for Removal from Study

Compliance will be identified by completed and returned forms (whether by post or online). Follow-ups will mainly consist of phone calls and/or email reminders which will be agreed with participants for non-compliance.

7 Assessment of safety

7.1 Definition

It is expected that this will be of minimal risk to the participants. However, the following issues have been considered.

7.2 Risks

Emotional distress is identified as a potential risk when patients and relatives are asked to discuss their experiences with respect to APC treatment. To manage this, the participants will be made aware of the nature of questions to expect before the start of the interviews through a pre-interview briefing with the researcher. They will be informed that they are free to pause or suspend their participation if and when they feel uncomfortable. Furthermore, contacts of professional counselling support at the hospital will be made available to the participants.

7.3 Burdens

The burdens for the participants shall be in the form of time spent in the focus groups and semi-structured interviews, completing questionnaires, and information tool testing. Efforts shall be made to ensure that a maximum of 1 hour is spent in the focus groups and the interviews. The filling of questionnaires and information tool testing will not exceed 20 minutes and 30 minutes, respectively. Different participants (patients and relatives) will be recruited for the Stage 2 of the Test phase (Phase 4). The venue of the focus groups shall be the hospitals. Interviews shall be conducted at the hospital in the first instance, or by phone, via Skype (or other teleconferencing application), or at the residence of participants (patients or relatives), if the other options do not meet the desired number of participants.

7.4 Reporting procedures for Adverse Events

Not applicable.

8 Statistics and data analysis

8.1 Description of statistical methods

Following transcription, qualitative data shall be subjected to a thematic data analysis approach (Silverman 2014, p.213; Nowell et al. 2017). Nvivo[4] software is proposed to be used. Nvivo is a software designed for qualitative data analysis. Emerging themes shall be elicited from the transcripts of the focus groups and interviews, and these will be used to inform understanding of preferences of patients and relatives about quality-of-life issues, information needs, and attitudes about the use of a web-based information tool. Data from the clinicians will be analysed to provide information on the consultation process in APC, the challenges and potential solutions in the decision-making phase of APC treatment, and perception about the use of web-based information tools.

This phase of data analysis will inform some of the design requirements for the proposed information tool.

Quantitative data is in two forms: (1) network meta-analysis (NMA) of randomized controlled trials (RCTs) of phase III chemotherapy regimens in APC from Phase 1, and (2) survey questionnaires from Phase 4.

The choice of software for the NMA is currently being considered. However, there are 5 major options, namely: R5, Comprehensive Meta-analysis[6] (CMA), STATA[7], Review Manager[8], and SPSS[9], in the order of decreasing priority. CMA and STATA have associated licence fees, but they are the most appropriate tools based on a

[4] http://www.qsrinternational.com/nvivo/nvivo-products
[5] https://www.r-project.org/
[6] https://www.meta-analysis.com/pages/why_use.php?cart=BFWF880984
[7] https://www.stata.com/
[8] http://community.cochrane.org/tools/review-production-tools/revman-5
[9] https://www.ibm.com/analytics/data-science/predictive-analytics/spss-statistical-software

cursory inspection of latest works on NMA. R is also used for NMA and it is freely available.
Quantitative data from Phase 4 can be analysed using either SPSS or R. The outcome will be descriptive statistics of the different components of the SDM process. Details of the this can be found in the DCS user manual (O'Connor 1993[updated 2010])

8.2 Number of participants

In sample size determination, it is important to note that, given the resources, duration of research study, and participant population, it may be necessary to adopt a pragmatic approach, rather than an exhaustive approach.
In a survey of over 500 PhD projects, Mason (2010) showed that a sample size of between 10 to 40 was common for qualitative interviews. For this study, it is anticipated that, starting with the minimum recommended size of 10 (per participant group) and potentially increasing it to twice that size will be sufficient. In all these decisions, ethical principles and the access considerations to participants with relevant data are the guiding philosophies (Holloway and Galvin 2016, p.144).
Proposed sample size for each phase is
Phase 2 (focus groups, interviews):
For clinicians, 10-20 participants
For patients, 10-20 participants
For relatives, 5-15 participants

Phase 4 (test/evaluation):
For stage 1, there will be a minimum of 15 tests in total
(5 clinicians, 5 patients, and 5 relatives) recruited from the participants in Phase 2. If the required numbers are not achieved, then new participants will be recruited.

For stage 2, Hertzog (2008) recommended a sample size of 20-25 for a single-group instrument efficacy demonstration. Therefore, a total of 30 tests is required to account for incomplete/missing data in returned questionnaires.
The requirements for stage 2 are: the use of the information tool during actual clinician-patient consultation about APC treatment and the subsequent data collection after the consultation.
The required participants for each phase of the study is summarised in Table 2.

Table 2: Summary of required participants for the study

	Participant	Study phase	Proposed range	Duration of activity
1	Clinician	Phase 2 (Focus group or semi-structured interviews)	10-20	1 hour
		Phase 4 (stage 1)		30 minutes
		Phase 4 (stage 2)		20 minutes
2	Patient	Phase 2 (Semi-structured interview)	10-20	1 hour
		Phase 4 (stage 1)		30 minutes
		Phase 4 (stage 2)	20-30	20 minutes
3	Relative	Phase 2 (Semi-structured interview)	5-15	1 hour
		Phase 4 (stage 1)		30 minutes
		Phase 4 (stage 2)	5-15	20 minutes

Due to the potential burden on the patients and relatives, and the possibility of health deterioration of the patients over the duration of the study, it is envisaged that

participants not previously involved in the study will be recruited for the last stage of phase 4 (i.e. stage 2 evaluation). Therefore, about 20-30 participants will be recruited (patient-relative mix). However, the clinicians will be invited to participate in all stages, except for those that will opt out of any of the phases. In this case, they will be replaced with new participants (clinicians).

8.3 Criteria for termination of the study

Since this study is low risk and does not interfere with participants' usual care, premature termination of the study is not envisaged. However, in the event of poor (or zero) recruitment for some (or all) participant groups, there will be need to review the inclusion/exclusion criteria. This will be agreed with the supervisors of the study with approval from NHS REC where necessary.

9 Ethical, Regulatory, Administrative and Quality Assurance

9.1 Ethical considerations

BU sponsorship has been approved for this study. NHS Research Ethics Committee (REC) approval will be required as well as BU ethical approval via the Science Technology & Health Research Ethics Panel. Data collection will commence after a favourable opinion is granted by REC and other approvals have been obtained from the participating sites.

9.2 Declaration of Helsinki

The study will be conducted in accordance with the recommendations for physicians involved in research on human participants adopted by the 18th World Medical Assembly, Helsinki 1964 and later revisions

9.3 Research Governance

This study will be conducted in compliance to the UK Policy Framework for Health and Social Care Research (2017), Good Clinical Practice guidelines, and Good Research Practice (MRC 2012).

9.4 Consent Process

Informed consent of all participants shall be obtained in keeping with ethical guidelines. All prospective participants will be told that participation is voluntary and that their participation or otherwise will have no impact on the care that they normally receive. Participant Information sheets (PIS) for the research will be provided to the prospective participants. The research purpose and contents of the PIS will be explained to the prospective participants at the hospital, through email, or on the phone, and any queries will be resolved. Interested persons will be given sufficient time (a minimum of 24 hours) to decide on joining the study. The informed consent process will be concluded by obtaining a written informed consent to indicate acceptance in taking part in the study. Consent will be re-confirmed at every new phase of the study.

9.5 Participant confidentiality

The personal data of participants will not be included in data analysis. To further protect the identity of the participants, codes or pseudonyms will be allocated to participants and a codebook that associates the participants with the pseudonyms will be maintained. This codebook will be securely stored away from the data collected during the study.
Audio recordings are strictly for transcription purposes, and transcriptions will be anonymised with the use of pseudonyms. During transcription, any personal data will

be coded. Access to any personal data collected from this study will be restricted to the research student and members of the supervision team. All personal data will be destroyed after data collection.
Data storage and protection shall be in line with General Data Protection Regulations (GDPR) and Data Protection Act 2018 which stipulates that personally identifiable records be securely stored to protect the identity of the owners, and usage of such records are clearly made known to their owners during collection. Because this is a PhD research, in addition to the Act, the University's guideline on data storage for an academic project shall be adhered to. Only authorised persons (the researcher, research supervisors, and regulatory authorities) may have access to the records. Secure storage lockers and password-protected computer systems at the university will be used to store and manage the collected data.

9.6 Study Management

The study will be managed by the PhD researcher. Since it is an educational research, it will be co-ordinated from BU.

9.7 Monitoring

The research study is monitored by research supervisors who are academic members of staff at BU, and a consultant medical oncologist from Poole Hospital NHS Foundation Trust. The study may also be monitored by the Clinical Governance Advisor within the Research & Knowledge Exchange Office (R&KEO) at BU.

9.8 Audit and Inspection

Audit and inspection for this research are both managed by the BU Research Ethics Committee and R&KEO. In addition, regulatory authorities may carry out inspections.

10 Data Handling and record keeping

Data handling and record keeping will be the responsibility of the PhD researcher. Data will be managed in adherence to the GDPR and Data Protection Act 2018. The identity of participants will be protected by the use of participant codes in place of their names. Other identifying data will not be included in the data analysis. Personal data of participants will be stored separately from other data to prevent the possible identification of participant data in the study.

10.1 Archiving

The study records will be stored for a period of 5 years on the university archive in line with Good Clinical Practice guidelines. The IT Services of BU should be consulted for authorising destruction of archived materials, in line with the BU Ethics Code of Practice: Policy and Procedure (version 2).

11 Finance, Indemnity and Insurance

11.1 Funding

The research is match-funded PhD study between BU and Poole Hospital NHS Foundation Trust. There are no payments for participating in the research. There is no additional funding for recruiting centres.

11.2 Sponsor

BU is the main sponsor for this study. NHS Trust sites involved in this study will act as participating sites for recruitment, locations for interviews and focus groups, and evaluation centres for the web-based information tool. PCUK will act as a recruitment site.

11.3 Indemnity

BU Public Liability and Professional Indemnity insurance policies provide an indemnity to BU employees for their potential liability for harm to participants during the conduct of the research.

This does not in any way affect an NHS Trust's responsibility for any clinical negligence on the part of its staff (including the Trust's responsibility for BU employees acting in connection with their NHS honorary appointments).

BU holds Professional Indemnity insurance to cover the legal liability of the University as Research Sponsor and/or as the employer of staff engaged in the research, for harm to participants arising from the design of the research, where the research protocol was designed by the University.

12 Publication Policy and Intellectual Property

Dissemination of results of the study shall be in the form of publications and a thesis write-up. Other anticipated forms of dissemination shall be through conference presentations and public engagement events related to PC, mixed methods, software development, or shared decision-making. Furthermore, there are plans for presentations at selected study sites, and the possibility of dissemination through PCUK online notice boards. Participants will be informed of this likelihood before they sign the informed consent form.

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