


BMJ Open Changing from face-to-face to virtual meetings due to the COVID-19 pandemic: protocol for a mixed-methods study exploring the impact on cancer multidisciplinary team (MDT) meetings

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ABSTRACT

Introduction In the UK, the National Cancer Plan (2000) requires every cancer patient's care to be reviewed by a multidisciplinary team (MDT). Since the introduction of these guidelines, MDTs have faced escalating demands with increasing numbers and complexity of cases. The COVID-19 pandemic has presented MDTs with the challenge of running MDT meetings virtually rather than face-to-face.

This study aims to explore how the change from face-to-face to virtual MDT meetings during the COVID-19 pandemic may have impacted the effectiveness of decision-making in cancer MDT meetings and to make recommendations to improve future cancer MDT working based on the findings.

Methods and analysis A mixed-methods study with three parallel phases:

1. Semistructured remote qualitative interviews with ≤ 40 cancer MDT members.
2. A national cross-sectional online survey of cancer MDT members in England, using a validated questionnaire with both multiple-choice and free-text questions.
3. Live observations of ≥ 6 virtual/hybrid cancer MDT meetings at four NHS Trusts.

Participants will be recruited from Cancer Alliances in England. Data collection tools have been developed in consultation with stakeholders, based on a conceptual framework devised from decision-making models and MDT guidelines. Quantitative data will be summarised descriptively, and χ^2 tests run to explore associations. Qualitative data will be analysed using applied thematic analysis. Using a convergent design, mixed-methods data will be triangulated guided by the conceptual framework. The study has been approved by NHS Research Ethics Committee (London—Hampstead) (22/HRA/0177). The results will be shared through peer-reviewed journals and academic conferences. A report summarising key findings will be used to develop a resource pack for MDTs to translate learnings from this study into improved effectiveness of virtual MDT meetings.

The study has been registered on the Open Science Framework (<https://doi.org/10.17605/OSF.IO/D2NHW>).

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The protocol has been designed collaboratively and study conduct is being overseen by a multidisciplinary group of research psychologists, health service researchers and managers, cancer multidisciplinary team (MDT) members and a patient representative.
- ⇒ The conceptual framework guiding the mixed-methods data collection and analysis procedures was developed by synthesising models of group decision-making with existing MDT best-practice guidelines.
- ⇒ The novel questionnaire developed for the national survey has undergone a construct validity and prioritisation exercise with an expert group of psychologists and cancer MDT members.
- ⇒ The study is taking place during a time of ongoing change in methods of care delivery, related to the evolving COVID-19 restrictions that may restrict generalisability of the findings outside of this context.
- ⇒ The cross-sectional design will not capture any changes in opinion or group decision-making effectiveness over time nor allow inference of causality.

INTRODUCTION

Input from several healthcare professionals from different specialities, together with good communication with and involvement of patients, is fundamental to the delivery of gold standard cancer care. In 1995, the Calman-Hine report advocated for radical reform of cancer services in the UK, including equality of access to specialists.¹ This informed the National Cancer Plan's (2000) subsequent mandate that every patient's care should be reviewed by a multidisciplinary team (MDT).² MDT meetings were introduced to facilitate this specialist input and in doing so, reduce



variation in access to, and decisions about, cancer care. However, since their introduction, MDT meetings have faced ever-increasing demands, in terms of the number of cases they review, the complexity of patient needs and growing diversity in available treatment options.³ This workload and time commitment must be managed alongside demanding clinical and professional roles, requiring additional capacity and attentional focus from the individual; a chair skilled in engaging all participants to achieve consensus; and adequate organisation, preparation, and notice.

In response to this increasingly demanding cancer care environment, the Cancer Vanguard reviewed MDT working across North East London (NEL) and North Central London (NCL). Their MDT Improvement Report (2017)⁴ concluded that improvements in infrastructure, streamlining processes, leadership and chairing are urgently needed. Subsequently, NHS England has set out guidance for streamlining MDT diagnostic and treatment decision-making during face-to-face meetings.⁵ This aimed to help ensure enough time is devoted to patients with more complex needs, to allow MDTs to be managed more flexibly to ensure specialists' time is used effectively and to improve the transparency of decision-making about cancer care across Cancer Alliances. Indeed, a recent cross-sectional observational study of cancer MDTs⁶ conceptualised task difficulty (eg, complexity of the case), internal group factors (eg, size and composition) and external circumstances (eg, workload, multiple treatment options) as functional factors that interact to determine the quality of group decision-making.

More recently, the COVID-19 pandemic has presented MDTs with a new challenge, forcing MDT meetings and decision-making to take place virtually rather than face-to-face. This has potential advantages and disadvantages. For example, virtual MDTs eliminate geographical barriers and promote clinical communication and decision-making in diagnosis.⁷ However, there is concern over the difficulties associated with connectivity and technology of virtual MDTs. Reduced engagement and concentration may also occur as it is common for team members not directly participating in the discussion to mute or remove video images to minimise 'digital noise' and save bandwidth.⁸ This could negatively affect quoracy in decision-making and team dynamics for interacting and contributing to discussions if turn-taking is not effectively chaired. Indeed, eye contact and some of the non-verbal immediacy behaviours that invite and encourage contributions, pick up on confusion or difficulties, signal agreement or add emphasis may be largely absent or difficult to convey in virtual settings with medium to large groups. In one study of head and neck cancer MDT members (n=97), two-thirds agreed that team working was adversely impacted by the move to virtual working, with some MDT team members stating they were unable to adequately reinforce a point.⁹

Before the onset of the pandemic, some MDTs were already using technology to facilitate virtual or hybrid

meetings.¹⁰ However, this was by no means universal, and the majority ran their meetings in a face-to-face format.^{10 11} The pandemic accelerated near-universal adoption of virtual meetings during periods of national lockdown, and many cancer MDTs are either continuing with virtual meetings or implementing more flexible hybrid meeting models (eg, meetings held face-to-face, with the option to join virtually as well), following the lifting of legal restrictions in place to limit transmission. Much existing research on MDT meeting effectiveness focuses specifically on virtual or face-to-face formats, but evidence suggests hybrid meeting formats in healthcare also have a distinct set of advantages and disadvantages.¹²

The existing evidence-base exploring the effectiveness of virtual and hybrid cancer MDT meetings has to date been limited to case studies and reflective reviews^{10 13-16}; single-site studies^{11 17-19} and specific cancer specialisms^{9 12 14} or does not directly examine the impact of the transition to these meeting formats on the effectiveness of cancer MDT decision-making.^{7 20 21} By capturing cancer MDT experiences across the UK using a multisite mixed-methods design informed by behavioural science, this study will provide unique, translational insights into the effectiveness of the group decision-making process in virtual and hybrid cancer MDT meetings. The findings will be used to coproduce a pragmatic resource pack with MDT members and patient representatives. The pack will combine the study findings, and reference the NHS England MDT streamlining guidance,⁵ to inform best-practice in cancer MDT decision-making and facilitate service improvement. In doing so, these findings ultimately have the potential to improve cancer care for patients and the MDT working environment for healthcare professionals.

Objectives

Primary objective

- ▶ To explore how the change from face-to-face to virtual and hybrid MDT meetings during the COVID-19 pandemic may have impacted the effectiveness of group decision-making in cancer MDT meetings.

Secondary objectives

- ▶ To explore cancer MDT members' experiences of changing to, and participating in, virtual and hybrid MDT meetings.
- ▶ To identify aspects of MDT meeting preparation, governance and engagement introduced by the change to virtual and hybrid hosting, that improve either the experience or perceived effectiveness of group decision-making.

METHODS AND ANALYSIS

Study design

A mixed-methods study splits into three stages: interviews, a national cross-sectional online survey and live MDT meeting observations.

Table 1 Preliminary conceptual framework guiding data collection and analysis

| Source | Constructs within conceptual framework impacting MDT group-decision making | | | | | | | |
|---|--|----------------------------|------------------------|------------|---|-----------------|-----------------|------------------------|
| Functional perspective of decision making ⁶ | Internal factors | External circumstances | | | Interaction processes | Decision-making | Case complexity | Repeated consecutively |
| National Cancer Action Team characteristics of an effective MDT ²³ | The Team | Organisation and logistics | Meeting infrastructure | Governance | Decision-making | | | |
| ODDI model of group decision-making ²² | | | | | Orientation Discussion Decision Implementation | | | |
| NHS England MDT streamlining guidelines ⁵ | Streamlining Standards of Care | | Audit | | | | | |

MDT, multidisciplinary team; NHS, National Health Service; ODDI, Orientation-Discussion-Decision-Implementation model.

We have developed a preliminary conceptual framework (table 1) informed by Soukup's factors important for the quality of decision-making in cancer MDT meetings⁶; Forsyth's Orientation-Discussion-Decision-Implementation (ODDI) group decision-making model²²; National Cancer Action Team's report on the characteristics of an effective MDT²³ and NHS England's (2020) MDT meeting streamlining guidelines.⁵

We used the framework to inform the design of the data collection tools, ensuring each construct is appropriately measured by at least one of the studies, while reducing redundancy (table 2).

Sample Population

Participants will be members of specialist and local cancer MDTs in England who have experience of taking part in virtual and/or hybrid cancer MDT meetings during the COVID-19 pandemic. The following definitions were

used to guide MDT eligibility, adapted from existing conceptualisations of virtual and hybrid MDT meetings¹⁰:

- ▶ Virtual MDT meetings are meetings where all members attend the meeting virtually (ie, no face-to-face meeting).
- ▶ Face-to-face MDT meetings are meetings where all members attend the meeting face-to-face.
- ▶ Hybrid MDT meetings are meetings conducted with some members attending face-to-face and others joining virtually.

Eligibility criteria

To be eligible for inclusion in this research, participants must meet all the following criteria:

- ▶ Able and willing to give informed consent (as an individual or on behalf of the MDT).
- ▶ Aged >18 years.
- ▶ Member, co-ordinator or lead of a cancer MDT in England.

Table 2 Mapping conceptual framework constructs to data collection tools for each study

| Meeting observations | Interviews | Questionnaire |
|---|---|---|
| The Team ▶ Attendees Organisation and logistics ▶ During the meeting Infrastructure ▶ Technical issues Interaction and decision-making processes ▶ Adapted version of <i>MDT-Mode</i> ²⁹ tool to assess quality on a case-by-case basis of: – Information presented (history, radiological, histopathological, psychosocial, co-morbidities, patient views) ▶ Atmosphere and dynamics ▶ Case complexity Change in processes over the course of meeting | Experiences of virtual MDT meetings ▶ Learnings, issues and how they can be addressed ▶ Hybrid meetings Interaction processes ▶ Team climate/atmosphere assessed in line with constructs of the <i>Team Climate Inventory</i> ²⁸ to assess: – Vision – Participatory safety – Task orientation – Support for innovation ▶ Individual factors: concentration/distracted ▶ Social factors: dynamics/disagreements/hierarchies Decision-making processes: ▶ Orientation ▶ Discussion ▶ Decision-making ▶ Implementation | The Team ▶ Attendance ▶ Training/personal development Organisation and logistics ▶ Preparation: – Streamlining SOC's ▶ During the meeting (including case complexity) ▶ Post-meeting ▶ Hybrid meetings Infrastructure ▶ Availability of space ▶ Technical issues Governance ▶ Chairing ▶ Data collection during meetings ▶ Audit Decision-making process: ▶ Interaction processes ▶ Case complexity ▶ Implementation Recommendations/preferences/advantages/disadvantages |

MDT, multidisciplinary team; SOC, Standards of care.

Individuals will be excluded from the study if they meet any of the following criteria:

- ▶ Unwilling or unable to give consent (as an individual or on behalf of the MDT).
- ▶ Unable to understand written and/or verbal English.

Sample size

Interviews

Up to 40 participants will be recruited for semistructured qualitative interviews, in line with norms for qualitative research²⁴ and depending on data saturation (the point when no new themes are being interpreted from the data).²⁵ This number has also been chosen to ensure that the sample is representative of factors likely to affect participants' skillset and experience of virtual MDT meetings, including MDT role/membership, discipline and demographics.

Questionnaire

Cancer Alliance leads across England will be invited to distribute the questionnaire to their membership lists, but to be conservative, our sample size is based on the NEL and NCL cancer alliances.

With approximately 200 MDTs across these networks and an anticipated 50% responsiveness, we expect to be able to invite the members of 100 MDTs to complete the questionnaire. Each MDT will have at least five members (range 5–25 across local and specialist MDTs). Factoring in a conservative 38% questionnaire response rate from MDT leads in a previous report,⁴ we anticipate achieving a minimum sample of 190 respondents. With 190 participants, if 50% report a specific outcome, the expected 95% CI on this would be 42%–58%. For 70%, the 95% CI would be expected to be 63%–77%. For 90%, the 95% CI would be expected to be 85%–95%. Therefore, 190 would confer acceptable precision of estimation, though we expect to achieve a larger sample.

Observation

A minimum of six virtual or hybrid MDT meetings will be observed, including specialist (eg, urology, gynaecology, head & neck) and local (eg, breast, colorectal, upper gastrointestinal) MDTs. This is a resource intensive, in-depth method of study to collect exploratory data. The diversity of observed meetings is the most critical consideration for determining the sample, to ensure it is representative of a diverse multidisciplinary workforce across different MDTs.

Recruitment

With agreement from respective Cancer Alliance leads, NHS Trust cancer leads or personnel within the Alliance will be asked to email the questionnaire and interview invitations and study information to existing cancer MDT membership distribution lists. These personnel will be asked to provide the research team with the total number of invitations sent, in order to estimate response rates.

While we plan to invite MDT members from within NEL and NCL Cancer Alliances specifically, we also hope to

involve other alliances in different regions across England in the interview and questionnaire study using the same processes. The invitation emails will include contact details for the research team, along with an instruction to contact them if they have any questions or would like to discuss anything about the study.

For the observation phase, our NHS coinvestigators will identify and invite leads or co-ordinators of eligible MDTs to take part.

Recruitment is planned to take place between April and July 2022.

Patient and public involvement (PPI)

Our patient representative member of our study management group (SMG) has reviewed the study design, methods and data collection tools. They have coauthored this manuscript (DH) and will remain involved throughout the study duration and be invited to be involved in activities to disseminate this work. A PPI consultation activity is also being undertaken to seek a more diverse range of perspectives, with a specific focus on understanding the acceptability of observing MDT meetings without requesting patient consent.

Study procedures

Interviews

An information sheet and consent form will be included with the initial approach email, along with a link to an online 'eligibility and entry characteristics form', to be completed by potential participants on the Online Surveys platform.²⁶ This will collect contact details and the information needed to confirm eligibility and purposively sample to ensure diversity with respect to professional role/membership, specialist/local, cancer type and demographics. A sampling matrix will be used to monitor and track the balance of characteristics recruited within the sample, against which any new potential participant will be compared to determine whether they are recruited. Potential participants will have to check a box to confirm they give their consent for their data to be processed and stored for this purpose.

Participants will be contacted by the research team if they are eligible to participate in the interview study to arrange a time for the interview. Informed consent will be obtained prior to any participant being interviewed. This will include a discussion between the potential participant and the researcher about the nature and objectives of the research, their rights as a research participant (eg, to withdraw without giving a reason), the possible risks associated with their participation and the opportunity to ask any questions. Any individual deemed to be incapable of providing informed consent will be excluded. Verbal consent will be taken and audio-recorded using a consent form. To achieve this, each participant will be asked to state their name and today's date. The researcher will read aloud each of the statements on the consent form and ask the participant to state whether they agree with each statement.

One-to-one, semistructured qualitative interviews will be carried out by research fellows remotely by telephone or Microsoft Teams. An interview topic guide has been developed, drawing on prior studies of MDT effectiveness^{4 27} in collaboration with patient representatives, clinicians and psychologists (see online supplemental file 1). The topic guide is structured to align with the conceptual framework (table 1) exploring participants' experiences of virtual/hybrid MDT meetings, with a focus on interaction processes (with questions informed by constructs within the Team Climate Inventory²⁸; individual and social factors) and the orientation, discussion and decision-making processes (informed by the ODDI model²²). Questions will be open ended to allow participant-led discussion and insight. However, prompts will be used to ensure coverage of factors previously found to be important for decision quality and MDT interaction as well as those specific to virtual and hybrid MDT meeting attendance. The researcher conducting the interviews will also conduct the MDT observations in parallel (see the Observations section). Therefore, their experience and insights from these observations will inform their interview approach, within the bounds of ethical approvals for the interview topic guide.

With participants' consent, the interviews will be audio-recorded using an encrypted digital audio recording device and transcribed verbatim.

Questionnaire

A link to the electronic questionnaire, hosted on the secure platform 'Online Surveys',²⁶ will be included in the email invitation. Information about the study and participants' rights will be presented on the first screen of this electronic questionnaire platform, with participants asked to complete an online informed consent form, which will be required before participants can progress to complete the questionnaire. Email addresses will be collected to enable the research team to identify duplicate responses during data cleaning and to send participants the results of the study (if they indicate that they would like to receive them). The survey will be open for 3 months. Reminder emails will be sent at weeks 3, 9 and 12.

Questionnaire development and validation

The questionnaire will measure aspects of virtual MDT preparation, governance, engagement and experience to identify the advantages and disadvantages of virtual versus face-to-face hosting (online supplemental file 2). It was developed from a preliminary question pool (n=87) based on the questionnaire used in the London Cancer MDT Improvement Report,⁴ early research evidence for virtual MDT meetings^{7 11} and the conceptual framework guiding the study (table 1).

A validation exercise was undertaken with a group of nine stakeholders (MDT members and behavioural scientists) to refine the questionnaire content from within this preliminary question pool. Questions in the initial pool

were grouped into categories (The Team; Organisation and Logistics; Infrastructure; Governance and Decision-making) aligned to the guiding conceptual framework (table 1). Stakeholders rated the Priority, Appropriateness and Clarity of each item on a 5-point scale. A mean Priority, Clarity and Appropriateness score was then generated for each item and summarised with a composite overall score across each rating domain. Based on these ratings, and in discussion with the SMG, the research team refined the question pool to include the items ranked as highest priority and appropriateness as well as to ensure that each construct was adequately captured. Questions were also reworded to improve clarity as needed. The refined questionnaire was cross-checked with the observation proforma and interview topic guide to eliminate redundant items. The questionnaire will be informally piloted by up to 10 MDT members, and any amendments made before opening the questionnaire. Pilot responses to the questionnaire will not be included in the final analysis.

Observations

Single virtual meetings of specialist (eg, urology, gynaecology, head and neck) and local (eg, breast, colorectal, upper gastrointestinal) cancer MDT meetings will be observed. Once the invited MDT leads confirm their interest, following discussion with and agreement from the MDT lead, researchers will visit the MDT meeting to introduce and discuss the study and provide information sheets to each MDT member at least 2 weeks before the planned observation. Consent for the observation of the meeting will be given by the lead clinician on behalf of the MDT and audio-recorded using a verbal consent form.

Two observation proformas (1: 'whole-meeting' and 2: 'case-by-case') have been developed based on previous MDT research^{4 27 29} and emerging studies in virtual MDT meetings^{7 11} to ensure a standardised approach between observers and across meetings (online supplemental file 3). Informed by the conceptual framework (table 1), the proformas focus on capturing information relating to The Team (eg, attendees); External Circumstances (eg, organisation and logistics during the meeting and technical issues); changes in processes over the course of the meeting; and a 'real-time' quantitative measure of decision-making quality. This will be assessed using an adapted version of the MDT Metric of Decision-Making (MDT-Mode) tool, which assesses decision-making in MDTs through observation.²⁹ Qualitative field notes will also be taken to record aspects of the MDT meeting, including team atmosphere, relative participation of different MDT members in the meeting, local context and case complexity. The proformas have been iteratively refined through training observations, in collaboration with our PPI representative and NHS coinvestigators.

To preserve the confidentiality of patient information disclosed during these meetings and ensure no patient data are inadvertently collected or retained in any way, the meetings will not be audio or visually recorded. Instead, the meetings will be observed live, by at least

two members of the research team following training and practice observations to orientate and familiarise researchers with the proformas.

Outcomes and analysis

Study outcomes

Data from the three phases of the study will be triangulated to address the following outcomes:

Primary outcomes

- ▶ Factors influencing the effectiveness of group decision-making in cancer MDT meetings (interpreted as themes from qualitative data and quantified with quantitative data).

Secondary outcomes

- ▶ Cancer MDT members' experiences of participating in virtual and hybrid MDT meetings.
- ▶ Changes in MDT meeting preparation, governance and engagement which should inform service improvement.

Methods of analysis

Qualitative analysis

Thematic analysis will be carried out using QSR International NVivo V.11 software.³⁰

Qualitative data from the interviews, free-text questionnaire questions and observation field notes will be collated and deductively coded to the constructs within the skeletal conceptual framework proposed in [table 1](#) using applied thematic analysis.³¹ An inductive coding approach will also be used to allow this framework to be iteratively revised and to interpret unique themes within each construct. Initial coding will be carried out by one researcher with a subset of randomly selected transcripts independently coded to control bias. There will be multiple opportunities for team discussion, disagreement and iteration of the emerging coding framework.

Quantitative analysis

Quantitative responses from the observation and questionnaire will be summarised using IBM SPSS Statistics V.24.³² Descriptive analyses will be used to examine the frequency of each type of response, which will be presented as percentages in graphs and tables. Data from the questionnaire will be compared by type of MDT member using χ^2 analysis (or logistic regression for adjusted analyses if a large enough sample size is achieved), to explore any associations between demographics, role, location and responses. A statistical analysis plan is provided in online supplemental file 4.

Triangulation

The cross-study findings from quantitative and qualitative components will be mapped to the constructs within the conceptual framework ([table 1](#)) to draw conclusions about how the transition to virtual and hybrid meetings has impacted the various inter-related aspects of group decision-making (eg, team composition, organisation

and logistics, interaction processes, case complexity, repetition) that combine to determine the overall quality of decisions made in MDT meetings. The preliminary skeletal version of this framework is presented in [table 1](#), but this will be iteratively refined based on study findings, where patterns emerge that suggest adaptation is needed. We will share the updated conceptual framework as an output of this work. In taking this approach, we aim to capture, integrate, compare and contrast the experiences of a range of cancer MDT types, which vary across many dimensions (eg, number and roles of attendees, cancer type, technological set up) to identify both general patterns of decision-making effectiveness in virtual and hybrid meetings as compared with face-to-face meetings as well as differences in effectiveness associated with differences in MDT characteristics. We will use these findings to make recommendations to facilitate effective, group-decision making in virtual and hybrid MDT meetings, making general recommendations that MDTs can use and adapt according to the specific needs of their team.

Data management

Data management plan

A detailed data management plan and Data Protection Impact Assessment have been developed and will be reviewed at regular intervals throughout the study in compliance with the UK Policy Framework for health and social care research, the Data Protection Legislation and Barts Health NHS Trust (Barts Health) and Queen Mary University of London (QMUL) Policies on the Retention and Disposal of Records (based on Department of Health recommendations on records retention).

Interviews

Separate recordings of the verbal consent and interview will be made using an encrypted digital audio-recording device. Following the interview, the audio recordings will be uploaded immediately to a secure folder within QMUL's Data Safe Haven and deleted from the device.

The audio recordings will be transferred securely to a professional transcription service ('The Transcription Agency') using a secure file transfer mechanism and governed by a data sharing and processing agreement. Transcripts will be pseudonymised and stored in a password-protected file on the QMUL network drive for 5 years in compliance with QMUL's record retention schedule. Audio recordings of verbal consent will be stored on the Safe Haven for a minimum period of 5 years. Audio recordings of the interview itself will be deleted after the transcriptions have been checked for accuracy by the researcher. During dissemination, quotes from interviews will be reported with limited demographic data to provide context to the quote (alliance, categorised job role and gender). More detailed demographics will only be reported in summary tables and not directly attributed to quotes to ensure anonymity of participants is protected.

Questionnaire

The Online Surveys platform being used to collect the questionnaire data is a secure, web-based application designed to support data capture for research studies and recommended by QMUL.²⁶ Strict information security standards are followed (ISO27001) and all data are processed in compliance with UK General Data Protection Regulation. Data can be exported directly into an SPSS file. Email addresses will be saved separately in a database on the secure QMUL Data Safe Haven once downloaded from Online Surveys and deduplication was completed. All other survey responses will be saved in an anonymised password-protected file on the secure QMUL network.

Observations

Meeting observation proformas will be completed electronically and saved in password-protected files on the secure QMUL network. No identifiable information will be recorded on the observation proformas. The data from these proformas will be entered directly onto an SPSS database (quantitative data) and Excel spreadsheet (qualitative data) stored in the secure QMUL network for analysis.

ETHICS AND DISSEMINATION

Approvals

The study is sponsored by the Joint Research Management Office (JMRO) for QMUL and Barts Health NHS Trust and has been approved by the Health Research Authority's (HRA) and the London—Hampstead NHS Research Ethics Committee (REC) (04 April 2022; 22/HRA/0177).

The study conduct is being monitored by the SMG, including the CI, NHS collaborators, a patient representative and the study research team.

Consent

Participation in all aspects of this study is entirely voluntary, which will be emphasised in our recruitment approaches; all participants will be required to give their informed consent to take part. Patient information is not being used for research purposes but will be incidentally disclosed to the research team during their MDT meeting observations. It is not feasible to request consent from each patient; however, patients have the right to be notified about this and to have the opportunity to dissent. Notification of the research and avenue for dissent will be displayed (physically or digitally) within hospital outpatient waiting rooms at least 2 weeks prior to meeting observations taking place.

Confidentiality

The research has been approved by HRA Confidentiality Advisory Group (25 March 2022; 22/CAG/0048). Participants' confidentiality will be protected by strict procedures for data collection and management. During the MDT meeting observations, researchers will hear information

about patients being discussed. The live method of observation (rather than audio or visual recording) was chosen to ensure no patient information will be stored in any way. The observation proformas completed by researchers do not collect any patient information nor any personally identifiable information about MDT members. The researchers will be bound by the terms of confidentiality agreements between QMUL and each participating Trust to formalise this arrangement. Each researcher will also hold a Letter of Access for each participating Trust, binding them to ensure that all information regarding patients or staff remains secure and strictly confidential in compliance with the requirements of the NHS Confidentiality Code of Practice and the Data Protection Act 2018.

Dissemination

Anonymised quantitative data from the questionnaire will be uploaded to QMUL Open Access Data repository at the end of the study. Study results will be published in peer-reviewed journals and presented at academic conferences. A report summarising key findings will be prepared for the NCL Cancer Alliance and 'Q Exchange' and shared with participants should they request this. The results will be used to develop a resource pack for MDTs to directly translate evidence from this study into improved effectiveness of virtual and hybrid MDT meetings, funded by a grant from The Health Foundation's 'Q Exchange' programme.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Not applicable—this is a research protocol and therefore no data are currently available.

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Appendix 1 – Cancer MDTM Research – Interview topic guide - V0.8 23 Nov 2021



MDTM Participant Interview Topic Guide

Introduction for participants [5-10 minutes]

The purpose of this interview is to explore your experiences and views of the impact of changing from face-to-face to virtual cancer multi-disciplinary team (MDT) meetings during the COVID-19 pandemic.

Interviewer will then talk through participant information sheet (V0.7 15 March 2022), answer any questions and invite participant to give verbal consent using the consent form (V0.4 17 February 2022).

MDT meetings in a virtual environment [10 minutes]

This interview is about your experience of participating in virtual MDT meetings during the pandemic, in comparison to face-to-face MDT meetings.

1. In general, how do you find working in the virtual MDT meeting environment?
 - What **differences** are there between virtual and face-to-face MDT meetings?
 - How well do you feel the team has **adapted** to working in a virtual MDT meeting compared to a face-to-face MDT meeting?
 - What do you think **works well** about virtual MDT meetings compared to face-to-face MDT meetings? What do you think does not work as well?
 - Are there any other disadvantages of a virtual MDT meeting compared to a face-to-face MDT meeting?
 - Is there anything you would **change** about the way virtual MDT meetings are run?
2. What **functions**, beyond its primary function of managing a patient's cancer, does the MDT meeting serve?
 - Do these functions differ between face-to-face and virtual meetings?
 - How has the shift from face-to-face to virtual MDT meetings changed the ability of the MDT to perform its functions? And why?
3. If you could choose between virtual MDT meetings or face-to-face MDT meetings, which would you choose? Why?
4. What experience do you have with **hybrid MDT** meetings?
 - If you were to move to a hybrid meeting mode, which parts of virtual MDT meetings would you choose to keep? Which parts of face-to-face?
 - What are the benefits (if any) of hybrid MDT meetings compared to virtual or face-to-face? What about any disadvantages?

Interacting with the team: I'd now like to talk to you about how you and other members of the MDT interact during the meeting [15 – 20 minutes]

1. What do you see as **your role** in the MDT meeting?
2. How does **your role** in the virtual MDT meeting compare to your role in a face-to-face MDT meeting?
 - Do you have any additional tasks you are expected to perform in the virtual compared to the face-to-face MDT meeting?

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- Are any parts of your role easier or more difficult? Why?
 - How do you feel about these changes?
3. In what ways, if any, has your **ability to perform** your role in the MDT meeting been impacted by the change from a face-to-face to a virtual setting?
 - Are there any differences in your ability to concentrate?
 - Are there any differences in how easily you become distracted? Differences in types of distraction?
 - Are there any differences in the way you interact with other members of the MDT meeting? Why do you think that is?
 - Are there any differences in how comfortable you feel contributing to discussions during the MDT meeting?
 - How does the way you contribute to discussions during a virtual MDT meeting compare to a face-to-face meeting? Why do you think that is?
 4. How do you think you could be **best supported** to enable you to perform your role effectively in a virtual MDT meeting? Is there anything that needs to change or that should stay the same?
 5. In what ways, if any, has the shift from face-to-face meetings affected the way the MDT meeting is chaired?
 - Have these differences had a **positive or negative** impact on the functioning of the team? In what ways?
 6. What is the **atmosphere** like in the virtual MDT meeting compared to a face-to-face MDT meeting?
 - What do you think creates this atmosphere?
 - What do you think could improve the atmosphere in the virtual MDT meeting?
 - How freely do you feel MDT members are able to speak during virtual MDT meetings compared to face-to-face meetings? Is this affected by any characteristics of MDT members?
 - How do different professional groups interact in the team? Do you think this is different in virtual compared to face-to-face MDT meetings?
 7. To what extent do you feel the team is open to **exploring innovative treatment or management approaches** during MDT meetings? Does this differ in a virtual MDT meeting compared to a face-to-face MDT meeting?
 - What barriers are there to exploring new approaches in a virtual MDT meeting compared to in a face-to-face MDT meeting?
 - How comfortable would you feel suggesting new or innovative ideas in a virtual MDT meeting, compared to in a face-to-face MDT meeting?
 8. What happens when there are **disagreements** during the MDT meeting? Does this happen more or less frequently in virtual compared to face-to-face MDT meetings?
 - How comfortable would you feel expressing viewpoints that disagree with other members of the MDT, in a virtual MDT meeting compared to a face-to-face MDT meeting?
 - What factors influence your decision to share opposing opinions during a virtual MDT meeting compared to in a face-to-face MDT meeting?
 - Are there any differences in how disagreements are managed in virtual compared to face-to-face MDT meetings?

Decision-making processes: I'd like to now focus specifically on how decisions are made within the MDT meeting [15 - 20 minutes]

Orientation

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1. How does the way that information about each patient/case is presented in a virtual MDT meeting compare to a face-to-face MDT?
 - How often do you experience issues in viewing/receiving that information during a virtual MDT? What types of issues? Are these issues different to those experienced during face-to-face meetings?
 - Can you suggest any ways of improving the way the information is presented during virtual MDT meetings?

Discussion

2. Who facilitates the discussion of each case/patient? How do they manage that discussion in a virtual MDT meeting compared to in a face-to-face meeting?
 - To what extent do you feel everybody's view is considered during the decision-making process?
 - What factors affect this? Do these factors differ between the face-to-face and virtual setting?
 - Has the virtual setting affected the balance of whose voice is heard?
 - In what ways, if any, do you think this affects the group dynamic?
3. Is there anything you think doesn't get discussed enough during a virtual MDT meeting? How does this compare to a face-to-face meeting?
 - Is there anything you think less time should be spent on?
 - How do you think that balance could be improved?

Decision

4. How does the team come to a final decision about a case/patient?
 - Is this affected by the characteristics of the case/patient being discussed?
 - Are there any differences in this process in a virtual MDT meeting compared to a face-to-face meeting?
5. Are there times when the team does not come to a decision? Why is this?
 - How often is this due to the team being unable to come to an agreement?
 - How often does this happen in virtual compared to face-to-face MDT meetings? Why do you think this is?
 - How do you think this could be addressed to ensure more decisions are made?
6. How do you think the quality of clinical decisions made in a virtual MDT meeting compares to those made in a face-to-face MDT meeting? Why?

In summary

7. To conclude this section, could you reflect on what could be improved about the way decisions are made in a virtual MDT meeting?
8. Are there any aspects of working in a virtual MDT meeting that you think could be applied to face-to-face meetings to improve MDT decision-making?
9. To what extent do you think that moving to a hybrid MDT meeting format could affect decision-making compared to virtual or face-to-face meetings?
 - In what ways (if any) do you think it might improve decision-making?
 - In what ways (if any) do you think it might impair decision-making?
 - How do you think these issues could be addressed to support better decision-making?

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Meeting infrastructure [2-3 minutes]

1. Thinking about the virtual environment, are there any aspects that we have not already discussed that influence the way the team interacts during MDT decision-making?

Interview close [2-3 minutes]

1. **Finally, is there anything else you would like to share relating to your experience of participating in virtual MDT meetings?**

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022



MDTM Research Questionnaire

*This questionnaire will be hosted on Online Surveys. Table columns marked * will not be included in the survey and are included here for review purposes only. The order and formatting of questions may change.*

Thank you for agreeing to take part in this survey as part of the study:

Changing from face-to-face to virtual meetings during the COVID-19 pandemic: exploring the impact on cancer multi-disciplinary team (MDT) meetings.

| Question # | Question | Response options | Who asked* | Construct being measured* |
|---|---------------------------------------|---|------------|---------------------------|
| SECTION 1: About you and basic information | | | | |
| 1 | What is your email address? | Freetext | ALL | Characteristics |
| 2 | In which Cancer Alliance do you work? | Drop down list of all Cancer Alliances in England | ALL | Characteristics |
| 3 | What is your gender? | <input type="radio"/> Female <input type="radio"/> Male <input type="radio"/> Other (please state) <input type="radio"/> Prefer not to say | ALL | Characteristics |
| 4 | What is your age? | <input type="radio"/> 18-30 <input type="radio"/> 31-45 <input type="radio"/> 46-60 <input type="radio"/> 61+ <input type="radio"/> Prefer not to say | ALL | Characteristics |
| 5 | What is your ethnicity? | <input type="radio"/> Select from 16 ONS categories <input type="radio"/> Prefer not to say | ALL | Characteristics |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|------------|---|---|------------|---------------------------|
| 6 | Which type(s) of cancer does your MDT manage? ¹ (Select all types managed by your MDT) | Drop down list of all cancer types (option to select more than one) | ALL | Characteristics |
| 7 | Do you currently act as an MDT lead? | <input type="radio"/> Yes <input type="radio"/> No | ALL | Characteristics |
| 8 | What is your role in cancer MDT meetings? ¹ (Select all that apply) | <input type="radio"/> Administrator <input type="radio"/> Clinical Oncologist <input type="radio"/> Endoscopist <input type="radio"/> Interventional Radiologist <input type="radio"/> Manager <input type="radio"/> MDT lead <input type="radio"/> MDT co-ordinator <input type="radio"/> Medical Secretary <input type="radio"/> Medical Oncologist <input type="radio"/> Oncology CNS <input type="radio"/> Nuclear Radiologist <input type="radio"/> Nurse Practitioner <input type="radio"/> Pathologist <input type="radio"/> Patient representative <input type="radio"/> Radiologist <input type="radio"/> STT CNS <input type="radio"/> Surgeon <input type="radio"/> Other – specify | ALL | Characteristics |
| 9a | <p>In this study, we are using the following definitions:</p> <ul style="list-style-type: none"> • Virtual MDT meetings are meetings where all members attend the meeting virtually (i.e. no face-to-face meeting). • Face-to-face MDT meetings are meetings where all members attend the meeting face-to-face. • Hybrid MDT meetings are meetings conducted with some members attending face-to-face and others joining virtually. <p>Using these definitions, what was the format of the majority of your cancer MDT meetings before the pandemic?¹</p> | <input type="radio"/> Virtual <input type="radio"/> Face-to-face <input type="radio"/> Hybrid (a combined virtual and face-to-face meeting) | ALL | Characteristics |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|----------------------------|--|--|------------|---------------------------|
| 9b | Using these definitions, what is the format of the majority of your cancer MDT meetings currently ? ¹ | <ul style="list-style-type: none"> ○ Virtual ○ Face-to-face ○ Hybrid (a combined virtual and face-to-face meeting) | ALL | Characteristics |
| 10 | Overall, to what extent do you feel virtual cancer MDT meetings result in the optimum treatment management decisions being made for each patient, when compared to face-to-face meetings? ¹ | <ul style="list-style-type: none"> ○ Much better treatment management decisions are made in virtual cancer MDT meetings ○ Slightly better treatment management decisions are made in virtual cancer MDT meetings ○ No difference ○ Slightly better treatment management decisions are made in face-to-face cancer meetings ○ Much better treatment management decisions are made in face-to-face meetings | ALL | Characteristics |
| SECTION 2: The Team | | | | |
| 11 | In your experience, on average, how well-attended are virtual cancer MDT meetings when compared to face-to-face cancer MDT meetings? ¹ | <ul style="list-style-type: none"> ○ Attendance is higher in virtual cancer MDT meetings ○ Attendance is the same ○ Attendance is lower in virtual cancer MDT meetings ○ Not sure | ALL | The Team – attendance |
| 12 | How likely is it that you would attend the whole of a virtual cancer MDT meeting (not just relevant parts), when compared with face-to-face cancer MDT meetings? ¹ | <ul style="list-style-type: none"> ○ More likely to attend the whole meeting if virtual ○ Equally likely ○ More likely to attend whole meeting if face-to-face | ALL | The Team – attendance |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|--|---|--|-------------------------------|--|
| 13 | Thinking about MDT member attendance at each cancer MDT meeting, how well-represented is your clinical speciality during virtual meetings, when compared with face-to-face meetings? ⁵ | <ul style="list-style-type: none"> ○ Better representation of my specialty in virtual meetings ○ About the same ○ Better representation of my specialty in face-to-face meetings | ALL from clinical specialties | The Team – disciplinary composition |
| SECTION 3: Organisation and logistics | | | | |
| 14a | Is the amount of time you <u>need to spend preparing</u> for each cancer MDT meeting different for virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ² | <ul style="list-style-type: none"> ○ Yes, I need less time to prepare for a virtual meeting ○ No, I need the same time ○ Yes, I need more time to prepare for a virtual meeting | LEAD | Organisation and logistics – preparation |
| 14b | Is the amount of time <u>you have available</u> for that preparation for each cancer MDT meeting different for virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ² | <ul style="list-style-type: none"> ○ Yes, I have less time available to prepare for virtual meetings ○ No, I have the same time ○ Yes, I have more time available to prepare for virtual meetings | LEAD | Organisation and logistics – preparation |
| 15 | How often does the meeting over-run to complete the agenda during virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ¹ | <ul style="list-style-type: none"> ○ Virtual meetings over-run more often ○ Equally often ○ Face-to-face meetings over-run more often | ALL | Organisation and logistics – timing and streamlining |
| 16 | How often is the meeting agenda organised to prioritise discussion of more complex cases during virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ¹ | <ul style="list-style-type: none"> ○ More often have a prioritised agenda during virtual cancer MDT meetings ○ Equally likely ○ More often have a prioritised agenda during face-to-face meetings | ALL | Organisation and logistics – timing and streamlining |
| 17 | How much time do you have to discuss each patient during virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ⁵ | <ul style="list-style-type: none"> ○ More time per patient ○ About the same time per patient ○ Less time per patient | ALL | Organisation and logistics – timing and streamlining |
| 18 | In how much depth are you able to discuss each patient during virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ³ | <ul style="list-style-type: none"> ○ More depth of discussion per patient | ALL | Organisation and logistics – timing and streamlining |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|--|---|--|------------|---|
| | | <ul style="list-style-type: none"> ○ About the same depth of discussion per patient ○ Less depth of discussion per patient | | |
| SECTION 4: Meeting infrastructure | | | | |
| 19a | How often have problems with technology negatively affected your participation in virtual cancer MDT meetings? ¹ | <ul style="list-style-type: none"> ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always | ALL | Infrastructure – resource and equipment |
| 19b | What problems with technology do you routinely experience in virtual cancer MDT meetings? (Select all that apply) ¹ | <ul style="list-style-type: none"> ○ Logging on ○ Wifi stability ○ Audio quality ○ Visual quality ○ Other – please specify | ALL | Infrastructure – resource and equipment |
| 20 | When attending virtual or hybrid cancer MDT meetings, how often does the organisation you work for provide <u>access to a room or space</u> with appropriate privacy to join a cancer MDT meeting virtually? ¹ | <ul style="list-style-type: none"> ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always | ALL | Infrastructure – resource and equipment |
| 21 | When attending virtual or hybrid cancer MDT meetings, how often does the organisation you work for provide <u>access to appropriate equipment</u> to join a cancer MDT meeting virtually? ¹ | <ul style="list-style-type: none"> ○ Never ○ Rarely ○ Sometimes ○ Often ○ Always | ALL | Infrastructure – resource and equipment |
| SECTION 5: Governance | | | | |
| 22 | How confident do you feel chairing a cancer MDT meeting virtually, when compared to face-to-face? ⁴ | <ul style="list-style-type: none"> ○ More confident ○ Same confidence ○ Less confident | LEAD | Governance – chairing |
| 23 | Have you had any prior training in chairing cancer MDT meetings, either face-to-face or virtually? ⁴ | <ul style="list-style-type: none"> ○ Yes, I have had training in chairing of virtual MDT meetings only ○ Yes, I have had training in chairing of face-to-face MDT meetings only ○ Yes, I have had training in chairing for BOTH virtual and face-to-face MDT meetings | LEAD | Governance – chairing |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|-----------------------------------|--|---|------------|---------------------------|
| | | <ul style="list-style-type: none"> ○ No, I have never had training in chairing MDT meetings | | |
| 24 | Does the MDT record/log any operational problems and serious incidents (e.g. persistent failure of IT, failure of transfer of information/images in time, failure to act on critical results etc.)? ¹ | <ul style="list-style-type: none"> ○ Yes, always ○ Yes, sometimes ○ No, not usually ○ No, never ○ Unsure | LEAD | Governance – audit |
| 25 | Is your virtual cancer MDT meeting performance audited through an annual MDT review meeting? ¹ | <ul style="list-style-type: none"> ○ Yes ○ No ○ Unsure | LEAD | Governance – audit |
| 26 | Are patient outcomes following virtual cancer MDT meetings audited through an annual MDT review meeting? ¹ | <ul style="list-style-type: none"> ○ Yes ○ No ○ Unsure | LEAD | Governance – audit |
| 27 | Are there any other processes in place to monitor and evaluate your virtual cancer MDT meeting performance in addition to, or instead of, an annual MDT review meeting? ¹ | <ul style="list-style-type: none"> ○ Yes ○ No ○ Unsure | LEAD | Governance – audit |
| 27b | (If yes to previous question) If yes, what monitoring and evaluation processes are in place for your virtual cancer MDT meeting performance? ¹ | Freetext | LEAD | Governance – audit |
| 28 | Do you have any suggestions for how virtual cancer MDT performance could be more effectively monitored or audited to inform quality improvement? ¹ | Freetext | LEAD | Governance – audit |
| 29 | Following virtual cancer MDT meetings, are all MDT decisions and outcomes checked by a clinical member of the team before being finalised? ² | <ul style="list-style-type: none"> ○ Yes, always ○ Yes, sometimes ○ No, not usually ○ No, never ○ Unsure | LEAD | Governance – audit |
| 30 | Do you feel there is adequate ‘sign-off’ and follow-up of MDT outcomes after virtual cancer MDT meetings, to ensure actions are completed? ² | <ul style="list-style-type: none"> ○ Yes, always ○ Yes, sometimes ○ No, not usually ○ No, never ○ Unsure | LEAD | Governance – audit |
| SECTION 6: Decision-making | | | | |

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| Question # | Question | Response options | Who asked* | Construct being measured* |
|------------|--|---|------------|-----------------------------------|
| 31 | How often are you able to access all relevant patient details (e.g., clinical information, scan images) during virtual cancer MDT meetings? ³ | <ul style="list-style-type: none"> <input type="radio"/> Never <input type="radio"/> Rarely <input type="radio"/> Sometimes <input type="radio"/> Often <input type="radio"/> Always | ALL | Decision-making – orientation |
| 32 | How clearly are you able to view relevant patient information (e.g., clinical information, scan images, pathology specimens) during virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ³ | <ul style="list-style-type: none"> <input type="radio"/> More clearly <input type="radio"/> About the same <input type="radio"/> Less clearly | ALL | Decision-making – orientation |
| 33 | How able are you to concentrate throughout virtual cancer MDT meetings, when compared with face-to-face cancer MDT meetings? ¹ | <ul style="list-style-type: none"> <input type="radio"/> My concentration is better <input type="radio"/> My concentration is the same <input type="radio"/> My concentration is worse | ALL | Decision-making – orientation |
| 34 | How well are you able to interact with other specialists during virtual cancer MDT meetings, when compared with face-to-face MDT meetings? ³ | <ul style="list-style-type: none"> <input type="radio"/> Better <input type="radio"/> About the same <input type="radio"/> Not as well | ALL | Decision-making – discussion |
| 35 | How comfortable do you feel contributing to discussions about patients during virtual cancer MDT meetings, when compared to face-to-face meetings? ¹ | <ul style="list-style-type: none"> <input type="radio"/> More comfortable <input type="radio"/> About the same <input type="radio"/> Less comfortable | ALL | Decision-making – discussion |
| 36 | How often do you contribute to the decisions made about patients during virtual cancer MDT meetings, when compared with face-to-face meetings? ⁵ | <ul style="list-style-type: none"> <input type="radio"/> More often <input type="radio"/> About the same <input type="radio"/> Less often | ALL | Decision-making – decision |
| 37a | Does the process by which a final decision is agreed upon in a virtual MDT meeting depend on how complex the case discussion is? ¹ | <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> To some extent <input type="radio"/> No | ALL | Decision-making – case-complexity |
| 37b | (If answered 'Yes' or 'To some extent' to previous question) How are final decisions agreed for more complex cases compared to simpler cases in virtual MDT meetings? ¹ | Freetext | ALL | Decision-making – case-complexity |
| 38 | How does complexity in each of the following domains affect the amount of time spent discussing a case during virtual cancer MDT meetings, when compared to face-to-face-meetings? ^{1,6} | <i>See below:</i> | ALL | Decision-making – case-complexity |
| 38a | Pathology of the tumour | <ul style="list-style-type: none"> <input type="radio"/> More time spent in virtual meetings <input type="radio"/> About the same | ALL | Decision-making – case-complexity |
| 38b | Psychosocial characteristics of the patient | <ul style="list-style-type: none"> <input type="radio"/> More time spent in face-to-face meetings | ALL | Decision-making – case-complexity |

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

| Question # | Question | Response options | Who asked* | Construct being measured* |
|---|---|--|------------|---|
| 38c | Physical characteristics of the patient | | ALL | Decision-making – case-complexity |
| 38d | Treatment factors (e.g., uncertainty, toxicity, lack of pathway) | | ALL | Decision-making – case-complexity |
| 39a | Are there any differences in how services for the patient are co-ordinated following a virtual MDT meeting compared to a face-to-face MDT meeting? ¹ | <input type="radio"/> Yes <input type="radio"/> No | ALL | Decision-making – implementation |
| 39b | (If answered yes to previous question) What differences are there? ¹ | Freetext | ALL | Decision-making – implementation |
| SECTION 7: Advantages, disadvantages and recommendations | | | | |
| 40 | Can you suggest three improvements that could be made to virtual cancer MDT meetings? ¹ | Freetext | ALL | Advantages, disadvantages and recommendations |
| 41 | If you could choose between virtual MDT meetings, hybrid MDT meetings or face-to-face MDT meetings, which would you choose? ¹ | <input type="radio"/> Face-to-face only <input type="radio"/> Hybrid meetings <input type="radio"/> Virtual only | ALL | |
| 42 | What are the three most important advantages of virtual cancer MDT meetings compared to face-to-face meetings? ¹ | Freetext | ALL | |
| 43 | What are the three most important disadvantages of virtual cancer MDT meetings compared to face-to-face meetings? ¹ | Freetext | ALL | |
| 44 | What, if any, are the advantages of hybrid cancer MDT meetings compared to virtual and face-to-face meetings? ¹ | Freetext | ALL | |
| 5 | What, if any, are the disadvantages of hybrid cancer MDT meetings compared to virtual and face-to-face meetings? ¹ | Freetext | ALL | |
| Results | | | | |
| 46 | Would you like to receive an email with the results of the survey and/or any resulting publications? ¹ | <input type="radio"/> Yes <input type="radio"/> No | ALL | Results |
| 47 | Would you be willing to be contacted about taking part in an interview with a researcher (by telephone or MS Teams) to explore your experiences of virtual and hybrid MDT meetings? | <input type="radio"/> Yes <input type="radio"/> No | ALL | Results |

You've finished!

Thank you very much for taking the time and thought to contribute to this survey.

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Appendix 2b. Cancer MDTM Research – Validated Questionnaire - V0.4 29 June 2022

Question sources:

- 1 New/original
- 2 Wording adapted from: Mughal M, Goodman J. MDT Improvement Report. 2017.
- 3 Wording adapted from: Rajasekaran RB, Whitwell D, Cosker TDA, Gibbons CLMH, Carr A. Will virtual multidisciplinary team meetings become the norm for musculoskeletal oncology care following the COVID-19 pandemic? - experience from a tertiary sarcoma centre. *BMC Musculoskelet Disord.* 2021 Jan 5;22(1):18. doi: 10.1186/s12891-020-03925-8. PMID: 33402136; PMCID: PMC7784619
- 4 Unknown
- 5 New/original but based on themes of framework and observational tools used in: Soukup T, Lamb BW, Morbi A, Shah NJ, Bali A, Asher V, et al. A multicentre cross-sectional observational study of cancer multidisciplinary teams: Analysis of team decision making. *Cancer Med.* 2020;9(19):7083–99.
- 6 Based on constructs in the MeDiC tool: Soukup T, Morbi A, Lamb BW, Gandamihardja TAK, Hogben K, Noyes K, Skolarus TA, Darzi A, Sevdalis N, Green JSA. A measure of case complexity for streamlining workflow in multidisciplinary tumor boards: Mixed methods development and early validation of the MeDiC tool. *Cancer Med.* 2020 Jul;9(14):5143-5154. doi: 10.1002/cam4.3026. Epub 2020 May 31. PMID: 32476281; PMCID: PMC7367630.

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022



MDT Whole Meeting Observation Proforma

Complete this form once per meeting

| | | | | | | |
|---------|--|---------------------|--|--|-------------------|--|
| Site ID | | Date of observation | | | Observer initials | |
|---------|--|---------------------|--|--|-------------------|--|

| | | | | | | | |
|--------------------|--|------------------|--|--------------------------|--|-----------------------|--|
| Meeting start time | | Meeting end time | | Scheduled meeting length | | Actual meeting length | |
|--------------------|--|------------------|--|--------------------------|--|-----------------------|--|

The Team

| | | | |
|-------------------------|---|------------------------------------|--|
| Meeting chair assigned? | <input type="checkbox"/> Yes <input type="checkbox"/> No | If yes, state job role (free text) | |
|-------------------------|---|------------------------------------|--|

Date data entry to database completed: _____ Initials of person completing data entry _____

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

| Meeting attendees | Number present during meeting at each timepoint | | | | | | | | Contribution to discussion | | |
|-------------------------------|---|----|----|----|-----|-----|-----|-------------|----------------------------|-------|-------|
| | Minutes | | | | | | | | Notes | Score | Notes |
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | Expand mins | | 1-5 | |
| Total number | | | | | | | | | | | |
| MDT Lead/Chair | | | | | | | | | | | |
| Specialist surgeon | | | | | | | | | | | |
| Oncologist | | | | | | | | | | | |
| Radiologist | | | | | | | | | | | |
| Histopathologist | | | | | | | | | | | |
| Cancer Nurse Specialist | | | | | | | | | | | |
| MDT Co-ordinator | | | | | | | | | | | |
| Other (describe-free text): | | | | | | | | | | | |
| Other (describe – free text): | | | | | | | | | | | |
| Other (describe – free text): | | | | | | | | | | | |

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

Meeting infrastructure

| | | | | |
|--|------------------------------------|--------------------------------------|---|--|
| Which video-conferencing software is being used to host the virtual MDT meeting? | <input type="checkbox"/> Zoom | <input type="checkbox"/> GoToMeeting | <input type="checkbox"/> Microsoft Teams | |
| | <input type="checkbox"/> BlueJeans | <input type="checkbox"/> Skype | <input type="checkbox"/> Other (please state) | |

Organisation and logistics

| | | | |
|-----------------------------------|---|---|---|
| Number of patients on the agenda: | <input type="checkbox"/> Not stated during meeting <input type="checkbox"/> Stated during meeting (if so, state number below): | Were any patients on the agenda not discussed at the meeting? | <input type="checkbox"/> Yes (if yes, state number below): <input type="checkbox"/> No <input type="checkbox"/> Not clear to researcher |
|-----------------------------------|---|---|---|

| | | | |
|--|---|--|--|
| Is there discussion of the re-prioritisation of cases on the agenda at the start of the meeting? | <input type="checkbox"/> Yes <input type="checkbox"/> No | If yes, which factors are discussed to inform the prioritisation? (describe - free text) | |
| Is virtual meeting etiquette introduced by the chair at the start of the meeting? <i>i.e. instruction to keep on mute, cameras on/off</i> | <input type="checkbox"/> Yes <input type="checkbox"/> No | If yes, describe (free text) | |

| | | | | |
|---|---|---------------------------------------|---|--|
| Does the chair explain how members should indicate when they wish to contribute during the meeting? | <input type="checkbox"/> Yes <input type="checkbox"/> No | If yes, are contributions invited by: | <input type="checkbox"/> Hand raise function <input type="checkbox"/> Free to speak at will <input type="checkbox"/> Other (describe) | |
|---|---|---------------------------------------|---|--|

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

| | | |
|--|---|--|
| How are contributions made by MDT members to the discussion? | <input type="checkbox"/> Only verbally <input type="checkbox"/> Typed into chat function <input type="checkbox"/> Both <input type="checkbox"/> Other (describe) | |
| How are meeting decisions recorded? | <input type="checkbox"/> Dictated by chair to designated scribe but not visible to members (describe job role of scribe) <input type="checkbox"/> Dictated by chair to designated scribe with outcome projected to members (describe job role of scribe) <input type="checkbox"/> Dictated by chair and recorded by transcription software, but transcription not visible to members <input type="checkbox"/> Dictated by chair and recorded by transcription software with transcription projected to members <input type="checkbox"/> Chair states and records decision themself <input type="checkbox"/> Not clear to researcher <input type="checkbox"/> Other (describe) | |
| When are decisions recorded? | <input type="checkbox"/> At end of each case discussion <input type="checkbox"/> After the meeting <input type="checkbox"/> Not clear to researcher <input type="checkbox"/> Other (describe) | |
| Who records meeting decisions? | <input type="checkbox"/> Chair <input type="checkbox"/> MDT Co-ordinator <input type="checkbox"/> Unclear to researcher <input type="checkbox"/> Other (describe) | |

Date data entry to database completed: _____ Initials of person completing data entry _____

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

Field notes: observations and reflections on the meeting as a whole

| | |
|---|---|
| Changes in decision-making process | Changes in atmosphere and dynamics |
| Relative contributions of members (sex, age, specialism, other factors?) | Joining and leaving the meeting (who, how often, impact) |
| Adherence to etiquette protocol | Impact and management of case-complexity |
| Patient information (access, sharing, visibility) | Impact and management of technical issues |

Date data entry to database completed: _____ Initials of person completing data entry _____

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

Field notes: observations and reflections on the meeting as a whole*Free text observations*

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022



MDTM Case-by-Case Observation Proforma

Complete this form for every case/patient discussed at the virtual MDT meeting being observed

| | | | | | |
|---------|--|---------------------|--|-------------------|--|
| Site ID | | Date of observation | | Observer initials | |
|---------|--|---------------------|--|-------------------|--|

| | | | | | |
|-----------------|--|---------------|--|-----------------|--|
| Case start time | | Case end time | | Total case time | |
|-----------------|--|---------------|--|-----------------|--|

| | |
|-----------------------------------|---|
| Case previously discussed by MDT? | <input type="checkbox"/> Stated during meeting that this case has previously been discussed at the MDT |
| | <input type="checkbox"/> Stated during meeting that this case has not previously been discussed at the MDT |
| | <input type="checkbox"/> Not stated/unclear to researcher |
| | <input type="checkbox"/> Other (describe) |

MDT-MODE (Metric for the Observation of Decision-making)

| # | Point | Information (1-5) | | | | | Patient-view | Outcome Y/D/N |
|---|-------|-------------------|-------|------|---------|----------|--------------|------------------|
| | | Hx | X-ray | Path | Psy/soc | Comorbid | | |
| | | | | | | | | |

Date data entry to database completed: _____ Initials of person completing data entry _____

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

Decision-making

| | | |
|--|--|--|
| How was the final decision arrived at? | <input type="checkbox"/> Delegating <input type="checkbox"/> Voting <input type="checkbox"/> Consensus <input type="checkbox"/> Unclear <input type="checkbox"/> Other (describe) | |
| Any disagreements/challenges during the decision-making process? | <input type="checkbox"/> Yes (describe nature anonymously) <input type="checkbox"/> No | |
| Did the chair verbally summarise and explicitly seek agreement on the final decision from the MDT? | <input type="checkbox"/> Yes, verbally summarised and agreement explicitly sought <input type="checkbox"/> Verbally summarised but agreement not explicitly sought <input type="checkbox"/> Agreement explicitly sought but decision not verbally summarised <input type="checkbox"/> Decision not verbally summarised, and agreement not explicitly sought | |
| Final decision agreed by all? | <input type="checkbox"/> Yes – each member agreed explicitly (verbal or typed assent*) <input type="checkbox"/> Yes – agreement assumed by absence of dissent <input type="checkbox"/> Yes – mixed methods of agreement (some members agreed explicitly by verbal or typed assent*; some by absence of dissent) <input type="checkbox"/> No – not all members agreed with the final decision <input type="checkbox"/> Unclear to researcher <input type="checkbox"/> Other (describe) | |

*Or another mode of expression requested by the Chair – in this case, please describe in box to the right

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Meeting infrastructure

| | | |
|---|--|--|
| Any technical issues observed during presentation of information ? | <input type="checkbox"/> No issues <input type="checkbox"/> Unable to present information/share screen with group <input type="checkbox"/> Unable to connect to/access information being presented at all <input type="checkbox"/> One or more person unable to view information being presented clearly <input type="checkbox"/> One or more person unable to hear information being presented clearly <input type="checkbox"/> Other (describe) | |
| Any technical issues observed during discussion ? | <input type="checkbox"/> No issues <input type="checkbox"/> One or more person unable to be heard clearly <input type="checkbox"/> One or more person unable to be seen clearly <input type="checkbox"/> Other (describe) | |
| Any technical issues observed during final decision-making reporting ? | <input type="checkbox"/> No issues <input type="checkbox"/> Unable to record decision in the planned/usual format <input type="checkbox"/> Other (describe) | |

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Cancer MDTM Research - Observation Proformas V0.8 31 Mar 2022

Field notes on factors impacting team ability to make a decision:

Team atmosphere (e.g. sociability, openness to suggestion, tension and conflict, disrespect, equal participation)

Team member participation in discussion
(relative contributions - surgeon, oncologist, nurse, radiologist, histopathologist, MDTC)

Case complexity

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Field notes on factors impacting team ability to make a decision:*Free text*

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Cancer MDTM Research Analysis Plan (Interventional and Research Studies)

| | |
|--------------------|--|
| Study Title | Changing from face-to-face to virtual meetings during the COVID-19 pandemic: exploring the impact on cancer multidisciplinary (MDT) meetings |
| Chief Investigator | Dr Samantha Quaife |
| IRAS number: | 307410 |
| Date Created: | 27 January 2022 |

| | |
|----------------|-----------------------------------|
| Version Number | 2.0 |
| Authors | Daisy McInnerney, Samantha Quaife |

| Version Number | Date | Reason for change |
|----------------|-------------|--|
| 1.0 | 08 Feb 2022 | n/a |
| 2.0 | 22 Mar 2022 | <p>4.1.1 Page 4 (Interviews): The words 'for analysis' added and 'email' and telephone numbers' removed from list of data items collected</p> <p>4.1.2 Page 4 (Questionnaire): The words 'for analysis' added and 'email address' was removed from list of data items collected</p> <p>4.1.3 Page 6 (Observations): The words 'for analysis' added</p> <p>6.1 (Descriptive information) Page 8: wording simplified; clarified table would report 'aggregated' numbers</p> <p>6.2. Page 9 (Primary endpoint): Change from Bonferroni correction for multiple comparisons (questionnaire analysis) as can be overly stringent; set alpha value for statistical significance at 0.01 as alternative. Also clarified chi-square analyses will be run to compare any associations between MDT member's demographics, membership type (e.g. role) and responses to quantitative items; and to compare any associations between Cancer Alliance and response to quantitative items. The option to use logistic regression to test adjusted associations was also included in the event a large enough sample size is achieved.</p> |



1. Introduction, study design and aims

The primary aim of this mixed-methods study is to explore how the change from face-to-face to virtual MDT meetings during the COVID-19 pandemic may have impacted the effectiveness of group decision-making in cancer MDT meetings. In addition, the study will aim to explore the following:

- To explore cancer MDT members' experiences of changing to, and participating in, virtual MDT meetings.
- To identify aspects of MDT meeting preparation, governance and engagement introduced by the change to virtual hosting, that improve either the experience or perceived effectiveness of group decision-making that could be retained for service improvement.

Full details of the study are given in the protocol. Briefly, participants are cancer MDT members in England. There are three parallel phases to the study:

- Semi-structured interviews with cancer MDT members
- A national cross-sectional survey of cancer MDT members
- Observations of cancer MDT meetings

See protocol for full description of data collection tool development. The findings will be used to co-produce pragmatic resource packs with MDTs representatives and patient representatives, to support MDT working. In doing so, these findings ultimately have the potential to improve cancer care for patients and the MDT working environment for healthcare professionals.

2. Study end points

2.1. Primary endpoint

- Factors influencing the effectiveness of group decision-making in cancer MDT meetings (interpreted as themes from qualitative data and quantified with quantitative data)

2.2. Secondary endpoints

- Experience of participating in virtual MDT meetings.
- Changes in MDT meeting preparation, governance, and engagement which should inform service improvement.

3. Sample size

3.1. Interviews

A sample of up to 40 participants will be recruited for the in-depth qualitative interviews, depending on data saturation (i.e., the point when no new themes are being interpreted from the data). This number has been chosen to ensure that the sample is representative of factors likely to affect participants' skillset and experience of virtual MDT meetings, including role/membership (chair/coordinator/core), discipline (CNS/radiologists/ oncologists/surgeons), and demographics (age).

3.2. Questionnaire

The questionnaire will be sent to all MDT leads, coordinators, and members within the NEL and NCL Cancer Alliance networks. We will also extend this to MDT members of cancer alliances within other regions of England but base our sample size on the NEL and NCL cancer alliances. With approximately 200 MDTs across these networks and an anticipated 50% responsiveness, we expect to be able to approach the members of 100 MDTs to invite them to complete the questionnaire. Each MDT will have at least 5 members



(range 5-25 across local and specialist MDTs). Factoring in a conservative 38% questionnaire response rate from MDT leads in a previous report (1), we anticipate achieving a minimum sample of 190 respondents. Based on the advice of Professor Stephen Duffy (Statistician), with 190 participants, if 50% report a specific outcome, the expected 95% CI on this would be 42-58%. For 70%, the 95% CI would be expected to be 63-77%. For 90%, the 95% CI would be expected to be 85-95%. Therefore, 190 would confer acceptable precision of estimation, though we expect to achieve a larger sample.

3.3. Observation

A minimum of six MDT meetings will be observed, including specialist (e.g., Urology, Gynaecology, Head & Neck) and local (e.g., Breast, Colorectal, Upper Gastrointestinal) MDTs. These include some of the same MDTs observed prior to the pandemic by Professor Mughal's (collaborator) previous report (1) as it may be possible to qualitatively describe differences across the two sets of observational data. This is a resource intensive, in-depth method of study to collect exploratory data. The diversity of observed meetings is the most critical consideration for determining the sample, to ensure it is representative of a diverse multidisciplinary workforce across different MDTs (with respect to cancer type and specialist/local composition).

4. Data

4.1. Data items

4.1.1. Interviews

The data items obtained for analysis will include the following:

Characteristics and eligibility form before interview

Time taking part in cancer MDT meetings
NHS Trust
Type of cancer MDT concerns
Primary specialty or discipline
Role in cancer MDT meetings
Gender
Age
Ethnicity

Interview:

Audio-recording of interview
Transcription of audio-recording (source data)

4.1.2. Questionnaire

The data items obtained for analysis on the online questionnaire will include the following:

Basic information

Cancer Alliance working within
Gender
Age
Ethnicity
Type of cancer managed by MDT
MDT lead – Y/N
Role in cancer MDT meetings
Format of majority of MDT meetings pre-pandemic
Format of majority of MDT meetings currently
Perception of treatment management decision quality in virtual vs face-to-face MDT meetings



The Team

Overall attendance of virtual compared to face-to-face MDT meetings
 Likelihood of attending whole virtual meeting compared to face-to-face MDT meetings
 Representation of clinical speciality at virtual meeting compared to face-to-face MDT meetings

Organisation and logistics

Amount of time needed to spend preparing for virtual meeting compared to face-to-face MDT meetings
 Amount of time available to spend preparing for virtual meeting compared to face-to-face MDT meetings
 Frequency of virtual meetings that overrun compared to face-to-face MDT meetings
 Frequency of agenda prioritisation in virtual compared to face-to-face MDT meetings
 Time to discuss each patient in virtual compared to face-to-face MDT meetings
 Depth of discussion of each patient in virtual compared to face-to-face MDT meetings

Meeting infrastructure

Frequency of technology problems negatively affecting participation in virtual compared to face-to-face meetings
 Types of technology problem routinely experienced in virtual MDT meetings
 Frequency of having access to appropriate room or space to join virtual or hybrid MDT meeting
 Frequency of having access to appropriate equipment to join virtual or hybrid MDT meeting

Governance

Confidence chairing a virtual compared to face-to-face MDT meeting
 Prior training in chairing MDT meetings virtually and face-to-face
 Recording of operational problems/serious incidents during MDT meetings
 Audit of virtual cancer MDT meeting performance
 Audit of patient outcomes following virtual cancer MDT meeting
 Processes to monitor and evaluate virtual cancer MDT meetings
 (Free text) Additional processes to monitor and evaluate virtual cancer MDT meetings
 (Free text) Suggestions for how virtual cancer MDT performance could be monitored/audited
 Checking and finalisation of MDT decisions following virtual MDT meetings
 Adequacy of sign off and follow up of MDT outcomes following virtual MDT meetings

Decision-making

Accessibility of patient details during virtual cancer MDT meetings
 Clarity of patient information during virtual cancer MDT meetings compared to face-to-face meetings
 Concentration throughout virtual cancer MDT meetings compared to face-to-face meetings
 Interaction with other specialists during virtual cancer MDT meetings compared to face-to-face meetings
 Comfort contributing to discussions about patients during virtual cancer MDT meetings compared to face-to-face meetings
 Frequency of contributions to decisions being made about patients during virtual cancer MDT meetings compared to face-to-face meetings
 Dependency of decision-making process on complexity in virtual MDT meetings
 (Free text) Decision-making process for complex cases compared to simple cases
 Effect of complexity in the following domains on time spent discussing case:
 Pathology of the tumour
 Psychosocial characteristics of patient
 Physical characteristics of patient
 Treatment factors
 Differences in patient service co-ordination following virtual MDT meeting compared to face-to-face meeting
 (Free text) Description of differences

Advantages and disadvantages

(Free text) Three improvements that could be made to virtual cancer MDT meetings
 Preference between virtual, hybrid and face-to-face MDT meetings



(Free text) Three most important advantages of virtual cancer MDT meetings compared to face-to-face meetings

(Free text) Three most important disadvantages of virtual cancer MDT meetings compared to face-to-face meetings

(Free text) What, if any, are the advantages of hybrid cancer MDT meetings compared to virtual and face-to-face meetings

(Free text) What, if any, are the disadvantages of hybrid cancer MDT meetings compared to virtual and face-to-face meetings

Follow up preference

Prefer to be followed up (Y/N)

4.1.3. Observations

The data items obtained for analysis on the electronic proformas will include the following:

Whole-meeting observation proforma:

Meeting start time

Meeting end time

Scheduled meeting length

Actual meeting length

The Team

Meeting chair assigned (Y/N) and job role (free text)

Meeting attendees present:

During meeting introduction

Join part-way through

Meeting infrastructure

Video-conferencing platform being used to host

Organisation and logistics

Presentation of meeting agenda (Y/N)

Number of patients on the agenda

Number of patients discussed during the meeting

Discussion of case prioritisation (Y/N)

Factors informing prioritisation (free text)

Virtual meeting etiquette discussed (Y/N)

Description of etiquette (free text)

Explanation from chair of how members should indicate they wish to participate (Y/N)

Method of inviting contributions (if other, free text)

Method of member contributions (if other, free text)

Recording of meeting decisions: how

Recording of meeting decisions: who

Field notes to capture:

Changes in decision making process

Changes in atmosphere and dynamics

Relative contributions of members

Joining and leaving the meeting

Adherence to etiquette protocol

Impact and management of case-complexity

Patient information (access, sharing, visibility)

Impact and management of technical issues

Observations and reflections on the meeting as a whole

**Case-by-case observation proforma:**

Case start time
Case end time
Total case time

MDT-MODe (2):

Provision of (score 1-5):

Case history
Radiological images
Histopathological information
Psychosocial issues
Co-morbidities
Patient view

Discussion quality (score 1-5)

Chair
Members

Outcome (Y/D/N)

Decision-making:

Method of making final-decision (if other, free text)
Disagreements/challenges (if yes, free text)
Final decision agreed by all
Implementation plan discussed and agreed by all

Meeting infrastructure:

Technical issues during information presentation (if other, free text)
Technical issues during discussion (if other, free text)
Technical issues during decision-reporting (if other, free text)

Field notes to capture:

Team atmosphere
Team member participation (relative contributions)
Case complexity
Factors affecting team ability to make a decision

5. Missing data

All attempts will be made to minimise any missing data.

In the questionnaire, all quantitative questions will be mandatory (with the option to answer 'Prefer not to say' for special category data). Only complete questionnaire responses will be included in the analysis.

MDTs will be observed by four researchers wherever possible to minimise information-recording burden to improve reliability of data recording. A minimum of two researchers will observe each meeting to improve reliability of recording. All observing researchers will be trained in using the proforma to ensure they are as familiar as possible with the data collection tools. In the event any items are not completed during data collection, the number of observed meetings on which each result is based will be reported. Missing data will be continually monitored to identify if there are any problematic measures which need to be adjusted or removed.

6. Statistical and qualitative analyses



The statistical analysis will be carried out by Queen Mary University of London. The computer programme SPSS (version 24 or above) will be used. As this is a mixed-methods study, findings from the descriptive quantitative and statistical analyses will be triangulated with findings from the qualitative analysis following the methods described below. Qualitative analysis will be carried out using the computer programme NVIVO (version 11 or above).

6.1. Descriptive information - participant characteristics

Descriptive data reported will include the numbers accrued in the recruitment process for the interview and questionnaire, including:

- Number invited (estimated based on number of invitations sent, and mailing list membership)
- Numbers screened for eligibility in the interview phase
- Number providing informed consent
- Number completing data collection.

Descriptive data reported for the observation will include number of MDTs invited to take part, number of MDT meetings observed, and type of cancer MDT concerns. A table of aggregated numbers and percentages of demographic characteristics will be reported for participants in the interview and questionnaire, reporting:

- Time taking part in cancer MDT meetings
- NHS Trust (interview) or Cancer Alliance (Questionnaire)
- Type of cancer MDT concerns
- Primary specialty or discipline
- Role in cancer MDT meetings
- Gender
- Age
- Ethnicity

6.2. Primary endpoint

The analysis population for this is the recruited population.

To guide the triangulation of mixed-methods data to meet the primary end-point, we have developed a preliminary conceptual framework based on National Cancer Action Team MDT guidelines (3), the functional perspective of group-decision making (4), the ODDI model of decision making (5), and the NHS England MDT streamlining guidelines (6). The conceptual framework defines broad categories within which factors that influence the effectiveness of group-decision can be grouped. Table 1 shows this preliminary conceptual framework.

Table 1. Frameworks and guiding constructs

| Functional perspective (see Soukup 2017) | Internal factors | External circumstances | | | Interaction processes | | Decision-making | | Case-complexity | Repeated consecutively |
|--|------------------|----------------------------|------------------------|------------|-----------------------|------------|-----------------|----------------|-----------------|------------------------|
| NCAT domains (2010) | The Team | Organisation and logistics | Meeting infrastructure | Governance | Decision-making | | | | | |
| ODDI model (Forsyth, 2014) | | | | | Orientation | Discussion | Decision | Implementation | | |
| NHS Streamlining Guidelines (2010) | | Streamlining SOCs | | Audit | | | | | | |

Qualitative data from the observations, interviews and questionnaire will be analysed using Applied Thematic Analysis (7). Data will initially be deductively coded to constructs within the conceptual framework, and inductively coded within each construct to generate themes or categories. The conceptual framework will be iteratively adapted based on interpretation of the qualitative data. Initial coding will be carried out by one



Researcher with a sub-set of randomly selected transcripts independently coded. There will be multiple opportunities for team discussion, disagreement, and iteration of the emerging coding framework.

Quantitative data from the questionnaire and observation proformas will be analysed descriptively to examine the frequency of each type of response. This will be presented as percentages in graphs and tables, and mapped to the constructs in the conceptual framework (following the categories described in Section 4.1.2 and 4.1.3 respectively).

Unadjusted associations between MDT member's demographics, membership type (e.g. role), Cancer Alliance and responses to quantitative items will be tested using Chi-squared analyses, and, if a large enough sample size is achieved, adjusted associations will be tested using logistic regression. A more stringent alpha level of 0.01 will be used to determine statistical significance, due to multiple testing.

7. Secondary endpoint

7.1. Experience of participating in virtual MDT meetings

Qualitative data from the interviews and free-text data from the questionnaire specifically relating to individuals' perceived experiences of participating in virtual MDT meetings will be analysed using applied thematic analysis.

7.2. Changes in MDT meeting preparation, governance, and engagement which should inform service improvement

The findings from the analyses described in Sections 6.2 and 7.1 will be used to inform the development of a set of practical recommendations to optimise virtual cancer MDT meetings. It will be highlighted where these recommendations may also translate to other MDT meeting formats (e.g., hybrid and face-to-face). The development of recommendations will be an iterative, discursive process led by the CI and Research Team in collaboration with all members of the Study Management Group.

8. Presentation of analysis

Before reporting for publication, the results will be discussed and agreed in full with the Study Management Group.



9. References

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